DEPARTMENT OF THE INTERIOR
Hubert Work, Secretary

U. S. GEOLOGICAL SURVEY
George Otis Smith, Director

Water-Supply Paper 574

SURFACE WATER SUPPLY OF THE UNITED STATES

1923

PART XII. NORTH PACIFIC SLOPE DRAINAGE BASINS

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

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CONTENTS

ILLUSTRATIONS

SURFACE WATER SUPPLY OF LOWER COLUMBIA RIVER AND PACIFIC SLOPE DRAINAGE BASINS IN OREGON, 1923

AUTHORIZATION AND SCOPE OF WORK

This volume is one of a series of 14 reports presenting records of measurements of flow made on streams in the United States during the year ending September 30, 1923.

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 appropriation bills passed by Congress have carried the following item:

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

Annual appropriations for the fiscal years ending June 30, 1895–1924

1895	$12,500.00
1896	20,000.00
1897 to 1900, inclusive	50,000.00
1901 to 1902, inclusive	100,000.00
1903 to 1906, inclusive	200,000.00
1907	150,000.00
1908 to 1910, inclusive	100,000.00
1911 to 1917, inclusive	150,000.00
1918	175,000.00
1919	148,244.10
1920	175,000.00
1921 to 1923, inclusive	180,000.00
1924	170,000.00

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 5.

Measurements of stream flow have been made at about 5,600 points in the United States and also at many points in Alaska and the Hawaiian Islands. In July, 1923, 1,590 gaging stations were being maintained by the Survey and the cooperating organizations. Many miscellaneous discharge measurements were made at other points. In connection with this work data were also collected in regard to precipitation, evaporation, storage reservoirs, river profiles, and water power in many sections of the country and will be made available in 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, acre-feet, and millions of cubic feet. They may be defined as follows:

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

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

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

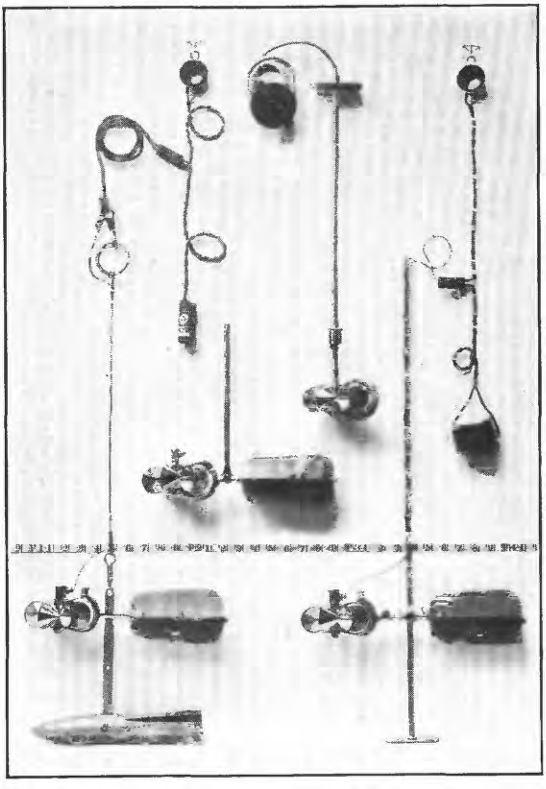
An "acre-foot," equivalent to 43,560 cubic feet, is the quantity required to cover an acre to the depth of 1 foot. The term is commonly used in connection with storage for irrigation.

The following terms not in common use are here defined:

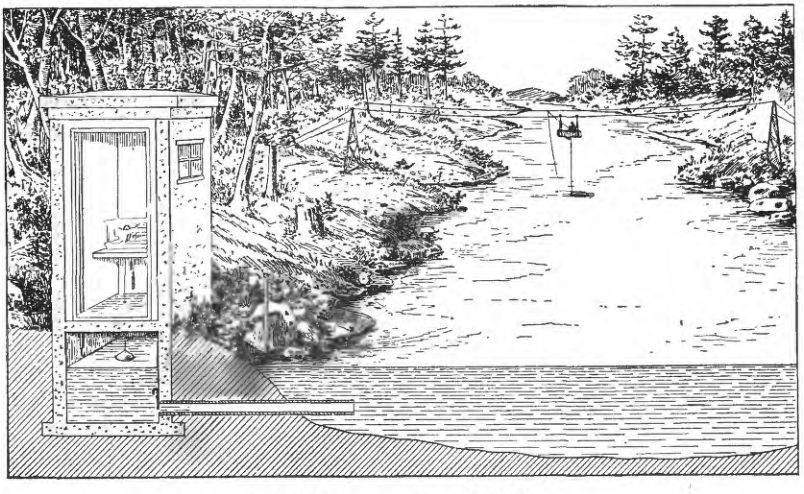
"Stage-discharge relation," an abbreviation for the term "relation of gage height to discharge."

"Control," a term used to designate the section or sections of the stream channel 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.

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.

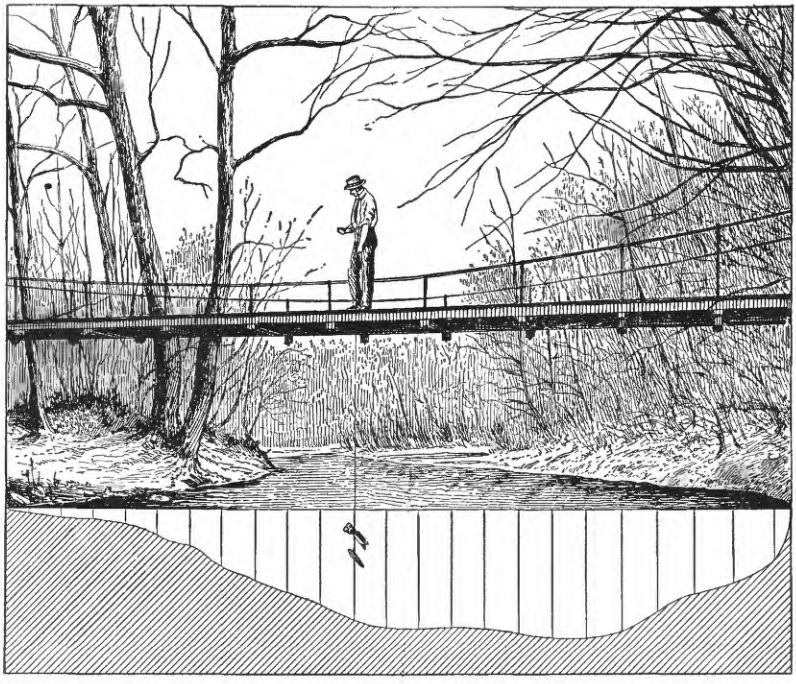


A. PRICE CURRENT METERS



B. TYPICAL GAGING STATION

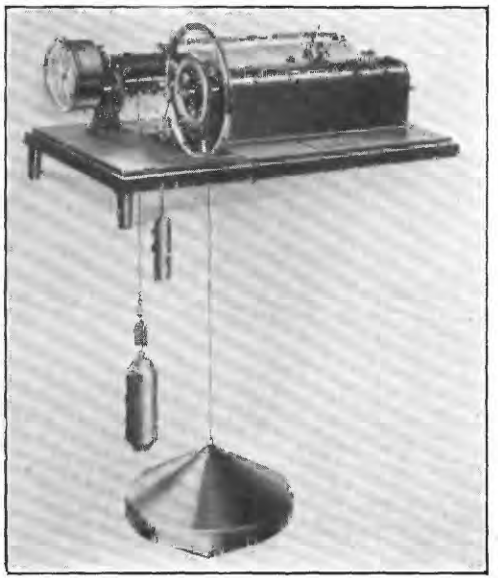
A



B

TYPICAL GAGING STATIONS

A, For wading measurement; *B*, for bridge measurement



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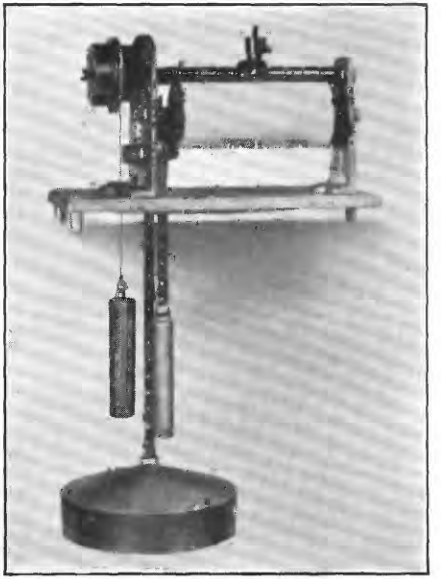

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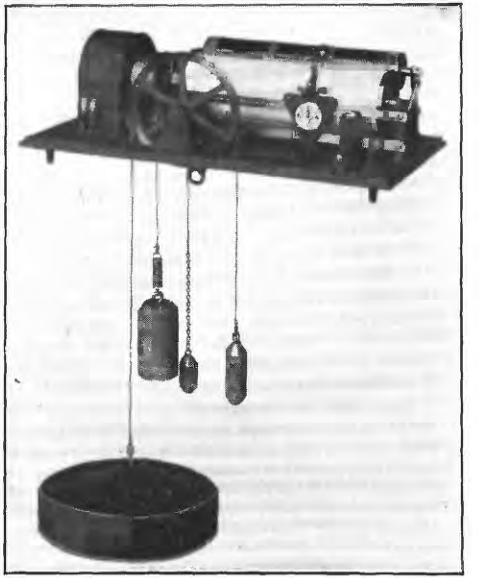

C

WATER-STAGE RECORDERS

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

EXPLANATION OF DATA

The data presented in this report cover the year beginning October 1, 1922, and ending September 30, 1923. 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 by the general methods outlined in standard textbooks on the measurement of river discharge. (See Pls. I–III.)

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 discharge from which the monthly and yearly mean discharge is determined.

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

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

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

The table of daily discharge gives, in general, the discharge in second-feet corresponding to the means of the gage heights read each day. At stations on streams subject to sudden or rapid diurnal fluctuation the discharge obtained from the rating table and the mean daily gage 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 use of the discharge integrator, an instrument operating on the principle of the planimeter and containing as an essential element the rating curve of the station.

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

ACCURACY OF FIELD DATA AND COMPUTED RESULTS

The accuracy of steam-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 height to the rating table to obtain the daily discharge.

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

The monthly means for any station may represent with high accuracy the quantity of water flowing past the gage, but the figures showing discharge per square mile and depth in inches may be subject to gross errors caused by the inclusion of large noncontributing districts in the measured drainage area, by lack of information concerning water diverted for irrigation or other use, or by inability to interpret the effect of artificial regulation of the flow of the river above the station. "Second-feet per square mile" and "Run-off in inches" are therefore not computed if such errors appear probable. The computations are also omitted for stations on streams draining areas in which the annual rainfall is less than 20 inches. All figures representing "second-feet per square mile" and "run-off in inches" published by the Survey in earlier reports should be used with caution because of possible inherent sources of error not known to the Survey.

Many gaging stations on streams in the irrigated areas of the United States are 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 be first satisfied. To give an idea of the amount of prior appropriations, a paragraph on diversions is presented in each station description. The figures given can not be considered exact but represent the best information available.

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

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.

Acknowledgment is due Percy A. Cupper and Rhea Luper, State engineers of Oregon, for the efficient manner in which they represented their State in the cooperative investigations.

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

Acknowledgments are also due the United States Weather Bureau for hydrographic and climatic data and the United States Bureau of Reclamation 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.

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 city of Portland, Deschutes County Municipal Improvement District, Teel Irrigation District, Central Oregon Irrigation District, East Fork Irrigation District, Talent Irrigation District, Medford Irrigation District, Horse Heaven Irrigation District, North Canal Co., Pacific Power & Light Co., Arnold Irrigation Co., Northwestern Electric Co., Portland Electric Power Co., North Coast Power Co., California Oregon Power Co., and Rogue River Valley Canal Co.

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, K. N. Phillips, Wendell Dawson, E. O. Hokanson, and R. J. McKinney.

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. F. Calkins, R. B. Kilgore, J. S. Gatewood, C. C. Osborne, and J. M. Rogers.

The manuscript was reviewed and assembled by H. C. Troxell.

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, Wasco County, 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, 1923. Maximum stages 1858 to 1877.

GAGE.—Vertical staff in several sections belongs to United States Weather Bureau and is attached to row of dolphins, with upper section on a warehouse. United States Engineer Corps gage at Cascade Locks, 40 miles below The Dalles attached to side of wooden fender of upper locks chamber between upper guard and lock gates. Elevation of datum of The Dalles gage, 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 were made 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 rapids at Cascade Locks, the control for both gages.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 33.8 feet June 14 and 15 (discharge, 581,000 second-feet); minimum stage recorded at Cascade Locks, —2.5 feet, December 19 (discharge, 56,000 second-feet).

1857–1923: 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 feet).

ICE.—Stage-discharge relation at The Dalles 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, except as affected by ice December 15–22 and February 16–19. Rating curve well defined. Gage

read to tenths once daily. Daily discharge ascertained by applying daily gage height to rating table. Records excellent.

COOPERATION.—Gage readings furnished by United States Weather Bureau.

No current-meter measurements made during the year.

Daily discharge, in second-feet, of Columbia River at The Dalles, Oreg., for the year ending September 30, 1923

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	98,000	78,200	69,800	90,400	79,600	78,200	129,000	223,000	418,000	505,000	234,000	150,000
2	96,000	78,200	70,400	85,000	76,800	79,600	139,000	229,000	416,000	501,000	230,000	148,000
3	95,000	78,900	71,000	89,500	74,000	81,000	148,000	220,000	412,000	489,000	229,000	145,000
4	95,000	78,900	71,600	88,600	74,000	82,600	154,000	215,000	441,000	477,000	225,000	141,000
5	94,000	78,900	69,800	85,000	73,400	81,800	163,000	209,000	447,000	469,000	220,000	141,000
6	93,100	78,900	68,600	113,000	72,200	81,000	164,000	205,000	439,000	455,000	215,000	137,000
7	92,200	79,600	68,600	148,000	71,600	82,600	164,000	211,000	439,000	437,000	208,000	135,000
8	91,300	79,600	69,800	163,000	71,600	81,800	168,000	225,000	453,000	422,000	202,000	135,000
9	91,300	79,600	70,400	145,000	71,000	80,300	173,000	243,000	471,000	412,000	192,000	135,000
10	91,300	79,600	71,000	154,000	71,000	81,000	167,000	266,000	495,000	407,000	185,000	133,000
11	94,000	79,600	68,600	158,000	71,000	81,000	165,000	292,000	518,000	394,000	178,000	131,000
12	92,200	78,900	66,200	145,000	70,400	80,300	164,000	311,000	536,000	385,000	173,000	129,000
13	91,300	78,900	62,000	131,000	70,400	79,600	163,000	327,000	560,000	374,000	169,000	126,000
14	89,500	78,900	61,400	122,000	63,800	79,600	162,000	332,000	581,000	358,000	164,000	124,000
15	87,700	78,200	60,000	114,000	61,400	78,900	164,000	322,000	581,000	347,000	156,000	122,000
16	85,900	78,200	59,000	106,000	68,400	78,900	167,000	322,000	572,000	339,000	154,000	120,000
17	85,000	79,600	58,000	107,000	67,600	78,900	168,000	327,000	560,000	328,000	153,000	117,000
18	84,200	78,900	57,000	106,000	65,300	78,200	176,000	332,000	553,000	318,000	151,000	115,000
19	82,600	77,500	56,000	103,000	67,600	77,500	192,000	339,000	551,000	308,000	149,000	113,000
20	81,800	76,800	57,200	101,000	69,800	80,300	205,000	349,000	549,000	300,000	147,000	111,000
21	81,000	77,500	59,000	99,000	68,600	83,400	213,000	365,000	545,000	297,000	144,000	109,000
22	80,300	76,100	60,200	98,000	69,200	85,000	215,000	372,000	530,000	291,000	143,000	107,000
23	79,600	74,700	78,200	96,000	70,400	85,900	208,000	374,000	524,000	281,000	153,000	105,000
24	78,900	74,000	81,000	93,100	72,800	92,200	198,000	383,000	520,000	272,000	153,000	103,000
25	79,600	73,400	82,600	92,200	77,500	86,800	187,000	394,000	520,000	264,000	153,000	101,000
26	78,900	73,400	84,200	90,400	76,800	84,200	180,000	401,000	524,000	260,000	153,000	101,000
27	78,900	72,800	85,000	88,600	76,800	84,200	181,000	414,000	524,000	254,000	151,000	101,000
28	78,200	72,200	85,900	87,700	77,500	87,700	187,000	445,000	516,000	248,000	151,000	99,000
29	78,200	71,600	83,400	86,800	-------	94,000	195,000	445,000	516,000	245,000	151,000	97,000
30	77,500	71,000	79,600	85,000	-------	103,000	211,000	433,000	511,000	243,000	153,000	95,000
31	77,500	-------	85,000	82,600	-------	116,000	-------	420,000	-------	239,000	150,000	-------

NOTE.—Gage heights taken at Cascade Locks used Dec. 15-22 and Feb. 16-19, when stage-discharge relation at The Dalles was affected by ice.

