DEPARTMENT OF THE INTERIOR
HUBERT WORK, Secretary

UNITED STATES GEOLOGICAL SURVEY
GEORGE OTIS SMITH, Director

Water-Supply Paper 534

SURFACE WATER SUPPLY OF THE UNITED STATES

1921

PART XII. NORTH PACIFIC SLOPE DRAINAGE BASINS

C. LOWER COLUMBIA RIVER BASIN AND PACIFIC SLOPE DRAINAGE BASINS IN OREGON

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Prepared in cooperation with the States of OREGON and WASHINGTON

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SURFACE WATER SUPPLY OF LOWER COLUMBIA RIVER AND PACIFIC SLOPE DRAINAGE BASINS IN OREGON, 1921

AUTHORIZATION AND SCOPE OF WORK

This volume is one of a series of 14 reports presenting results of measurements of flow made on 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 the following authority contained in the organic law (20 Stat. L., p. 394):

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

The work was begun in 1888 in connection with special studies relating to irrigation in the arid West. Since the fiscal year ending June 30, 1895, successive sundry civil bills passed by Congress have carried the following items 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 ended June 30, 1895–1922

1895	$12,500.00
1896	20,000.00
1897 to 1900, inclusive	50,000.00
1901 to 1902, incusive	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 the execution of the work many private and State organizations have cooperated either by furnishing data or by assisting in collecting data. Acknowledgments for cooperation of the first kind are made in connection with the description of each station affected; 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 are made at other points. In connection with this work data were also collected in regard to precipitation, evaporation, storage reservoirs, river profiles, and water power in many sections of the country and will be made available in 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 a certain class of work. These terms may be divided into two groups—(1) those that represent a rate of flow, as second-feet, gallons per minute, miners' inches, and discharge in second-feet per square mile, and (2) those that represent the actual quantity of water, as run-off in inches, acre-feet, and millions of cubic feet. The principal terms used in this series of reports are second-feet, second-feet per square mile, run-off in inches, and acre-feet. They may be defined as follows:

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

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

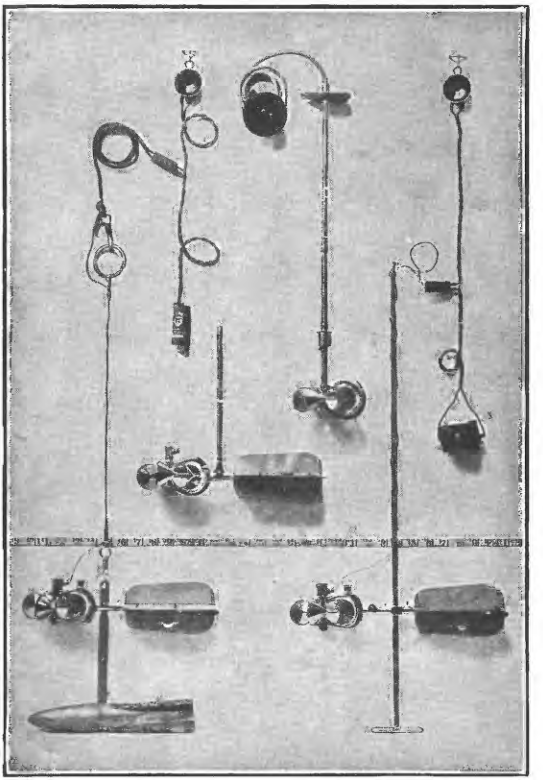
"Run-off in inches" is the depth to which an area would be covered if all the water flowing from it in a given period were uniformly distributed on the surface. It is used for comparing run-off with rainfall, which is usually expressed in depth in inches.

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

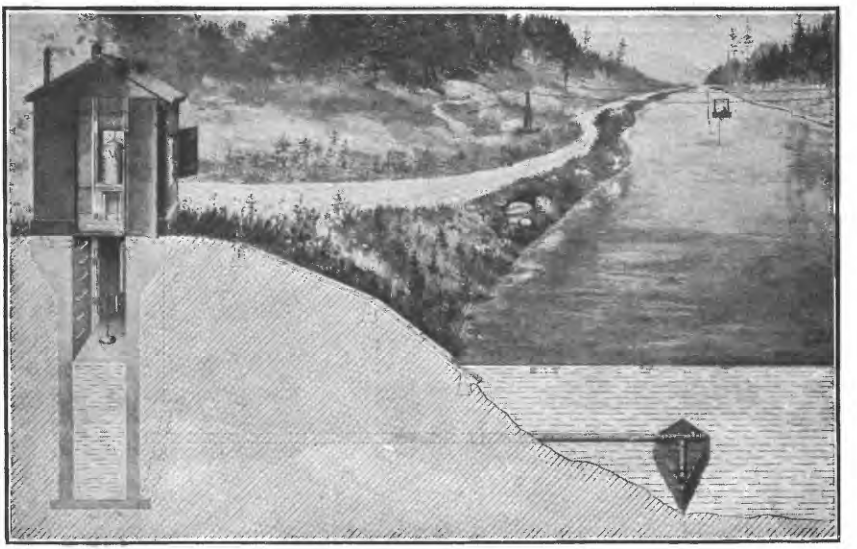
The following terms not in common use are here defined:

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

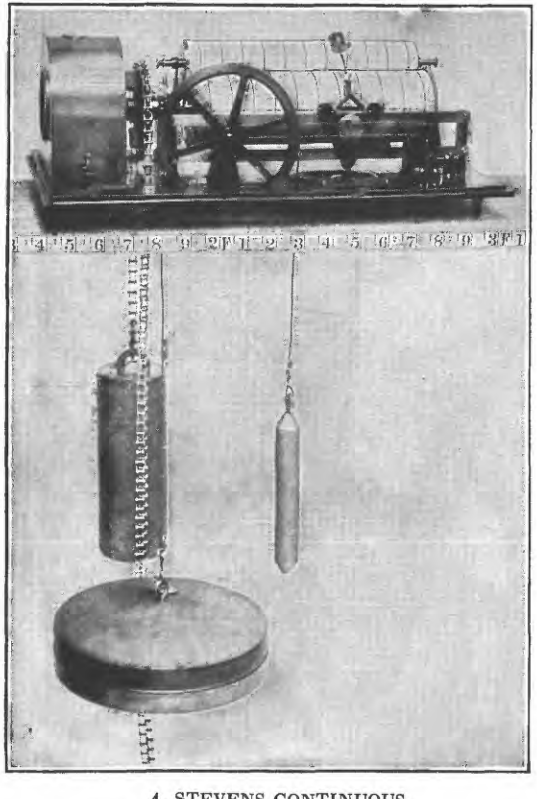
"Control," a term used to designate the section or sections of the stream below the gage which determines the stage-discharge relation at the gage. It should be noted that the control may not be the same section or sections at all stages.



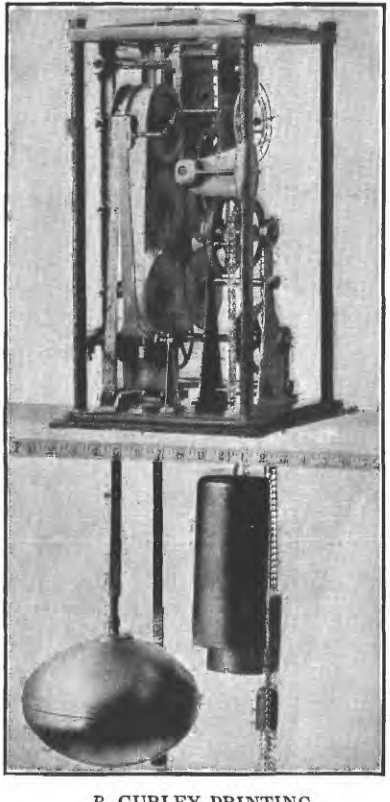
A. PRICE CURRENT METERS.



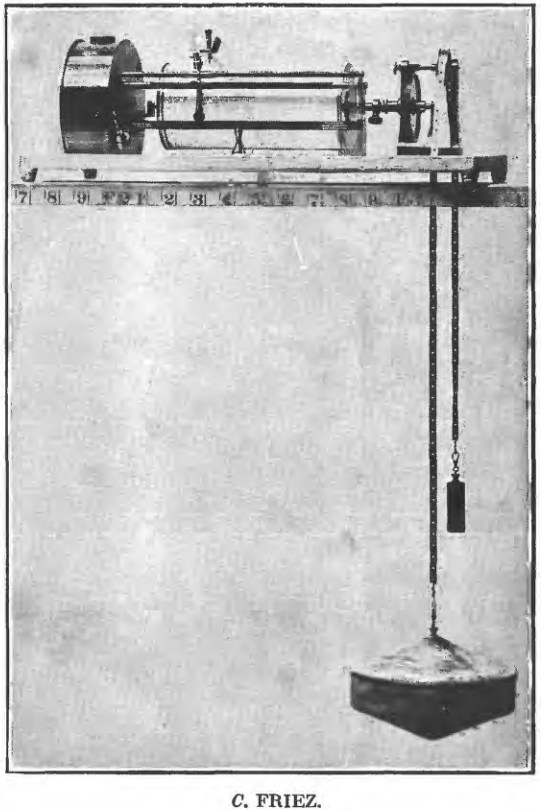
B. TYPICAL GAGING STATION.



A. STEVENS CONTINUOUS.



B. GURLEY PRINTING.



C. FRIEZ.

WATER-STAGE RECORDERS.

The "point of zero flow" for a 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 beginning of January in most parts of the United States much of the precipitation in the preceding three months is stored as ground water in the form of snow or ice, or in ponds, lakes, and swamps, and this stored water passes off in the streams during the spring break-up. At the end of September, on the other hand, the only stored water available for run-off is possibly a small quantity in the ground; therefore the run-off for 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. (See Pls. I, II.) The general methods are outlined in standard textbooks on the measurement of river discharge.

From the discharge measurements rating tables are prepared that give the discharge for any stage. The application of the daily gage heights to these rating tables gives the daily discharge from which the monthly and yearly mean discharge is 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 of the stream, and a table of monthly and yearly discharge and run-off.

If the base data are insufficient to determine the daily discharge, tables giving daily gage 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 control, and the cause and effect of backwater; it gives also information as to diversions that decrease the flow at the gage, artificial regulation, maximum and minimum recorded stages, and the accuracy of the records.

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

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fluctuation the discharge obtained from the rating table and the mean daily gage height may not be the true mean discharge for the day. If such stations are equipped with water-stage recorders the mean daily discharge may be obtained by averaging discharge at regular intervals during the day, or by using the discharge integrator, an instrument operating on the principle of the planimeter and containing as an essential element the rating curve of the station.

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

ACCURACY OF FIELD DATA AND COMPUTED RESULTS

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

A paragraph in the description of the station gives information regarding 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.[1]

For the rating tables "well defined" indicates, in general, that the rating is probably accurate within 5 per cent; "fairly well defined," within 10 per cent; "poorly defined," within 15 to 25 per cent. These notes are very general and are based on the plotting of the individual measurements with reference to the main 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 run-off in inches may be subject to gross errors caused by the inclusion of large noncontributing districts in the measured drainage area, by lack of information concerning water diverted for irrigation or other use, or by inability to interpret the effect of artificial regulation of the flow of the river above the station. "Second-feet per square mile" and "Run-off

[1] For a more detailed discussion of the accuracy of stream-flow data see Grover, N. C., and Hoyt, J. C., Accuracy of stream-flow data: U. S. Geol. Survey Water-Supply Paper 400, pp. 53–59, 1916.

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 in earlier reports by the Survey should be used with caution because of possible inherent sources of error not known to the Survey.

Many gaging stations on streams in the irrigated areas of the United States are situated 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 prepiously 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 investigation 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, annual reports, and monographs.

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 basins.
II. South Atlantic 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 Missippi River basin.
VIII. Western Gulf of Mexico basins.
IX. Colorado River basin.
X. Great basin.
XI. Pacific basins in California.

Part 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 furnish lists giving prices.

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

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

Boston, Mass., 2500 Customhouse.
Albany, N. Y., 704 Journal Building.
Trenton, N. J., State House.
Asheville, N. C., 316 Jackson Building.
Chattanooga, Tenn., 37 Municipal Building.
Columbus, Ohio, Brown Hall, Ohio State University.
Chicago, Ill., 624 South Michigan Avenue.
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., 45–46 Federal Building.
Denver, Colo., 403 Post Office Building.
Salt Lake City, Utah, 313 Federal Building.
Idaho Falls, Idaho, 228 Federal Building.
Boise, Idaho, 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 pages 7 and 8.

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	
B 140	Descriptions, measurements, gage heights, ratings, and monthly discharge (also many data covering earlier years).	1895.
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 table following 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 contains 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	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII		
												North Pacific slope basins		
	North Atlantic slope basins (St. John River to York River)	South Atlantic and eastern Gulf of Mexico basins (James River to the Mississippi)	Ohio River basin	St. Lawrence River basin	Hudson Bay and upper Mississippi River basins	Missouri River basin	Lower Mississippi River basin	Western Gulf of Mexico basin	Colorado River basin	Great Basin	Pacific slope basins in California	Pacific slope basins in Washington and upper Columbia River basin	Snake River basin	Lower Columbia River basin 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] 179, 173	174	175, [s] 177	176, [r] 177	177	178	178	[t] 177, 178
1906	[n] 201, [o] 202, [p] 203	[p] 203, 204	205	206	207	208	[k] 205, 209	210	211	212, [r] 213	213	214	214	214
1907–8	241	242	243	244	245	246	247	248	249	250, [r] 251	251	252	252	252
1909	261	262	263	264	265	266	267	268	269	270, [r] 271	271	272	272	272
1910	281	282	283	284	285	286	287	288	289	290	291	292	292	292
1911	301	302	303	304	305	306	307	308	309	310	311	312	312	312
1912	321	322	323	324	325	326	327	328	329	330	331	332–A	332–B	332–C
1913	351	352	353	354	355	356	357	358	359	360	361	362–A	362–B	362–C
1914	381	382	383	384	385	386	387	388	389	390	391	392	393	394
1915	401	402	403	404	405	406	407	408	409	410	411	412	413	414
1916	431	432	433	434	435	436	437	438	439	440	441	442	443	444
1917	451	452	453	454	455	456	457	458	459	460	461	462	463	464
1918	471	472	473	474	475	476	477	478	479	480	481	482	483	484
1919–20	501	502	503	504	505	506	507	508	509	510	511	512	513	514
1921	521	522	523	524	525	526	527	528	529	530	531	532	533	534

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

COOPERATION

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

Cooperation with the States is affected 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.

Acknowledgments are due to Percy A. Cupper, State engineer of Oregon, and to Henry Landes, State geologist of Washington, 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 use of data gathered exclusively for them and paid for by them, and to the United States Weather Bureau for hydrographic and climatic data.

Special acknowledgments are due for financial assistance rendered by municipalities, corporations, and individuals, as follows: Water masters for Umatilla, Crook, and Deschutes counties, water bureau of the city of Portland; Tumalo project of the State of Oregon; John Day Irrigation District; Teel Irrigation District; Ochoco Irrigation District; Suttle Lake Irrigation District; East Fork Irrigation District; Talent Irrigation District; Medford Irrigation District; Horse Heaven Irrigation District; Jefferson County Conservancy District; Pacific Power & Light Co.; Central Oregon Irrigation Co.; Arnold Irrigation Co.; Northwestern Electric Co.; Portland Railway, Light & Power Co.; North Coast Power Co.; California-Oregon Power Co.; Rogue River Valley Canal Co.; and M. A. Moody.

DIVISION OF WORK

Data for stations in Oregon and Washington, except those in the Cowlitz River basin in Washington, were collected and prepared for publication under the direction of F. F. Henshaw, district engineer, assisted by G. H. Canfield, J. W. Bones, K. N. Phillips, and Wendell Dawson.

The data for the stations in the Cowlitz River basin in Washington were collected and prepared for publication under the direction of G. L. Parker, district engineer, assisted by D. J. Calkins, R. B. Kilgore, John McCombs, and C. C. Osborne.

GAGING-STATION RECORDS

COLUMBIA RIVER AT THE DALLES, OREG.

LOCATION.—In NW. ¼ sec. 3, T. 1 N., R. 13 E., at foot of Court Street at The Dalles, 18 miles below Deschutes River, and above Hood and Klickitat rivers.

DRAINAGE AREA.—237,000 square miles.

RECORDS AVAILABLE.—June 1, 1878, to September 30, 1921. Maximum stages 1858 to 1877.

GAGE.—Vertical staff in sections spiked to the piling of viaduct connecting Regulator Dock with the warehouse; read by W. D. Crichton for the United States Weather Bureau.

Elevation of datum of gage is 46.36 feet (adjustment of primary level net, 1912).

DISCHARGE MEASUREMENTS.—In 1903, made by United States Army engineers with rod floats and meter from a steamer; in 1907, 1923, and 1924 by United States Geological Survey engineers with meter from a launch; in 1908, flood measurements by United States Geological Survey engineers 2,000 feet below gage at The Dalles; in 1910 and 1913, measurements by United States Geological Survey engineers on Columbia River above Snake River and on Snake River referred to The Dalles gage, allowance being made for intervening tributaries.

CHANNEL AND CONTROL.—Rocky and permanent at the rapids at Cascade Locks the control for all three gages.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 42.4 feet June 11 (discharge, 773,000 second-feet); minimum stage recorded, 2.7 feet December 25 to 28 (discharge, 86,600 second-feet).

1857–1921: Maximum stage recorded, 59.6 feet at 2 p. m. June 6, 1894 (discharge, 1,170,000 second-feet); minimum stage recorded, −4.0 feet on gage at Cascade Locks December 17, 1919 (discharge, 47,000 second-feet, revised).

WINTER FLOW.—Stage-discharge relation not affected by ice.

DIVERSIONS.—Quantity of water diverted for irrigation is large in the aggregate but constitutes only a small proportion of the total flow; the low-water flow, which comes in the winter, is little affected.

REGULATION.—None.

ACCURACY.—Stage-discharge relation practically permanent. Rating curve well defined; below 100,000 second-feet it is based on 1923–24 low-water measurements. Gage read to tenths once daily. Daily discharge ascertained by applying daily gage readings to rating table. Records excellent.

A discharge measurement was made June 9 to 11, 1921, by the United States Army engineers at Vancouver, Wash.; discharge 735,000 second-feet; inflow from The Dalles to Vancouver measured and estimated, 12,000 second-feet, discharge at The Dalles 723,000 second-feet; weighted mean gage height at The Dalles 41.3 feet.

Daily discharge, in second-feet, of Columbia River at The Dalles, Oreg., for the year ending Sept. 30, 1921

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	122,000	120,000	117,000	115,000	97,300	144,000	187,000	254,000	649,000	509,000	237,000	140,000
2	124,000	118,000	115,000	144,000	95,500	147,000	187,000	254,000	649,000	501,000	236,000	138,000
3	123,000	116,000	112,000	178,000	96,400	155,000	190,000	252,000	662,000	495,000	230,000	137,000
4	122,000	114,000	110,000	170,000	97,300	168,000	192,000	251,000	684,000	479,000	226,000	136,000
5	122,000	112,000	107,000	180,000	95,500	177,000	201,000	251,000	700,000	467,000	219,000	135,000
6	128,000	110,000	106,000	183,000	93,800	195,000	211,000	255,000	716,000	453,000	212,000	134,000
7	131,000	107,000	106,000	169,000	92,200	213,000	206,000	260,000	734,000	437,000	208,000	128,000
8	131,000	104,000	105,000	160,000	92,200	268,000	198,000	275,000	743,000	418,000	205,000	121,000
9	132,000	102,000	102,000	151,000	94,600	205,000	185,000	294,000	750,000	403,000	202,000	117,000
10	135,000	100,000	99,100	141,000	102,000	195,000	178,000	315,000	762,000	388,000	198,000	116,000
11	138,000	98,200	101,000	129,000	113,000	188,000	176,000	322,000	773,000	376,000	194,000	113,000
12	138,000	96,400	101,000	121,000	124,000	183,000	176,000	332,000	766,000	370,000	190,000	110,000
13	136,000	95,500	101,000	118,000	140,000	177,000	180,000	347,000	757,000	359,000	185,000	105,000
14	138,000	93,800	100,000	117,000	154,000	172,000	187,000	363,000	746,000	344,000	183,000	104,000
15	142,000	92,200	96,400	115,000	178,000	166,000	199,000	376,000	736,000	334,000	178,000	103,000
16	142,000	92,200	95,500	112,000	185,000	163,000	213,000	390,000	732,000	323,000	174,000	102,000
17	142,000	94,600	94,600	107,000	176,000	176,000	218,000	422,000	713,000	311,000	170,000	101,000
18	143,000	100,000	93,000	108,000	169,000	190,000	219,000	465,000	688,000	310,000	168,000	98,200
19	144,000	102,000	92,200	108,000	161,000	220,000	218,000	511,000	655,000	305,000	166,000	97,300
20	143,000	114,000	91,400	110,000	155,000	251,000	219,000	551,000	631,000	300,000	164,000	96,400
21	142,000	124,000	89,000	110,000	148,000	240,000	227,000	587,000	605,000	291,000	163,000	94,600
22	141,000	128,000	87,400	114,000	141,000	230,000	239,000	613,000	585,000	283,000	161,000	93,000
23	138,000	131,000	87,400	114,000	137,000	222,000	249,000	624,000	570,000	273,000	160,000	92,200
24	136,000	129,000	87,400	112,000	136,000	211,000	273,000	640,000	562,000	267,000	157,000	93,000
25	134,000	118,000	86,600	106,000	136,000	208,000	295,000	651,000	558,000	267,000	156,000	93,800
26	131,000	122,000	86,600	101,000	137,000	205,000	287,000	666,000	555,000	258,000	154,000	94,600
27	128,000	125,000	86,600	98,200	138,000	204,000	278,000	677,000	549,000	254,000	152,000	93,800
28	128,000	122,000	86,600	99,100	140,000	202,000	267,000	690,000	539,000	249,000	151,000	93,800
29	125,000	120,000	93,000	97,300	-------	195,000	260,000	702,000	528,000	246,000	148,000	92,200
30	123,000	121,000	104,000	96,400	-------	191,000	254,000	690,000	520,000	245,000	146,000	89,800
31	121,000	-------	114,000	96,400	-------	187,000	-------	668,000	-------	242,000	143,000	-------

Monthly discharge of Columbia River at The Dalles, Oreg., for the year ending Sept. 30, 1921

[Drainage area, 237,000 square miles]

Month	Discharge in second-feet				Run-off	
	Maximum	Minimum	Mean	Per square mile	Inches	Acre-feet
October	144,000	121,000	133,000	0.561	0.65	8,180,000
November	131,000	92,200	111,000	.468	.52	6,600,000
December	117,000	86,600	98,500	.416	.48	6,060,000
January	183,000	96,400	125,000	.527	.61	7,690,000
February	185,000	92,200	129,000	.544	.57	7,160,000
March	251,000	144,000	193,000	.814	.94	11,900,000
April	295,000	176,000	219,000	.924	1.03	13,000,000
May	702,000	251,000	450,000	1.90	2.19	27,700,000
June	773,000	526,000	661,000	2.79	3.11	39,300,000
July	509,000	242,000	347,000	1.46	1.68	21,300,000
August	237,000	143,000	182,000	.768	.89	11,200,000
September	140,000	89,800	109,000	.460	.51	6,490,000
The year	773,000	86,600	230,000	.970	13.18	167,000,000

TRIBUTARIES OF COLUMBIA RIVER BELOW MOUTH OF SNAKE RIVER

WALLA WALLA RIVER BASIN

WALLA WALLA RIVER NEAR MILTON, OREG.

LOCATION.—In sec. 21, T. 5 N., R. 36 E., half a mile below junction of North and South forks of Walla Walla River and 4 miles above Milton, Umatilla County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—February 13, 1903, to May 29, 1906; March 17, 1918, to September 30, 1919; and March 19, 1920, to September 30, 1921.

GAGE.—Friez water-stage recorder referred to vertical staff; inspected by George Demaris. Staff gage in sec. 11, T. 5 N. R., 35 E., used 1903 to September 30, 1905; staff gage in sec. 14, T. 5 N., R. 35 E. used August 12, 1905, to May 29, 1906.

DISCHARGE MEASUREMENTS.—Made from cable at gage.

CHANNEL AND CONTROL.—Channel straight at cable; curved about 150 feet above and below. Current makes considerable angle with cable at low water, but not at high water. Two channels at extreme high water, with some discharge passing around cable to south where bank is low and brush covered; right bank high and rocky. Control 100 feet below gage, is composed of gravel and small boulders; shifts at high stages.

EXTREMES OF DISCHARGE.—Maximum stage during year from water-stage recorder 3.30 feet at 3 a. m. March 18 (discharge, 1,940 second-feet); minimum stage recorded from water-stage recorder, 0.80 foot September 28 (discharge, 112 second-feet). Discharge probably lower during August when no record is available.

1903–1906; 1918–1921: Highest flood ever known occurred May 30, 1906, discharge 8,130 second-feet, estimated from observation of cross-sections and slope, after flood had subsided; minimum discharge recorded, 95 second-feet July 18, 1918.

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

DIVERSIONS.—A few small canals take water out above station; total area irrigated, only a few hundred acres; some small diversions between sites of present and former gaging stations.

REGULATION.—The Pacific Power & Light Co.'s power plant about 5 miles above this station affects the flow somewhat, especially at low water. Water is ponded in fore bay to some extent.

ACCURACY.—Stage-discharge relation changed during high water of February 12–14 and May 17–18. Rating curves fairly well defined except for period between shifts. Operation of water-stage recorder satisfactory except October 23 to November 20 and July 9 to September 14. Daily discharge obtained by applying to rating table mean daily gage height obtained by inspecting recorder graph. Records good, except estimates for periods of missing records, which are poor.

Discharge measurements of Walla Walla River near Milton, Oreg., during the year ending Sept. 30, 1921

Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*
Nov. 21	Briggs and Perry	1.09	321
Jan. 2	A. E. Perry [a]	2.81	1,700
9	do	1.20	386
Mar. 3	do	2.30	698
May 6	do	1.66	450
June 10	do	1.21	260
21	do	1.00	176
July 16	do	.83	117

[a] Watermaster for Umatilla County.

Daily discharge, in second-feet, of Walla Walla River near Milton, Oreg., for the year ending Sept. 30, 1921

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Sept.
1	126		253	700	197	535	420	570	380	157	
2	137		234	1,270	164	566	460	528	376	155	
3	200		220	1,080	172	664	486	492	376	153	
4	167		220	813	200	700	430	492	376	143	
5	150		197	736	194	535	390	465	344	137	
6	141		184	566	210	427	362	498	322	129	
7	150		181	468	214	357	348	570	322	126	
8	137		175	397	238	286	344	540	294	123	115
9	135		175	368	336	257	353	570	274		
10		170	178	322	1,220	238	385	570	258		
11			191	304	1,590	217	420	570	258		
12	140		191	295	1,420	184	430	570	242	122	
13			191	282	1,170	158	410	570	238		
14			184	265	1,170	153	400	635	222		
15	170		175	282	664	146	380	670	210		129
16	170		172	286	458	359	360	780	202	120	123
17	172		167	318	359	1,220	348	705	195		120
18	178		164	512	290	1,440	366	670	195		123
19	167		167	489	234	990	415	705	183		159
20	161		164	402	210	670	455	705	180		153
21	161	322	161	354	194	540	860	705	172		140
22	156	336	156	313	214	480	1,660	670	159		146
23		387	153	286	524	470	1,130	635	162		134
24		328	170	270	566	480	1,040	600	172	115	134
25		290	204	253	524	492	860	600	166		126
26	160	422	197	253	442	465	740	570	166		123
27		529	207	253	392	425	600	504			118
28		402	736	253	437	415	570	445	160		112
29		322	1,030	249	--------	425	670	405			115
30		278	1,370	238	--------	410	670	385			115
31		--------	1,030	207	--------	405	--------	385	--------		--------

NOTE.—Braced figures show estimated mean discharge for period estimated. Mean discharge estimated for August at 110 second-feet. Discharge interpolated April 13–16; July 1 and 2 estimated.

Monthly discharge of Walla Walla River near Milton, Oreg., for the year ending Sept. 30, 1921

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	200	126	155	9,530
November	529	----------	234	13,900
December	1,370	153	297	18,300
January	1,270	207	422	25,900
February	1,590	164	500	27,800
March	1,440	146	487	29,900
April	1,660	344	559	33,300
May	780	385	574	35,300
June	380	----------	236	14,000
July	157	----------	123	7,600
August	----------	----------	[a] 110	6,760
September	159	112	123	7,320
The year	1,660	----------	317	230,000

[a] Estimated.

UMATILLA RIVER BASIN

UMATILLA RIVER ABOVE McKAY CREEK, NEAR PENDLETON, OREG.

LOCATION.—In NW. ¼ sec. 8, T. 2 N., R. 32 E., near track of main line of Oregon-Washington Railroad & Navigation Co., one-fourth mile above mouth of McKay Creek, and 2 miles west of Pendleton, Umatilla County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—May 1 to September 30, 1921. Records at Pendleton, February, 1891, to July, 1892, and May 22, 1903, to March 21, 1906. are directly comparable with those at this station.

GAGE.—Vertical staff gage on left bank. Read by Fred Price.

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

CHANNEL AND CONTROL.—Channel straight 100 yards above and below gage; banks high and are not overflowed. The control is a gravel riffle opposite gage, where at low stages the stream is confined to narrow channel along left bank.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period May 8 to September 30, 4.00 feet May 18 (discharge, 1,510 second-feet); minimum stage recorded, 0.12 foot August 13 (discharge, 16 second-feet).

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

DIVERSIONS.—Water diverted for power at Pendleton is returned to river above this station.

REGULATION.—At low stages there is considerable diurnal fluctuation due to impounding and releasing of water in the power canals of the two flour mills at Pendleton.

ACCURACY.—Stage-discharge relation permanent during period of records. Rating curve fairly well defined above 40 second-feet and poorly defined below. Gage read to hundredths once daily. Daily discharge ascertained by applying daily gage height to rating table. Records good, except during low water when they are poor owing to poor definition of curve below 40 second-feet and large diurnal fluctuation caused by mills at Pendleton.

Discharge measurements of Umatilla River above McKay Creek, near Pendleton, Oreg., during the period May 8 to Sept. 30, 1921

Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*
June 14	E. R. Crocker [a]	1.05	182
23	----do----	.80	115
July 11	J. W. Bones	.41	57

[a] Engineer, U. S. Bureau of Reclamation.

Daily discharge, in second-feet, of Umatilla River above McKay Creek, near Pendleton, Oreg., for the period May 1 to Sept. 30, 1921

Day	May	June	July	Aug.	Sept	Day	May	June	July	Aug.	Sept.
1		430	97	41	33	16	1,160	160	67	25	46
2		415	97	32	33	17	1,160	156	45	25	48
3		400	86	26	37	18	1,510	153	41	29	45
4	1,500	370	83	25	38	19	1,010	153	41	29	45
5		340	83	32	39	20	1,010	149	38	29	45
6		310	83	32	41	21	1,080	138	38	30	83
7		298	75	30	39	22	1,080	130	38	29	81
8	1,240	285	38	29	41	23	940	118	38	28	80
9	1,240	272	38	23	41	24	880	151	37	28	81
10	1,160	235	52	23	42	25	830	145	70	29	81
11	1,160	208	67	22	42	26	740	118	70	29	81
12	1,080	208	67	17	42	27	720	109	67	32	67
13	1,010	196	52	16	44	28	630	104	46	32	60
14	1,010	184	60	22	44	29	525	97	41	32	60
15	1,010	160	67	22	45	30	430	100	41	32	56
						31	430	-------	41	33	-------

NOTE.—Braced figure shows estimated mean discharge for period indicated.

Monthly discharge of Umatilla River above McKay Creek, near Pendleton, Oreg., for the period May 1 to Sept. 30, 1921

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
May	----------	430	1,080	66,400
June	430	97	210	12,500
July	97	37	58.2	3,580
August	41	16	27.8	1,710
September	83	33	52.0	3,090
The period	----------	----------	----------	87,300

UMATILLA RIVER ABOVE FURNISH RESERVOIR, NEAR YOAKUM, OREG.

LOCATION.—In NW. ¼ sec. 17, T. 2 N., R. 31 E., at Oregon-Washington Railroad & Navigation Co.'s bridge one-fourth mile above Campbell flag station, 5 miles by river above Yoakum and old gaging station, and 10 miles west of Pendleton, Umatilla County; just above backwater from Furnish reservoir.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—June 18 to August 28, 1915; July 5, 1916, to September 30, 1921.

GAGE.—Stevens continuous water-stage recorder with inside and outside gages on right of main channel at downstream end of bridge pier, inspected by A. E. Perry, water master.

DISCHARGE MEASUREMENTS.—Made from cable 20 feet above gage or by wading.

CHANNEL AND CONTROL.—Channel straight at bridge; current even; overflow channel extends under west span of bridge; left bank high and rocky; right bank low with some cottonwood and brush. Control is at almost right angle turn to right, about 250 feet below gage and below deep pool and is composed of gravel and free of vegetation; subject to slight shifts.

EXTREMES OF DISCHARGE.—Maximum stage during year from water-stage recorder, 9.9 feet at 8 a. m. January 3 (discharge, 10,000 second-feet); minimum stage 0.24 foot August 12 (discharge, 20 second-feet).

1916–1921: Maximum discharge that of January 3, 1921. Minimum discharge, 16 second-feet, August 19, 1920.

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

DIVERSIONS.—On Umatilla River above gaging station and below mouth of McKay Creek 150 acres are irrigated, and above mouth of McKay Creek 600 acres. On the principal tributaries, 1,750 acres are irrigated on Birch Creek and 1,300 acres on McKay Creek.

REGULATION.—At low stages water is ponded in the power canals of two flouring mills at Pendleton and released at intervals to obtain sufficient power for operating the mills. This causes considerable fluctuation at the station at low stages. There is practically no effect at medium and high stages. The backwater from the Furnish reservoir extends to within a few hundred yards below the control.

ACCURACY.—Stage-discharge relation changed below 5.0 feet during the high water in January and changed again during August. Rating curves and periods of application fairly well defined except for discharges below 40 second-feet during the summer. Water-stage recorder operated fairly satisfactorily, except for short periods. There was no recorder at station and no gage-height record was obtained from October 24 to December 5. Daily discharge ascertained by applying to rating table the mean daily gage height determined from recorder graph by inspection, except for August 12 to September 20, for which the mean daily gage heights were applied to rating table indirectly by method of shifting channel. Discharge for periods of no gage record estimated by comparison with records for other stations. Records good, except for periods of no gage-height record, for which they are fair.

Discharge measurements of Umatilla River above Furnish reservoir, near Yoakum, Oreg., 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. 20	R. C. Briggs	4.24	1,540	May 8	Bones and Perry	4.34	1,580
Dec. 17	A. E. Perry [a]	1.93	339	June 9	Perry and Crocker [b]	2.28	307
Jan. 5	do	6.60	3,510	13	A. E. Perry	1.95	242
Feb. 10	do	7.95	6,280	16	do	1.74	210
27	do	5.10	2,130	23	do	1.24	114
Mar 5	do	6.73	4,080	July 1	do	1.03	86
18	do	7.42	6,160	11	J. W. Bones	.71	51

[a] Water master for Umatilla County.
[b] Engineer, U. S. Bureau of Reclamation.

Daily discharge, in second-feet, of Umatilla River above Furnish reservoir, near Yoakum, Oreg., for the year ending Sept. 30, 1921

Day	Oct.	Nov.	Dec.	Jan	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	75			3,880	675	2,820	1,990	2,580		88	36	33
2	75			5,160	650	3,180	2,180	2,280		86	34	34
3	90		700	7,730	675	3,740	2,480	1,900		82	29	36
4	145			6,970	840	4,650	2,180	1,730		81	27	38
5	141			4,180	750	4,330	1,810	1,650	450	73	26	38
6	119		510	3,180	675	3,320	1,650	1,490		71	27	39
7	103		470	2,480	650	2,580	1,420	1,570		66	24	38
8	96		442	2,080	725	2,080	1,210	1,490		58	22	37
9	95		407	1,730	2,820	1,900	1,180	1,420	345	58	22	37
10	94	250	400	1,420	4,990	1,810	1,280	1,420	328	55	22	38
11	91		400	1,140	6,970	1,730	1,490	1,350	295	53	20	39
12	90			1,070	6,040	1,490	1,570	1,280	265	50	20	45
13	97			1,040	5,330	1,350	1,730	1,210	242	48	22	50
14	105		360	965	5,860	1,280	1,570	1,210	226	44	24	50
15	157			965	4,490	1,180	1,420	1,240	210	41	28	47
16	225			965	4,490	1,900	1,240	1,350	198	44	32	47
17	312		306	930	2,280	5,500	1,140	1,350	184	40	32	42
18	308			1,490	1,990	6,780	1,180	1,280	166	39	31	39
19	318			1,650	1,730	5,330	1,280	1,240	157	37	28	52
20			280	1,420	1,570	3,880	1,570	1,280	145	36	28	76
21	325			1,210	1,490		1,900	1,280	132	36	27	82
22				1,070	1,350		3,740	1,280	122	36	27	80
23				965	1,570	2,800	4,180	1,210	113	36	27	82
24	470	1,200	282	900	2,080		3,060	1,070	122	36	27	80
25			321	810	2,280		2,480	1,000	128	46	28	73
26			396	750	2,280	2,580	2,160	930	117	60	29	64
27	350		424	725	2,180	2,280	1,840	810	111	55	31	64
28			805	725	2,280	2,480	3,180	725	100	47	30	63
29			3,180	725	-------	1,990	3,880	675	94	44	30	60
30			5,680	780	-------	1,990	3,180	600	94	40	36	60
31		-------	6,400	725	-------	1,900	-------	575	-------	37	33	-------

NOTE.—Braced figures show estimated mean discharge for periods indicated. Discharge, Apr. 26, nterpolated.

Monthly discharge of Umatilla River above Furnish reservoir, near Yoakum, Oreg., for the year ending Sept. 30, 1921

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	-------	75	224	13,800
November	-------	-------	630	37,500
December	6,400	-------	884	54,400
January	7,730	725	1,930	119,000
February	6,970	650	2,490	138,000
March	6,780	1,180	2,840	175,000
April	4,180	1,140	2,040	121,000
May	2,580	575	1,310	80,600
June	-------	94	250	14,900
July	88	36	52.4	3,220
August	36	20	27.7	1,700
September	82	33	52.1	3,100
The year	7,730	20	1,050	762,000

UMATILLA RIVER NEAR UMATILLA, OREG.

LOCATION.—In NW. ¼ sec. 21, T. 5 N., R. 28 E., near main line of Oregon-Washington Railroad & Navigation Co., 1½ miles below diversion point of main canal of the west division, Umatilla Project, and 1½ miles above Umatilla, Umatilla County, and mouth of river.

DRAINAGE AREA.—2,130 square miles.

RECORDS AVAILABLE.—October 21, 1903, to September 30, 1921.

GAGE.—Inclined staff in two sections; lower section 2.0 to 3.5 feet, upper 3.5 to 10.8 feet. Read by employees of United States Bureau of Reclamation.

DISCHARGE MEASUREMENTS.—Made from cable or by wading.

CHANNEL AND CONTROL.—Solid rock overlain with coarse gravel or sand. One channel at all stages.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 2.26 feet on gage at diversion dam of West division during afternoon of January 3 (discharge, 8,300 second-feet); minimum stage recorded, 1.70 feet October 5, and October 28 to November 2 (discharge, 1.5 second-feet).

1903–1921: Maximum stage recorded, 11.0 feet May 31, 1906 (discharge 19,600 second-feet); no flow July 25 and August 1–9, 1906.

ICE.—Occasionally shore and floating ice, but stage-discharge relation not materially affected.

DIVERSIONS.—Large part of total flow of river diverted for irrigation above station. The Umatilla project feed canal also diverts water during the winter for storage in the Cold Springs reservoir. The main canal of the West Umatilla project of the United States Bureau of Reclamation diverts just above the station. The low-water flow is return water from the Hermiston project and other irrigated tracts.

REGULATION.—Discharge is occasionally affected by pondage at the West division dam.

ACCURACY.—Stage-discharge relation permanent; affected by drift on control June 21 to July 16. Rating curve fairly well defined. Gage read to half-tenths once daily. Daily discharge ascertained by applying daily gage height to rating table except from June 21 to July 16 when shifting-control method was used. Records good.

Discharge measurements of Umatilla River near Umatilla, Oreg., during the year ending Sept. 30, 1921

Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*
Nov. 24	R. C. Briggs	3.63	785
June 8	E. R. Crocker [a]	2.33	51
July 9	J. W. Bones	2.30	23.4

[a] Engineer, U. S. Bureau of Reclamation.

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

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	93	1.5	580	3,680	580	2,620	1,590	1,970	43	26	19	26
2	93	1.5	625	2,790	535	2,960	1,740	1,820	22	22	17	29
3	93	69	580	7,340	535	2,960	1,820	1,740	18	22	12	26
4	93	80	580	6,480	580	4,050	1,820	995	26	22	14	26
5	1.5	76	535	3,680	580	4,460	1,590	995	26	22	20	33
6	101	58	535	2,960	580	3,680	1,380	995	26	31	12	33
7	93	93	535	2,290	580	2,620	1,310	825	26	26	4.0	33
8	69	69	410	1,820	580	2,960	995	825	43	26	9.8	31
9	58	58	370	1,450	580	2,290	770	825	43	22	7.1	31
10	43	42	295	1,240	2,620	1,820	770	625	43	22	8.0	29
11	43	46	260	995	6,540	1,820	770	625	43	22	17	31
12	26	42	204	770	6,540	1,820	670	670	50	22	26	31
13	26	46	140	670	4,910	1,380	1,310	580	26	22	20	31
14	26	43	123	670	4,680	1,380	1,310	450	26	22	18	35
15	43	43	123	625	5,370	1,380	1,060	450	26	26	22	35
16	46	46	123	625	3,680	995	770	580	26	22	14	26
17	69	43	93	676	2,620	3,680	670	580	26	22	22	17
18	106	80	85	580	2,290	5,830	580	720	29	22	22	17
19	106	260	80	625	1,820	6,790	580	625	22	22	14	17
20	93	410	76	1,180	1,380	4,050	770	625	26	16	14	18
21	93	490	76	1,060	1,380	2,960	995	625	26	14	20	26
22	76	1,180	76	770	1,380	2,620	1,180	625	26	14	20	43
23	93	770	69	720	1,380	2,290	2,960	625	26	7.1	18	46
24	93	770	165	670	1,820	2,290	2,960	580	26	20	22	43
25	150	770	123	625	2,290	2,290	2,790	580	26	24	22	43
26	62	580	165	580	2,290	2,620	1,740	535	26	19	24	62
27	37	770	260	580	2,290	2,290	1,180	535	26	16	26	62
28	1.5	1,520	90	580	2,290	1,820	1,120	140	22	13	31	80
29	1.5	1,240	170	580	-------	1,740	2,290	50	22	14	31	80
30	1.5	880	2,450	580	-------	1,740	2,790	50	22	17	37	80
31	1.5	-------	6,300	580	-------	1,740	-------	50	-------	20	31	-------

NOTE—Daily discharge Jan. 2 and 3 ascertained by applying to rating table for diversion dam the mean of two gage heights observed in morning and afternoon.

Monthly discharge of Umatilla River near Umatilla, Oreg., for the year ending Sept. 30, 1921

Month.	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	106	1.5	62.3	3,830
November	1,520	1.5	353	21,000
December	6,300	69	526	32,300
January	7,340	580	1,560	95,900
February	6,540	535	2,240	124,000
March	6,790	995	2,710	167,000
April	2,960	580	1,410	83,900
May	1,970	50	707	43,500
June	43	18	28.8	1,710
July	31	7.1	20.5	1,260
August	37	4.0	19.2	1,180
September	80	17	37.3	2,220
The year	7,340	1.5	798	578,000

McKAY CREEK NEAR PILOT ROCK, OREG.

LOCATION.—In NE. ¼ sec. 23, T. 1 N., R. 32 E., just above proposed reservoir site, 3 miles above gaging station at proposed dam site, 6 miles northeast of Pilot Rock, and 8 miles south of Pendleton, Umatilla County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—May 7 to August 14, 1921, when station was discontinued.

GAGE.—Vertical staff gage; read by Omer Adkinson.

DISCHARGE MEASUREMENTS.—Made by wading near gage.

CHANNEL AND CONTROL.—Control is at gravel bar 300 feet below gage. One channel at all stages opposite gage but two channels above low stages below gage.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period 2.72 feet May 7 (discharge, 144 second-feet); stream bed dry August 4–14.

DIVERSIONS.—A number of small ditches divert water above station using practically all of the summer flow.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined. Gage read to hundredths once a day. Daily discharge ascertained by applying daily gage height to rating table. Record good.

Discharge measurements of McKay Creek near Pilot Rock, Oreg., during the period May 7 to Aug. 14, 1921

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
May 7	Bones and Crocker [a]	2.72	144	June 14	E. R. Crocker	1.88	5.7
13	do	2.46	80	July 10	J. W. Bones	1.60	.5
June 2	E. R. Crocker	2.05	17.5				

[a] Engineer, U. S. Bureau of Reclamation.

Daily discharge, in second-feet, of McKay Creek near Pilot Rock, Oreg., for the period May 7 to Aug. 14, 1921

Day	May	June	July	Aug.	Day	May	June	July	Aug.
1		30	1.0	0.4	16	70	5.8	0.5	
2		23	.7	.3	17	66	5.8	.5	
3		23	.7	.1	18	54	5.4	.7	
4		21	.7		19	55	5.0	.7	
5		18	.7		20	64	4.7	.7	
6		21	.7		21	68	5.4	.7	
7	144	21	.5		22	68	5.4	.7	
8	126	21	.5		23	63	5.0	.5	
9	126	18	.7		24	59	4.7	.3	
10	108	17	.9		25	50	5.0	.3	
11	102	9.8	1.2		26	48	4.3	.5	
12	99	8.5	1.1		27	42	4.3	.5	
13	88	7.2	.7		28	38	3.5	.5	
14	72	5.8	.7		29	36	2.3	.5	
15	68	5.4	.5		30	35	1.3	.4	
					31	33		.4	

NOTE.—Discharge estimated May 8, 9; no flow Aug. 4–14.

Monthly discharge of McKay Creek near Pilot Rock, Oreg., for the period May 7 to July 31, 1921

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
May 7-31	144	33	71.3	3,540
June	30	1.3	10.6	631
July	1.2	.3	.635	39
The period				4,210

McKAY CREEK NEAR PENDLETON, OREG.

LOCATION.—In sec. 34, T. 2 N. R. 32 E., at proposed dam site 5 miles south of Pendleton, Umatilla County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—October 31, 1918, to September 30, 1921; also May 23, 1903, to July 6, 1904, at a station about 4 miles downstream in section 8.

GAGE.—Vertical staff in pool near ditch head gates used since April 3, 1919; read by Harry Jones. Vertical staff at Holmes Bridge, in section 11, T. 1 N., R. 32 E., read October 30, 1918, to April 15, 1919.

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

CHANNEL AND CONTROL.—Concrete diversion dam at dam site, fairly permanent; changes in head gate of small canal will affect stage-discharge relation only during irrigation season.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 4.4 feet February 10 (discharge, 3,250 second-feet). Creek bed dry at times.

1903–4 and 1919–1921: Maximum discharge recorded, that of February 10, 1921; no flow at times.

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

DIVERSIONS.—A considerable number of small ditches divert above the station, using practically all the summer flow.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed after high water January 4. Rating curve used fairly well defined below and poorly defined above 1,400 second-feet. Staff gage read to hundredths once a day. Daily discharge ascertained by applying daily gage height to rating tables; discharge estimated February 13–16. Records good except for discharge above 1,400 second-feet for which they are fair.

Discharge measurements of McKay Creek near Pendleton, Oreg., 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. 20	Briggs and Perry [a]	0.92	124	May 7	Bones and Crocker	0.84	141
Feb. 17	E. R. Crocker [b]	1.44	454	13	do	.58	67
24	do	1.45	415	June 2	E. R. Crocker	.30	17.6
Mar. 18	A. E. Perry	1.83	660	14	do	.14	6.7
31	do	1.17	260	July 10	J. W. Bones		[c].5
Apr. 24	do	1.21	281				

[a] Water master for Umatilla County.
[b] Engineer, U. S. Bureau of Reclamation.
[c] Estimated.

Daily discharge, in second-feet, of McKay Creek near Pendleton, Oreg., for the year ending Sept. 30, 1921

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July
1		54	138	570	138	503	278	278	21	0.3
2		54	125	1,390	177	570	293	256	20	.3
3		56	113	1,300	185	640	288	242	17	-------
4		54	99	1,030	208	713	233	233	20	-------
5		52	105	676	217	676	208	212	13	-------
6	5	52	99	536	221	470	181	185	12	-------
7		52	93	409	229	438	162	145	8.9	-------
8		50	88	318	317	380	155	132	9.8	-------
9		48	86	283	1,120	338	148	122	17	-------
10		47	79	251	3,250	317	138	105	17	-------
11		47	79	233	2,310	288	155	93	12	-------
12	12	44	76	221	1,860	251	148	80	8.9	-------
13	15	42	76	208	1,160	242	162	73	7.0	-------
14	18	40	74	200		233	185	55	6.0	-------
15	20	40	71	204	700	208	174	47	5.5	-------
16	22	38	69	217		212	155	51	5.0	-------
17	23	41	65	229	409	438	145	47	4.0	-------
18	38	102	61	307	358	605	155	42	3.0	-------
19	38	122	60	283	302	676	155	51	1.8	-------
20	42	129	58	251	298	438	181	53	1.2	-------
21	47	155	58	242	278	409	208	51	.9	-------
22	54	148	61	238	278	380	278	53	.6	-------
23	56	116	65	229	269	380	327	47	.9	-------
24	54	104	63	208	409	369	288	44	.6	-------
25	56	79	67	200	438	358	256	38	.6	-------
26	54	74	69	192	409	354	242	37	.6	-------
27	56	188	125	192	409	317	251	33	.6	-------
28	56	217	438	185	470	298	640	33	.6	-------
29	56	200	830	181	-------	288	605	27	.6	-------
30	56	162	790	177	-------	278	288	26	.3	-------
31	56	-------	752	174	-------	264	-------	24	-------	-------

NOTE.—Stream bed practically dry July 3 to Sept. 30. Braced figures show mean discharge for periods included.

Monthly discharge of McKay Creek near Pendleton, Oreg., for the year ending Sept. 30, 1921

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	56	-------	28.5	1,750
November	217	38	86.9	5,170
December	830	58	162	9,960
January	1,390	174	366	22,500
February	3,250	138	636	35,300
March	713	208	398	24,500
April	640	138	236	14,000
May	278	24	94.0	5,780
June	21	.3	7.21	429
July	.3	0	.02	1
The year	3,250	0	165	119,000

NOTE.—See footnote to table of daily discharge.

BIRCH CREEK NEAR PILOT ROCK, OREG.

LOCATION.—In SE. ¼ sec. 22, T. 1 N., R. 32 E., at Guderian diversion dam, 3 miles downstream from Pilot Rock and 9 miles south of Pendleton, Umatilla County.

DRAINAGE AREA.—Not measured.

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

GAGE.—Vertical staff gage on right bank in pool 30 feet above diversion dam and head gates, 1 mile above Guderian ranch house. Zero of gage set level with crest of dam. Gage read by George Guderian.

DISCHARGE MEASUREMENTS.—At high stages made from highway bridge 100 yards upstream; at medium and low stages made by wading.

CHANNEL AND CONTROL.—The bed of the stream is of gravel; banks high and not subject to overflow. The low concrete diversion dam acts as the control; the stage-discharge relation is not seriously affected by operation of head gate to ditch.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year ending September 30, 1920, 3.80 feet; April 13 (discharge, 1,270 second-feet).

Maximum stage recorded during year ending September 30, 1921, 3.50 feet February 19 (discharge, 1,120 second-feet). Stream bed dry at times in both years.

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

DIVERSION.—Several small ditches divert water above the station, using practically all the summer flow. The head gate of the Guderian ditch is in the same section across stream as the diversion dam.

REGULATION.—None.

ACCURACY.—Stage-discharge relation practically permanent; affected, possibly by operation of gates, November 12, 1919, to December 6, 1919; by drift on control, February 14, 1921, to March 2, 1921. Rating curve well defined by discharge measurements below 500 second-feet and poorly defined above by averaging five points determined by multiplying discharge at McKay Creek by 0.45, which is the mean ratio between discharge measurements made on same day at both stations. Staff gage read to hundredths once a day. Daily discharge ascertained by applying daily gage height to rating table, except for November 12, 1919, to December 6, 1919, and February 14, 1921, to March 2, 1921, for which indirect method was used. Records for 1920 good, except for estimated periods and discharge above 500 second-feet when they are fair. Records for 1921 poor because of unsatisfactory gage-height record.

Discharge measurements of Birch Creek near Pilot Rock, Oreg., during the years ending September 30, 1920 and 1921

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
1919		*Feet*	*Sec.-ft.*	1920		*Feet*	*Sec.-ft.*
Nov. 12	Crocker and Schilling[a]	0.62	66	June 4	E. R. Crocker	0.33	17.1
				Nov. 20	Briggs and Perry[b]	.37	19.5
1920				1921			
Feb. 25	Crocker and Patterson[a]	.34	19.4	Feb. 24	Crocker and Taylor[a]	1.18	148
Mar. 18	Schilling and Crocker	.74	66	Mar. 18	A. E. Perry	1.77	358
Apr. 7	Crocker and Patterson	1.60	344	31	----do	1.10	174
May 11	E. R. Crocker	1.40	264	Apr. 24	----do	1.22	191
24	----do	.72	68				

[a]Engineers, U. S. Bureau of Reclamation.
[b]Water master for Umatilla County.

Daily discharge, in second-feet, of Birch Creek near Pilot Rock, Oreg., for the years ending Sept. 30, 1920 and 1921.

Day	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	Sept.
1919–20									
1		136	92	124	17	104	323	19	
2		118	80	163	23	97	226	15	
3		94	70	133	23	104	194	15	
4		92	60	118	23	157	178	15	
5		72	52	104	21	393	163	14	
6	100	62	48	92	19	470	160	15	
7			33	80	17	430	174	15	
8			31		19	393	148	19	
9			30		21	550	393	17	
10			28		23	550	323	16	
11			28		23	430	258	15	
12	66		30		23	393	226	14	
13		20	33		23	1,270	194	15	
14	62		38		104	845	172	15	
15			45		104	630	148	33	
16	58		52	35	104	470	133	31	
17	62		70		99	393	118	28	
18	80		80		94	323	110	26	
19	94		80		87	258	102	23	4
20	136		92		82	194	92	23	4
21	113	323	92		80	133	80	19	4
22	97	306	80		104	118	70	15	4
23	82	290	70		163	104	60	9	4
24	74	274	60		133	92	52	9	4
25	72	258	60	18	127	110	45	4	4
26	68	242	92	21	104	97	45	4	4
27	66	226	133	20	104	92	43	4	4
28	64	163	133	17	104	406	37	4	4
29	52	148	178	15	102	358	33	.4	4
30	107	133	163	-------	97	340	28	-------	4
31	-------	104	133	-------	102	-------	23	-------	-------

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1920–21									
1	4.0	23	70	210	52	210		290	23
2	4.0	22	74	226	52	242		258	23
3	4.0	22	74	323	60	470		226	23
4	4.5	21	74	290	60	470	160	194	19
5	5.0	21	80	258	60	393		178	39
6	5.5	21	80	226	60	430		163	33
7	6.5		80	178	52	393		148	31
8	7.5		80	163	60	358	163	133	29
9	9.0		80	133	226	323	163	118	28
10	9.0		85	118	1,120	290	163	104	26
11	9.0		85	104	1,070	258	163	92	25
12	9.0		85	80	710	226	163	80	25
13	10	20	85	76	470	194	258	70	23
14	11		85	66	590	194	226	60	22
15	11		80	60	406	226	194	60	19
16	11		80	104	242	393	133	52	17
17	10		80	133	185	393	104	45	4.0
18	11		78	133	124	372	104	45	4.0
19	11		80	104	74	358	104	39	6.5
20	12	20	92	104	97	306	258	39	5.0
21	13		133	80	97	258	258	133	4.0
22	14		178	60	85	274	226	133	-------
23	15		178	60	85	258	226	118	-------
24	15	50	178	60	154	242	226	104	-------
25	17		163	60	169	226	210	92	2.0
26	17		80	52	185	210	194	85	-------
27	18		104	52	185		133	60	-------
28	20	70	139	52	200	190	430	52	-------
29	21	70	323	52	-------		372	45	-------
30	23	70	242	52	-------	174	323	33	-------
31	23	-------	226	52	-------	-------	-------	28	-------

NOTE.—Braced figures show estimated mean discharge for periods indicated; stream practically dry on days for which no discharge is given.

Monthly discharge of Birch Creek near Pilot Rock, Oreg., for the years ending Sept. 30, 1920 and 1921

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1919–20				
November			85.9	5,110
December	323		107	6,580
January	178	28	73.1	4,490
February	163	15	51.7	2,970
March	163	17	70.0	4,300
April	1,270	92	343	20,400
May	393	23	140	8,610
June	33	0	15.0	893
September	4.0	0	1.6	95
The year	1,270	0	73.7	53,400
1920–21				
October	23	4.0	11.6	713
November	70		32.3	1,920
December	323	70	115	7,070
January	323	52	120	7,380
February	1,120	52	248	13,800
March	470	174	287	17,600
April	430	104	197	11,700
May	290	28	106	6,520
June	39	0	14.3	851
The year	1,120	0	93.3	67,600

NOTE.—Stream bed practically dry during months for which no record is given.