Monthly discharge of Columbia River at The Dalles, Oreg., for the year ending September 30, 1923

[Drainage area, 237,000 square miles]

Month	Discharge in second-feet				Run-off	
	Maximum	Minimum	Mean	Per square mile	Inches	Acre-feet
October	98,000	77,500	86,500	0.365	0.42	5,320,000
November	79,600	71,000	77,100	.325	.36	4,590,000
December	85,900	56,000	70,000	.295	.34	4,300,000
January	163,000	82,600	108,000	.456	.53	6,640,000
February	79,600	61,400	71,400	.301	.31	3,970,000
March	116,000	77,500	84,000	.354	.41	5,160,000
April	215,000	129,000	176,000	.743	.83	10,500,000
May	445,000	205,000	321,000	1.35	1.56	19,700,000
June	581,000	412,000	507,000	2.14	2.39	30,200,000
July	505,000	239,000	352,000	1.49	1.72	21,600,000
August	234,000	143,000	174,000	.734	.85	10,700,000
September	150,000	95,000	121,000	.511	.57	7,200,000
The year	581,000	56,000	179,000	.755	10.29	130,000,000

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 December 31, 1908; March, 17, 1918, to September 30, 1919; March 19, 1920, to September 30, 1921, and irrigation seasons 1922 and 1923.

GAGE.—Friez water-stage recorder on left bank; read by W. C. Mason.

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, and some water passes around cable to south where bank is low and brush covered; right bank high and rocky. Control 100 feet below gage; composed of gravel and small boulders; shifts at high stages.

EXTREMES OF DISCHARGE.—Maximum stage during period of record from water-stage recorder, 2.26 feet at 1 p. m. June 2 (discharge, 900 second-feet); minimum stage, 0.30 foot at 4 a. m. September 30, due to shutting down of power plant above (discharge, not computed).

1903–1908; 1918–1923: 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 stage that of September 30, 1923.

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

DIVERSIONS.—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 stations.

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

ACCURACY.—Stage-discharge relation changed during high water of June 2 and 3. Two fairly well defined rating curves used, shifting-control method used June 1–6. Operation of water-stage recorder satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height obtained by inspecting recorder graph. Records good.

COOPERATION.—Most of data obtained under direction of A. E. Perry, water master for Umatilla County.

Discharge measurements of Walla Walla River near Milton, Oreg., during the year ending September 30, 1923

Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*
Apr. 16	Canfield and Perry	1.65	510
July 18	A. E. Perry[a]	.94	126

[a] Water master, Umatilla County.

Daily discharge, in second-feet, of Walla Walla River near Milton, Oreg., for the year ending September 30, 1923

Day	Apr.	May	June	July	Aug.	Sept.	Day	Apr.	May	June	July	Aug.	Sept.
1	500	332	498	157	102	91	16	576	540	322	121	93	93
2	500	300	820	157	100	89	17	670	522	300	130	95	93
3	486	288	740	151	97	88	18	552	540	286	127	97	93
4	460	320	635	145	95	86	19	480	594	268	130	97	93
5	460	368	498	145	95	89	20	410	558	246	127	102	93
6	430	425	455	142	97	89	21	368	528	232	121	100	93
7	372	415	400	145	95	89	22	340	516	228	111	97	93
8	344		368	142	95	89	23	324	480	219	111	97	93
9	324		354	136	93	93	24	316	465	282	108	97	95
10	340	500	350	127	93	93	25	328	470	232	106	97	97
11	352		354	121	89	93	26	364	480	219	104	100	100
12	400		345	115	91	91	27	405	455	203	104	100	102
13	368		381	108	89	93	28	405	410	192	102	97	102
14	368	594	363	111	91	93	29	390	440	175	104	97	102
15	415	558	336	118	89	93	30	352	415	160	104	97	95
							31		400		104	93	

Monthly discharge of Walla Walla River near Milton, Oreg., for the year ending September 30, 1923

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
April	670	316	413	24,600
May	594	288	465	28,600
June	820	160	349	20,800
July	157	102	124	7,620
August	102	89	95.7	5,880
September	102	86	93.2	5,550
The period				93,000

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, 1921, to September 30, 1922, and January 25 to September 30, 1923. 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.—Stevens continuous water-stage recorder on right bank since March 7, 1923; prior to that date 200 feet downstream on left bank. Vertical staff on left bank used prior to October 13, 1921. Gage reader, A. E. Perry.

DISCHARGE MEASUREMENTS.—Made from cable 8 feet above gage or by wading.

CHANNEL AND CONTROL.—Channel straight 100 yards above and below gage; banks high and not subject to overflow. Control is gravel riffle 200 feet downstream, where at low stages stream is confined to narrow channel along left bank.

EXTREMES OF DISCHARGE.—Maximum stage during period from water-stage recorder, 6.7 feet at 5 a. m. on March 31 (discharge, 3,190 second-feet); minimum stage, 2.48 feet on August 17 (discharge, 23 second-feet).

1921–1923: Maximum stage, 6.6 feet April 22, 1922 (discharge, 5,400 second-feet); minimum stage, 0.12 foot August 13, 1921 (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; some small diversions are made for irrigation above station.

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

ACCURACY.—Stage-discharge relation for both gages practically permanent. Rating curves for both gages well defined. Operation of water-stage recorder satisfactory except for periods indicated in footnote to daily-discharge table. Daily discharge ascertained by applyimg to rating table mean daily gage height determined from recorder graph by inspection, except for periods of breaks in gage-height record when mean discharge was estimated from records for stations on Umatilla River above Furnish Reservoir and McKay and Birch Creeks. Records good, except for periods of no gage-height record for which they are fair.

Discharge measurements of Umatilla River above McKay Creek, near Pendleton, Oreg., during the year ending September 30, 1923

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Feb. 8	Canfield and Perry[a]	1.49	190	May 29	A. E. Perry	3.77	433
Mar. 14	A. E. Perry	3.80	498	June 10	Canfield and Perry	3.96	552
Apr. 17	Canfield and Perry	5.72	1,910	July 11	A. E. Perry	2.97	125
18	do	5.34	1,700	26	do	2.73	61
29	A. E. Perry	4.78	1,120	Aug. 18	do	2.50	25.6

[a] Water master for Umatilla County.

Daily discharge, in second-feet, of Umatilla River above McKay Creek, near Pendleton, Oreg., for the year ending September 30, 1923

Day	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1		205	880	2,240	840	476		44	34
2		202	880	2,190	742			44	32
3		189	725	2,190	664			44	32
4		184		1,930	670			46	32
5		178	630	1,830	812			44	30
6		172		1,880	1,030	820	200	44	32
7		178	688	1,680	1,070			41	30
8		193	670	1,500	1,070			40	30
9		195	628	1,360	1,190			41	30
10		200	580	1,410	1,190	580		40	26
11		210	562	1,540	1,070	550	134	38	28
12		215	514	1,680	926	538	103	35	28
13		198	509	1,500	934		97	35	29
14		180	465	1,360	861		89	34	34
15		168	443	1,410	763	740	94	30	35
16		172	492	1,680	707		101	26	35
17		180	770	2,030	688		114	23	36
18		182	989	1,680	707		106	26	35
19		193	1,070	1,460	756	550	94	30	36
20		200	1,230	1,320	721	498	86	40	36
21		218	1,070	1,110	670	465	79	41	36
22		260	910	990	628	426	75	44	40
23		428	763	950	592		70	38	43
24		750	763	950	538		70	36	44
25	345	920	854	910	514	400	67	36	50
26	300	840	1,070	982	520		63	35	56
27	312	725	1,540	1,120	492	492	58	35	55
28	291	700	2,030	1,190	448	448	55	35	55
29	270		2,360	1,150	443	410	50	34	55
30	242		2,670	990	465	382	50	35	53
31	228		2,740		454		44	34	

NOTE.—Braced figures give mean discharge for periods indicated.

Monthly discharge of Umatilla River above McKay Creek, near Pendleton, Oreg., for the year ending September 30, 1923

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
January 25–31	345	228	284	3,940
February	920	172	308	17,100
March	2,740	443	993	61,100
April	2,240	910	1,470	87,500
May	1,190	443	748	46,000
June		382	614	36,500
July		44	119	7,320
August	46	23	37.0	2,280
September	56	26	37.6	2,240
The period				264,000

UMATILLA RIVER ABOVE FURNISH RESERVOIR, NEAR YOAKUM, OREG.

LOCATION.—In NW. ¼ sec. 17, T. 2N., 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 the 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, 1923.

GAGE.—Stevens continuous water-stage recorder 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; composed of gravel and free of vegetation; subject to slight shifts.

EXTREMES OF DISCHARGE.—Maximum stage during year from water-stage recorder, 7.10 feet at 8 a.m. January 7 (discharge, 4,820 second-feet); minimum stage, 0.49 foot August 18 (discharge, 40 second-feet).

1916–1923: Maximum stage, 9.9 feet, January 3, 1921 (discharge, 10,000 second-feet); minimum discharge, 16 second-feet, August 19, 1920.

ICE.—Stage-discharge relation affected by ice February 14–19.

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 principal tributaries, 1,750 acres are irrigated on Birch Creek and 1,300 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, thus causing considerable flunctuation at the station. There is practically no effect at medium and high stages. Backwater from Furnish Reservoir extends to within a few hundred yards below control.

ACCURACY.—Stage-discharge relation changed during high water of January 6 and was changing during the period July 30 to August 18. Rating curves before and after changes fairly well defined; shifting-control method used July 30 to August 18. Operation of water-stage recorder satisfactory except for periods as indicated in footnote to daily-discharge table. Daily discharge ascertained by applying to rating table mean daily gage height deter-

mined from recorder graph by inspection, or for days of considerable variation in stage, by averaging results obtained by applying mean daily gage height for shorter intervals; mean discharge for periods of no gage-height record estimated from climatic data and records for station on Umatilla River above McKay Creek and stations on McKay and Birch Creeks. Records excellent, except for periods when discharge was estimated, for which they are fair.

Discharge measurements of Umatilla River above Furnish Reservoir, near Yoakum, Oreg., during the year ending September 30, 1923

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Feb. 10	Canfield and Perry[a]	1.88	254	July 5	A. E. Perry	1.92	279
Mar. 14	A. E. Perry	2.86	610	10	do	1.65	187
31	do	6.38	3,470	15	do	1.30	110
Apr. 18	Canfield and Perry	5.20	2,370	29	do	.91	59
May 14	A. E. Perry	3.55	1,070	Aug. 19	do	.50	41
June 9	Canfield and Taylor	3.03	734				

[a] Water master, Umatilla County.

Daily discharge, in second-feet, of Umatilla River above Furnish Reservoir, near Yoakum, Oreg., for the year ending September 30, 1923

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	42	64	66	440	247	1,320	3,180	1,080	496	456	49	
2	42	65	67	380	241	1,420	2,940	960	870	386	48	
3	42	65	66	380	238	1,140	2,940	840	1,600	350	49	
4	46	63	67	380	238	930	2,700	810	1,530	304	51	
5	50	63	69	725	241	810	2,480	930	1,280	277	49	
6	55	62	75	2,990	241	750	2,480	1,180	1,110	259	47	
7	59	63	77	4,330	244	930	2,380	1,220	990	259	45	
8	59	64	78	3,180	250	960	2,080	1,220	870	247	45	
9	60	65		1,960	250	870	1,880	1,320	750	229	45	
10	59	66		1,390	259	780	1,880	1,360	700	180	45	
11	59	66		1,140	271	725	1,960	1,280	675	155	47	
12	58	66		930	271	700	2,180	1,110	675	142	46	
13	59	67		780	265	675	2,040	1,050	900	131	42	
14	56	67		675		630	1,880	1,020	1,280	119	42	
15	55	65	90	555		605	1,840	900	1,250	113	42	43
16	55	65		488	250	650	2,080	810	1,110	117	43	
17	53	66		480		1,250	2,480	780	990	133	41	
18	51	67		510		1,360	2,280	780	840	142	40	
19	52	68		510		1,530	1,880	810	725	119	41	
20	52	66		525	241	1,840	1,640	840	650	113	51	
21	54	68		530	250	1,640	1,500	780	585	99	55	
22	55	66	127	500	271	1,360	1,360	725	520	96	57	
23	56	60	168	488	432	1,140	1,320	675	488	92	57	
24	57	66	216	456	1,020	1,140	1,280	615	635	88	55	
25	57	68	230	425	1,310	1,250	1,220	575	990	86	52	
26	58	66	260		1,250	1,500	1,250	550	990	79	51	
27	60	68	326	370	1,080	1,960	1,360	575	930	72	48	
28	60	66	500		1,050	2,580	1,460	515	780	67	48	
29	61	66	525	289	-------	2,940	1,420	480	675	58		
30	63	67	440	274	-------	3,460	1,250	488	555	50	48	
31	63	-------	420	256	-------	3,600	-------	468	-------	47		-------

NOTE.—Braced figures give mean discharge for periods indicated.

Monthly discharge of Umatilla River above Furnish Reservoir, near Yoakum, Oreg., for the year ending September 30, 1923

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	63	42	45.1	2,770
November	68	62	65.7	3,910
December	525	66	160	9,840
January	4,330	256	87.3	53,700
February	1,310	238	416	23,100
March	3,600	605	1,370	84,200
April	3,180	1,220	1,950	116,000
May	1,360	468	863	53,100
June	1,600	488	881	52,400
July	456	47	163	10,000
August	57	40	47.6	2,930
September			43	2,560
The year	4,330	40	574	415,000

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 on west division of 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, 1923.

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, 5.1 feet January 7 (discharge, 3,130 second-feet); minimum stage, 1.83 feet November 28 (discharge, 5 second-feet).

1903–1923: Maximum stage recorded, 11.0 feet May 31, 1906 (discharge, 19,600 second-feet); no flow July 25 and August 1–9, 1906, and September 1–15, 1922.

ICE.—Stage-discharge relation affected by ice.

DIVERSIONS.—Large part of total flow of river diverted for irrigation above station. Umatilla project feed canal also diverts water during winter for storage in Cold Springs Reservoir. Main canal on west division of Umatilla project of the United States Bureau of Reclamation diverts 1½ miles above station. Low-water flow is return water from Hermiston project and other irrigated tracts.

REGULATION.—Discharge is occasionally affected by pondage at diversion dam.

ACCURACY.—Stage-discharge relation practically permanent; affected by ice February 13–19. Rating curve well defined. Gage read to hundredths once a day. Daily discharge ascertained by applying daily gage height to rating table except February 13–19 when it is computed from gage heights observed at United States Bureau of Reclamation diversion dam. Records good.

Discharge measurements of Umatilla River near Umatilla, Oreg., during the year ending September 30, 1923

Date	Made by–	Gage height	Discharge	Date	Made by–	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Feb. 6	Canfield and Crocker [a]	2.60	111	June 7	Canfield and Taylor [a]	3.56	688
Apr. 13	Canfield and Taylor [a]	4.11	1,590	8	do	3.33	551

[a] Engineer, United States Bureau of Reclamation.

Daily discharge, in second-feet, of Umatilla River near Umatilla, Oreg., for the year ending September 30, 1923

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	31	31	22	341	46	715	2,790	715	43	80	54	33
2	24	31	22	276	18	1,090	2,450	375	60	76	41	31
3	22	55	22	257	141	950	2,620	341	670	62	43	31
4	20	55	22	257	141	765	2,450	141	1,230	76	33	28
5	18	55	22	245	94	580	1,970	94	1,160	76	31	31
6	13	58	141	188	94	535	1,970	295	1,020	80	29	31
7	18	58	141	3,130	114	455	1,970	535	715	88	31	35
8	18	60	141	2,960	110	580	1,660	535	535	80	35	35
9	22	60	141	2,130	107	535	1,510	535	455	85	33	36
10	17	62	80	1,300	102	535	1,230	625	178	124	35	41
11	13	62	80	820	102	495	1,230	625	295	85	36	43
12	14	80	80	670	107	375	1,230	535	257	85	29	39
13	13	80	114	535	137	375	1,510	307	314	83	26	43
14	12	31	107	415	215	341	1,230	375	670	50	35	54
15	12	43	102	341	215	307	1,090	341	1,740	55	29	73
16	12	43	102	341	215	245	1,090	188	715	50	29	43
17	12	43	102	341	216	245	1,510	141	580	80	35	69
18	13	43	141	276	216	1,020	1,970	124	415	58	25	69
19	107	43	150	245	295	1,090	1,230	107	295	55	28	56
20	107	31	150	245	295	1,230	1,090	124	141	76	41	69
21	102	31	150	216	307	1,510	950	141	134	58	31	48
22	124	31	150	188	245	1,230	715	80	62	50	29	49
23	102	18	150	188	245	950	625	107	43	50	22	54
24	80	16	164	141	375	715	580	43	43	69	18	50
25	80	14	199	375	535	765	535	14	31	69	24	58
26	76	14	307	276	950	950	535	8	33	60	37	76
27	24	14	178	276	950	1,090	535	37	495	69	37	49
28	22	5	307	245	820	1,660	950	33	455	55	33	52
29	22	10	307	245	------	2,130	715	22	216	55	36	52
30	24	10	307	80	------	2,290	715	10	150	46	31	55
31	29	------	341	58	------	2,620	------	41	------	49	33	------

Monthly discharge of Umatilla River near Umatilla, Oreg., for the year ending September 30, 1923

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	107	12	38.8	2,390
November	80	5	39.6	2,360
December	341	22	143	8,790
January	3,130	58	568	34,900
February	950	18	265	14,700
March	2,620	245	915	56,300
April	2,790	535	1,360	80,900
May	715	8	245	15,100
June	1,740	31	438	26,100
July	124	46	68.8	4,230
August	54	18	32.5	2,000
September	76	28	47.8	2,840
The year	3,130	5	346	251,000

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, 1923, when station was discontinued due to construction of dam at this point by the United States Bureau of Reclamation; 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 since April 3, 1919; read by Harry Jones. Vertical staff at Holmes Bridge, in sec. 11, T. 1 N., R. 32 E., read October 31, 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 gates of small canal will affect stage-discharge relation only during irrigation season.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 2.2 feet during night of January 6–7 (discharge, 910 second-feet); no flow at times.

1903–4; 1919–1923: Maximum discharge recorded, 3,250 second-feet February 10, 1921 (gage height, 4.4 feet); no flow at times.

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

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

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed January 6. Rating curves used before and after change well defined. Staff gage read to hundredths once a day. Daily discharge ascertained by applying daily gage height to rating table. Records good.

Discharge measurements of McKay Creek near Pendleton, Oreg., during the year ending September 30, 1923

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Feb. 10	Canfield and Perry[a]	0.47	33.7	June 10	Canfield and Perry	0.82	101
Mar. 25	A. E. Perry	1.26	264	July 13	A. E. Perry	.25	13.5
May 13	do	.73	82				

[a] Water master, Umatilla County.

Daily discharge, in second-feet, of McKay Creek near Pendleton, Oreg., for the year ending September 30, 1923

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1			20	84	46	235	580	167	52	85	10.0	2.4
2			20	82	43	203	580	160	203	71	9.6	2.4
3			20	82	40	174	545	136	295	63	6.0	-------
4			18	84	38	154	480	121	250	44	5.5	-------
5			19	89	34	145	510	103	203	34	5.5	-------
6			22	750	32	148	480	85	170	31	5.0	-------
7			19	730	34	174	450	82	142	27	6.0	-------
8			20	480	35	164	390	78	109	25	6.5	-------
9			19	295	34	160	390	75	106	21	5.5	-------
10			18	211	37	151	300	71	109	17	5.0	-------
11			17	170	36	178	305	67	106	16	5.0	-------
12			16	136	35	154	285	69	112	14	4.0	-------
13			16	112	35	167	275	95	300	13	4.0	-------
14			14	106	37	142	285	92	335	13	3.5	-------
15			14	100	36	148	265	88	255	12	3.5	-------
16	3	10	12	93	35	174	285	85	231	11	3.0	-------
17			14	88	34	362	245	92	174	12	3.0	-------
18			14	82	35	335	227	88	215	20	3.0	-------
19			15	78	37	295	219	85	211	16	3.0	-------
20			16	75	37	450	215	67	203	16	3.0	-------
21			16	71	39	362	240	71	195	15	3.5	-------
22			17	71	40	362	240	65	142	14	3.0	-------
23			19	67	54	335	235	63	92	14	3.0	-------
24			22	65	154	295	219	61	174	14	3.0	-------
25			26	61	203	260	211	48	215	13	3.0	-------
26			28	57	215	290	203	46	211	12	3.0	-------
27			39	55	199	362	199	44	203	10	3.0	-------
28			72	43	188	450	195	44	195	9.6	3.0	-------
29			76	40	-------	545	188	46	142	10	3.0	-------
30			82	39	-------	580	178	48	92	11	2.7	-------
31			79	40	-------	618	-------	50	-------	11	2.7	-------

NOTE.—Discharge estimated from Birch Creek on Dec. 2 and 3 because of no gage-height record. Braced figures give estimated mean discharge for periods indicated.

Monthly discharge of McKay Creek near Pendleton, Oreg., for the year ending September 30, 1923

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	----------	----------	a3	184
November	----------	----------	a10	595
December	82	12	26.4	1,620
January	750	39	146	8,980
February	215	32	65.1	3,620
March	618	142	277	17,000
April	580	178	314	18,700
May	167	44	80.4	4,940
June	335	52	181	10,800
July	85	9.6	22.4	1,380
August	10	2.7	4.27	263
September	2.4	0	.16	10
The year	618	0	94.0	68,100

a Estimated.

McKAY CREEK AT MOUTH, NEAR PENDLETON, OREG.

LOCATION.—In NW. ¼ SE. ¼ sec. 8, T. 2 N., R. 32 E., at road bridge ¼ mile above Umatilla River, 2½ miles west of Pendleton, Umatilla County, and 4½ miles downstream from gaging station at dam site.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—April 19, 1922, to September 30, 1923.

GAGE.—Vertical staff gage fastened to right pier of bridge; read by C. H. Judkinson and Ned Cheney. Former gage fastened to log just above bridge.

DISCHARGE MEASUREMENTS.—Made by wading, from this bridge, or from another bridge 2 miles upstream, correcting for diversions.

CHANNEL AND CONTROL.—Banks are high and not subject to overflow. Section at bridge is pool of still water at low stages, but there is an eddy near left bank at higher stages. Below bridge the stream divides into two channels separated by a gravel bar, the main channel being against right bank. The control is at a gravel riffle 50 feet below bridge and is subject to change.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period, 2.90 feet on April 2 (discharge, 545 second-feet); minimum discharge was estimated mean for September, 2 second-feet.

DIVERSIONS.—Numerous ditches above station divert practically entire summer flow, but at this point there is a constant flow of 2 or 3 second-feet from springs or return water.

REGULATION.—None.

ACCURACY.—Stage-discharge relation practically permanent. Rating curve fairly well defined for range of stage. Staff gage read to hundredths once a day. Daily discharge ascertained by applying daily gage height to rating table except as indicated in footnote to daily-discharge table Records fair, except for periods when discharge was estimated, for which they are poor.

Discharge measurements of McKay Creek at mouth, near Pendleton, Oreg., during the year ending September 30, 1923

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Feb. 8	G. H. Canfield	3.50	32.7	July 11	A. E. Perry	1.15	29.2
Apr. 18	Canfield and Perry [a]	2.24	273	Aug. 18	do	.64	3.5
May 13	A. E. Perry	1.78	91				

[a] Water master for Umatilla County.

Daily discharge, in second-feet, of McKay Creek at mouth, near Pendleton, Oreg., for the year ending September 30, 1923

Day	Apr.	May	June	July	Aug.	Sept.
1	545	158	200		10	
2	545	146			8	
3	528	141			10	
4	490	120			9	
5	490	107	200	60	8	
6	435	102	163		7	
7	435	95	120		6	
8	385	95	111		6	
9	385	95	102		5	
10	360	95	95		5	
11	335	95	84	25	5	
12	335	95	116		5	
13	335	95	326	22	5	
14	312	91	282		5	
15	290	81	234	20	5	2
16	290	73	203	17	4	
17	335	73	169	17	4	
18	335	73	155	38	4	
19	250	78	116	22		
20	250	81	98	22		
21	250	88	91	21		
22	274		78	20		
23	290		75	19		
24	282		210	20		
25	274		258	17	3	
26	203	60	258	16		
27	203		210	15		
28	203		196	15		
29	189		158	13		
30	182		125	11		
31				10		

NOTE.—No gage height record, Apr. 1, May 7, 11, May 22 to June 4, July 1–10, 12–14, and Aug. 19 to Sept. 30; discharge estimated by comparison with record of flow for upper gaging station on McKay Creek. Braced figures give mean discharge for periods indicated.

Monthly discharge of McKay Creek at mouth, near Pendleton, Oreg., for the year ending September 30, 1923

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
April	545	182	333	19,800
May	158		86.3	5,310
June	326	75	168	10,000
July		10	32.4	1,990
August	10		4.84	298
September			2.00	119
The period				37,500

BIRCH CREEK NEAR PILOT ROCK, OREG.

LOCATION.—In SE. ¼ sec. 15, T. 1 N., R. 32 E., at Guderian ranch, 6 miles downstream from Pilot Rock and 8 miles south of Pendleton, Umatilla County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—October 1, 1919, to September 30, 1923.

GAGE.—Vertical staff gage on right bank about 50 feet above bridge, 400 feet west of Guderian ranch house. Vertical staff above diversion dam in SE. ¼ sec. 22, 1 mile above Guderian ranch, used until February 12, 1922. Gage read by Howard Guderian.

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

CHANNEL AND CONTROL.—Stream bed of gravel and small boulders. Banks high and not subject to overflow; fairly permanent.

EXTREMES OF DISCHARGE.—Maximum discharge, estimated 410 second-feet January 6. Stream bed practically dry August 1 to September 25.

1920–1923: Maximum discharge recorded, 1,270 second-feet April 13, 1920. Stream bed dry at numerous times.

ICE.—Stage-discharge relation affected by ice.

DIVERSIONS.—Several small ditches divert water above station, using practically all summer flow.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent except as affected by ice, February 18–22. Rating curve well defined above and poorly defined below 10 second-feet. Staff gage read to hundredths twice a day. Daily discharge ascertained by applying mean daily gage height to rating table except as indicated in footnote to table of daily discharge. Records good, except those for estimated periods and discharges below 10 second-feet which are poor.

Discharge measurements of Birch Creek near Pilot Rock, Oreg., during the year ending September 30, 1923

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Feb. 10	Canfield and Perry	0.39	15.6	June 10	Perry and Canfield	0.88	86
Mar. 25	A. E. Perry	.78	61	July 13	A. E. Perry	.20	5.4
May 13	do	.75	63	23	do	.12	5.1

Daily discharge, in second-feet, of Birch Creek near Pilot Rock, Oreg., for the year ending September 30, 1923

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Sept.
1	1.5	2.6	10	38	8	78	320	105	38	87	-------
2	1.5	2.6	10	38	14	78	302	105	78	51	-------
3	1.5	2.6	11	38	11	78	269	105	132	41	-------
4	1.5	2.6	12	38	18	62	223	46	109	36	-------
5	1.5	2.6	14	38	18	62	196	46	101	32	-------
6	1.5	2.6	13		18	62	196	46	96	31	-------
7	1.5	2.6	13		18	65	196	46	96	27	-------
8	1.5	2.6	13	220	15	65	158	46	84	22	-------
9	1.5	2.6	13		13	59	142	52	78	17	-------
10	1.5	2.6	13		16	56	124	54	82	14	-------
11	1.5	2.6	13	64	17	54	114	51		11	-------
12	1.5	6.0	13	59	16	54	158	60		6.1	-------
13	1.5	6.0	13	54	14	52	170	65		6.0	-------
14	1.5	6.0	13	48	11	54	170	67		6.0	-------
15	1.5	6.0	13	41	8	54	158	57		5.4	-------
16	1.5	6.0	13	38	8	54	158	48		5.4	-------
17	1.5	8.0	13	34	8	54	158	46	88	5.4	-------
18	1.5	8.0	13	38		54	158	46		5.4	-------
19	1.5	5.4	13	38		57	158	46		5.4	-------
20	1.5	5.4	13	38	10	70	170	46		5.4	-------
21	1.5	5.4	13	38		70	135	46		5.1	-------
22	1.5	5.4	13	36		70	124	43		5.7	-------
23	1.5	6.0	15	32	24	70	105	37		5.7	-------
24	1.5	6.0	26	32	38	67	105	33	158	5.7	-------
25	1.5	6.0	38	32	54	70	105	28	285	5.1	-------
26	1.5	6.0	38	32	54	70	105	26	253	3.8	2.0
27	1.5	6.0	38	28	54	73	105	32	253	2.4	2.0
28	1.5	6.0	41	28	62	124	105	28	238	2.0	2.0
29	1.5	8.0	51	26	-------	170	105	28	196	2.0	2.0
30	1.5	10.0	38	22	-------	196	105	28	128	1.7	2.0
31	1.5	-------	38	15	-------	285	-------	26	-------	1.5	-------

NOTE.—Gage heights Jan. 6–10 considered erroneous; mean discharge for period estimated by comparison with discharge for McKay Creek. Stage-discharge relation affected by ice Feb. 18–23; discharge estimated. Gage-height record lost June 11–23; discharge estimated. Stream bed practically dry Aug. 1 to Sept. 25.

Monthly discharge of Birch Creek near Pilot Rock, Oreg., for the year ending September 30, 1923

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	1.5	1.5	1.50	92
November	10.0	2.6	5.01	298
December	51	10	19.4	1,190
January	----------	15	66.5	4,090
February	62	----------	20.3	1,130
March	285	52	80.2	4,930
April	320	105	160	9,520
May	105	26	49.6	3,050
June	285	38	118	7,020
July	87	1.5	14.8	910
August	----------	----------	0	0
September	2.0	0	0.333	20
The year	320	0	44.6	32,200

BIRCH CREEK AT RIETH, OREG.

LOCATION.—In NW. ¼ sec. 13, T. 2 N., R. 31 E., one-fourth mile above Umatilla River, 1 mile south of Rieth, and 8 miles below gaging station at Guderian ranch, Umatilla County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—May 1 to August 31, 1921; March 1 to July 31, 1922, and April 1 to September 30, 1923, when station was discontinued.

GAGE.—Vertical staff on right bank 200 feet below footbridge; read by W. H. Harrison. Vertical staff gage at footbridge used March 1 to July 15, 1922, and April 1–14, 1923.

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

EXTREMES OF DISCHARGE.—Maximum stage recorded for period, 3.32 feet April 2 (discharge, 280 second-feet); estimated mean discharge for September, 1 second-foot.

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

REGULATION.—None.

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

Discharge measurements of Birch Creek at Rieth, Oreg., during the year ending September 30, 1923

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Apr. 13	A. E. Perry[a]	1.70	157	June 10	Perry and Canfield	1.40	88
18	Perry and Canfield	1.85	185	July 11	A. E. Perry	.77	14.8
May 13	A. E. Perry	1.26	69	22	do	.53	3.8

[a] Water master for Umatilla County.

Daily discharge, in second-feet, of Birch Creek near Rieth, Oreg., for the year ending September 30, 1923

Day	Apr.	May	June	July	Aug.	Sept.
1	268	81	64	84		
2	280	72	89	72		
3	255	58	100	55		
4	220	63	129	41		
5	191	76	114	38		
6	191	72	100	35		
7	191	71	89	33		
8	173	69	68	25		
9	164	66	64	21		
10	138	68	91	17		
11	164	71	86	15		
12	182	72	81	11		
13	153	63	93	10		
14	149	54	102	7.8		
15	162	54	118			
16	181	50	112		2	1
17	197	48	99			
18	189	46	93	5.8		
19	174	47	79			
20	171	46	69			
21	158	38	68			
22	144	36	64	3.8		
23	112	31	81			
24	104	29	144			
25	99	28	230			
26	91	29	242			
27	95	30	202	3.0		
28	108	28	186			
29	97	29	146			
30	91	32	108			
31		46				

NOTE.—Braced figures give mean discharge for periods indicated.

Monthly discharge of Birch Creek at Rieth, Oreg., for the year ending September 30, 1923

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
April	280	91	163	9,700
May	81	28	51.8	3,180
June	242	64	110	6,540
July	84	----------	17.3	1,060
August	----------	----------	2.0	123
September	----------	----------	1.0	60
The period	----------	----------	----------	20,700

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, 1923.

GAGE.—Vertical staff on right bank 60 feet above concrete dam just below 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 CONTROLS.—Gage is at earth 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 stage-discharge relation because gate is below crest of dam.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 2.00 feet several times during January, March, and April (discharge, 315 second-feet); canal dry at numerous times.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined. Gage read to hundredths once a day and also after making changes at head gate. 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 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 which it is released during the irrigation season.

Discharge measurements of Umatilla project feed canal near Echo, Oreg., during the year ending September 30, 1923

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Feb. 7	Canfield and Crocker[a]	1.48	208	Mar. 9	C. N. Taylor	2.00	314
8	C. N. Taylor[a]	1.59	219	29	do	1.98	313
23	do	1.02	122	Apr. 12	Canfield and Taylor	1.99	314
28	do	1.87	287	May 22	C. N. Taylor	1.86	278
Mar. 7	do	2.00	316	July 9	do	.32	24

[a] Engineer, United States Bureau of Reclamation.

Daily discharge, in second-feet, of Umatilla project feed canal near Echo, Oreg., for the year ending September 30, 1923

Day	Dec.	Jan.	Feb	Mar.	Apr.	May	June	July
1		285	193	290	304	306	259	226
2		290	205	297	304	308	270	158
3		292	211	301	304	308	277	37
4		292	207	304	306	308	281	37
5		292	205	304	308	304	218	37
6		288	203	306	308	306	259	37
7		292	205	313	308	304	259	37
8	31	294	224	315	308	304	259	35
9	93	299	224	315	308	304	259	26
10	66	301	224	315	310	297	259	7
11		263	226	310	313	299	248	
12		301	230	315	315	304	235	
13		310	115	315	315	304	237	
14		315		315	315	294	239	
15		315		315	315	299	237	
16		315		304	315	304	228	
17		315		315	315	294	226	
18		315		280	315	270	226	
19		315		288	315	270	226	
20		315		297	315	279	226	
21		315	54	304	315	283	226	
22		315	107	306	315	297	226	
23		315	128	306	315	288	207	
24	35	79	201	304	310	252	198	
25	96		230	304	315	226	220	
26	129		252	304	315	228	235	
27	201		274	304	306	230	237	
28	239		285	304	304	230	237	
29	263	124		304	304	222	237	
30	279	174		304	304	201	230	
31	281	193		304		228		

NOTE.—Canal dry for days when no record is given.