BIRCH CREEK AT REITH, OREG.

LOCATION.—In NW. ¼ sec. 13, T. 2 N., R. 31 E., one-fourth mile above Umatilla River, 1 mile south of Reith, and 9 miles below gaging station at Guderian diversion dam, Umatilla County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—May 1 to August 31, 1921.

GAGE.—Vertical staff on right bank 200 feet below footbridge; read by W. H. Harrison.

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

CHANNEL AND CONTROL.—Stream bed, gravel; channel straight; current swift; no well-defined control.

EXTREMES OF DISCHARGE.—Maximum discharge occurred prior to installation of gage on May 9; minimum stage, 0.89 foot July 12 (discharge, 0.4 second-foot).

DIVERSIONS.—Numerous ditches above station divert practically all the summer flow.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined. Staff gage read to hundredths once a day. Daily discharge ascertained by applying daily gage height to rating table; mean discharge estimated May 1–8 and August 21–31. Records good except for periods when mean discharge was estimated for which they are fair.

Discharge measurements of Birch Creek at Reith, Oreg., 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 9	Bones and Crocker[a]	2.10	116	June 14	E. R. Crocker	1.40	21.9
13	do	1.90	85	23	do	1.06	3
June 3	E. R. Crocker	1.48	27.7	July 11	J. W. Bones	.94	1

[a] Engineer, U. S. Bureau of Reclamation.

Daily discharge, in second-feet, of Birch Creek at Reith, Oreg., for the period May 1 to Aug. 31, 1921

Day	May	June	July	Aug.	Day	May	June	July	Aug.
1		40	1.1	0.8	16	84	17	0.6	1.1
2		31	1.0	1.0	17	84	9.8	.8	1.0
3		24	.8	1.0	18	86	8.0	.8	1.0
4		68	.8	1.0	19	84	5.6	.6	1.0
5	200	43	.6	1.1	20	87	4.8	.8	1.1
6		41	.6	1.1	21	135	2.6	.6	
7		40	.8	1.0	22	121	2.4	.6	
8		40	.6	1.0	23	121	2.8	.5	
9	118	33	.6	1.1	24	101	2.4	.8	
10	101	31	.5	1.1	25	87	2.6	.8	
11	89	24	.8	1.1	26	84	2.4	.6	1.0
12	86	22	.4	1.1	27	73	2.2	.6	
13	84	22	.5	2.0	28	70	2.2	.8	
14	70	21	.6	2.0	29	68	2.0	.8	
15	84	22	.6	2.0	30	56	2.0	.6	
					31	44		.8	

Monthly discharge of Birch Creek at Reith, Oreg., for the period May 1 to Aug. 31, 1921

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
May		44	117	7,200
June	68	2.0	19.0	1,130
July	1.1	.4	.693	43
August	2.0		1.12	69
The period				8,440

UMATILLA PROJECT FEED CANAL NEAR ECHO, OREG.

LOCATION.—In SW. ¼ sec. 22, T. 3 N., R. 29 E., one-fourth mile below head gate at United States Bureau of Reclamation diversion dam on Umatilla River and 2 miles above Echo, Umatilla County.

RECORDS AVAILABLE.—October 1, 1920, to September 30, 1921.

GAGE.—Vertical staff on right bank 60 feet above concrete dam just below the first waste gate in canal. Gage read by L. M. Hills, ditch rider for United States Bureau of Reclamation.

DISCHARGE MEASUREMENTS.—Made at footbridge across concrete-lined section of canal half a mile below gage.

CHANNEL AND CONTROL.—Gage is at vertical section of canal just above concrete dam having five piers. At middle of dam is a gate, 2 feet wide, of removable 2-inch planks, the top of which is 0.33 foot below crest of dam. Just above at left bank is a gate used to flush sand out of canal, but its

operation does not affect the stage-discharge relation because the gate is below the crest of dam.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 1.92 feet May 7–9 and 11–26 (discharge, 289 second-feet); canal dry at times.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined. Gage read to hundredths once a day and also after making changes at headgate. Daily discharge ascertained by applying daily or weighted mean daily gage height to rating table, or for days when large changes were made, by taking weighted mean of results obtained by applying to rating table the gage heights for various periods. Records excellent.

Umatilla project feed canal diverts from right bank of Umatilla River at diversion dam. The water is carried to Cold Springs reservoir from where it is released for irrigation during the irrigation season.

Discharge measurements of Umatilla project feed canal near Echo, Oreg., 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 10	Bones and Crocker [a]	1.67	224	June 1	Crocker and Taylor	1.07	110
19	Crocker and Taylor [a]	1.92	292	9	Crocker and Perry [b]	.43	29.0
31	E. R. Crocker	1.36	158				

[a] Engineer, U. S. Bureau of Reclamation. [b] Watermaster.

Daily discharge, in second-feet, of Umatilla project feed canal near Echo, Oreg., for the year ending Sept. 30, 1921

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July
1	22	259	272	247	284	54	54	272	108	37
2	22	249	272	247	284	54	54	272	100	37
3	22	237	272	230	284	54	54	278	89	37
4	22	237	272	240	284	54	54	282	93	37
5	22	233	272	247	284	54	54	284	97	37
6	22	225	272	247	284	54	54	284	90	
7	22	211	272	247	284	54	54	289	92	
8	22	211	272	235	156	54	54	289	89	
9	22	204	274	247	284	54	82	289	49	
10	22	197	272	235	103	54	75	259	29	
11	22	188	272	211	81	54	54	289	26	25
12	22	188	254	245	73	54	70	289	32	25
13	22	180	245	247	73	54	135	289	37	25
14	22	178	242	245	73	54	148	289	37	25
15	22	178	233	247	73	54	148	289	37	25
16	22	188	228	240	73	54	132	289	37	
17	22	209	247	240	73	54	124	289	37	
18	22	235	247	259	87	54	134	289	37	
19	93	235	247	276	54	54	193	289	37	
20	134	247	247	284	54	54	213	289	37	
21	169	237	247	284	54	54	218	289	37	
22	193	235	247	284	54	54	218	289	37	
23	200	252	247	284	54	54	218	289	37	
24	200	259	247	276	54	54	218	289	37	
25	213	259	247	279	54	54	230	289	37	
26	225	259	247	284	54	54	245	289	37	
27	233	259	247	284	54	54	254	274	37	
28	245	259	247	284	54	54	264	262	37	
29	252	259	247	284		54	269	237	37	
30	257	269	247	284		54	272	197	37	
31	259		247	284		54		146		

NOTE.—No flow in canal on days for which record is not given.

Monthly discharge of Umatilla project feed canal near Echo, Oreg., for the year ending Sept. 30, 1921

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	259	22	99	6,090
November	269	178	228	13,600
December	274	228	255	15,700
January	284	211	259	15,900
February	284	54	131	7,280
March	54	54	54	3,320
April	272	54	145	8,630
May	289	146	275	16,900
June	108	26	52	3,090
July	37	0	10	615
The year	289	0	126	91,100

NOTE.—No flow during months for which no record is given.

ECHO MILL TAILRACE AT ECHO, OREG.

LOCATION.—In NW. ¼ sec. 16, T. 3 N., R. 29 E., 100 yards west of Echo mill and 200 yards west of head gate on Umatilla project feed canal at Echo, Umatilla County.

RECORDS AVAILABLE.—October 1, 1920, to September 30, 1921.

GAGE.—Vertical staff gage 50 feet below outlet of tunnel under main-line track of Oregon-Washington Railroad & Navigation Co. Prior to May 11, gage readings were obtained at United States Bureau of Reclamation gage at outlet of tunnel; read by L. M. Hills, ditch rider for United States Bureau of Reclamation.

DISCHARGE MEASUREMENTS.—Made by wading or from strut across channel 15 feet below tunnel outlet.

CHANNEL AND CONTROL.—The channel is of earth and banks high; likely to be affected by aqueous growth during summer and occasionally by flashboards at outlet into Umatilla River.

EXTREMES OF DISCHARGE.—Maximum discharge, 37 second-feet May 19 and June 13. Channel dry July 5–10 and July 16 to September 30.

ACCURACY.—Stage-discharge relation permanent. Affected by flashboards June 24 to July 4. Rating curve for gage used October 1 to May 10, defined by United States Bureau of Reclamation in 1917 but not checked since that time; rating curve used May 11 to June 23 fairly well defined. Gage read to hundredths once a day and also after making change at head gate. Daily discharge October 1 to May 10 furnished by United States Bureau of Reclamation; daily discharge May 11 to June 23 ascertained by applying daily or weighted mean daily gage height to rating table; mean discharge June 24 to July 4 and July 11–15 estimated by United States Bureau of Reclamation. Records good May 11 to June 23 and fair for remainder of year.

Water diverted from the Umatilla project feed canal is used for power in the Echo flour mill or wasted into tailrace and returned to Umatilla River one-fourth mile below gage. The flow at gage is not subject to diurnal fluctuation.

Discharge measurements of Echo mill tailrace at Echo, Oreg., during the year ending Sept. 30, 1921

Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*
May 11	Bones and Crocker [a]	2.25	25.7
June 9	E. R. Crocker	1.49	6.8

[a] Engineer, U. S. Bureau of Reclamation.

Daily discharge, in second-feet, of Echo mill tailrace at Echo, Oreg., for the year ending Sept. 30, 1921

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July
1		4	19	5	34	30	30	30	27	
2		11	17	5	34	30	30	30	22	25
3		11	17	5	34	30	30	30	16	
4		11	15	5	34	30	30	30	10	8
5		2	13	5	34	30	30	30	8	-------
6		2	17	5	34	30	30	30	8	-------
7		2	17	5	34	30	30	30	4	-------
8		2	17	5	34	30	30	30	4	-------
9		2	17	5	34	30	30	30	7	-------
10	22	2	17	5	34	30	30	30	7	-------
11		2	15	5	34	26	30	26	22	
12		2	5	5	34	30	30	26	36	
13		2	5	5	34	30	30	26	37	25
14		2	5	5	34	30	30	26	33	
15		2	5	5	34	30	30	26	32	
16		2	5	5	34	30	30	30	27	-------
17		2	5	5	34	30	30	30	27	-------
18		2	5	5	34	30	30	27	27	-------
19	5	2	5	34	34	30	30	37	27	-------
20	5	2	5	34	30	30	30	32	27	-------
21	5	2	5	28	30	30	30	27	27	-------
22	5	2	5	28	30	30	30	26	27	-------
23	5	15	5	28	30	30	30	26	27	-------
24	5	15	5	28	30	30	30	26		-------
25	5	13	5	28	30	30	30	26		-------
26	5	13	5	28	30	30	30	26	25	-------
27	5	15	5	28	30	30	30	26		-------
28	4	13	5	24	30	30	30	26		-------
29	4	13	5	24	-------	30	30	26		-------
30	4	19	5	24	-------	30	30	26		-------
31	4	-------	5	24	-------	30	-------	26	-------	-------

NOTE.—Braced figures show estimated mean discharge for periods indicated; canal dry on days for which no discharge is given.

Monthly discharge of Echo mill tailrace at Echo, Oreg., for the year ending Sept. 30, 1921

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October		4	15.6	959
November	19	2	6.30	375
December	19	5	9.06	557
January	34	5	14.5	892
February	34	30	32.7	1,820
March	30	26	29.9	1,840
April	30	30	30.0	1,790
May	37	26	28.2	1,730
June	37	4	22.1	1,320
July			6.71	413
The year	37	0	16.1	11,700

NOTE.—No flow during months for which no record is given.

WESTERN LAND & IRRIGATION CO.'S CANAL AT ECHO, OREG.

LOCATION.—In SE. ¼ sec. 17, T. 3 N., R. 29 E., at rectangular timber weir, half a mile below turn out to Allen canal, 1 mile below head gate on Umatilla River, and 1 mile southwest of Echo, Umatilla County.

RECORDS AVAILABLE.—May 10 to July 31, 1921.

GAGE.—Vertical staff gage on right wing wall of weir; read by G. S. Sherman.

DISCHARGE MEASUREMENTS.—Made from footbridge half a mile upstream, just below turn out to Allen canal.

CHANNEL AND CONTROL.—Canal is in earth section. Control for gage is 16-foot rectangular weir having 2-inch crest.

EXTREMES OF DISCHARGE.—Maximum stage recorded, 2.69 feet at 4 p. m. May 16 (discharge, 265 second-feet). Canal dry at times.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined. Gage read to hundredths twice a day. Daily discharge ascertained by applying mean daily gage height to rating table. Records excellent.

COOPERATION.—Gage-height record furnished by Western Land & Irrigation Co., and discharge measurements by United States Bureau of Reclamation and A. E. Perry, water master.

Head gate is situated in NE. ¼ sec. 21, T. 3 N., R. 29 E., on left bank of Umatilla River. A portion of flow may be turned into Allen Canal half a mile below head gate and into Pioneer & Courtney canal one-fourth mile below gage. During the irrigation season of 1921 the amount of water turned into Allen canal was approximately as follows:

Water in canal, but no record prior to May 10; May 10–31, 1,100 acre-feet; June, 1,530 acre-feet; July 1–20 and 28—29, 1,170 acre-feet; canal dry July 21–27 and practically dry from July 30 to September 30.

Discharge measurements of Western Land & Irrigation Co.'s canal at Echo, Oreg., during the period May 10 to July 31, 1921

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
May 10	Bones and Crocker [a]	2.37	207	June 16	E. R. Crocker	1.31	79
20	Crocker and Taylor [a]	2.54	250	29	Crocker and Taylor	.52	23.3
June 13	E. A. Perry [b]	1.34	84	July 12	J. W. Bones	.47	19.3

[a] Engineer, U. S. Bureau of Reclamation.
[b] Water master.

Daily discharge, in second-feet, of Western Land & Irrigation Co.'s canal, at Echo, Oreg., for the period May 10 to July 31, 1921

Day	May	June	July	Day	May	June	July	Day	May	June	July
1		235	24	11	219	142	24	21	243	49	1.2
2		227	23	12	227	108	21	22	243	36	
3		211	19	13	235	85	18	23	251	30	
4		211	18	14	251	78	14	24	181	24	
5		227	38	15	259	76	11	25	164	24	
6		211	53	16	259	76	8.6	26	219	30	
7		174	30	17	251	76	5.5	27	211	26	
8		167	26	18	259	74	4.4	28	219	26	9.0
9		174	26	19	219	74	2.9	29	219	24	9.0
10	211	161	26	20	227	70	1.8	30	235	26	
								31	227		

NOTE.—No record prior to May 10; canal dry July 22-27; and no record July 30 and 31 (canal probably dry).

Monthly discharge of Western Land & Irrigation Co.'s canal at Echo, Oreg. for the period May 10 to July 31, 1921

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
May 10-31	259	164	229	10,000
June	235	24	105	6,250
July	53	0	13.3	818

NOTE.—See footnote to table of daily discharge.

MAXWELL CANAL NEAR HERMISTON, OREG.

LOCATION.—In SW. ¼ sec. 20, T. 4 N., R. 28 E., 2.34 miles below headgate on Umatilla River and 3 miles southwest of Hermiston, Umatilla County.

RECORDS AVAILABLE.—March 18, 1921, to October 31, 1921.

GAGE.—Vertical staff and float gage in stilling well 200 feet below second waste way into Umatilla River. Read by W. H. Starr, employee of United States Bureau of Reclamation.

DISCHARGE MEASUREMENTS.—Made from foot plank 100 feet below gage.

CHANNEL AND CONTROL.—The canal is concrete lined and is straight between gage and measuring section; control is permanent except when affected by aqueous growth.

EXTREMES OF DISCHARGE.—Maximum stage during period March 18 to October 31, 1921, 3.25 feet May 24–25 (discharge, 96 second-feet). Canal dry during year prior to March 18 and after October 31.

ACCURACY.—Stage-discharge relation constant March 18 to June 15; changing due to aqueous growth June 16–23; constant June 24 to July 31; changing, August 2 to September 26; and constant September 27 to October 31. Rating curves used March 18 to June 15, June 24 to July 31, and September 27 to October 31 fairly well defined. Gage read to hundredths once daily and also after making change at head gate. Daily discharge ascertained by applying daily or weighted mean daily gage height to rating table; shifting-channel method used June 16–23 and August 1 to September 26. Records good.

COOPERATION.—Field data furnished by United States Bureau of Reclamation.

Maxwell canal diverts from right bank of Umatilla River at diversion dam in SW. ¼ sec. 28, T. 4 N., R. 28 E. The water is used for irrigation on the Umatilla project of United States Bureau of Reclamation.

Discharge measurements of Maxwell canal near Hermiston, Oreg., during the period Mar. 18 to Oct. 31, 1921

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Mar. 21	C. N. Taylor [a]	1.85	28.0	June 29	C. N. Taylor	2.50	35.9
May 11	J. W. Bones	3.18	90	July 1	do	2.30	31.0
21	Crocker and Taylor	3.20	90	23	do	2.14	23.3
June 11	do	2.84	62	Aug. 29	do	2.00	13.6
13	E. R. Crocker [a]	2.79	58	Oct. 5	do	1.71	15.0
24	C. N. Taylor	2.66	44.6				

[a] Engineer, U. S. Bureau of Reclamation.

Daily discharge, in second-feet, of Maxwell canal near Hermiston, Oreg., for the period Mar. 18 to Oct. 31, 1921

Day	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.
1		31	82	91	29	21	11	15
2		31	82	91	29	27	11	15
3		31	82	92	28	23	12	15
4		34	82	76	35	21	11	15
5		45	82	80	40	21	10	15
6		47	82	91	51	21	15	15
7		47	82	87	45	19	12	15
8		47	82	82	42	17	12	15
9		47	82	77	41	14	12	15
10		47	89	70	44	12	11	15
11		47	89	58	39	12	14	15
12		54	89	59	35	12	15	21
13		72	89	59	32	11	16	21
14		78	89	59	34	12	16	21
15		77	89	58	35	12	13	15
16		76	89	57	32	13	13	15
17		76	89	54	31	15	12	15
18	28	76	89	52	31	13	12	15
19	28	76	89	51	28	13	12	15
20	28	76	89	48	28	12	12	15
21	28	76	89	45	37	12	12	15
22	28	86	89	46	34	13	12	15
23	25	73	94	46	24	12	11	15
24	25	68	96	43	23	10	11	15
25	25	57	96	42	22	11	11	15
26	18	77	94	42	23	12	11	15
27	18	82	94	40	22	12	12	15
28	18	82	90	38	21	16	12	15
29	18	82	87	37	20	14	12	15
30	18	82	82	35	21	9	12	15
31	19		82		21	12		15

Monthly discharge of Maxwell canal near Hermiston, Oreg., for the period Mar. 18 to Oct. 31, 1921

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
March 18-31	28	18	23.1	642
April	86	31	62.7	3,730
May	96	82	87.4	5,370
June	92	35	60.2	3,580
July	51	20	31.5	1,940
August	27	9	14.6	898
September	16	10	12.3	732
October	21	15	15.6	959
The period				17,800

MAIN CANAL, WEST DIVISION UMATILLA PROJECT, NEAR UMATILLA, OREG.

LOCATION.—In SW. ¼ sec. 28, T. 5 N., R. 28 E., just below head gate at United States Bureau of Reclamation diversion dam on Umatilla River, 1½ miles above Umatilla.

RECORDS AVAILABLE.—March 17 to September 30, 1921.

GAGE.—Vertical staff gage in stilling well just below head gate; read by United States Bureau of Reclamation ditch rider.

DISCHARGE MEASUREMENTS.—Made from footbridge 12 feet below gage.

CHANNEL AND CONTROL.—Canal is concrete lined; stage-discharge relation seriously affected by aqueous growth during summer.

EXTREMES OF DISCHARGE.—Maximum discharge during period March 17, to September 30, 1921, 164 second-feet May 16–19; canal dry at times.

ACCURACY.—Stage-discharge relation changing owing to aqueous growth. Rating curves fairly well defined and used as follows: March 17 to May 27, July 12 to September 10, and September 1 to September 30. Gage read to hundredths once a day. Daily discharge ascertained by applying daily gage height to rating table except May 28 to July 11 and September 11–20 when daily discharge was determined by shifting-control method. Records fair.

Main canal diverts water from left bank of Umatilla River at United States Bureau of Reclamation diversion dam for irrigation on the western division of the Umatilla project of the United States Bureau of Reclamation. Part of the area was formerly irrigated by the Oregon Land & Water Co.'s ditch which diverted water from the left bank of Umatilla River 1 mile below the present United States Bureau of Reclamation diversion dam.

Discharge measurements of main canal, west division Umatilla project, near Umatilla, Oreg., during the period Mar. 17 to Sept. 30, 1921

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Mar. 17	C. N. Taylor [a]	1.60	15.7	June 15	E. R. Crocker	5.13	148
Apr. 18	do	4.50	116	July 22	C. N. Taylor	5.54	140
27	do	4.50	125	Aug. 15	do	5.00	113
May 12	Bones and Crocker [a]	4.88	155	31	do	5.10	118
19	Crocker and Taylor	4.80	146	Sept. 26	do	4.36	71
June 1	do	4.88	142				

[a] Engineer, U. S. Bureau of Reclamation.

Daily discharge, in second-feet, of main canal, west division Umatilla project, near Umatilla, Oreg., for the period Mar. 17 to Sept. 30, 1921

Day	Mar.	Apr.	May	June	July	Aug.	Sept.
1		44	124	143	144	123	117
2		44	122	141	143	123	117
3		44	124	140	144	122	118
4		44	126	139	143	122	116
5		44	124	137	148	122	116
6		44	124	136	148	124	109
7		44	150	138	153	122	110
8		91	150	138	153	121	110
9		98	150	140	152	121	110
10		108	148	140	155	121	111
11		108	153	141	153	113	110
12		115	155	141	153	112	108
13		118	153	140	151	112	107
14		118	155	143	151	112	107
15		118	153	146	149	113	106
16		118	164	147	148	111	105
17	15	118	164	144	149	116	104
18	15	122	164	143	153	116	102
19	15	122	164	143	153	116	104
20	15	124	146	142	152	117	95
21	15	127	146	144	146	118	88
22	30	126	134	147	140	118	80
23	30	130	134	148	137	118	64
24	30	122	134	146	133	118	64
25	30	122	134	155	131	118	66
26	30	122	134	153	132	119	70
27	30	122	134	151	130	120	70
28	37	122	144	150	130	110	48
29	36	122	143	148	128	110	48
30	36	122	141	146	126	118	48
31	42	------	141	------	122	117	------

Monthly discharge of main canal, west division Umatilla project, near Umatilla, Oreg., for the period Mar. 17 to Sept. 30, 1921

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
March 17-31	42	15	27.1	806
April	130	44	101	6,010
May	164	122	143	8,790
June	155	136	144	8,570
July	155	122	144	8,850
August	124	110	118	7,260
September	118	48	94.3	5,610
The period	------	------	------	45,900

WILLOW CREEK BASIN

WILLOW CREEK NEAR MORGAN, OREG.

LOCATION.—In sec. 15, T. 1 N., R. 23 E., 1½ miles south of Morgan, Morrow County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—December 30, 1920, to June 4, 1921, when station was discontinued.

GAGE.—Vertical staff on right bank just below concrete diversion dam; read by N. E. Pettijohn.

DISCHARGE MEASUREMENTS.—Made by wading at gage or from bridge about three-fourths mile upstream.

CHANNEL AND CONTROL.—Control is bedrock reef overlain with a little gravel; practically permanent. Water swift at high stages.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period, December 30, 1920, to June 4, 1921, 3.35 feet at 9.30 a. m. on February 11 (discharge, 866 second-feet); minimum stage recorded, 1.01 feet April 16 and 17 (discharge, 31 second-feet).

ICE.—No ice during period of records.

DIVERSIONS.—Little water diverted during periods of records.

REGULATION.—Practically none.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined. Gage read to hundredths once daily except at times of high water when it is read twice daily. Discharge determined by applying to rating table daily or mean daily gage height. Records good.

Discharge measurements of Willow Creek near Morgan, Oreg., during the period Sept. 17, 1920, to June 4, 1921

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Sept. 17	R. C. Briggs	0.17	0.5	Feb. 11	H. B. Schminky	3.35	866
Jan. 28	H. B. Schminky [a]	1.33	55	Mar. 5	do	2.17	242

[a] Engineer, John Day irrigation district.

Daily discharge, in second-feet, of Willow Creek near Morgan, Oreg., for the period Dec. 30 to June 4, 1921

Day	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1		133	84	220	76	84	44
2		110	92	255	76	76	52
3		186	92	291	76	76	52
4		186	84	422	76	76	44
5		133	84	238	76	76	
6		110	76	353	76	76	
7		110	76	255	76	76	
8		92	84	172	63	63	
9		92	529	133	63	63	
10		76	702	133	63	63	
11		92	366	110	58	63	
12		110	614	110	52	58	
13		76	448	92	52	52	
14		76	398	110	52	52	
15		63	398	110	52	52	
16		63	158	133	31	52	
17		63	502	158	31	63	
18		76	220	158	44	63	
19		92	172	158	44	63	
20		92	146	158	70	63	
21		92	133	133	70	70	
22		63	133	122	84	76	
23		63	220	110	101	76	
24		63	220	110	92	76	
25		63	331	101	92	70	
26		63	220	92	84	63	
27		52	186	92	84	63	
28		58	220	92	84	63	
29		58		84	84	63	
30	133	63		76	84	52	
31	158	84		76		52	

106543—25†—WSP 534——4

Monthly discharge of Willow Creek near Morgan, Oreg., for the period Jan. 1 to May 31, 1921

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
January	186	52	88.8	5,460
February	866	76	267	14,800
March	422	76	157	9,650
April	101	31	68.9	4,100
May	84	52	65.6	4,030
The period				38,000

JOHN DAY RIVER BASIN

JOHN DAY RIVER NEAR DAYVILLE, OREG.

LOCATION.—In SW. ¼ sec. 4, T. 13 S., R. 27 E., at a private wagon bridge 3 miles above mouth of South Fork and Dayville, Grant County.

DRAINAGE AREA.—1,000 square miles.

RECORDS AVAILABLE.—November 23, 1908, to September 30, 1914; June 23, 1920, to September 30, 1921, when station was discontinued.

GAGE.—Vertical staff on bridge abutment, temporary low-water sections near bridge were set to agree with bridge gate. Gage read by L. V. Stewart.

DISCHARGE MEASUREMENTS.—Made from bridge or by wading.

CHANNEL AND CONTROL.—Bed composed of sand and gravel; shifting. Control 200 yards below gage.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 9.7 feet February 14 (discharge, 2,420 second-feet); minimum stage recorded, 4.10 feet July 21 to 24 and August 8 to 13 (discharge, 70 second-feet).

1908–1914; 1920–1921: Maximum discharge recorded, 3,090 second-feet March 20, 1910 (gage height 6.3 feet, old datum); minimum stage recorded, 3.50 feet July 28 and 29, 1920 (discharge estimated, 1 second-foot).

DIVERSIONS.—A number of canals above this point divert water from John Day River and tributaries for irrigation and for domestic use.

REGULATION.—Flow affected by diversions.

ACCURACY.—Stage-discharge relation changed during high water of February 14. Two rating curves used fairly well defined at low stages but poorly defined at high water. Gage read to tenths once a day. Discharge ascertained by applying daily gage heights to rating table. Records fair.

The following discharge measurement was made by J. W. Bones:

July 19, 1921: Gage height, 4.22 feet; discharge, 87 second-feet.

Daily discharge, in second-feet, of John Day River near Dayville, Oreg., for the year ending Sept. 30, 1921

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.
1	100	130	210	570	310	690	620	960	880	330	100
2	100	130	190	570	290	1,000	695	920	840	330	100
3	100	130	190	940	290	1,000	840	880	840	330	100
4	100	130	190	670	290	1,040	840	800	840	330	85
5	100	130	190	570	290	1,580	725	760	840	305	85
6	100	130	190	480	290	1,280	655	725	880	260	85
7	100	130	170	450	270	1,000	620	725	920	220	85
8	100	130	170	425	270	880	585	760	880	180	70
9	100	122	170	425	350	840	655	760	840	160	70
10	100	115	170	310	820	760	655	800	760	130	70
11	100	115	170	250	1,310	725	655	760	725	130	70
12	100	115	170	250	1,370	690	800	760	655	130	70
13	100	115	170	290	1,690	655	880	760	620	130	70
14	115	115	170	310	2,340	655	800	760	655	115	820
15	100	115	170	310	1,280	620	725	1,000	620	100	180
16	100	115	170	310	760	655	690	1,130	585	100	130
17	115	130	170	375	620	800	620	1,130	550	100	130
18	115	230	170	510	585	960	690	1,340	490	100	130
19	115	270	170	425	585	920	690	1,460	490	85	130
20	130	290	170	375	620	800	690	1,520	460	85	130
21	130	270	170	290	655	760	725	1,520	430	70	130
22	130	230	170	270	585	725	760	1,720	430	70	130
23	130	230	150	270	655	690	800	1,580	430	70	130
24	115	230	170	330	585	655	880	1,520	430	70	115
25	115	250	170	330	620	620	800	1,520	430	85	115
26	115	230	170	330	620	585	725	1,460	405	100	115
27	130	230	170	330	620	655	655	1,340	405	115	115
28	130	230	190	425	655	620	880	1,180	380	115	115
29	130	230	270	330	-------	620	1,040	1,080	355	115	100
30	130	230	705	330	-------	655	1,000	960	355	115	100
31	130	-------	670	310	-------	585	-------	880	-------	115	100

NOTE.—Estimated mean discharge for month of September is 100 second-feet.

Monthly discharge of John Day River near Dayville, Oreg., for the year ending Sept. 30, 1921

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	130	100	112	6,890
November	290	115	175	10,400
December	705	150	211	13,000
January	940	250	399	24,500
February	2,340	270	701	38,900
March	1,580	585	797	49,000
April	1,040	585	746	44,400
May	1,720	725	1,080	66,400
June	920	355	614	36,500
July	330	70	151	9,280
August	820	70	128	7,870
September	----------	----------	[a] 100	5,950
The year	2,340	70	433	313,000

[a] Estimated to complete year.

JOHN DAY RIVER AT CLARNO, OREG.

LOCATION.—In NE. ¼ sec. 32, T. 7 S., R. 19 E., at Clarno highway bridge, 14 miles east of Antelope, on Wasco-Wheeler County line.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—April 1, 1914, to September 30, 1915; June 21, 1920, to September 30, 1921, when station was discontinued.

GAGE.—Chain gage on rail of bridge; read by Charles Chapman.

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

CHANNEL AND CONTROL.—Gravel and silt; may shift in extreme flood.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period, June 21 to September 30, 1920, 5.2 feet June 22 (discharge, 2,750 second-feet); minimum stage recorded, 1.7 feet August 20 and 22 to 24 (discharge, 28 second-feet).

Maximum stage recorded during year ending September 30, 1921, 11.9 feet at 9.20 a. m. February 14 (discharge, 15,100 second-feet); minimum stage recorded, 1.74 feet September 9, at time of measurement (discharge, 190 second-feet).

1914–15 and 1920–21: Maximum discharge recorded, that of February 14, 1921; minimum discharge recorded, that of August 20 and 22 to 24, 1920.

A high-water mark of 19.8 feet was determined in 1914 for a flood which occurred about 1894 (discharge estimated from extension of rating curve as 35,000 second-feet).

DIVERSIONS.—Station below practically all diversions.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed during high water of February 13–14. Rating curves fairly well defined by measurements at medium and low stages and form of 1914–1915 curve. Gage read to half-tenths once daily. Daily discharge ascertained by applying daily gage heights to rating tables. Records fair.

Discharge measurements of John Day River at Clarno, Oreg., during the period June 21, 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.*
June 21	H. B. Schminky	5.00	2,460	July 6	J. W. Bones	3.53	1,190
July 20	F. C. Dillard	2.60	[a] 380	Sept. 9	Wendell Dawson	1.74	190
Sept. 16	H. B. Schminky	2.65	269				
Nov. 20	do	4.12	1,350				

[a] Slight reverse current noted but not measured; results questionable.

NOTE.—Dillard and Schminky were engineers for John Day Irrigation District.

Daily discharge, in second-feet, of John Day River at Clarno, Oreg., for the period June 21, 1920, to Sept. 30, 1921

Day	June	July	Aug.	Sept.	Day	June	July	Aug.	Sept.
1920					1920				
1		1,230	98	212	16		380	58	270
2		1,130	87	178	17		380	67	310
3		1,030	76	178	18		290	42	310
4		940	58	164	19		212	42	231
5		860	50	164	20		250	28	212
6		780	58	150	21	2,460	231	42	195
7		700	76	150	22	2,750	231	28	212
8		625	50	136	23	2,320	195	28	212
9		554	67	122	24	2,320	178	28	212
10		490	76	122	25	2,040	178	42	250
11		432	58	122	26	1,720	164	42	330
12		432	67	150	27	1,660	150	42	330
13		380	76	164	28	1,550	136	250	355
14		490	72	195	29	1,440	76	250	380
15		432	67	212	30	1,330	110	212	330
					31		110	212	

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.
1920-21											
1	330	522	1,080	6,060	1,550	6,650	6,310	10,200	6,140	1,430	340
2	330	490	1,080	7,140	1,440	7,370	7,190	9,780	5,800	1,430	340
3	330	490	985	10,500	1,550	10,900	8,450	8,640	6,480	1,340	300
4	310	461	940	8,640	1,660	12,700	9,590	8,270	5,800	1,250	300
5	330	461	900	6,060	1,660	14,500	8,640	8,270	5,800	1,160	265
6	461	490	900	6,420	1,550	12,700	7,370	8,270	9,210	990	265
7	330	432	900	6,060	1,550	11,300	6,830	7,910	5,460	915	265
8	330	406	860	5,360	1,440	9,210	6,310	8,270	6,140	878	265
9	330	406	820	4,340	1,910	8,450	5,630	8,270	5,290	840	265
10	330	406	820	3,050	5,190	7,550	5,630	8,270	4,950	840	282
11	310	406	780	2,750	10,200	7,190	7,550	8,270	4,470	770	265
12	380	406	740	1,440	11,700	6,830	7,730	8,270	4,310	700	265
13	432	355	700	1,660	12,100	6,830	8,450	8,270	3,850	667	265
14	432	310	662	1,910	14,900	6,480	9,210	8,270	3,700	635	265
15	490	310	662	1,910	12,500	6,310	8,090	9,020	3,560	575	840
16	490	490	590	1,780	10,200	5,970	8,090	12,100	3,280	520	635
17	522	590	590	1,910	7,910	8,450	7,550	12,100	2,880	520	520
18	522	700	590	1,910	5,630	10,500	7,370	12,500	2,750	470	470
19	490	860	590	2,180	5,630	11,500	7,190	12,900	2,510	448	380
20	490	1,330	740	2,750	5,290	9,210	7,550	12,900	2,750	425	340
21	490	1,780	740	2,460	5,120	8,450	8,090	12,100	2,390	380	340
22	461	1,440	662	2,180	5,120	7,730	8,450	10,900	2,270	360	340
23	432	1,230	625	2,180	4,950	8,450	9,210	10,200	2,160	360	300
24	432	1,230	662	2,040	4,950	7,910	9,590	9,780	2,270	380	300
25	432	1,440	662	1,660	4,950	7,730	9,020	9,400	2,160	380	300
26	461	1,660	662	1,660	5,120	7,010	8,450	9,020	2,050	360	300
27	461	1,780	662	1,550	5,460	6,310	7,730	9,020	2,050	340	265
28	490	1,910	740	1,910	5,460	5,970	7,190	8,640	1,830	336	265
29	490	1,660	700	2,460		5,970	11,900	7,190	1,630	380	233
30	490	1,230	1,180	2,180		6,140	11,700	6,480	1,630	380	233
31	490		8,450	1,660		6,310		6,140		340	233

NOTE.—Mean daily discharge estimated at 210 second-feet for month of September, 1921.

Monthly discharge of John Day River at Clarno, Oreg., for the period June 21, 1920, to Sept. 30, 1921

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1920				
June 21–30	2,750	1,330	1,960	38,900
July	1,230	76	444	27,300
August	250	28	79.0	4,860
September	380	122	219	13,000
The period				84,000
1920–21				
October	522	310	423	26,000
November	1,910	310	856	50,900
December	8,450	590	1,020	62,700
January	10,500	1,440	3,410	210,000
February	14,900	1,440	5,600	311,000
March	14,500	5,970	8,340	513,000
April	11,900	5,630	8,070	480,000
May	12,900	6,140	9,340	574,000
June	9,210	1,630	3,850	229,000
July	1,430	340	672	41,300
August	840	233	330	20,300
September			a 210	12,500
The year	14,900		3,490	2,530,000

a Estimated from record at McDonald.

JOHN DAY RIVER AT McDONALD, OREG.

LOCATION.—In NW. ¼ sec. 11, T. 1 N., R. 19 E., at ferry at McDonald post office, Sherman County, half a mile below mouth of Rock Creek, 16 miles above junction with Columbia River, and 18 miles southwest of Arlington.

DRAINAGE AREA.—7,800 square miles.

RECORDS AVAILABLE.—December 16, 1904, to September 30, 1921.

GAGE.—Inclined staff in two sections on left bank, 183 feet above ferry cable; read by William G. McDonald.

DISCHARGE MEASUREMENTS.—Made from cable or by wading.

CHANNEL AND CONTROL.—Bed composed of clean gravel and sand; shifts slightly. Banks high. One channel at all stages.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 8.8 feet at 8.30 a. m. February 15 (discharge, 18,400 second-feet); minimum stage recorded, 1.30 feet September 7 and 8 (discharge, 120 second-feet).

1904–1921: Maximum stage recorded, 10.38 feet February 6, 1907 (discharge, 22,800 second-feet). A flood, probably in 1894, is said to have reached a stage of 12.8 feet (discharge estimated from extension of rating curve, 33,000 second-feet). Minimum stage recorded, 1.02 feet September 8–11, 1915 (discharge, 63 second-feet).

ICE.—Stage-discharge relation affected by ice during extremely cold periods.

DIVERSIONS.—Large part of natural low-water flow of stream diverted in the upper John Day Valley for irrigation.

REGULATION.—None.

ACCURACY.—Stage-discharge relation practically permanent. Rating curve well defined. Gage read to half-tenths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table. Records good.

Discharge measurements of John Day River at McDonald, Oreg., during the year ending Sept. 30, 1921

Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*
Mar. 21	Wendell Dawson	6.15	8,950
June 23	Dawson and Phillips	3.38	2,070
Aug. 20	K. N. Phillips	1.71	345

Daily discharge, in second-feet, of John Day River at McDonald, Oreg., for the year ending Sept. 30, 1921

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	438	555	1,320	7,960	1,770	6,760	6,760	11,900	6,180	1,570	300	160
2	400	598	1,100	5,100	1,700	7,360	7,360	10,500	6,180	1,440	300	160
3	400	555	1,050	4,580	1,700	8,600	7,960	9,880	5,900	1,320	300	152
4	400	539	1,000	10,200	1,840	11,600	9,560	9,240	6,460	1,210	300	140
5	400	515	1,000	7,060	1,840	14,700	8,600	8,600	6,180	1,050	270	140
6	415	475	955	6,460	1,840	14,000	7,960	8,280	6,460	1,000	270	128
7	430	515	955	5,620	1,770	11,900	7,360	7,960	6,180	1,050	270	120
8	438	539	910	4,100	1,840	10,900	6,460	8,600	5,900	1,000	240	120
9	438	555	775	5,360	2,140	9,560	6,460	8,920	6,180	910	240	140
10	400	555	820	3,200	4,840	8,600	6,180	8,920	5,620	820	240	140
11	386	515	820	2,810	7,060	7,960	6,180	8,600	4,840	730	240	140
12	386	491	910	2,460	11,200	7,360	6,760	8,600	4,580	730	210	140
13	400	475	865	1,840	12,200	7,060	10,500	8,600	4,100	685	210	140
14	415	445	820	1,990	13,300	6,760	9,880	8,600	4,100	685	400	140
15	445	372	820	1,990	17,200	6,760	9,240	9,240	3,640	598	555	140
16	475	445	775	1,990	11,900	6,460	7,960	9,560	3,200	555	1,000	140
17	475	523	640	1,840	9,240	7,360	7,360	11,200	3,000	515	910	160
18	515	515	555	1,840	7,360	10,900	6,760	12,600	2,810	475	730	170
19	555	523	598	2,140	6,180	12,200	6,760	13,300	2,810	460	515	200
20	555	640	775	2,460	5,900	11,200	7,360	13,600	2,630	438	330	222
21	539	1,210	865	2,460	5,620	9,560	7,960	12,200	2,460	400	330	330
22	539	1,700	820	2,300	5,360	8,600	8,600	13,000	2,300	400	300	365
23	523	1,380	775	2,140	5,100	8,280	9,240	12,600	2,140	386	330	386
24	515	1,210	730	1,990	4,840	8,600	10,500	11,200	2,140	365	330	400
25	515	1,160	775	1,840	5,360	7,960	9,560	10,500	2,140	365	270	330
26	515	1,100	730	1,840	5,620	7,360	8,280	10,500	2,140	330	258	330
27	515	1,000	775	1,840	5,900	6,760	7,960	9,880	1,990	330	240	330
28	555	1,000	820	1,990	5,900	6,760	7,060	9,240	1,840	306	210	330
29	515	1,700	820	1,920	-------	6,180	10,200	8,600	1,700	300	210	330
30	515	1,380	1,050	1,990	-------	6,180	12,600	7,360	1,570	306	185	300
31	539	-------	2,140	1,920	-------	6,460	-------	6,760	-------	300	185	-------

Monthly discharge of John Day River at McDonald, Oreg., for the year ending Sept. 30, 1921

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	555	386	469	28,800
November	1,700	372	773	46,000
December	2,140	555	896	55,100
January	10,200	1,840	3,330	205,000
February	17,200	1,700	5,950	330,000
March	14,700	6,180	8,730	537,000
April	12,600	6,180	8,180	487,000
May	13,600	6,760	9,950	612,000
June	6,460	1,570	3,910	233,000
July	1,570	300	678	41,700
August	1,000	185	344	21,200
September	400	120	214	12,700
The year	17,200	120	3,600	2,610,000

SOUTH FORK OF JOHN DAY RIVER AT DAYVILLE, OREG.

LOCATION.—In NW. ¼ sec. 7, T. 13 S., R. 27 E., 1 mile above mouth and half a mile above highway bridge in Dayville, Grant County.

DRAINAGE AREA.—600 square miles.

RECORDS AVAILABLE.—November 21, 1908, to September 30, 1914; July 1, 1920, to September 30, 1921, when station was discontinued.

GAGE.—Vertical staff spiked to alder tree on left bank; read by J. Campbell-Martin. Datum of gage changed by an unknown amount when station was reestablished July 1, 1920.

DISCHARGE MEASUREMENTS.—Made from cable 30 feet below gage or by wading.

CHANNEL AND CONTROL.—Bed composed of small boulders and gravel; likely to shift in flood. Changes in control are sometimes caused by beaver dams in summer.

EXTREMES OF DISCHARGE.—Maximum stage during year about 10.0 feet during night of February 13, observed from high-water marks the next morning (discharge by extension of rating curve 2,200 second-feet); minimum stage recorded, 5.08 feet August 30–31 (discharge, 7 second-feet).

1908–1914, 1920–1921: Maximum stage recorded, 5.1 feet (old datum) during night of March 2, 1910 (discharge, 2,390 second-feet); minimum stage recorded, 4.96 feet, August 17, 1920 (discharge, 2.0 second-feet.)

ICE.—Shore ice reported occasionally.

DIVERSIONS.—Dayville ditch carries water around gage. Large part of natural flow of South Fork of John Day River and tributaries diverted for irrigation and domestic use.

REGULATION.—Only by diversion.

ACCURACY.—Stage-discharge relation changed slightly on February 14. The two rating curves used are fairly well defined below and poorly defined above 200 second-feet. Gage read once a day except during high stages when it is read twice a day. Daily discharge ascertained by applying to rating tables the daily gage height. Records fair.

The following discharge measurement was made by J. W. Bones:

July 19, 1921: Gage height, 5.42 feet; discharge, 31 second-feet.

Daily discharge, in second-feet, of South Fork of John Day River at Dayville, Oreg., for the year ending Sept. 30, 1921

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.
1	13	24	62	307	129	641	592	641	301	83	13
2	13	24	62	400	118	641	641	592	267	83	13
3	17	26	62	506	118	960	796	568	250	83	16
4	17	26	62	506	141	1,310	743	568	301	75	16
5	12	26	55	506	141	1,430	691	545	267	67	16
6	10	26	42	225	118	1,310	592	522	267	67	13
7	13	26	55	209	118	1,070	545	499	284	64	13
8	15	26	55	180	129	850	522	499	234	60	13
9	15	26	52	180	420	743	499	477	218	60	13
10	15	21	52	107	1,080	641	545	477	203	53	13
11	17	18	55	87	1,140	641	616	477	188	46	16
12	19	31	55	129	1,200	616	743	455	174	43	16
13	17	29	55	153	1,380	641	850	414	161	40	16
14	17	29	8	129	1,550	641	743	414	136	40	24
15	19	29	40	129	796	568	641	375	148	40	29
16	21	31	45	129	641	905	592	499	148	40	20
17	21	62	52	129	375	850	592	743	148	31	20
18	24	69	55	240	394	1,190	592	691	148	36	20
19	15	78	55	180	414	1,070	592	641	161	31	20
20	15	87	52	166	434	850	796	568	143	29	13
21	26	78	48	141	545	796	691	743	136	29	13
22	26	62	52	87	455	743	743	592	124	29	13
23	26	55	34	87	375	641	743	522	124	26	13
24	24	52	34	129	375	641	743	455	102	22	13
25	24	52	55	153	394	641	641	394	102	13	13
26	24	48	55	153	394	568	616	375	92	16	13
27	24	118	55	141	455	499	592	337	83	20	13
28	26	78	62	129	641	499	592	337	83	20	13
29	26	69	240	141	------	522	691	356	83	16	10
30	26	62	600	153	------	522	691	356	83	16	7
31	24	------	1,000	129	------	545	------	356	------	16	7

NOTE.—Stage-discharge relation affected by ice Dec. 30 and 31; discharge estimated from notes of observer; interpolated Jan. 2; estimated mean discharge for month of September is 15 second-feet.

Monthly discharge of South Fork of John Day River at Dayville, Oreg., for the year ending Sept. 30, 1921

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	26	10	19.4	1,190
November	118	18	46.3	2,760
December	1,000	8	105	6,460
January	506	87	195	12,000
February	1,550	118	517	28,700
March	1,430	499	780	48,000
April	850	499	656	39,000
May	743	337	500	30,700
June	301	83	172	10,200
July	83	13	41.8	2,570
August	29	7	14.9	916
September	------	------	[a] 15.0	893
The year	1,550	------	253	183,000

[a] Estimated to complete year.

CAMAS CREEK ABOVE CABLE CREEK, NEAR UKIAH, OREG.

LOCATION.—In SE. ¼ sec. 4, T. 5 S., R. 32 E., at highway bridge 200 feet above mouth of Cable Creek and 6 miles east of Ukiah, Umatilla County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—May 1, 1914, to September 30, 1917; November 1, 1919, to September 30, 1921.

GAGE.—Enameled vertical staff on abutment of highway bridge.

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

CHANNEL AND CONTROL.—Bed composed of rock and gravel; slightly shifting.

EXTREMES OF DISCHARGE.—Maximum stage recorded during the period November 1, 1920, to September 30, 1921, 4.4 feet at 4 p. m. March 5 (discharge, 1,700 second-feet); minimum stage recorded, 1.0 foot, August 22–24, 27–29, September 1–4, 7, and 8 (discharge, 2.0 second-feet).

1914–1917, 1919–21: Maximum stage recorded, 4.5 feet May 13 and 14, 1917 (discharge, 1,790 second-feet); minimum discharge recorded, that of August 22–24, 27–29, September 1–4, 7 and 8, 1921. Discharge also estimated to have become as low as 2 second-feet in December, 1914.

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

DIVERSIONS.—Practically none.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed, during March flood. Two fairly well-defined curves used November 1 to March 5 and March 6 to September 30. Gage read to half-tenths twice daily. Discharge ascertained by applying mean daily gage heights to rating tables, except for periods affected by ice, November 10–14, December 11–22, January 16–24, and January 26 to February 7, for which discharges have been estimated. Records good except for December and January which are fair.

Discharge measurements of Camas Creek above Cable Creek, near Ukiah, Oreg., during the year ending Sept. 30, 1921

Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*
Oct. 29	W. B. Hinkle [a]	1.50	44.3
July 18	J. W. Bones	1.11	5.6

[a] Engineer, Teel irrigation district.

Daily discharge, in second-feet, of Camas Creek above Cable Creek, near Ukiah, Oreg., for the period Nov. 1, 1920, to Sept. 30, 1921

Day	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	42	110	230		420	365	660	230	30	3.5	2.0
2	44	90	590		420	420	590	230	27	3.5	2.0
3	50	70	590		590	365	660	192	25	3.5	2.0
4	46	67	530	130	1,190	530	590	230	21	3.5	2.0
5	46	70	530		1,520	560	530	230	21	3.5	3.5
6	34	63	420		1,350	530	475	192	17	3.5	3.5
7	50	63	315		530	475	420	192	17	5.0	2.0
8	50	74	315	115	530	270	420	160	19	5.0	2.0
9	44	94	270	130	475	270	420	148	19	5.0	3.5
10	40	110	250	230	420	315	420	130	17	3.5	3.5
11	40		250	365	365	270	475	122	14	5.0	3.5
12	40		270	625	315	315	475	110	10	5.0	3.5
13	40		292	800	365	365	420	94	10	7.5	5.0
14	40		365	800	315	420	365	74	7.5	7.5	5.0
15	42		420	730	270	420	420	67	7.5	5.0	3.5
16	46	80	448	590	420	475	420	46	5.0	5.0	5.0
17	46		270	475	560	420	475	39	5.0	7.5	5.0
18	54			365	695	420	475	39	7.5	7.5	3.5
19	54			392	530	420	502	36	7.5	5.0	5.0
20	135			420	530	420	475	39	5.0	3.5	7.5
21	135		200	420	475	475	530	30	4.4	3.5	7.5
22	130			420	530	560	530	34	5.0	2.0	5.0
23	130	110		420	530	530	475	42	7.5	2.0	6.0
24	115	135		365	560	590	475	46	9.0	2.0	7.5
25	135	135	176	270	530	590	475	39	10	3.5	7.5
26	135	135		230	475	502	420	34	7.5	3.5	7.5
27	148	110		230	420	560	392	39	7.5	2.0	5.0
28	135	160		315	115	590	315	34	7.5	2.0	5.0
29	122	211	160	-------	135	530	340	36	5.0	2.0	3.5
30	115	590		-------	292	660	270	34	5.0	3.5	3.5
31	-------	475		-------	420	-------	230	-------	5.0	3.5	-------

NOTE.—Stage-discharge relation affected by ice Nov. 10–14, Dec. 11–22, Jan. 18–24, and Jan. 26 to Feb. 7; discharge estimated by study of weather records, observer's notes, and comparison with records of flow for Cable Creek.

Monthly discharge of Camas Creek above Cable Creek, near Ukiah, Oreg., for the period Nov. 1, 1920, to Sept. 30, 1921

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
November	148	34	76.1	4,530
December	590	63	124	7,620
January	590	----------	287	17,600
February	800	----------	343	19,000
March	1,520	115	526	32,300
April	660	270	454	27,000
May	660	230	456	28,000
June	230	30	98.9	5,880
July	30	4.4	11.8	726
August	7.5	2	4.11	253
September	7.5	2	4.35	259
The period	----------	----------	----------	143,000

CABLE CREEK NEAR UKIAH, OREG.

LOCATION.—In NE. ¼ sec. 9, T. 5 S., R. 32 E., at highway bridge 1,000 feet above mouth of creek and 6 miles east of Ukiah, Umatilla County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—May 1, 1914, to September 30, 1917; November 1, 1919, to September 30, 1921.

GAGE.—Vertical staff on abutment of bridge.

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

CHANNEL AND CONTROL.—Bed composed of gravel and rock; slightly shifting.

EXTREMES OF STAGE.—Maximum stage recorded during period November 1, 1920, to September 30, 1921, 2.55 feet on May 29 (discharge, 530 second-feet); minimum stage recorded, 0.05 foot August 2–6 and 10 (discharge, 0.5 second-foot).

1914–1917, 1920–1921: Maximum stage recorded, 2.7 feet at 8 a. m. May 15, 1917 (discharge, 590 second-feet); minimum, creek probably dry at times during winter of 1917.

ICE.—Stage-discharge relation seriously affected.

DIVERSIONS.—Probably none.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed during high water May 29. Rating curves used not well defined. Staff gage read to half-tenths once a day. Daily discharge ascertained by applying daily gage heights to rating tables. Records fair.

Discharge measurements of Cable Creek near Ukiah, Oreg., during the year ending Sept. 30, 1921

Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*
Oct. 29	W. B. Hinkle *	0.30	11.0
July 17	J. W. Bones	.34	4.9

* Engineer, Teel Irrigation District.

Daily discharge, in second-feet, of Cable Creek near Ukiah, Oreg., for the period Nov. 1, 1920, to Sept. 30, 1921

Day	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	7.0	89	56	}	170	39	264	407	14	0.8	1.0
2	7.0	68	82		161	51	240	382	13	.5	1.0
3	11	41	85	30	195	43	264	337	10	.5	1.0
4	7.0	39	71		270	149	306	294	7.0	.5	1.0
5	11	32	89	}	246	149	300	264	7.0	.5	1.5
6	7.0	28	85	24	235	141	294	210	5.5	.5	1.5
7	7.0	17	89	26	195	129	270	180	5.5	1.0	1.0
8	7.0	23	85	26	195	89	246	128	6.4	1.0	1.5
9	}	24	53	30	185	71	246	106	6.4	1.0	1.5
10	}	28	}	71	149	89	228	74	4.0	.5	2.0
11	6.0	26	}	202	109	71	235	64	3.0	1.0	2.0
12	}	28	50	285	89	89	246	47	2.4	1.0	2.0
13	}	24	}	418	95	101	235	38	2.0	1.0	2.0
14	}	20	}	330	71	101	235	32	2.0	1.5	3.0
15	7.8	}	}	240	68	105	246	24	3.0	1.0	2.0
16	10	}	178	165	149	101	264	22	4.0	1.5	2.0
17	10	}	125	105	195	89	270	22	4.6	1.0	1.5
18	12	}	}	185	220	101	285	22	5.5	1.0	1.5
19	12	}	}	285	190	150	294	24	5.5	1.0	2.0
20	24	18	}	276	195	101	285	22	4.0	1.0	3.0
21	190	}	}	285	190	121	294	18	3.0	1.0	3.0
22	185	}	}	270	195	195	300	14	3.6	1.5	2.0
23	185	}	}	294	170	195	285	20	3.6	1.5	2.0
24	170	}	}	285	195	190	276	22	3.6	1.0	3.0
25	190	24	50	264	185	185	285	18	4.6	1.0	3.0
26	190	17	}	240	149	195	276	14	4.0	1.5	3.0
27	165	14	}	228	101	228	246	16	3.0	1.0	2.0
28	149	23	}	190	95	264	220	16	2.0	1.0	2.0
29	125	28	}	--------	105	235	530	18	1.5	1.0	1.5
30	105	85	}	--------	101	264	452	14	1.5	1.5	1.5
31	--------	56	}	--------	65	--------	407	--------	1.0	1.5	--------

NOTE.—Braced figures show estimated mean discharge for periods indicated; stage-discharge relation affected by ice; discharge estimated from study of gage height, observer's notes, and weather records.

Monthly discharge of Cable Creek near Ukiah, Oreg., for the period Nov. 1, 1920, to Sept. 30, 1921

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
November	190	6.0	61.0	3,630
December	89	14	29.5	1,810
January	178	----------	64.5	3,970
February	418	----------	174	9,660
March	270	65	159	9,780
April	264	39	133	7,910
May	530	220	285	17,500
June	407	14	95.6	5,690
July	14	1.0	4.72	290
August	1.5	.5	1.01	62
September	3.0	1.0	1.90	113
The period	----------	----------	----------	60,400

DESCHUTES RIVER BASIN

DESCHUTES RIVER NEAR LAPINE, OREG.

LOCATION.—In NW. ¼ sec. 26, T. 20 S., R. 10 E., at Forest Service bridge at Big River ranger station, 7 miles by river above mouth of East Fork, 11 miles north of Lapine, Deschutes County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—September 22 to December 21, 1910; February 18 to December 31, 1912; April 7 to October 27, 1913, occasional readings; October 1, 1914, to May 14, 1917; August 26 to October 27, 1920, when station was discontinued.

GAGE.—Vertical staff on bent of bridge. Stevens recorder, installed temporarily, used in 1920.

DISCHARGE MEASUREMENTS.—Made from upstream side of wagon bridge. Conditions excellent.

CHANNEL AND CONTROL.—Stream bed composed of gravel and sand; no defined control. Channel crooked, gradient low.

EXTREMES OF DISCHARGE.—Not determined.

ICE.—None during period.

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent during period. Rating curve fairly well defined. Operation of recorder unsatisfactory part of time, but gage-height record adequate on account of small fluctuation. Daily discharge ascertained by applying the daily gage height to rating table and by interpolating discharge for days when gage was not read. Records good.