Monthly discharge of Umatilla project feed canal near Echo, Oreg., for the year ending September 30, 1923

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
December	281	0	55.3	3,400
January	315	0	243	14,900
February	285	0	150	8,330
March	315	280	305	18,800
April	315	304	311	18,500
May	308	201	279	17,200
June	281	198	239	14,200
July	226	0	20.5	1,260
The year	315	0	133	96,600

NOTE.—Canal dry for 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, 1923.

GAGE.—Inclined staff about 150 feet below outlet of tunnel under main-line track of Oregon-Washington Railroad Navigation Co. Prior to April 4, 1922, two vertical gages above present gage were used.

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

CHANNEL AND CONTROL.—Channel is in earth, and banks high; liable to be affected by aqueous growth during summer and occasionally by flashboards at outlet into Umatilla River.

EXTREMES OF DISCHARGE.—Maximum discharge recorded during year, 37 second-feet July 3–7; channel dry at numerous times.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined above and fairly well defined below 16 second-feet. Staff gage read to hundredths once a day and time noted when water was turned in or out. Daily discharge ascertained by applying daily gage height to rating table. Records good.

Water diverted from the Umatilla project feed canal is used for power in the Echo flour mill or wasted into tailrace or occasionally into spillway at that point 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 September 30, 1923

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Feb. 28	C. N. Taylor [a]	2.09	25.5	May 14	C. N. Taylor	1.95	25.2
Apr. 12	Canfield and Taylor	1.88	22.7	28	do	1.66	18.4

[a] Engineer, United States Bureau of Reclamation.

Daily discharge, in second-feet, of Echo mill tailrace at Echo, Oreg., for the year ending September 30, 1923

Day	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July
1		13	6	27	23	21	21	23
2		13		27	23	23	20	21
3		21		28	23	21	20	37
4		23		27	23	21	21	37
5		21	23	23	23	21	21	37
6		21	28	32	23	21	20	37
7		21	28	33	23	23	20	37
8		24	28	36	23	23	20	35
9		31	28	36	23	21	21	26
10		31	28	36	23	21	21	7
11	16	31	9	31	23	21	22	
12		17		31	23	21	23	
13		31		32	23	21	22	
14		27		31	23	21	22	
15		28		32	23	24	23	
16		28		30	23	24	23	
17		28		23	23	24	23	
18		34		23	23	24	23	
19		34		23	23	24	23	
20		34		34	23	21	23	
21		27		34	23	21	22	
22		30		33	23	19	22	
23		31		24	23	18	23	
24				24	23	17	24	
25				24	32	18	24	
26			20	23	32	18	24	
27			27	23	20	18	24	
28	28		27	23	20	19	23	
29	28			23	18	19	24	
30	26	12		23	18	19	23	
31	16	13		23		21		

NOTE.—No flow on days for which no record is given.

Monthly discharge of Echo mill tailrace at Echo, Oreg., for the year ending September 30, 1923

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
December	28	0	3.7	228
January	34	0	20.1	1,240
February	28	0	9.0	500
March	36	23	28.1	1,730
April	23	18	23.1	1,370
May	24	17	20.9	1,290
June	24	20	22.2	1,320
July	37	0	9.6	590
The year	37	0	11.4	8,270

NOTE.—Canal dry in 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 turnout 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; April 1 to June 30, 1922; and March 1 to September 30, 1923.

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

DISCHARGE MEASUREMENTS.—Made from footbridge half a mile upstream, just below turnout 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, 2.52 feet May 21–23 and June 28 (discharge, 235 second-feet). Canal dry at times.

1921–1923: Maximum stage recorded, 2.78 feet May 18 and 19, 1922 (discharge, 284 second-feet).

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

Head gate is situated in NE. ¼ sec. 21, T. 3 N., R. 29 E., on left bank of Umatilla River. Some of the flow may be turned into Allen Canal half a mile below head gate and into Pioneer & Courtney Canal one-fourth mile below gage. During irrigation season of 1923 amount of water turned into Allen Canal was approximately as follows: April, 1,460 acre-feet; May, 1,620 acre-feet; June, 994 acre-feet; July, 1,390 acre-feet; August, 1,370 acre-feet; and September, 1,260 acre-feet.

Discharge measurements of Western Land & Irrigation Co.'s canal at Echo, Oreg., during the year ending September 30, 1923

[Made by Canfield and Taylor]

Date	Gage height	Discharge
	Feet	*Sec.-ft.*
Apr. 12	1.90	150
June 8	2.19	194

Daily discharge, in second-feet, of Western Land & Irrigation Co.'s canal at Echo, Oreg., for the year ending September 30, 1923

Day	Mar.	Apr.	May	June	July	Aug.	Sept.
1	44	110	203	219	133	28	
2	46	110	219	227	143	26	
3	41	105	188	203	160	25	
4	41	98	227	80	133	21	
5	52	100	219	80	100	20	
6	52	100	203	85	90	20	
7	52	110	203	146	100	16	
8	52	110	203	141	100	10	
9	52	110	227	160	90	10	
10	54	110	219	188	90	9.0	
11	50	127	196	188	76	8.5	
12	51	146	203	181	80	5.0	
13	61	160	203	188	55	2.0	
14	61	160	211	219	41		
15	80	160	219	188	38		
16	80	160	211	188	41		
17	63	203	211	188	52		
18	63	203	219	188	55		
19	63	160	219	188	63		
20	55	146	219	211	71		2.0
21	55	203	235	203	71		2.0
22	55	203	235	203	63		2.0
23	100	203	235	153	71	5.0	3.2
24	100	203	227	188	59	2.0	3.2
25	80	211	219	219	63		4.7
26	80	160	219	211	55		4.7
27	110	196	211	188	41	5.0	2.6
28	110	174	211	235	40	16	4.4
29	108	174	203	219	34	13	4.7
30	112	196	140	211	34		4.7
31	110		146		33		

Note.—Canal dry on days for which no record is given.

Monthly discharge of Western Land & Irrigation Co.'s canal at Echo, Oreg., for the year ending September 30, 1923

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
March	112	41	68.8	4,230
April	211	98	154	9,160
May	235	140	210	12,900
June	235	141	183	10,900
July	160	33	73.4	4,510
August	28	0	7.79	479
September	4.7	0	1.27	76
The period				42,300

MAXWELL CANAL NEAR HERMISTON, OREG.

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

RECORDS AVAILABLE.—March 18, 1921, to September 30, 1923.

GAGE.—Vertical staff and float gage in stilling well 200 feet below second wasteway into Umatilla River; read by W. H. Starr for United States Bureau of Reclamation.

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

CHANNEL AND CONTROL.—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, 3.24 feet May 14 (discharge, 87 second-feet). Canal dry during winter.

1919–1923: Maximum stage recorded, 3.25 feet May 24 and 25, 1921 (discharge, 96 second-feet). Canal dry during winters.

ACCURACY.—Stage-discharge relation permanent, except during summer, when it is affected by aqueous growth. Rating curve well defined. Method of shifting control used July 1 to October 15. Gage read to hundredths once a day and also after making change at head gate. Daily discharge ascertained by applying daily gage height to rating table. Records excellent, except from August to October, for which they are fair.

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.

During the winter of 1922 and 1923 the United States Bureau of Reclamation constructed a wasteway from the A line canal into the Maxwell Canal just above the second wasteway of Maxwell Canal into Umatilla River. At times the flow from the A line goes down the Maxwell Canal into Umatilla River, or both. In 1923 the amount wasted at this point from the A line was as follows: April, 354 acre-feet; May, 652 acre-feet; June, 556 acre-feet; July, 1,050 acre-feet; August, 713 acre-feet; and September, 1,120 acre-feet.

Discharge measurements of Maxwell Canal near Hermiston, Oreg., during the year ending September 30, 1923

[Made by C. N. Taylor*]

Date	Gage height	Discharge	Date	Gage height	Discharge
	Feet	*Sec.-ft.*		*Feet*	*Sec.-ft.*
Apr. 10	2.48	50	May. 28	3.18	84
24	2.85	66	July. 24	2.31	40

* Engineer, United States Bureau of Reclamation.

Daily discharge, in second-feet, of Maxwell Canal near Hermiston, Oreg., for the year ending September 30, 1923

Day	Mar.	Apr.	May	June	July	Aug.	Sept.
1		21	85	75	44	38	25
2		21	83	77	43	36	22
3		21	81	78	46	37	20
4		21	84	75	44	31	13
5		21	82	75	44	34	24
6		21	83	74	47	34	20
7		29	85	74	47	40	22
8		36	84	70	47	37	23
9		44	84	67	48	33	24
10		49	85	68	12	22	26
11		53	82	72		21	26
12		54	84	72		22	27
13		58	86	68	3	27	27
14		60	87	68	32	24	29
15		65	85	68	35	21	28
16		64	85	76	23	16	29
17		64	84	75	34	23	29
18		65	84	72	30	35	29
19		64	82	60	32	27	28
20		65	84	52	37	29	26
21		72	82	47	37	29	25
22		75	82	39	38	31	21
23	4.0	73	78	35	37	29	36
24	6.2	64	65	37	39	26	36
25	4.5	64	82	37	39	26	35
26	10	74	78	37	34	27	30
27	10	78	84	47	35	27	29
28	13	80	85	47	34	27	31
29	15	83	84	43	35	23	30
30	21	86	81	45	37	22	14
31	21		85		38	24	

NOTE.—Canal dry on days for which no record is given.

Monthly discharge of Maxwell Canal near Hermiston, Oreg., for the year ending September 30, 1923

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
March	21	0	3.38	208
April	86	21	54.8	3,260
May	87	65	82.7	5,080
June	78	35	61.0	3,630
July	48	0	33.9	2,080
August	40	16	28.3	1,740
September	36	13	26.5	1,580
The year				17,600

NOTE.—No water in canal for months for which no record is given.

MAIN CANAL, ON WEST DIVISION OF 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, 1921, to September 30, 1923.

GAGE.—Vertical staff gage in stilling well just below head gate used October 1 to March 31; inclined staff gage below Umatilla spillway used April 1 to September 30. Read by United States Bureau of Reclamation ditch rider.

DISCHARGE MEASUREMENTS.—Made from footbridge about 2 miles below intake and just below Umatilla spillway.

CHANNEL AND CONTROL.—Canal is concrete lined; stage-discharge relation of both gages seriously affected by aqueous growth during summer. Stage-discharge relation of gage at head seriously affected by sand drifting into canal and flushed out through the Umatilla spillway.

EXTREMES OF DISCHARGE.—Maximum discharge recorded during year, 156 second-feet on June 25 (gage height, 4.80 feet); canal dry at times.

1921–1923: Maximum discharge recorded, 164 second-feet, May 16–19, 1921, and June 10–14, 1922. Canal dry at times.

ACCURACY.—Stage-discharge relation unstable during most of year due to shifting sand and growth of aquatic plants. Rating curves for both gages are fairly well defined. Shifting-control method used October 1 to February 3 and June 1 to September 30. Staff gage read to hundredths once a day. Daily discharge ascertained by applying daily gage height to rating table. Records good March to May and fair for remainder of year.

Main canal diverts water from left bank of Umatilla River at United States Bureau of Reclamation diversion dam for irrigation on the west 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 left bank of Umatilla River 1 mile below present diversion dam.

Discharge measurements of main canal, on west division of Umatilla project, near Umatilla, Oreg., during the year ending September 30, 1923

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Apr. 7	C. N. Taylor[a]	2.96	69	June 15	C. N. Taylor	4.26	127
11	Canfield and Taylor	3.44	94	23	do	4.76	151
23	C. N. Taylor	4.00	123	July 18	do	4.86	131
May 18	do	4.40	153	Aug. 6	do	5.30	135
31	do	4.20	140				

[a]Engineer, United States Bureau of Reclamation.

Daily discharge, in second-feet, of main canal, on west division of Umatilla project, near Umatilla, Oreg., for the year ending September 30, 1923

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	96	58	116	35	125	------	10	126	135	144	132	123
2	96	58	116	35	125	------	40	126	135	147	135	126
3	96	58	116	35	32	------	56	126	126	141	135	129
4	96	58	116	10	------	------	55	126	115	147	132	129
5	96	58	82	32	------	------	50	129	120	147	135	132
6	96	58	------	72	------	------	67	135	78	138	135	129
7	96	58	------	51	------	------	66	129	81	138	135	132
8	96	54	------	60	------	82	66	141	87	141	135	132
9	96	54	------	58	------	110	70	138	109	144	135	135
10	96	62	------	62	------	110	70	153	109	147	135	135
11	94	66	------	60	------	110	96	147	106	144	129	135
12	94	66	------	70	------	110	96	153	123	132	129	135
13	94	66	------	68	------	110	96	135	120	135	126	132
14	94	66	------	66	------	110	109	144	126	135	120	129
15	94	96	------	68	------	110	109	150	126	135	120	125
16	94	96	------	68	------	110	132	135	123	129	123	126
17	94	96	------	68	------	110	135	153	120	132	123	123
18	94	96	------	68	------	110	138	153	129	129	123	120
19	23	96	------	68	------	59	138	150	129	132	123	120
20	------	104	------	68	------	59	126	153	144	129	126	115
21	------	109	------	68	------	59	126	153	141	126	129	118
22	------	109	------	68	------	27	126	150	150	129	129	118
23	------	116	------	114	------	56	126	132	153	129	129	118
24	------	116	------	128	------	65	126	150	153	129	132	118
25	------	116	------	128	------	65	147	150	156	129	120	115
26	------	116	------	128	------	65	126	120	132	123	115	112
27	14	114	------	128	------	65	126	126	135	123	118	112
28	56	114	------	120	------	65	120	135	153	118	118	112
29	56	114	------	120	------	65	126	138	153	118	115	104
30	54	114	23	120	------	65	120	132	150	138	118	104
31	54	------	35	120	------	52	------	138	------	135	120	------

NOTE.—Canal dry on days for which no discharge is given.

Monthly discharge of main canal, on west division of Umatilla project, near Umatilla, Oreg., for the year ending September 30, 1923

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	96	0	63.5	3,900
November	116	54	85.4	5,080
December	116	0	19.5	1,200
January	128	10	76.3	4,690
February	125	0	10.1	561
March	110	0	62.9	3,870
April	147	10	99.8	5,940
May	153	120	140	8,610
June	156	78	127	7,560
July	147	118	134	8,240
August	135	118	127	7,810
September	135	104	123	7,320
The year	156	0	89.4	64,800

JOHN DAY RIVER BASIN

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, 1923.

GAGE.—Inclined staff in two sections on left bank, 183 feet above ferry cable; read by W. G. Stofer and C. W. Anderson.

DISCHARGE MEASUREMENTS.—Made from cable or by wading.

CHANNEL AND CONTROL.—Clean gravel and sand; shifts slightly. Banks high. One channel at all stages.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 6.6 feet on morning of April 19 (discharge, 10,500 second-feet); minimum stage recorded, 1.20 feet October 1 (discharge, 117 second-feet).

1905–1923: Maximum stage recorded, 10.38 feet February 6, 1907 (discharge, 22,800 second-feet); minimum stage, 1.02 feet September 8–11 1915 (discharge, 63 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).

ICE.—Stage-discharge relation affected by ice.

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 permanent except as affected by ice December 7–23. Rating curve well defined. Staff gage read to half-tenths once a day to January 15 and twice a day February 21 to September 30. Daily discharge ascertained by applying daily or mean daily gage height to rating table, except as noted in footnote to daily-discharge table. Records good, except when stage-discharge relation was affected by ice and period of no gage-height record for which they are fair.

Discharge measurements of John Day River at McDonald, Oreg., during the year ending September 30, 1923

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Nov. 2	Wendell Dawson	1.62	318	Mar. 21	R. J. McKinney	3.40	2,150
July 18	do	3.06	1,740	Aug. 24	Wendell Dawson	1.42	204

Daily discharge, in second-feet, of John Day River at McDonald, Oreg., for the year ending September 30, 1923

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	Jnly	Aug.	Sept.
1	117	375	410	1,490		2,000	7,260	4,700	3,160	2,980	389	178
2	136	342	410	1,270		2,150	7,260	4,220	2,800	2,460	389	160
3	155	342	410	1,380		2,460	6,960	4,000	2,800	2,300	370	155
4	178	342	410	1,270		2,460	6,660	3,560	3,160	2,150	362	147
5	178	375	410	1,220		2,150	6,060	3,560	3,160	2,300	349	136
6	200	445	410	1,270		1,860	5,500	3,560	3,160	2,150	342	147
7	200	445		5,500		1,860	5,780	4,000	3,160	2,000	323	155
8	225	445		8,500		1,860	6,660	4,960	3,160	1,860	323	160
9	250	445		6,060		2,000	7,860	5,500	3,160	1,860	336	155
10	250	485		4,220		1,860	6,660	6,960	3,160	1,670	323	147
11	292	501		3,160	1,000	1,860	6,060	8,500	3,360	1,490	336	136
12	310	525		2,460		1,730	6,060	8,500	3,560	1,380	336	125
13	310	525		2,150		1,550	6,660	7,860	4,000	1,170	304	132
14	310	525		1,860		1,490	6,660	6,060	4,000	1,320	280	136
15	310	525	400	1,610		1,440	6,060	4,960	4,000	1,170	262	136
16	310	525				1,380	6,060	4,460	4,000	1,220	250	151
17	310	485				1,380	6,660	4,700	3,780	1,860	240	147
18	310	445				1,380	8,180	4,960	3,560	1,610	225	136
19	310	445				1,860	10,500	4,960	3,560	1,220	225	132
20	310	410				2,150	10,200	4,960	3,360	1,170	225	136
21	310	445			1,380	2,150	8,500	4,960	3,360	1,070	210	136
22	310	525			1,380	2,630	6,960	4,960	3,160	920	210	136
23	310	565			1,380	2,150	5,780	4,460	3,160	870	205	136
24	310	525	1,000	1,200	2,000	2,000	4,960	4,220	2,800	780	205	136
25	310	485	1,860		2,150	2,150	4,460	4,000	2,980	780	220	155
26	310	445	1,860		2,300	2,630	4,220	4,000	3,360	648	250	160
27	310	445	1,120		2,150	3,160	4,460	4,000	3,560	605	245	173
28	310	445	1,220		2,000	3,780	4,960	3,560	3,780	565	230	178
29	310	445	1,320		-------	4,960	5,220	3,160	3,780	525	225	178
30	310	410	1,610		-------	5,780	5,500	3,160	3,560	485	205	191
31	342	-------	1,440		-------	6,960	--------	3,160	-------	431	186	-------

NOTE.—Discharge estimated Dec. 7–23, because of ice effect. Because of no gage-height record Jan. 16 to Feb. 20, mean discharge estimated from a comparison with records of flow for Deschutes River at Moody and Umatilla River near Umatilla. Braced figures show mean discharge for periods indicated.