Discharge measurements of Deschutes River near Lapine, Oreg., for the period Aug. 26 to Oct. 27, 1920

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Aug. 26	Phillips and Briggs	1.30	931	Sept. 13	K. N. Phillips	1.40	966
26	Briggs and Phillips	1.30	897	Oct. 27	Briggs and Dawson	1.22	902
Sept. 13	K. N. Phillips	1.41	981	27	Dawson and Briggs	1.22	900

Daily discharge, in second-feet, of Deschutes River near Lapine, Oreg., for the period Aug. 26 to Oct. 27, 1920

Day	Aug.	Sept.	Oct.	Day	Aug.	Sept.	Oct.	Day	Aug.	Sept.	Oct.
1			[a] 926	11		935	922	21		925	909
2			[a] 926	12				22		928	
3			925	13		945		23		932	
4			925	14		945	920	24		932	900
5		935	925	15		935		25			900
6				16		930		26	920		900
7				17		930	918	27		928	900
8			924	18		928		28			
9				19		925	909	29	923		
10				20		925		30			
								31			

[a] Estimated.

NOTE.—Braced figures show estimated mean discharge for periods indicated.

Monthly discharge of Deschutes River near Lapine, Oreg., for the period Aug. 26 to Oct. 27, 1920

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
August 26–31			922	11,000
September			932	55,500
October 1–27	926	900	916	49,100
The period				116,000

DESCHUTES RIVER AT BENHAM FALLS, NEAR BEND, OREG.

LOCATION.—In SE. ¼ sec. 9, T. 19 S., R. 11 E., 100 yards above head of Benham Falls, 1½ miles below proposed dam site for Benham Falls reservoir, and 14 miles by road south of Bend, Deschutes County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—March 30, 1909, to September 30, 1913; August 27 to December 22, 1920, and July 1 to September 15, 1921, when station was discontinued.

GAGE.—Vertical staff on left bank installed in August, 1920, nearly opposite gage used from 1909 to 1913. Temporary gage on railroad trestle about one-half mile above regular gage read July 10 to September 15.

DISCHARGE MEASUREMENTS.—Made from cable about 100 yards above gage.

CHANNEL AND CONTROL.—Control is rock reef at head of Benham Falls. Gage and cable located in comparatively deep and sluggish water above head of falls. Logs may jam at or near control.

EXTREMES OF DISCHARGE.—Maximum stage recorded during the periods August 27 to December 22, 1920, and July 10 to September 15, 1921, 2.70 feet at time of measurement June 3, 1921 (discharge, 2,110 second-feet); minimum stage recorded, 0.77 foot December 15, 1920 (discharge, 1,080 second-feet).

ICE.—None.

DIVERSIONS.—Some irrigation in headwaters of river. Station is above all large diversions near Bend.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent except as affected by logs on control August 27 to September 24, 1920. Rating curves fairly well defined. Staff gage read to hundredths twice daily August 27 to December 22 and three times a week July 10 to September 15. Daily discharge ascertained by applying daily gage heights to rating tables. Records good.

Discharge measurements of Deschutes River at Benham Falls, near Bend, Oreg., during the period Sept. 10, 1920, to Oct. 7, 1921

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
1920		*Feet*	*Sec.-ft.*	1921		*Feet*	*Sec.-ft.*
Sept. 10	K. N. Phillips	1.31	1,150	Apr. 18	Wendell Dawson	2.11	1,680
10	do	1.31	1,170	May 5	do	2.42	1 940
Oct. 27	Briggs and Dawson	1.22	1,270	June 3	do	2.70	2,090
1921				Sept. 6	do	1.99	1,640
Apr. 1	J. W. Bones	2.00	1,670	Oct. 7	G. H. Canfield	1.98	1,510

Daily discharge, in second-feet, of Deschutes River at Benham Falls, near Bend, Oreg., for the periods Aug. 27 to Dec. 22, 1920, and July 1 to Sept. 15, 1921

Day	1920					1921		
	Aug.	Sept.	Oct.	Nov	Dec.	July	Aug.	Sept.
1		1,150	1,260	1,260	1,460	1,900	1,680	1,640
2		1,150	1,260	1,260	1,480		1,680	1,640
3		1,150	1,260	1,240	1,440		1,680	1,640
4		1,150	1,260	1,240	1,410		1,680	1,660
5		1,150	1,260	1,260	1,410		1,680	1,680
6		1,150	1,260	1,240	1,340		1,680	1,660
7		1,150	1,260	1,240	1,340		1,680	1,640
8		1,150	1,260	1,240	1,340		1,680	1,640
9		1,150	1,260	1,240	1,340		1,710	1,640
10		1,150	1,280	1,220	1,340	1,840	1,740	1,640
11		1,150	1,260	1,220	1,340	1,820	1,710	1,640
12		1,180	1,280	1,220	1,340	1,800	1,680	1,630
13		1,180	1,280	1,220	1,300	1,770	1,680	1,620
14		1,200	1,280	1,260	1,300	1,820	1,680	1,630
15		1,200	1,300	1,260	1,080	1,870	1,690	1,640
16		1,200	1,280	1,280	1,260	1,780	1,700	
17		1,200	1,280	1,360	1,510	1,700	1,700	
18		1,200	1,300	1,420	1,340	1,750	1,700	
19		1,200	1,300	1,480	1,340	1,800	1,690	
20		1,180	1,300	1,480	1,340	1,800	1,680	
21		1,180	1,300	1,540	1,340	1,800	1,680	
22		1,180	1,280	1,510	1,340	1,750	1,680	
23		1,200	1,280	1,480		1,700	1,680	
24		1,220	1,280	1,460		1,700	1,680	
25		1,280	1,280	1,460		1,700	1,680	
26		1,260	1,260	1,460		1,700	1,680	
27	1,150	1,260	1,260	1,480		1,700	1,680	
28	1,150	1,260		1,480		1,700	1,680	
29	1,180	1,240	1,260	1,480		1,700	1,660	
30	1,150	1,240		1,480		1,690	1,640	
31	1,150					1,680	1,640	

Monthly discharge of Deschutes River at Benham Falls, near Bend, Oreg., for the periods Aug. 27 to Dec. 22, 1920, and July 10 to Sept. 15, 1921

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1920				
August 27–31	1,180	1,150	1,160	11,500
September	1,280	1,150	1,190	70,800
October	1,300	1,260	1,270	78,100
November	1,540	1,220	1,350	80,300
December 1–22	1,510	1,080	1,350	58,900
1921				
July 10–31	1,870	1,680	1,750	76,300
August	1,740	1,640	1,680	103,000
September 1–15	1,680	1,620	1,640	48,800

DESCHUTES RIVER BELOW BEND, OREG.

LOCATION.—In SE. ¼ sec. 20, T. 17 S., R. 12 E., half a mile below North canal dam and 2 miles north of Bend, Deschutes County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—November 27, 1914, to September 30, 1921.

GAGE.—Stevens water-stage recorder on right bank; inspected by W. L. Beebe.

DISCHARGE MEASUREMENTS.—Made from cable about 50 feet upstream from gage.

CHANNEL AND CONTROL.—Coarse gravel and boulders. Logs, drift, and aquatic plants lodged on the wide shallow control may affect stage-discharge relation at times.

EXTREMES OF DISCHARGE.—Maximum stage during year, from water-stage recorder, 2.51 feet at 2 a. m., March 21 (discharge, 1,700 second-feet); minimum stage from water-stage recorder, 0.91 foot at 1 a. m. October 5 (discharge, 331 second-feet).

1914–1921: Maximum stage from water-stage recorder, 2.75 feet (caused by failure of dam at mill pond above gage) at noon February 1, 1920 (discharge, 2,320 second-feet); minimum stage recorded, 0.23 foot, August 21, 1920 (discharge, 70 second-feet).

1905–1921: Maximum stage recorded, 3.45 feet, at pumping plant at Bend, at 7.45 a. m. November 27, 1909 (discharge, 4,820 second-feet; no diversions).

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

DIVERSIONS.—Station is below intakes of the five large canals (Arnold, Central Oregon, Pilot Butte, North, and Swalley canals) which divert water from Deschutes River near Bend; only small diversions below station.

REGULATION.—Flow regulated by two hydroelectric plants, one at North canal dam and one at Bend.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined. Operation of water-stage recorder fairly satisfactory. Daily discharge ascertained by applying to rating table the mean daily gage height obtained by inspecting recorder graph. Discharge for days of no gage-height record ascertained by interpolation based on figures obtained by first including the diversions in the five canals near Bend and then subtracting from the interpolated figures the total discharge of the canals for those days. Records good.

Discharge measurements of Deschutes River below Bend, Oreg., 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. 28	J. W. Bones	2.25	1,440	May 4	Wendell Dawson	1.75	970
Apr. 2	do	1.92	1,130	June 3	do	2.22	1,490
17	Wendell Dawson	2.08	1,320	Aug. 5	J. W. Bones	1.40	685
May 1	J W. Bones	1.86	1,120				

Daily discharge, in second-feet, of Deschutes River below Bend, Oreg., for the year ending Sept. 30, 1921

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	584	756	1,300	1,390	1,300	1,390	1,260	1,080	1,120	895	640	688
2	576	765	1,300	1,300	1,260	1,390	1,260	1,080	1,120	850	640	705
3	560	808	1,300	1,260	1,160	1,440	1,340	1,120	1,390	895	648	705
4	560	808	1,260	1,260	1,160	1,390	1,440	1,080	1,490	895	688	714
5	568	808	1,300	1,390	1,160	1,340	1,540	1,120	1,490	895	688	722
6	584	808	1,260	1,540	1,160	1,300	1,540	1,160	1,490	850	680	740
7	584	850	1,210	1,590	1,160	1,340	1,490	1,160	1,440	850	656	765
8	584	895	1,210	1,590	1,210	1,340	1,490	1,080	1,440	850	664	748
9	592	985	1,080	1,590	1,210	1,340	1,440	1,120	1,440	808	688	748
10	600	1,120	1,030	1,590	1,340	1,390	1,440	1,120	1,490	765	714	740
11	600	1,120	1,080	1,250	1,440	1,390	1,490	1,080	1,440	765	705	731
12	592	1,120	1,120	1,250	1,440	1,340	1,540	1,080	1,340	765	705	740
13	600	1,160	1,210	1,350	1,440	1,340	1,540	1,080	1,300	765	731	740
14	608	1,160	1,260	1,410	1,440	1,340	1,590	1,080	1,150	756	740	740
15	632	1,160	1,160	1,320	1,350	1,340	1,540	1,030	1,130	731	700	740
16	600	1,160	1,160	1,490	1,350	1,390	1,540	1,030	1,360	714	760	760
17	608	1,210	1,250	1,350	1,350	1,440	1,260	1,120	1,110	697	730	820
18	680	1,160	1,220	1,280	1,320	1,490	1,260	1,160	1,130	705	700	820
19	740	1,080	1,260	1,350	1,320	1,540	1,210	1,210	1,390	680	672	850
20	740	1,120	1,210	1,320	1,280	1,540	1,210	1,210	1,340	680	672	940
21	765	1,120	1,160	1,280	1,440	1,590	1,210	1,210	1,260	680	664	1,000
22	740	1,260	1,160	1,250	1,390	1,540	1,160	1,260	1,120	680	664	1,010
23	731	1,390	1,160	1,300	1,390	1,540	1,160	1,300	1,080	680	672	1,020
24	731	1,390	1,160	1,340	1,300	1,540	1,160	1,340	985	640	688	1,020
25	714	1,340	1,210	1,390	1,300	1,490	1,160	1,300	940	648	680	1,080
26	722	1,390	1,210	1,260	1,300	1,490	1,120	1,210	895	640	672	1,080
27	706	1,390	1,260	1,210	1,440	1,490	1,120	1,120	895	672	672	1,090
28	722	1,390	1,260	1,300	1,440	1,490	1,120	1,120	895	688	680	1,100
29	731	1,340	1,260	1,340	-------	1,490	1,120	1,120	850	680	680	1,100
30	765	1,300	1,390	1,340	-------	1,440	1,120	1,120	895	648	680	1,100
31	808	-------	1,390	1,340	-------	1,300	-------	1,120	-------	640	680	-------

NOTE.—Discharge for Dec. 15–18, Jan. 11–15, 17–22, and Feb. 15–20, determined by applying special rating table (derived by making simultaneous readings at regular station and temporary one) to daily staff-gage readings made on temporary gage at North canal diversion. Discharge for days of missing gage height, June 14–18, July 19–23, Aug. 14–18, Sept. 16–18, 21–24, and 27–30, determined by subtracting total flow of canals from estimated discharge for Deschutes River, including canals, near Bend.

Monthly discharge of Deschutes River below Bend, Oreg., for the year ending Sept. 30, 1921

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	808	560	656	40,300
November	1,390	756	1,110	66,000
December	1,390	1,030	1,220	75,000
January	1,590	1,210	1,360	83,600
February	1,440	1,160	1,320	73,300
March	1,590	1,300	1,430	87,900
April	1,590	1,120	1,330	79,100
May	1,340	1,030	1,140	70,100
June	1,490	850	1,210	72,000
July	895	640	745	45,800
August	760	640	686	42,200
September	1,100	688	859	51,100
The year	1,590	560	1,090	786,000

Daily discharge, in second-feet, of Deschutes River, including canals, near Bend, Oreg., for the year ending Sept. 30, 1921

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	1,250	1,150	1,310	1,410	1,310	1,420	1,540	1,800	1,980	1,850	1,580	1,580
2	1,240	1,140	1,310	1,400	1,400	1,420	1,530	1,800	1,990	1,800	1,580	1,580
3	1,230	1,170	1,310	1,540	1,330	1,470	1,530	1,860	1,900	1,850	1,590	1,580
4	1,230	1,170	1,270	1,580	1,330	1,420	1,520	1,840	1,960	1,850	1,630	1,590
5	1,240	1,170	1,310	1,580	1,320	1,360	1,540	1,880	1,960	1,850	1,630	1,590
6	1,220	1,170	1,270	1,550	1,320	1,430	1,550	1,930	1,960	1,800	1,620	1,600
7	1,220	1,170	1,220	1,590	1,320	1,520	1,510	1,920	1,920	1,800	1,620	1,570
8	1,240	1,160	1,300	1,590	1,370	1,520	1,520	1,860	1,930	1,800	1,630	1,590
9	1,260	1,120	1,310	1,590	1,370	1,520	1,490	1,900	1,930	1,760	1,650	1,590
10	1,270	1,120	1,290	1,590	1,390	1,480	1,510	1,900	1,970	1,720	1,680	1,580
11	1,270	1,120	1,300	1,250	1,450	1,420	1,540	1,860	1,940	1,720	1,660	1,560
12	1,260	1,120	1,250	1,250	1,450	1,450	1,580	1,860	1,950	1,720	1,660	1,580
13	1,250	1,160	1,210	1,350	1,470	1,450	1,590	1,850	2,080	1,720	1,620	1,580
14	1,240	1,160	1,260	1,410	1,470	1,470	1,650	1,860		1,730		1,570
15	1,270	1,160	1,100	1,320	1,360	1,480	1,680	1,840		1,690		1,560
16	1,230	1,160	1,160	1,490	1,360	1,450	1,810	1,840	1,980	1,680	1,610	
17	1,220	1,210	1,250	1,350	1,360	1,460	1,620	1,860		1,660		1,540
18	1,290	1,300	1,220	1,280	1,330	1,520	1,600	1,870		1,670		
19	1,310	1,390	1,260	1,350	1,330	1,570	1,600	1,920	1,890		1,600	1,510
20	1,300	1,430	1,210	1,320	1,290	1,570	1,610	1,920	1,880		1,600	1,530
21	1,300	1,420	1,170	1,280	1,450	1,610	1,620	1,930	1,910	1,640	1,610	
22	1,280	1,320	1,180	1,250	1,460	1,560	1,620	1,980	1,990		1,610	1,580
23	1,250	1,390	1,190	1,300	1,530	1,570	1,680	2,000	1,880		1,620	
24	1,260	1,390	1,160	1,340	1,440	1,570	1,710	2,030	1,870	1,610	1,620	
25	1,240	1,340	1,210	1,410	1,450	1,520	1,740	2,020	1,860	1,620	1,610	1,640
26	1,250	1,390	1,210	1,370	1,360	1,520	1,720	1,980	1,820	1,570	1,580	1,640
27	1,220	1,390	1,260	1,360	1,450	1,520	1,740	1,920	1,830	1,610	1,580	
28	1,220	1,390	1,270	1,360	1,460	1,520	1,770	1,940	1,840	1,620	1,570	1,650
29	1,230	1,350	1,280	1,360	-------	1,520	1,790	1,940	1,800	1,620	1,580	
30	1,230	1,320	1,410	1,350	-------	1,550	1,810	1,950	1,840	1,580	1,590	
31	1,260	-------	1,410	1,350	-------	1,560	-------	1,960	-------	1,580	1,570	-------

NOTE.—Braced figures show mean discharge for periods indicated, estimated by interpolation.

Monthly discharge of Deschutes River, including canals, near Bend, Oreg., for the year ending Sept. 30, 1921

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	1,310	1,220	1,250	76,900
November	1,430	1,120	1,250	74,400
December	1,410	1,100	1,250	76,900
January	1,590	1,250	1,400	86,100
February	1,530	1,290	1,390	77,200
March	1,610	1,360	1,500	92,200
April	1,810	1,490	1,620	96,400
May	2,030	1,800	1,900	117,000
June	2,080	1,800	1,930	115,000
July	1,850	1,570	1,700	105,000
August	1,680	1,570	1,610	99,000
September	1,650	1,510	1,580	94,000
The year	2,080	1,100	1,530	1,110,000

DESCHUTES RIVER AT MECCA, OREG.

LOCATION.—In SW. ¼ sec. 20, T. 9 S., R. 13 E., at bridge at Mecca station on Oregon Trunk Railway, Jefferson County, 1½ miles below mouth of Shitike Creek and 12 miles above mouth of Warm Spring River.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—June 7, 1911, to September 30, 1921.

GAGE.—Vertical staff fastened to tree on right bank 75 feet above bridge; read by H. E. Massey.

DISCHARGE MEASUREMENTS.—Made from highway bridge.

CHANNEL AND CONTROL.—Bed composed of rock and gravel; subject to seasonal shifts.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 5.05 feet February 15 (discharge, 9,820 second-feet); minimum stage recorded, 2.35 feet October 1, 2, 6, 13–15 (discharge, 3,850 second-feet).

1911–1921: Maximum stage recorded, 5.75 feet March 21, 1916 (discharge, 11,700 second-feet); minimum stage recorded, 1.95 feet August 27–30, 1920 (discharge, 3,170 second-feet).

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

DIVERSIONS.—Flow affected by diversions from upper Deschutes River, near Bend, Tumalo, and Cline Falls. Summer flow of Crooked River above head of lower canyon near Terrebonne practically all diverted.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed during high water of January 6. Two well-defined rating curves used up to August 4, after which stage-discharge relation appears unstable and shifting-control method was used. Gage read to half-tenths once a day. Daily discharge ascertained by applying daily gage heights to rating table. Records good.

Discharge measurements of Deschutes River at Mecca, Oreg., 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	Dawson and Briggs	2.48	4,100	July 7	J. W. Bones	2.80	4,900
May 17	V. H. Reineking	3.40	6,090	Sept. 9	Wendell Dawson	2.55	4,060

Daily discharge, in second-feet, of Deschutes River at Mecca, Oreg., for the year ending Sept. 30, 1921

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	3,850	4,040	5,150	7,110	5,260	7,120	6,900	6,900	6,470	5,450	4,380	4,060
2	3,850	4,040	4,940	7,110	5,260	7,120	7,120	6,900	6,470	5,260	4,380	4,060
3	4,330	4,040	4,940	7,110	5,260	7,340	7,800	6,470	6,470	5,080	4,380	4,060
4	4,330	4,140	4,730	7,110	5,260	7,800	7,570	6,470	6,470	4,900	4,330	4,060
5	4,040	4,140	4,730	7,340	5,260	8,280	7,340	6,260	6,680	4,900	4,550	4,060
6	3,850	4,140	4,730	7,340	5,260	8,280	7,120	6,040	6,900	4,900	4,220	4,220
7	3,950	4,140	4,730	6,900	5,260	7,800	6,900	6,260	6,900	4,900	4,220	4,220
8	3,950	4,140	4,730	6,470	5,080	7,570	6,680	6,260	6,680	4,900	4,380	4,220
9	3,950	4,330	4,730	6,260	5,260	7,340	6,470	6,260	6,470	4,900	4,380	4,060
10	3,950	4,330	4,730	6,050	6,050	7,340	6,900	6,470	6,470	4,900	4,380	4,060
11	3,950	4,330	4,730	5,850	6,900	7,340	7,340	6,470	6,050	4,900	4,220	4,060
12	3,950	4,530	4,730	5,650	8,280	6,900	7,570	6,260	6,050	4,720	4,220	4,060
13	3,850	4,530	4,730	5,650	8,520	6,900	7,570	6,260	5,850	4,720	4,220	4,060
14	3,850	4,530	4,730	6,050	8,280	6,900	7,570	6,050	5,650	4,720	4,220	4,060
15	3,850	4,730	4,730	6,050	9,820	6,680	7,340	6,050	5,260	4,550	4,220	4,060
16	3,950	5,150	4,730	6,050	8,280	6,900	6,900	6,050	5,260	4,550	4,220	4,220
17	3,950	5,570	4,730	6,050	7,120	7,340	6,680	6,050	5,260	4,550	4,220	4,220
18	3,950	5,990	4,730	5,850	6,900	9,300	6,470	6,470	5,260	4,550	4,220	4,220
19	3,950	5,570	4,730	5,850	6,470	9,560	6,680	7,340	5,650	4,550	4,220	4,900
20	3,950	5,150	4,730	5,650	6,260	8,780	6,680	7,340	5,650	4,550	4,220	4,550
21	3,950	5,150	4,730	5,650	6,050	7,800	6,900	6,900	5,650	4,550	4,220	4,900
22	4,140	5,150	4,730	5,650	6,050	7,340	7,340	6,900	5,650	4,550	4,220	4,720
23	4,040	5,150	4,730	5,450	6,050	7,340	7,340	6,900	5,650	4,550	4,220	4,550
24	4,040	5,150	5,150	5,260	6,050	7,340	7,120	6,900	5,650	4,550	4,220	4,550
25	4,140	5,150	5,150	5,260	6,050	6,900	6,900	6,680	5,260	4,550	4,220	4,550
26	4,140	5,150	4,940	5,260	6,470	6,900	6,680	6,470	5,260	4,550	4,060	4,550
27	4,040	5,360	4,730	5,450	6,470	6,900	6,470	6,260	5,080	4,550	4,060	4,550
28	4,040	5,150	4,730	5,450	6,470	6,900	6,900	6,050	5,260	4,550	4,060	4,550
29	4,040	5,150	5,150	5,450	-------	6,680	6,900	5,650	5,260	4,550	4,060	4,550
30	4,040	5,150	6,430	5,260	-------	6,900	7,120	5,650	5,260	4,550	4,060	4,550
31	4,040	-------	6,880	5,260	-------	6,900	-------	5,650	-------	4,380	4,060	-------

Monthly discharge of Deschutes River at Mecca, Oreg., for the year ending Sept. 30, 1921

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	4,330	3,850	3,960	243,000
November	5,990	4,040	4,780	284,000
December	6,880	4,730	4,930	303,000
January	7,340	5,260	6,030	371,000
February	9,820	5,080	6,420	357,000
March	9,560	6,680	7,440	457,000
April	7,800	6,470	7,040	419,000
May	7,340	5,650	6,410	394,000
June	6,900	5,080	5,860	349,000
July	5,450	4,380	4,720	290,000
August	4,550	4,060	4,240	261,000
September	4,900	4,060	4,320	257,000
The year	9,820	3,850	5,510	3,980,000

DESCHUTES RIVER AT MOODY, NEAR BIGGS, OREG.

LOCATION.—In SE. ¼ sec. 26, T. 2 N., R. 15 E., opposite Moody railroad station, 1¼ miles above bridge of Oregon-Washington Railroad & Navigation Co., 1½ miles above mouth of river, and 5 miles southwest of Biggs, Sherman County.

DRAINAGE AREA.—About 9,180 square miles.

RECORDS AVAILABLE.—July 7, 1906, to September 30, 1921; October 19, 1897, to December 31, 1899, for a station near Moro, 10 miles above mouth of river in NE. ¼ sec. 5, T. 1 S., R. 16 E. Records for 1908 and 1910 somewhat fragmentary.

GAGE.—Staff in two sections, the lower inclined, the upper vertical; read by Dave Jones.

DISCHARGE MEASUREMENTS.—Made from a cable about 450 feet above gage.

CHANNEL AND CONTROL.—Bed composed of rock and gravel; shifting only in floods.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 4.85 feet at 4.30 p. m. January 3 (discharge, 14,600 second-feet); minimum stage recorded, 2.2 feet October 1, 2, and 10–12 (discharge, 4,200 second-feet).

1906–1921: Maximum stage recorded, 7.50 feet February 6, 1907 (discharge, 30,600 second-feet); minimum stage recorded, 1.9 feet August 23–28, 1920 (discharge, 3,510 second-feet).

ICE.—Stage-discharge relation never affected by ice.

DIVERSIONS.—Summer discharge at this station has been progressively reduced since about 1904 or 1905 by diversions from the upper river. Some of the water returns but the net reduction during midsummer now probably exceeds 20 per cent.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent during year. Rating curve well defined. Gage read to tenth or half-tenths; from December 30 to March 31 read twice daily and the rest of year once daily. Daily discharge ascertained by applying daily gage height to rating table. Records good.

Discharge measurements of Deschutes River at Moody, near Biggs, Oreg., 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. 1	R. C. Briggs	2.72	5,820	June 23	K. N. Phillips	2.94	6,220
Mar. 21	Wendell Dawson	4.05	10,600	Aug. 21	do	2.32	4,590

Daily discharge, in second-feet, of Deschutes River at Moody, near Biggs, Oreg., for the year ending Sept. 30, 1921

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	4,200	4,450	5,870	8,630	5,870	9,440	8,630	8,630	7,170	5,870	4,720	4,580
2	4,200	4,450	5,570	9,440	5,870	10,300	8,630	8,630	7,170	5,870	4,720	4,580
3	4,720	4,720	5,570	14,300	6,500	10,300	9,030	8,250	7,170	5,870	4,720	4,580
4	5,000	4,720	5,570	12,300	6,500	10,800	9,030	7,880	8,630	5,280	4,720	4,580
5	5,000	4,720	5,570	13,300	6,500	10,800	8,250	7,520	8,630	5,280	4,720	4,580
6	4,720	4,720	5,280	11,300	5,870	11,300	7,880	7,520	8,250	5,280	4,720	4,580
7	4,720	4,720	5,280	9,440	5,870	10,800	7,880	7,520	8,250	5,280	4,720	4,580
8	4,450	4,720	5,280	8,630	6,500	10,300	7,880	7,880	7,880	5,280	4,720	4,580
9	4,450	4,720	5,280	8,250	8,630	9,860	7,880	7,880	7,880	5,280	4,720	4,580
10	4,200	4,720	5,280	7,520	10,300	9,030	7,880	7,880	7,880	5,280	4,720	4,580
11	4,200	4,720	5,280	7,170	11,300	8,630	7,880	7,880	7,520	5,280	4,720	4,580
12	4,200	4,720	5,280	6,830	11,800	8,630	8,250	7,880	7,170	5,280	4,720	4,580
13	4,450	4,720	5,000	6,830	12,800	8,630	9,030	7,880	6,830	5,280	4,720	4,580
14	4,450	4,720	5,000	7,170	12,300	7,880	9,440	7,880	6,500	5,280	4,720	4,580
15	4,450	5,000	5,000	7,880	11,800	7,880	9,030	7,880	6,500	5,280	4,860	4,580
16	4,450	5,280	5,000	7,880	12,300	7,880	8,630	7,880	6,500	5,280	4,720	4,580
17	4,450	5,280	5,280	7,880	9,440	10,300	7,880	7,880	6,500	5,280	4,720	4,580
18	4,450	6,180	5,280	7,170	8,250	12,300	7,880	7,880	6,180	5,280	4,720	4,860
19	4,450	6,830	5,280	6,830	8,250	12,800	8,250	9,440	6,180	4,860	4,580	5,280
20	4,450	6,830	5,280	6,830	8,250	12,300	8,250	9,440	6,500	4,720	4,580	5,280
21	4,720	6,180	5,280	6,500	7,880	10,800	9,030	9,440	6,500	4,720	4,580	5,280
22	4,720	6,180	5,000	6,500	7,520	10,300	9,440	8,630	6,500	4,720	4,580	5,280
23	4,720	6,180	5,000	6,500	7,520	9,860	9,440	9,030	6,180	4,720	4,580	5,280
24	4,450	6,180	5,870	6,180	7,880	9,440	9,440	8,630	6,180	4,720	4,450	5,280
25	4,450	5,570	6,180	5,870	7,880	9,440	9,030	8,630	5,870	4,720	4,450	5,280
26	4,450	6,180	5,280	5,870	8,250	9,030	8,630	8,630	5,870	4,720	4,450	5,280
27	4,450	6,500	5,280	5,870	8,630	8,630	8,250	7,880	5,570	4,720	4,450	5,280
28	4,450	6,180	5,570	5,870	9,030	8,250	8,250	7,520	5,570	4,720	4,450	5,280
29	4,450	5,870	5,870	6,180	-------	8,250	9,030	7,170	5,870	4,720	4,450	5,000
30	4,450	5,870	7,170	6,180	-------	8,250	9,030	7,170	5,870	4,720	4,450	5,000
31	4,450	-------	10,300	5,870	-------	8,250	-------	7,170	-------	4,720	4,580	-------

Monthly discharge of Deschutes River at Moody, near Biggs, Oreg., for the year ending Sept. 30, 1921

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	5,000	4,200	4,500	277,000
November	6,830	4,450	5,390	321,000
December	10,300	5,000	5,580	343,000
January	14,300	5,870	7,840	482,000
February	12,800	5,870	8,550	475,000
March	12,800	7,880	9,700	596,000
April	9,440	7,880	8,570	510,000
May	9,440	7,170	8,110	499,000
June	8,630	5,570	6,840	407,000
July	5,870	4,720	5,110	314,000
August	4,860	4,450	4,640	285,000
September	5,280	4,580	4,850	289,000
The year	14,300	4,200	6,630	4,800,000

EAST FORK AT MORSON INTAKE, NEAR LAPINE, OREG.

LOCATION.—In sec. 33, T. 23 S., R. 9 E., above intake of canal of Morson project and below Crescent Creek, half a mile from river road to Crescent, and 12 miles southwest of Lapine, Deschutes County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—May 26, 1914, to September 14, 1917 (except winter periods), May 7 to August 31, 1919; April 5 to September 13, 1920, June 9 to September 30, 1921.

GAGE.—Vertical staff on right bank above Morson intake. Vertical staff nailed to a tree root in section 33, just below mouth of Crescent Creek used prior to July 27, 1915, and May 15 to September 14, 1917, and staff on bent of private bridge, in NE. ¼ sec. 34, below canal intake during 1916, 1919, and 1920. Gage read by Mrs. C. S. Stearns.

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

CHANNEL AND CONTROL.—Bed composed of gravel and sand, with steep banks of silt, overgrown with brush; may shift in floods.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period June 9 to September 30, 5.6 feet June 12 (discharge, 660 second-feet); minimum stage recorded, 3.00 feet September 14–17 (discharge, 122 second-feet.)

1914–1917 and 1919–1921: Maximum stage, 6.73 feet June 12, 1917 (discharge, 835 second-feet); flood of November 25, 1909, may have reached 1,800 second-feet (estimated from records at Allen's ranch). Minimum stage recorded, 0.42 foot September 9–10, 1920 (discharge, 34 second-feet).

ICE.—Stream is frozen two or three months; no winter records have been obtained.

DIVERSIONS.—A few small ditches divert water above station. Water was diverted in Morson Canal past the gage at bridge during a portion of 1919 and 1920.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined. Gage read to tenths once a day. Daily discharge ascertained by applying daily gage height to rating table. Records good.

Discharge measurements of East Fork at Morson intake, near Lapine, Oreg., during the period May 3 to Sept. 30, 1921

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
May 3	Wendell Dawson	a 3.78	542	July 1	J. W. Bones	4.60	412
June 9	J. W. Bones	5.42	613	Sept. 2	Wendell Dawson	3.10	133

a Referred to staff gage used in 1920.

Daily discharge, in second-feet, of East Fork at Morson intake, near Lapine, Oreg., for the period June 9 to Sept. 30, 1921

Day	June	July	Aug.	Sept.	Day	June	July	Aug.	Sept.
1		388	188	145	16	510	240	173	122
2		388	188	133	17	510	240	173	122
3		388	188	133	18	485	240	158	133
4		388	173	133	19	485	222	158	133
5		388	173	133	20	460	222	158	133
6		388	173	133	21	436	222	158	133
7		388	173	133	22	436	222	158	133
8		388	173	133	23	436	205	158	145
9	610	365	173	133	24	436	205	158	145
10	627	343	173	133	25	436	205	158	
11	644	321	173	133	26	412	205	145	
12	660	321	173	133	27	412	205	145	120
13	610	300	173	133	28	412	205	145	
14	560	279	173	122	29	412	205	145	
15	535	259	173	122	30	412	205	145	
					31		205	145	

NOTE.—Braced figure shows estimated mean discharge for period indicated. Discharge interpolated June 10 and 11.

Monthly discharge of East Fork at Morson intake, near Lapine, Oreg., for the period June 9 to Sept. 30, 1921

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
June 9–30	660	412	497	21,700
July	388	205	282	17,300
August	188	145	165	10,100
September	145		130	7,740
The period				56,800

EAST FORK NEAR LAPINE, OREG.

LOCATION.—In sec. 2, T. 22 S., R. 10 E., at wagon bridge at former town of Rosland, 1½ miles north of Lapine, Deschutes County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—September 22, 1910, to October 31, 1913, fragmentary; June 23 to November 2, 1918, and August 26 to October 28, 1920, when station was discontinued.

GAGE.—Vertical staff on downstream side of east bent of bridge; read by M. C. Bogue.

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

CHANNEL AND CONTROL.—Earth banks which are overflowed at high stages, sandy bottom. No well-defined control.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period August 26 to October 28, 1920, 1.12 feet October 16 (discharge, 162 second-feet); minimum stage recorded, 0.20 foot September 8–11 (discharge, 38 second-feet).

1910–1913; 1918; and 1920: Maximum stage recorded, 4.6 feet, about June 12, 1912, observed from high-water marks July, 1912, discharge 760 second-feet. Minimum, that of September 8–11, 1920.

DIVERSIONS.—Some water diverted above station for irrigating small tracts of land.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent during period of records, rating curve well defined. Gage read to hundredths twice a day. Daily discharge obtained by applying mean daily gage height to rating table. Records good.

Discharge measurements of East Fork near Lapine, Oreg., during the period Aug. 26 to Oct. 28, 1920

Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*
Aug. 26	Phillips and Briggs	0.26	44.0
Sept. 12	K. N. Phillips	.22	42.9
Oct. 28	Dawson and Briggs	.85	124

Daily discharge, in second-feet, of East Fork near Lapine, Oreg., for the period Aug. 26 to Oct. 28, 1920

Day	Aug.	Sept.	Oct.	Day	Aug.	Sept.	Oct.	Day	Aug.	Sept.	Oct.
1		48	106	11		38	121	21		67	142
2		54	111	12		42	125	22		67	144
3		54	120	13		48	125	23		68	139
4		54	120	14		68	130	24		76	137
5		54	124	15		94	137	25		89	139
6		41	128	16		100	149	26	46	95	137
7		41	127	17		98	158	27	48	84	128
8		38	120	18		77	156	28	48	82	124
9		38	121	19		77	156	29	48	85	
10		38	120	20		67	153	30	48	74	
								31	48		

Monthly discharge of East Fork near Lapine, Oreg., for the period Aug. 26 to Oct. 28, 1920

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
August 26–31	48	46	47.7	568
September	100	38	65.2	3,880
October 1–28	158	106	132	7,330

ARNOLD CANAL NEAR BEND, OREG.

LOCATION.—In SW. ¼ sec. 23, T. 18 S., R. 11 E., 1 mile below intake of canal and 9 miles south of Bend, Deschutes County.

RECORDS AVAILABLE.—April 10, 1914, to September 30, 1921; information sufficient for an approximate estimate, October, 1912, to March, 1914.

GAGE.—Vertical staff on right side of flume 400 feet below a spillway, installed May 12, 1917; staff on left side below spillway used May 1, 1915, to December 2, 1916. A gage half a mile above, in the NE. ¼ sec. 27, was used up to April 30, 1915; gage read by R. C. Miller.

DISCHARGE MEASUREMENTS.—Made from collar of flume near gage.

CHANNEL AND CONTROL.—Flume 12 to 14 feet wide, fairly steep gradient.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 2.26 feet July 25 (discharge, 111 second-feet); canal dry at various times during year.

1914–1921: Maximum stage recorded, 2.5 feet June 1–3, 1920 (discharge, 134 second-feet); canal dry at various times each year.

ICE.—Canal dry during winter.

ACCURACY.—Stage-discharge relation subject to frequent changes due to settlement and repairing flume. Rating curves poorly defined. Gage read once a day except during July when it was read four times a week. Daily discharge ascertained by applying to rating table, either directly or by the shifting-control method, the daily gage height. Records fair.

Arnold canal diverts water from the right bank of Deschutes River at the head of Lava Island, in the SW. ¼ sec. 27, T. 18 S., R. 11 E., and irrigates land south and east of Bend lying above the Central Oregon Irrigation Co.'s Carey Act segregation.

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Discharge measurements of Arnold canal near Bend, Oreg., 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. 28	Dawson and Briggs	1.33	39.4	May 4	Wendell Dawson	1.90	81.9
Apr. 17	Wendell Dawson	1.24	46.5	June 5	do	1.72	76
28	J. W. Bones	1.74	74.3	Aug. 6	J. W. Bones	1.48	66

Daily discharge, in second-feet, of Arnold canal near Bend, Oreg., for the year ending Sept. 30, 1921

Day	Oct.	Apr.	May	June	July	Aug.	Sept.
1	64	-------	77	80	99	66	91
2	64	-------	78	80	99	66	94
3	64	-------	78	77	99	66	94
4	64	-------	82	77	99	66	94
5	64	-------	80	77	99	66	99
6	64	11	84	77	99	66	96
7	64	17	82	82	99	88	53
8	64	29	82	88	99	91	85
9	64	41	80	91	102	94	85
10	68	45	80	91	105	91	85
11	68	45	80	91	105	94	88
12		45	69	94	105	94	94
13		47	55	94	106	27	94
14	60	45	50	94	107	18	94
15		45	67	91	108	77	91
16		47	67	91	108	77	68
17		47	39	96	108	91	0
18	50	48	-------	99	108	91	40
19		49	-------	99	108	91	74
20		50	-------	99	108	91	68
21		51	-------	99	108	91	58
22		52	-------	99	108	91	52
23		64	-------	99	108	91	52
24		71	-------	99	110	91	52
25	40	73	25	99	111	91	
26		75	68	99	65	91	
27		76	71	102	65	91	52
28	39	74	77	102	65	91	
29		75	80	102	65	91	
30	39	77	80	102	65	91	
31		-------	80	-------	65	91	-------

NOTE.—Canal dry during periods for which no discharge is given. Braced figures show estimated mean discharge for periods indicated when gage was not read; discharge also interpolated or estimated for following periods when gage was not read: Oct. 10, 11, July 3, 5, 7, 9, 11, 13, 14, 16, 18, 20, 22, 24, 27-29, 31, Aug. 1-5, and 19.

Monthly discharge of Arnold canal near Bend, Oreg., for the year ending Sept. 30, 1921

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	68	39	53.2	3,270
November	0	0	0	0
December	0	0	0	0
January	0	0	0	0
February	0	0	0	0
March	0	0	0	0
April	77	0	43.3	2,580
May	84	0	55.2	3,390
June	102	77	92.3	5,490
July	111	65	96.9	5,960
August	94	18	81.0	4,980
September	99	0	70.4	4,190
The year	111	0	41.3	29,900

CENTRAL OREGON CANAL NEAR BEND, OREG.

LOCATION.—In NE. ¼ sec. 7, T. 18 S., R. 12 E., at flume section half a mile below point where waters in main diversion canal are divided between this canal and Pilot Butte canal, 2 miles south of Bend, Deschutes County.

RECORDS AVAILABLE.—May 11, 1905, to September 30, 1921.

GAGE.—Vertical enameled staff nailed to inside of flume on right side; read by Frank Slattery.

DISCHARGE MEASUREMENTS.—Made from yoke of flume at gage section.

CHANNEL AND CONTROL.—A plank flume of rectangular cross section with battened seams. Flume rather unstable, but the rating appears to have changed little.

EXTREMES OF DISCHARGE.—Maximum discharge recorded during year, 411 second-feet at time of measurement August 5 (gage height, 3.85 feet). Canal dry at various times during year.

1905–1921: Maximum stage recorded, 4.1 feet at time of measurement August 20, 1919 (discharge, 459 second-feet).

ICE.—Canal operated in winter only for a few days during periods of moderately cold weather, for furnishing water for domestic use. The gradient of the flume below the gage is sufficient to maintain open channel at all times.

ACCURACY.—Stage-discharge relation changed during August. Rating curves well defined. Staff gage read to half-tenths twice a day and hour of changing head gates noted. Daily discharge ascertained by applying to rating table the mean daily gage height, except for period August 7 to 31, when method of shifting control was used. Records good, except for August, for which they are fair.

COOPERATION.—Gage-height records furnished by Central Oregon Irrigation Co.

Central Oregon canal diverts water from the right bank of Deschutes River in the NE. ¼ sec. 13, T. 18 S., R. 12 E., and irrigates land lying to the east of Bend and near Powell Buttes.

Discharge measurements of Central Oregon canal near Bend, Oreg., 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. 2	J. W. Bones	1.98	149	June 29	J. W. Bones	3.75	427
29	do	3.02	295	Aug. 5	do	3.85	400
May 5	Wendell Dawson	3.40	338	Sept. 5	Wendell Dawson	3.80	363

Daily discharge, in second-feet, of Central Oregon canal near Bend, Oreg., for the year ending Sept. 30, 1921

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	292	208					93	322	382	397	397	365
2	292	208		55	109		98	322	382	397	397	365
3	292	208		144	144		150	322	32	397	397	365
4	292	208		150	144		56	337		397	397	365
5	292	208		88	144			352		397	397	365
6	278	208			156	104		352		397	397	365
7	278	169			156	144		352		397	397	365
8	292	169	44		156	144		352		397	397	365
9	292	120	88		156	144		352		397	397	365
10	292		109		52	48		352		397	397	365
11	292		156					352		397	382	351
12	292		130					352	114	397	382	351
13	278							352	278	397	382	351
14	264						15	367	322	397	382	351
15	278						30	382	352	397	382	351
16	278						74	382	126	397	382	351
17	292						156	382	367	397	382	351
18	292	45					182	382	337	397	382	309
19	264	150					182	382		397	382	253
20	264	150					182	382	36	397	382	187
21	250	150					182	382	144	397	382	187
22	250	51					208	382	352	397	382	187
23	236						222	382	292	397	382	187
24	250						236	382	367	397	382	187
25	250						250	382	382	397	382	187
26	250						264	382	382	397	367	187
27	236						278	382	382	397	367	187
28	222						292	382	397	397	367	187
29	222						292	382	397	367	367	187
30	222					26	307	382	397	397	367	187
31	208					74		382		397	367	

NOTE.—Canal dry during periods for which no discharge is given.

Monthly discharge of Central Oregon canal near Bend, Oreg., for the year ending Sept. 30, 1921

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	292	208	267	16,400
November	208	0	75.1	4,470
December	156	0	17.0	1,050
January	150	0	14.1	867
February	156	0	43.5	2,420
March	144	0	22.1	1,360
April	307	0	125	7,440
May	382	322	366	22,500
June	397	0	207	12,300
July	397	397	397	24,400
August	397	367	384	23,600
September	365	187	291	17,300
The year	397	0	185	134,000

PILOT BUTTE CANAL NEAR BEND, OREG.

LOCATION.—In NE. ¼ sec. 7, T. 18 S., R. 12 E., directly opposite gaging station on Central Oregon canal, half a mile below point where waters are divided between this canal and Central Oregon canal, and 2 miles south of Bend, Deschutes County.

RECORDS AVAILABLE.—March 6, 1905, to September 30, 1921.

GAGE.—Vertical staff on right bank; read by Frank Slattery.

DISCHARGE MEASUREMENTS.—Made by wading at the gage.

CHANNEL AND CONTROL.—Channel of gravel and sand. Control partly solid rock; somewhat shifting.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 1.6 feet, October 1–28 (discharge, 22 second-feet); canal dry at various times.

1905–1921: Maximum stage recorded, 3.10 feet June 8, 11–16, July 19–21, 1913 (discharge, 244 second-feet); canal dry at various times.

ICE.—Canal dry during freezing weather.

ACCURACY.—Stage-discharge relation unstable, due largely to drift lodged on control. Poorly defined rating curves used October 1 to March 10, March 30 to April 4, April 14 to June 3, and June 12 to 30. Daily discharge ascertained by applying mean daily gage heights to rating table. Discharge July 1 to September 30 estimated from meter measurements (gage heights not a reliable index of discharge and flow almost constant). Records poor.

Pilot Butte canal diverts water from the right bank of Deschutes River, in NE. ¼ sec. 13, T. 18 S., R. 12 E., in a flume common to it and the Central Oregon canal, for irrigating lands lying mostly north of Bend and extending nearly to Crooked River. North canal also diverts water into the Pilot Butte.

Discharge measurements of Pilot Butte canal near Bend, Oreg., 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. 2	J. W. Bones	1.51	15.5	June 29	J. W. Bones	1.61	12.3
29	do	1.66	17.7	Aug. 18	Wendell Dawson	[a] 1.44	14.0
May 5	Wendell Dawson	1.00	1.5				

[a] Gage read, 1.70 feet before drift was cleaned off control.

Daily discharge, in second-feet, of Pilot Butte canal near Bend, Oreg., for the year ending Sept. 30, 1921

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	22	18					16	12	15			
2	22	18			18		16	12	15			
3	22	18		7	16		15	12	1			
4	22	18		18	14		6	6				
5	22	18		10	5			1				
6	22	18				10						
7	22	14				18						
8	22	14	2			18		12			13	
9	22	10	8			18		15				
10	22		8			18		15				14
11	22							15				
12	22							15				
13	22							15	4			
14	22						1	15	10			
15	22						2	15	11			
16	22						8	15		12		
17	22						12	15	8			
18	22	2					12	15	8			
19	22	11					12	15			14	
20	22	11					12	15				13
21	22	11					12	15	6			13
22	22	4					12	15	11			13
23	22						12	15	4			13
24	22						14	15	8		6	13
25	22				11		13	15	8			13
26	22				14		12	15	11			13
27	22						12	15	11			13
28	22						12	15	11			13
29	20						12	15	11		9	13
30	20					4	12	15	11		14	13
31	20					16		15			14	

NOTE.—Canal dry during periods for which no discharge is given. Braced figures show estimated mean discharge for periods indicated.

Monthly discharge of Pilot Butte canal near Bend, Oreg., for the year ending Sept. 30, 1921

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	22	20	21.8	1,340
November	18	0	6.2	369
December	8	0	.6	37
January	18	0	1.1	68
February	18	0	2.8	156
March	18	0	3.3	203
April	16	0	7.8	464
May	15	0	12.9	793
June	15	0	5.5	327
July			12.0	738
August		0	11.3	695
September			13.6	809
The year	22	0	8.29	6,000

NORTH CANAL NEAR BEND, OREG.

LOCATION.—In NE. ¼ sec. 29, T. 17 S., R. 13 E., 500 feet below bridge on road to Tumalo, one-fourth mile below intake, and 1 mile north of Bend, Deschutes County.

RECORDS AVAILABLE.—June 14, 1913, to September 30, 1921.

GAGE.—Inclined staff painted on left side of concrete lining of flume; read by W. L. Beebe.

DISCHARGE MEASUREMENTS.—Made from plank across canal.

CHANNEL AND CONTROL.—Concrete-lined section extends about 1,000 feet below gage; below this point the canal is unlined and sides and bottom are very rough. Changes in unlined section affect stage-discharge relation.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 6.2 feet July 14 to August 26 (discharge, 374 second-feet). Canal dry at various times.

1913–1921: Maximum discharge recorded, 376 second-feet, August 20 to September 2, 1919; canal dry at various times.

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

ACCURACY.—Stage-discharge relation practically permanent. Rating curve well defined. Gage read to half-tenths twice a day. Daily discharge determined by applying to rating table mean daily gage height. Records good.

North canal diverts water from the right bank of Deschutes River at a concrete dam about 60 feet high, in the NE. ¼ sec. 29, T. 17 S., R. 13 E., and extends eastward for about a mile, where it discharges water into Pilot Butte canal.

Discharge measurements of North canal near Bend, Oreg., 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	F. F. Henshaw	4.40	228	May 4	Wendell Dawson	5.00	264
Apr. 2	J. W. Bones	3.35	143	June 4	do	5.80	336
17	Wendell Dawson	3.35	153	Aug. 5	J. W. Bones	6.15	382
29	J. W. Bones	4.50	231				

Daily discharge, in second-feet, of North canal near Bend, Oreg., for the year ending Sept. 30, 1921

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	228	164					143	252	332	365	374	356
2	228	150		29			125	260	340	365	374	348
3	228	136		109				276	340	365	374	348
4	228	136		129				276	340	365	374	348
5	228	136		70				276	340	365	374	340
6	228	136						276	340	365	374	332
7	236	136						276	340	365	374	324
8	244	85	40					276	340	365	374	324
9	252		129					276	340	365	374	324
10	252		136					276	340	365	374	324
11	252		62			37		276	340	365	374	324
12	252					85		284	340	365	374	324
13	252					85		292	340	365	374	324
14	244				14	97		292	340	374	374	316
15	236				18	112	62	292	340	374	374	308
16	228					38	143	292	340	374	374	300
17	212						143	292	340	374	374	300
18	204	88		30			143	292	340	374	374	300
19	196	150					143	292	340	374	374	268
20	180	150					143	292	340	374	374	268
21	180	136					150	292	340	374	374	268
22	180				64		164	292	340	374	374	268
23	180		16		129		196	268	340	374	374	268
24	180				129		196	260	340	374	374	268
25	180			16	129		212	260	356	374	374	268
26	180			91	32		220	268	356	374	374	268
27	180			122			220	292	356	374	365	268
28	180			36			228	300	356	374	356	260
29	180					56	236	300	356	374	356	252
30	180					143	236	308	356	374	356	252
31	180							316		374	356	

NOTE.—Canal dry during periods for which discharge is not given.

Monthly discharge of North canal near Bend, Oreg., for the year ending Sept. 30, 1921

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	252	180	212	13,000
November	164	0	53.4	3,180
December	136	0	12.4	762
January	129	0	20.4	1,250
February	129	0	18.4	1,020
March	143	0	21.1	1,300
April	236	0	103	6,130
May	316	252	283	17,400
June	356	332	343	20,400
July	374	365	370	22,800
August	374	356	371	22,800
September	356	252	301	17,900
The year	374	0	177	128,000

SWALLEY CANAL NEAR BEND, OREG.

LOCATION.—In NE. ¼ sec. 29, T. 17 S., R. 12 E., 100 yards above road crossing, one-fourth mile below intake of canal at North canal dam, and 1½ miles north of Bend, Deschutes County.

RECORDS AVAILABLE.—June 1, 1913, to September 30, 1921.

GAGE.—Vertical staff on right bank at lower end of intake flume; read by W. L. Beebe.

DISCHARGE MEASUREMENTS.—Made from plank across flume.

CHANNEL AND CONTROL.—Earth canal of regular cross section and practically permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 2.47 feet at time of measurement, August 5 (discharge, 103 second-feet). Canal dry at various times.

1913–1921: Maximum discharge recorded, 105 second-feet 7 a. m. July 31 and August 3, 1919. Canal dry at various times.

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

ACCURACY.—Stage-discharge relation changed May 17. Both curves well defined. Gage read to hundredths twice a day. Daily discharge ascertained by applying to rating table the mean daily gage height. Records good.

Swalley canal diverts water from the right bank of Deschutes River at the North canal dam, in the NE. ¼ sec. 29, and irrigates the Carey Act segregation of the Deschutes Reclamation & Irrigation Co. north of Bend and west of the Pilot Butte tract.

Discharge measurements of Swalley canal near Bend, Oreg., 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. 2	J. W. Bones	1.23	30.5	June 4	Wendell Dawson	1.86	54
29	do	1.62	49.3	4	do	1.86	56
May 4	Wendell Dawson	1.68	52	4	do	.70	7.4
				Aug. 5	J. W. Bones	2.47	103

Daily discharge, in second-feet, of Swalley canal near Bend, Oreg., for the year ending Sept. 30, 1921

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	61		9.5	17	13	29	29	52	52	80	88	64
2	61		9.5	17	9.5	29	29	49	53	80	88	55
3	61		9.5	21	13	29	29	52	58	80	88	52
4	61		8.0	21	13	29	22	55	58	80	88	52
5	61		6.5	17	13	21		55	58	80	88	52
6	49		6.5	12	2.4	21		55	58	80	88	52
7	39		6.5		1.3	21		55	58	80	88	52
8	39		6.5		1.3	21		55	58	80	88	52
9	39		5.4		1.3	21	8.5	55	58	80	88	52
10	39		4.2		1.3	29	22	55	48	80	88	52
11	39		4.2		13	29		55	64	80	88	52
12	39		4.2		13	29		55	64	80	88	52
13	39		3.3		13	29		55	64	80	88	52
14	39		2.4		13	29		55	64	80	80	52
15	39		2.4		13	25		55	64	72	60	52
16	39		1.8		13	21		55	64	72		52
17	39		1.3		9.5	25		14	58	72	17	52
18	39		1.3		9.5	25		18	61	72	47	52
19	39		.6		9.5	29		20	64	72	72	52
20	39				9.5	29		26	64	72	72	52
21	39		14		9.5	21	3.6	28	61	72	88	52
22	39		25		9.5	25	29	28	64	72	88	47
23	39		15		9.5	29	29	32	64	72	84	42
24	39				9.5	29	29	32	68	76	80	42
25	39				9.5	29	29	37	72	80	80	42
26	39			15	9.5	29	29	42	76	84	80	42
27	39			25	9.5	29	29	42	80	88	80	42
28	39		10	21	25	25	42	42	80	88	80	42
29	39	6	21	21		25	55	42	80	88	80	42
30		15	21	13		25	55	47	80	88	80	42
31			19	13		29		50		88	64	

NOTE.—Canal dry during periods for which no discharge is given.

Monthly discharge of Swalley canal near Bend, Oreg., for the year ending Sept. 30, 1921

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	61	0	40.4	2,480
November	15	0	.700	42
December	25	0	7.05	433
January	25	0	6.87	422
February	25	1.3	9.88	549
March	29	21	26.3	1,620
April	55	0	15.6	928
May	55	14	44.1	2,710
June	80	48	63.8	3,800
July	88	72	79.0	4,860
August	88	0	76.6	4,710
September	64	42	49.7	2,960
The year	88	0	35.2	25,500

TUMALO CREEK NEAR BEND, OREG.

LOCATION.—In SE. ¼ sec. 23, T. 17 S., R. 11 E., one-fourth mile above diversion dam of feed canal of Tumalo project, half a mile below highway bridge on old Bend-Sisters road, 4 miles above mouth, and 4 miles northwest of Bend, Deschutes County.

DRAINAGE AREA.—57 square miles.

106543—25†—WSP 534——6

RECORDS AVAILABLE.—November 1, 1913, to September 30, 1921, also during winters from October 6,1906, to April 30, 1913, except 1909–10.

GAGE.—Stevens continuous water-stage recorder referred to outside staff gage, inspected by E. T. Dean and F. N. Wallace. Records previous to November, 1910, obtained at different site.

DISCHARGE MEASUREMENTS.—At ordinary stages, made by wading near gage or from footbridge across canal when all water is diverted; at flood stages, from a large tree fallen across stream about 200 yards below gage, or by wading below diversion dam and adding measured canal flow.

CHANNEL AND CONTROL.—Bed composed of rock and gravel; one channel at all stages; fairly straight above and below gage; fairly permanent. Gage in canal is in concrete-lined section and apparently permanent.

EXTREMES OF DISCHARGE.—Maximum stage during year, from water-stage recorder, 2.73 feet at 11 p. m. June 3 (discharge, 430 second-feet); minimum stage from recorder, 1.31 feet at 5 p. m. September 13 (discharge, 58 second-feet).

1906–1921: Maximum stage recorded, 3.8 feet at old gage, November 14, 1906 (discharge, estimated from extension of rating curve, 820 second-feet). The peak of the flood of November, 1909, was probably considerably greater. Minimum stage recorded, 0.84 foot at 2 p. m. October 31, 1920 (discharge, 19 second-feet).

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

DIVERSIONS.—Columbia Southern canal diverted water above the station practically continuously throughout the year. Water was diverted into the head of Tumalo Creek from Crater Creek, tributary of Deschutes River; no record of this diversion in 1921.

REGULATION.—None.

ACCURACY.—Stage-discharge relation practically permanent. Rating curve well defined between 40 and 300 second-feet. Operation of recorder satisfactory during most of year. Daily discharge obtained by applying to rating table the mean daily gage height obtained by inspecting the recorder graph. Records good except those for ice period, and estimates for first half of July which are fair.

Discharge measurements of Tumalo Creek near Bend, Oreg., 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. 28	R. C. Briggs	1.51	[a] 90	May 4	Wendell Dawson	1.54	[a] 93
Mar. 3	J. W. Bones	1.53	102	June 2	do	2.22	274
Apr. 5	do	1.37	68	28	J. W. Bones	1.88	192
17	Wendell Dawson	1.38	[a] 68				

[a] Measured in Tumalo feed canal.