Monthly discharge of John Day River at McDonald, Oreg., for the year ending September 30, 1923

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	342	117	271	16,700
November	565	342	456	27,100
December	1,860	----------	667	41,000
January	8,500	----------	2,020	124,000
February	2,300	----------	1,240	68,900
March	6,960	1,380	2,430	149,000
April	10,500	4,220	6,490	386,000
May	8,500	3,160	4,790	295,000
June	4,000	2,800	3,390	202,000
July	2,980	431	1,390	85,500
August	389	186	277	17,000
September	191	125	150	8,930
The year	10,500	117	1,960	1,420,000

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, 1923.

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

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

CHANNEL AND CONTROL.—Rock and gravel; slightly shifting.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 3.1 feet on afternoon of June 27 (discharge, 540 second-feet); minimum stage recorded, 1.15 feet December 16–25 (discharge, 4.5 second-feet).

1914–1917; 1920–1923: Maximum stage recorded, 4.5 feet May 13 and 14, 1917 (discharge, 1,790 second-feet); minimum discharge recorded, 2 second-feet in August and September, 1921, and August, 1922.

ICE.—Stage-discharge relation affected by ice.

DIVERSIONS.—Practically none.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent except as affected by ice January 1–13 and February 1 to March 24. Rating curve fairly well defined. Staff gage read to hundredths twice a day except during winter, when it is read once a day. Daily discharge ascertained by applying daily or mean daily gage height to rating table; during ice-affected periods mean discharge is computed by comparison with climatic data. Records good, except for ice-affected periods for which they are fair.

Discharge measurements of Camas Creek above Cable Creek, near Ukiah, Oreg., during the year ending September 30, 1923

[Made by Canfield and Perry]

Date	Gage height	Discharge
	Feet	*Sec.-ft.*
Feb. 9	*1.99	11.3
May 5	2.33	162

* Seriously affected by ice.

Daily discharge, in second-feet, of Camas Creek above Cable Creek, near Ukiah, Oreg., for the year ending September 30, 1923

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	6.0	6.0	8.5				295	345	165	270	14	6.0
2	6.0	8.5	8.5				320	320	195	250	14	4.5
3	6.0	8.5	8.5				320	295	195	230	11	4.5
4	6.0	8.5	6.0				370	250	195	212	14	4.5
5	6.0	8.5	6.0		16		370	195	195	180	11	4.5
6	6.0	8.5	6.0				420	195	195	165	11	4.5
7	6.0	8.5	6.0	7			480	230	195	165	11	4.5
8	6.0	8.5	6.0				480	230	195	130	11	4.5
9	6.0	8.5	6.0		11		420	250	195	106	11	4.5
10	8.5	8.5	6.0				420	270	212	82	11	4.5
11	8.5	8.5	6.0				420	270	230	61	11	4.5
12	8.5	8.5	6.0				420	250	212	48	8.5	4.5
13	8.5	6.0	6.0			66	395	230	195	37	6.0	4.5
14	8.5	6.0	6.0	11			420	250	230	35	6.0	4.5
15	8.5	6.0	6.0	14			420	230	230	40	6.0	4.5
16	8.5	6.0	4.5	17			480	180	212	35	6.0	4.5
17	8.5	6.0	4.5	17			510	230	195	35	6.0	4.5
18	8.5	6.0	4.5	21			480	270	180	40	6.0	4.5
19	8.5	6.0	4.5	25	13		510	320	171	45	6.0	4.5
20	8.5	6.0	4.5	25			480	295	165	40	6.0	4.5
21	8.5	6.0	4.5	30			420	270	150	33	10	4.5
22	8.5	6.0	4.5	30			420	230	150	25	12	4.5
23	6.0	6.0	4.5	35			370	195	165	21	10	4.5
24	6.0	6.0	4.5	35			395	212	230	16	8.5	4.5
25	6.0	6.0	4.5	35		195	370	195	320	14	8.5	4.5
26	6.0	6.0	6.0	30		212	345	180	370	14	6.0	4.5
27	6.0	6.0	6.0	30		212	320	180	510	14	6.0	4.5
28	6.0	6.0	6.0	30	-------	230	295	180	480	11	6.0	4.5
29	6.0	6.0	6.0	25	-------	230	295	165	395	11	6.0	4.5
30	6.0	8.5	6.0	25	-------	270	320	150	320	11	6.0	4.5
31	6.0	-------	6.0	21	-------	270	-------	150	-------	11	7.0	-------

Monthly discharge of Camas Creek above Cable Creek, near Ukiah, Oreg., for the year ending September 30, 1923

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	8.5	6.0	7.05	433
November	8.5	6.0	7.09	417
December	8.5	4.5	5.76	354
January	35	-------	17.6	1,080
February	-------	-------	13.8	766
March	270	-------	103	6,330
April	510	295	399	23,700
May	345	150	233	14,300
June	510	150	235	14,000
July	270	11	77.0	4,730
August	14	6	8.79	540
September	6.0	4.5	4.55	271
The year	510	4.5	92.5	66,900

CABLE CREEK NEAR UKIAH, OREG.

LOCATION.—In NE. ¼ sec. 9, T. 5 S., R. 32 E., at highway bridge 1,000 fee 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, 1923.

GAGE.—Vertical staff on abutment of bridge; read by C. W. Metteer.

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

CHANNEL AND CONTROL.—Gravel and rock; uneven, slightly shifting.

EXTREMES OF STAGE.—Maximum stage recorded during year, 1.50 feet on afternoon of June 27 (discharge, 265 second-feet); minimum stage, 0.15 foot December 16 to 24 (discharge, 0.5 second-foot).

1914–1917; 1920–1923: Maximum stage recorded, 2.7 feet May 15, 1917 (discharge, 590 second-feet); creek probably dry at times during freezing weather in winter of 1917.

ICE.—Stage-discharge relation affected by ice.

DIVERSIONS.—Probably none.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent, except as affected by ice February 13 to March 17. Rating curve fairly well defined. Staff gage read to hundredths twice a day except during low water when it was read once a day. Daily discharge ascertained by applying daily or mean daily gage height to rating table, except when stage-discharge relation was affected by ice when mean discharge was estimated from climatic data. Records good.

Discharge measurements of Cable Creek near Ukiah, Oreg., during the year ending September 30, 1923

[Made by Canfield and Perry]

Date	Gage height	Discharge
	Feet	*Sec.-ft.*
Feb. 9	0.34	2.5
May 5	.91	70

Daily discharge, in second-feet, of Cable Creek near Ukiah, Oreg., for the year ending September 30, 1923

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	1.0	1.5	1.5	1.0	4.0		56	45	81	122	2.0	1.5
2	1.0	1.5	1.5	1.0	4.0		63	56	100	108	3.0	1.0
3	1.0	1.5	1.5	1.0	3.0		73	45	108	94	3.0	1.0
4	1.0	1.5	1.0	1.0	3.0		89	63	94	73	4.0	1.0
5	1.5	1.5	1.0	1.0	2.0		100	68	81	56	3.0	1.0
6	1.5	1.5	1.0	1.0	2.0		108	89	68	56	3.0	1.0
7	1.5	1.5	1.0	1.0	2.0		122	108	68	45	3.0	1.0
8	1.5	1.5	1.0	1.5	2.2		116	122	81	31	2.0	1.0
9	1.5	1.5	1.0	1.5	2.5		100	138	81	18	2.0	1.0
10	1.5	1.5	1.0	2.0	3.0	10	94	162	94	15	2.0	1.0
11	1.5	1.5	1.0	3.0	3.0		81	155	81	15	2.0	1.0
12	1.5	1.5	1.0	3.0	3.0		73	138	94	22	2.0	1.0
13	1.5	1.5	1.0	3.0	3.0		73	122	81	15	1.5	1.0
14	1.5	1.5	1.0	3.0			68	138	68	15	1.5	1.0
15	1.5	1.5	1.0	4.0			74	122	68	28	1.5	1.0
16	1.5	1.5	.5	6.0			100	108	56	22	1.5	1.0
17	1.5	1.5	.5	6.0			108	122	56	15	1.5	1.0
18	1.5	1.5	.5	8.0		12	94	138	45	22	1.5	1.0
19	1.5	1.5	.5	8.0		15	108	138	45	22	1.5	1.0
20	1.5	1.5	.5	8.0		15	94	122	56	15	1.5	1.0
21	1.5	1.5	.5	8.0	3.0	15	74	122	56	9.4	2.0	1.0
22	1.5	1.5	.5	12		22	68	108	68	8.0	2.4	1.0
23	1.0	1.5	.5	12		22	56	94	81	6.0	1.8	1.0
24	1.0	1.5	.5	12		22	45	108	116	4.0	1.5	1.0
25	1.0	1.5	1.0	8.0		28	50	94	162	3.0	1.5	1.0
26	1.0	1.5	1.0	8.0		28	45	81	197	2.0	1.5	1.0
27	1.0	1.5	1.0	8.0		36	50	81	245	3.0	1.5	1.0
28	1.0	1.5	1.0	8.0		31	56	94	218	2.0	1.5	1.0
29	1.0	1.5	1.0	6.0		42	45	81	183	2.0	1.5	1.0
30	1.0	1.5	1.0	6.0		42	56	68	148	2.0	1.8	1.0
31	1.0		1.0	4.0		50		68		2.0	1.8	

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

Monthly discharge of Cable Creek near Ukiah, Oreg., for the year ending September 30, 1923

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	1.5	1.0	1.29	79
November	1.5	1.5	1.50	89
December	1.5	.5	.90	55
January	12	1.0	5.03	309
February	4.0	2.0	2.92	162
March	50	----------	17.7	1,090
April	122	45	78.0	4,640
May	162	45	103	6,330
June	245	45	99.3	5,910
July	122	2.0	27.5	1,690
August	4.0	1.5	1.99	122
September	1.5	1.0	1.02	61
The year	245	.5	28.2	20,500

DESCHUTES RIVER BASIN

DESCHUTES RIVER ABOVE SNOW CREEK, NEAR LAPINE, OREG.

LOCATION.—In NE. ¼ sec. 21, T. 20 S., R. 8 E., 1 mile above mouth of Snow Creek and backwater of proposed Crane Prairie Reservoir, and 30 miles northwest of Lapine, Deschutes County.

DRAINAGE AREA.—Indeterminate, as most of water comes from springs.

RECORDS AVAILABLE.—May 25, 1922, to September 30, 1923.

GAGE.—Vertical staff on left bank; read by George Graft and E. L. Dalrymple.

DISCHARGE MEASUREMENTS.—Made from footbridge 150 feet above gage.

CHANNEL AND CONTROL.—Gravel with steep soil banks; somewhat shifting.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 1.96 feet August 28 (discharge, 183 second-feet); minimum discharge probably less than 52 second-feet during April.

1922–1923: Maximum stage recorded, 2.2 feet August 14–19, 1922 (discharge, 213 second-feet); minimum stage that of 1923.

ICE.—Ice never forms; stream spring fed.

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation unstable. Well-defined rating curve used October 1–26, shifting-control method used thereafter. Gage read to hundredths six times a week to October 26, once or twice a week thereafter. Daily discharge ascertained by applying daily gage reading to rating table. Records good.

Discharge measurements of Deschutes River above Snow Creek, near Lapine, Oreg., during the year ending September 30, 1923

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Nov. 17	Wendell Dawson	1.48	114	June 21	Wendell Dawson	1.38	111
Jan. 20	do	1.08	71	Aug. 28	Arthur Cramer*	1.98	185
Apr. 25	do	.84	53	Sept. 25	Wendell Dawson	1.89	168

* Employee, North Canal Co.

Daily discharge, in second-feet, of Deschutes River above Snow Creek, near Lapine, Oreg., for the year ending September 30, 1923

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1		119			66							
2	163										123	
3	162								99		127	180
4	160					56						
5	159			100								
6	157		94					57	99			181
7	156											
8												
9	152					59		63	105		141	
10	151			89	63		52				144	
11	148									113		176
12	147											
13	145							64				
14	144					54					140	
15									109			174
16				72		58		65				
17	137	114	87						113	115	151	
18	134											
19	133					53		67			154	
20	131			72					112			
21				70	56				111			169
22							52					
23	129									118		
24	127		81									
25	126						52	74				178
26	124	97									165	
27								78		119		
28						52					183	
29												
30												
31											180	

NOTE.—Daily discharge given for days when gage was read. Braced figures show the estimated mean discharge for the periods indicated. Discharge for other periods when gage was not read, interpolated for purpose of computing monthly discharge.

Monthly discharge of Deschutes River above Snow Creek, near Lapine, Oreg., for the year ending September 30, 1923

Month	Discharge in second-feet, mean	Run-off in acre-feet	Month	Discharge in second-feet, mean	Run-off in acre-feet	Month	Discharge in second-feet, mean	Run-off in acre-feet
October	140	8,610	March	55.4	3,410	August	151	9,280
November	113	6,720	April	52.0	3,090	September	174	10,400
December	87.3	5,370	May	67.4	4,140			
January	80.6	4,960	June	107	6,370	The year	100	72,800
February	60.3	3,350	July	115	7,070			

CRANE PRAIRIE RESERVOIR NEAR LAPINE, OREG.

LOCATION.—At reservoir dam, in NW. ¼ sec. 16, T. 21 S., R. 8 E., 28 miles by road west of Lapine, Deschutes County.

RECORDS AVAILABLE.—November 15, 1922, to September 30, 1923.

GAGE.—Vertical staff on left bank; read by George Graft and E. L. Dalrymple; datum 4,400 feet above sea level, based on levels by United States Bureau of Reclamation in 1914.

EXTREMES OF CONTENTS.—Maximum stage recorded, 40.30 feet, September 30; contents 33,790 acre-feet.

Crane Prairie Reservoir temporary dam was completed in 1922, spillway crest at elevation, 4,445 feet; capacity, 55,200 acre-feet. Stored water to be used for irrigation.

As shown by the tables which follow the monthly gain or loss in storage, as determined from the run-off into and the outflow from the reservoir at the end of each month, indicates that there is some loss when the contents exceeds 30,000 acre-feet. Only a part of this loss is chargeable to evaporation.

Monthly stage and contents of Crane Prairie Reservoir near Lapine, Oreg., for the year ending September 30, 1923

Date	Gage height	Contents	Loss or gain during month	Date	Gage height	Contents	Loss or gain during month
	Feet	*Acre-feet*	*Acre-feet*		*Feet*	*Acre-feet*	*Acre-feet*
Nov. 4[a]		0		May 31	39.49	30,460	+12,930
Nov. 30	31.34	3,790	+3,790	June 30	39.82	31,800	+1,340
Dec. 30	32.60	6,840	+3,050	July 31	39.82	31.800	0
Jan. 31	34.10	11,130	+4,290	Aug. 31	37.89	24,200	−7,600
Feb. 28	34.00	10,820	−310	Sept. 30	40.30	33,790	+9,590
Mar. 31	34.08	11,070	+250				
Apr. 30	36.05	17,530	+6,460	The year			+33,790

[a] Storage began on this date.