Daily discharge, in second-feet, of Tumalo Creek near Bend, Oreg., for the year ending Sept. 30, 1921

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	96	87	87	134	97	95	85	120	177	200	100	106
2	96	83	81	158	95	91	89	111	267	150	128	100
3	105	81		156	89	97	75	102	379	105	122	97
4	105	83		141	87	102	75	102	367	130	105	91
5	100	81		139	87	104		104	318	150	105	89
6	105	81	72	130	95	102		106	346	160	105	91
7	100	83		122	83	100		109	382	160	105	91
8	86	83		114	85	100		118	338	180	134	95
9	82	83	64	106	120	95		120	329	140	122	97
10	86	95	66		158	91		123	318	110	110	79
11	82	91	66		141	89	73	134	292	120	110	62
12	82	97	83	100	130	89		132	278	150	110	62
13	74	100	75		149	87		154	278	140	116	60
14	74	85			139	83		166	258	134		60
15	86	85		83	134	81		180	174	134		60
16	82	104			130	87		180	118	128	128	62
17	74	198			126	95	71	169	97	128		64
18	74	236			122	93	71	156	166	128		81
19	74	225	75		118	87	73	151	158	148	123	125
20	70	171		75	120	83	73	123	198	125	123	87
21	66	164			113	81	79	130	231	123	125	148
22	74	144			104	79	104	148	212	123	123	161
23	66	132			104	77	97	154	223	120	125	95
24	78	127			102	75	93	171	193	144	118	81
25	78	123	81			75	87	190	161	141	100	79
26	78	120	81		98	71	83	217	173	132	100	71
27	74	104	83			69	83	201	190	127	100	73
28	95	104	95	90		69	132	164	215	127	102	79
29	87	95	109		-------	75	132	223	231	123	102	69
30	83	93	188		-------	81	120	225	250	105	102	66
31	81	-------	146		-------	79	-------	236	-------	105	106	-------

NOTE.—Stage-discharge relation affected by ice Dec. 3–8, 14–24, Jan. 6–8, 10–14, 16–31, and Feb. 16–18; discharge estimated from study of gage heights, observer's notes, and temperature records. Discharge interpolated Feb. 25–28. Discharge taken from record in Tumalo feed canal (water all diverted) Oct. 1–27, July 1, 10, 14–19, and July 30 to Aug. 13. Discharge estimated from hydrographic comparison with Squaw Creek and Tumalo feed canal June 30 to July 2, July 4–9, and 11–13.

Monthly discharge of Tumalo Creek near Bend, Oreg., for the year ending Sept. 30, 1921

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	105	66	83.6	5,140
November	236	81	115	6,840
December	188	64	82.6	5,080
January	158	----------	99.1	6,090
February	158	83	111	6,160
March	104	69	86.5	5,320
April	132	71	83.3	4,960
May	236	102	152	9,350
June	382	97	246	14,600
July	200	105	135	8,300
August	134	100	115	7,070
September	161	60	86.0	5,120
The year	382	60	116	84,000

Combined monthly discharge of Tumalo Creek and Columbia Southern canal near Bend, Oreg., for the year ending Sept. 30, 1921

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	115	76	93.6	5,760
November	243	88	122	7,260
December	193	69	87.6	5,390
January	160	----	101	6,210
February	160	85	113	6,280
March	114	77	92.8	5,710
April	----	----	112	6,660
May	316	----	203	12,500
June	463	189	339	20,200
July	360	119	205	12,600
August	162	102	124	7,600
September	198	83	108	6,430
The year	463	69	144	103,000

COLUMBIA SOUTHERN CANAL NEAR TUMALO, OREG.

LOCATION.—In sec. 1, T. 18 S., R. 10 E., 200 feet below highway bridge across canal on Tumalo Creek road, 1 mile below head gates, 9 miles west of Bend, and 12 miles southwest of Tumalo, Deschutes County.

RECORDS AVAILABLE.—May 15, 1906, to May 23, 1914; May 5 to July 28, 1916; October 1, 1917, to September 30, 1921; also estimates in connection with Tumalo Creek station, beginning October 24, 1916.

GAGE.—Stevens continuous water-stage recorder on left bank referred to vertical staff; inspected by F. N. Wallace.

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

CHANNEL AND CONTROL.—Canal is earth cut about 30 feet wide and 4 feet deep. Control not well defined but fairly permanent.

EXTREMES OF DISCHARGE.—Maximum stage during year from water-stage recorder, 2.42 feet at 1 a. m. July 2 (discharge, 165 second-feet; estimated from extension of rating curve). Canal dry at times.

1906–1914 and 1916–1921: Maximum discharge recorded that of July 2, 1921; canal dry at times.

DIVERSIONS.—None above gage.

REGULATION.—Flow controlled by head gates.

ACCURACY.—Stage-discharge relation apparently permanent during year. Rating curve well defined below 50 second-feet, poorly defined above 50 second-feet. Operation of recorder fairly satisfactory after March 2; it was not attended regularly and several gaps occurred. Daily discharge obtained by applying to rating table mean daily gage heights obtained by inspecting recorder graph. Records fair; estimates October to February are uncertain and are made only for the purpose of computing total flow of Tumalo Creek.

Columbia Southern canal diverts water from Tumalo Creek in SE. ¼ sec. 2, T. 18 S., R. 10 E. It has been operated since 1916 primarily to furnish water to a sawmill and to supplement the Tumalo feed canal. Most of the water eventually finds its way to the Tumalo project canals.

Discharge measurements of Columbia Southern canal near Tumalo, Oreg., during the year ending Sept. 30, 1921

Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*
Nov. 6	R. C. Briggs	0.81	6.7
Mar. 2	J. W. Bones	.60	2.0
May 7	Wendell Dawson	1.23	26.8

Daily discharge, in second-feet, of Columbia Southern canal near Tumalo, Oreg., for the year ending Sept. 30, 1921

Day	Mar.	Apr.	May	June	July	Aug.	Sept.
1	2.0	9.3		103	160	3.0	4.0
2	2.0	19		22	162	-------	5.0
3	2.0	36		-------		10	5.0
4	3.0		25	-------		13	5.2
5	4.0			81		16	5.5
6	5.2			81		19	5.5
7	10		27	81	119	25	5.5
8			28	87		28	5.5
9			87	99		28	5.5
10			46	97		28	9.3
11				93		28	23
12				92	76	27	23
13				89	78	16	23
14	6.5			82	78	-------	23
15			46	81	76	-------	24
16				87	73	-------	24
17		30		92	69	-------	25
18			47	87	41	-------	26
19			56	101	38	-------	28
20			76	92	34	-------	35
21	6.5		77	94	31	-------	35
22	6.5		76	104	28	-------	37
23	6.8		71	105	27	2.0	45
24	7.9		76	118	25	2.0	44
25	6.8		71	122	27	2.0	32
26	9.0		70	124	16	2.0	32
27	9.0		70	136	15	2.4	32
28	8.3		70	141	14	3.0	32
29	6.5		70	152	14	3.0	34
30	6.5		70	160	14	3.6	34
31	8.3	-------	70	-------	14	4.0	-------

NOTE.—Braced figures show estimated mean discharge for periods indicated. No flow June 3, 4, Aug. 2, and 14-22.

Monthly discharge of Columbia Southern canal near Tumalo, Oreg., for the year ending Sept. 30, 1921

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October			[a] 10	615
November			[a] 7	417
December			[a] 5	307
January			[a] 2	123
February			[a] 2	111
March	10	2.0	6.28	386
April		9.3	29.1	1,730
May	77		51.0	3,140
June	160	0	93.4	5,560
July	162	14	70.4	4,330
August	28	0	8.55	526
September	45	4.0	22.2	1,320
The year	162	0	25.6	18,600

[a] Estimated.

TUMALO FEED CANAL NEAR BEND, OREG.

LOCATION.—In SE. ¼ sec. 23, T. 17 S., R. 11 E., in concrete-lined section, 300 feet below diversion dam, half a mile below bridge across Tumalo Creek on old road from Bend to Sisters, and 4 miles from Bend, Deschutes County.

RECORDS AVAILABLE.—May 21, 1914, when water was first diverted, to September 30, 1919, October 1–31, 1920, and April 1 to September 30, 1921.

GAGE.—Painted on sloping concrete lining. Stevens continuous recorder used October 1 to 28, staff gage used from May 1 to August 13; read by R. M. Wells.

DISCHARGE MEASUREMENTS.—Made from footbridge at gage.

CHANNEL AND CONTROL.—Trapezoidal concrete section; the control is the sand trap just above the intake to a steel flume.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 3.3 feet July 19 and 20 (discharge, 148 second-feet); canal dry at various times.

1914–1921: Maximum stage recorded, 3.80 feet May 4, 5, and 6, 1916 (discharge, 219 second-feet).

ICE.—Water has to be turned out in extremely cold weather.

ACCURACY.—Stage-discharge relation practically permanent. Rating curve well defined. Water-stage recorder operated satisfactorily October 1 to 28. Gage read twice a day to tenths May 1 to August 13. Daily discharge obtained by applying to rating table the mean daily gage height obtained by inspecting recorder graph or the mean of two readings. Records good.

Tumalo feed canal diverts water from Tumalo Creek in SE. ¼ sec. 23, T. 17 S., R. 11 E., for irrigation on the Tumalo project.

Discharge measurements of Tumalo feed canal near Bend, Oreg., 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. 28	R. C. Briggs	2.70	88	May 4	Wendell Dawson	2.82	93
Mar. 1	J. W. Bones	2.70	84	June 1	do	3.20	133
Apr. 5	do	2.60	65	Sept. 5	do	2.67	72
17	Wendell Dawson	2.52	68				

Daily discharge, in second-feet, of Tumalo feed canal near Bend, Oreg., for the year ending Sept. 30, 1921

Day	Oct.	Apr.	May	June	July	Aug.	Sept.
1	96	85	100	128	134	100	100
2	96	89	100	134	134	128	100
3	105	75	100	122	105	122	97
4	105	75	100	110	122	105	91
5	100		110	122	134	105	89
6	105		110	128	134	105	91
7	100		69	128	134	105	91
8	86		0	128	134	134	95
9	82		0	134	134	122	97
10	86		0	134	110	110	79
11	82	73	0	128	116	110	62
12	82		71	122	134	110	62
13	74		122	128	134	116	60
14	74		122	134	134		60
15	86		134	128	134		60
16	78		134	110	128	128	62
17	74	71	134	105	128		64
18	74	71	134	110	128		81
19	74	73	134	128	148	123	100
20	70	73	134	128	148	123	87
21	66	79	134	128	134	125	100
22	74	104	134	128	128	123	100
23	66	97	134	128	128	125	95
24	78	93	134	128	128	118	81
25	78	87	134	134	128	100	79
26	78	83	134	134	116	100	71
27	74	83	128	134	110	100	73
28	74	132	128	128	110	102	79
29		132	134	134	100	102	69
30	80	120	128	134	105	102	66
31			128		105	106	

NOTE.—Braced figures show estimated mean discharge for periods indicated. Water diverted for a considerable portion of time November to March, inclusive, but no record kept. Daily discharge for Apr. 1-30 and Aug. 19-31 taken from records of Tumalo Creek; all water diverted up to 100 second-feet from Sept. 1-30 taken from Tumalo Creek.

Monthly discharge of Tumalo feed canal near Bend, Oreg., for the year ending Sept. 30, 1921

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	105	66	82.5	5,070
April	132	71	83.3	4,960
May	134	0	105	6,460
June	134	105	127	7,560
July	148	105	126	7,750
August	134	100	112	6,890
September	100	60	81.4	4,840

NOTE.—See footnote to table of daily discharge.

SQUAW CREEK NEAR SISTERS, OREG.

LOCATION.—In NW. ¼ sec. 32, T. 15 S., R. 10 E., immediately above intake of McCallister ditch and 5 miles by road above Sisters, Deschutes County.

DRAINAGE AREA.—63 square miles.

RECORDS AVAILABLE.—May 30 to December 31, 1913; April 7 to September 13, 1914; March 24 to December 13, 1916; April 5 to December 5, 1917, March 1 to October 17, 1918; June 25 to August 23, 1919; March 17 to September 30, 1920; and May 6 to September 30, 1921. From July 1, 1906, to May 23,

1913, in section 29, at station below the intake of McCallister ditch and about 700 feet farther downstream.

GAGE.—Stevens 8-day water-stage recorder on right bank; with outside gage; inspected by water master.

DISCHARGE MEASUREMENTS.—Made from a cable about 100 yards above gage or by wading near gage.

CHANNEL AND CONTROL.—Gravel and boulders; fairly permanent.

EXTREMES OF DISCHARGE.—Maximum stage during period May 6 to September 30, 1921, from water-stage recorder, 3.48 feet at 10 p. m. June 30 (discharge 478 second-feet); minimum stage from recorder, 2.40 feet September 26 (discharge, 93 second-feet). Stage may have been lower than this during September 27–30, no record.

1906–1921: Maximum stage recorded, 7.5 feet at old station, November 22, 1909 (discharge, estimated from extension of rating curve, 1,940 second-feet); minimum stage recorded, 2.65 feet at old station, March 19, 1912 (discharge, 32 second-feet).

DIVERSIONS.—Pole Creek, a tributary of Squaw Creek from the west, has been diverted for irrigation. The diversion canal has been eroded until it carries the entire flow of this creek. Low-water flow entirely diverted below the station.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent during period. Rating curve well defined. Operation of water-stage recorder satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height obtained by inspecting recorder graph. Records excellent except for estimated periods.

Discharge measurements of Squaw Creek near Sisters, Oreg., 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. 28	D. D. Hunt [a]	2.32	88	June 6	Wendell Dawson	3.08	300
May 6	Wendell Dawson	2.39	87	Sept. 3	do	2.40	93
31	do	2.68	153				

[a] Manager, Squaw Creek Irrigation District.

Daily discharge, in second-feet, of Squaw Creek near Sisters, Oreg., for the period May 6 to Sept. 30, 1921

Day	May	June	July	Aug.	Sept.	Day	May	June	July	Aug.	Sept.
1	-------	190	388		122	16	148	204	229	158	82
2	-------	218	302		117	17	142	190	229		82
3	-------	282	244		106	18	137	229	229		111
4	-------	282	252		98	19	140	244	259		148
5	-------	302	302	190	97	20	155	282	263	140	100
6	92	323	323		97	21	174	344	236		158
7	90	366	323		102	22	194	344	225		164
8	88	344	366		107	23	187	366	229		111
9	90	344	323		106	24	197	366	233	122	97
10	106	323	282	194	102	25	218	344	259	117	97
11	115	302	363	190	98	26	233	323	214	115	93
12	111	302	252	190	92	27	218	344	190	113	
13	124	302	248	168	87	28	194	344	184	111	90
14	137	263	248	171	86	29	164	388	187	113	
15	142	218	236	161	84	30	158	433	188	117	
						31	174	-------	188	119	-------

NOTE.—Braced figures show estimated mean discharge for periods indicated.

Monthly discharge of Squaw Creek near Sisters, Oreg., for the period May 6 to Sept. 30, 1921

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
May 6–31	233	88	151	7,790
June	433	190	304	18,100
July	388	184	255	15,700
August		111	156	9,600
September	164		103	6,130
The period				57,300

CROOKED RIVER NEAR CULVER, OREG.

LOCATION.—In NW.¼ sec. 11, T. 12 S., R. 12 E., one-eighth mile below Cove power plant and 6 miles west of Culver, Jefferson County.

DRAINAGE AREA.—Not measured.

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

GAGE.—Inclined staff on left bank 100 feet below highway bridge. Surge of current makes accurate reading impossible. A. K. McAlpine, observer.

DISCHARGE MEASUREMENTS.—Made from cable half a mile below gage.

CHANNEL AND CONTROL.—Banks rocky; bed and control composed of boulders; probably permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 6.0 feet February 15 (discharge, 4,900 second-feet); minimum stage recorded, 1.70 feet July 12 to September 5 (discharge, 970 second-feet).

1917–1921: Maximum stage recorded, 6.3 feet at 1 p. m. April 5, 1919, (discharge, 5,200 second-feet); minimum discharge, 970 second-feet July 12 to September 5, 1921.

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

DIVERSIONS.—Practically all the summer flow of Crooked River above Prineville is diverted for irrigation. Low-water flow at this station is from springs within a few miles above.

REGULATION.—Slight regulation by power plant above gage and storage reservoir on Ochoco project.

ACCURACY.—Stage-discharge relation changed for low stages during spring high water. Rating curves well defined. Gage read to tenths once a day. Daily discharge ascertained by applying daily gage height to rating table. Records good.

Discharge measurements of Crooked River near Culver, Oreg., during the year ending Sept. 30, 1921

Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*
Oct. 26	Briggs and Dawson	1.92	1,220
May 19	V. H. Reineking	4.35	3,240
Sept. 8	Wendell Dawson	1.85	1,050

Daily discharge, in second-feet, of Crooked River near Culver, Oreg., for the year ending Sept. 30, 1921

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	1,120	1,120	1,250	2,720	1,250	2,540	2,900	2,720	1,490	1,040	970	970
2	1,120	1,120	1,250	2,180	1,250	2,540	3,000	2,720	1,410	1,040	970	970
3	1,120	1,120	1,250	2,010	1,320	2,810	3,400	2,630	1,330	1,040	970	970
4	1,120	1,120	1,250	2,360	1,320	3,400	3,700	2,450	2,180	1,040	970	970
5	1,120	1,120	1,250	2,270	1,390	3,900	2,720	2,450	2,180	1,040	970	970
6	1,120	1,120	1,180	2,090	1,390	3,500	2,720	2,540	1,910	1,040	970	1,040
7	1,120	1,120	1,180	2,010	1,390	3,300	2,540	2,720	1,730	1,040	970	1,040
8	1,120	1,120	1,180	1,530	1,390	3,200	2,360	2,630	1,650	1,040	970	1,040
9	1,120	1,120	1,180	1,390	1,390	2,900	2,270	2,540	1,490	1,040	970	1,040
10	1,120	1,120	1,180	1,250	1,390	2,900	2,360	2,450	1,410	1,040	970	1,040
11	1,120	1,120	1,180	1,180	2,360	2,900	2,540	2,360	1,330	1,040	970	1,040
12	1,120	1,120	1,180	1,180	3,500	2,810	2,900	2,360	1,250	970	970	1,040
13	1,120	1,120	1,180	1,180	3,600	2,630	3,500	2,180	1,180	970	970	1,040
14	1,120	1,120	1,120	1,250	3,700	2,450	3,500	2,090	1,180	970	970	1,040
15	1,120	1,120	1,120	1,530	4,900	2,450	2,900	2,090	1,180	970	970	1,040
16	1,120	1,120	1,120	1,390	3,300	2,450	2,810	2,000	1,180	970	970	1,040
17	1,120	1,120	1,120	1,390	2,720	2,900	2,540	2,000	1,110	970	970	1,040
18	1,120	1,120	1,120	1,390	2,360	3,900	2,540	3,400	1,110	970	970	1,040
19	1,120	1,180	1,120	1,390	2,090	4,400	2,540	3,200	1,110	970	970	1,040
20	1,120	1,250	1,120	1,460	2,090	3,500	2,450	3,000	1,040	970	970	1,040
21	1,120	1,390	1,120	1,530	2,090	2,900	2,450	2,810	1,040	970	970	1,040
22	1,120	1,390	1,120	1,390	2,010	2,720	2,720	2,720	1,040	970	970	1,040
23	1,120	1,250	1,120	1,390	2,010	2,450	3,000	2,540	1,040	970	970	1,040
24	1,120	1,180	1,120	1,390	2,010	2,360	2,900	2,360	1,040	970	970	1,040
25	1,120	1,180	1,120	1,390	2,010	2,450	2,720	2,090	1,040	970	970	1,040
26	1,120	1,250	1,120	1,390	1,930	2,720	2,630	1,910	1,040	970	970	1,040
27	1,120	1,250	1,120	1,390	2,010	2,540	2,450	1,730	1,040	970	970	1,040
28	1,120	1,180	1,120	1,390	2,360	2,450	2,450	1,650	1,040	970	970	1,040
29	1,120	1,530	1,120	1,390	-------	2,360	2,540	1,650	1,040	970	970	1,040
30	1,120	1,390	1,120	1,320	-------	2,720	2,630	1,570	1,040	970	970	1,040
31	1,120	-------	1,120	1,250	-------	2,720	-------	1,490	-------	970	970	-------

Monthly discharge of Crooked River near Culver, Oreg., for the year ending Sept. 30, 1921

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	1,120	1,120	1,120	68,900
November	1,530	1,120	1,190	70,800
December	1,250	1,120	1,160	71,300
January	2,720	1,180	1,560	95,900
February	4,900	1,250	2,160	120,000
March	4,400	2,360	2,900	178,000
April	3,700	2,270	2,760	164,000
May	3,400	1,490	2,360	145,000
June	2,180	1,040	1,300	77,400
July	1,040	970	995	61,200
August	970	970	970	59,600
September	1,040	970	1,030	61,300
The year	4,900	970	1,620	1,170,000

BEAR CREEK AT RICKMAN RANCH, NEAR ROBERTS, OREG.

LOCATION.—In NE. ¼ sec. 31, T. 18 S., R. 19 E., at Rickman ranch, 12 miles southeast of Roberts post office, and 35 miles from Prineville, Crook County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—December 30, 1920, to June 30, 1921.

GAGE.—Vertical staff on right bank about 100 yards back of Rickman's ranch house; read by J. A. Rickman.

DISCHARGE MEASUREMENTS.—Made by wading near gage.

CHANNEL AND CONTROL.—Bed composed of heavy gravel and boulders; practically permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period December 30, 1920, to June 30, 1921, 3.30 feet about 5 p. m. June 3 (discharge, 341 second-feet). Stream bed dry during midsummer.

ICE.—None during period of record.

DIVERSIONS.—A few small ditches divert water above station.

REGULATION.—None.

ACCURACY.—Stage-discharge relation practically permanent. Rating curve well defined below 20 second-feet and fairly well defined up to about 100 second-feet. Gage read to hundredths once a day; two readings on days of considerable fluctuation. Daily discharge obtained by applying to rating table the daily gage height, or the mean gage height obtained by plotting the two readings of high-water days to the readings for days before and after. Records good.

Discharge measurements of Bear Creek at Rickman ranch, near Roberts, Oreg., during the years ending Sept. 30, 1920 and 1921

Date	Made by—	Gage height	Discharge
1920		*Feet*	*Sec.-ft.*
Jan. 31	R. C. Briggs	0.30	3.0
Apr. 12	J. J. Dirzulaitis	.51	8.1
1921			
May 16	Miller and Ellis [a]	.44	6.1

[a] Water master for Cook County.

Daily discharge, in second-feet, of Bear Creek at Rickman ranch, near Roberts, Oreg., for the period Dec. 30, 1920, to June 30, 1921

Day	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1		0.7	0.3	35	52	9.2	5.2
2		1.2	.3	32	35	8.6	4.3
3		1.2	.3	127	35	8.0	192
4		1.9	.3	143	41	8.6	15
5		1.9	.3	93	27	8.6	9.2
6		1.2	.3	68	17	24	8.0
7		.8	.3	56	17	10	8.0
8		.7	.5	48	13	8.6	6.3
9		.5	.8	64	32	7.4	5.2
10		.5	3.4	64	32	6.9	4.3
11		.3	5.2	56	21	5.2	4.3
12		.3	19	56	22	6.3	4.8
13		.3	29	48	24	4.3	4.8
14		.3	29	29	20	3.0	4.3
15		.3	35	19	17	4.3	3.9
16		.5	35	41	14	6.3	3.9
17		.7	25	48	13	64	3.9
18		.7	15	56	16	26	4.3
19		.7	9.8	32	14	14	3.4
20		.3	8.0	24	14	45	2.6
21		.3	8.0	15	14	29	2.3
22		.2	7.4	14	15	15	2.3
23		.2	4.8	14	16	13	2.3
24		.2	5.2	17	15	10	1.9
25		.2	10	15	11	5.2	1.9
26		.2	9.2	17	10	9.2	1.9
27		.5	33	15	11	6.9	1.5
28		.3	32	16	11	7.4	
29		.2		21	10	9.2	
30	0.8	.2		27	9.8	6.9	
31	.8	.3		29		5.8	

NOTE.—Braced figures show estimated mean discharge for periods indicated. Probably some water running in December and July; no record.

Monthly discharge of Bear Creek at Rickman ranch, near Roberts, Oreg., for the period Jan. 1 to June 30, 1921

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
January	1.9	0.2	0.57	35
February	35	.3	11.7	650
March	143	14	43.2	2,660
April	52	9.8	20.0	1,190
May	64	3.0	12.8	787
June	192		10.5	625
The period				5,950

MILL CREEK NEAR PRINEVILLE, OREG.

LOCATION.—In SE. ¼ sec. 22, T. 14 S., R. 17 E., on Dill ranch, 1 mile above mouth and 10 miles east of Prineville, Crook County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—March 14 to September 5, 1916; December 8 to July 4, 1918; December 21, 1919, to June 30, 1920, and October 1, 1920, to September 30, 1921, when station was discontinued.

GAGE.—Stevens 8-day recorder on left bank referred to vertical staff braced to gage house; inspected by S. B. Ellis. Vertical staff gage 1 mile above read during 1916.

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

CHANNEL AND CONTROL.—Bed and control composed of gravel subject to shift at high stages.

EXTREMES OF DISCHARGE.—Maximum stage during year from water-stage recorder, 2.86 feet at 11 a. m. February 14 (discharge, 225 second-feet); creek bed practically dry during October, August, and September.

1916; 1918; 1920–1921: Maximum discharge recorded, that of February 14, 1921; stream practically dry every summer.

DIVERSIONS.—Many small ditches above station. Two diverted some water around gage during year; probably not over a few hundred acre-feet.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined between 10 and 150 second-feet. Operation of water-stage recorder unsatisfactory for low stages owing to inlet to stilling well being too high. Daily discharge ascertained by applying to rating table the mean daily gage height obtained by inspecting recorder graph. Records excellent except for estimated periods.

Discharge measurements of Mill Creek near Prineville, Oreg., during the year ending Sept. 30, 1921

[Made by J. W. Bones]

Date	Gage height	Discharge
	Feet	*Sec.-ft.*
Apr. 4	1.51	99
July 2	.32	15.6

Daily discharge, in second-feet, of Mill Creek near Prineville, Oreg., for the year ending Sept. 30, 1921

Day	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July
1		18	82	25	141	82	98	44	20
2		17	78	26	132	94	98	40	21
3		17	102	25	159	106	106	98	
4		16	98	25	195	98	106	86	
5		14	102	24	195	94	114	70	
6		13	90	23	177	90	114	58	16
7		13	74	24	159	86	98	54	
8		12	62	24	141	78	114	51	
9		12	54	32	132	78	123	48	
10		13	40	120	123	78	123	44	12
11		11	40	195	106	82	123	44	
12		16	40	195	98	90	114	44	
13		14	40	195	94	94	106	44	
14		12	40	204	90	94	106	40	10
15		14	38	159	82	90	106	38	
16		15	37	132	94	82	106	38	
17		15	38	106	106	82	132	38	9
18		14	39	94	114	82	159	38	
19		12	38	86	102	82	159	30	
20		12	37	86	106	82	141	29	
21		9	35	82	102	86	141	28	
22	20	11	33	74	98	98	123	26	
23		11	30	70	94	102	106	24	
24		12	26	74	94	98	102	21	
25		12	26	78	94	94	94	18	5
26		9	27	86	86	86	86	14	
27		9	27	102	82	94	78	15	
28	19	10	26	141	82	94	70	16	
29	18	25	26	-------	82	102	62	17	
30	18	132	27	-------	78	102	58	18	
31	-------	114	26	-------	78	-------	51	-------	

NOTE.—Stream dry Oct. 1 to about Nov. 15, and from about Aug. 1 to Sept. 30. Braced figures show estimated mean discharge for periods indicated. Discharge estimated Feb. 11–13, May 27, 28, June 29, 30, and July 1.

Monthly discharge of Mill Creek near Prineville, Oreg., for the year ending Sept. 30, 1921

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
November	----------	0	9.83	585
December	132	9	20.5	1,260
January	102	26	47.7	2,930
February	204	23	89.5	4,970
March	195	78	113	6,950
April	106	78	90.0	5,360
May	159	51	107	6,580
June	98	14	39.1	2,330
July	21	----------	9.81	603
The year	204	0	43.6	31,600

NOTE.—See footnote to table of daily discharge.

LAKE CREEK NEAR SISTERS, OREG.

LOCATION.—In SE. ¼ sec. 24, T. 13 S., R. 8 E., one-fourth mile below outlet of Suttle Lake, 6 miles from mouth of creek, and 15 miles northwest of Sisters, Jefferson County, Oreg.

DRAINAGE AREA.—20.5 square miles.

RECORDS AVAILABLE.—April 7, 1915, to September 30, 1921, with a few gaps; occasional readings May to November, 1911; March to September, 1912, May to October, 1913.

GAGE.—Stevens continuous water-stage recorder on left bank October 16, 1917, to September 30, 1921, except April 7 to August 24, 1919; vertical staff to which recorder is referred used May 11, 1916, to October 15, 1917, and June 7 to August 24, 1919. Gage about 20 feet above a 15-foot weir read April 7, 1915, to April 30, 1916. Gage in natural channel, near site of weir, used 1911 to 1913. Gage reader, Joe Hanson.

CHANNEL AND CONTROL.—Bed composed of heavy gravel and boulders; practically permanent.

EXTREMES OF DISCHARGE.—Maximum stage during year, from water-stage recorder, 1.68 feet January 5–7, somewhat uncertain as water in well may have been frozen (discharge, 148 second-feet). Minimum stage, 0.61 foot November 12 (discharge, 29 second-feet).

1911–13 and 1915–1921: Maximum stage recorded, 2.24 feet December 30, 1917 (discharge, 247 second-feet); minimum stage recorded, 0.31 foot October 18, 1916 (discharge, 20 second-feet).

ICE.—Stage-discharge relation apparently unaffected by ice.

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation somewhat unstable, owing to accumulation of drift on control. Fairly well defined rating curve used October 26 to May 8 and June 6 to July 6. Indirect method of shifting control used May 30 to June 5 and for reading of August 28. Daily discharge ascertained by applying to rating table mean daily gage height obtained by inspecting recorder graph. Discharge estimated for periods when gage was not operating. Records fair, estimates for periods of missing records can not be greatly in error, as flow is very uniform due to regulation by lake.

Discharge measurements of Lake Creek near Sisters, Oreg., during the year ending Sept. 30, 1921

[Made by Wendell Dawson]

Date	Gage height	Discharge	Date	Gage height	Discharge
	Feet	*Sec.-ft.*		*Feet*	*Sec.-ft.*
Oct. 26	0.66	31.9	June 6	1.33	95
May 6	1.32	94	Sept. 3	.62	35
30	1.42	98			

Daily discharge, in second-feet, of Lake Creek near Sisters, Oreg., for the year ending Sept. 30, 1921

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1		32	74	69	69	64	69	98	92			35
2		32	69	92	74	59	69	105	86			35
3		32	69	126	80	59	69	98	86	43		35
4		32	69	133	77	59	69	98	92			
5		31	64	148	74	59	69	98	92			
6		32	64	148	76	42	69	92	92	42		
7		32	59	148	78	69	69	92	92			
8		32	59	140	80	69	64	92	92			
9		30	59	133		69	64		86			
10		29	56	118		69	64		80			
11		30	64	112		64	64		80			
12		29	64	112		64	64		74			
13	34	30	59	105		68	64		74			
14		30	59	92		72	64		69		34	
15		30	59	86		76	64		64			
16		32	57	86		80	69		64			35
17		39	50	80	72	84	69		59			
18		43	48	74		88	69		57			
19		48	48	74		92	69	95	56	37		
20		59	47			98	69		54			
21		69	47	69		98	69		54			
22		74	47			105	74		53			
23		74	47			98	80		52			
24		74	50	64		98	92		50			
25		74	52			92	98		48			
26	32	74	50			86	92		48			
27	32	80	48	66	64	86	98		47			
28	32	80	50		64	80	98				32	
29	32	74	54			80	98		45			
30	32	74	64	69		74	98	98			34	
31	32		69	69		74		98				

NOTE.—Braced figures show estimated mean discharge for periods indicated. Discharge interpolated Mar. 13–18, May 7, Sept. 1 and 2.

Monthly discharge of Lake Creek near Sisters, Oreg., for the year ending Sept. 30, 1921

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October			33.6	2,070
November	80	29	47.7	2,840
December	74	47	57.3	3,520
January	148		93.0	5,720
February			72.6	4,030
March	105	42	76.6	4,710
April	98	64	74.6	4,440
May	105		95.6	5,880
June	92		67.6	4,020
July			38.1	2,340
August			33.9	2,080
September			35.0	2,080
The year	148	29	60.4	43,700

WHITE RIVER BELOW TYGH VALLEY, OREG.

LOCATION.—In NW. ¼ sec. 8, T. 4 S., R. 14 E., just below Pacific Power & Light Co.'s plant at White River Falls and 4½ miles below Tygh Valley, Wasco County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—November 20, 1917, to September 30, 1921.

GAGE.—Stevens 8-day water-stage recorder on left bank with vertical gage inside of well; inspected by M. F. Coberth.

DISCHARGE MEASUREMENTS.—Made from cable one-fourth mile below gage or by wading under cable.

CHANNEL AND CONTROL.—Control of rock overlain with sand deposits; stage-discharge relation changes somewhat.

EXTREMES OF DISCHARGE.—Maximum stage during year from water-stage recorder, 6.15 feet at 1 a. m. January 3 (discharge, 3,640 second-feet); minimum stage indicated by pencil as 0.57 foot, which occurred sometime between September 13 and 20 when recorder was not operating (discharge, 60 second-feet).

1917–1921: Maximum stage from recorder, 8.24 feet December 19, 1917 (discharge, 5,940 second-feet); minimum discharge occurred December 11 to 14, 1919, due to extreme cold, estimated from records at power plant as 10 second-feet.

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

DIVERSIONS.—Numerous small irrigation canals take out above this station.

REGULATION.—Operation of power plant above regulates flow to some extent.

ACCURACY.—Stage-discharge relation changed during high water. Change made arbitrarily November 19. Two well-defined rating curves used. Operation of water-stage recorder satisfactory, except for some breaks during winter and September 13–30. Daily discharge obtained by applying to rating table mean daily gage heights obtained by inspecting recorder graph. Estimated periods based on graphic comparison with Hood River records. Records good except for estimated periods for which they are fair.

Discharge measurements of White River below Tygh Valley, Oreg., 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	Briggs and Dawson	1.26	212	July 22	Wendell Dawson	1.37	213
Nov. 29	R. C. Briggs	1.75	343	Aug. 19	K. N. Phillips	1.11	174
Mar. 23	Wendell Dawson	3.37	1,090	Sept. 10	Wendell Dawson	.99	136

Daily discharge, in second-feet, of White River below Tygh Valley, Oreg., for the year ending Sept. 30, 1921

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	180	195	325	900	372	1,310	820	1,140	900	408	188	151
2	225	185	325	2,230	408	1,140	870	1,050	900	390	178	153
3	308	190	325	3,030	520	1,110	870	960	1,080	372	178	153
4	258	190	325	2,050	600	1,140	820	930	1,080	355	172	153
5	246	172	310	2,050	480	1,110	770	900	1,050	340	170	151
6	240	163	310	1,450	460	1,020	745	900	1,050	325	170	151
7	237	160	295		442	960	695	900	1,050	325	178	135
8	222	156	295		645	870	695	960	960	310	180	144
9	208	153	280	1,000	870	820	695	960	870	295	182	137
10	195	148	295		1,690	820	745	1,050	820	295	185	131
11	190	151	310		2,050	770	770	1,050	745	280	182	131
12	192	156	295	720	1,870	720	820	1,020	720	280	170	126
13	220	156	295		1,780	695	820	1,020	645	265	162	
14	249		262		1,610	670	795	1,110	670	265	155	
15	268		247		1,380	620	745	1,140	600	253	162	
16	234	340	238	750	1,050	990	720	1,240	580	280	165	
17	225		235		960	1,530	745	1,170	540	244	162	
18	219		238			1,690	1,080	1,140	540	235	162	
19	211	520	222	580		1,450	1,050	1,170	560	235	165	
20	195		218	560	800	1,240	990	1,170	540	241	165	
21	195		232			1,110	1,140	1,140	520	228	155	190
22	208		230			1,110	1,530	1,170	500	220	165	
23	203		230	500	695	1,080	1,380	1,170	500	212	153	
24	203	400	253		720	1,080	1,240	1,170	500	215	153	
25	203		295		720	1,050	1,110	1,240	480	210	144	
26	195		280	408	770	990	1,050	1,240	460	218	148	
27	188		295	408	870	870	1,020	1,080	442	212	153	
28	190		442	390	960	845	1,380	990	425	205	151	
29	203	340	645	390	------	845	1,380	900	425	200	158	
30	203	340	1,380	390	------	820	1,240	900	408	200	153	
31	190	------	1,310	372	------	745	------	900	------	200	151	------

NOTE.—No gage-height record for following periods: Oct. 13 (discharge, interpolated); Nov. 14–18, 20–28, Jan. 7–11, 13–18, 21–25, Feb. 18–22, and Sept. 13–30 (discharge estimated from hydrographic comparison with records of flow of Hood River at Powerdale. Braced figures show estimated mean discharge for periods indicated.

Monthly discharge of White River below Tygh Valley, Oreg., for the year ending Sept. 30, 1921

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	308	180	216	13,300
November	----------	148	289	17,200
December	1,380	218	362	22,300
January	3,030	372	901	55,400
February	2,050	372	926	51,400
March	1,690	620	1,010	62,100
April	1,530	695	958	57,000
May	1,240	900	1,060	65,200
June	1,080	408	685	40,800
July	408	200	268	16,500
August	188	144	165	10,100
September	----------	126	171	10,200
The year	3,030	126	582	422,000

CLEAR CREEK ABOVE INTAKE, NEAR WAPINITIA, OREG.

LOCATION.—In SW. ¼ sec. 10, T. 5 S., R. 9 E., 300 feet above intake of Wapinitia Irrigation Co.'s canal, 4 miles below outlet of Clear Lake, and 22 miles west of Wapinitia, Wasco County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—May 16 to September 20, 1918, December 19, 1918, to September 30, 1921, fragmentary.

GAGE.—Stevens continuous water-stage recorder on right bank; inspected by R. E. Ellenwood. New gage set at slightly different location on December 4, 1918, read 0.83 foot less than earlier gage.

DISCHARGE MEASUREMENTS.—Made by wading near canal intake.

CHANNEL AND CONTROL.—Bed composed of sand, gravel, and small boulders. May shift slightly.

EXTREMES OF DISCHARGE.—Minimum stage from water-stage recorder, 0.47 foot October 11–13 (discharge, 6.5 second-feet). No record of maximum.

ICE.—No ice during period of record.

DIVERSIONS.—Wapinitia Irrigation Co.'s canal diverts water just below station. No diversion above.

REGULATION.—None.

ACCURACY.—Stage-discharge relation practically permanent. Rating curve fairly well defined below 24 second-feet. The gage record is incomplete and no estimates have been made during gaps, and no monthly discharge computed. Daily discharge ascertained by applying to rating table mean daily gage heights obtained by inspecting recorder graph. Daily records good.

Discharge measurements of Clear Creek above intake, near Wapinitia, Oreg., during the year ending Sept. 30, 1921

Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*
Nov. 30	R. C. Briggs	0.64	14.0
July 22	Wendell Dawson	.60	14.7

Daily discharge, in second-feet, of Clear Creek above intake, near Wapinitia, Oreg., for the year ending Sept. 30, 1921

Day	Oct.	Nov.	Dec.	Mar.	July	Aug.	Sept.
1	7.0		20			14	
2	8.0		23			14	
3	10		26			13	
4	8.0		30			14	
5	8.0		31			13	
6	7.5		24			12	
7	7.5		22			12	
8	7.0		21	48		12	
9	7.0					12	
10	7.0					12	
11	6.5					12	
12	6.5						
13	6.5						
14	7.0						
15	8.0						8.0
16	7.5						8.0
17	7.5						8.7
18	7.5						13
19	8.0						12
20		18					12
21		17					12
22		17			15		12
23		18			15		12
24		20			16		12
25		20			15		12
26		20			16		12
27		20			16		12
28		20			15		12
29		20			16		12
30		20			15		12
31					14		

NOTE.—No record for days for which no discharge is given.

GATE CREEK NEAR WAMIC, OREG.

LOCATION.—In sec. 35, T. 4 S., R. 11 E., 100 yards north of old Purcell ranch and 8 miles southwest of Wamic, Wasco County.

RECORDS AVAILABLE.—October 24, 1920, to July 31, 1921. Records at Mulvany sawmill in sec. 21, T. 4 S., R. 12 E. for October 7, 1917, to July 31, 1918 show slightly more water.

GAGE.—Vertical staff on right abutment of highway bridge; read by Miss Ora Duncan.

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

CHANNEL AND CONTROL.—Bed composed of clean gravel and small boulders; probably slightly shifting. Control section narrow at low stages. Banks are overflowed at extreme high water.

EXTREMES OF DISCHARGE.—Maximum stage recorded during the period October 24, 1920, to July 31, 1921, 2.2 feet February 22 (discharge, 106 second-feet); minimum stage recorded, 0.17 foot October 25 (discharge, 0.5 second-foot).

ICE.—Apparently no ice during winter.

DIVERSIONS.—Practically none above stations.

REGULATION.—None.

ACCURACY.—Stage-discharge relation practically permanent. Rating curve well defined below 60 second-feet. Gage read to hundredths once a day. Daily discharge obtained by applying daily gage height to rating table. Records good.

Discharge measurements of Gate Creek near Wamic, Oreg., during the year ending Sept. 30, 1921

[Made by Wendell Dawson]

Date	Gage height	Discharge
	Feet	*Sec.-ft.*
Mar. 28	1.60	52
July 22	.40	2.5

Daily discharge, in second-feet, of Gate Creek near Wamic, Oreg., for the period Oct. 24, 1920, to July 31, 1921

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July
1		0.6	1.6	15	8.0	35	42	32	18	8.9
2		.6	1.5	23	8.6	39	44	32	18	5.6
3		.6	1.6	88	11	48	42	33	20	5.0
4		.6	1.6	55	12	47	42	28	21	5.0
5		.6	1.8	48	13	52	37	28	19	4.8
6		.6	1.4	42	12	48	32	28	20	4.5
7		.6	1.4	36	15	47	32	28	19	4.2
8		.6	1.4	31	20	46	32	27	19	4.2
9		.6	1.3	30	71	41	30	23	19	4.2
10		.6	1.3	23	67	42	25	23	19	4.0
11		.8	1.3	23	88	40	24	25	19	3.8
12		.8	2.4	20	88	38	26	23	18	3.5
13		.8	2.8	19	79	37	26	21	17	3.2
14		.9	2.5	24	63	36	25	19	17	3.0
15		2.2	5.0	23	63	48	27	20	16	2.8
16		3.2	2.4	23	59	63	25	22	19	2.5
17		4.0	2.3	23	48	67	23	23	15	2.5
18		4.2	2.1	23	44	71	42	24	15	2.5
19		2.5	1.3	22	42	79	40	24	13	2.5
20		2.2	1.4	19	41	63	39	25	13	2.5
21		2.1	1.4	18	44	67	37	25	12	2.5
22		1.8	1.8	17	106	59	42	23	12	2.5
23		1.6	1.6	14	88	79	43	23	11	2.5
24	0.5	1.4	1.6	13	44	55	40	22	11	2.4
25	.5	1.4	2.5	11	32	55	39	23	8.6	2.3
26	.5	2.8	4.8	11	26	55	37	23	6.8	2.4
27	.5	3.5	2.8	11	32	52	35	23	5.6	2.4
28	.5	2.1	2.2	15	34	52	36	23	5.0	2.4
29	.5	1.8	4.2	16		52	37	21	4.8	2.2
30	.6	1.7	7.4	16		44	37	19	4.5	1.4
31	.6		14	10		43		19		1.4

Monthly discharge of Gate Creek near Wamic, Oreg., for the period Nov. 1, 1920, to July 31, 1921

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
November	4.2	0.6	1.59	95
December	14	1.3	2.67	164
January	88	10	24.6	1,510
February	106	8.0	45.0	2,500
March	79	35	51.6	3,170
April	44	23	34.6	2,060
May	33	19	24.3	1,490
June	21	4.5	14.5	863
July	5.9	1.4	3.44	212
The period				12,100

KLICKITAT RIVER BASIN

KLICKITAT RIVER NEAR GLENWOOD, WASH.

LOCATION.—In NE. ¼ sec. 14, T. 7 N., R. 12 E., just below Dairy Creek, 2½ miles below southern boundary of Yakima Indian Reservation, 3 miles below Big Muddy Creek, and 6 miles north of Glenwood, Klickitat County.

DRAINAGE AREA.—356 square miles.

RECORDS AVAILABLE.—December 16, 1910, to September 30, 1921, with gap in winter of 1921. October 29, 1909, to December 15, 1910, at a point a mile above, in section 11.

GAGE.—Stevens water-stage recorder referred to vertical staff on left bank read by A. G. Hanson; datum lowered 1.0 foot October 1, 1918. Prior to July, 1910, several vertical staffs were used.

DISCHARGE MEASUREMENTS.—Made from cable just below gage.

CHANNEL AND CONTROL.—Bed composed of heavy gravel, shifts in high water.

EXTREMES OF DISCHARGE.—Maximum stage during period of record for year ending September 30, 1921, from water-stage recorder, 3.90 feet at midnight May 25, June 4, and 5 and 5 a. m. and 9 p. m. June 7 (discharge, 3,770 second-feet); minimum stage from water-stage recorder, 1.07 feet at 10 a. m. November 10 (discharge, 395 second-feet). No higher or lower stages were indicated by recorder pencil when clock was stopped.

1909–1921: Maximum stage recorded, 5.20 feet on original gage, November 24, 1909 (discharge, estimated by extension of rating curve, 6,250 second-feet); minimum discharge recorded, 285 second-feet at 1 p. m. November 13, 1915 (gage height, 0.63 foot).

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

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed during period when no records are available. Rating curve used as follows: October 1 to November 20, well defined between 400 and 1,600 second-feet; April 3 to September 30, fairly well defined. Operation of water-stage recorder satisfactory for periods for which daily discharge has been computed. Daily discharge ascertained by applying to rating table mean daily gage height obtained by inspecting recorder graph. Records good.

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

[Made by A. G. Hanson]

Date	Gage height	Discharge
	Feet	*Sec.-ft.*
Oct. 22	1.33	510
Aug. 13	1.84	818
Sept. 25	1.51	543

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

Day	Oct.	Nov.	Apr.	May	June	July	Aug.	Sept.
1	598	460			3,230	1,960	940	680
2	634	455			3,410	1,780	920	640
3	870	455	1,600		3,410	1,620	890	610
4	1,090	455			3,590	1,550	840	600
5		445			3,680	1,550	840	590
6		437			3,590	1,550	870	590
7		433			3,680	1,640	890	596
8		433			3,500	1,680	900	596
9		433			3,130	1,580	870	589
10		417			3,050	1,500	840	554
11		421			2,790	1,450	830	547
12		417			2,710	1,380	840	534
13		425			2,710	1,360	840	522
14		425			2,550	1,340	840	522
15		433			2,320	1,300	840	516
16		550			2,170	1,280	830	516
17		1,270			2,100	1,230	830	516
18		2,190			2,030	1,230	810	540
19		2,190			2,030		780	568
20		1,800			2,100		790	575
21					2,240	1,170	780	680
22	510			3,320	2,170		760	589
23	517			3,320	2,100		740	554
24	506			3,410	2,100	1,110	700	547
25	506			3,590	2,030	1,070	710	547
26	506			3,590	1,960	1,050	680	600
27	500			3,050	1,890	1,020	710	620
28	506			2,790	1,890	1,000	720	589
29	495			2,630	1,960	980	730	554
30	506			2,710	2,100	970	710	554
31	470			2,870		940	700	

NOTE.—No record for days for which no discharge is given.

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

[Drainage area, 356 square miles]

Month	Discharge in second-feet				Run-off	
	Maximum	Minimum	Mean	Per square mile	Inches	Acre-feet
May 22-31	3,590	2,630	3,130	8.79	3.27	62,100
June	3,680	1,890	2,610	7.33	8.18	155,000
July	1,960	940	1,320	3.71	4.28	81,200
August	940	680	806	2.26	2.61	49,600
September	680	516	574	1.61	1.80	34,200

NOTE.—See footnote to table of daily discharge.

HOOD RIVER BASIN

HOOD RIVER AT POWERDALE, NEAR HOOD RIVER, OREG.

LOCATION.—In NE. ¼ sec. 36, T. 3 N., R. 10 E., at Powerdale, three-fourths mile south of Hood River, Hood River County, above discharge of tailrace of Powerdale plant of Pacific Power & Light Co., and 1½ miles above mouth of stream.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—March 31, 1913, to September 30, 1921.

GAGE.—Water-stage recorder on right bank near power plant, about half a mile above railroad bridge since July 23, 1919. Gurley 8-day recorder used during 1921; inspected by R. E. Fewel. Vertical staff at gage location used March 31, 1913, to September 30, 1914, and December 21, 1915, to July 22, 1919. Vertical staff on left bank just below bridge of Mount Hood Railway, October 1, 1914, to July 26, 1915; water-stage recorder at same location July 27 to December 21, 1915.

DISCHARGE MEASUREMENTS.—Made from cable 100 feet above gage.

CHANNEL AND CONTROL.—Bed composed of rock and boulders; shifts slightly.

EXTREMES OF DISCHARGE.—Maximum stage during year from water-stage recorder, 7.45 feet at noon, January 2 (discharge, 14,300 second-feet); minimum stage recorded, 1.22 feet at 11 a. m. August 26 (discharge, 260 second-feet).

1913–1921: Maximum stage determined from high-water marks, 8.9 feet December 18 or 19, 1917 (discharge, 17,200 second-feet); minimum stage recorded, 0.80 foot August 26, 1920 (discharge, 170 second-feet).

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

DIVERSIONS.—Large diversions for irrigation above station; water for power plant is diverted around upper gage but is returned above the bridge gage. A record of this diversion has been kept (p. 99).

REGULATION.—Water stored at sawmill at Dee causes sudden fluctuations at low water.

ACCURACY.—Stage-discharge relation permanent. Rating curve fairly well defined. Operation of water-stage recorder satisfactory except January 23, March 3 to April 6, April 8, May 1–6, 15–20, and September 11–13; staff gage read once daily by observer March 3 to April 2 and September 11–13. Daily discharge ascertained by applying to rating table mean daily gage height determined by inspecting recorder graph or daily gage height by observer; discharge for periods when recorder was not operating or staff gage read, estimated by comparison with records of flow for White Salmon River near Underwood. Records fair.

Discharge measurements of Hood River at Powerdale, near Hood River, Oreg., 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. 28	R. C. Briggs	2.95	1,190	June 24	K. N. Phillips	2.56	1,080
Mar. 3	V. H. Reineking	3.67	2,500	July 19	Wendell Dawson	1.79	550
24	Wendell Dawson	3.88	2,500	Aug. 22	K. N. Phillips	1.56	400
June 22	Phillips and Dawson	2.58	1,090	Sept. 27	Wendell Dawson	1.89	573

Daily discharge, in second-feet, of Hood River at Powerdale, near Hood River, Oreg., for the year ending Sept. 30, 1921

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	905	509	1,100	3,920	1,190	2,300	1,660		1,560	1,100	537	335
2	1,370	481	1,190	11,000	1,240	2,380	1,660		1,510	1,140	509	314
3	1,760	455	1,240	8,770	1,460	2,230		1,700	1,710	870	481	314
4	1,370	429	1,140	5,310	1,710	2,160	1,500		1,760	870	455	344
5	1,190	455	1,020	5,310	1,510	1,970			1,860	800	429	366
6	1,060	429	940	3,700	1,320	1,810			1,810	765	429	380
7	1,060	481	940	1,610	1,320	1,710	1,370	1,560	1,920	800	537	322
8	940	455	905	2,300	1,760	1,560	1,370	1,560	1,710	870	566	314
9	870	404	905	2,030	3,000	1,510	1,370	1,510	1,560	800	509	326
10	835	390	940	1,810	5,570	1,610	1,420	1,860	1,460	800	455	326
11	800	390	1,460	1,660	5,310	1,560	1,420	1,760	1,370	695	414	301
12	800	390	1,460	1,660	4,820	1,460	1,460	1,660	1,370	660	414	309
13	730	390	1,760	1,660	4,140	1,510	1,560	1,610	1,370	660	429	318
14	1,100	455	1,370	1,970	3,490	1,420	1,460	1,760	1,280	628	596	322
15	1,280	429	1,240	2,380	2,710	1,460	1,420		1,140	596	537	340
16	1,100	537	1,100	2,160	2,300	5,310	1,370		1,060	566	509	344
17	1,020	2,180	980	1,920	2,030	9,160	1,370	1,800	1,020	596	481	344
18	940	2,710	940	1,760	1,810	5,830	1,560		1,100	566	481	455
19	870	2,460	905	1,610	1,710	4,360	1,610		1,280	566	455	835
20	800	2,300	870	1,460	1,710	2,710	1,610		1,140	566	390	596
21	765	1,810	800	1,320	1,660	2,380	2,090	1,760	1,190	537	455	660
22	730	1,760	800	1,320	1,560	2,090	3,920	1,810	1,140	509	358	596
23	695	1,660	800	1,260	1,610	2,230	2,710	1,760	1,140	537	314	509
24	695	1,420	1,240	1,190	1,660	2,460	2,230	1,810	1,100	628	301	481
25	660	1,370	1,560	1,190	1,610	2,460	1,970	1,920	1,020	596	284	596
26	596	1,240	1,370	1,140	1,610	2,230	1,920	1,860	940	537	284	537
27	596	1,460	1,370	1,100	1,660	1,970	1,860	1,610	980	509	301	628
28	628	1,420	2,710	1,020	1,970	1,860	2,460	1,460	980	509	366	695
29	596	1,320	4,820	1,060	-------	1,810	2,620	1,370	940	509	322	566
30	566	1,190	11,000	1,060	-------	1,710	2,230	1,420	940	509	309	537
31	537	-------	5,570	1,020	-------	1,710	-------	1,460	-------	596	309	-------

NOTE.—Braced figures show estimated mean discharge for periods indicated; Jan. 23 interpolated.

Monthly disharge of Hood River at Powerdale, near Hood River, Oreg., for the year ending Sept. 30, 1921

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	1,760	537	899	55,300
November	2,710	390	1,050	62,500
December	11,000	800	1,760	108,000
January	11,000	1,020	2,470	152,000
February	5,570	1,190	2,270	126,000
March	9,160	1,420	2,480	152,000
April	3,920	----------	1,790	107,000
May	1,920	1,370	1,690	104,000
June	1,920	940	1,310	78,000
July	1,140	509	674	41,400
August	596	284	426	26,200
September	835	301	444	26,400
The year	11,000	284	1,430	1,040,000

Combined daily discharge, in second-feet, of Hood River and Pacific Power & Light Co.'s tailrace at Powerdale, near Hood River, Oreg., for the year ending Sept. 30, 1921

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	1,000	609	1,210	3,990	1,300	2,420	1,770		1,670	1,200	647	445
2	1,460	581	1,300	11,000	1,360	2,500	1,770		1,620	1,240	619	424
3	1,760	555	1,350	8,850	1,580	2,350			1,820	940	591	424
4	1,430	529	1,250	5,380	1,820	2,280		1,810	1,870	870	565	454
5	1,250	555	1,090	5,380	1,580	2,090	1,580		1,860	905	539	366
6	1,140	529	1,050	3,770	1,380	1,880			1,920	870	539	483
7	1,140	481	1,050	1,680	1,440	1,820	1,480	1,560	2,030	905	537	425
8	1,030	555	1,020	2,370	1,880	1,670	1,480	1,670	1,820	975	676	417
9	958	504	1,020	2,140	3,120	1,620	1,480	1,620	1,670	905	619	429
10	835	490	1,050	1,920	5,680	1,720	1,420	1,970	1,570	800	565	429
11	890	490	1,570	1,770	5,420	1,670	1,530	1,870	1,480	801	524	301
12	890	490	1,490	1,770	4,890	1,570	1,570	1,770	1,370	766	524	414
13	820	490	1,870	1,770	4,210	1,570	1,670	1,720	1,480	766	539	423
14	1,190	455	1,480	2,040	3,590	1,490	1,570	1,870	1,390	734	596	427
15	1,370	529	1,350	2,490	2,780	1,560	1,530		1,250	702	647	445
16	1,190	637	1,210	2,270	2,420	5,420	1,480		1,170	672	619	449
17	1,110	2,240	1,090	2,030	2,140	9,260	1,480	1,900	1,130	702	591	449
18	1,030	2,810	1,020	1,870	1,920	5,940	1,670		1,210	672	591	455
19	960	2,560	1,020	1,720	1,820	4,460	1,720		1,280	672	565	942
20	890	2,400	980	1,570	1,820	2,820	1,720		1,250	672	500	703
21	855	1,810	910	1,430	1,780	2,480	2,200	1,870	1,300	643	455	767
22	820	1,860	910	1,430	1,680	2,200	4,030	1,810	1,250	615	471	703
23	785	1,760	910	1,330	1,780	2,340	2,820	1,870	1,240	643	427	616
24	695	1,520	1,350	1,300	1,720	2,560	2,340	1,920	1,200	734	414	588
25	760	1,470	1,620	1,300	1,720	2,560	2,080	2,030	1,120	702	397	703
26	696	1,340	1,430	1,260	1,720	2,340	2,030	1,970	1,040	643	397	644
27	696	1,560	1,480	1,220	1,720	2,040	1,970	1,720	1,080	615	414	735
28	728	1,480	2,820	1,140	2,090	1,970	2,570	1,570	1,080	615	366	802
29	696	1,420	4,930	1,180	-------	1,920	2,730	1,430	1,040	615	432	673
30	666	1,290	11,000	1,130	-------	1,820	2,340	1,420	1,040	615	419	644
31	637	-------	5,630	1,140	-------	1,820	-------	1,570	-------	702	419	-------

NOTE.—Braced figures show estimated mean discharge for periods indicated.

Combined monthly discharge of Hood River and Pacific Power & Light Co.'s tailrace at Powerdale, near Hood River, Oreg., for the year ending Sept. 30, 1921

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	1,760	637	980	60,300
November	2,810	490	1,130	67,200
December	11,000	910	1,850	114,000
January	11,000	1,140	2,570	158,000
February	5,680	1,300	2,370	132,000
March	9,260	1,490	2,590	159,000
April	4,030	----------	1,890	112,000
May	2,030	1,420	1,790	110,000
June	2,030	1,040	1,410	83,900
July	1,240	615	771	47,400
August	676	397	523	32,200
September	942	301	539	32,100
The year	11,000	301	1,530	1,110,000

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EAST FORK OF HOOD RIVER NEAR MOUNT HOOD, OREG.

LOCATION.—In SW. ¼ sec. 4, T. 1 S., R. 10 E., 1,000 feet above intake of East Fork Irrigation District canal, three-fourths mile above highway bridge, and 2 miles south of Mount Hood post office, Hood River County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—July 22, 1915, to October 16, 1918, May 9 to October 15, 1919, and May 5, 1920, to September 30, 1921, with gaps in January to June, 1921.

GAGE.—Stevens water-stage recorder on left bank; inspected by C. H. Shaw.

DISCHARGE MEASUREMENTS.—Made from cable 15 feet below gage or by wading.

CHANNEL AND CONTROL.—Bed composed of heavy boulders; shifts at flood stages.

EXTREMES OF DISCHARGE.—Maximum stage from water-stage recorder during period ending September 30, 1921, 3.55 feet at 10 a. m. January 2 (discharge, 1,080 second-feet); minimum stage from water-stage recorder, 0.90 feet November 12 to 14 (discharge, 146 second-feet).

1915–1921: Maximum stage from water-stage recorder, 5.9 feet December 18, 1917 (discharge, 2,420 second-feet); minimum discharge recorded, 108 second-feet November 11, 1915.

ICE.—No record during frozen period.

DIVERSIONS.—The Glacier canal and other small canals divert water for irrigation above station.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed between two periods of record. Rating curves well defined to 600 second-feet. Operation of water-stage recorder unsatisfactory January 5 to June 23. Daily discharge ascertained by applying to rating table mean daily gage height obtained by inspecting recorder graph. Records excellent except for estimated periods.

Discharge measurements of East Fork of Hood River near Mount Hood, Oreg., 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	Wendell Dawson	1.31	234	July 19	Wendell Dawson	1.62	286
Mar. 5	V. H. Reineking	1.78	371	Aug. 18	K. N. Phillips	1.29	216
25	Wendell Dawson	1.90	420	Sept. 11	Wendell Dawson	1.12	159
June 22	do	2.02	421	27	G. H. Canfield	1.23	189

Daily discharge, in second-feet, of East Fork of Hood River near Mount Hood, Oreg., for the year ending Sept. 30, 1921

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	a 210	154	205	451		364	381			397	256	173
2	255	154	194	915		381	381			347	256	173
3	284	154	a 200	794		372				347	242	163
4	242	154	205	638						331	242	163
5	229	146	194	600		364				347	242	154
6	205	146	194			364				331	242	154
7	194	146	183			348				347	256	163
8	183	146	183			332				364	256	163
9	173	146	183			332				347	242	163
10	163	146	a 183			332				331	229	163
11	173	146	183			a 324				331	229	163
12	173	146	183		525	316				315	229	154
13	163	146	183		506	a 300				315	217	154
14	217	146	173	348	470	284				315	229	154
15	194	154	183	381						285	229	154
16	183	183	183	364		461				300	229	154
17	173	470	a 168							285	217	163
18	173	415	154			638				285	217	194
19	173	348				600				285	205	242
20	173	360	154	284		525				285	205	194
21	173	270				488				285	205	242
22	173	255				470			414	285	194	205
23	173	242	154			450			414	285	194	183
24	173	229	163						a 406	285	183	173
25	173	229	163		332	420			397	285	183	173
26	173	255	163		332	418			397	285	183	183
27	173	242	173		332				397	256	173	194
28	173	217	270		348	415			397	256	173	194
29	163	205	381			398			397	256	173	173
30	154	205	754			381			397	256	173	163
31	154		562			381				256	173	

a Interpolated.

NOTE.—Braced figures show estimated mean discharge for periods indicated. No record for days for which no discharge is given.

Monthly discharge of East Fork of Hood River near Mount Hood, Oreg., for the year ending Sept. 30, 1921

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	284	154	187	11,500
November	470	146	210	12,500
December	754	154	217	13,300
March			407	25,000
June 22-30	414	397	402	7,170
July	397	256	306	18,800
August	256		215	13,200
September	242	154	175	10,400

NOTE.—See footnote to table of daily discharge.

EAST FORK IRRIGATION DISTRICT CANAL NEAR MOUNT HOOD, OREG.

LOCATION.—In SE. ¼ sec. 33, T. 1 N., R. 10 E., 1 mile below point of diversion, 1½ miles south of Mount Hood post office, Hood River County, and 2 miles east of Parkdale station on Mount Hood Railroad.

RECORDS AVAILABLE.—June 17, 1913, to September 30, 1921, irrigation seasons only.

GAGE.—Stevens water-stage recorder on left side of canal just below road crossing; inspected by C. H. Shaw. Vertical staff on side of flume, 1,000 feet below, in the SW. ¼ section 34, used up to October, 1914; and recorder just above road crossing up to October, 1920.

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

CHANNEL AND CONTROL.—Smooth earth section. Head of flume probably acts as control; fairly permanent.

EXTREMES OF DISCHARGE.—Maximum stage during period ending September 30, 1921, from water-stage recorder, 3.63 feet at 1 a. m. August 8 (discharge, 138 second-feet); canal dry at various times.

1913–1921: Maximum discharge recorded, 153 second-feet July 9, 1919.

ICE.—No water carried in cold weather.

ACCURACY.—Stage-discharge relation changed owing to relocation of station during nonirrigating season. Rating curves well defined. Operation of water-stage recorder satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height obtained by inspecting recorder graph. Records excellent except for estimated periods in September.

The East Fork Irrigation District canal diverts water in SW. ¼ sec. 4, T. 1 S., R. 10 E., and irrigates lands lying east of Hood River. Most of the return water reaches Neal Creek and the lower part of Hood River.

Discharge measurements of East Fork Irrigation District canal near Mount Hood, Oreg., 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 22	Wendell Dawson	3.43	120	Sept. 11	Wendell Dawson	3.02	89
July 19	do	3.52	126	27	do	1.90	26.2
Aug. 18	K. N. Phillips	3.56	131				

Daily discharge, in second-feet, of East Fork Irrigation District canal near Mount Hood, Oreg., for the year ending Sept. 30, 1921

Day	Oct.	Apr.	May	June	July	Aug.	Sept
1	19		23	114	122	134	130
2	20		23	118	122	134	130
3	20		23	118	122	130	130
4	20		24	118	122	114	126
5	20		24	118	122	130	118
6	20		24	118	126	130	114
7	20		24	122	126	134	110
8	20		24	122	130	134	110
9	20	14	24	118	130	130	110
10	20		24	118	130	126	95
11	21		24	118	130	130	102
12	21	14	32	118	126	130	74
13	21		41	118	130	130	
14	22		45	118	130	134	
15	23		45	118	130	134	60
16		14	45	118	126	134	
17		14	45	118	130	130	64
18		14	45	118	130	130	64
19		14	45	122	126	130	
20		14	45	122	130	130	
21		14	45	122	130	134	
22		14	45	122	130	130	
23		14	48	122	130	130	26
24		14	63	122	130	130	
25		15	63	122	130	130	
26		15	68	122	130	130	
27		19	83	122	130	130	26
28		22	81	122	130	130	
29		23	83	122	134	130	26
30		23	88	122	134	130	
31			106		130	130	

NOTE.—Braced figures show estimated mean discharge for periods indicated. Canal dry during most of period for which no discharge is given; a little water may have been diverted of which no record was obtained.

Monthly discharge of East Fork Irrigation District canal near Mount Hood, Oreg., for the year ending Sept. 30, 1921

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October 1-15	23	19	20.5	610
April 9-30	23	----------	15.5	676
May	106	23	45.9	2,820
June	122	114	120	7,140
July	134	122	128	7,870
August	134	114	130	7,990
September	130	----------	67.6	4,020

NOTE.—See footnote to table of daily discharge.

GREEN POINT CREEK NEAR DEE, OREG.

LOCATION.—In NE. ¼ sec. 9, T. 1 N., R. 9 E., just above Mount Hood Irrigation District canal diversion and 3½ miles west of Dee, Hood River County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—July 24 to September 7, 1919; July 9 to September 9, 1920; and July 20 to September 17, 1921; when station was discontinued.

GAGE.—Enameled staff in creek above dam; read by H. Schlief.

DISCHARGE MEASUREMENTS.—Made by wading 150 feet above gage or in Mount Hood Irrigation District canal when all water is diverted.

CHANNEL AND CONTROL.—Diversion dam acts as control when water is spilling over dam, stage-discharge relation is affected by changes in head gates. No record on canal in 1921.

DIVERSIONS.—Practically all the low-water flow of creek diverted immediately below gage.

REGULATION.—None.

ACCURACY.—Stage-discharge relation apparently permanent July 20 to September 17. Rating curve well defined for that period. Gage read to hundredths once a day. Daily discharge obtained by applying daily gage readings to rating table. Records fair.

Discharge measurements of Green Point Creek near Dee, Oreg., 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	R. C. Briggs	1.05	37.2	Aug. 23	K. N. Phillips	0.53	11.2
July 20	Wendell Dawson	.79	14.7	Sept. 28	Wendell Dawson	.65	9.5
Aug. 18	K. N. Phillips	.61	11.8				

Daily discharge, in second-feet, of Green Point Creek near Dee, Oreg., for the period July 20 to Sept. 17, 1921

Day	July	Aug.	Sept.	Day	July	Aug.	Sept.	Day	July	Aug.	Sept.
1		13	11	11		11	10	21	14	11	
2		13	11	12		11	10	22	14	11	
3		13	11	13		11	10	23	14	11	
4		13	10	14		11	10	24	14	11	
5		12	10	15		11	10	25	14	11	
6		12	10	16		12	10	26	14	11	
7		12	10	17		12	10	27	14	11	
8		12	10	18		11		28	14	10	
9		11	10	19		11		29	13	10	
10		12	10	20	15	11		30	13	10	
								31	13	10	

Monthly discharge of Green Point Creek near Dee, Oreg., for the period July 20 to Sept. 17, 1921

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
July 20–31	15	13	13.8	330
August	13	10	11.4	701
September 1–17	11	10	10.2	343

NORTH FORK OF GREEN POINT CREEK NEAR DEE, OREG.

LOCATION.—In SW. ¼ sec. 3, T. 1 N., R. 9 E., at crossing of Hood River Irrigation District low-line canal, a quarter of a mile above mouth and 3 miles west of Dee, Hood River County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—June 17 to September 7, 1919; July 10 to August 5, 1920, and July 20 to September 30, 1921, when station was discontinued.

GAGE.—Vertical staff, just above intake of flume diverting North Fork into main canal.

DISCHARGE MEASUREMENTS.—Made by wading near gage or in flume.

CHANNEL AND CONTROL.—Bed composed of heavy boulders; subject to shift at high stages.

DIVERSIONS.—None above gage, practically all the low-water flow diverted immediately below.

REGULATION.—None.

ACCURACY.—Stage-discharge relation fairly permanent during period. Curve fairly well defined. Gage read to hundredths once a day. Daily discharge ascertained by applying to rating table daily gage height. Records fair except for estimated periods.

Discharge measurements of North Fork of Green Point Creek near Dee, Oreg., 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	J. J. Dirzulaitis	0.87	5.5	Aug. 23	K. N. Phillips	0.52	9.2
July 20	Wendell Dawson	.74	18.4	Sept. 28	G. H. Canfield	.50	7.4

Daily discharge, in second-feet, of North Fork of Green Point Creek near Dee, Oreg., for the period July 20 to Sept. 30, 1921

Day	July	Aug.	Sept.	Day	July	Aug.	Sept.	Day	July	Aug.	Sept.
1		14	8.8	11			6.6	21	21	[a]9.8	21
2		14	9.2	12		12	6.6	22	21	9.6	13
3			9.6	13			6.6	23	20	9.6	11
4			[a]9.0	14		10	6.3	24	20	9.2	8.0
5			8.4	15		10	6.3	25	18	8.8	
6		12	8.4	16		11	6.0	26	17	8.4	8.6
7			8.0	17		12	6.0	27	17	8.0	
8			7.7	18		10	[a]18	28	16	8.0	8.0
9			7.3	19		10	29	29	16	7.7	
10			7.0	20	18	10	27	30	15	7.7	8.0
								31	15	7.7	

[a] Interpolated.

NOTE.—Braced figures show estimated mean discharge for periods indicated.

Monthly discharge of North Fork of Green Point Creek near Dee, Oreg., for the period July 20 to Sept. 30, 1921

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
July 20-31	21	15	17.8	424
August	14	7.7	10.6	652
September	29	6.0	10.1	601
The period				1,670

FARMERS CANAL NEAR OAKGROVE, OREG.

LOCATION.—In SE. ¼ sec. 30, T. 2 N., R. 10 E., 30 feet below wasteway, three-fourths mile below canal heading, and 3 miles southwest of Oakgrove, Hood River County.

RECORDS AVAILABLE.—May 1 to August 30, 1917, and July 7 to September 30, 1920, and July 1 to September 30, 1921.

GAGE.—Enameled staff nailed to flume.

DISCHARGE MEASUREMENTS.—Made from plank at gage.

CHANNEL AND CONTROL.—Flume 7 feet wide, fairly steep gradient.

EXTREMES OF DISCHARGE.—Maximum stage recorded, 1.98 feet on a number of days in July and August (discharge, 61 second-feet); minimum stage recorded, 0.90 foot September 22 to 30 (discharge, 18 second-feet).

1917; 1910–1921: Maximum discharge recorded, 67 second-feet, on a number of days in July and August, 1920.

DIVERSIONS.—Above all diversions from canal.

REGULATION.—Flow controlled by head gates and wasteway.

ACCURACY.—Stage-discharge relation permanent during irrigation season. Rating curve well defined. Gage read to hundredths once a day. Daily discharge obtained by applying daily gage reading to rating table. Records good.

Canal diverts water from the right bank of Hood River in SE. ¼ sec. 36, T. 2 N., R. 9 E. Water is used for irrigating west side of Hood River valley near Oakgrove and Rockford.

Discharge measurements of Farmers canal near Oakgrove, Oreg., during the period June 24 to Sept. 30, 1921

[Made by Wendell Dawson]

Date	Gage height	Discharge
	Feet	*Sec.-ft.*
June 24	1.96	59
July 19	1.94	58
Sept. 28	.91	18.7

Daily discharge, in second-feet, of Farmers canal near Oakgrove, Oreg., for the period July 1 to Sept. 30, 1921

Day	July	Aug.	Sept.	Day	July	Aug.	Sept.	Day	July	Aug.	Sept.
1	59	59	52	11	61	57	37	21	61	61	21
2	57	59	48	12	59	57	37	22	59	57	18
3	59	61	48	13	59	61	37	23	59	57	18
4	57	61	48	14	61	61	37	24	61	59	18
5	59	61	48	15	61	57	37	25	57	57	18
6	59	57	48	16	59	59	37	26	57	57	18
7	59	59	48	17	61	61	37	27	57	59	18
8	57	61	48	18	59	57	37	28	61	57	18
9	59	61	46	19	57	59	21	29	59	57	18
10	59	59	43	20	59	61	21	30	61	52	18
								31	61	52	

Monthly discharge of Farmers canal near Oakgrove, Oreg., for the period July 1 to Sept. 30, 1921

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
July	61	57	59.1	3,630
August	61	52	58.5	3,600
September	52	18	33.3	1,980
The period				9,210

PACIFIC POWER & LIGHT CO.'S TAILRACE NEAR HOOD RIVER, OREG.

LOCATION.—In SE. ¼ sec. 36, T. 3 N., R. 10 E., just below power house, opposite gage on Hood River, and three-fourths mile south of Hood River, Hood River County.

RECORDS AVAILABLE.—October 1, 1913, to September 30, 1914, and January 1, 1916, to September 30, 1921.

GAGE.—Vertical staff on right bank of tailrace; read by R. E. Fewel. Similar gage at different datum used 1913 to 1914.

DISCHARGE MEASUREMENTS.—Made from footbridge just below gage.

CHANNEL AND CONTROL.—Flume 11 feet wide extends a few feet down from gage; below this the canal is excavated in gravel.

EXTREMES OF DISCHARGE.—Maximum discharge recorded during year, 118 second-feet at time of measurement March 3 (gage height, 2.16 feet). Tailrace dry at times.

1913–1914, 1916–1921: Maximum discharge recorded, 123 second-feet, in June, July, August, September, and December, 1919, and January and February, 1920.

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

ACCURACY.—Stage-discharge relation practically permanent during year. Rating curve fairly well defined to a stage of 2 feet. Gage read to tenths once a day. Daily discharge, for stage below 2 feet, ascertained by applying to rating table daily gage height. The method of shifting control used for stage of 2 feet or over. Records poor.

The Pacific Power & Light Co's. pipe line diverts water from Hood River at a dam in NE. ¼ sec. 1, T. 2 N., R. 10 E. to a power plant in SE. ¼ sec. 36, T. 3 N., R. 10 E., and the tailrace empties into the river in NE. ¼ sec. 36, below gage on Hood River at Powerdale and above former gage at bridge.

Discharge measurements of Pacific Power & Light Co.'s tailrace near Hood River, Oreg., 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	R. C. Briggs	2.15	91	June 24	K. N. Phillips	2.20	102
23	Wendell Dawson	2.10	89	July 19	Wendell Dawson	2.20	106
Nov. 28	do	1.78	69	Aug. 22	K. N. Phillips	2.20	113
Mar. 3	V. H. Reineking	2.16	118	Sept. 10	Wendell Dawson	2.10	103
25	Wendell Dawson	2.10	105	27	G. H. Canfield	2.18	107
June 22	K. N. Phillips	2.20	106				

Daily discharge, in second-feet, of Pacific Power & Light Co.'s tailrace near Hood River, Oreg., for the year ending Sept. 30, 1921

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	95	100	110	70	115	118	110	110	110	100	110	110
2	95	100	110	0	115	118	110	110	110	100	110	110
3	0	100	110	70	115	118	0	110	110	70	110	110
4	58	100	110	70	115	118	110	110	110	0	110	110
5	61	100	70	70	70	118	110	110	0	105	110	0
6	76	100	110	70	58	70	110	110	110	105	110	103
7	76	0	110	70	115	110	110	110	110	105	0	103
8	88	100	110	70	115	110	110	0	110	105	110	103
9	88	100	110	110	115	110	110	110	110	105	110	103
10	0	100	110	110	115	110	0	110	110	0	110	103
11	90	100	110	110	115	110	110	110	110	106	110	0
12	90	100	29	110	70	110	110	110	0	106	110	105
13	90	100	110	110	70	58	110	110	110	106	110	105
14	90	0	110	70	100	70	110	110	110	106	0	105
15	90	100	110	110	70	105	110	35	110	106	110	105
16	90	100	110	110	115	105	110	110	110	106	110	105
17	90	64	110	110	115	105	110	110	110	106	110	105
18	90	100	79	110	115	105	110	110	110	106	110	0
19	90	100	110	110	115	105	110	110	0	106	110	107
20	90	100	110	110	115	105	110	110	106	106	110	107
21	90	0	110	110	115	105	110	110	106	106	0	107
22	90	100	110	110	115	105	110	0	106	106	113	107
23	90	100	110	70	115	105	110	110	104	106	113	107
24	0	100	110	115	115	105	110	110	102	106	113	107
25	100	100	64	115	115	105	110	110	100	106	113	107
26	100	100	64	115	115	105	110	110	100	106	113	107
27	100	100	110	115	58	70	110	110	100	106	113	107
28	100	64	110	115	118	110	110	110	100	106	0	107
29	100	100	110	115	-------	110	110	64	100	106	110	107
30	100	100	0	70	-------	110	110	0	100	106	110	107
31	100	-------	64	115	-------	110	-------	110	-------	106	110	-------

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Monthly discharge of Pacific Power & Light Co.'s tailrace near Hood River, Oreg., for the year ending Sept. 30, 1921

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	100	0	80.9	4,970
November	100	0	87.6	5,210
December	110	0	97.1	5,970
January	115	0	94.7	5,820
February	115	58	104	5,780
March	118	58	104	6,400
April	110	0	103	6,130
May	110	0	95.5	5,870
June	110	0	96.1	5,720
July	106	0	97.5	6,000
August	113	0	96.4	5,930
September	110	0	95.6	5,690
The year	118	0	95.9	69,500

WHITE SALMON RIVER BASIN

WHITE SALMON RIVER NEAR UNDERWOOD, WASH.

LOCATION.—In NW. ¼ sec. 14, T. 3 N., R. 10 E., 200 yards below Northwestern Electric Co.'s Condit power plant, 2 miles north of Underwood, Skamania County.

DRAINAGE AREA.—384 square miles (measured on map of Columbia National Forest).

RECORDS AVAILABLE.—March 1, 1915, to December 14, 1917, and June 1, 1918, to September 30, 1921; also October 18, 1912, to February 26, 1913, at dam about a mile above.

GAGE.—Stevens continuous water-stage recorder on right bank, beginning November 21, 1920; Gurley recorder 1918 to 1920; Friez and Fuller recorders on left bank prior to 1918. Gage inspected by D. J. Shore, foreman of power plant.

DISCHARGE MEASUREMENTS.—Made from cable at gage; measuring conditions good.

CHANNEL AND CONTROL.—Bed composed of rock and gravel; practically permanent.

EXTREMES OF DISCHARGE.—Maximum stage during year from water-stage recorder, 5.98 feet at 8 a. m., March 18 (discharge, 4,300 second-feet); minimum stage from recorder, −0.19 foot at 10 a. m. August 28 (discharge, 62 second-feet).

1915–1921: Maximum stage from high-water marks, 9.5 feet, old gage datum December 29, 1917 (discharge about 9,700 second-feet). Minimum stage occurs when power plant is occasionally shut down suddenly, recorder does not operate to such low stages, discharge negligible.

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

DIVERSIONS.—About 3,500 acres irrigated above this station.

REGULATION.—At low and medium stages practically all the water is used through the wheels of the power plant. The pond above the dam covers about 80 acres; daily discharges for October to December and July to September have been corrected for storage.

ACCURACY.—Stage-discharge relation practically permanent. Rating curve well defined above 300 second-feet. Operation of water-stage recorder satisfactory except as noted in footnote to table of daily discharge. Daily discharge obtained by integration, except for October 1–4 and September

11–30, computed from electrical output of power plant, January 1–9, from electrical output plus discharge over spillway of dam, and February 5–21, and March 16–20, ascertained by applying to rating table mean daily gage height obtained by inspecting recorder graph. Records good.

Discharge measurements of White Salmon River near Underwood, 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	R. C. Briggs	2.67	1,030	July 20	Wendell Dawson	2.49	902
Nov. 28	Wendell Dawson	2.75	1,070	Aug. 22	K. N. Phillips	2.62	970
Mar. 4	V. H. Reineking	4.14	2,280	23	do	1.99	646
4	do	4.05	2,310	23	do	2.75	1,070
June 22	K. N. Phillips	3.62	1,720	Sept. 29	G. H. Canfield	2.43	830
24	do	3.64	1,700				

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

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	1,080	602	1,040	2,750	1,240	1,800	1,610	1,590	1,850	1,390	980	798
2	1,180	674	1,030	2,800	1,240	1,880	1,600	1,720	1,960	1,340	950	793
3	1,780	831	1,010	3,400	1,280	1,920	1,530	1,580	1,960	1,290	950	824
4	1,290	591	1,000	3,300	1,310	1,920	1,540	1,580	2,000	1,300	936	844
5	1,210	576	955	3,100	1,290	1,910	1,450	1,540	1,960	1,270	930	776
6	1,050	614	957	2,800	1,260	1,800	1,380	1,560	2,060	1,250	968	800
7	992	740	926	2,600	1,290	1,840	1,350	1,600	2,000	1,220	934	754
8	890	566	919	2,400	1,320	1,720	1,320	1,550	1,980	1,230	968	765
9	840	566	938	2,000	1,800	1,700	1,300	1,740	1,860	1,190	952	766
10	780	550	1,060	1,760	2,350	1,670	1,360	1,720	1,830	1,180	904	765
11	780	564	1,210	1,620	2,880	1,640	1,720	1,820	1,760	1,180	894	756
12	844	552	1,170	1,550	3,330	1,560	1,710	1,820	1,600	1,160	870	762
13	814	550	1,210	1,450	3,210	1,510	1,790	1,800	1,740	1,150	900	772
14	814	600	1,090	1,740	2,880	1,560	1,750	1,820	1,560	1,140	1,110	764
15	876	556	1,020	2,000	2,350	1,530	1,680	1,900	1,550	1,130	863	768
16	848	628	1,000	1,880	2,150	2,850	1,640	2,210	1,500	1,110	891	768
17	832	1,280	965	1,830	2,050	4,050	1,510	2,240	1,480	1,090	888	788
18	792	1,830	944	1,670	1,850	4,110	1,780	2,210	1,460	1,120	944	746
19	748	2,430	913	1,580	1,850	3,450	1,740	2,220	1,450	1,010	918	804
20	742	2,150	919	1,520	1,760	2,990	1,780	2,170	1,570	1,040	892	836
21	750	1,710	870	1,420	1,670	2,680	1,780	2,080	1,490	1,080	852	850
22	866	1,550	884	1,360	1,580	2,480	2,020	2,040	1,520	1,020	889	826
23	674	1,400	934	1,280	1,570	2,400	2,160	2,130	1,450	1,000	842	798
24	674	1,270	919	1,380	1,600	2,410	1,980	2,040	1,460	1,020	834	778
25	680	1,210	934	1,280	1,600	2,380	1,960	2,080	1,410	1,030	828	732
26	859	1,330	950	1,290	1,600	2,100	1,820	2,140	1,330	1,030	849	734
27	644	1,270	976	1,280	1,570	1,820	1,780	2,020	1,460	984	812	768
28	656	1,190	1,290	1,240	1,750	1,780	1,820	1,840	1,360	1,000	788	768
29	656	1,120	1,980	1,220	-------	1,720	1,890	1,640	1,360	978	814	750
30	631	1,120	3,330	1,120	-------	1,660	1,820	1,760	1,390	960	794	682
31	626	-------	2,960	1,280	-------	1,640	-------	1,760	-------	944	804	-------

NOTE.—See "Accuracy" paragraph. Daily discharge for October to December and July to September, inclusive, corrected for storage.

Monthly discharge of White Salmon River near Underwood, Wash., for the year ending Sept. 30, 1921

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	1,780	626	861	52,900
November	2,430	550	1,020	60,700
December	3,330	870	1,170	71,900
January	3,400	1,120	1,870	115,000
February	3,330	1,240	1,840	102,000
March	4,110	1,510	2,140	132,000
April	2,160	1,300	1,690	101,000
May	2,240	1,540	1,870	115,000
June	2,060	1,330	1,650	98,200
July	1,390	944	1,120	68,900
August	1,110	788	895	55,000
September	850	682	777	46,200
The year	4,110	550	1,410	1,020,000

NOTE.—October to December and July to September, inclusive, corrected for storage.

SANDY RIVER BASIN

SANDY RIVER NEAR MARMOT, OREG.

LOCATION.—In SE. ¼ sec. 24, T. 2 S., R. 5 E., on the Vanderhoof ranch, 2 miles by river above Sandy River dam of Portland Railway, Light & Power Co., 5 miles below mouth of Salmon River, and 1½ miles above Marmot post office, Clackamas County.

DRAINAGE AREA.—267 square miles.

RECORDS AVAILABLE.—August 15, 1911, to December 21, 1915, and July 1, 1919, to September 30, 1921. Combined discharge of Sandy River and canal gives same results for the gap in record.

GAGE.—Stevens 8-day water-stage recorder on right bank; inspected by employees of Portland Railway, Light & Power Co. Gage used 1911 to 1915 referred to different datum.

DISCHARGE MEASUREMENTS.—Made from a cable about a mile below gage.

CHANNEL AND CONTROL.—Bed composed of rocks and gravel, may shift slightly.

EXTREMES OF DISCHARGE.—Maximum stage during year occurred January 2, about 10 a. m., when water-stage recorder was not operating; gage height estimated from observer's gage reading at noon as 13.05 feet (discharge, 15,800 second-feet); minimum stage from water-stage recorder, 3.09 feet September 15 and 16 (discharge, 281 second-feet).

1911–1921: Maximum stage recorded, 15.3 feet at recorder below dam and 39.0 feet at dam December 18, 1917, at 9.30 p. m. (discharge, 22,800 second-feet). Minimum stage recorded, 3.07 feet at 4 p. m. September 29, 1919 (discharge, 274 second-feet).

ICE.—Stage-discharge relation apparently unaffected by ice.

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation apparently permanent during year. Rating curve well defined below 6,000 second-feet. Operation of water-stage recorder satisfactory. Daily discharge obtained by applying to rating table mean daily gage height obtained by inspecting recorder graph, or for days of considerable fluctuation by subdividing days. Records good.

Discharge measurements of Sandy River near Marmot, Oreg., during the year ending Sept. 30, 1921

Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*
Mar. 8	Wendell Dawson	5.35	1,640
13	V. H. Reineking	5.49	1,870
Aug. 9	Wendell Dawson	3.60	492

Daily discharge, in second-feet, of Sandy River near Marmot, Oreg., for the year ending Sept. 30, 1921

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	1,100	766	1,370	4,620	1,060	3,560	1,680	3,070	1,770	1,060	498	396
2	2,070	730	1,370	14,300	1,250	3,180	1,820	2,540	1,720	1,030	473	388
3	3,180	745	1,500	8,480	1,820	2,940	1,590	2,270	2,020	925	485	416
4	2,440	720	1,640	5,340	2,540	2,710	1,460	2,070	1,870	790	464	408
5	1,770	705	1,410	5,520	1,770	2,270	1,330	2,020	1,720	760	456	368
6	1,460	680	1,250	3,830	1,370	1,970	1,210	1,970	1,720	750	472	352
7	1,330	670	1,170	2,820	1,500	1,770	1,170	2,120	1,720	755	507	340
8	1,100	665	1,140	2,320	2,790	1,640	1,170	1,970	1,500	790	516	324
9	995	655	1,140	1,970	6,790	1,540	1,250	2,070	1,370	725	480	313
10	890	615	1,290	1,680	10,200	1,500	1,460	2,540	1,290	700	444	313
11	960	583	1,680	1,500	7,740	1,410	1,640	2,240	1,210	660	424	309
12	1,100	579	1,540	1,640	5,880	1,250	1,720	2,270	1,170	651	432	302
13	1,210	592	1,970	1,770	4,860	1,250	1,770	2,380	1,140	633	448	299
14	2,300	610	1,590	2,170	3,690	1,250	1,540	2,600	1,100	624	485	288
15	2,710	579	1,330	2,490	2,820	1,290	1,370	2,490	1,030	615	480	281
16	2,120	680	1,210	2,070	2,270	6,540	1,290	2,540	995	606	468	281
17	1,680	2,270	1,100	1,820	1,920	8,160	1,370	2,440	960	597	456	285
18	1,460	2,900	1,100	1,640	1,680	5,520	2,120	2,380	1,140	579	472	358
19	1,250	3,000	1,140	1,460	1,540	3,430	2,170	2,490	1,370	575	464	1,140
20	1,140	2,780	1,060	1,290	1,680	2,490	2,270	2,490	1,210	579	444	800
21	1,100	2,170	995	1,170	1,770	2,120	3,760	2,490	1,170	566	448	743
22	1,060	1,970	1,030	1,100	1,540	1,970	6,700	2,440	1,100	561	424	671
23	995	1,770	1,030	1,100	1,870	1,870	4,190	2,380	1,060	561	408	539
24	960	1,500	2,160	1,030	2,220	2,020	3,130	2,490	1,030	575	392	460
25	890	1,540	2,890	960	2,220	2,540	2,800	2,540	925	547	384	480
26	820	2,270	2,170	960	2,120	2,120	2,880	2,380	890	534	384	469
27	766	2,380	2,380	995	2,170	1,870	3,960	1,970	890	516	384	539
28	995	1,970	5,880	1,100	2,820	1,720	6,100	1,770	890	507	392	376
29	995	1,640	6,060	1,030	-------	1,720	5,430	1,720	855	507	392	570
30	890	1,460	9,000	995	-------	1,680	3,840	1,720	1,030	516	384	448
31	820	-------	5,100	960	-------	1,680	-------	1,770	-------	507	384	-------

NOTE.—Water-stage recorder not operating satisfactorily Jan. 2 and 3; discharge computed from gage height graph estimated from observer's daily readings and gage-height graphs of nearby streams.

Monthly discharge of Sandy River near Marmot, Oreg., for the year ending Sept. 30, 1921

[Drainage area, 267 square miles]

Month	Discharge in second-feet				Run-off	
	Maximum	Minimum	Mean	Per square mile	Inches	Acre-feet
October	3,180	820	1,370	5.13	5.91	84,200
November	3,000	579	1,340	5.02	5.60	79,700
December	9,000	995	2,120	7.94	9.15	130,000
January	14,300	960	2,580	9.66	11.14	159,000
February	10,200	1,060	2,930	11.00	11.45	163,000
March	8,160	1,250	2,480	9.29	10.71	152,000
April	6,700	1,170	2,470	9.25	10.32	147,000
May	3,070	1,720	2,280	8.54	9.85	140,000
June	2,020	855	1,260	4.72	5.27	75,000
July	1,060	507	655	2.45	2.82	40,300
August	516	384	443	1.66	1.91	27,200
September	1,140	281	442	1.66	1.85	26,300
The year	14,300	281	1,690	6.33	85.98	1,220,000

ZIGZAG RIVER AT ZIGZAG, OREG.

LOCATION.—In NW. ¼ sec. 11, T. 3 S., R. 7 E., above mouth of Still Creek, half a mile from Rhododendron Inn, Zigzag, Clackamas County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—February 11, 1920, to September 15, 1921, when station was discontinued.

GAGE.—Vertical staff with enameled face on post driven in stream bed and braced; read by Emilio Boitano and Edward F. Peterson.

DISCHARGE MEASUREMENTS.—Made by wading.

CHANNEL AND CONTROL.—Bed composed of boulders and glacial sand; shifting.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period October 1, 1920, to September 15, 1921, 3.30 feet, February 10 (discharge not computed); minimum stage recorded, 0.86 foot August 27–30 (discharge, 86 second-feet).

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

DIVERSIONS.—None.

ACCURACY.—Stage-discharge relation changed frequently during high water. Three rating curves used, poorly defined by one discharge measurement each and form of standard curve for 1920, which was fairly well defined below 280 second-feet; indirect shifting-control method used May 25–28. Staff gage read to hundredths once a day. Daily discharge ascertained by applying daily gage height to rating table. Records fair.

Discharge measurements of Zigzag River at Zigzag, Oreg., during the year ending Sept. 30, 1921

Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*
Mar. 9	Wendell Dawson	1.46	217
Apr. 12	V. H. Reineking	1.70	233
Aug. 10	Wendell Dawson	.97	101

Daily discharge, in second-feet, of Zigzag River at Zigzag, Oreg., for the period Oct. 1, 1920, to Sept. 15, 1921

Day	Oct.	Nov.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	151	119		292	224	232	220	158	112	92
2	275	119		292	215	232	228	150	112	92
3	266	122		284	215	232	234	150	105	92
4	232	119		292	207	232	245	150	105	92
5	183	116		275	199	240	245	150	105	98
6	180	115		275	194	240	245	142	105	105
7	167	111		250	185	249	234	142	105	105
8	161	111		224	183	249	228	142	105	98
9	136	111		224	177	258	220	135	105	98
10	136	108		204	186	302	212	135	98	98
11	148	111		207	194	275	204	135	98	98
12	145	108		193	199	266	196	135	98	98
13	151	108		191	207	266	196	135	105	92
14	249	105	301	183	215	275	188	135	105	92
15	232	105	266	199	215	284	180	135	105	92
16	215	105	250		207	284	180	135	105	
17	173		240		207	266	180	135	105	
18	167		224		224	266	172	135	105	
19	151		216		232	266	172	128	105	
20	151		232		258	266	180	128	98	
21	173		224		266	275	172	128	98	
22	164		191	275	284	284	172	128	98	
23	148		204	249	284	284	165	120	98	
24	148		216	224	266	284	165	120	98	
25	136		216	199	266	285	158	120	92	
26	136		224	188	266	280	150	120	92	
27	133		232	199	275	260	150	120	86	
28	133		266	207	266	235	150	120	86	
29	130			207	266	220	150	112	86	
30	130			215	240	212	158	112	86	
31	122			215		212		112	86	

NOTE.—Daily gage heights available but daily discharge not computed Nov. 17–27 and Jan. 15 to Feb 7 owing to no measurements to define probable changes in stage-discharge relation. Discharge not computed Feb. 8–13 and Mar. 16–21; stages above limits of rating curve. No record Nov. 28 to Jan. 14.

Monthly discharge of Zigzag River at Zigzag, Oreg., for the period Oct. 1, 1920, to Sept. 15, 1921

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	275	122	168	10,300
November 1–16	122	105	112	3,550
April	284	177	227	13,500
May	302	212	258	15,900
June	245	150	192	11,400
July	158	112	132	8,120
August	112	86	99.7	6,130
September 1–15	105	92	96.1	2,860

NOTE.—See footnote to table of daily discharge.

STILL CREEK AT ZIGZAG, OREG.

LOCATION.—In SW. ¼ sec. 2, T. 3 S., R. 7 E., 300 yards above mouth, 100 feet below Still Creek highway bridge on Mount Hood loop road, and half a mile west of Rhododendron Inn, Zigzag, Clackamas County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—February 14, 1920, to September 15, 1921, when station was discontinued.

GAGE.—Vertical staff nailed to alder tree; read by E. F. Peterson.

DISCHARGE MEASUREMENTS.—Made by wading just above gage.

CHANNEL AND CONTROL.—Bed consists of gravel and boulders. Control wide; formed of boulders; not permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded, 5.0 feet March 17 (discharge, not computed); minimum stage recorded, 1.18 feet September 13–15 (discharge, 36 second-feet).

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

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation not permanent; not sufficient measurements to determine definitely the number and time of changes. Rating curve used January 15 to April 28, fairly well defined between 150 and 330 second-feet, not defined above 330 second-feet; rating curve used April 29 to September 15, fairly well defined below and poorly defined above 100 second-feet. Staff gage read to hundredths once a day. Daily discharge ascertained by applying daily gage height to rating table except October 1 to November 27, when rating is uncertain, and February 9–13 and March 16–19, when stage is higher than rating curve is defined. Records good June 15 to September 15, poor prior to June 15.

Discharge measurements of Still Creek at Zigzag, Oreg., during the period Oct. 1, 1920, to Oct. 21, 1921

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
1921		*Feet*	*Sec.-ft.*	1921		*Feet*	*Sec.-ft.*
Mar. 3	V. H. Reineking	1.96	166	Aug. 9	K. N. Phillips	1.25	38
Apr. 12	do	2.19	215	Oct. 21	Wendell Dawson	1.56	57

Daily discharge, in second-feet, of Still Creek at Zigzag, Oreg., for the period Oct. 1, 1920, to Sept. 15, 1921

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1		126	324	174	236	148	57	38	38
2		144	324	174	202	158	52	38	38
3		164	287	174	158	177	52	39	38
4		195	275	164	136	177	52	39	38
5		144	252	154	158	168	52	39	37
6		154	240	135	148	158	48	39	37
7		144	206	117	158	148	45	39	37
8		263	184	126	177	148	45	39	37
9			174	126	190	126	45	39	37
10			154	154	224	126	45	39	37
11			154	174	260	126	45	39	37
12			139	195	236	117	45	39	37
13			135	195	213	91	45	39	36
14		287	126	184	236	84	45	40	36
15	174	140	154	164	272	76	45	40	36
16	164	217		154	248	76	45	39	
17	174	195		164	224	62	45	39	
18	154	174		206	213	62	45	39	
19	144	154		240	213	84	45	39	
20	135	154	263	263	213	84	45	39	
21	117	164	217	312	224	62	45	38	
22	117	144	195	300	236	62	45	38	
23	144	174	174	420	213	62	44	38	
24	126	195	174	324	213	62	44	38	
25	126	195	174	287	213	62	44	37	
26	108	217	174	287	213	62	42	37	
27	108	217	174	300	202	62	42	37	
28	108	263	174	540	158	57	41	37	
29	108		174	335	136	52	40	37	
30	108		164	248	136	62	39	37	
31	108		174		148		39	38	

NOTE.—Daily gage heights available but daily discharge not computed Oct. 1 to Nov. 27 (stage-discharge relation very uncertain after high water of Sept. 25, 1920), Feb. 9–13, and Mar. 16–19 (stage is higher than rating curve is defined by discharge measurements). No record Nov. 28 to Jan. 14.

Monthly discharge of Still Creek at Zigzag, Oreg., for the period Apr. 1 to Sept. 15, 1921

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
April	540	117	226	13,400
May	272	136	200	12,300
June	177	52	100	5,950
July	57	39	45.4	2,790
August	40	37	38.5	2,370
September 1-15	98	36	37.1	1,100

NOTE.—See footnote to table of daily discharge.

SALMON RIVER AT WELCHES, OREG.

LOCATION.—In S. ½ sec. 9, T. 3 S., R. 7 E., just below mouth of Sheeny Creek, 200 feet west of Tawney's Hotel, and three-fourths of a mile southeast of former station at Welches, Clackamas County.

DRAINAGE AREA.—97.6 square miles (from national-forest map).

RECORDS AVAILABLE.—July 26, 1920, to September 30, 1921, when station was discontinued; August 15, 1913, to September 30, 1914, at station three-fourths of a mile farther downstream.

GAGE.—Vertical staff in two sections; read by F. H. Tawney.

DISCHARGE MEASUREMENTS.—Made by wading near gage or from highway bridge one-half mile below.

CHANNEL AND CONTROL.—Bed composed of coarse gravel; one channel at all stages; shifts occasionally; no definite control.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period July 26, 1920, to September 15, 1921, 9.7 feet January 2 (discharge, 5,230 second-feet). Minimum stage recorded, 4.25 feet, September 14 and 15 (discharge, 94 second-feet).

ICE.—None.

DIVERSION.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed during high water, March 16. Rating curves fairly well defined. Staff gage read to hundredths once a day. Daily discharge ascertained by applying daily gage height to rating table. Records fair, except for period March 17 to August 10, when gage was loose.

Discharge measurements of Salmon River at Welches, Oreg., during period July 26, 1920, to Oct. 24, 1921

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
1920		*Feet*	*Sec.-ft.*	1921		*Feet*	*Sec.-ft.*
July 26	R. C. Briggs	4.18	130	Apr. 12	V. H. Reineking	5.55	689
Sept. 25	do	5.88	1,060	Aug. 10	Dawson and Phillips	4.43	134
1921				Oct. 24	Wendell Dawson	4.55	164
Mar. 9	Wendell Dawson	5.27	544				

Daily discharge, in second-feet, of Salmon River at Welches, Oreg., for the period July 26, 1920, to Sept. 30, 1921

Day	July	Aug.	Sept.	Day	July	Aug.	Sept.	Day	July	Aug.	Sept.
1920				1920				1920			
1		122	113	11		113	166	21		104	204
2		122	109	12		113	980	22		104	394
3		122	109	13		109	795	23		104	566
4		117	104	14		109	394	24		104	1,030
5		117	104	15		109	266	25		104	1,230
6		113	99	16		109	204	26	128	104	932
7		113	99	17		104	177	27	128	109	473
8		113	99	18		104	154	28	128	132	347
9		113	104	19		104	143	29	122	219	305
10		113	177	20		104	154	30	122	122	284
								31	117	113	

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1920-21												
1	266	204	444	1,930	326	1,280	613	1,100	688	335	156	109
2	602	204	419	5,230	473	1,130	613	1,050	688	270	150	109
3	1,180	204	444	2,480	566	1,080	576	904	768	335	148	118
4	715	204	534	1,930	755	980	541	857	727	335	148	116
5	419	204	444	1,710	566	795	506	810	650	312	148	116
6	370	190	394	1,280	394	676	474	727	613	290	148	116
7	326	177	347	932	534	602	442	857	576	243	145	109
8	266	177	326	715	932	566	474	857	506	224	145	109
9	266	177	305	676	2,260	534	506	904	506	224	145	105
10	250	177	347	566	2,810	502	576	1,050	442	213	135	105
11	250	166	473	502	2,040	502	688	1,100	414	207	135	101
12	305	166	394	502	2,040	473	727	1,000	414	207	132	101
13	305	177	637	502	2,040	444	768	1,000	386	200	127	101
14	1,030	177	394	715	1,180	419	650	1,150	414	197	127	94
15	795	177	347	932	980	444	541	1,100	414	191	127	94
16	637	419	305	755	755	3,360	541	1,100	414	184	127	
17	473	1,180	266	534	602	2,380	541	1,050	414	184	127	
18	444	1,080	266	473	566	1,940	650	1,050	541	175	127	
19	347	1,080	284	419	502	1,300	810	1,000	442	175	127	
20	305	1,030	266	394	534	1,000	952	1,000	386	170	123	
21	305	637	250	370	502	904	1,940	1,000	360	170	123	
22	305	566	234	347	444	857	2,710	1,050	335	167	118	
23	266	566	234	326	637	810	1,940	952	335	167	118	194
24	250	473	566	305	715	952	1,500	904	312	161	116	
25	234	473	1,030	305	715	1,100	1,150	857	290	161	116	
26	234	676	566	305	637	810	1,100	857	290	161	116	
27	234	884	1,180	305	715	727	1,250	857	290	161	109	
28	250	637	3,140	305	1,030	650	1,400	810	270	161	109	
29	266	502	1,930	305		650	2,160	810	290	161	109	
30	234	473	2,590	305		650	1,300	688	312	161	109	
31	234		1,600	284		613		650		156	109	

NOTE.—Braced figures show estimated mean discharge for periods indicated.

Monthly discharge of Salmon River at Welches, Oreg., for the period July 26, 1920, to Sept. 30, 1921

[Drainage area, 97.6 square miles]

Month	Discharge in second-feet				Run-off	
	Maximum	Minimum	Mean	Per square mile	Inches	Acre-feet
1920						
July 26–31	128	117	124	1.27	0.28	1,470
August	219	104	115	1.18	1.36	7,070
September	1,230	99	344	3.53	3.94	20,500
The period						29,000
1920–21						
October	1,180	234	399	4.09	4.72	24,500
November	1,180	166	449	4.60	5.13	26,700
December	3,140	234	676	6.93	7.99	41,600
January	5,230	284	859	8.80	10.14	52,800
February	2,810	326	938	9.61	10.01	52,100
March	3,360	419	940	9.63	11.10	57,800
April	2,710	442	955	9.78	10.91	56,800
May	1,150	650	939	9.62	11.09	57,700
June	768	270	450	4.61	5.14	26,800
July	335	156	208	2.13	2.46	12,800
August	156	109	129	1.32	1.52	7,930
September		94	150	1.54	1.72	8,920
The year	5,230	94	589	6.03	81.93	426,000

BULL RUN RIVER NEAR BULL RUN, OREG.

LOCATION.—In SE. ¼ sec. 25, T. 1 S., R. 5 E., 1½ miles above intake of Portland water-supply pipe line and 5 miles east of Bull Run, Clackamas County.

DRAINAGE AREA.—102 square miles.

RECORDS AVAILABLE.—August 20, 1907, to September 30, 1921; also readings on a gage of city water department, January 5, 1895, to November 13, 1906.

GAGE.—Friez water-stage recorder referred to vertical staff on left bank; gage datum raised 2.0 feet July 26, 1916. Prior to July 28, 1909, and during gaps in recorder record an inclined staff at headworks 1¼ miles below present gage. Gage inspected by W. B. Wilson.

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

CHANNEL AND CONTROL.—Bed composed of rocks and gravel; shifting in extreme floods.

EXTREMES OF DISCHARGE.—Maximum stage during year from water-stage recorder, 10.7 feet at 9 a. m. January 2 (discharge, 15,000 second-feet); minimum stage from water-stage recorder, 0.35 foot at 5 p. m. September 15 (discharge, 81 second-feet).

1895–1921: Maximum stage recorded, 10.72 feet January 25, 1920 (discharge, 16,000 second-feet); minimum stage recorded, 0.35 foot October 1, 1918 (discharge, 68 second-feet).

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

DIVERSIONS.—None above station. The two water-supply pipes divert practically all the low-water flow 1½ miles below the station.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed during high water January 2; not affected by ice. Rating curves well defined to 10,000 second-feet. Operation of water-stage recorder satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height obtained by inspecting recorder graph, or, in times of considerable fluctuation, by subdividing days. Records excellent.

Discharge measurements of Bull Run River near Bull Run, Oreg., during the year ending Sept. 30, 1921

Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*
Mar. 1	Wendell Dawson	3.75	2,520
Apr. 13	V. H. Reineking	2.01	858
Aug. 8	Dawson and Phillips	.50	114

Daily discharge, in second-feet, of Bull Run River near Bull Run, Oreg., for the year ending Sept. 30, 1921

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	1,000	310	638	3,480	810	2,320	759	1,390	537	481	135	112
2	2,160	298	785	11,400	964	1,750	781	1,100	525	459	132	107
3	2,280	314	890	4,480	1,570	1,520	704	892	652	423	130	143
4	1,450	290	1,110	3,260	1,800	1,260	614	840	584	392	130	122
5	1,000	274	890	3,120	1,220	1,140	548	810	525	350	124	105
6	785	260	750	1,850	956	964	502	781	497	329	122	99
7	820	242	668	1,300	1,060	1,220	481	825	531	308	117	96
8	614	228	620	1,220	2,420	870	470	786	438	274	117	96
9	530	218	715	1,020	7,180	774	519	774	387	266	114	96
10	460	207	960	862	8,080	[a] 729	590	1,390	355	252	114	96
11	602	200	1,540	752	4,480	684	614	1,180	374	237	110	96
12	890	194	1,190	893	4,810	578	745	1,030	350	226	107	94
13	925	221	1,540	1,220	2,920	584	885	1,040	350	219	110	92
14	2,100	224	1,000	1,750	1,950	578	718	1,040	374	206	110	88
15	1,880	224	750	2,050	1,390	570	620	964	374	199	114	88
16	1,320	396	632	1,520	1,060	7,340	578	1,020	342	199	114	85
17	1,110	2,260	536	1,220	900	7,500	620	918	333	193	114	85
18	890	2,580	548	1,020	774	3,690	1,140	918	639	184	143	127
19	701	2,580	596	900	711	2,050	1,300	1,040	759	177	122	531
20	584	2,160	578	752	732	1,480	1,340	1,140	671	168	119	342
21	518	1,360	560	646	948	1,260	3,740	1,050	566	154	114	519
22	460	1,500	548	596	810	1,140	4,910	1,800	497	160	112	333
23	420	1,270	650	560	972	1,100	2,610	1,750	448	162	107	263
24	400	960	1,880	514	1,100	1,480	2,000	1,750	[a] 411	160	105	223
25	364	1,190	2,400	481	1,100	2,000	1,800	885	374	157	99	263
26	332	1,630	1,540	459	1,060	2,380	1,750	1,620	355	151	99	248
27	302	1,450	2,160	491	1,100	1,100	3,120	1,340	342	148	99	240
28	350	1,110	6,480	566	878	948	3,620	1,260	316	146	99	250
29	435	890	5,280	525	-------	878	2,990	[a] 904	316	143	99	213
30	368	722	6,900	525	-------	803	1,800	548	590	137	96	193
31	332	-------	2,780	531	-------	767	-------	548	-------	137	96	-------

[a] Interpolated.

Monthly discharge of Bull Run River near Bull Run, Oreg., 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	2,280	302	851	8.34	9.61	52,300
November	2,580	194	859	8.42	9.39	51,100
December	6,900	536	1,550	15.2	17.52	95,300
January	11,400	459	1,610	15.8	18.22	99,000
February	8,080	711	1,920	18.8	19.58	107,000
March	7,500	570	1,660	16.3	18.79	102,000
April	4,910	470	1,430	14.0	15.62	85,100
May	1,800	548	1,080	10.6	12.22	66,400
June	759	316	460	4.51	5.03	27,400
July	481	137	232	2.27	2.62	14,300
August	143	96	114	1.12	1.29	7,010
September	531	85	182	1.78	1.99	10,800
The year	11,400	85	991	9.72	131.88	718,000

LITTLE SANDY RIVER NEAR BULL RUN, OREG.

LOCATION.—In NE. ¼ sec. 10, T. 2 S., R. 5 E., three-eights mile above Portland Railway Light & Power Co.'s dam and tunnel from Sandy River and between 3 and 4 miles south of Bull Run station, Clackamas County.

DRAINAGE AREA.—23.0 square miles.

RECORDS AVAILABLE.—May 21, 1911, to April 29, 1913, fragmentary; July 1, 1919, to September 30, 1921.

GAGE.—Stevens 8-day water-stage recorder on left bank, with inside and outside staff gages. Original gage, vertical staff three-fourths mile below.

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

CHANNEL AND CONTROL.—Stream bed composed of boulders and gravel; fairly permanent. One channel at all stages.

EXTREMES OF DISCHARGE.—Maximum stage, 7.2 feet at 4 a.m. December 30 estimated from water-stage recorder, which was reset at 11 a.m. (discharge, 2,500 second-feet); minimum stage from water-stage recorder, 2.03 feet August 31 and September 1 (discharge, 16 second-feet).

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

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation practically permanent. Rating curve well defined below 200 second-feet and fairly well defined below 2,000 second-feet. Operation of recorder satisfactory except from December 28 to about February 20 when the float wire was slipping; but during this period the observer reset the pencil two or three times a week and for only short periods when there is considerable fluctuation is the record uncertain. Daily discharge ascertained by applying to rating table mean daily gage height obtained by inspecting recorder graph, or, for days of considerable fluctuation by averaging results obtained by applying to rating table mean gage heights for regular intervals of the day except January 29, when discharge was interpolated, and April 4–9, when mean discharge was estimated. Records good.

Discharge measurements of Little Sandy River near Bull Run, Oreg., during the year ending Sept. 30, 1921

Date	Made by—	Gage height	Discharge
		Feet.	*Sec.-ft.*
Oct. 28	Apperson and Foch	3.12	123
Apr. 11	V. H. Reineking	3.05	119
Aug. 8	Dawson and Phillips	2.10	20

Daily discharge, in second-feet, of Little Sandy River near Bull Run, Oreg., for the year ending Sept. 30, 1921

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	150	69	138	556	115	489	160	311	110	81	22	16
2	366	67	197	1,590	132	370	150	252	101	80	22	18
3	516	74	203	970	304	314	141	206	134	70	22	22
4	268	67	206	690	415	268		191	115	59	22	22
5	170	61	158	690	296	203		200	96	55	22	22
6	136	56	141	489	232	165	120	179	87	50	21	20
7	121	53	127	363	219	168		191	98	46	21	19
8	94	51	121	304	391	162		170	75	44	20	18
9	78	49	130	248	1,980	145		168	67	43	20	18
10	68	47	168	213	1,500	134	96	296	61	40	20	18
11	94	45	235	176	850	123	104	255	58	38	20	17
12	162	46	203	191	881	108	123	210	54	38	20	17
13	200	54	286	200	716	112	127	219	53	36	20	17
14	458	55	200	355	552	127	125	229	57	36	20	17
15	428	56	160	355	390	125	108	203	60	34	24	17
16	268	94	136	311	272	948	96	268	57	32	22	18
17	197	395	117	258	219	1,060	101	232	51	31	21	18
18	150	529	152	197	191	616	242	255	106	30	24	21
19	117	506	158	188	173	386	268	318	102	30	23	187
20	98	394	145	155	194	276	268	322	93	29	21	90
21	93	268	134	136	290	232	661	268	78	29	20	72
22	83	265	143	121	245	213	992	239	68	27	20	58
23	74	216	173	114	268	206	484	226	60	27	20	46
24	68	165	448	110	276	272	340	229	55	27	19	43
25	62	216	552	102	258	407	307	216	51	27	18	40
26	59	329	363	99	245	279	329	170	48	27	18	38
27	55	300	556	94	339	219	759	132	48	26	18	41
28	110	339	1,030	90	366	191	921	119	46	24	18	49
29	102	191	1,250	88	-------	182	690	117	46	24	18	38
30	82	158	1,460	88	-------	165	411	117	94	22	17	33
31	75	-------	767	91	-------	162	-------	119	-------	22	16	-------

NOTE.—Braced figures show estimated mean discharge for periods indicated.