Monthly run-off, in acre-feet, of streams tributary to Crane Prairie Reservoir, compared with the measured outflow from the reservoir

1922-23	Deschutes River above Snow Creek	Snow Creek	Cultus River above Cultus Creek	Cultus Creek	Deer Creek	Quinn River	Charlton Creek	Rock Creek	Cold Creek and springs	Total inflow	Outflow	Gain or loss in storage
October	8,610	1,750	4,320	0	0	1,230	0	680	180	16,770	16,200	+570
November	6,720	1,730	3,390	0	0	1,010	0	650	180	13,680	10,900	+2,780
December	5,370	1,780	3,320	0	0	861	0	680	180	12,190	10,800	+1,390
January	4,960	1,780	3,320	0	0	738	0	680	180	11,660	12,100	−440
February	3,350	1,610	2,780	0	0	666	0	610	170	9,190	9,440	−250
March	3,410	1,520	3,070	0	0	738	0	680	180	9,600	9,720	−120
April	3,090	1,550	2,860	0	0	714	0	650	180	9,040	3,500	+5,140
May	4,140	1,780	3,380	1,320	500	1,050	650	680	180	13,680	1,180	+12,600
June	6,370	1,730	3,990	4,230	1,500	1,750	270	650	180	20,670	11,200	+9,470
July	7,070	1,780	4,240	2,280	700	2,160	40	680	180	19,130	13,800	+5,330
August	9,280	1,780	4,240	760	300	2,130	0	680	180	19,350	23,200	−3,850
September	10,400	1,730	3,870	480	100	1,930	0	650	180	19,340	5,150	+14,200
The year	72,800	20,500	42,800	9,070	3,100	15,000	960	7,970	2,150	174,300	128,000	+46,800

NOTE.—Monthly run-off of Rock and Cold Creeks and springs estimated; very uncertain as the sources of all these streams were submerged during most of the year. Monthly run-off estimated for Deer Creek and also for Cultus Creek for September. Some other unmeasured run-off may have occurred, especially during January and June

DESCHUTES RIVER AT CRANE PRAIRIE, NEAR LAPINE, OREG.

LOCATION.—In NW. ¼ sec. 16, T. 21 S., R. 8 E., 200 yards below Crane Prairie Dam and 28 miles by road west of Lapine, Deschutes County.

DRAINAGE AREA.—Indeterminate.

RECORDS AVAILABLE.—January 1, 1914, to June 30, 1917, and February 23, 1922, to September 30, 1923; fragmentary gage readings 1907 to 1913.

GAGE.—Stevens eight-day recorder on left bank, just above new Forest Service bridge. Staff gage in sec. 17, about half a mile above present gage, used up to June 8, 1922.

DISCHARGE MEASUREMENTS.—Made from cable at gage.

CHANNEL AND CONTROL.—Rock and boulders, probably permanent; slight aquatic growth at times.

EXTREMES OF DISCHARGE.—Maximum stage during year from water-stage recorder, 2.00 feet from 6 p. m. August 7 to about 6 a. m. August 12 (discharge, 430 second-feet); minimum stage recorded, 0.05 foot at noon April 24, due to closing of gates at dam (discharge, 25 second-feet).

1907–1917; 1922–1923: Maximum stage from fragmentary records, 2.75 feet on old gage July 31, 1913, determined from high-water marks (discharge, 531 second-feet); minimum discharge recorded, same as of April 24, 1923, due to regulation at dam.

ICE.—None.

DIVERSIONS.—None.

REGULATION.—Gates at dam at outlet of Crane Prairie just above station were first closed November 4, 1922. Monthly discharge has been corrected for effect of storage.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined. Operation of water-stage recorder satisfactory, except during winter when staff gage was read once a day except for short period. Discharge ascertained by applying to rating table mean daily gage height determined by inspecting recorder graph or daily gage reading when recorder was not operating. Records excellent, except for periods of no gage-height record for which they are fair.

Discharge measurements of Deschutes River at Crane Prairie, near Lapine, Oreg., during the year ending September 30, 1923

[Made by Wendell Dawson]

Date	Gage height	Discharge	Date	Gage height	Discharge
	Feet	*Sec.-ft.*		*Feet*	*Sec.-ft.*
Nov. 16	1.34	189	Apr. 28	0.34	16.7
Jan. 18	.95	91	June 23	1.54	259
19	1.26	171	Sept. 30	.44	21
24	.12	[a]5			

[a] Estimated

Daily discharge, in second-feet, of Deschutes River at Crane Prairie, near Lapine, Oreg., for the year ending September 30, 1923

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	314	246	224	230	192	156	156	14	110	224	211	333
2	310	233	224	230	192	156	156	13	110	224	211	340
3	310	211	224	230	192	156	156	12	110	217	232	388
4	310	83	224	249	192	156	156	11	110	211	401	388
5	314	15	224	256	192	159	156		110	199	422	388
6	310	130	110	262	192	162	156		110	192	422	267
7	306	76			186	159	156		130	192	422	23
8	303	36		266	180	159	153		148	192	430	19
9	300	130	47		177	159	153		105	205	430	19
10	300	205		269	174	159	38		145	221	430	19
11	298	217			171	159	38		177	230	430	19
12	292	217	47		168	159	40		177	230	409	19
13	289	196	186	205	159	159	40		177	233	409	19
14	282	180	186			159	40		177	237	409	19
15	282	189	214		150	159	40		183	246	409	19
16	272	192	243	205	150	159	40	12	202	269	388	20
17	249	192		168	156	159	40		199	289	388	20
18	230	192	240	91	156	159	39		208	292	388	20
19	186	192		168	165	159	38		233	280	388	20
20	196	192	237	174	165	159	38		249	249	388	21
21	205	196	196	174		159	38		246	237	388	22
22	214	199	156	162		159	16		243	214	388	22
23	227	205	159	117	165	159	4		256	211	388	22
24	230	221	162	84		159	4		256	211	388	21
25	230	221	171	162	165	159	4		253	211	388	21
26	230	221	174	165	165	159	10		253	211	388	21
27	233	221	202		156	156	16		253	211	388	21
28	237	224		166	156	156	16		249	211	360	21
29	240	224	230		-------	156	16		243	211	333	22
30	243	224	230	168	-------	156	16	100	233	211	333	23
31	246	-------	230	192	-------	156	-------	110	-------	211	333	-------

NOTE.—Braced figures show mean discharge for periods indicated. Daily discharge interpolated, Dec. 13, 21, 31, Feb. 11, Mar. 17, 18, and Apr. 7.

Monthly discharge of Deschutes River at Crane Prairie, near Lapine, Oreg., for the year ending September 30, 1923

Month	Observed discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	314	186	264	16,200
November	246	15	183	10,900
December	243	47	175	10,800
January	269	84	196	12,100
February	192	150	170	9,440
March	159	156	158	9,720
April	156	4	65.6	3,900
May	110	11	18.1	1,110
June	256	110	188	11,200
July	292	192	225	13,800
August	430	211	377	23,200
September	388	19	86.5	5,150
The year	430	4	176	128,000

DESCHUTES RIVER AT PRINGLE FALLS, NEAR LAPINE, OREG.

LOCATION.—In NE. ¼ sec. 23, T. 21 S., R. 9 E., at head of Pringle Falls and 9 miles by road northwest of Lapine, Deschutes County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—December 26, 1915, to June 17, 1916; October 1, 1916, to June 30, 1917, and June 6, 1922, to September 30, 1923.

GAGE.—Stevens eight-day water-stage recorder, on left bank about 250 yards above road bridge. Staff gage almost directly opposite used 1915 to 1917.

DISCHARGE MEASUREMENTS.—Made from cable one-half mile below gage.

CHANNEL AND CONTROL.—Control is at head of falls, mostly rock and practically permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year from water-stage recorder, 2.49 feet at 6 p. m. August 11 (discharge, 995 second-feet); minimum stage, 1.56 feet at 11 a. m. April 23 (discharge, 559 second-feet).

1915–1917; 1922–1923: Maximum discharge recorded, 1,170 second-feet June 21–27, 29, 30, 1917; minimum discharge, 540 second-feet December 27, 1915 (gage height, 0.40 foot).

ICE.—None.

DIVERSIONS.—None.

REGULATION.—Flow affected by storage in Crane Prairie Reservoir.

ACCURACY.—Stage-discharge relation practically permanent. Rating curve well defined. Operation of water-stage recorder satisfactory except for short intervals. Daily discharge ascertained by applying to rating table mean daily gage height obtained by inspecting recorder graph. Records good.

Discharge measurements of Deschutes River at Pringle Falls, near Lapine, Oreg., during the year ending September 30, 1923

[Made by Wendell Dawson]

Date	Gage height	Discharge	Date	Gage height	Discharge
	Feet	*Sec.-ft.*		*Feet*	*Sec.-ft.*
Nov. 14	2.04	761	June 21	2.15	831
Apr. 3	1.92	729	Sept. 17	1.65	594
25	1.57	562			

Daily discharge, in second-feet, of Deschutes River at Pringle Falls, near Lapine, Oreg., for the year ending September 30, 1923

Day	Oct.	Nov.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	890			714	571	674	782	786	895
2	890			714	563	674	768	786	900
3	890	780		714	559	678	768	786	
4	890			719	555	678		890	950
5	890	607		710	559	678	765	920	
6	890	660		719	555	672		970	830
7		714		714	559	691	768	970	
8		607		714	563	710	763	970	595
9		674		710	563	730	759	970	
10		750		710	571	690	764	970	599
11	878	786		591	571	720	777	970	599
12		804		591	579	750	782	970	599
13		804		591	567	750	782	940	599
14		782		591	567	750	782	970	599
15		768		591	567	750	782		599
16	866	768		591	575	759	800		597
17	856	782		591	575	759	860		595
18	833	772		591	571	795	861		595
19	800	777		591	575	804	860		595
20	772	777		591	575	814	847		595
21	777	782		587		818	833	950	595
22	786	782		583	575	818	814		595
23	800	782		559		823	804		595
24	800	786		563	575	823	800		599
25		786		563	575	823	800		607
26			705	563	575	823	800		
27	800		705	563	575	818	786		
28		790	705	575	575	818	786	920	607
29			705	575	579	818	786		
30			705	575	591	804	786	895	
31			705		669		786		

NOTE.—Discharge estimated, Apr. 10–12, 14–16, June 8–11, July 16, 17, Aug. 5, Sept. 1, 2, 6, 16. Braced figures show mean discharge for periods indicated.

Monthly discharge of Deschutes River at Pringle Falls, near Lapine, Oreg., for the year ending September 30, 1923

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	890	772	843	51,800
November	804	607	761	45,300
March 26–31	705	705	705	8,390
April	719	559	625	37,200
May	669	555	574	35,300
June	823	672	757	45,000
July	861	759	793	48,800
August	970	786	930	57,200
September			662	39,400

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, 1923.

GAGE.—Stevens water-stage recorder on right bank; gage reader, W. L. Beebe.

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

CHANNEL AND CONTROL.—Composed of coarse gravel and boulders. Logs, drift, and aquatic plants lodged on control may affect stage-discharge relation at times.

EXTREMES OF DISCHARGE.—Maximum stage during year, from water-stage recorder, 2.58 feet at noon February 3 (discharge, 1,850 second-feet); minimum stage, −0.03 foot at 2 a. m. September 11 (discharge, 23 second-feet).

1915–1923: Maximum stage from water-stage recorder, 2.90 feet December 7, 1921 (discharge, 2,500 second-feet); minimum discharge that of 1923.

1905–1923: Maximum discharge of river in this vicinity, 4,820 second-feet at 7.45 a. m. November 27, 1909, for a gage height of 3.45 feet at pumping plant at Bend; no diversions.

ICE.—Stage-discharge relation unaffected by ice.

DIVERSIONS.—Station is below intakes of the six large canals which divert water from Deschutes River near Bend; only small diversions below station.

REGULATION.—Flow regulated by storage in Crane Prairie and Crescent Lake reservoirs and by two hydroelectric plants, one at North Canal Dam and one at Bend.

ACCURACY.—Stage-discharge relation practically permanent during year. Rating curve well defined. Operation of recorder satisfactory except June 21 to July 24 and August 11–19. Daily discharge, except as noted in footnote to table of 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 discharges obtained by applying rating table to gage heights for portions of the day. Records good except for July, for which they are fair.

Discharge measurements of Deschutes River below Bend, Oreg., during the year ending September 30, 1923

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Nov. 27	Wendell Dawson	1.94	1,120	June 18	Wendell Dawson	1.03	386
Jan. 12	do	2.10	1,310	Sept. 4	F. F. Henshaw	1.10	402
Mar. 12	do	2.04	1.190	12	Wendell Dawson	.10	39
13	do	2.07	1,220	12	do	.01	28
26	do	1.99	1,130				

Daily discharge, in second-feet, of Deschutes River below Bend, Oreg., for the year ending September 30, 1923

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	508	1,070	800	1,220	1,070	1,170	1,270	845	285		86	186
2	566	1,220	980	1,270	1,120	1,220	1,320	800	316		82	297
3	646	1,220	1,170	1,270	1,320	1,170	1,320	800	316	295	65	618
4	702	1,170	1,170	1,270	1,220	1,170	1,380	755	317		68	358
5	678	1,120	1,220	1,270	1,120	1,170	1,320	755	292		145	197
6	678	980	1,220	1,440	1,170	1,170	1,270	733	232		204	240
7	678	1,020	1,170	1,490	1,170	1,120	1,320	755	205		227	278
8	686	1,120	1,070	1,490	1,170	1,070	1,320	710	570		240	164
9	638	1,070	1,020	1,490	1,170	1,120	1,270	590	630		252	101
10	662	1,070	1,070	1,490	1,170	1,120	1,270	515	596	300	257	48
11	678	1,170	1,070	1,490	1,170	1,170	1,170	558	373			54
12	755	1,220	1,020	1,380	1,170	1,220	1,120	672	428			39
13	755	1,170	1,020	1,270	1,170	1,220	1,120	531	333		279	26
14	755	1,170	1,220	1,270	1,170	1,220	1,120	494	316			27
15	890	1,170	1,270	1,270	1,120	1,170	1,070	456	311	280		52
16	1,120	1,170	1,380	1,320	1,070	1,170	1,070	403	322	290		124
17	1,120	1,170	1,170	1,320	1,070	1,170	1,070	358	344	326		154
18	1,120	1,170	1,170	1,220	980	1,070	1,120	328	361	347	230	140
19	1,070	1,220	1,320	1,220	980	1,070	1,120	311	361	381		150
20	1,020	1,270	1,170	1,170	980	1,070	1,170	320	367	398	205	197
21	1,070	1,270	1,170	1,170	935	1,070	1,170	355	386	408	240	201
22	1,120	1,270	1,170	1,170	935	1,120	1,120	322	378	333	295	270
23	1,120	1,220	1,170	1,170	935	1,170	1,120	328	377	228	265	278
24	1,120	1,170	1,120	1,170	1,070	1,120	1,070	285	344	160	250	235
25	1,170	1,170	1,120	1,170	1,170	1,170	1,020	278		146	250	205
26	1,120	1,170	1,070	1,170	1,220	1,170	935	239		150	290	275
27	1,170	1,120	935	1,170	1,220	1,220	845	229	360	138	235	379
28	1,070	1,120	800	1,220	1,170	1,220	800	228		137	222	397
29	890	1,020	755	1,220	-------	1,220	845	275		131	211	403
30	800	800	890	1,170	-------	1,170	845	280		109	188	397
31	935	-------	1,220	1,170	-------	1,170	-------	260	-------	79	176	-------

NOTE.—Discharge for June 8, 21–23, 25–30, July 1–14, 16–21, 23, 24, and Aug. 11–19, computed by deducting that of the six canals diverting above station from the estimated total flow above diversions. Braced figures show mean discharge for periods indicated.

Monthly discharge of Deschutes River below Bend, Oreg., for the year ending September 30, 1923

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	1,170	508	881	54,200
November	1,270	800	1,140	67,800
December	1,380	755	1,100	67,600
January	1,490	1,170	1,280	78,700
February	1,320	935	1,120	62,200
March	1,220	1,070	1,160	71,300
April	1,380	800	1,130	67,200
May	845	228	476	29,300
June	630	205	364	21,700
July	408	79	265	16,300
August	295	65	218	13,400
September	403	26	216	12,900
The year	1,490	26	777	563,000

Combined daily discharge, in second-feet, of Deschutes River and canals near Bend, Oreg., for the year ending September 30, 1923

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	1,300	1,260	1,140	1,280	1,070	1,170	1,270	1,260	1,310		1,240	1,480
2	1,320	1,320	1,100	1,330	1,120	1,220	1,330	1,230	1,300		1,240	1,450
3	1,350	1,320	1,190	1,330	1,320	1,170	1,340	1,240	1,310	1,320	1,230	1,490
4	1,380	1,260	1,190	1,330	1,220	1,170	1,400	1,200	1,400		1,170	1,530
5	1,350	1,210	1,240	1,330	1,120	1,170	1,340	1,210	1,380		1,360	1,470
6	1,300	1,070	1,240	1,450	1,170	1,170	1,290	1,200	1,330		1,440	1,400
7	1,300	1,110	1,190	1,500	1,170	1,120	1,320	1,220	1,260		1,470	1,440
8	1,390	1,210	1,090	1,500	1,170	1,150	1,320	1,200	1,300		1,490	1,320
9	1,340	1,090	1,040	1,500	1,170	1,170	1,270	1,100	1,350		1,510	1,190
10	1,360	1,090	1,090	1,510	1,170	1,130	1,270	1,050	1,360	1,280	1,520	1,240
11	1,360	1,190	1,080	1,510	1,170	1,170	1,170	1,100	1,370			1,230
12	1,380	1,230	1,030	1,400	1,170	1,220	1,140	1,220	1,400			1,180
13	1,380	1,180	1,030	1,290	1,170	1,220	1,150	1,280	1,470		1,550	1,160
14	1,370	1,180	1,220	1,280	1,170	1,230	1,160	1,280	1,450			1,150
15	1,280	1,180	1,270	1,280	1,120	1,180	1,200	1,370	1,440	1,260		1,090
16	1,380	1,180	1,380	1,330	1,130	1,180	1,240	1,300	1,450	1,260		1,170
17	1,380	1,180	1,170	1,340	1,240	1,250	1,240	1,290	1,470	1,280		1,160
18	1,380	1,180	1,170	1,240	1,170	1,220	1,280	1,290	1,480	1,300	1,530	1,160
19	1,300	1,230	1,330	1,240	1,160	1,270	1,290	1,280	1,400	1,320		1,150
20	1,270	1,280	1,180	1,190	1,190	1,270	1,340	1,290	1,420	1,330	1,520	1,190
21	1,200	1,280	1,180	1,180	1,200	1,280	1,340	1,350	1,380	1,340	1,550	1,160
22	1,250	1,280	1,180	1,180	1,190	1,230	1,320	1,320	1,380	1,360	1,610	1,190
23	1,230	1,240	1,180	1,180	1,190	1,250	1,320	1,320	1,380	1,330	1,560	1,190
24	1,230	1,200	1,130	1,210	1,130	1,200	1,270	1,270	1,310	1,300	1,540	1,160
25	1,280	1,200	1,130	1,180	1,180	1,250	1,310	1,270		1,220	1,510	1,160
26	1,230	1,250	1,160	1,180	1,220	1,250	1,290	1,220		1,250	1,520	1,140
27	1,280	1,200	1,220	1,180	1,220	1,300	1,240	1,250	1,340	1,230	1,520	1,130
28	1,310	1,200	1,170	1,230	1,170	1,260	1,220	1,230		1,230	1,510	1,140
29	1,290	1,280	1,160	1,230	-------	1,260	1,250	1,240		1,230	1,500	1,140
30	1,240	1,220	1,160	1,180	-------	1,260	1,250	1,260		1,250	1,480	1,160
31	1,260	-------	1,230	1,180	-------	1,220	-------	1,270	-------	1,260	1,460	------

NOTE.—Discharge June 8, 21–23, 25–30, July 1–14, 16–21, 23, 24, Aug. 11–19; estimated from hydrographic comparison with sum of flow of Deschutes River at Pringle Falls and East Fork above Morson intake.

Combined monthly discharge of Deschutes River and canals near Bend, Oreg., for the year ending September 30, 1923

Month	Discharge in second-feet			Run-off in acre-feet	Month	Discharge in second-feet			Run-off in acre feet
	Maximum	Minimum	Mean			Maximum	Minimum	Mean	
October	1,390	1,200	1,310	80,600	May	1,370	1,050	1,250	76,900
November	1,320	1,070	1,210	72,000	June	1,480	1,260	1,370	81,500
December	1,380	1,030	1,170	71,900	July	1,360	1,220	1,290	79,300
January	1,510	1,180	1,300	79,900	August	1,610	1,170	1,480	91,000
February	1,320	1,070	1,180	65,500	September	1,530	1,090	1,240	73,800
March	1,300	1,120	1,210	74,400					
April	1,400	1,140	1,270	75,600	The year	1,610	1,030	1,270	922,400

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, 1923.

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.—Composed of rock and gravel; subject to occasional slight shifts.

EXTREMES OF DISCHARGE.—Maximum stage during year, observed from high-water marks, 6.9 feet during night of January 6 (discharge, 15,200 second-feet); minimum stage recorded, 2.10 feet September 11–17 (discharge, 3,410 second-feet).

1911–1923: Maximum stage recorded, that of January 6; 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, only small diversions below Bend gaging station. Summer flow of Crooked River above head of lower canyon near Terrebonne and of Tumalo and Squaw Creeks practically all diverted.

REGULATION.—None.

ACCURACY.—Stage-discharge relation apparently permanent. Rating curve well defined below 10,000 second-feet. Gage read to half-tenths once a day. Daily discharge ascertained by applying daily gage reading to rating table. Records excellent.

Discharge measurements of Deschutes River at Mecca, Oreg., during the year ending September 30, 1923

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Mar. 31	Wendell Dawson	3.94	7,100	July 17	Wendell Dawson	2.64	4,540
June 10	F. F. Henshaw	2.84	4,900	Sept. 8	do	2.30	3,720

Daily discharge, in second-feet, of Deschutes River at Mecca, Oreg., for the year ending September 30, 1923

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	3,760	4,330	4,330	5,570	4,730	5,570	7,800	5,150	4,140	4,330	3,580	3,580
2	3,760	4,530	4,330	5,150	4,730	5,570	7,570	5,150	4,140	4,330	3,580	3,760
3	3,760	4,530	4,330	5,150	4,940	5,780	7,340	5,150	4,140	4,330	3,670	3,850
4	3,850	4,530	4,730	5,150	4,940	5,570	7,340	4,940	4,330	4,140	3,670	3,950
5	3,950	4,530	4,730	5,150	4,730	5,570	6,880	4,940	4,330	4,040	3,670	3,670
6	4,040	4,530	4,730	10,900	4,730	5,360	6,880	4,730	4,330	4,330	3,670	3,580
7	4,040	4,530	4,730	13,100	4,730	5,360	6,880	4,730	4,330	4,330	3,760	3,760
8	4,040	4,530	4,530	11,400	4,730	5,150	7,340	5,360	4,330	4,330	3,760	3,670
9	4,040	4,530	4,330	9,300	4,940	5,150	7,110	5,150	5,150	4,330	3,760	3,670
10	4,040	4,730	4,330	8,280	4,940	5,150	6,880	5,570	4,730	4,330	3,760	3,580
11	4,040	4,730	4,330	7,570	4,940	5,150	6,880	5,360	4,530	4,330	3,760	3,410
12	4,040	4,730	4,330	7,110	4,940	5,150	6,880	5,150	4,330	4,330	3,760	3,410
13	4,040	4,730	4,330	6,430	4,940	5,150	6,880	5,150	4,330	4,330	3,760	3,410
14	4,140	4,730	4,330	6,430	4,730	5,150	6,880	4,730	4,330	4,330	3,760	3,410
15	4,330	4,730	4,330	5,990	4,730	5,150	6,880	5,150	4,140	4,330	3,670	3,410
16	4,530	4,730	4,330	5,990	4,730	5,150	6,880	5,150	4,140	4,530	3,670	3,410
17	4,530	4,730	4,530	5,990	4,730	5,150	6,880	5,150	4,140	4,940	3,670	3,410
18	4,330	4,730	4,730	5,780	4,730	5,150	7,340	5,150	4,330	4,530	3,670	3,490
19	4,330	4,730	4,940	5,570	4,730	5,150	7,340	4,730	4,330	4,530	3,670	3,490
20	4,330	4,730	4,730	5,570	4,730	5,570	6,880	4,730	4,330	4,330	3,580	3,490
21	4,330	4,730	4,730	5,570	4,730	5,570	6,880	4,730	4,330	4,330	3,580	3,580
22	4,330	4,730	4,730	5,570	4,940	5,570	6,430	4,730	4,330	4,330	3,760	3,580
23	4,330	4,730	4,730	5,360	5,150	5,570	5,990	4,730	4,330	4,330	3,670	3,580
24	4,330	4,730	5,570	5,360	5,150	5,570	5,990	4,730	4,330	4,140	3,580	3,580
25	4,730	4,730	5,360	5,360	5,360	5,570	5,780	4,530	4,330	3,950	3,580	3,670
26	4,530	4,730	5,150	5,360	5,360	5,570	5,570	4,330	4,330	3,950	3,580	3,670
27	4,530	4,730	5,360	5,360	5,360	5,990	5,570	4,330	4,330	3,850	3,580	3,670
28	4,330	4,530	5,150	5,150	5,360	6,430	5,570	4,140	4,530	3,850	3,670	3,760
29	4,330	4,530	4,940	5,150	------	6,880	5,360	4,140	4,330	3,760	3,670	3,760
30	4,330	4,330	4,730	5,150	------	7,110	5,360	4,140	4,530	3,760	3,580	3,760
31	4,330	------	5,150	4,940	------	7,340	------	4,140	------	3,670	3,580	------

Monthly discharge of Deschutes River at Mecca, Oreg., for the year ending September 30, 1923

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	4,730	3,760	4,200	258,000
November	4,730	4,330	4,640	276,000
December	5,570	4,330	4,700	289,000
January	13,100	4,940	6,450	397,000
February	5,360	4,730	4,910	273,000
March	7,340	5,150	5,590	344,000
April	7,800	5,360	6,670	397,000
May	5,570	4,140	4,840	298,000
June	5,150	4,140	4,350	259,000
July	4,940	3,670	4,230	260,000
August	3,760	3,580	3,670	226,000
September	3,950	3,410	3,600	214,000
The year	13,100	3,410	4,820	3,490,000

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, 1923. 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 Frisco Parodi.

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

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

EXTREMES OF DISCHARGE.—Maximum stage during year, 10.2 feet at 1 a. m. January 7 (discharge, 43,600 second-feet); minimum discharge, 4,120 second-feet September 12–18.

1906–1923: Maximum stage that of January 7, 1923; minimum stage, 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 changed during high water of January and again near end of July. Rating curves used as follows: October 1 to January 5, well defined; January 6 to July 19, well defined below 20,000 second-feet; July 20–29, shifting-control method used; July 30 to September 30, well defined. Gage read twice daily to tenths December 24 to March 31, daily to half-tenths the rest of year. Daily discharge ascertained by applying mean daily gage height to rating table. Records good.

Discharge measurements of Deschutes River at Moody, near Biggs, Oreg., during the year ending September 30, 1923

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Mar. 21	R. J. McKinney	3.31	6,720	July 18	Wendell Dawson	2.90	5,430
June 15	Wendell Dawson	2.80	4,840	Aug. 25	do	2.40	4,340

Daily discharge, in second-feet, of Deschutes River at Moody, near Biggs, Oreg., for the year ending September 30, 1923

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	4,320	4,720	4,720	8,630	5,620	8,160	9,420	6,640	5,300	4,860	4,490	4,240
2	4,200	4,860	4,720	7,170	5,620	8,160	9,860	6,640	5,300	4,860	4,360	4,490
3	4,320	5,000	4,720	7,880	5,620	7,760	9,860	6,280	5,000	4,860	4,360	4,620
4	4,450	5,000	4,720	7,170	5,620	7,380	9,860	6,280	5,000	4,860	4,360	4,750
5	4,580	5,000	5,000	8,250	5,940	7,380	9,860	6,280	5,000	4,590	4,360	4,620
6	4,450	5,000	5,000	23,600	5,940	7,000	9,420	6,640	5,300	4,720	4,360	4,360
7	4,450	4,860	5,000	37,800	5,620	7,000	9,420	7,000	5,300	4,860	4,240	4,240
8	4,580	4,860	5,000	29,600	5,620	6,640	9,420	7,000	5,620	5,000	4,360	4,240
9	4,450	4,860	5,000	20,300	5,620	6,280	9,420	7,380	5,620	4,860	4,360	4,240
10	4,320	5,280	5,000	16,100	5,300	6,280	8,980	7,760	5,940	4,860	4,490	4,240
11	4,450	5,280	4,720	16,100	5,620	6,280	8,980	7,760	6,280	5,000	4,490	4,240
12	4,450	5,280	4,720	12,200	5,620	6,280	8,560	7,380	5,620	5,000	4,490	4,120
13	4,450	5,280	4,720	10,800	5,300	5,940	8,560	7,380	5,300	4,720	4,490	4,120
14	4,450	5,280	4,720	10,300	5,000	6,280	8,980	7,000	5,000	4,720	4,490	4,120
15	4,580	5,000	4,720	9,420	5,000	6,280	8,560	7,000	5,000	4,720	4,490	4,120
16	4,450	5,280	4,720	8,560	5,000	6,640	8,560	7,380	5,000	4,720	4,490	4,120
17	4,450	5,280	4,720	9,420	5,300	6,640	9,420	7,380	5,000	4,720	4,360	4,120
18	4,860	5,570	4,720	8,560	5,620	6,140	9,420	7,000	5,000	5,000	4,360	4,120
19	4,860	5,570	5,000	7,760	5,620	7,000	9,860	6,640	5,000	5,000	4,360	4,240
20	4,860	5,280	5,570	7,760	6,280	7,000	9,420	6,280	5,000	5,000	4,360	4,240
21	4,860	5,280	5,280	7,000	5,940	6,640	8,560	6,280	5,000	5,000	4,360	4,240
22	4,860	5,280	5,000	7,000	5,940	6,640	8,160	6,280	4,860	4,860	4,360	4,240
23	4,860	5,000	5,000	7,380	6,280	6,640	7,380	6,280	4,860	4,720	4,360	4,240
24	4,860	5,000	7,520	7,000	7,760	7,000	7,380	5,940	4,860	4,720	4,360	4,360
25	4,860	5,000	9,030	7,000	7,760	7,000	7,380	5,940	4,860	4,720	4,360	4,360
26	4,860	5,000	7,520	6,640	8,160	6,640	7,000	5,620	4,860	4,460	4,360	4,360
27	5,000	5,000	7,520	6,640	7,760	7,000	7,000	5,300	4,860	4,460	4,360	4,360
28	5,000	5,280	7,170	6,640	7,760	7,000	7,000	5,300	5,000	4,460	4,240	4,360
29	4,860	5,280	6,500	6,280	-------	7,760	7,000	5,300	5,000	4,460	4,240	4,360
30	4,720	5,000	5,870	6,280	-------	8,560	7,000	5,300	5,000	4,490	4,240	4,360
31	4,720	-------	7,880	6,280	-------	9,420	-------	5,300	-------	4,490	4,240	-------

Monthly discharge of Deschutes River at Moody, near Biggs, Oreg., for the year ending September 30, 1923

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	5,000	4,200	4,630	285,000
November	5,570	4,720	5,120	305,000
December	9,030	4,720	5,530	340,000
January	37,800	6,280	11,000	676,000
February	8,160	5,000	6,010	334,000
March	9,420	5,940	7,010	431,000
April	9,860	7,000	8,660	515,000
May	7,760	5,300	6,510	400,000
June	6,280	4,860	5,160	307,000
July	5,000	4,460	4,770	293,000
August	4,490	4,240	4,370	269,000
September	4,750	4,120	4,290	255,000
The year	37,800	4,120	6,090	4,410,000

SNOW CREEK ABOVE CRANE PRAIRIE, NEAR LAPINE, OREG.

LOCATION.—In SE. ¼ sec. 21, T. 20 S., R. 8 E., one-half mile above mouth and backwater of Crane Prairie Reservoir, 30 miles northwest of Lapine, Deschutes County.

DRAINAGE AREA.—Indeterminate; stream spring fed.

RECORDS AVAILABLE.—May 25, 1922, to September 30, 1923.

GAGE.—Vertical staff; read by George Graft and E. L. Dalrymple.

DISCHARGE MEASUREMENTS.—Made by wading near gage.

CHANNEL AND CONTROL.—Gravel, but practically permanent.

EXTREMES OF DISCHARGE.—Maximum stage of 0.80 foot occurred during each month except March and April (discharge, 29 second-feet); minimum stage, 0.75 foot March 28 (discharge, 22 second-feet).

ICE.—Ice never forms.

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation practically permanent. Rating curve well defined. Gage read to hundredths on days for which discharge is presented. Daily discharge ascertained by applying daily gage reading to rating table. Records excellent.

The following discharge measurement was made by Wendell Dawson:
April 26: Gage height, 0.79 foot; discharge, 28 second-feet.

Daily discharge, in second-feet, of Snow Creek above Crane Prairie, near Lapine, Oreg., for the year ending September 30, 1923

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

Monthly discharge of Snow Creek above Crane Prairie, near Lapine, Oreg., for the year ending September 30, 1923

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	29	28	28.5	1,750
November	29	29	29.0	1,730
December	29	29	29.0	1,780
January	29	29	29.0	1,780
February	29	29	29.0	1,610
March	28	22	24.8	1,520
April	28	24	26.0	1,550
May	29	29	29.0	1,780
June	29	29	29.0	1,730
July	29	29	29.0	1,780
August	29	29	29.0	1,780
September	29	29	29.0	1,730
The year	29	22	28.4	20,500

CULTUS RIVER ABOVE CULTUS CREEK, NEAR LAPINE, OREG.

LOCATION.—In SW. ¼ sec. 20, T. 20 S., R. 8 E., 2 miles above Cultus Creek and 5 miles north of Crane Prairie Dam, Deschutes County.

DRAINAGE AREA.—Indeterminate; mostly spring-fed.

RECORDS AVAILABLE.—June 10 to September 30, 1923. June 13 to October 26, 1922, at station below mouth of Cultus Creek.

GAGE.—Vertical staff on left bank one-half mile above footbridge and ford; a gage about 1 mile farther upstream was used in June. Gages read by George E. Graft and E. L. Dalrymple.

DISCHARGE MEASUREMENTS.—Made by wading.

CHANNEL AND CONTROL.—The channel is wide and narrow and stream bed consists of gravel and small stones; practically permanent.

EXTREMES OF DISCHARGE.—Maximum discharge recorded, 70 second-feet, August 8, 14, and 17; minimum discharge, 48 second-feet, April 29.

ICE.—None.

DIVERSIONS.—None.

REGULATION.—Stream is fed by springs and yearly variation is small.