Monthly discharge of Little Sandy River near Bull Run, Oreg., for the year ending Sept. 30, 1921

[Drainage area, 23.0 square miles]

Month	Discharge in second-feet				Run-off	
	Maximum	Minimum	Mean	Per-square mile	Inches	Acre-feet
October	516	55	161	7.00	8.07	9,900
November	529	45	174	7.57	8.45	10,400
December	1,460	117	331	14.4	16.60	20,400
January	1,590	88	311	13.5	15.56	19,100
February	1,980	115	440	19.1	19.89	24,400
March	1,060	108	285	12.4	14.30	17,500
April	992	96	291	12.7	14.17	17,300
May	322	117	214	9.31	10.73	13,200
June	134	46	74.3	3.23	3.60	4,420
July	81	22	38.2	1.66	1.91	2,350
August	24	16	20.3	.883	1.02	1,250
September	187	16	35.7	1.55	1.73	2,120
The year	1,980	16	197	8.57	116.03	142,000

WILLAMETTE RIVER BASIN

WILLAMETTE RIVER AT EUGENE, OREG.

LOCATION.—In SW. ¼ sec. 29, T. 17 S., R. 3 W., at highway bridge at Eugene, Lane County.

DRAINAGE AREA.—2,150 square miles.

RECORDS AVAILABLE.—June 1, 1919, to September 30, 1921. Record at Springfield November 27, 1911, to September 30, 1913.

GAGE.—Vertical staff graduated to tenths, fixed to first pier from left bank of highway bridge; read by Lee Goetschius for the United States Weather Bureau.

DISCHARGE MEASUREMENTS.—Made from highway bridge at Springfield 4 miles by river above gage.

CHANNEL AND CONTROL.—Channel straight with even current. Bed composed of gravel and sand; subject to shift at high stages.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 16.5 feet at 8 p. m. December 30 (discharge, 63,000 second-feet); minimum stage recorded, 1.0 foot September 3 to 18 (discharge, 780 second-feet).

ICE.—Stage-discharge not affected by ice.

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed during high water of December 31. Two well defined rating curves used. Gage read to tenths once a day. Daily discharge ascertained by applying daily gage reading to rating table. Records good.

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

Discharge measurements of Willamette River at Eugene, Oreg., during the year ending Sept. 30, 1921

[Made by K. N. Phillips]

Date	Gage height	Discharge	Date	Gage height	Discharge	Date	Gage height	Discharge
	Feet.	*Sec.-ft.*		*Feet.*	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Oct. 16	5.82	9,490	Mar. 27	5.96	9,250	Sept. 14	1.02	878
Nov. 13	2.75	3,200	May 26	5.2	7,740			
Dec. 29	13.90	47,300	July 16	2.04	1,740			

Daily discharge, in second-feet, of Willamette River at Eugene, Oreg., for the year ending Sept. 30, 1921

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	3,120	3,120	9,330	27,900	7,100	9,060	6,440	9,060	5,010	3,050	1,330	860
2	4,720	3,120	8,060	24,900	7,100	8,800	6,230	8,800	5,210	3,050	1,230	860
3	5,920	2,960	7,610	40,700	9,060	8,290	6,230	8,290	5,810	2,730	1,230	780
4	6,340	2,490	9,900	32,900	13,100	8,540	6,230	7,100	6,230	2,580	1,230	780
5	4,910	2,340	10,500	32,900	13,700	8,540	5,810	6,880	6,020	2,430	1,230	780
6	4,160	2,340	9,060	29,400	11,600	8,540	5,210	6,660	6,020	2,290	1,130	780
7	3,620	2,340	8,060	18,100	9,850	8,040	4,820	6,440	6,230	2,290	1,130	780
8	3,450	2,070	8,060	14,100	10,700	7,100	4,630	6,020	6,020	2,290	1,130	780
9	3,280	2,070	9,060	12,500	19,400	6,660	4,440	5,810	5,610	2,290	1,130	780
10	2,490	2,070	11,700	11,000	29,400	6,230	4,260	5,610	5,010	2,290	1,130	780
11	2,490	1,940	24,500	9,850	26,400	6,020	4,260	6,230	4,820	2,150	1,130	780
12	2,800	1,940	25,000	9,320	18,900	5,610	4,820	6,230	4,820	1,890	1,040	780
13	5,110	3,280	16,300	11,000	14,500	5,610	5,410	6,020	4,440	1,890	1,040	780
14	4,720	2,960	15,900	13,100	16,900	5,410	5,410	6,440	4,440	1,770	1,040	780
15	10,500	2,800	11,700	11,000	13,700	5,410	4,820	6,660	4,260	1,770	1,040	780
16	9,900	3,120	9,610	11,900	11,600	5,210	4,630	6,660	4,080	1,770	1,040	780
17	8,060	5,920	8,800	11,000	10,100	11,000	4,440	7,330	3,900	1,770	1,040	780
18	8,550	26,000	8,300	11,000	9,580	12,500	4,630	9,320	3,720	1,770	1,040	780
19	7,830	19,900	9,330	11,000	9,080	13,700	4,820	8,540	5,210	1,650	1,040	1,040
20	6,550	26,000	8,800	10,400	9,060	11,600	6,440	7,800	5,010	1,540	1,040	2,730
21	5,510	15,500	7,610	9,580	25,400	9,850	9,580	9,320	4,630	1,540	1,040	1,650
22	5,510	11,700	7,830	8,290	16,100	9,580	10,100	8,540	4,440	1,540	1,040	1,330
23	5,310	12,900	7,830	7,800	11,900	9,580	12,500	8,040	4,260	1,540	950	1,430
24	4,530	10,200	9,610	7,100	10,100	10,400	11,300	7,800	4,260	1,430	950	1,330
25	4,340	8,550	20,400	6,880	9,850	10,700	10,100	7,560	3,900	1,430	950	1,230
26	4,160	11,700	17,100	6,440	9,580	10,100	10,400	7,560	3,380	1,430	950	1,230
27	3,620	33,700	14,000	6,020	9,060	9,320	9,850	7,330	3,210	1,430	950	1,130
28	3,450	19,100	14,000	6,440	9,060	6,020	9,580	6,660	3,050	1,330	950	1,040
29	3,450	13,300	43,200	6,230	-------	5,610	10,100	6,020	3,050	1,330	950	1,040
30	3,450	10,500	39,200	7,100	-------	6,880	19,100	5,810	3,050	1,330	860	950
31	3,120	-------	56,500	7,100	-------	6,660	-------	5,010	-------	1,330	860	-------

Monthly discharge of Willamette River at Eugene, Oreg., for the year ending Sept. 30, 1921

[Drainage area, 2,150 square miles]

Month	Discharge in second-feet				Run-off	
	Maximum	Minimum	Mean	Per square mile	Inches	Acre-feet
October	10,500	2,490	5,000	2.33	2.69	307,000
November	33,700	1,940	8,860	4.12	4.60	527,000
December	56,500	7,610	15,100	7.02	8.09	928,000
January	40,700	6,020	14,000	6.51	7.50	861,000
February	29,400	7,100	13,300	6.19	6.45	739,000
March	13,700	5,210	8,270	3.85	4.44	508,000
April	12,500	4,260	6,920	3.22	3.59	412,000
May	9,320	5,010	7,140	3.32	3.83	439,000
June	6,230	3,050	4,640	2.16	2.41	276,000
July	3,050	1,330	1,900	.884	1.02	117,000
August	1,330	860	1,060	.493	.57	65,200
September	2,730	780	1,010	.470	.52	60,100
The year	56,500	780	7,230	3.36	45.71	5,240,000

WILLAMETTE RIVER AT ALBANY, OREG.

LOCATION.—In SW. ¼ sec. 6, T. 11 S., R. 3 W., at end of Broadalbin Street, Albany, Linn County, half a mile above Southern Pacific Railroad bridge, just below mouth of Calapooya River, and 9 miles by river above Santiam River.

DRAINAGE AREA.—4,860 square miles.

RECORDS AVAILABLE.—November 24, 1878, to April 30, 1882; January 21, 1892, to September 30, 1921; some fragmentary records 1883 to 1888.

GAGE.—Vertical staff in two sections on right bank; read by F. M. French for United States Weather Bureau.

DISCHARGE MEASUREMENTS.—Made from Southern Pacific bridge.

CHANNEL AND CONTROL.—Bed composed of sand and fine gravel; control practically permanent. Above gage height 17.0 feet some water flows through a slough several hundred feet to the left of the main channel.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 23.5 feet at 5 p. m. January 1 (discharge, 118,000 second-feet); minimum stage recorded, 0.9 foot August 19 to September 3 and September 10 to 18 (discharge, 3,030 second-feet).

1878–1882 and 1892–1921: Maximum stage recorded, 32.8 feet January 14, 1881 (discharge, 245,000 second-feet); minimum stage recorded, 0.2 foot September 21–27, 1879 (discharge, 1,870 second-feet), but this is somewhat uncertain. Lowest stages recorded in recent years are 0.4 foot October 30 to November 10, 1895 (discharge, 2,220 second-feet), and 0.5 foot August 26 to September 25, 1905, and September 5–14, 1915 (discharge, 2,400 second-feet). The maximum stage ever known was 36.0 feet December 8, 1861 (discharge, estimated from extension of rating curve, 302,000 second-feet).

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

DIVERSIONS.—The Albany power canal has diverted water from South Santiam River near Lebanon and discharged into Willamette River above the gage and measuring section since the early nineties. It ordinarily carries between 200 and 250 second-feet.

REGULATION.—Practically none.

ACCURACY.—Stage-discharge relation slightly changed during winter for low stages. Rating curves well defined. Gage read to tenths once a day. Daily discharge ascertained by applying to rating table the daily gage height. Records good.

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

Discharge measurements of Willamette River at Albany, Oreg., during the year ending Sept. 30, 1921

[Made by K. N. Phillips]

Date	Gage height	Discharge	Date	Gage height	Discharge
	Feet	*Sec.-ft.*		*Feet*	*Sec.-ft.*
Oct. 2	3.91	10,000	Mar. 21	9.56	32,800
23	5.04	14,000	July 16	1.89	5,100
Nov. 6	2.67	7,280	Sept. 12	.93	3,050
Jan. 8	15.10	58,300			

Daily discharge, in second-feet, of Willamette River at Albany, Oreg., for the year ending Sept. 30, 1921

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr	May	June	July	Aug.	Sept.
1	8,490	8,490	30,800	115,000	17,500	22,700	16,000	23,100	12,000	7,480	4,260	3,030
2	9,040	7,950	25,800	97,500	18,700	22,700	14,900	20,700	11,700	7,480	4,260	3,030
3	13,600	7,680	23,600	73,000	19,900	20,700	14,200	19,900	11,700	7,210	4,040	3,030
4	19,900	7,420	22,700	81,000	25,800	20,300	14,200	18,300	11,400	6,940	4,040	3,230
5	18,300	7,160	28,500	95,800	37,500	20,300	13,500	17,100	11,100	6,410	4,040	3,230
6	14,600	7,160	28,500	89,000	38,300	20,300	13,200	16,000	12,300	6,150	3,830	3,230
7	12,400	6,900	24,900	85,200	33,400	19,500	12,000	15,200	12,300	6,150	3,830	3,230
8	11,600	6,900	21,900	63,000	29,800	17,100	11,400	14,200	12,600	5,900	3,830	3,230
9	10,400	6,900	22,700	47,800	33,000	16,000	10,800	13,500	12,300	5,900	3,630	3,230
10	9,320	6,650	24,400	39,800	46,500	14,600	10,800	12,900	11,400	5,650	3,630	3,030
11	8,760	6,400	36,200	33,000	61,500	13,800	10,500	12,900	10,500	5,650	3,430	3,030
12	8,490	6,150	54,500	28,500	66,800	13,200	10,200	14,200	9,960	5,410	3,430	3,030
13	9,600	6,900	63,000	27,600	56,500	12,600	11,100	13,800	9,960	5,410	3,430	3,030
14	12,100	7,420	52,000	33,000	50,100	12,600	12,000	13,200	9,680	5,410	3,430	3,030
15	13,000	7,420	44,700	34,800	47,800	13,500	11,700	13,800	9,680	5,170	3,430	3,030
16	22,700	7,680	34,800	35,700	41,600	14,600	11,100	14,600	9,680	5,170	3,230	3,030
17	22,300	8,760	28,000	37,500	34,800	29,400	10,500	14,900	9,120	5,170	3,230	3,030
18	20,700	19,900	24,400	35,700	29,000	39,300	10,200	16,000	8,840	4,940	3,230	3,030
19	21,500	44,200	23,600	34,800	25,400	43,800	10,500	17,500	8,840	4,940	3,030	3,630
20	20,700	52,500	24,400	33,000	23,600	40,600	11,100	16,000	10,800	4,940	3,030	4,480
21	17,500	59,000	22,300	29,400	33,400	33,900	15,200	16,000	10,200	4,940	3,030	5,900
22	15,200	47,400	20,700	25,400	50,600	28,500	19,900	17,900	9,680	4,710	3,030	4,710
23	14,200	38,000	20,300	22,300	43,800	26,700	25,800	16,700	9,400	4,710	3,030	4,480
24	13,000	35,200	29,300	20,300	33,900	25,800	29,800	16,000	9,120	4,480	3,030	4,260
25	12,100	29,400	30,300	19,100	29,000	26,700	25,800	15,600	8,840	4,480	3,030	4,040
26	11,600	24,900	42,000	17,900	25,800	26,700	23,100	14,900	8,560	4,480	3,030	3,830
27	11,000	35,700	40,600	16,300	23,600	25,400	24,000	14,900	8,020	4,480	3,030	3,830
28	10,200	56,000	38,000	15,200	22,300	22,300	21,900	14,900	7,750	4,480	3,030	3,630
29	9,600	51,000	43,400	16,000	-------	20,300	22,700	14,200	7,480	4,480	3,030	3,630
30	9,600	38,800	68,000	16,700	-------	18,300	24,900	12,600	7,480	4,260	3,030	3,430
31	9,040	-------	89,000	17,900	-------	16,700	-------	12,000	-------	4,260	3,030	-------

Monthly discharge of Willamette River at Albany, Oreg., for the year ending Sept. 30, 1921

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	22,700	8,490	13,600	836,000
November	59,000	6,150	21,900	1,300,000
December	89,000	20,300	34,700	2,130,000
January	115,000	15,200	43,100	2,650,000
February	66,800	17,500	35,700	1,980,000
March	43,800	12,600	22,500	1,380,000
April	29,800	10,200	15,800	940,000
May	23,100	12,000	15,600	959,000
June	12,600	7,480	10,100	601,000
July	7,480	4,260	5,390	331,000
August	4,260	3,030	3,410	210,000
September	5,900	3,030	3,520	209,000
The year	115,000	3,030	18,700	13,500,000

McKENZIE RIVER AT McKENZIE BRIDGE, OREG.

LOCATION.—In sec. 14, T. 16 S., R. 6 E., at highway bridge at McKenzie Bridge, Lane County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—August 8, 1910, to September 30, 1916; April 1, 1917, to September 30, 1921.

GAGE.—Vertical staff attached to right abutment of the highway bridge at McKenzie Bridge, installed March 12, 1918, at datum different from that of previous gage which washed out; read by S. L. Taylor. A gage at Hayes ranch, half a mile above McKenzie Bridge, and another gage on left bank at Paradise ranger station, about 2 miles above bridge, were formerly used.

DISCHARGE MEASUREMENTS.—Made from cable three-eighths mile above ranger station.

CHANNEL AND CONTROL.—Bed rocky; practically permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 5.2 feet December 30 (discharge, 8,600 second-feet); minimum stage recorded, 0.70 foot September 29 and 30 (discharge, 1,320 second-feet).

1910–1921: Maximum stage recorded, that of December 30, 1920; minimum discharge recorded, 924 second-feet November 7, 1915.

ICE.—Stage-discharge relation unaffected by ice.

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined to 3,000 second-feet. Gage read to hundredths once a day; records only fair due to gaps. Discharge ascertained by applying to rating table the daily gage heights and interpolating for periods of missing gage heights. Records fair.

Discharge measurements of McKenzie River at McKenzie Bridge, Oreg., during the year ending Sept. 30, 1921

[Made by K. N. Phillips]

Date	Gage height	Discharge
	Feet	*Sec.-ft.*
May 24	2.04	2,570
25	2.12	2,700
Sept. 15	.70	1,350

Daily discharge, in second-feet, of McKenzie River at McKenzie Bridge, Oreg., for the year ending Sept. 30, 1921

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	[a]1,850	1,460	2,210	2,800	1,810	2,210		2,670		1,900	1,540	
2	2,320	[a]1,460	2,100	5,300	1,810	2,210	2,220	2,670		1,900	1,540	
3	2,670	1,460	2,320	6,550	1,900	2,320		2,430	2,490	1,900	1,540	
4	2,100	1,460	2,430	4,720	2,000	2,320	2,000	2,430			1,540	1,390
5	1,810	1,390	[a]2,260	4,560		2,320	2,000	2,430	2,550		1,540	
6		[a]1,390	2,100	3,780	3,040	2,210	2,000	2,430	2,550	1,810		
7	1,720	1,390	2,100	3,480		2,210	1,900	2,320	2,550			
8		1,390	2,000	3,060		2,100	1,900	[a]2,260	[a]2,490		1,540	1,390
9	1,630	1,320	2,100	2,800	4,080	2,100	1,900	2,210	2,430			1,390
10	[a]1,580		2,000	2,670	4,240	2,000	1,900	2,320	[a]2,350	1,720	1,540	
11	1,540		2,210	2,550	[a]3,790	2,000	1,900	2,430	[a]2,280		1,540	1,360
12	1,630		2,000	2,550	3,340	1,900	1,900	[a]2,430	2,210		1,540	
13	1,630		2,000	2,430	3,060	1,900	2,000	2,430	2,210		1,540	1,320
14	1,720		2,000	2,430	2,930	1,900	2,000	2,550		1,680	1,540	
15	2,100	2,120	1,900	2,550	2,800	1,900	1,900	2,550			[a]1,500	
16	[a]2,000		1,810	2,550	2,550	2,430	1,900	2,670	2,210		1,460	1,430
17	1,900		1,810	2,430	2,430	3,200	1,900	2,670		1,630		
18	1,900		1,810	2,320	2,320	3,780	1,900	2,550		1,630		
19	1,810		1,810	2,210	2,320	3,060	2,000	2,550		1,630		1,540
20	1,720	2,930	1,720	2,210	2,210	2,800	[b]2,530	[a]2,550	2,210	[a]1,630	1,460	[a]1,490
21	1,810	2,670	1,720	2,100	2,430	2,670	[b]2,530	2,550	2,100	1,630		[a]1,440
22	1,810	2,550	1,720	2,000	2,210	2,550	3,060	2,550	2,100	[a]1,630		1,390
23	1,630	2,320	[a]1,810	1,900	2,210	2,550	2,930	2,550	2,100	1,630		1,390
24	1,630	2,210	1,900	1,900	2,100	2,550	2,670	2,550	2,100		1,460	
25	1,630	2,210	2,000	1,900	2,100	2,550	2,430	[a]2,590	2,100		1,460	
26	1,630	2,930		1,810	2,100	2,550	2,430	[a]2,630	2,000	1,580	[a]1,440	1,360
27	1,630	3,340	4,050	1,810	2,100	2,430	2,430	2,670	2,000		[a]1,410	
28	1,630	2,930		1,810	2,210		2,800	2,430	2,000		1,390	
29	1,540	2,670	6,100	1,810		2,220	3,060	2,430	2,000		1,390	1,320
30	1,540	2,430	8,600	1,810			2,930	2,430	1,900	1,540	[a]1,390	1,320
31	1,540		4,240	1,810				2,430		[a]1,540	[a]1,390	

[a] Interpolated. [b] Estimated.

NOTE.—Braced figures show estimated mean discharge for periods indicated.

Monthly discharge of McKenzie River at McKenzie Bridge, Oreg., for the year ending Sept. 30, 1921

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	2,670	1,540	1,780	109,000
November	3,340	1,320	2,100	125,000
December	8,600	1,720	2,610	160,000
January	6,550	1,810	2,730	168,000
February	4,240	1,810	2,610	145,000
March	3,780	1,900	2,370	146,000
April	3,060	1,900	2,250	134,000
May	2,670	2,210	2,500	154,000
June	2,550	1,900	2,250	134,000
July	1,900	1,540	1,640	101,000
August	1,540	1,390	1,490	91,600
September	1,540	1,320	1,390	82,700
The year	8,600	1,320	2,140	1,550,000

LONG TOM RIVER NEAR MONROE, OREG.

LOCATION.—In sec. 21, T. 14 S., R. 5 W., at highway bridge 1½ miles north of Monroe, Benton County.

DRAINAGE AREA.—400 square miles.

RECORDS AVAILABLE.—November 13, 1920, to July 31, 1921, when station was discontinued.

GAGE.—Vertical staff on right abutment of bridge; read by William V. Pfouts.

DISCHARGE MEASUREMENTS.—Made from bridge or by wading.

CHANNEL AND CONTROL.—Bed composed of silt and gravel; banks low and wooded. Control 400 feet below gage; fairly permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period, November 13, 1920, to July 31, 1921, 11.1 feet (from high-water mark), December 12 (discharge, 6,900 second-feet); minimum stage recorded, 0.26 foot, at time of measurement, September 14 (discharge, 23 second-feet).

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

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent during period. Rating curve well defined below 5,000 second-feet. Gage read to half-tenths once a day and in times of considerable fluctuation twice a day. Discharge ascertained by applying to rating table mean daily gage height. Records good.

Discharge measurements of Long Tom River near Monroe, Oreg., during the year ending Sept. 30, 1921

[Made by K. N. Phillips]

Date	Gage height	Discharge	Date	Gage height	Discharge	Date	Gage height	Discharge
	Feet	*Sec.-ft.*		*Feet*	*Sec.-ft.*		*Feet*	*Sec.-ft.*
Nov. 13	1.52	307	Jan. 22	6.29	1,930	Mar. 22	5.24	1,480
22	9.68	4,440	Feb. 12	7.82	2,690	July 5	.54	63
Dec. 18	6.78	2,030	22	9.33	3,940	Sept. 14	.26	20.6
21	6.33	1,930	Mar. 11	2.26	498			

Daily discharge, in second-feet, of Long Tom River near Monroe, Oreg., for the period Nov. 13, 1920, to July 31, 1921

Day	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July
1		2,210	5,320	1,250	1,160	620	470	120	78
2		1,880	4,700	1,440	1,160	590	470	120	78
3		1,720	4,320	1,760	1,040	560	740	120	73
4		1,880	4,320	2,310	920	500	800	110	70
5		1,920	4,840	3,100	800	440	740	110	64
6		2,370	5,320	3,340	740	410	680	110	63
7		2,260	5,320	3,100	680	380	560	110	61
8		2,370	4,320	2,670	620	380	470	100	56
9		2,490	4,320	2,800	590	350	410	100	54
10		2,370	3,260	2,940	560	320	380	91	53
11		4,080	2,670	2,940	530	320	290	91	52
12		6,500	2,260	2,670	500	320	276	91	50
13	290	6,000	2,430	2,670	530	320	261	91	48
14	142	5,000	2,310	3,100	560	350	246	91	47
15	142	3,740	3,100	3,180	560	320	232	91	46
16	218	3,180	3,100	2,800	830	320	232	91	46
17	110	2,670	3,440	2,210	1,880	320	232	91	46
18	290	2,110	3,100	1,760	2,370	300	218	91	46
19	3,100	1,960	2,940	1,600	2,550	350	218	91	46
20	5,160	2,060	2,670	2,110	2,310	380	218	91	46
21	4,860	1,920	2,260	3,180	1,760	440	204	91	46
22	4,560	1,640	1,920	3,960	1,440	590	204	91	46
23	3,840	1,480	1,560	3,540	1,250	500	204	91	46
24	3,640	1,680	1,440	2,800	1,250	500	191	91	41
25	3,260	2,110	1,280	2,060	1,190	560	178	89	41
26	2,870	2,670	1,160	1,520	1,130	590	166	87	41
27	3,260	2,870	1,100	1,280	1,010	560	153	86	41
28	4,440	2,870	1,070	1,190	920	500	131	84	40
29	3,640	3,100	1,070		860	500	131	82	38
30	3,020	4,200	1,160		740	470	131	80	38
31		4,840	1,280		680		131		38

NOTE.—Discharge, Nov. 21, interpolated; Dec. 12 and 13 estimated by use of crest stage determined from high-water marks and by comparison with records for near-by streams; July 31 estimated.

Monthly discharge of Long Tom River near Monroe, Oreg., for the period Nov. 13, 1920, to July 31, 1921

[Drainage area, 400 square miles]

Month	Discharge in second-feet				Run-off	
	Maximum	Minimum	Mean	Per square mile	Inches	Acre-feet
November 13-30	5,160	110	2,600	6.50	4.34	92,900
December	6,500	1,480	2,840	7.10	8.19	175,000
January	5,320	1,070	2,880	7.20	8.30	177,000
February	3,960	1,190	2,470	6.18	6.44	137,000
March	2,550	500	1,070	2.68	3.09	65,800
April	620	300	435	1.09	1.22	25,900
May	800	131	322	.805	.93	19,800
June	120	80	95.8	.240	.27	5,700
July	78	38	50.9	.127	.15	3,130
The period						702,000

MUDDY CREEK NEAR CORVALLIS, OREG.

LOCATION.—In SW. ¼ sec. 29, T. 12 S., R. 5 W., at highway bridge 1½ miles east of Independence School and 3 miles south of Corvallis, Benton County.

DRAINAGE AREA.—120 square miles (from national-forest maps).

RECORDS AVAILABLE.—October 30, 1920, to June 30, 1921.

GAGE.—Vertical staff nailed to pile of bridge.

DISCHARGE MEASUREMENTS.—Made from bridge or by wading.

CHANNEL AND CONTROL.—Deep and narrow, very crooked, overflows banks at about 10-foot stage below, but not at, gage. Control not definite but apparently permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of record, 15.5 feet November 19, 1920, and at 11.45 a. m. December 12, 1920 (discharge, 2,100 second-feet); minimum stage recorded, −0.10 foot, July 5, 1921, at time of measurement (discharge, 25 second-feet).

ACCURACY.—Stage-discharge relation practically permanent. Rating curve fairly well defined below 2,000 second-feet. Gage read to half-tenths once a day and twice a day during time of considerable fluctuation and high water. Daily discharge ascertained by applying mean daily gage height to rating table. Records good.

Discharge measurements of Muddy Creek near Corvallis, Oreg., during the year ending Sept. 30, 1921

[Made by K. N. Phillips]

Date	Gage height	Discharge	Date	Gage height	Discharge	Date	Gage height	Discharge
	Feet	*Sec.-ft.*		*Feet*	*Sec.-ft.*		*Feet*	*Sec.-ft.*
Oct. 30	1.57	41.0	Dec. 21	8.78	466	Mar. 22	9.94	538
Nov. 22	13.40	1,060	Feb. 7	12.47	800	July 5	−.10	25
Dec. 18	10.20	524	Mar. 11	3.46	138			

Daily discharge, in second-feet, of Muddy Creek near Corvallis, Oreg., for the period Oct. 30, 1920, to June 30, 1921

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1		64	492	1,230	518	326	219	135	46
2		61	452	1,230	554	290	204	174	43
3		58	518	1,230	616	249	189	219	43
4		60	554	1,270	986	229	164	199	43
5		62	536	1,980	1,170	209	155	189	43
6		62	545	1,920	1,040	189	143	164	43
7		60	509	1,470	844	159	135	139	40
8		60	476	1,230	732	147	131	127	40
9		58	468	1,130	986	143	127	115	40
10		55	664	886	986	141	123	107	40
11		49	1,470	676	886	139	111	103	37
12		62	1,920	664	676	139	107	99	34
13		88	1,420	718	844	143	123	91	31
14		123	1,270	808	864	184	119	88	31
15		147	1,070	776	776	169	111	85	31
16		139	844	844	628	574	103	79	31
17		234	664	844	518	1,230	103	82	31
18		484	545	844	436	1,420	119	79	31
19		2,100	509	746	429	1,200	123	79	31
20		1,470	484	664	718	934	107	76	31
21		1,300	429	594	1,100	664	119	73	31
22		1,100	387	476	1,170	518	131	70	31
23		934	356	460	826	444	155	67	31
24		808	536	401	616	509	174	64	31
25		746	844	374	460	518	169	61	
26		664	1,170	332	408	484	189	58	
27		886	1,040	344	338	387	179	55	28
28		1,070	886	362	344	356	164	52	
29		652	1,040	374		320	135	52	
30	72	536	1,230	436		274	123	49	
31	67		1,300	468		244		46	

NOTE.—Braced figures show estimated mean discharge for periods indicated. March 10, interpolated.

Monthly discharge of Muddy Creek near Corvallis, Oreg., for the period Nov. 1, 1920, to June 30, 1921

[Drainage area, 120 square miles]

Month	Discharge in second-feet				Run-off	
	Maximum	Minimum	Mean	Per square mile	Inches	Acre-feet
November	2,100	49	473	3.94	4.40	28,100
December	1,920	356	794	6.62	7.63	48,800
January	1,980	332	832	6.93	7.99	51,200
February	1,170	338	731	6.09	6.34	40,600
March	1,420	139	417	3.48	4.01	25,600
April	219	103	142	1.18	1.32	8,450
May	219	46	99.2	.827	.95	6,100
June	46		34.4	.287	.32	2,050
The period						211,000

CALAPOOYA RIVER NEAR TANGENT, OREG.

LOCATION.—In sec. 32, T. 12 S., R. 3 W., at highway bridge 1 mile southeast of bridge on Pacific Highway and 4 miles southeast of Tangent, Linn County.

DRAINAGE AREA.—262 square miles (from national-forest map).

RECORDS AVAILABLE.—November 27, 1920, to September 30, 1921.

GAGE.—Chain gage on downstream side of highway bridge near center; read by Miss Alvadia Suiker.

DISCHARGE MEASUREMENTS.—Made from downstream side of bridge or by wading.

CHANNEL AND CONTROL.—Channel narrow; fairly straight near gage; overflows at stage of about 16 feet; banks wooded. Low-water control hard-pan 300 feet below gage; fairly permanent; no definite control at high water.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period November 27, 1920, to September 30, 1921, 19.4 feet December 31 (discharge, 4,740 second-feet); minimum stage recorded, 1.00 foot August 26 and September 18 (discharge, 3 second-feet).

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

DIVERSIONS.—None.

REGULATION.—Small pondage at Thompson flouring mills several miles above causes considerable fluctuation at low stages.

ACCURACY.—Stage-discharge relation practically permanent during period. Rating curve well defined below 5,000 second-feet. Gage read to half-tenths once and in times of considerable fluctuation twice a day. Discharge ascertained by applying to rating table mean daily gage height. Records good.

Discharge measurements of Calapooya River near Tangent, Oreg., during the period Nov. 27, 1920, to Sept. 30, 1921

[Made by K. N. Phillips]

Date	Gage height	Discharge	Date	Gage height	Discharge	Date	Gage height	Discharge
	Feet	*Sec.-ft.*		*Feet*	*Sec.-ft.*		*Feet*	*Sec.-ft.*
Nov. 27	17.80	3,690	Feb. 26	8.90	1,030	July 5	2.26	93
Dec. 11	19.00	4,360	Mar 5	6.67	616	Sept. 12	1.36	10.8
20	9.73	1,120	19	15.71	2,300			
Feb. 19	9.71	1,200	Apr. 17	3.85	290			

Daily discharge, in second-feet, of Calapooya River near Tangent, Oreg., for the period Nov. 27, 1920, to Sept. 30, 1921

Day	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1		1,040	3,400	894	1,040	528	800	221	121	25	25
2		1,050	3,040	958	862	502	712	209	116	25	35
3		990	4,010	1,440	740	476	645	198	116	25	45
4		1,590	4,010	1,980	684	450	580	198	110	35	45
5		1,490	4,450	2,250	632	425	554	198	104	35	35
6		1,090	4,010	1,730	554	401	528	187	104	35	25
7		990	2,920	1,510	489	377	502	187	88	45	15
8		1,120	1,860	1,710	489	353	489	187	77	55	25
9		1,150	1,630	2,280	425	329	476	132	66	55	35
10		1,840	1,670	3,850	401	329	463	132	66	55	15
11		4,360	1,710	3,850	377	329	450	132	66	45	4
12		4,180	1,740	3,340	377	329	437	132	66	45	12
13		2,710	1,800	3,160	425	389	401	138	55	25	20
14		1,920	1,610	3,400	476	425	401	138	55	15	25
15		1,520	1,630	2,250	541	329	401	154	55	35	15
16		1,220	2,280	1,740	1,510	305	401	154	45	55	8
17		1,020	1,800	1,390	2,560	281	401	154	45	77	5
18		1,050	1,900	1,170	2,510	305	401	165	45	55	3
19		1,670	1,710	1,100	2,390	329	377	187	45	45	121
20		1,070	1,470	1,840	1,630	815	425	187	35	35	209
21		862	1,050	3,690	1,430	926	463	187	45	35	154
22		958	958	1,950	1,320	1,290	425	187	55	35	110
23		800		1,540	1,120	1,400	401	126	45	20	99
24		1,540		1,240	1,220	1,130	365	126	45	8	77
25		2,510		1,100	1,180	878	353	121	35	5	45
26		2,100	684	974	1,050	878	329	121	35	3	77
27	3,400	1,950		846	958	785	305	121	35	15	121
28	2,510	2,430		958	770	862	281	121	35	25	165
29	1,630	4,540			698	894	257	121	35	45	55
30	1,250	4,360	958		632	862	245	121	25	45	35
31		4,640	894		580		221		15	35	

NOTE.—Braced figures show estimated mean discharge for periods indicated. Discharge interpolated Jan. 10–12.

Monthly discharge of Calapooya River near Tangent, Oreg., for the period Dec. 1, 1920, to Sept. 30, 1921

[Drainage area, 262 square miles]

Month	Discharge in second-feet				Run-off	
	Maximum	Minimum	Mean	Per square mile	Inches	Acre-feet
December	4,640	800	1,930	7.37	8.51	119,000
January	4,450		1,850	7.06	8.15	114,000
February	3,850	846	1,930	7.37	7.65	107,000
March	2,560	377	970	3.70	4.26	59,600
April	1,400	281	597	2.28	2.54	35,500
May	800	221	435	1.66	1.91	26,700
June	221	121	158	.603	.67	9,400
July	121	15	60.8	.232	.27	3,740
August	77	3	35.0	.134	.15	2,150
September	209	3	55.3	.211	.24	3,290
The period						480,000

OAK CREEK NEAR ALBANY, OREG.

LOCATION.—In sec. 34, T. 11 S., R. 3 W., at highway bridge 1 mile south of Fry station on Lebanon branch of Southern Pacific Railroad and 5 miles southeast of Albany, Linn County.

DRAINAGE AREA.—39 square miles (from national-forest map).

RECORDS AVAILABLE.—November 1, 1920, to May 31, 1921.

GAGE.—Enameled vertical staff fixed to downstream side of right abutment of highway bridge; read by Jesse Roth.

DISCHARGE MEASUREMENTS.—Made from bridge or by wading.

CHANNEL AND CONTROL.—Straight with high clean banks above; crooked and wooded below. Bed composed of gravel and hardpan; subject to shift at high stages. Two channels above stage of about 1.0 foot.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period November 1, 1920, to May 31, 1921, 5.70 feet at 8. a. m. November 19 (discharge, 767 second-feet); minimum stage, 0.37 foot November 11 (discharge, 3 second-feet).

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

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed during high water February 20. Rating curve for first period fairly well defined; for second period, well defined. Discharge ascertained by applying daily gage height to rating table. Records good.

Discharge measurements of Oak Creek near Albany, Oreg., during the year ending Sept. 30, 1921

[Made by K. N. Phillips]

Date	Gage height	Discharge	Date	Gage height	Discharge	Date	Gage height	Discharge
	Feet	*Sec.-ft.*		*Feet.*	*Sec.-ft.*		*Feet.*	*Sec.-ft.*
Nov. 7	0.61	11.3	Dec. 20	1.74	88	Mar. 19	2.31	161
26	4.11	453	Jan. 14	1.91	96			

Daily discharge, in second-feet, of Oak Creek near Albany, Oreg., for the period Nov. 1, 1920, to May 31, 1921

Day	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May
1		74	147	104	115	17	28
2		116	358	74	94	15	35
3		99	304	54	36	22	54
4	10	78	287	244	30	15	36
5		88	647	340	25	12	33
6		99	358	174	20	10	30
7	9	236	278	147	20	8	22
8	6	88	134	174	18	7	18
9	5	110	110	340	16	4	15
10	4	433	88	174	17	4	16
11	3	627	69	122	20	4	19
12	7	433	110	433	17	4	16
13	36	395	220	304	30	30	11
14	27	140	182	395	110	17	
15	22	228	147	236	36	12	
16	60	83	322	134	548	8	
17	99	68	304	94	377	8	
18	340	99	220	67	377	6	
19	707	220	174	69	270	10	
20	358	88	147	490	115	69	
21	212	83	88	287	115	52	
22	128	99	69	115	132	75	8
23	94	88	61	89	66	54	
24	69	358	69	80	126	66	
25	72	204	61	62	84	52	
26	253	236	50	49	54	54	
27	358	228	46	42	46	36	
28	134	471	110	104	40	33	
29	88	587	134		28	28	
30	69	395	122		22	24	
31		376	110		19		

NOTE.—Braced figures show estimated mean discharge for periods indicated.

Monthly discharge of Oak Creek near Albany, for the period Nov. 1, 1920, to May 31, 1921

[Drainage area 39 square miles]

Month	Discharge in second-feet				Run-off	
	Maximum	Minimum	Mean	Per sqnare mile	Inches	Acre-feet
November	707	3	107	2.77	3.09	6,370
December	627	68	223	5.72	6.58	13,700
January	647	46	178	4.56	5.24	10,900
February	490	42	178	4.56	4.75	9,890
March	548	16	97.5	2.50	2.89	6,000
April	84	4	26.2	.672	.75	1,560
May	54		15.4	.395	.46	947
The period						49,400

CLACKAMAS RIVER AT BIG BOTTOM, OREG.

LOCATION.—In SE. ¼ sec. 26, T. 6 S., R. 7 E., one-half mile above proposed dam site, just below Pot Creek, 10 miles above mouth of Oak Grove Fork of Clackamas River, and 26 miles southeast of Cazadero, Clackamas County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—April 11, 1920, to September 30, 1921.

GAGE.—Stevens continuous water-stage recorder on right bank referenced to an outside gage; inspected by employees of Portland Railway, Light & Power Co.

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

CHANNEL AND CONTROL.—Bed composed of boulders; control fairly permanent. One channel at all stages.

EXTREMES OF DISCHARGE.—Maximum stage during period, April 11 to September 30, 1920, from water-stage recorder, 2.91 feet at 10 a. m. May 9 (discharge, 890 second-feet); minimum stage, 1.85 feet, July 26 to August 4 and August 13 and 14 (discharge, 280 second-feet).

Maximum stage during year ending September 30, 1921, from water-stage recorder, 6.2 feet at 1 a. m. January 3 (discharge, 3,760 second-feet); minimum stage from recorder 1.50 feet September 6–8 (discharge, 280 second-feet).

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

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation practically permanent, except as affected by logs July 26 to November 18, 1920. Rating curve for unobstructed channel conditions well defined by measurements made during 1921. Two poorly defined curves, based on one meter measurement and changes in stage-discharge relation as indicated by sudden jump in recorder graph, used for period of log obstruction July 26 to November 18. Operation of water-stage recorder satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height determined by inspecting recorder graph. Records good except from about September 1 to November 18, for which period they are poor.

Discharge measurements of Clackamas Creek at Big Bottom, Oreg., during the period Apr. 11, 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.*
Sept. 30	A. L. Apperson [a]	2.06	354	Mar. 18	Nicholson and Bannister	4.60	2,010
Dec. 15	Sharp [a] and Bannister	2.26	567	Apr. 15	do	2.34	642
1921				May 11	Sharp and Bannister	3.00	920
Jan. 11	Nicholson and Bannister [a]	2.70	844	Aug. 5	do	1.60	298
18	do	2.42	643	21	Sharp and Nicholson	1.55	295
Feb. 16	do	2.90	974	Sept. 9	G. H. Canfield	1.53	297

[a] Engineer, Portland Railway, Light & Power Co.

Daily discharge, in second-feet, of Clackamas River at Big Bottom, Oreg., for the period Apr. 11, 1920, to Sept. 30, 1921

Day	Apr.	May	June	July	Aug.	Sept.	Day	Apr.	May	June	July	Aug.	Sept.
1920							1920						
1	------	640	478	317	280	292	16	715	690	461	304	282	350
2	------	640	470	310	280	282	17	690	790	457	301	282	338
3	------	595	470	307	280	290	18	640	765	433	295	284	332
4	------	595	478	304	280	290	19	640	715	413	292	282	330
5	------	595	474	301	284	292	20	640	690	397	292	282	332
6	------	618	470	295	284	292	21	618	690	409	295	284	348
7	------	665	595	292	284	292	22	595	640	377	295	282	458
8	------	740	640	289	284	295	23	572	618	365	304	282	580
9	------	840	542	289	282	305	24	550	595	361	289	284	555
10	------	815	505	283	282	325	25	550	572	361	286	284	595
11	690	765	501	283	282	318	26	572	546	353	280	284	509
12	690	740	478	310	282	440	27	595	546	342	280	298	435
13	790	740	470	338	280	455	28	640	542	338	280	320	395
14	790	715	518	320	280	500	29	640	530	345	280	335	375
15	740	690	501	314	282	380	30	690	506	320	280	305	359
							31	------	492	------	280	295	------

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1920-21												
1	443	355	790	1,560	457	665	690	891	915	433	310	283
2	938	351	790	2,730	449	690	715	840	915	425	310	286
3	1,170	339	740	3,060	501	715	690	790	1,040	417	310	295
4	772	339	765	2,060	526	765	665	765	1,040	405	310	286
5	620	328	690	2,100	492	740	640	740	990	393	310	283
6	555	321	665	1,520	465	715	618	765	965	385	310	280
7	536	318	640	1,270	470	690	595	765	965	385	304	280
8	491	314	618	1,100	538	640	572	765	890	373	298	280
9	455	304	618	965	865	618	572	765	815	369	295	286
10	435	300	665	840	1,130	618	595	915	790	369	295	289
11	468	293	715	790	1,210	618	618	965	740	365	295	286
12	509	293	640	765	1,240	595	665	915	715	357	295	286
13	486	304	665	715	1,300	572	715	915	690	361	295	286
14	565	304	595	740	1,160	572	665	990	640	357	295	283
15	695	304	572	765	1,020	550	640	1,040	640	353	295	283
16	595	371	550	740	890	1,210	595	1,070	595	353	295	283
17	570	1,050	542	690	815	2,250	618	1,040	572	349	295	280
18	545	1,530	534	640	740	2,200	665	990	572	345	295	334
19	500	1,800	526	618	715	1,480	715	965	572	345	295	518
20	482	1,480	510	572	690	1,210	765	1,020	550	345	295	372
21	468	1,160	496	550	618	1,100	865	1,040	542	345	295	345
22	451	1,070	492	510	618	1,020	1,180	1,040	534	345	295	342
23	431	965	492	510	595	965	1,100	1,040	518	345	295	320
24	423	840	618	501	572	965	940	1,070	501	338	295	307
25	415	865	618	488	572	965	865	1,130	488	338	295	314
26	403	1,270	572	478	550	890	840	1,130	474	334	295	307
27	395	1,210	595	465	550	815	840	1,040	457	328	292	304
28	403	990	1,020	453	595	765	965	940	449	328	292	301
29	391	890	1,640	453	------	740	1,070	890	441	320	289	298
30	375	840	3,280	445	------	715	965	865	441	317	286	298
31	367	------	2,100	437	------	715	------	890	------	310	283	------

Monthly discharge of Clackamas River at Big Bottom, Oreg., for the period Apr. 11, 1920, to Sept. 30, 1921

[Drainage area, 136 square miles]

Month	Discharge in second-feet				Run-off	
	Maximum	Minimum	Mean	Per square mile	Inches	Acre-feet
1920						
April 11-30	790	550	652	4.80	3.57	25,900
May	840	492	655	4.82	5.56	40,300
June	640	320	444	3.26	3.64	26,400
July	338	280	296	2.18	2.51	18,200
August	335	280	287	2.11	2.43	17,600
September	595	282	378	2.78	3.10	22,500
The period						151,000
1920-21						
October	1,170	367	527	3.88	4.47	32,400
November	1,800	293	763	5.17	5.77	41,800
December	3,280	492	798	5.87	6.77	49,100
January	3,060	437	953	7.01	8.08	58,600
February	1,300	449	727	5.35	5.57	40,400
March	2,250	550	896	6.59	7.60	55,100
April	1,180	572	755	5.55	6.19	44,900
May	1,130	740	935	6.88	7.93	57,500
June	1,040	441	682	5.01	5.59	40,600
July	433	310	359	2.64	3.04	22,100
August	310	283	297	2.18	2.51	18,300
September	518	280	306	2.25	2.51	18,200
The year	3,280	280	662	4.87	66.03	479,000

CLACKAMAS RIVER NEAR CAZADERO, OREG.

LOCATION.—In NE. ¼ sec. 11, T. 4 S., R. 4 E., a short distance above backwater from Cazadero dam of Portland Railway, Light & Power Co. and 3 miles southeast of Cazadero, Clackamas County.

DRAINAGE AREA.—685 square miles.

RECORDS AVAILABLE.—January 1, 1909, to September 30, 1921.

GAGE.—Friez water-stage recorder referred to a vertical staff gage on right bank; inspected by employees of Portland Railway, Light & Power Co.

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

CHANNEL AND CONTROL.—Bed composed of rocks and gravel; control subject to shift.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year 39.00 feet December 30 (one reading daily), (discharge, 29,900 second-feet); minimum stage recorded, from water-stage recorder, 26.83 feet September 16 and 17 (discharge, 900 second-feet).

1909–1921: Maximum stage recorded, 43.7 feet at 1 p. m. November 22, 1909 (discharge, 46,800 second-feet); minimum discharge recorded, 705 second-feet September 21–23 and October 8–10, 1915, at stage of 25.7 feet.

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

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed after peak of high water in April. Rating curves well defined but date of shift uncertain. Operation of water-stage recorder satisfactory except December 25 to March 19 when staff gage was read once a day. Daily discharge ascertained by applying to rating table mean daily gage height obtained by inspecting recorder graph or in times of considerable fluctuation by subdividing days, except April 26 to May 1, when shifting control method was used. Records good.

COOPERATION.—Most of field data furnished by Portland Railway, Light & Power Co.

Discharge measurements of Clackamas River near Cazadero, Oreg., 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. 15	Apperson and Dick [a]	29.67	5,540	Aug. 20	W. W. Laxton [a]	26.50	1,040
Apr. 22	W. L. Sharp [a]	31.95	9,710	27	do	26.45	1,030
July 6	W. W. Laxton [a]	27.05	1,610	Sept. 14	G. H. Canfield	26.36	889
21	do	26.75	1,290	23	do	26.83	1,310
Aug. 10	do	26.50	1,240				

[a] Engineer, Portland Railway, Light & Power Co.

Daily discharge, in second-feet, of Clackamas River near Cazadero, Oreg., for the year ending Sept. 30, 1921

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	2,320	1,680	3,450	21,000	3,450	6,060	4,100	5,870	3,330	1,720	1,100	940
2	5,160	1,630	3,330	17,400	3,450	5,900	4,230	4,050	3,330	1,820	1,100	940
3	8,540	1,630	3,330	21,600	3,970	5,900	4,230	3,690	3,690	1,720	1,060	1,020
4	5,600	1,630	3,580	22,200	5,600	5,900	3,970	3,450	3,810	1,680	1,060	980
5	3,970	1,580	3,330	16,000	4,750	5,300	3,710	3,330	3,570	1,580	1,060	940
6	3,090	1,530	2,970	10,700	4,100	4,880	3,580	3,210	3,450	1,630	1,060	940
7	2,730	1,480	2,790	8,150	3,710	5,160	3,450	3,210	3,570	1,500	1,060	940
8	2,370	1,430	2,610	6,540	4,360	5,600	3,330	3,210	3,210	1,500	1,060	940
9	2,040	1,340	2,610	5,750	10,200	4,100	3,330	3,210	2,920	1,450	1,020	940
10	1,830	1,200	3,030	4,880	17,700	3,970	3,580	3,690	2,750	1,400	1,020	940
11	1,880	1,140	4,880	4,490	12,800	3,840	3,710	4,050	2,640	1,400	1,020	940
12	2,260	1,250	4,100	4,620	11,600	3,580	3,840	3,810	2,530	1,360	1,020	940
13	2,320	1,250	4,230	4,490	11,100	3,580	4,100	3,810	2,420	1,360	1,020	940
14	4,320	1,480	3,580	4,620	9,160	3,710	3,970	4,170	2,370	1,320	1,020	940
15	5,600	1,380	2,970	5,450	9,160	3,840	3,710	4,300	2,320	1,320	1,020	940
16	4,360	1,630	2,700	5,160	5,900	10,200	3,450	4,300	2,320	1,270	1,020	900
17	3,840	5,560	2,430	4,620	5,020	20,100	3,450	4,170	2,220	1,270	1,020	900
18	3,330	9,800	2,320	5,360	4,620	15,700	3,840	3,930	2,320	1,240	1,020	1,040
19	2,850	11,100	2,490	4,100	4,360	10,500	4,100	3,810	2,530	1,240	1,020	2,120
20	2,490	8,950	2,320	3,840	4,100	7,590	4,880	3,810	2,320	1,180	1,020	1,630
21	2,550	6,540	2,150	3,580	4,880	6,710	5,900	4,050	2,220	1,180	1,020	1,650
22	2,350	5,300	2,150	3,450	4,360	6,060	8,740	3,930	2,120	1,180	988	1,450
23	2,150	4,750	2,100	3,330	4,100	5,750	8,150	3,930	2,070	1,180	980	1,270
24	2,100	3,970	4,100	3,210	4,360	5,900	6,380	4,050	2,020	1,180	980	1,180
25	2,040	3,840	5,450	3,090	4,360	6,220	5,600	4,300	1,870	1,140	980	1,180
26	1,930	6,060	4,230	3,030	4,360	5,600	5,450	4,300	1,820	1,140	956	1,140
27	1,830	7,050	4,490	3,030	4,490	5,020	8,340	3,810	1,820	1,140	940	1,100
28	2,040	5,600	8,740	3,210	5,020	4,620	7,960	3,450	1,720	1,140	940	1,100
29	2,040	4,360	12,600	3,090	-------	4,360	7,410	3,210	1,680	1,100	940	1,060
30	1,830	3,840	29,900	3,030	-------	4,230	4,620	3,210	1,720	1,100	940	1,060
31	1,780	-------	24,700	3,030	-------	4,100	-------	3,210	-------	1,100	940	-------

NOTE.—Discharge, Oct. 22, Dec. 16, and Jan. 1, interpolated.

Monthly discharge of Clackamas River near Cazadero, Oreg., for the year ending Sept. 30, 1921

[Drainage area, 685 square miles]

Month	Discharge in second-feet				Run-off	
	Maximum	Minimum	Mean	Per square mile	Inches	Acre-feet
October	8,540	1,780	3,020	4.41	5.08	186,000
November	11,100	1,140	3,670	5.36	5.98	218,000
December	29,900	2,100	5,280	7.70	8.88	325,000
January	22,200	3,030	6,940	10.1	11.64	427,000
February	17,700	3,450	6,250	9.13	9.51	347,000
March	20,100	3,580	6,260	9.13	10.53	385,000
April	8,740	3,330	4,840	7.07	7.89	288,000
May	5,870	3,210	3,820	5.58	6.43	235,000
June	3,810	1,680	2,560	3.74	4.17	152,000
July	1,820	1,100	1,340	1.96	2.26	82,400
August	1,100	940	1,010	1.47	1.70	62,100
September	2,120	900	1,100	1.61	1.80	65,500
The year	29,900	900	3,830	5.60	75.87	2,770,000

OAK GROVE FORK OF CLACKAMAS RIVER AT TIMOTHY MEADOWS, NEAR CAZADERO, OREG.

LOCATION.—In T. 5 S., R. 8 E., about sec. 26 (unsurveyed), at Timothy Meadows, 11¼ miles above station at intake, 17 miles above mouth of Oak Grove Fork, and 43 miles above Cazadero, Clackamas County.

DRAINAGE AREA.—52 square miles.

RECORDS AVAILABLE.—February 25, 1913, to November 26, 1916; July 14, 1918 to September 30, 1921, fragmentary.

GAGE.—Stevens continuous water-gage recorder on right bank; inspected by employees of Portland Railway, Light & Power Co.

DISCHARGE MEASUREMENTS.—Made from footbridge 20 feet above gage.

CHANNEL AND CONTROL.—Bed composed of gravel. Control fairly permanent.

EXTREMES OF DISCHARGE.—Maximum stage during year ending September 30, 1921, from water-stage recorder, 2.40 feet at 8 a. m. January 3 (discharge, 670 second-feet); minimum stage from recorder, 0.57 foot November 3–10 (discharge, 115 second-feet).

1913–1916 and 1918–1921: Maximum stage recorded, that of January 3, 1921; minimum stage recorded, 0.43 foot at 6 p. m. November 11, 1915 (discharge, 100 second-feet).

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

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed during spring high water. Rating curves fairly well defined. Operation of water-stage recorder satisfactory except for periods when clock was not wound. Daily discharge ascertained by applying to rating table mean daily gage height obtained by inspecting recorder graph; shifting-control method used May 1–5. Records good.

COOPERATION.—Field data furnished by the Portland Railway, Light & Power Co.

Discharge measurements of Oak Grove Fork of Clackamas River at Timothy Meadows, near Cazadero, Oreg., 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	Nicholson and Bannister.[a]	1.71	453	Sept. 11	G. H. Canfield	0.78	145
May 9	Sharp and Bannister [a]	1.58	352	11	Swanson [a] and Canfield.	.78	140

[a] Engineers for Portland Railway, Light & Power Co.

Daily discharge, in second-feet, of Oak Grove Fork of Clackamas River at Timothy Meadows, near Cazadero, Oreg., for the year ending Sept. 30, 1921

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	127	122	173	329	200	255	299	420	358	197	147	147
2	147	117	173	565	200	255	299	390	358	197	147	147
3	160	115	173	670	200	255	284	380	386	197	147	147
4	147	115	173	530	200	255	269	370	386	184	147	147
5	140	115	173	530		255	269	360	358	184	147	147
6	134	115	160	464		255	269	344	344	184	147	147
7	134	115	160	404			269	358	344	184	147	147
8	127	115	160	374			269	344	330	184	147	147
9	127	115	160	344			284	358	316	172	147	147
10	127	115	160	314			284	386	303	172	147	147
11	127		160	299			284	386	289	172	147	147
12	132		160	299			299	386	276	172	147	147
13	130		160	284			299		276	172	147	147
14	147		160	284			284		276	159	147	147
15	160	150	160	299	280		269		262	159	147	147
16	147		160	284			269		262	159	147	147
17	147		160	269			284		249	159	147	147
18	142		160	269		300	345		249	159	147	147
19	137		160	255			345		249	159	147	159
20	134	213	160	241			330		236	159	147	159
21	134	200	160	241			353	400	223	159	147	147
22	134	200	160	241			464		210	159	147	147
23	132	186	160	241			434		210	159	147	135
24	132	173	140	227			404		210	159	147	135
25	130	186	140	227			404		197	159	147	135
26	127	227	160	227	241		404		197	159	147	135
27	124	200	173	213	227		404		197	159	147	135
28	122	186	213	213	241		464		197	159	147	135
29	122	173	269	200	------		496		197	159	147	135
30	122	173	374	200	------		434	386	197	159	147	135
31	122	------	329	200	------	299	------	358	------	147	147	------

NOTE.—Braced figures show estimated mean discharge for periods indicated.

Monthly discharge of Oak Grove Fork of Clackamas River at Timothy Meadows, near Cazadero, Oreg., for the year ending Sept. 30, 1921

[Drainage area, 52 square miles]

Month	Discharge in second-feet				Run-off	
	Maximum	Minimum	Mean	Per square mile	Inches	Acre-feet
October	160	122	135	2.60	3.00	8,300
November	227	115	154	2.96	3.30	9,160
December	374	140	179	3.44	3.97	11,000
January	670	200	314	6.04	6.96	19,300
February	----------	200	264	5.08	5.29	14,700
March	----------	----------	291	5.60	6.46	17,900
April	496	269	335	6.44	7.18	19,900
May	----------	344	388	7.46	8.60	23,900
June	386	197	271	5.21	5.81	16,100
July	197	147	169	3.25	3.75	10,400
August	147	147	147	2.83	3.26	9,040
September	159	135	145	2.79	3.11	8,630
The year	670	115	232	4.46	60.69	168,000

OAK GROVE FORK OF CLACKAMAS RIVER AT INTAKE, NEAR CAZADERO, OREG.

LOCATION.—In SW. ¼ sec. 4, T. 6 S., R. 7 E., 2,000 feet above proposed intake of Oak Grove power development of Portland Railway, Light & Power Co. and 35 miles above Cazadero, Clackamas County.

DRAINAGE AREA.—131 square miles (measured by Portland Railway, Light & Power Co.).

RECORDS AVAILABLE.—May 21, 1909, to September 30, 1921 (fragmentary).

GAGE.—Stevens water-stage recorder installed on right bank, used since December, 1916; inspected by employees of Portland Railway, Light & Power Co. Watson recording gage on left bank used March, 1912, to September, 1913; Friez water-stage recorder October, 1913, to October, 1916. Datum of gage lowered 0.10 foot and location changed September 20, 1920.

DISCHARGE MEASUREMENTS.—Made from cable at gage.

CHANNEL AND CONTROL.—Bed composed of boulders; apparently permanent.

EXTREMES OF DISCHARGE.—Maximum stage during year from water-stage recorder, 3.25 feet at 9 a. m. January 2 (discharge, 2,320 second-feet); minimum stage from recorder, 0.81 foot November 12–14 (discharge, 314 second-)

1909–1921: Maximum stage recorded, 3.40 feet November 24, 1909 (discharge, 2,670 second-feet); minimum discharge, that of November 12–14, 1920.

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

DIVERSIONS.—None.

REGULATION.—None.

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

COOPERATION.—Field data furnished by Portland Railway, Light & Power Co.

Discharge measurements of Oak Grove Fork of Clackamas River at intake, near Cazadero, Oreg., 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. 12	Sharp and Bannister	1.15	623	May 8	Sharp and Nicholson	1.95	959
Jan. 24	Nicholson and Bannister	1.30	630	10	do	2.10	962
Feb. 19	do	1.60	848	June 24	Sharp and Driskill	1.30	590
Mar. 20	do	2.00	1,090	Aug. 5	W. W. Laxton	1.02	484
21	do	1.90	1,030	Sept. 12	G. H. Canfield	.96	342
Apr. 13	do	1.62	827	13	do	.96	364
22	do	2.20	1,320				

NOTE.—All measurements, except those of Sept. 12 and 13, made by employees of the Portland Railway, Light & Power Co.

Daily discharge, in second-feet, of Oak Grove Fork of Clackamas River at intake, near Cazadero, Oreg., for the year ending Sept. 30, 1921

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1		355		1,040	533	762	804	1,130	1,040	546	438	405
2		350		1,700	533	776	811	1,090	1,030	559	438	400
3		350		2,050	559	797	797	1,060	1,070	546	432	405
4		346	515	1,610	572	811	762	1,040	1,080	533	432	405
5		340		1,610	552	804	748	1,030	1,030	520	432	405
6		337		1,330	598	776	727	1,030	1,030	508	427	400
7		332		1,170	546	762	720	1,060	994	502	427	400
8		338	508	1,060	650	748	713	1,050	946	496	427	400
9		319	514	970	962	741	727	1,070	916	490	427	395
10		319	546	896	1,250	741	748	1,130	888	490	427	395
11		319	559	846	1,170	734	755	1,130	874	490	427	390
12		314	520	825	1,210	706	720	1,130	846	484	427	390
13		314	508	776	1,170	706	804	1,130	832	478	427	385
14	380	314	484	776	1,060	692	776	1,130	818	478	427	385
15		338	478	783	962	713	755	1,170	804	472	427	385
16		337	472	755	888	954	734	1,210	790	472	427	385
17		585	460	732	832	1,290	748	1,170	783	466	427	385
18		706	460	706	797	1,420	846	1,170	769	466	422	422
19		748	454	678	776	1,210	867	1,170	748	460	422	520
20		671	448	657	776	1,090	874	1,170	713	460	422	444
21		604	438	630	734	1,010	946	1,170	692	460	416	449
22		578	438	611	713	978	1,210	1,170	656	454	416	416
23		540	444	598	685	946	1,170	1,170	620	454	410	400
24		508	472	592	685	954	1,090	1,170	585	454	410	395
25		520	496	572	678	962	1,030	1,210	578	449	410	395
26		644	526	566	664	923	1,030	1,170	568	449	405	395
27	380	624	559	552	664	867	1,070	1,130	559	444	405	390
28	390	546	776	552	692	846	1,290	1,090	552	444	405	390
29	380	520	946	546	-------	832	1,290	1,070	546	444	405	385
30	375	515	1,250	533	-------	818	1,210	1,060	546	438	405	380
31	360	-------	1,170	520	-------	804	-------	1,050	-------	438	405	-------

NOTE.—Because of no gage height record, mean discharge Oct. 1–24 estimated by a percentage comparison with record of flow for gaging station at Timothy Meadows: discharge Nov. 29 and 30, and mean discharge Dec. 1–7 estimated by comparison with record of flow at Timothy Meadows; discharge June 22 and 23, interpolated.

Monthly discharge of Oak Grove Fork of Clackamas River at intake, near Cazadero, Oreg., for the year ending Sept. 30, 1921

[Drainage area, 131 square miles]

Month	Discharge in second-feet				Run-off	
	Maximum	Minimum	Mean	Per square mile	Inches	Acre-feet
October	----------	----------	380	2.90	3.34	23,400
November	748	314	454	3.47	3.87	27,000
December	1,250	438	566	4.32	4.98	34,800
January	2,050	520	876	6.69	7.71	53,900
February	1,250	533	783	5.98	6.23	43,500
March	1,420	692	877	6.69	7.71	53,900
April	1,290	713	892	6.81	7.60	53,100
May	1,210	1,030	1,120	8.55	9.86	68,900
June	1,040	546	797	6.08	6.78	47,400
July	559	438	479	3.66	4.22	29,500
August	438	405	421	3.21	3.70	25,900
September	520	380	403	3.08	3.44	24,000
The year	2,050	314	670	5.11	69.44	485,000

106543—25†—WSP 534——10

LEWIS RIVER BASIN

LEWIS RIVER NEAR AMBOY, WASH.

LOCATION.—In sec. 36, T. 6 N., R. 3 E., at Cresap's ferry crossing, on county road from Amboy to Cougar, 1½ miles below Canyon Creek, 2 miles above Speilei Creek, and 5 miles northwest of Amboy, Clark County.

DRAINAGE AREA.—665 square miles (measured on map in Water Supply Paper 253, p. 74, and checked on Forest Service map.)

RECORDS AVAILABLE.—January 20, 1911, to September 30, 1921.

GAGE.—Inclined and vertical staffs on left bank; read by J. M. Hanley.

DISCHARGE MEASUREMENTS.—Made from cable 30 feet above gage.

CHANNEL AND CONTROL.—Bed composed of gravel and small boulders; shifts during extreme floods.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 11.0 feet at 8 a. m. December 30 (discharge, 41,600 second-feet); minimum stage recorded, 0.20 foot September 17 (discharge, 880 second-feet).

1911–1921: Maximum stage determined by leveling to high-water marks, 16.4 feet December 18, 1917 (discharge estimated from extension of rating curve, 60,000 second-feet); minimum discharge recorded, 686 second-feet September 30, 1915 (gage height, 0.08 foot).

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

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation practically permanent during year. Rating curve well defined. Gage read to half-tenths twice a day. Daily discharge ascertained by applying to rating table mean daily gage height. Records good.

Discharge measurements of Lewis River near Amboy, 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.*
Mar. 16	Wendell Dawson	5.30	12,700	Mar. 17	Wendell Dawson	9.16	31,700
16	do	6.01	14,800	Aug. 1	K. N. Phillips	.87	1,580

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

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	6,660	2,790	6,800	17,200	2,400	9,040	4,300	6,400	5,630	3,590	1,540	1,210
2	9,680	2,630	6,800	29,600	2,400	8,410	4,670	5,880	5,760	2,870	1,540	1,180
3	11,300	2,550	6,930	22,300	2,480	7,210	4,560	5,390	6,270	2,550	1,540	1,160
4	12,600	2,480	7,800	16,800	2,630	6,660	4,330	4,910	6,530	2,480	1,480	1,110
5	13,000	2,320	6,930	19,900	2,630	4,440	4,000	4,670	6,530	2,400	1,480	1,110
6	10,300	2,250	6,400	16,000	2,870	3,400	3,690	4,910	6,800	2,320	1,420	1,060
7	9,680	2,180	5,760	11,000	3,900	3,790	3,590	5,030	6,800	2,320	1,420	1,060
8	8,100	2,110	5,630	8,720	5,150	4,330	3,590	4,910	6,140	2,250	1,370	1,060
9	7,210	2,110	5,880	7,500	9,040	4,560	3,500	4,560	5,390	2,250	1,370	1,020
10	6,400	2,040	6,800	6,660	19,400	4,330	3,790	4,910	5,030	2,320	1,370	1,020
11	7,800	2,040	8,410	6,270	18,900	3,900	4,220	6,270	4,690	2,230	1,370	970
12	9,680	1,970	7,800	6,930	20,300	3,900	4,000	6,140	4,560	2,250	1,320	970
13	10,600	1,900	6,930	9,360	15,200	3,690	4,440	5,880	4,230	2,250	1,320	970
14	10,000	1,900	6,530	11,600	12,300	3,500	4,690	6,140		2,180	1,320	952
15	9,360	1,840	5,880	11,600	10,600	3,690	4,440	6,660		2,180	1,280	925
16	9,040	1,900	5,390	9,460	8,720	12,600	4,330	7,210	4,120	2,110	1,260	898
17	9,040	4,110	4,910	7,210	6,930	29,000	4,560	7,210		2,110	1,260	880
18	8,410	13,000	4,440	6,270	6,140	20,800	5,390	6,930		2,040	1,260	1,370
19	7,800	19,900	4,110	5,630	5,630	14,800	5,880	6,660	3,900	2,040	1,260	1,970
20	6,800	14,400	3,900	5,030	4,690	12,000	6,400	6,270	4,110	1,970	1,260	1,600
21	6,140	12,300	3,690	4,440	4,560	10,000	8,410	6,140	4,330	1,970	1,260	1,720
22	5,630	11,000	3,500	3,790	4,110	8,100	15,200	6,010	4,110	1,900	1,260	1,720
23	5,150	10,000	3,590	3,400	4,330	6,530	11,600	6,270	3,790	1,900	1,210	1,420
24	4,670	9,360	6,800	2,790	5,150	5,880	10,000	6,800	3,690	1,900	1,210	1,260
25	4,330	9,680	6,400	2,480	5,270	5,270	9,040	7,500	3,790	1,900	1,210	1,210
26	4,110	10,000	5,630	2,250	5,630	4,560	7,500	6,930	3,690	1,780	1,180	1,370
27	4,000	9,680	7,500	2,110	6,010	4,110	7,500	6,270	3,500	1,840	1,160	1,370
28	3,900	8,720	14,800	1,970	6,930	3,790	7,800	5,270	3,220	1,780	1,160	1,350
29	3,690	7,800	16,000	2,040	-------	3,590	8,100	4,910	2,960	1,720	1,160	1,260
30	3,500	6,930	38,600	2,180	-------	3,790	7,210	5,150	2,870	1,600	1,160	1,210
31	2,870	-------	20,800	2,320	-------	4,000	-------	5,510	-------	1,540	1,160	-------

NOTE.—Braced figures show estimated mean discharge for periods indicated.

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

[Drainage area, 665 square miles]

Month	Discharge in second-feet				Run-off	
	Maximum	Minimum	Mean	Per square mile	Inches	Acre-feet
October	13,000	2,870	7,470	11.2	12.91	459,000
November	19,900	1,840	6,060	9.11	10.16	361,000
December	38,600	3,500	8,110	12.2	14.07	499,000
January	29,600	1,970	8,540	12.8	14.76	525,000
February	20,300	2,400	7,300	11.0	11.45	405,000
March	29,000	3,500	7,220	10.9	12.57	444,000
April	15,200	3,500	6,020	9.05	10.10	358,000
May	7,500	4,560	5,930	8.92	10.28	365,000
June	6,800	2,870	4,630	6.96	7.76	276,000
July	3,590	1,540	2,150	3.23	3.72	132,000
August	1,540	1,160	1,300	1.95	2.25	79,900
September	1,970	880	1,210	1.82	2.03	72,000
The year	38,600	880	5,490	8.25	112.06	3,980,000

KALAMA RIVER BASIN

KALAMA RIVER NEAR KALAMA, WASH.

LOCATION.—In sec. 7, T. 6 N., R. 1 E., 150 feet below power house of North Coast Power Co. and 9 miles by road east of Kalama, Cowlitz County.

DRAINAGE AREA.—184 square miles, measured on map of Columbia National Forest.

RECORDS AVAILABLE.—July 6, 1911, to January 11, 1912; December 1, 1912, to September 30, 1913; August 19, 1916, to September 30, 1921.

GAGE.—Vertical staff bolted to rock ledge; lower section up to 8 feet on left bank; upper section, 8 to 12 feet, in a cove on right bank opposite lower section; read by L. A. Van Fleet. Gage at same location, but with datum 2.0 feet lower, used 1911 to January, 1912, and one with datum 3.0 feet lower used December, 1912, to September, 1913.

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

CHANNEL AND CONTROL.—Control is a rock reef and bar of coarse gravel about 100 feet below gage; gravel may shift in extreme floods.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 9.7 feet at 4 p. m. March 17 (discharge, 10,500 second-feet); minimum stage recorded, 0.83 foot September 17 (discharge, 265 second-feet).

1911–1913 and 1916–1921: Maximum stage recorded, 10.3 feet December 18, 1917 (discharge, 11,700 second-feet); minimum stage recorded, 0.60 foot September 3 and 4, 1920 (discharge, 166 second-feet).

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

DIVERSIONS.—None.

REGULATION.—Operation of power plant causes some fluctuation, but gage is read only at times when load is steady.

ACCURACY.—Stage-discharge relation changed for low stage twice during year; assumed permanent for medium and high stages. Rating curves fairly well defined. Gage read to hundredths once a day at low water and to half-tenths at medium and high. Daily discharge ascertained by applying daily gage height to rating table. Records good.

The following discharge measurement was made by K. N. Phillips:
August 4, 1921: Gage height, 1.11 feet; discharge, 346 second-feet.

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

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	1,770	756	1,860	4,010	1,390	2,150	1,770	2,350	930	870	355	280
2	1,460	700	1,860	9,500	1,950	2,150	1,770	2,150	930	815	340	280
3	2,950	650	1,860	6,210	2,050	1,860	1,690	2,050	930	815	340	280
4	4,660	650	1,860	5,770	2,050	1,690	1,610	1,950	930	765	340	280
5	3,050	650	1,860	6,060	1,770	1,530	1,530	1,770	990	715	340	280
6	2,450	600	1,770	4,400	1,460	1,530	1,460	1,690	990	715	340	280
7	2,850	600	1,610	4,270	1,460	1,250	1,320	1,610	930	715	340	280
8	2,350	600	1,610	2,750	3,510	1,110	1,250	1,460	990	715	325	280
9	1,950	600	2,550	2,250	4,930	1,110	1,180	1,320	930	620	325	265
10	1,690	575	2,850	2,050	6,360	1,110	1,050	1,690	930	575	325	265
11	2,450	528	4,270	2,050	6,210	1,110	990	1,610	990	530	325	265
12	2,350	482	3,270	2,250	5,350	1,110	990	1,460	930	508	310	265
13	2,150	482	3,160	2,050	4,400	1,110	1,250	1,460	990	485	310	265
14	2,850	505	2,550	2,750	3,750	1,050	1,180	1,460	1,050	485	310	265
15	2,550	505	2,050	4,010	2,850	1,050	1,050	1,390	930	465	310	265
16	3,050	550	1,770	3,160	2,460	3,390	990	1,460	930	445	295	265
17	3,160	2,450	1,770	3,050	2,050	9,900	1,050	1,460	930	445	340	265
18	2,550	4,270	1,770	2,850	1,770	5,770	1,180	1,460	1,050	425	310	340
19	2,050	3,050	1,770	2,850	1,610	4,010	1,950	1,320	990	425	310	665
20	1,690	3,050	1,690	2,650	1,770	3,160	1,770	1,320	990	425	310	380
21	1,530	2,350	1,770	2,450	1,690	2,650	2,750	1,180	930	425	295	700
22	1,460	3,510	1,690	2,150	1,610	2,350	4,530	1,180	930	405	295	460
23	1,320	3,050	1,610	1,320	1,610	2,050	3,050	1,050	870	405	295	700
24	1,250	2,450	2,650	1,250	1,690	2,150	2,550	1,180	815	388	295	380
25	1,170	2,850	2,850	1,180	1,690	2,250	2,450	1,250	815	370	280	344
26	1,100	2,950	2,650	1,180	1,610	2,250	2,650	1,250	815	370	280	329
27	1,030	2,550	2,750	1,180	1,770	2,150	2,450	1,180	815	370	280	362
28	954	2,650	5,350	1,250	2,150	2,050	2,450	990	765	370	280	362
29	884	1,950	4,930	1,250	-------	1,950	2,460	930	765	370	280	344
30	812	1,860	9,500	1,250	-------	1,860	2,250	1,050	990	370	280	329
31	783	-------	4,790	1,320	-------	1,770	-------	990	-------	355	280	-------

NOTE.—Discharge, Oct. 24–29 and 31, estimated.

Monthly discharge of Kalama River near Kalama, 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	4,660	783	2,010	10.9	12.57	124,000
November	4,270	482	1,610	8.75	9.76	95,800
December	9,500	1,610	2,720	14.8	17.06	167,000
January	9,500	1,180	2,930	15.9	18.33	180,000
February	6,360	1,390	2,610	14.2	14.79	145,000
March	9,900	1,110	2,280	12.4	14.30	140,000
April	4,530	990	1,820	9.89	11.03	108,000
May	2,350	930	1,440	7.83	9.03	88,500
June	1,050	765	926	5.03	5.61	55,100
July	870	355	521	2.83	3.26	32,000
August	355	280	311	1.69	1.95	19,100
September	700	265	344	1.87	2.09	20,500
The year	9,900	265	1,620	8.80	119.78	1,180,000

COWLITZ RIVER BASIN

LAKE CREEK AT OUTLET OF PACKWOOD LAKE, NEAR LEWIS, WASH.

LOCATION.—In sec. 21, T. 13 N., R. 10 E., 400 feet below outlet of Packwood Lake and 5 miles east of Lewis, Lewis County.

DRAINAGE AREA.—About 18 square miles (measured on Plate I, Water-Supply Paper 313).

RECORDS AVAILABLE.—September 2, 1911, to September 30, 1921.

GAGE.—Friez water-stage recorder on left bank, installed August 3, 1918; inspected by J. A. Combs. For description of gages used prior to August 3, 1918, see Water-Supply Paper 484.

DISCHARGE MEASUREMENTS.—Made by wading near gage or from footbridge 200 feet upstream.

CHANNEL AND CONTROL.—Bed composed of gravel and small boulders. Partial control about 20 feet downstream from gage formed by several trees felled across the stream from both banks. Trees partly broken and wedged against a large boulder in midstream.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, from water-stage recorder, 3.1 feet at midnight June 7 (discharge, 452 second-feet); minimum stage from recorder, 1.29 feet on November 12 (discharge, 38 second-feet).

1911–1921: Maximum stage estimated, 6.0 feet December 18, 1917 (discharge not determined); minimum stage recorded, 1.16 feet October 28–31, 1919 (discharge, 30 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 changed at midnight June 7. Rating curve used prior to the change well defined below 250 second-feet; rating curve used thereafter well defined throughout. 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 excellent.

COOPERATION.—Gage-height record and some discharge measurements furnished by Portland Railway, Light & Power Co.

Discharge measurements of Lake Creek at outlet of Packwood Lake, near Lewis, Wash., during the year ending Sept. 30, 1921

Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*
Aug. 28	McCombs and Combs	1.39	60.6
28	do	1.39	57.2

Daily discharge, in second-feet, of Lake Creek at outlet of Packwood Lake, near Lewis, Wash., for the year ending Sept. 30, 1921

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	93	51	86	246	61	157	71	139	262	325	169	80
2	121	51	84	246	57	155	71	131	292	305	169	80
3	166	50	78	252	53	152	74	123	322	275	166	77
4	190	49	76	222	51	145	71	116	354	243	156	70
5	186	47	76	210	51	139	71	111	344	218	144	60
6	177	46	71	203	51	129	69	108	344	210	138	56
7	166	46	69	195	51	118	65	106	386	210	141	54
8	179	45	67	184	49	111	63	106	430	231	150	54
9	172	44	63	177	51	104	59	104	398	239	153	54
10	159	44	61	172	67	96	57	106	367	239	130	52
11	145	39	59	168	106	91	57	108	346	235	138	51
12	131	38	59	157	177	88	59	108	336	223	130	48
13	118	39	57	152	220	81	63	111	325	214	127	45
14	106	40	53	146	220	76	63	123	305	207	133	43
15	96	40	51	143	206	74	65	146	285	203	130	43
16	96	41	51	137	173	86	67	190	257	198	127	43
17	94	59	50	131	141	137	69	216	233	193	124	43
18	88	149	49	106	137	203	67	219	218	191	127	43
19	81	292	49	96	127	208	67	222	233	191	124	50
20	76	302	47	88	114	182	74	241	253	189	118	51
21	76	262	46	84	101	157	76	244	275	179	115	80
22	74	212	45	81	96	135	114	244	285	174	112	87
23	71	177	50	74	101	121	177	242	285	176	103	87
24	69	157	69	69	116	114	191	248	295	181	94	80
25	69	148	71	69	129	106	179	282	305	181	91	74
26	65	137	76	67	141	96	163	302	295	174	80	74
27	61	133	81	67	152	91	148	292	275	169	70	80
28	59	127	86	63	157	84	150	262	275	166	63	84
29	57	111	104	61	-------	81	155	237	265	169	60	87
30	55	91	232	61	-------	76	148	222	295	176	63	80
31	51	-------	272	61	-------	74	-------	231	-------	174	67	-------

NOTE.—Water-stage recorder not operating Oct. 1 and May 18; discharge ascertained by interpolation.

Monthly discharge of Lake Creek at outlet of Packwood Lake, near Lewis, Wash., for the year ending Sept. 30, 1921

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	190	51	108	6,640
November	302	38	102	6,070
December	272	45	77.0	4,730
January	252	61	135	8,300
February	220	49	113	6,280
March	208	74	118	7,260
April	191	57	94.1	5,600
May	302	104	182	11,200
June	430	218	305	18,100
July	325	166	208	12,800
August	169	60	120	7,380
September	87	43	63.7	3,790
The year	430	38	136	98,200

JOHNSON CREEK AT MOUTH, NEAR LEWIS, WASH.

LOCATION.—In sec. 33, T. 13 N., R. 9 E., 1 mile above mouth and 3 miles southwest of Lewis, in Lewis County.

DRAINAGE AREA.—About 30 square miles (measured on Plate I, Water-Supply Paper 313).

RECORDS AVAILABLE.—August 14, 1907, to September 23, 1914, and October 1, 1918, to September 30, 1921.

GAGE.—Friez water-stage recorder on left bank, installed October 1, 1918; inspected by J. A. Combs. A vertical staff gage 80 feet below present site was used prior to September 23, 1914.

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

CHANNEL AND CONTROL.—Channel composed of small boulders. Low-water control is riffle about 40 feet below gage; at high stages a considerable length of channel forms control. Banks steep, not subject to overflow. Channel fairly straight for 300 feet below gage. Stage of zero flow, according to measurements made August 27, 1921, gage height −0.30 foot.

EXTREMES OF DISCHARGE.—Maximum stage, from water-stage recorder, 3.25 feet December 31 (discharge, 1,560 second-feet); minimum stage from recorder, 0.59 foot September 16 and 17 (discharge, 45 second-feet).

1907–1914; 1918–1921: Maximum stage recorded, 3.75 feet at 4 a. m., January 23, 1919 (discharge, 2,500 second-feet); minimum stage recorded, 0.40 foot September 1 and 7, 1914 (discharge, 28 second-feet).

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

DIVERSIONS.—None.

REGULATION.—None.

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 mean daily gage height determined from recorder charts by inspection. Records excellent except for periods when recorder was not operating.

COOPERATION.—Gage-height record and some discharge measurements furnished by Portland Railway, Light & Power Co.

Discharge measurements of Johnson Creek at mouth, near Lewis, Wash., during the year ending Sept. 30, 1921

Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*
Feb. 12	J. A. Combs	2.29	619
14	do	2.00	481
Aug. 27	McCombs and Combs	.69	62.1

Daily discharge, in second-feet, of Johnson Creek at mouth, near Lewis, Wash., for the year ending Sept. 30, 1921

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	358	112	187	1,490	103	376	178	240	646	335	126	62
2	404	107	178	1,160	112	362	178	227	626	323	116	58
3	423	105	170	820	112	353	173	212	640	257	110	58
4	409	103	167	600	107	335	167	202	607	231	103	56
5	344	101	156	588	103	310	159	205	607	244	99	54
6	327	96	150	474	99	283	151	215	646	250	99	52
7	306	94	145	394	101	261	143	208	715	247	101	52
8	287	90	140	348	119	267	135	215	673	261	101	50
9	327	89	137	310	177	221	132	224	633	250	92	49
10	287	86	132	290	689	205	145	240	582	247	87	49
11	268	84	137	287	607	190	170	240	552	244	84	49
12	244	82	137	283	640	176	190	247	534	231	82	49
13	231	84	137	266	546	170	193	287	523	224	79	49
14	224	81	123	248	490	156	187	390	443	213	79	48
15	215	81	119	231	380	156	173	496	380	208	78	46
16	208	89	116	218	314	253	167	464	344	199	74	45
17	202	126	114	205	283	627	176	454	334	196	72	46
18	190	216	114	193	244	692	187	468	324	193	72	54
19	184	596	112	178	218	473		483	314	187	68	73
20	173	508	107	170	202	362		497	303	176	68	76
21	164	358	105	161	184	302	380	511	293	164	68	
22	159	268	101	156	193	264		526	283	161	68	
23	150	224	101	142	453	237	399	540	306	161	68	105
24	148	184	144	132	614	224	340	576	353	156	67	
25	142	137	187	128	582	215	298	552	399	150	64	
26	140	126	230	123	501	199	268	433	390	142	58	70
27	130	199	274	119	409	187	261	331	353	140	58	67
28	126	212	317	116	371	178	272	283	344	135	58	66
29	119	202	360	114	-------	181	276	374	340	132	58	62
30	114	193	1,420	110	-------	178	254	464	380	130	58	58
31	114	-------	1,560	110	-------	178	-------	555	-------	128	58	-------

NOTE.—Water-stage recorder not operating Dec. 24–28, Jan. 2, 13, 14, Apr. 5–7, 19–22, May 18–22, 29–31, June 17–21, July 31, and Sept. 21–25; discharge determined by interpolation except for the periods Apr. 19–22 and Sept. 21–25. Flat estimates of discharge for these two periods determined by comparison with records of Little Nisqually River near Alder, Wash. Braced figures show mean discharge for periods indicated.

Monthly discharge of Johnson Creek at mouth, near Lewis, Wash., for the year ending Sept. 30, 1921

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	423	114	230	14,100
November	596	81	168	10,000
December	1,560	101	244	15,000
January	1,490	110	328	20,200
February	640	99	318	17,700
March	692	156	276	17,000
April	-------	132	230	13,700
May	576	202	366	22,500
June	715	283	462	27,500
July	335	128	204	12,500
August	126	58	79.8	4,910
September	-------	45	64.1	3,810
The year	1,560	45	247	179,000

TOUTLE RIVER NEAR SILVER LAKE, WASH.

LOCATION.—In sec. 19, T. 10 N., R. 1 E., 300 feet below highway bridge just below outlet of Silver Lake, on Coalbank road, half a mile below junction of North and South forks, 5 miles northeast of Silver Lake, and 9 miles northeast of Castle Rock, in Cowlitz County.

DRAINAGE AREA.—472 square miles (measured on Pl. XV, Water-Supply Paper 253).

RECORDS AVAILABLE.—October 1, 1919, to September 30, 1921; September 4, 1909, to August 3, 1912, at a station 2 miles below described as "near Castle Rock."

GAGE.—Stevens continuous water-stage recorder on right bank; installed October 9, 1919; inspected by George Halleck. Earlier records obtained from vertical staff on left bank about 2 miles below.

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

CHANNEL AND CONTROL.—Channel is in rocky canyon with steep sides. Control composed of large boulders just below gage.

EXTREMES OF DISCHARGE.—Maximum stage during year, from water-stage recorder, 17.6 feet at 6 a. m. December 30 (discharge, 14,700 second-feet). Minimum stage during year, from recorder, 1.30 feet September 17 (discharge, 601 second-feet).

1910–1912; 1920–1921: Maximum stage recorded, 11.0 feet on March 2 1910, at gage near Castle Rock (discharge, 35,600 second-feet); minimum stage recorded, 0.46 foot from 5 to 6 p. m. August 26, 1920 (discharge, 293 second-feet).

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

DIVERSIONS.—None.

REGULATION.—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 mean daily gage heights determined from recorder graph by inspection or, for days when there was considerable variation in stage, by averaging results obtained by applying to rating table mean gage heights for shorter periods. Records good for periods when water-stage recorder was operating; for remainder of year, fair.

COOPERATION.—Station maintained in cooperation with J. C. Stevens, who established station at his expense and furnishes gage-height record.

Discharge measurements of Toutle River near Silver Lake, Wash., during the year ending Sept. 30, 1921

Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*
Jan. 15	R. B. Kilgore	7.95	5,060
16	do	6.91	4,190

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

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	2,380	1,560	2,450	7,640	2,170		2,380	3,360	2,450	1,960	948	710
2	3,430	1,470	2,870	11,900	2,380		2,310	3,220	2,450	1,960	923	756
3	3,710	1,470	2,800	11,500	2,800		2,240	3,010	2,730	1,720	898	756
4	6,200	1,380	3,430	9,800	2,870		2,100	2,730	2,940	1,590	874	779
5	5,150	1,300	3,010	11,900	2,590	3,150	1,960	2,660	2,870	1,500	850	733
6	4,190	1,240	2,660	8,300	2,310		1,890	2,450	2,870	1,470	830	710
7	4,030	1,200	2,380	6,290	2,310		1,750	2,380	2,940	1,440	810	688
8	3,500	1,140	2,240	5,230	3,040		1,680	2,240	2,660	1,440	790	688
9	2,940	1,100	2,520	5,310	4,670	2,170	1,620	2,170	2,450	1,440	770	688
10	2,590	1,070	3,010	3,870	7,910	2,100	1,620	2,660	2,380	1,350	750	688
11	4,030	1,020	4,590	3,430	8,900	2,030	1,680	2,520	2,310	1,350	730	666
12	4,830	1,020	4,270	3,430	9,300	1,960	1,820	2,380	2,240	1,320	710	644
13	3,950	1,050	4,350	3,360	7,910	1,820	2,310	2,310	2,170	1,300	710	644
14	4,110	1,020	3,430	3,790	6,650	1,820	2,170	2,590	2,170	1,270	710	622
15	4,270	996	2,940	4,990	5,310	1,820	1,960	2,800	2,240	1,240	710	622
16	4,110	1,240	2,660	4,350	4,270	4,230	1,750	2,450	2,100	1,220	710	601
17	4,350	3,050	2,380	3,870	3,640	11,200	1,680	2,940	1,890	1,200	733	601
18	3,950	5,390	2,310	3,570	3,220	12,100	2,310	2,870	1,960	1,170	898	622
19	3,360	5,750	2,240	3,360	3,010	8,320	2,660	2,800	2,100	1,140	826	923
20	2,940	5,480	2,100	3,080	2,940	6,110	2,730	2,730	2,030	1,120	756	1,070
21	2,730	4,270	2,030	2,800	2,940	5,750	3,160	2,660	2,030	1,100	733	1,120
22	2,590	4,590	2,100	2,590	3,010	4,270	5,840	2,660	2,030	1,070	710	1,070
23	2,450	4,510	2,310	2,380	3,640	3,640	5,230	2,660	1,890	1,070	710	923
24	2,380	3,710	3,950	2,240	3,710	3,640	4,350	2,730	1,890	1,070	710	850
25	2,310	3,640	3,790	2,170	3,640	3,870	3,790	2,940	1,820	1,050	688	874
26	2,240	3,570	3,570	2,100	3,500	3,570	3,500	2,870	1,750	1,050	688	826
27	2,100	3,710	4,190	2,100	3,360	3,290	3,430	2,520	1,720	1,020	666	850
28	2,100	3,220	6,830	2,170	3,600	3,710	3,790	2,310	1,650	996	666	850
29	1,960	2,940	8,000	2,030	-------	2,800	4,110	2,170	1,620	972	688	850
30	1,820	2,660	13,700	2,030	-------	2,660	3,640	2,170	1,820	972	688	826
31	1,680	-------	9,700	1,960	-------	2,450	-------	2,310	-------	948	666	-------

NOTE.—Water-stage recorder not operating Feb. 28 to Mar. 8 and Aug. 6–11. Discharge Feb. 28 to Mar. 8 determined partly from maximum and minimum gage heights and partly from comparison with records of Lewis River near Amboy, Wash., and Kalama River near Kalama, Wash. Discharge Aug. 6–11 determined by interpolation.

Monthly discharge of Toutle River near Silver Lake, Wash., for the year ending Sept. 30, 1921

[Drainage area, 472 square miles]

Month	Discharge in second-feet				Run-off	
	Maximum	Minimum	Mean	Per square mile	Inches	Acre-feet
October	6,200	1,680	3,300	6.99	8.06	203,000
November	5,750	996	2,530	5.36	5.98	151,000
December	13,700	2,030	3,830	8.11	9.35	236,000
January	11,900	1,960	4,630	9.81	11.31	285,000
February	9,300	2,170	4,130	8.75	9.11	229,000
March	12,100	1,820	3,890	8.24	9.50	239,000
April	5,840	1,620	2,720	5.76	6.43	162,000
May	3,360	2,170	2,620	5.55	6.40	161,000
June	2,940	1,620	2,210	4.68	5.22	132,000
July	1,960	948	1,270	2.69	3.10	78,100
August	948	666	760	1.61	1.86	46,700
September	1,120	601	775	1.64	1.83	46,100
The year	13,700	601	2,720	5.76	78.15	1,970,000

STREAMS BETWEEN COLUMBIA RIVER AND KLAMATH RIVER

ROGUE RIVER BASIN

ROGUE RIVER BELOW PROSPECT, OREG.

LOCATION.—In center of W. ½ sec. 6, T. 33 S., R. 3 E., at Prospect power plant of California-Oregon Power Co., 1 mile below mouth of Mill Creek, 2 miles above Middle Fork, 47 miles northeast of Medford, and 2 miles below Prospect, Jackson County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—August 3, 1913, to September 30, 1921.

GAGE.—Vertical staff on right bank 100 feet above power house; read by E. B. Price.

DISCHARGE MEASUREMENTS.—Made from cable 500 feet above gage.

CHANNEL AND CONTROL.—Control composed of large boulders; fairly permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 6.0 feet December 30 (discharge, 3,450 second-feet; total including discharge of flume, 3,630 second-feet); minimum stage recorded, 2.55 feet October 11 (discharge, 432 second-feet; minimum including discharge of flume, 602 second-feet).

1913–1921: Maximum stage recorded, 5.4 feet January 12, 1918 (discharge, 3, 540 second-feet; total including discharge of flume 3,720 second-feet): minimum stage recorded, 2.3 feet January 1, 1919 (discharge, 330 second-feet; total including flume 487 second-feet).

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

DIVERSIONS.—The California-Oregon Power Co.'s flume diverts around this station; a record is kept of this diversion. (See p. 145.)

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed during high water of December 30. Rating curves used as follows: October 1 to December 30, well defined below 1,000 second-feet; December 31 to September 30, fairly well defined. Staff gage read to half-tenths twice a day. Daily discharge obtained by applying to rating table mean daily gage height. Records good.

Discharge measurements of Rogue River below Prospect, Oreg., during the year ending Sept. 30, 1921

[Made by K. N. Phillips]

Date	Gage height	Discharge
	Feet	*Sec.-ft.*
July 14	3.22	897
Sept. 27	2.74	652

Daily discharge, in second-feet, of Rogue River below Prospect, Oreg., for the year ending Sept. 30, 1921

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	500	575	1,150	1,950	860	1,410	1,410	1,670	1,850	1,250	745	670
2	600	550	1,150	2,250	860	1,490	1,490	1,580	1,850	1,170	720	645
3	660	525	1,070	2,880	890	1,670	1,670	1,490	2,050	1,170	720	645
4	550	525	1,070	2,350	890	1,850	1,490	1,490	2,050	1,100	720	645
5	525	500	920	2,450	890	1,850	1,410	1,490	1,950	1,100	720	645
6	500	500	920	2,050	860	1,850	1,330	1,410	2,050	1,100	720	645
7	550	500	850	1,760	860	1,850	1,330	1,410	1,950	1,030	720	645
8	478	455	920	1,580	890	1,670	1,250	1,580	1,950	1,030	720	645
9	455	455	850	1,490	2,050	1,580	1,330	1,490	1,830	1,030	720	645
10	455	455	815	1,330	2,050	1,490	1,410	1,490	1,760	1,030	720	645
11	432	455	780	1,250	2,050	1,410	1,670	1,580	1,760	960	720	645
12	600	550	750	1,330	1,760	1,410	1,670	1,670	1,670	960	720	645
13	550	550	750	1,250	1,850	1,410	1,580	1,850	1,760	960	720	645
14	575	525	660	1,170	2,450	1,410	1,490	1,950	1,670	960	695	645
15	850	550	660	1,170	1,950	1,330	1,330	1,950	1,580	890	720	645
16	630	600	660	1,100	1,670	1,670	1,330	2,050	1,490	890	720	620
17	600	2,630	660	1,100	1,490	1,580	1,330	2,050	1,490	890	695	620
18	660	1,900	690	1,100	1,410	1,760	1,330	1,760	1,490	890	695	645
19	600	2,100	690	1,100	1,330	1,580	1,330	1,670	1,670	890	695	890
20	600	1,900	660	1,030	1,330	1,490	1,580	1,850	1,580	860	670	720
21	600	1,470	660	960	1,410	1,410	1,760	1,950	1,580	830	670	670
22	660	1,390	660	890	1,330	1,330	2,050	1,850	1,490	830	670	670
23	630	1,230	630	960	1,250	1,330	2,050	1,950	1,490	830	670	670
24	690	1,070	720	960	1,250	1,330	1,850	2,050	1,490	800	670	670
25	780	1,070	720	960	1,250	1,410	1,670	2,150	1,410	800	670	670
26	720	2,100	690	890	1,330	1,330	1,580	2,250	1,330	800	670	670
27	720	1,900	660	890	1,410	1,250	1,580	2,150	1,330	770	670	645
28	690	1,470	920	890	1,490	1,250	1,670	1,950	1,330	770	670	620
29	630	1,310	2,300	890	-------	1,330	1,850	1,850	1,250	770	670	620
30	600	1,230	3,450	860	-------	1,330	1,850	1,850	1,250	770	670	620
31	600	-------	2,560	860	-------	1,330	-------	1,850	-------	770	670	-------

Monthly discharge of Rogue River below Prospect, Oreg., for the year ending Sept. 30, 1921

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	850	432	603	37,100
November	2,630	455	1,040	61,900
December	3,450	630	989	60,800
January	2,890	860	1,350	83,000
February	2,450	860	1,400	77,800
March	1,850	1,250	1,500	92,200
April	2,050	1,250	1,560	92,800
May	2,250	1,410	1,780	109,000
June	2,050	1,250	1,650	98,200
July	1,250	770	932	57,300
August	745	670	698	42,900
September	890	620	657	39,100
The year	3,450	432	1,180	852,000

Combined monthly discharge of Rogue River and California-Oregon Power Co.'s flume near Prospect, Oreg., for the year ending Sept. 30, 1921

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	1,010	602	774	47,600
November	2,810	625	1,210	72,000
December	3,630	794	1,160	71,300
January	3,060	1,020	1,510	92,800
February	2,610	1,020	1,560	86,600
March	2,020	1,410	1,660	102,000
April	2,230	1,410	1,720	102,000
May	2,410	1,580	1,950	120,000
June	2,210	1,410	1,810	108,000
July	1,410	940	1,100	67,600
August	915	840	868	53,400
September	1,070	797	834	49,600
The year	3,630	602	1,340	973,000

ROGUE RIVER NEAR TOLO, OREG.

LOCATION.—In sec. 18, T. 36 S., R. 2 W., at Raygold railroad station, just below Gold Ray dam and power house of California-Oregon Power Co., half a mile below mouth of Bear Creek, 1½ miles below Tolo, Jackson County, and 7 miles above Gold Hill.

DRAINAGE AREA.—2,020 square miles.

RECORDS AVAILABLE.—August 30, 1905, to September 30, 1921.

GAGE.—Friez water-stage recorder referred to vertical staff bolted to concrete pier of bridge near right bank. Gage inspected by James Robins.

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

CHANNEL AND CONTROL.—Bed composed of rock and boulders; practically permanent. One channel at all stages.

EXTREMES OF DISCHARGE.—Maximum stage during year from water-stage recorder, 10.52 feet at 1 p. m. December 30 (discharge, 24,400 second-feet); minimum stage due to sudden decrease in power load, 0.28 foot, at 2 p. m. September 3 (discharge, 830 second-feet).

1905–1921: Maximum stage recorded, 20.00 feet at 7.30 a. m. November 23, 1909 (discharge, estimated by extension of rating curve at 60,000 second-feet); minimum stage indeterminate, as water went below intake pipe of well (gage height, 0.20 foot) practically every night during low water of 1918 (discharge probably 400 second-feet or less).

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

DIVERSIONS.—A large area of land is irrigated from Rogue River and its tributaries.

REGULATION.—Discharge is influenced by changes of load on power plant just above station.

ACCURACY.—Stage-discharge relation changed during high water December 30. Rating curves fairly well defined. Operation of water-stage recorder satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height obtained by inspecting recorder graph. Records fair.

Discharge measurements of Rogue River near Tolo, Oreg., during the year ending Sept. 30, 1921

[Made by K. N. Phillips]

Date	Gage height	Discharge
	Feet	*Sec.-ft.*
July 10	1.80	2,270
Sept. 24	1.10	1,530

Daily discharge, in second-feet, of Rogue River near Tolo, Oreg., for the year ending Sept. 30, 1921

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	1,260	1,460	3,190	9,240	4,340	5,570	4,020	5,030	5,220	3,350	1,840	1,580
2	1,360	1,460	3,640	10,600	4,180	5,390	4,180	5,030	5,220	3,280	1,780	1,580
3	1,520	1,410	3,480	17,400	4,510	5,770	4,340	4,680	5,570	3,140	1,780	1,630
4	1,520	1,360	4,780	16,800	7,040	6,380	4,340	4,340	5,870	3,000	1,780	1,630
5	1,310	1,360	4,180	18,300	8,200	7,480	4,040	4,180	5,570	3,000	1,780	1,630
6	1,220	1,360	3,640	12,000	5,390	7,960	3,780	4,340	5,390	2,930	1,730	1,630
7	1,360	1,310	3,340	8,720	4,510	7,480	3,560	4,180	5,390	2,670	1,730	1,580
8	1,310	1,310	3,480	7,040	4,680	6,600	3,560	4,180	5,220	2,540	1,730	1,580
9	1,220	1,260	3,780	6,170	11,400	5,970	3,560	4,180	5,050	2,410	1,730	1,580
10	1,220	1,260	4,680	5,210	12,900	5,570	3,560	4,180	4,880	2,410	1,730	1,580
11	1,260	1,220	9,440	4,680	10,900	5,210	4,180	4,180	4,550	2,410	1,730	1,580
12	1,310	1,260	5,990	4,680	8,980	4,680	4,180	4,510	4,390	2,410	1,680	1,580
13	1,460	1,310	5,770	5,030	11,700	4,680	4,180	4,510	4,390	2,410	1,680	1,580
14	1,410	1,340	5,030	4,680	18,300	5,390	4,020	5,210	4,230	2,290	1,680	1,580
15	2,000	1,310	3,710	4,340	11,400	4,850	3,710	5,390	4,080	2,290	1,730	1,580
16	2,000	1,580	3,260	4,020	8,720	5,570	3,640	5,390	3,930	2,230	1,680	1,580
17	1,880	8,040	3,190	4,340	7,260	5,570	3,410	6,170	3,700	2,170	1,680	1,580
18	2,060	7,160	3,410	4,850	6,380	5,970	3,560	6,170	3,560	2,170	1,680	1,580
19	2,190	7,930	3,560	5,030	5,770	5,770	3,640	5,570	3,930	2,170	1,630	1,780
20	1,880	6,600	3,260	4,510	8,980	5,390	3,860	7,960	4,080	2,120	1,630	1,950
21	1,820	4,510	2,980	3,860	14,400	5,030	4,340	7,480	3,930	2,120	1,630	1,730
22	1,820	4,180	3,190	3,560	8,720	5,030	5,210	6,600	3,780	2,060	1,630	1,680
23	1,880	3,680	3,120	3,410	6,820	4,850	5,770	6,380	3,860	2,000	1,630	1,680
24	1,820	3,340	4,180	3,340	6,170	5,570	5,390	6,380	3,700	2,000	1,630	1,630
25	1,940	2,910	4,180	3,340	5,970	5,210	5,030	6,380	3,630	2,000	1,630	1,630
26	1,940	7,790	4,020	3,190	5,770	4,850	5,210	6,380	3,490	1,950	1,630	1,630
27	1,880	9,750	3,640	3,120	5,570	4,510	4,850	6,380	3,490	1,950	1,630	1,630
28	1,760	5,390	3,890	3,340	5,770	4,180	4,850	5,770	3,420	1,950	1,630	1,580
29	1,760	4,180	9,400	3,410	-------	4,020	5,210	5,770	3,350	1,900	1,630	1,580
30	1,640	3,560	19,300	5,210	-------	4,020	5,210	5,390	3,350	1,900	1,630	1,580
31	1,580	-------	14,700	4,180	-------	4,020	-------	5,390	-------	1,840	1,580	-------

Monthly discharge of Rogue River near Tolo, Oreg., for the year ending Sept. 30, 1921

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	2,190	1,220	1,630	100,000
November	9,750	1,220	3,350	199,000
December	19,300	2,980	5,080	312,000
January	18,300	3,120	6,370	392,000
February	18,300	4,180	8,030	446,000
March	7,960	4,020	5,440	334,000
April	5,770	3,410	4,280	255,000
May	7,960	4,180	5,410	334,000
June	5,870	3,350	4,340	258,000
July	3,350	1,840	2,360	145,000
August	1,840	1,580	1,690	104,000
September	1,950	1,580	1,620	96,400
The year	19,300	1,220	4,110	2,980,000

CALIFORNIA-OREGON POWER CO.'S FLUME NEAR PROSPECT, OREG.

LOCATION.—In sec. 6, T. 33 S., R. 3 E., at lower end of power flume just above forebay, 2 miles below Prospect, Jackson County.

RECORDS AVAILABLE.—August 1, 1913, to September 30, 1921.

GAGE.—Vertical staff in stilling box on right side of flume, 500 feet above forebay, used after August 17, 1915. Gage 1 mile above forebay used August 1, 1913, to August 16, 1915.

DISCHARGE MEASUREMENTS.—Made from collar of flume.

CHANNEL AND CONTROL.—Wooden flume at the end of which there is a free fall into the forebay.

EXTREMES OF DISCHARGE.—Maximum stage recorded, 2.6 feet December 29 and February 9 (discharge, 198 second-feet); flume dry May 8.

1913–1921: Maximum stage recorded, 2.7 feet April 25, 26, 30, May 1, 2, 1916, and December 12, 1919 (discharge, 212 second-feet). Flume dry at times.

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

ACCURACY.—Stage-discharge relation practically permanent. Rating curve fairly well defined. Gage read to half-tenths once a day. Daily discharge ascertained by applying daily gage height to rating table. Records good.

The California-Oregon Power Co.'s flume diverts water from Rogue River in SE. ¼ sec. 30, T. 32 S., R. 3 E., and delivers it to the power plant in NW. ¼ sec. 6, T. 33 S., R. 3 E., where a head of about 500 feet is obtained.

The following discharge measurement was made by K. N. Phillips:

September 27, 1921: Gage height, 2.45 feet; discharge, 166 second-feet.

Daily discharge, in second-feet, of California-Oregon Power Co.'s flume near Prospect, Oreg., for the year ending Sept. 30, 1921.

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	170	170	170	170	164	164	164	164	170	164	170	177
2	170	170	177	170	164	164	164	170	170	164	170	177
3	170	170	170	170	164	164	164	170	164	164	170	177
4	164	170	170	150	164	170	157	170	157	164	170	177
5	164	170	170	170	164	164	164	170	157	164	170	177
6	157	170	170	164	164	164	157	170	164	164	170	177
7	164	170	170	164	164	164	164	170	164	164	170	177
8	170	170	170	157	164	164	164	0	164	164	170	177
9	170	170	170	157	198	164	164	138	164	164	170	177
10	170	170	170	157	164	164	164	170	164	164	170	177
11	170	170	170	157	170	164	170	164	164	164	170	177
12	184	170	170	164	164	164	164	164	144	164	170	177
13	170	170	170	164	164	164	164	164	157	164	170	177
14	184	170	164	164	164	170	170	164	157	164	170	177
15	164	170	170	164	170	164	164	157	157	170	170	177
16	164	177	177	164	170	170	170	164	150	170	170	177
17	170	177	177	157	164	164	170	164	150	164	170	177
18	184	177	177	164	164	164	170	164	150	170	170	177
19	177	177	177	164	164	164	170	164	157	170	170	177
20	170	177	177	164	164	164	177	170	157	170	170	177
21	170	184	177	157	170	164	170	170	157	170	170	177
22	170	177	164	164	164	164	177	170	157	170	170	184
23	170	177	164	164	164	164	170	170	164	170	170	177
24	170	170	170	164	164	164	157	170	164	170	170	177
25	177	170	170	164	164	164	170	164	164	170	170	177
26	177	184	170	164	170	164	170	164	164	170	170	170
27	177	184	170	164	164	164	170	164	164	170	170	177
28	170	184	177	164	164	164	170	164	164	170	170	177
29	170	184	198	164	-------	164	170	164	157	170	170	177
30	170	170	184	164	-------	164	170	170	170	170	170	177
31	170	-------	157	164	-------	164	-------	170	-------	170	177	-------

Monthly discharge of California-Oregon Power Co.'s flume near Prospect, Oreg., for the year ending Sept. 30, 1921

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	184	157	171	10,500
November	184	170	174	10,400
December	198	157	172	10,600
January	170	150	163	10,000
February	198	164	166	9,220
March	170	164	165	10,100
April	177	157	167	9,940
May	170	0	160	9,840
June	170	144	160	9,520
July	170	164	167	10,300
August	177	170	170	10,500
September	184	170	177	10,500
The year	198	0	168	121,000

SOUTH FORK OF BIG BUTTE CREEK NEAR BUTTE FALLS, OREG.

LOCATION.—In SE. ¼ sec. 11, T. 35 S., R. 2 E., at covered highway bridge 1 mile above Butte Falls, Jackson County, and 2 miles above junction of North and South forks.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—September 20, 1910, to October 5, 1911; August 5 to October 10, 1915; October 31, 1917, to September 30, 1921.

GAGE.—Vertical staff on pier near left bank; read by C. W. Jackson.

DISCHARGE MEASUREMENTS.—Made by wading; flood measurements can be made from bridge.

CHANNEL AND CONTROL.—Bed composed of rock and gravel; may shift.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 3.4 feet at 7 a. m. February 21 (discharge, 1,480 second-feet); minimum stage recorded 1.30 feet October 3–12 and November 1–15 (discharge, 93 second-feet).

1910–11; 1915; 1918–1921: Maximum stage recorded, that of February 21, 1921; minimum stage recorded, 1.2 feet August 29, 1920 (discharge, 83 second-feet).

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

DIVERSIONS.—A canal diverts water above the station for use in the State fish hatchery; its discharge, 4.0 second-feet, measured on September 25, 1919, remains practically steady. A small amount of land is irrigated above this station.

REGULATION.—None.

ACCURACY.—Stage-discharge relation practically permanent. Rating curve well defined below 300 second-feet; poorly defined above. Gage read to hundredths once a day. Daily discharge ascertained by applying daily gage height to rating table. Records good for discharges below 300 second-feet and fair for discharges above 300 second-feet.

Discharge measurements of South Fork of Big Butte Creek near Butte Falls, Oreg., during the year ending Sept. 30, 1921

[Made by K. N. Phillips]

Date	Gage height	Discharge
	Feet	*Sec.-ft.*
July 15	1.56	144
Sept. 26	1.50	122

Daily discharge, in second-feet, of South Fork of Big Butte Creek near Butte Falls, Oreg., for the year ending Sept. 30, 1921

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	95	93	178	650	269	535	269	344	235	154	130	124
2	95	93	188	850	303	500	279	294	235	154	130	124
3	93	93	164	1,280	318	500	294	269	235	148	130	124
4	93	93	188	1,180	465	570	279	256	256	148	127	124
5	93	93	164	1,380	500	650	269	248	248	148	127	124
6	93	93	161	900	370	770	261	248	227	142	124	124
7	93	93	161	810	344	730	248	240	227	136	124	124
8	93	93	164	650	344	730	240	227	219	130	124	124
9	93	93	157	570	1,080	690	235	227	219	130	124	124
10	93	93	157	430	1,080	610	227	219	208	130	124	124
11	93	93	370	370	990	570	248	219	208	133	124	124
12	93	93	227	370	810	500	256	219	208	133	124	124
13	98	93	308	370	850	500	256	219	208	130	124	124
14	98	93	235	370	990	430	248	227	188	130	124	124
15	104	93	192	318	900	400	235	227	188	142	124	124
16	104	100	192	318	690	370	227	248	188	142	124	124
17	114	318	188	344	690	370	227	318	181	142	124	124
18	114	208	227	400	610	650	227	269	188	136	124	124
19	114	227	212	400	507	570	227	294	188	136	124	130
20	104	196	200	344	730	500	227	430	181	136	124	127
21	164	164	188	318	1,380	436	248	370	171	136	124	124
22	102	181	208	269	810	400	318	370	171	136	124	124
23	98	154	212	269	730	370	318	370	171	136	124	124
24	98	130	318	269	690	344	294	318	154	136	124	124
25	98	139	310	256	650	318	318	318	154	136	124	124
26	98	370	269	248	650	318	294	308	154	133	124	124
27	98	318	269	269	570	303	269	294	148	130	124	124
28	98	248	284	261	570	294	269	269	148	130	124	124
29	98	219	400	235	-------	279	294	318	148	130	124	124
30	98	188	1,080	265	-------	269	294	269	161	130	124	124
31	98	-------	576	248	-------	269	-------	261	-------	130	124	-------

Monthly discharge of South Fork of Big Butte Creek near Butte Falls, Oreg., for the year ending Sept. 30, 1921

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	114	93	98.6	6,060
November	370	93	152	9,040
December	1,080	157	263	16,200
January	1,380	235	491	30,200
February	1,380	269	675	37,500
March	770	269	475	29,200
April	318	227	263	15,600
May	430	219	281	17,300
June	256	148	194	11,500
July	154	130	137	8,420
August	130	124	125	7,690
September	130	124	124	7,380
The year	1,380	93	271	196,000

SOUTH FORK OF LITTLE BUTTE CREEK NEAR LAKE CREEK, OREG.

LOCATION.—In NW. ¼ sec. 33, T. 36 S., R. 2 E., one-fourth mile above intake of Rogue River Valley Canal Co.'s South Fork canal and 1½ miles southeast of Lake Creek, Jackson County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—April 29 to September 30, 1921. At station in sec. 11, T. 37 S., R. 2 E., 5 miles above Lake Creek post office, November 26, 1910, to April 19, 1913.

GAGE.—Lietz 8-day recorder on left bank. Inspected by employees of Rogue River Valley Canal Co.

CHANNEL AND CONTROL.—Bed composed of gravel and small boulders; probably somewhat shifting in floods.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period, April 29 to September 30, 1921, 3.58 feet May 17 (discharge, 1,070 second-feet); minimum stage recorded, 1.20 feet August 31 and September 10, (discharge, 19 second-feet).

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

DIVERSIONS.—Several hundred acres irrigated in small tracts above the station.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent. Rating curve fairly well defined below 600 second-feet. Staff gage read once daily April 29 to June 16; water-stage recorder operated satisfactorily June 17 to September 30. Discharge ascertained by applying to rating table daily gage height or mean daily gage height determined by inspection of recorder graph. Records good.

Discharge measurements of South Fork of Little Butte Creek near Lake Creek, Oreg., during the period Apr. 15 to Sept. 30, 1921

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Apr. 15	LeTourneux[a] and Scheffel[a]	2.18	239	July 13	K. N. Phillips	1.39	37.8
May 9	do	2.34	269	7	LeTourneux and Scheffel	1.43	41.5
19	do	2.66	438	Aug. 12	F. S. Scheffel	1.28	27.6
June 13	do	1.93	135	Sept. 23	K. N. Phillips	1.26	22.8
24	do	1.65	67				

[a] Employee of Rogue River Valley Canal Co.

Daily discharge, in second-feet, of South Fork of Little Butte Creek near Lake Creek, Oreg., for the period Apr. 29, to Sept. 30, 1921

Day	Apr.	May	June	July	Aug.	Sept.	Day	Apr.	May	June	July	Aug.	Sept.
1		410	315	56	28	21	16		325	133	34	25	21
2		388	296	51	28	21	17		1,070	115	34	25	21
3		366	325	51	27	24	18		477	108	33	25	24
4		345	296	48	25	23	19		432	98	34	24	25
5		315	269	46	25	22	20		836	93	34	24	25
6		345	243	44	25	21	21		738	85	33	25	24
7		315	226	42	25	21	22		597	79	31	25	24
8		305	210	38	25	21	23		537	73	28	25	24
9		296	184	39	25	21	24		501	72	29	25	24
10		305	168	39	24	21	25		477	69	29	25	23
11		296	155	39	24	21	26		465	65	27	23	23
12		305	143	38	24	21	27		443	59	26	22	22
13		269	133	36	25	21	28		388	58	25	21	23
14		296	122	35	25	21	29	399	443	58	27	21	23
15		305	133	35	25	21	30	410	356	59	27	21	23
							31		345		25	21	

Monthly discharge of South Fork of Little Butte Creek near Lake Creek, Oreg., for the period May 1 to Sept. 30, 1921

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
May	1,070	269	429	26,400
June	325	58	148	8,810
July	56	25	35.9	2,210
August	28	21	24.4	1,500
September	25	21	22.3	1,330
The period				40,200

LITTLE BUTTE CREEK ABOVE EAGLE POINT, OREG.

LOCATION.—In NW. ¼ sec. 5, T. 36 S., R. 1 E., at Bieberstedt's ranch, half a mile above intake of Eagle Point ditch and 3 miles east of Eagle Point, Jackson County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—April 24, 1916, to September 30, 1921. Station at Tronson ranch, below intake of Eagle Point ditch, was maintained July 13, 1907, to April 30, 1916.

GAGE.—Vertical staff on right bank; read by Carl Bieberstedt. A staff gage one-fourth mile below was used April 24, 1916, to February 9, 1920.

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

CHANNEL AND CONTROL.—Bedrock overlain on one side by firm gravel, practically permanent. Control for old station was diversion dam of Eagle Point ditch which changed occasionally.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 8.9 feet during night of January 4 (discharge, 4,420 second-feet); minimum stage recorded, 0.74 foot October 5 (discharge, 43 second-feet).

1916–1921: Maximum stage recorded, 11.3 feet at lower station January 12, 1918 (discharge, 6,200 second-feet); minimum stage recorded, 1.50 feet at lower station July 28 and August 1 and 21, 1918 (discharge, 10 second-feet). The flood of 1884 is said to have reached a stage of about 15 feet.

ICE.—Stage-discharge relation apparently unaffected by ice.

DIVERSIONS.—The Rogue River Valley canal diverts water above station, the record at Bradshaw drop showing about the quantity carried past the gage; also, the municipal water-supply (about 7.5 second-feet) for Medford is taken out above. Several hundred acres are irrigated along the creek above the station. The Eagle Point canal diverts just below this station, but above the old station at Tronson's ranch; for records see p. 157.

REGULATION.—Water was being stored in Fish Lake reservoir during May and released during July, August, and September; see record of stage of reservoir, p. 151.

ACCURACY.—Stage-discharge relation practically permanent during year. Rating curve well defined below 2,500 second-feet. Gage read to hundredths twice a day. Discharge ascertained by applying mean daily gage height to rating table. Records good.

Discharge measurements of Little Butte Creek above Eagle Point, Oreg., 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. 6	R. C. Briggs	1.56	219	June 15	J. E. LeTourneux	1.63	219
Apr. 15	J. E. LeTourneux [a]	1.91	335	30	do	1.14	125
May 10	do	2.12	380	July 13	K. N. Phillips	1.02	80
20	do	5.25	2,060	Aug. 13	F. S. Scheffel [a]	.96	75.0
June 3	do	2.29	458	Sept. 23	K. N. Phillips	1.01	83

[a] Employee of Rogue River Valley Canal Co.

Daily discharge, in second-feet, of Little Butte Creek above Eagle Point, Oreg., for the year ending Sept. 30, 1921

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	46	65	201	640	534	486	324	494	460	107	84	60
2	46	66	263	1,480	534	483	350	483	452	107	86	77
3	46	65	214	1,580	490	526	374	445	452	107	84	86
4	46	65	684	1,830	1,200	640	357	423	415	100	82	92
5	45	70	260	2,150	1,010	778	340	412	374	98	82	96
6	48	66	220	1,120	506	1,040	327	456	353	94	78	98
7	48	63	220	957	467	904	311	415	330	88	73	94
8	46	65	245	684	575	754	298	398	304	88	75	94
9	46	62	231	640	1,470	684	298	388	276	88	70	94
10	46	63	214	434	1,340	596	301	381	254	80	66	90
11	47	63	984	405	1,170	530	340	384	237	82	75	88
12	59	66	374	445	1,010	479	353	391	214	77	68	86
13	56	66	988	618	1,460	467	374	394	198	78	70	82
14	54	63	388	514	1,830	596	357	394	195	78	72	78
15	102	63	263	464	1,340	445	340	412	209	77	72	77
16	88	66	251	449	1,040	522	324	464	209	77	68	73
17	88	1,060	231	554	904	475	317	1,120	185	72	66	75
18	123	320	260	596	754	662	340	802	182	78	68	75
19	128	434	237	730	640	596	340	707	198	90	66	94
20	98	304	217	534	1,520	486	324	1,700	167	90	98	86
21		217	195	398	1,230	449	350	1,170	150	92	68	80
22	90	228	301	357	778	441	430	904	140	92	73	80
23		162	273	314	640	426	449	778	128	88	72	78
24		167	353	343	575	398	449	730	116	88	68	66
25	82	160	279	330	534	394	518	662	116	88	62	68
26	75	1,370	266	301	506	357	486	618	112	88	65	70
27	73	596	251	357	494	334	438	575	112	90	65	68
28	72	343	254	320	510	317	430	534	107	82	62	73
29	72	263	426	288	------	317	486	640	105	84	63	70
30	72	228	1,620	827	------	307	479	596	112	82	65	68
31	68	------	802	490	------	311	------	502	------	86	59	------

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

Monthly discharge of Little Butte Creek above Eagle Point, Oreg., for the year ending Sept. 30, 1921

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	128	45	70.3	4,320
November	1,370	62	230	13,700
December	1,620	195	386	23,700
January	2,150	288	682	41,900
February	1,830	467	895	49,700
March	1,040	307	522	32,100
April	518	298	373	22,200
May	1,700	381	603	37,100
June	460	105	229	13,600
July	107	72	87.6	5,390
August	86	59	70.8	4,350
September	98	60	80.5	4,790
The year	2,150	45	349	253,000

FISH LAKE RESERVOIR NEAR LAKE CREEK, OREG.

LOCATION.—At dam of Fish Lake reservoir, in SW. ¼ sec. 3 T. 37 S., R. 4 E., 18 miles east of Lake Creek, Jackson County.

RECORDS AVAILABLE.—December 8, 1915, to September 30, 1921.

GAGE.—Vertical staff fixed to gate tower, graduated in feet and inches; read by George Compton. Zero of gage, 4,799 feet above mean sea level and about 2 feet below normal level of Fish Lake.

EXTREMES OF STAGE.—Maximum stage recorded during year, 13.70 feet at 9 a. m. May 17 (storage, 2,786 acre-feet). Water drawn down practically to normal lake level October 1 to noon February 18, when gage read 1.75 feet; gates closed at noon February 18.

COOPERATION.—Gage readings and storage table furnished by Rogue River Valley Canal Co.

Gage readings on Fish Lake reservoir near Lake Creek, Oreg., used in correcting observed flow of North Fork of Little Butte Creek below dam for the year ending Sept. 30, 1921

Date	Gage height (feet)	Storage [a] (acre-feet)	Loss or gain during month (acre-feet)
Jan. 31		0	0
Feb. 28	6.82	887	+887
Mar. 31	12.18	2,328	+1,441
Apr. 30	13.48	2,719	+391
May 31	13.04	2,584	−135
June 30	13.32	2,670	+86
July 31	10.95	1,969	−701
Aug. 31	6.10	719	−1,250
Sept. 30	3.20	219	−500

NORTH FORK OF LITTLE BUTTE CREEK AT FISH LAKE, NEAR LAKE CREEK, OREG.

LOCATION.—In SW. ¼ sec. 3, T. 37 S., R. 4 E., at outlet of Fish Lake, 18 miles east of Lake Creek post office, Jackson County.

DRAINAGE AREA.—15 square miles.

RECORDS AVAILABLE.—October 21, 1914, to July 20, 1915; June 11, to November 5, 1916; and May 26, 1917, to September 30, 1921.

GAGE.—Lietz water-stage recorder about one-fourth mile below dam, installed July 10, 1918. Vertical staff just above wasteway in temporary dam, 1914–15; vertical staff at location of present recorder, June, 1916, to July 10, 1918. Gage reader, E. W. Frey.

DISCHARGE MEASUREMENTS.—Made by wading.

CHANNEL AND CONTROL.—Bed composed of gravel and boulders, fairly permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 2.10 feet at 4 p. m. May 17 (discharge, 108 second-feet); minimum stage recorded, 0.24 foot February 19 (discharge, 5.8 second-feet).

1914–1921: Maximum stage recorded, that of May 17, 1921; minimum discharge 3 second-feet April 17, 1920 (gage height, 0.4 foot).

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

DIVERSIONS.—None.

REGULATION.—Discharge is controlled by reservoir dam at outlet of Fish Lake one-fourth mile above; a record has been kept of the height of water in reservoir and monthly run-off corrected.

ACCURACY.—Stage-discharge relation affected by beaver dam until November 20; permanent thereafter except when affected by ice, December 17–22 and January 7–11. Rating curve well defined between 25 and 100 second-feet. Staff gage read to hundredths once a day, except when water-stage recorder was operating satisfactorily. Daily discharge ascertained by shifting-control method and by directly applying to the rating table the daily gage height or the mean daily gage height determined by inspecting recorder-graph. Records for period prior to November 21 poor; after that date, good.

COOPERATION.—Gage-height records and part of measurements furnished by Rogue River Valley Canal Co.

Discharge measurements of North Fork of Little Butte Creek at Fish Lake, near Lake Creek, Oreg., 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. 31	H. D. Powell [a]	1.62	19.0	Aug. 1	J. E. LeTourneux [b]	1.79	83
July 11	Phillips and Scheffel [b]	1.57	63	31	Summers [b]	1.72	76
11	do	1.57	66	Sept. 27	Scheffel and Compton [b]	1.39	54.7

[a] Engineer, Medford Irrigation District.
[b] Employee, Rogue River Valley Canal Co.

Daily discharge, in second-feet, of North Fork of Little Butte Creek at Fish Lake, near Lake Creek, Oreg., for the year ending Sept. 30, 1921

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	16	21	30	36	30	8.6	16	64	85	68	83	83
2	16	21	32	37	30	6.4	16	64	83	68	83	91
3	17	21	32	37	31	7.1	16	64	79	68	83	99
4	17	20	31	42	32	7.8	16	64	76	68	83	99
5	17	21	30	45	30	12	17	64	72	68	79	95
6	19	28	30	42	30	14	17	68	72	68	79	91
7	20	25	30		30	13	17	68	72	68	79	91
8	19	25	30		31	14	17	68	72	68	75	83
9	18	26	30		39	14	20	68	72	68	79	79
10	19	26	29	40	38	10	31	68	72	68	79	79
11	16	31	30		37	7.0	45	68	72	68	79	72
12	21	31	29	45	37	7.0	45	68	72	64	75	72
13	21	31	30	39	39	7.4	45	72	72	64	75	64
14	20	30	28	36	38	7.2	48	75	72	64	75	64
15	24	29	28	34	37	7.4	48	75	72	64	75	61
16	20	34	28	34	38	7.8	48	79	72	68	72	54
17	20	36		34	36	8.4	48	95	72	68	72	51
18	26	37		34	20	8.8	45	108	72	79	72	51
19	27	36		34	5.8	8.6	48	104	72	91	72	51
20	26	34	29	34	6.0	8.4	48	104	68	95	75	51
21	18	32		33	7.0	9.0	48	87	68	91	79	51
22	23	33		33	7.4	10	48	83	68	91	79	51
23	17	31	32	32	7.4	10	48	79	68	87	79	51
24	17	36	33	32	8.2	10	54	83	68	87	79	58
25	16	33	34	32	9.8	10	58	83	68	87	79	58
26	16	35	34	30	11	10	61	83	68	87	75	58
27	15	34	32	30	13	10	61	83	68	87	75	58
28	15	34	34	31	18	11	61	83	68	83	75	54
29	16	32	35	31	-------	12	64	83	68	83	75	42
30	21	30	35	32	-------	16	64	87	68	83	79	42
31	18	-------	34	31	-------	16	-------	85	-------	83	75	-------

NOTE.—Stage-discharge relation affected by ice Dec. 17–22 and Jan. 7–11; discharge estimated. Gage not read Mar. 3; discharge interpolated.

Monthly discharge of North Fork of Little Butte Creek at Fish Lake, near Lake Creek, Oreg., for the year ending Sept. 30, 1921

Month	Discharge in second-feet			Run-off in acre-feet		
	Maximum	Minimum	Mean	Observed	Stored	Without storage
October	27	15	19.0	1,170	0	1,170
November	37	20	29.8	1,770	0	1,770
December	35	28	30.8	1,890	0	1,890
January	45	30	35.8	2,200	0	2,200
February	39	5.8	25.7	1,430	+887	2,320
March	16	6.4	9.96	612	+1,441	2,050
April	64	16	40.6	2,420	+391	2,810
May	108	64	78.3	4,820	−135	4,680
June	85	68	71.7	4,270	+86	4,360
July	95	64	75.9	4,670	−701	3,970
August	83	72	77.2	4,750	−1,250	3,500
September	99	42	66.8	3,950	−500	3,450
The year	108	5.8	46.9	34,000	+219	34,200

NORTH FORK OF LITTLE BUTTE CREEK NEAR LAKE CREEK, OREG.

LOCATION.—In sec. 21, T. 36 S., R. 2 E., one-eighth mile above intake of Rogue River Valley canal and 1 mile above Lake Creek post office, Jackson County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—April 20 to October 13, 1916; May 7, 1917, to September 30, 1919; and April 13 to September 30, 1921. Station above city intake, about 3 miles above, September 10, 1911, to March 31, 1913 (gives results slightly greater than present station).

GAGE.—Stevens 8-day recorder on right bank inspected by employees of Rogue River Valley Canal Co.

DISCHARGE MEASUREMENTS.—Made by wading near gage.

CHANNEL AND CONTROL.—Bed composed of boulders and gravel; fairly permanent except in extreme floods.

EXTREMES OF DISCHARGE.—Maximum discharge during period April 13 to September 30, 1921, from water-stage recorder, 4.08 feet at 2 a. m. May 17 (discharge, estimated from extension of rating curve, 1,100 second-feet); minimum stage from recorder, 0.92 foot at 6 p. m. September 23 (discharge, 40 second-feet).

1916–1919 and 1921: Maximum stage from high-water marks, 6.02 feet January 12, 1918 (discharge not computed); minimum stage, 0.80 foot December 17, 1918 (discharge, 16 second-feet).

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

DIVERSIONS.—Pipe line for water supply of city of Medford, capacity about 7.5 second-feet, carries water past the gage. Several hundred acres irrigated above station.

REGULATION.—Water was stored in Fish Lake reservoir, 15 miles above station on which a gage-height record has been kept (see p. 151 for record of storage).

ACCURACY.—Stage-discharge relation permanent. Rating curve fairly well defined below 400 second feet. Operation of recorder satisfactory. Discharge ascertained by applying to rating table mean daily gage heights determined by inspecting recorder graph. Records good.

Discharge measurements of North Fork of Little Butte Creek near Lake Creek, Oreg., during period Apr. 13 to Sept. 30, 1921

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Apr. 13	LeTourneux[a] and Scheffel[a]	1.36	106	July 13	K. N. Phillips	1.31	88
May 7	do	1.49	138	Aug. 6	Summers[a] and Scheffel	1.39	107
19	do	1.85	228	10	do	1.36	100
June 15	do	1.45	111	Sept. 23	K. N. Phillips	1.10	53.4

[a] Employee, Rogue River Valley Canal Co.

Daily discharge, in second-feet, of North Fork of Little Butte Creek near Lake Creek, Oreg., for the period Apr. 13 to Sept. 30, 1921

Day	Apr.	May	June	July	Aug.	Sept.	Day	Apr.	May	June	July	Aug.	Sept.
1	------	153	186	105	117	92	16	107	358	127	94	96	71
2	------	155	180	110	114	114	17	112	560	122	101	96	69
3	------	150	188	107	129	127	18	114	273	127	112	96	76
4	------	148	158	107	114	127	19	114	276	127	127	94	83
5	------	153	145	103	114	124	20	105	502	114	135	94	76
6	------	148	135	103	105	117	21	107	361	114	130	103	74
7	------	142	137	103	105	117	22	122	286	110	132	103	72
8	------	140	137	101	101	114	23	127	250	107	122	99	61
9	------	137	137	99	99	110	24	127	238	112	124	94	64
10	------	137	122	98	99	99	25	145	220	105	120	90	65
11	------	135	124	94	94	94	26	145	208	103	120	92	62
12	------	122	122	94	96	88	27	142	197	103	117	94	57
13	107	127	124	92	96	83	28	142	203	103	112	94	71
14	107	135	120	92	101	83	29	142	229	107	112	99	66
15	107	127	127	96	99	79	30	145	200	107	114	99	68
							31	------	194	------	117	90	------

Monthly discharge of North Fork of Little Butte Creek near Lake Creek, Oreg., for the period Apr. 13 to Sept. 30, 1921

Month	Discharge in second-feet			Run-off in acre-feet		
	Maximum	Minimum	Mean	Observed	Stored	Without storage
April 13-30	145	105	123	4,400	+80	4,480
May	560	122	215	13,200	−135	13,100
June	186	103	128	7,620	+86	7,710
July	135	92	109	6,700	−701	6,000
August	120	90	100	6,150	−1,250	4,900
September	127	61	86.8	5,160	−500	4,660
The period				43,200	+2,420	40,800

ROGUE RIVER VALLEY CANAL NEAR BROWNSBORO, OREG.

LOCATION.—In SW. ¼ sec. 8, T. 36 S., R. 1 E., at head of Bradshaw drop, 2 miles southwest of Brownsboro, 8 miles below intake, and 16 miles from Medford, Jackson County.

RECORDS AVAILABLE.—Irrigation seasons of 1913; 1915 to 1919; and 1921.

GAGE.—Stevens' 8-day water-stage recorder after April 24, 1918, referred to old vertical staff at head of drop, installed June 5, 1916. Former gages were a few feet upstream.

DISCHARGE MEASUREMENTS.—Made by wading or from a plank.

CHANNEL AND CONTROL.—Bed composed of solid rock at head of drop; practically permanent.

EXTREMES OF DISCHARGE.—Maximum stage during period April 26 to September 30, 1920, from water-stage recorder, 2.18 feet at noon July 28 (discharge, 43 second-feet); canal dry up to about April 23.

1913–1921: Maximum stage recorded, 2.23 feet May 15, 1919 (discharge, 46 second-feet). Canal dry each winter.

ACCURACY.—Stage-discharge relation practically permanent. Rating curve well defined. Operation of recorder satisfactory except for short periods when it was allowed to run down. Daily discharge ascertained by applying to rating table mean daily gage heights obtained by inspecting the recorder graph. Records excellent except for estimated periods, for which they are fair.

The Rogue River Valley canal diverts water from North Fork of Little Butte Creek in SE. ¼ sec. 22, T. 36 S., R. 2 E., to irrigate land lying in the basin of Bear Creek. Any seepage or return water from irrigation of about 300 acres above this point reaches Little Butte Creek above the station above Eagle Point.

Discharge measurements of Rogue River Valley canal near Brownsboro, Oreg., during the period Apr. 26 to Sept. 30, 1921

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Apr. 29	J. E. LeTourneux [a]	1.54	16.2	June 22	J. E. LeTourneux [a]	2.03	35.7
May 10	do	1.53	16.0	July 1	do	1.96	32.2
27	do	2.06	40.1	Aug. 12	F. S. Scheffel [a]	2.14	40.7
June 13	do	2.09	38.3	Sept. 10	do	1.88	29.5

[a] Employee, Rogue River Valley Canal Co.

Daily discharge, in second-feet, of Rogue River Valley canal near Brownsboro, Oreg., for the period Apr. 26 to Sept. 30, 1921

Day	Apr.	May	June	July	Aug.	Sept.	Day	Apr.	May	June	July	Aug.	Sept.
1		17	34	32	38	38	16		34	36	40	40	27
2		18	19	32	38	38	17		34	36	40	40	26
3		17	38	32	39	40	18		15	36	40	40	25
4		17	38	36	39	40	19		17	38	40	40	24
5		16	34	36	39	38	20		36	36	40	38	25
6		19	33	36	39	30	21		25	36	40	38	25
7		17	34	36	40	29	22		20	34	40	40	26
8		17	38	36	40	28	23		18	34	40	40	25
9		15	36	34	40	27	24		19	32	40	38	20
10		15	36	38	40	28	25		28	34	40	38	
11		15	36	38	40	28	26	9.5	28	32	40	40	
12		13	38	40	40	28	27	14	36	31	38	38	22
13		12	36	40	40	26	28	15	36	30	40	38	
14		30	36	40	40	27	29	15	38	29	38	38	
15		32	36	40	40	27	30	16	36	32	38	38	
							31		36		38	38	

NOTE.—Braced figures show estimated mean discharge for periods indicated. Practically no water diverted Oct. 1 to Apr. 25. Discharge interpolated May 7, 8, July 16, 17, 23, 24, 30, 31, and Aug. 1–11.

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Monthly discharge of Rogue River Valley canal near Brownsboro, Oreg., for the period Apr. 26 to Sept. 30, 1921

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
April 26-30	16	9.5	13.9	138
May	38	12	23.4	1,440
June	38	19	34.3	2,040
July	40	32	38.0	2,340
August	40	38	39.2	2,410
September	40	20	27.6	1,640
The period				10,000

EAGLE POINT CANAL NEAR EAGLE POINT, OREG.

LOCATION.—In SE. ¼ sec. 31, T. 35 S., R. 1 W., halfway between point of diversion and point where canal crosses Eagle Point-Brownsboro road, 100 feet above intake of Pelouze lateral, and about 2½ miles east of Eagle Point, Jackson County.

RECORDS AVAILABLE.—May 9 to October 31, 1920, and June 15 to September 30, 1921.

GAGE.—Vertical staff fixed to an alder tree on left bank; read by Carl Bieberstedt.

CHANNEL AND CONTROL.—Artificial earth channel; banks high and uniform; no definite control; regulation of head gate of Pelouze lateral may change stage-discharge relation.

EXTREMES OF DISCHARGE.—Maximum discharge recorded during period ending September 30, 26 second-feet July 7 and 9 (gage height, 1.78 feet). Canal dry at times in winter.

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

DIVERSION.—None.

REGULATION.—Flow in canal regulated by head gates.

ACCURACY.—Stage-discharge relation unstable owing to regulation of Pelouze lateral head gates. Rating curves well defined for October 1–19 and April 25 to June 29; indirect shifting-control method used beginning July 1. Gage read to hundredths three times a week. Discharge ascertained by applying daily gage height to rating table. Records fair.

Canal diverts water from Little Butte Creek, in sec. 1, T. 36 S., R. 1 E.; water is used for irrigation near Eagle Point.

Discharge measurements of Eagle Point canal near Eagle Point, Oreg., 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. 6	R. C. Briggs	0.72	2.9	June 29	J. E. LeTourneux	1.66	24.9
Apr. 25	J. E. LeTourneux[a]	.66	2.4	Aug. 13	F. S. Scheffel	1.78	20.8
May 10	do	1.45	16.7	23	do	1.78	20.3
June 15	F. S. Scheffel[a]	1.72	25.7	Sept. 23	K. N. Phillips	1.72	18.2

[a] Employee, Rogue River Valley Canal Co.

Daily discharge, in second-feet, of Eagle Point canal near Eagle Point, Oreg., for the year ending Sept. 30, 1921

Day	Oct.	Dec.	Apr.	May	June	July	Aug	Sept.
1	12					21		17
2							21	
3	12					21		18
4							21	
5	12					21		18
6		2.9					21	
7	12					26		17
8							21	
9	12					26		17
10				16			20	
11	12					23		17
12							20	
13	13					23	20	17
14							20	
15	13				26	23		16
16							20	
17	13					23		19
18							20	
19	8					24		19
20							20	
21	6					23		18
22							20	
23	6					23	20	18
24							20	
25	6		2.4			23		17
26							20	
27	5				23	23		17
28							20	
29	5				23	23		17
30							19	
31	5					23		

NOTE.—Daily discharge Oct. 21–31 estimated from last gage reading on Oct. 17. Some water was probably diverted all winter; no record obtained.

Monthly discharge of Eagle Point canal near Eagle Point, Oreg., for the year ending Sept. 30, 1921

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	13	5	9.50	584
June			* 24.0	1,430
July	26	21	23.1	1,420
August	21	19	20.2	1,240
September	19	17	17.5	1,040

*Estimated.

EMIGRANT CREEK NEAR ASHLAND, OREG.

LOCATION.—In SE. ¼ sec. 20, T. 39 S., R. 2 E., 200 feet above bridge on Ashland-Johnson Prairie road, 300 feet below Emigrant Gap reservoir site, and 11 miles by road above Ashland, Jackson County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—January 27 to June 30, 1920, and November 23, 1920, to July 15, 1921.

GAGE.—Stevens 8-day water-stage recorder on left bank, with inside and outside staff gages.

DISCHARGE MEASUREMENTS.—Made by wading or from downstream side of highway bridge.

CHANNEL AND CONTROL.—Bed composed of gravel; channel fairly straight. Control is gravel bar 25 feet below gage; fairly permanent.

EXTREMES OF DISCHARGE.—Maximum stage during the year, from water-stage recorder, 7.65 feet February 13 (clock stopped; discharge, 900 second-feet). Stream bed reported dry up to November 22 and after about August 1.

1920–21: Maximum stage, that of February 13, 1921.

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

DIVERSIONS.—Station is above practically all diversions in Rogue River valley.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined. Operation of water-stage recorder satisfactory except for few short periods in January and February. Daily discharge ascertained by applying to rating table mean daily gage height obtained by inspecting recorder graph except for days of considerable variation, for which the mean of hourly discharges was used. Records excellent except for November, January, and February, for which they are fair.

Discharge measurements of Emigrant Creek near Ashland, Oreg., during the year ending Sept. 30, 1921

Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*
Dec. 7	R. C. Briggs	4.23	20.4
Feb. 24	Boyden [a] and Robison [a]	5.36	163
Apr. 11	Dillard [b] and Robison	4.66	53
May 21	do	5.65	220

[a] Employee, Talent Irrigation District. [b] Chief engineer, Talent Irrigation District.

Daily discharge, in second-feet, of Emigrant Creek near Ashland, Oreg., for the year ending Sept. 30, 1921

Day	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July
1		24	112	78	145	74	63	38	7.5
2		37	165	82	163	78	66	35	7.3
3		28	187	86	187	82	62	49	7.0
4		41	221	109	220	76	54	45	6.5
5		32	252	119	249	68	58	37	5.6
6		27	167	88	269	62	92	33	5.1
7		22	131	86	220	57	83	31	4.3
8		24	104	111	181	54	68	29	4.0
9		36	86	254	158	55	63	27	3.8
10		109	64	260	140	58	59	25	3.8
11		187	52	230	124	58	58	24	3.6
12		64	52	210	109	56	55	22	3.1
13		77	64	289	115	56	53	21	2.4
14		47	70	640	115	55	48	19	2.0
15		37	77	380	100	50	45	20	2.0
16		34	90	250	95	47	46	20	
17		36	168	177	95	47	109	18	
18		58	156	156	88	50	134	18	
19		49	117	141	101	48	141	20	
20		38	89	289	94	46	240	18	
21		33	71	220	86	53	249	16	
22		34	68	195	82	54	179	14	
23	12	33	65	182	84	56	145	12	
24	18	48	63	173	114	56	119	10	
25		43	60	162	106	68	98	9.9	
26		37	57	154	95	71	83	9.9	
27		42	54	152	86	63	70	9.3	
28		48	51	150	80	64	58	8.4	
29		94	91		80	63	55	8.2	
30	38	200	116		74	61	47	8.1	
31		152	86		72		42		

NOTE.—Stream reported dry Oct. 1 to Nov. 22 and from about Aug. 1 to Sept. 30. No record Nov. 25–29, Jan. 11, 12, 22–26, Feb. 14–16, and 21–23; discharge estimated by comparison with records for Bear Creek at Medford and from maximum and minimum stages indicated by recorder while clock stopped.

Monthly discharge of Emigrant Creek near Ashland, Oreg., for the year ending Sept. 30, 1921

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
November 23-30			[a] 90.0	1,430
December	200	22	57.1	3,510
January	252	51	103	6,330
February	[a] 640	78	194	10,800
March	269	72	127	7,810
April	82	46	59.5	3,540
May	249	42	88.5	5,440
June	49	8.1	21.8	1,300
July 1-15	7.5	2.0	4.53	135
The period				40,300

[a] Estimated.

BEAR CREEK AT MEDFORD, OREG.

LOCATION.—In NW. ¼ sec. 30, T. 37 S., R. 1 W., just above Main Street Bridge in Medford, Jackson County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—March 13, 1915, to September 30, 1921; with some breaks during low-water periods.

GAGE.—Leitz water-stage recorder on left bank beginning September 20, 1918. Vertical staff prior to that date, with datum 1 foot lower. Gage read by H. P. Powell.

DISCHARGE MEASUREMENTS.—Made from bridge or by wading.

CHANNEL AND CONTROL.—Bed composed of loose gravel. A concrete sewer passing under stream forms a partial control.

EXTREMES OF DISCHARGE.—Maximum stage during year from water-stage recorder, 5.80 feet at 5 a. m. February 14 (discharge, 1,710 second-feet); minimum stage from recorder, 0.53 foot August 9 and 10 (discharge, 1.2 second-feet).

1915–1921: Maximum stage determined from high-water marks 6.8 feet in forenoon of February 9, 1919 (discharge, estimated from extension of rating curve, 2,400 second-feet); stream bed dry at times.

ICE.—No ice during year.

DIVERSIONS.—A large area is irrigated above the station.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed during September, date assumed as September 19. Rating curves fairly well defined. Operation of water-stage recorder satisfactory except for first quarter when record is fragmentary. Daily discharge ascertained by applying to rating table mean daily gage height determined by inspecting the gage-height graph. Records good, except for estimated periods for which they are fair.

Discharge measurements of Bear Creek at Medford, Oreg., 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. 7	R. C. Briggs	1.30	65	July 2	J. E. LeTourneux	1.08	33.4
May 4	J. E. LeTourneux [a]	2.07	195	9	LeTourneux and Phillips	.86	15.7
18	do	2.58	351	9	J. E. LeTourneux	.86	15.9
26	do	2.31	262	Aug. 11	F. S. Scheffel [a]	.54	1.3
June 11	do	1.83	126	Sept. 24	K. N. Phillips	.80	7.8

[a] Employee, Rogue River Valley Canal Co.

Daily discharge, in second-feet, of Bear Creek at Medford, Oreg., for the year ending Sept. 30, 1921

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept
1				240	207	399	211	208	211	35	2.1	1.8
2				307	183	410	214	216	205	32	2.0	1.8
3				482	207	441	225	206	214	31	1.8	2.5
4			70	482	197	463	219	197	234	32	2.0	4.4
5		10		930	317	576	205	188	199	32	1.4	5.1
6				519	231	614	194	249	183	22	2.0	4.4
7			56	375	199	519	186	243	178	17	1.4	4.4
8			58	297	252	434	178	216	170	13	1.4	4.7
9			63	252	519	385	178	202	159	14	1.2	5.7
10			98	208	633	357	175	197	146	11	1.2	5.1
11	6	8.9	320	183	576	330	180	188	131	13	1.4	3.8
12		10	146	183	463	307	180	183	125	7.3	2.1	4.1
13		10	157	191	690	307	183	178	116	5.4	2.5	3.8
14		11	142	197	1,210	340	180	173	104	5.7	2.0	3.8
15		10	96	186	790	310	173	216	102	9.4	2.5	3.8
16		17	82	191	633	301	166	310	101	9.4	2.3	3.1
17		196	85	231	500	297	176	313	93	10	2.0	3.8
18		120	101	333	456	313	186	310	76	7.8	2.5	3.8
19		131	106	279	399	310	173	340	82	5.4	2.8	3.8
20			95	231	660	297	166	500	74	3.8	2.3	5.2
21		100	85	180	940	273	168	576	64	3.1	2.1	6.1
22	10		99	168	595	267	183	406	54	2.8	2.1	7.3
23	11		104	148	519	252	186	310	47	2.8	2.1	5.2
24	10		112	144	500	273	197	310	42	2.8	2.0	7.8
25	10	44	104	140	463	267	216	304	41	4.1	2.0	6.9
26	10	261	93	135	434	246	255	275	39	3.5	2.1	5.7
27	8.9	307	98	130	424	225	219	255	39	3.8	2.1	5.2
28	8.9	200	107	125	420	219	216	240	36	3.8	2.5	4.1
29	8.9	150	188	131	-------	216	219	267	33	3.5	2.3	3.8
30	10	100	500	320	-------	211	208	243	38	3.1	2.1	3.2
31	10	-------	350	261	-------	211	-------	228	-------	3.1	2.1	-------

NOTE.—Discharge estimated by comparison with flow of Emigrant and Little Butte creeks, and maximum indicated by recorder Oct. 1–21, Oct. 30 to Nov. 18, Nov. 20–24, Nov. 28 to Dec. 6, Dec. 11, 12, 25, 26, Jan. 25–28, Feb. 20 and 21. Discharge interpolated Apr. 17, May 3, 4, 12, and 13.

Monthly discharge of Bear Creek at Medford, Oreg., for the year ending Sept. 30, 1921

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	11	----------	7.22	444
November	307	----------	72.5	4,310
December	500	----------	125	7,690
January	930	125	264	16,200
February	1,210	183	486	27,000
March	614	211	334	20,500
April	255	166	194	11,500
May	576	173	266	16,400
June	234	33	111	6,600
July	35	2.8	11.4	701
August	2.8	1.2	2.01	124
September	7.8	1.8	4.47	266
The year	1,210	1.2	154	112,000

TALENT LATERAL NEAR ASHLAND, OREG.

LOCATION.—In SW. ¼ sec. 33, T. 38 S., R. 1 E., at intake, one-fourth mile above mouth of Ashland Creek and half a mile east of Ashland, Jackson County.

RECORDS AVAILABLE.—Irrigation periods of 1920 and 1921.

GAGE.—Vertical staff read by employee of Talent Irrigation District.

DISCHARGE MEASUREMENTS.—Made by wading near gage.

CHANNEL AND CONTROL.—Channel excavated in earth and gravel; shifts slightly owing to growth of aquatic plants.

ACCURACY.—Stage-discharge relation permanent for June; that for July changed constantly owing to growth of moss. Rating curve fairly well defined. Gage read once a day. Daily discharge ascertained by applying daily gage height to rating table, either directly or by shifting-control method. Records fair.

Canal diverts water from the east bank of Bear Creek, in SW. ¼ sec. 33, T. 38 S., R. 1 E. Water is carried across Ashland Creek in a flume and used to irrigate land on the west side of creek near Talent and Phoenix. Water is diverted only during periods of considerable run-off. Return water finds its way back into Bear Creek or into the Phoenix ditch.

Discharge measurements of Talent lateral near Ashland, Oreg., during the period June 3 to July 17, 1921

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
June 4	Le Tourneux[a] and Scheffel[a]	0.94	3.9	June 28	Le Tourneux and Scheffel	1.65	13.8
4	do	.94	3.8	July 9	do	1.47	9.0
18	do	1.80	15.2	9	K. N. Phillips	1.47	9.2

[a] Employee, Rogue River Valley Canal Co.

Daily discharge, in second-feet, of Talent lateral near Ashland, Oreg., for the period June 3 to July 17, 1921

Day	June	July	Day	June	July	Day	June	July
1		13	11	8.0	8.6	21	19	
2		11	12	8.0	6.4	22	20	
3	2.7	11	13	13	6.2	23	20	
4	4.4	13	14	16	5.5	24	20	
5	4.0	11	15	16	4.9	25	17	
6	4.0	11	16	16	3.9	26	16	
7	4.0	11	17	16	2.9	27	16	
8	4.0	9.7	18	16		28	15	
9	6.8	9.6	19	16		29	14	
10	8.0	8.7	20	18		30	14	
						31		

NOTE.—Water diverted June 3 to July 17, inclusive.

Monthly discharge of Talent lateral near Ashland, Oreg., for the period June 3 to July 17, 1921

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
June 3–30	20	2.7	12.6	700
July 1–17	13	2.9	8.67	292
The period				992

PHOENIX DITCH AT TALENT, OREG.

LOCATION.—In NW. ¼ sec. 23, T. 38 S., R. 1 W., 80 feet below intake, one-fourth mile below an old bridge across Bear Creek and half a mile north of Talent, Jackson County.

RECORDS AVAILABLE.—April 19, 1916, to September 10, 1921.

GAGE.—Stevens 8-day water-stage recorder on right bank referred to vertical staff on left of flume. Gage inspected by employees of Rogue River Valley Canal Co.

DISCHARGE MEASUREMENTS.—Made from collar of flume.

CHANNEL AND CONTROL.—Flume extends only a few feet below gage; no well-defined control.

EXTREMES OF DISCHARGE.—Maximum stage during period May 2 to September 10, 1921, from water-stage recorder, 3.14 feet at 10 a. m. May 28 (discharge, 48 second-feet).

1916–1921: Maximum discharge recorded, that of May 28, 1921.

ACCURACY.—Stage-discharge relation permanent to about June 8, and continually changing to about August 1, owing to growth of moss and flat gradient of canal. Rating curve used to June 8, well defined. Method of shifting control used thereafter. Water-stage recorder successfully operated throughout irrigation season. Daily discharge ascertained by applying to rating table, either directly or by shifting-control method, the mean daily gage height determined by inspecting recorder graph. Record good May 1 to June 8, poor thereafter.

The Phoenix ditch diverts water from Bear Creek in the NW. ¼ sec. 23, T. 38 S., R. 1 W., for irrigating about 1,000 acres of land between Medford and Talent.

Discharge measurements of Phoenix ditch at Talent, Oreg., during the period May 2 to Sept. 10, 1921

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
May 3	J. E. Le Tourneux [a]	1.33	8.6	May 28	J. E. Le Tourneux	3.14	48.2
23	do	1.30	8.1	June 28	do	2.30	16.2
28	do	2.40	26.6	Aug. 11	F. S. Scheffel [a]	1.48	1.6

[a] Employee, Rogue River Valley Canal Co.

Daily discharge, in second-feet, of Phoenix ditch at Talent, Oreg., for the period May 2 to Sept. 10, 1921

Day	May	June	July	Aug.	Sept.	Day	May	June	July	Aug.	Sept.
1	-------	9.2	16	2	2	16	7.8	12	9	2	-------
2	8.3	9.1	16	2	2	17	9.6	12	8	2	-------
3	8.5	9.3	15	2	2	18	9.5	12	8	2	-------
4	8.2	9.7	15	2	1	19	9.6	13	8	2	-------
5	8.2	9.8	14	2	1	20	11	16	6	2	-------
6	8.8	9.7	13	2	1	21	9.5	18	6	2	-------
7	8.6	9.8	11	2	1	22	8.9	18	5	2	-------
8	8.2	9.7	16	2	1	23	8.3	18	5	2	-------
9	8.0	9.3	19	1	1	24	8.0	17	3	2	-------
10	8.0	12	20	1	1	25	8.0	17	3	2	-------
11	8.0	16	17	2	-------	26	7.7	17	4	2	-------
12	7.8	14	15	2	-------	27	7.6	17	2	2	-------
13	7.7	8.3	17	2	-------	28	13	16	2	2	-------
14	7.7	13	14	2	-------	29	9.4	16	2	2	-------
15	7.7	13	10	2	-------	30	9.4	14	2	2	-------
						31	9.3	-------	2	2	-------

NOTE.—Discharge, May 10 and 12, interpolated.

Monthly discharge of Phoenix ditch at Talent, Oreg., for the period May 2 to Sept. 10, 1921

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
May 2–31	13	7.6	8.68	516
June	18	8.3	13.2	786
July	20	2	9.77	601
August	2	1	1.94	119
September 1–10	2	1	1.3	26
The period				2,040

COQUILLE RIVER BASIN

SOUTH FORK OF COQUILLE RIVER AT POWERS, OREG.

LOCATION.—In SW. ¼ sec. 13, T. 31 S., R. 12 W., 1,000 feet below Salmon Creek, 200 feet above Bingham Creek, and one-fourth mile due west of Powers post office, Coos County, present terminus of Marshfield branch of Southern Pacific Railroad.

DRAINAGE AREA.—168 square miles (measured on topographic map and on Douglas County Abstract Co.'s map.)

RECORDS AVAILABLE.—September 4, 1916, to September 30, 1921.

GAGE.—Inclined staff in three sections on left bank under footbridge. Gage read by Ray Brown.

DISCHARGE MEASUREMENTS.—Made by wading or from footbridge.

CHANNEL AND CONTROL.—Bed composed of gravel and solid rock; shifts during floods.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 11 feet at 2 p. m. February 20 (discharge, 10,100 second-feet); minimum stage recorded, 2.48 feet September 15–17 (discharge, 28 second-feet).

1916–1921: Maximum stage recorded, 13.0 feet at 3 p. m. January 17, 1919 (discharge, 12,000 second-feet); minimum discharge, 18 second-feet September 26, 28, October 1–4 and 24–26, 1918.

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

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation practically permanent during year. Rating curve well defined. Gage read once a day to tenths during high water and three times a week to hundredths during low water. Discharge ascertained by applying daily gage height to rating table. Records good except those for October and September, which are fair.

Discharge measurements of South Fork of Coquille River at Powers, Oreg., 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	K. N. Phillips	7.13	3,130	Jan. 23	Ray Brown	4.85	826
Jan. 1	do	6.58	2,260	Feb. 20	do	11.00	10,100
2	do	6.50	2,190	23	do	6.10	1,670
2	do	7.19	3,180	25	do	5.40	1,170
3	do	7.52	3,710	July 6	Phillips and Brown	2.95	76.6
5	Ray Brown	9.57	7,310	7	K. N. Phillips	2.93	76.8
5	do	8.60	5,380	Sept. 2	Ray Brown	2.53	31.4
15	do	5.70	1,370	20	do	3.30	118
21	do	5.30	1,130				

Daily discharge, in second-feet, of South Fork of Coquille River at Powers, Oreg., for the year ending Sept. 30, 1921

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Sept.
1	430	270	1,100	2,350	2,350	770	710	830	205	106	------
2	710	252	2,130	2,580	2,130	680	650	925	205	97	33
3	660	235	2,350	3,540	1,930	625	680	1,030	190	------	------
4	600	252	2,820	3,860	2,130	600	600	960	190	97	32
5	550	310	2,350	6,500	3,540	575	550	960	190	------	32
6	500	270	2,240	3,240	2,350	550	475	925	190	85	------
7	960	252	1,830	2,350	2,130	550	425	890	175	78	32
8	650	235	2,350	1,740	1,930	525	400	800	175	73	------
9	510	205	3,700	1,480	3,860	525	378	710	162	------	30
10	378	190	5,390	1,240	3,100	475	355	600	150	80	------
11	540	190	9,260	1,100	2,580	400	332	575	138	------	30
12	710	310	5,570	1,240	1,740	355	310	525	138	66	------
13	680	710	4,340	1,830	1,650	378	425	475	150	------	30
14	650	550	3,100	1,560	1,740	550	500	400	162	73	------
15	720	500	2,130	1,480	1,400	500	450	378	175	------	28
16	800	1,480	1,320	1,320	1,240	2,130	475	500	162	73	------
17	2,570	5,570	1,240	1,930	960	1,830	425	550	150	73	28
18	4,340	7,450	1,170	2,130	1,030	2,820	400	575	138	------	------
19	2,910	9,680	3,100	1,650	1,100	1,740	425	550	150	73	550
20	1,480	3,700	2,130	1,400	5,390	1,650	770	500	150	------	150
21	1,100	2,350	2,350	1,170	4,850	1,560	925	500	138	73	------
22	1,240	6,120	1,830	960	2,820	1,400	830	500	127	------	73
23	1,170	3,700	1,400	860	1,830	1,320	650	450	116	80	------
24	960	1,930	3,540	890	1,560	1,830	960	400	106	60	60
25	650	1,030	4,340	770	1,240	1,650	925	355	106	------	------
26	525	2,460	2,820	770	1,100	1,560	960	310	106	------	66
27	450	3,390	2,350	1,100	960	1,320	860	290	106	60	------
28	400	2,130	1,830	1,480	890	960	800	270	97	------	60
29	378	1,930	1,930	1,400	------	890	740	270	97	------	------
30	355	1,170	6,690	2,580	------	800	650	235	97	60	49
31	310	------	3,240	1,830	------	740	------	220	------	------	------

NOTE.—Gage not read during August; mean discharge estimated at 40 second-feet. Gage read three times a week during July and September.

Monthly discharge of South Fork of Coquille River at Powers, Oreg., for the year ending Sept. 30, 1921

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	4,340	310	932	57,300
November	9,680	190	1,960	117,000
December	9,260	1,100	2,970	183,000
January	6,500	770	1,880	116,000
February	5,390	890	2,130	118,000
March	2,820	355	1,040	64,000
April	960	310	601	35,800
May	1,030	220	563	34,600
June	205	97	148	8,810
July	106	60	[a] 76.9	4,730
August	------	------	[b] 40.0	2,460
September	550	28	[a] 80.2	4,770
The year	9,680	28	1,030	746,000

[a] Mean of discharges for days when gage was read. [b] Estimated.

UMPQUA RIVER BASIN

UMPQUA RIVER NEAR ELKTON, OREG.

LOCATION.—In sec. 8, T. 23 S., R. 7 W., at ferry crossing 4 miles south (by road) from Elkton, Douglas County, and 8 miles up river above Elk Creek.

DRAINAGE AREA.—3,680 square miles.

RECORDS AVAILABLE.—October 18, 1905, to December 31, 1906; May 12, 1907, to September 30, 1921.

GAGE.—Staff in five sections. Low-water section inclined, the others vertical. Datum lowered 0.52 foot September 2, 1910. Gage read by D. C. Higginbotham.

DISCHARGE MEASUREMENTS.—Made from car on ferry cable 100 feet below gage.

CHANNEL AND CONTROL.—Bed composed of gravel: somewhat shifting. Control of rock; practically permanent except as affected by growth of aquatic plants in summer.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 23.0 feet at 5 p. m. December 30 (discharge, 81,000 second-feet); minimum stage recorded, 0.30 foot August 9 to September 17 (discharge, 1,120 second-feet).

1905–1921: Maximum stage recorded, 38.5 feet (present datum) at 7 a. m. November 23, 1909 (discharge estimated from extension of rating curve, 163,000 second-feet); minimum stage recorded, 0.17 foot in August and September, 1918 (discharge, 930 second-feet).

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

DIVERSIONS.—Practically none.

REGULATION.—Practically none.

ACCURACY.—Stage-discharge relation practically permanent except as affected by growth of aquatic plants. Rating curve well defined below 40,000 second-feet. Indirect shifting control method used July 23 to September 30. Gage read twice a day to tenths. Discharge ascertained by applying mean daily gage height to rating table. Records good.

Discharge measurements of Umpqua River near Elkton, Oreg., during the year ending Sept. 30, 1921

[Made by K. N. Phillips]

Date	Gage height	Discharge
	Feet	*Sec.-ft.*
Mar. 25	6.79	13,100
Sept. 17	.32	1,140

Daily discharge, in second-feet, of Umpqua River near Elkton, Oreg., for the year ending Sept. 30, 1921

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	8,600	3,590	20,200	41,100	10,800	19,600	9,350	11,400	11,400	2,990	1,300	1,120
2	7,220	3,590	15,700	27,200	12,600	18,500	11,700	10,500	10,800	2,990	1,250	1,120
3	6,200	3,290	13,800	25,500	15,000	18,500	14,100	10,500	10,200	2,690	1,250	1,120
4	5,630	3,140	16,800	49,100	20,200	17,100	21,300	12,600	9,100	2,600	1,300	1,120
5	5,260	2,990	16,400	62,500	31,100	16,800	18,500	15,400	8,600	2,420	1,300	1,120
6	4,560	2,690	19,200	49,100	35,100	15,000	17,100	18,500	8,120	2,180	1,250	1,120
7	4,230	2,420	22,700	31,100	23,800	13,500	14,700	22,700	7,660	2,180	1,200	1,120
8	3,910	2,690	29,100	23,800	16,800	12,600	13,800	25,500	7,440	1,900	1,160	1,120
9	3,910	2,990	43,100	20,600	19,200	13,200	12,900	26,600	8,120	1,730	1,120	1,120
10	4,560	3,910	58,000	19,200	21,300	15,000	12,300	22,400	8,120	1,570	1,120	1,120
11	5,080	4,560	69,200	15,000	27,200	16,400	13,200	21,300	7,220	1,520	1,120	1,120
12	6,200	4,900	51,200	13,800	24,400	15,700	13,200	19,200	7,220	1,430	1,120	1,120
13	8,120	4,900	25,500	13,200	21,300	14,700	11,700	18,500	6,800	1,340	1,120	1,120
14	10,500	4,900	19,200	15,700	21,300	14,700	10,800	17,800	6,400	1,480	1,120	1,120
15	11,400	7,660	16,400	18,800	22,700	16,400	10,200	15,700	6,010	1,570	1,120	1,120
16	9,350	11,100	15,000	18,500	19,600	19,200	12,000	14,400	5,630	1,380	1,120	1,120
17	8,360	25,500	12,600	16,400	18,500	22,000	14,700	10,800	6,010	1,380	1,120	1,120
18	7,660	23,800	12,600	15,700	17,100	21,600	17,100	8,850	6,010	1,380	1,120	1,480
19	7,010	45,100	15,000	14,700	25,500	19,900	19,600	8,600	5,630	1,340	1,120	2,990
20	6,400	35,100	17,100	12,900	41,100	18,500	16,400	13,800	4,900	1,380	1,120	2,420
21	5,820	23,800	16,400	12,000	49,100	17,800	14,100	17,800	4,560	1,480	1,120	1,900
22	5,260	19,900	15,000	11,400	31,100	16,400	13,200	21,000	4,230	1,380	1,120	1,480
23	4,560	23,800	13,800	10,500	21,300	15,000	11,400	19,200	3,910	1,300	1,120	1,380
24	4,730	31,500	13,800	9,600	19,200	13,200	9,600	17,100	3,440	1,300	1,120	1,620
25	4,900	36,300	12,300	9,100	18,200	13,200	9,100	15,000	3,290	1,340	1,120	1,520
26	4,390	43,100	14,400	9,600	16,400	14,400	9,600	14,400	2,990	1,340	1,120	1,430
27	3,910	37,900	17,400	11,700	15,700	13,200	9,350	13,500	3,290	1,340	1,120	1,380
28	3,750	31,900	24,100	12,900	17,800	12,600	10,800	12,600	3,590	1,300	1,120	1,480
29	3,590	28,300	35,100	13,200	-------	11,400	12,600	12,000	3,290	1,300	1,120	1,380
30	3,590	24,100	62,500	12,000	-------	10,200	12,600	11,400	2,990	1,300	1,120	1,380
31	3,910	-------	60,200	11,400	-------	9,100	-------	10,800	-------	1,300	1,120	-------

Monthly discharge of Umpqua River near Elkton, Oreg., for the year ending Sept. 30 1921

[Drainage area, 3,680 square miles]

Month	Discharge in second-feet				Run-off	
	Maximum	Minimum	Mean	Per square mile	Inches	Acre-feet
October	11,400	3,590	5,890	1.60	1.84	363,000
November	45,100	2,420	16,600	4.51	5.03	988,000
December	69,200	12,300	25,600	6.96	8.02	1,570,000
January	62,500	9,100	20,200	5.49	6.33	1,240,000
February	49,100	10,800	22,600	6.14	6.39	1,260,000
March	22,000	9,100	15,700	4.27	4.92	965,000
April	21,300	9,100	13,200	3.59	4.00	786,000
May	26,600	8,600	15,800	4.29	4.95	972,000
June	11,400	2,990	6,230	1.69	1.89	371,000
July	2,990	1,300	1,680	.457	.53	103,000
August	1,300	1,120	1,150	.312	.36	70,700
September	2,990	1,120	1,360	.370	.41	80,900
The year	69,200	1,120	12,100	3.29	44.67	8,770,000

MISCELLANEOUS DISCHARGE MEASUREMENTS

Records of measurements of the flow of streams at points other than those at which gaging stations were maintained are presented in the following tables:

Miscellaneous discharge measurements in lower Columbia River and Pacific slope drainage basins in Oregon during the year ending Sept. 30, 1921

Umatilla River basin

Date	Stream	Tributary to or diverting from—	Locality	Gage height	Discharge
				Feet	*Sec.-ft.*
May 11	Stanfield drain	Umatilla River	Near outlet, at Stanfield, Oreg.	1.73	12.2
June 4	do	do	do	.62	12.2
13	do	do	do	.47	14.1
July 12	do	do	do		12.0
Sept. 20	do	do	do		6.9
May 7	Butter Creek	do	Neill ranch, in SW. ¼ sec. 14, T. 1 N., R. 27 E.	.96	57
22	do	do	do	.82	42.9
June 2	do	do	do	.27	18.4
Mar. 7	Hermiston drain	do	Near outlet, near Hermiston, Oreg.	.50	23.3
18	do	do	do	.45	21.8
Apr. 30	do	do	do	.90	32.8
May 12	do	do	do	1.12	39.6
June 1	do	do	do	1.35	43.0
7	do	do	do	1.59	51
15	do	do	do	1.60	51
July 12	do	do	do	1.85	60
22	do	do	do	1.84	60
Aug. 29	do	do	do	2.16	70

Deschutes River basin

Date	Stream	Tributary to or diverting from—	Locality	Gage height	Discharge
				Feet	*Sec.-ft.*
Oct. 27	Spring River	Deschutes River	100 feet above mouth near Harper, Oreg.		142
June 9	Morson canal	Diverts from East Fork.	Intake near Lapine, Oreg.		37.0
July 1	do	do	do		10.0
Oct. 27	Squaw Creek canal	Diverts from Squaw Creek.	Discontinued gaging station near Sisters, Oreg.	0.98	48.6
27	do	do	do	.79	32.8
May 6	do	do	do	1.08	51
31	do	do	do	1.28	74
Sept. 3	do	do	do	1.11	55
May 17	Bear Creek	Crooked River	Carlin ranch, sec. 2, T. 19 S., R. 17 E., Oreg.	.81	12.6
17	do	do	do	1.45	46.8
17	do	do	do	1.44	48.0
19	do	do	do	1.14	43.8
Nov. 5	Ochoco Creek	do	Discontinued gaging station above Mill Creek, near Prineville, Oreg.	.64	4.2
Apr. 4	do	do	do	2.56	213
July 2	do	do	do	.98	22.5
Mar. 4	McKay Creek	Ochoco Creek	Discontinued gaging station near Prineville, Oreg.	3.02	228
Apr. 4	do	do	do	2.02	82
30	do	do	do	1.53	36.5

Hood River basin

				Feet	*Sec.-ft.*
June 24	Dead Point Creek	Hood River	Road crossing, near Dee, Oreg.		5.6

Herman Creek basin

				Feet	*Sec.-ft.*
June 21	Herman Creek	Columbia River	Above power flume intake, near Cascade Locks, Oreg.	1.10	57
Aug. 24	do	do	do	66	20.1
Mar. 2	Columbia River Light & Power Co.'s flume.	Diverts from Herman Creek.	Intake, near Cascade Locks, Oreg.		22.8

Willamette River basin

				Feet	*Sec.-ft.*
May 24	Horse Creek	McKenzie River	Near McKenzie Bridge, Oreg., in sec. 11, T. 16 S., R. 6 E.		972
Sept. 16	do	do	do		327
Oct. 11	Cazadero power flume.	Divert from Clackamas River.	Near Cazadero, Oreg., about half a mile below dam.		1,700
Mar. 16	Balch Creek	Willamette River	Near St. Helens road, Portland, Oreg.		[a] 84

[a] Maximum stage of day about 0.7 foot higher; crest discharge estimated at about 120 second-feet.

Rogue River basin

Date	Stream	Tributary to or diverting from—	Locality	Gage height	Discharge
				Feet	*Sec.-ft.*
Apr. 29	Rogue River Valley canal.	Diverts from North Fork of Little Butte Creek.	Discontinued gaging station in sec. 20, T. 36 S., R. 2 E., near Lake Creek, Oreg.	1.40	18.8
May 10	do	do	do	1.39	19.1
27	do	do	do	2.01	42.8
June 13	do	do	do	2.19	44.8
22	do	do	do	2.23	40.8
July 1	do	do	do	2.44	43.1
8	do	do	do	2.63	44.7
Aug. 10	do	do	do	2.33	57.4
23	do	do	do	2.19	50.0
Sept. 10	do	do	do	1.92	30.6
23	do	do	do	1.79	22.4
May 31	Antelope Creek	Little Butte Creek	Near crossing of Medford irrigation district canal in sec. 31, T. 36 S., R. 1 E., Oreg.		18.5
Apr. 19	Emigrant Creek	Bear Creek	Above Walker Creek near Ashland, Oreg.	1.63	45.3
May 3	do	do	do	1.77	60
13	do	do	do	1.69	51
13	do	do	do	1.69	47.9
18	do	do	do	2.19	119
25	do	do	do	2.00	92
June 11	do	do	do	1.20	19.9
28	do	do	do	1.00	6.1
May 3	Bear Creek	Rogue River	Discontinued gaging station in sec. 23, T. 38 S., R. 1 W., at Talent, Oreg.	2.81	184
13	do	do	do	2.78	166
21	do	do	do	3.86	582
28	do	do	do	3.06	247
June 11	do	do	do	2.72	120
18	do	do	do	2.40	78
28	do	do	do	2.11	43
July 1	do	do	do	1.87	26
9	do	do	do	1.86	24
Aug. 11	do	do	do	1.15	2.9
Apr. 25	do	do	Central Point, Oreg.	2.30	206
May 4	do	do	do	2.23	187
18	do	do	do	2.91	403
June 11	do	do	do	2.05	128
July 2	do	do	do	1.40	30.9
Aug. 11	do	do	do	.90	2.1
May 24	Griffin Creek	Bear Creek	Phoenix canal crossing near Medford, Oreg.		1.4
24	Jackson Creek	do	Phoenix canal crossing near Jacksonville, Oreg.		

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