ACCURACY.—Stage-discharge relation practically permanent at each gage. Rating curves fairly well defined. Staff gage read to hundredths once a week after June 10. Daily discharge ascertained by applying daily gage height to rating table. Records June to September good; for remainder of year, which were mostly estimated, fair.

Discharge measurements of Cultus River above Cultus Creek, near Lapine, Oreg., during the years ending September 30, 1922 and 1923

[Made by Wendell Dawson]

Date	Gage height	Discharge	Date	Gage height	Discharge	Date	Gage height	Discharge
1922	*Feet*	*Sec.-ft.*	1923	*Feet*	*Sec.-ft.*	1923	*Feet*	*Sec.-ft.*
May 26	0.71	67	Jan. 20		54	June 23	0.69	69
Nov. 22		54	Apr. 29		48	Sept. 25	.68	62

Daily discharge, in second-feet, of Cultus River above Cultus Creek, near Lapine, Oreg., for the year ending September 30, 1923

Day	June	July	Aug.	Sept.	Day	June	July	Aug.	Sept.
1					16				
2					17			70	
3				66	18				
4					19		69		
5					20				
6				66	21				65
7					22			69	
8			70		23	68			
9					24				
10	66			66	25		69		63
11		68			26				
12					27			68	
13					28	68			
14			70		29				
15	66			66	30				
					31			68	

Monthly discharge of Cultus River above Cultus Creek, near Lapine, Oreg., for the year ending September 30, 1923

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October			70.2	4,320
November			57	3,390
December			54	3,320
January			54	3,320
February			50	2,780
March			50	3,070
April			48	2,860
May			55	3,380
June	68	66	67	3,990
July	69	68	69	4,240
August	70	68	69	4,240
September	66	63	65	3,870
The year			59.0	42,800

NOTE.—The mean discharge for October based on flow at station below Cultus Creek. Mean discharge for November to May estimated.

QUINN RIVER ABOVE CRANE PRAIRIE, NEAR LAPINE, OREG.

LOCATION.—In NW. ¼ sec. 1, T. 21 S., R. 7 E., 400 feet below head of river, and 3 miles northwest of Crane Prairie Dam, Deschutes County.

DRAINAGE AREA.—Indeterminate because stream is spring fed.

RECORDS AVAILABLE.—June 1, 1922, to September 30, 1923.

GAGE.—Vertical staff on tree root, 400 feet below springs which form source of river.

DISCHARGE MEASUREMENTS.—Made by wading 200 feet above gage.

CHANNEL AND CONTROL.—Bed composed of fine loose gravel; riffle just below gage forms a well-defined and practically permanent control.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 0.83 foot on July 15 (discharge, 36 second-feet); minimum discharge, 12 second-feet January 12.

ICE.—None.

REGULATION.—Stream is spring fed.

ACCURACY.—Stage-discharge relation practically permanent. Rating curve well defined. Staff gage read to hundredths once a week during May to September. Daily discharge ascertained by applying daily gage height to rating table. Records May to September, 1923, good; estimated monthly discharge June, 1922, to April, 1923, fair.

Discharge measurements of Quinn River above Crane Prairie, near Lapine, Oreg., during the years ending September 30, 1922 and 1923

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
1922		*Feet*	*Sec.-ft.*	1923		*Feet*	*Sec.-ft.*
June 19	Wendell Dawson	0.70	21.8	Jan. 21	Wendell Dawson	0.48	12.0
Aug. 24	do	.78	27.7	Apr. 30	do	.48	13.2
Nov. 23	do	.54	16.2	June 19	do	.78	32.5
				Aug. 28	Arthur Cramer	.80	34.0

Daily discharge, in second-feet, of Quinn River above Crane Prairie, near Lapine, Oreg., for the year ending September 30, 1923

Day	May	June	July	Aug.	Sept.	Day	May	June	July	Aug.	Sept.
1						16	18			36	
2						17		31			
3		23			34	18					
4						19		32			
5						20	16	32			
6	14				34	21					32
7			34			22				34	
8						23		32			
9	15					24					
10		26			32	25					31
11						26			36		
12						27	21			34	
13	18					28				34	
14				36		29					
15		30	36		32	30			35		
						31				34	

Monthly discharge of Quinn River above Crane Prairie, near Lapine, Oreg., for the years ending September 30, 1922 and 1923

Month	Mean discharge in second-feet	Run-off in acre-feet	Month	Mean discharge in second-feet	Run-off in acre-feet
1922			1922-23		
June	20	1,190	January	12	738
July	26	1,600	February	12	666
August	27	1,660	March	12	738
September	24	1,430	April	12	714
			May	17	1,050
The period		5,880	June	29.4	1,750
			July	35.2	2,160
1922-23			August	34.7	2,130
October	20	1,230	September	32.5	1,930
November	17	1,010			
December	14	861	The year		15,000

NOTE.—Mean discharges for June, 1922, to April, 1923, estimated; based on infrequent discharge measurements.

BROWN CREEK NEAR LAPINE, OREG.

LOCATION.—In SE. ¼ sec. 29, T. 21 S., R. 8 E., at road crossing a quarter of a mile above mouth, 3½ miles south of Crane Prairie Dam, and 20 miles west of Lapine, Deschutes County.

DRAINAGE AREA.—Indeterminate; spring fed.

RECORDS AVAILABLE.—May 24, 1922, to September 30, 1923.

GAGE.—Vertical staff on left bank; read by George Graft and E. L. Dalrymple.

DISCHARGE MEASUREMENTS.—Made by wading near gage.

CHANNEL AND CONTROL.—Gravel bar, with aquatic plants along sides; somewhat unstable.

EXTREMES OF DISCHARGE.—Maximum stage recorded, 0.56 foot January 1 (discharge, 47 second-feet); minimum stage recorded, 0.40 foot March 22, May 26, and June 14, 20, and 30 (discharge, 34 second-feet).

ICE.—None.

DIVERSIONS.—None

REGULATION.—None.

ACCURACY.—Stage-discharge relation not permanent. Two fairly well defined rating curves used, changing November 1. Gage read to hundredths once on days for which discharge is given. Daily discharge ascertained by applying daily gage reading to rating table. Records good.

Discharge measurements of Brown Creek near Lapine, Oreg., during the year ending September 30, 1923

[Made by Wendell Dawson]

Date	Gage height	Discharge
	Feet	*Sec.-ft.*
Nov. 21	0.50	43
June 25	.41	34

Daily discharge, in second-feet, of Brown Creek near Lapine, Oreg., for the year ending September 30, 1923

Day	Oct	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1		42	40	47								
2	43						36					
3						38						
4	43											
5	43							36				
6												
7	43											
8					40							
9	43							35		36		
10			40	44		36						
11	44						39					
12												
13	44											
14									34			
15					40			35				
16	43										38	44
17			40						36			
18	43	44				35	40					
19												
20	43				39				34			
21	43	42										
22				43								
23	43					34						
24		44										
25									35			
26	43		42					34				
27												
28												
29												
30		40							34			
31												

Monthly discharge of Brown Creek near Lapine, Oreg., for the year ending September 30, 1923

Month	Mean discharge in second-feet	Run-off in acre-feet	Month	Mean discharge in second-feet	Run-off in acre-feet
October	43.0	2,640	May	35.0	2,150
November	42.0	2,500	June	35.0	2,080
December	40.0	2,460	July	36.0	2,210
January	45.0	2,770	August	38.0	2,340
February	40.0	2,220	September	44.0	2,620
March	36.0	2,210			
April	38.0	2,260	The year	39.3	28,500

LITTLE DESCHUTES RIVER ABOVE WALKER BASIN INTAKE, NEAR LAPINE, OREG.[1]

LOCATION.—In sec. 33, T. 23 S., R. 9 E., above intake of canal of Walker Basin 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, and May 1, 1922, to September 30, 1923.

GAGE.—Stevens continuous water-stage recorder on right bank above intake. Vertical staff nailed to a tree root in sec. 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, and winter of 1922–23, staff gage at present location during 1921. Gage reader, Fred L. Mahn.

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 during year from water-stage recorder, 4.90 feet at 10 p. m. May 13 (discharge, 469 second-feet); minimum stage recorded, 2.42 feet at 4 a. m. November 15 (discharge, 34 second-feet).

1914–1917; 1919–1923: Maximum stage, 6.73 feet June 12, 1917 (discharge, 835 second-feet); minimum discharge, that of November 15. Flood of November 24, 1909, may have reached 1,800 second-feet (estimated from records at Allen ranch).

ICE.—Stage-discharge relation affected by ice.

DIVERSIONS.—A few small ditches divert water above station, Walker Basin Canal diverts a short distance below.

REGULATION.—Affected by storage at Crescent Lake Reservoir.

ACCURACY.—Stage-discharge relation at recorder changed during winter; affected by ice November 24 to March 1. Well-defined rating curves used October 1 to January 11 and March 16 to September 30. Stage-discharge relation at staff gage at bridge apparently permanent. Rating curve fairly well defined. Operation of recorder satisfactory prior to beginning of ice period about November 20, during December and January high water and after March 16, except for several short periods. Staff gage at bridge read about 3 times a week January 21 to March 30. Daily discharge ascertained by applying to rating table daily gage reading or mean daily gage height obtained by inspecting recorder graph. Records good except during ice-affected period, November 24 to March 1, for which they are rather uncertain.

Discharge measurements of Little Deschutes River above Walker Basin intake, near Lapine, Oreg., during the year ending September 30, 1923

[Made by Wendell Dawson]

Date	Gage height	Discharge
	Feet	*Sec.-ft.*
Mar. 28	3.28	148
May 2	4.05	278
July 13	3.38	161

[1] Formerly referred to as East Fork at Morson intake.

Daily discharge, in second-feet, of Little Deschutes River above Walker Basin intake, near Lapine, Oreg., for the year ending September 30, 1923

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	63	70				115	192	278	298	192	120	248
2	63	71				115	197	278	298	195	200	239
3	66	68		110		100	174	268	258	195	235	239
4	71	74	80			84	166	258	239	195	239	239
5	76	77				96	166	258	258	189		239
6	75	67		150		94	179	268	258	195		239
7	74	67		250		93	178	278	278	197		239
8	71	70		350		92	167	288	288	190		230
9	67	72		400		90	167	320		189		239
10	66	74		400		87	174	352		182		239
					80						260	
11	66	74		350		84	187	386		174		239
12	72	72				90	234	397		166		239
13	72	72	70			93	248	432		159		230
14	69	62		200		96	248	397		167		230
15	67	59				96	268	374		166		230
16	66	82				116	298	374		176		230
17	65	89				134	330	374	248	174	258	230
18	63	103				142	341	374		174	258	230
19	62	111				136	330	386		173	258	230
20	62	99				137	320	374		168	258	221
21	62	96				136	330	352		163	248	221
22	61	76				124	309	341		163	248	221
23	60	70				122	288	320		156	248	212
24	59			100		130	278	320		153	248	210
25	59				120	128	268	320		146	248	212
26	60	70	100			136	268	330		137	212	212
27	61					142	278	330	209	127	205	150
28	64					147	278	320	204	122	207	110
29	65				-------	158	278	309	198	120	239	110
30	65				-------	170	268	309	195	120	248	110
31	66	-------			-------	182	-------	298	-------	120	248	-------

NOTE.—Braced figures show mean discharge for periods. Stage-discharge relation affected by ice Nov. 24 to Mar. 1; discharge estimated, based on gage-height record, observer's notes, temperature records, and discharge of Deschutes River at Bend. Discharge estimated July 10–12 and July 29 to Aug. 3 when no gage-height record was obtained.

Monthly discharge of Little Deschutes River above Walker Basin intake, near Lapine, Oreg., for the year ending September 30, 1923

Month	Observed discharge in second-feet			Run-off in acre-feet		
	Maximum	Minimum	Mean	Observed	Stored	Corrected for storage
October	75	59	65.7	4,040	+2,090	6,130
November	111	59	75.5	4,490	+2,030	6,520
December	----------	----------	82.6	5,080	+4,280	9,360
January	400	----------	160	9,840	+3,880	13,700
February	----------	----------	91.4	5,080	+1,440	6,520
March	182	84	118	7,260	+1,040	8,300
April	341	166	247	14,700	+1,620	16,300
May	432	258	331	20,400	+4,910	25,300
June	298	195	248	14,800	+1,860	16,700
July	197	120	166	10,200	−50	10,200
August	----------	120	243	14,900	−11,250	3,650
September	248	110	216	12,900	−7,870	5,030
The year	432	59	171	124,000	+3,980	128,000

CRESCENT LAKE RESERVOIR NEAR CRESCENT, OREG.

LOCATION.—At reservoir dam in sec. 11, T. 24 S., R. 6 E., 16 miles west of Crescent, Klamath County.

RECORDS AVAILABLE.—August 25, 1922, to September 30, 1923; only occasional readings during winter, averaging two a month.

GAGE.—Vertical staff on outlet gate tower, readings reported to sea-level datum.

EXTREMES OF CONTENTS.—Maximum stage recorded, 4,845.55 feet on July 15–18 (contents, 67,760 acre-feet); minimum stage, 4,839.30 feet on September 25 (contents, 45,320 acre-feet).

Crescent Lake Reservoir was completed in 1922, the water was stored back of a coffer dam beginning some time in August. As most of the storage is obtained by lowering the outlet, storage began with about 41,380 acre-feet, as computed above the sill of the outlet gate. Water used by Deschutes County Municipal Improvement District through their canal that diverts from Deschutes River at Bend.

Monthly stage and contents of Crescent Lake Reservoir near Crescent, Oreg., for years ending September 30, 1922 and 1923

Date	Gage height	Contents	Loss or gain during month	Date	Gage height	Contents	Loss or gain during month
1922	*Feet*	*Acre-feet*	*Acre-feet*	1922–23	*Feet*	*Acre-feet*	*Acre-feet*
Aug. 25	4,838.19	41,380		Mar. 31		[a]58,520	+1,040
31		[a]41,720	+340	Apr. 30		[a]60,140	+1,620
Sept. 30	4,838.86	43,750	+2,030	May 31		[a]65,040	+4,900
1922–23				June 30		[a]66,900	+1,860
Oct. 31	4,839.45	45,850	+2,100	July 31	4,845.30	66,860	−40
Nov. 30	4,840.02	47,880	+2,030	Aug. 31	4,842.18	55,600	−11 2[illegible]
Dec. 31		[a]52,160	+4,280	Sept. 30	4,839.98	47,730	[illegible]
Jan. 31	4,842.3	56,040	+3,880	The year			+3,[illegible]50
Feb. 28		[a]57,480	+1,440				

[a] Interpolated.

CRESCENT CREEK BELOW COLD CREEK, NEAR CRESCENT, OREG.

LOCATION.—In SW. ¼ sec. 7, T. 24 S., R. 7 E., 1 mile below mouth of Cold Creek, 2 miles by road below outlet of Crescent Lake, and 15 miles west of Crescent, Klamath County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—August 30, 1912, to December 11, 1913; June 17 to December 6, 1922, and May 30 to September 30, 1923.

GAGE.—Stevens continuous water-stage recorder on left bank; staff gage at road bridge, half a mile above road during 1912–13.

DISCHARGE MEASUREMENTS.—Made by wading near gage.

CHANNEL AND CONTROL.—Gravel and boulders, wide and flat; fairly permanent.

EXTREMES OF DISCHARGE.—Maximum stage during year from water-stage recorder, 1.47 feet August 9 and 10 (discharge, 222 second-feet); minimum stage recorded, −0.11 foot November 15 (discharge, 17 second-feet).

1912–13; 1922–23: Maximum stage recorded, 1.50 feet June 17, 1922 (discharge, 228 second-feet); minimum stage that of November 15.

ICE.—Stage-discharge relation probably affected at times.

DIVERSIONS.—None.

REGULATION.—Flow regulated by storage in Crescent Lake Reservoir.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined. Daily discharge ascertained by applying to rating table mean daily gage height determined from recorder graph by inspection, or for days of considerable variation in stage, by averaging results obtained by applying mean gage heights for shorter intervals. Records good.

The following measurement was made by Wendell Dawson:
July 14, 1923: Gage height, 0.42 foot; discharge, 61 second-feet.

Daily discharge, in second-feet, of Crescent Creek below Cold Creek, near Crescent, Oreg., for the year ending September 30, 1923

Day	Oct.	Nov.	Dec.	May	June	July	Aug.	Sept.
1	17		23		55	66	100	202
2	17		23		45	66	180	202
3	17		22		36	66	180	202
4	17	17	21		45	62	182	200
5	17		21		47	58	212	200
6	17		21		60	58	218	198
7	17	17			68	59	218	198
8	17	17			68	60	218	197
9	17	17			68	59	222	195
10	17	17			68	59	222	193
11	17	17			66	60	220	191
12	17	17			66	57	220	189
13	17	17			66	57	218	189
14	17	18			66	57	218	187
15	17	17			66		216	187
16	17	18			66		216	185
17	17	20			68		214	184
18	17	19			68		214	184
19		19			67		212	175
20		19			67		212	162
21		19			67		210	158
22		21			67	60	210	153
23		19			66		206	141
24		19			64		204	136
25	17	19			66		186	133
26		23			66		169	88
27		19			67		164	51
28		24			67		184	51
29		25			66		204	51
30		20		41	66		204	51
31				41			204	

NOTE—Daily discharge estimated Oct. 19 to Nov. 6, and July 15–31; recorder not operating. No record Dec. 7 to May 29.

Monthly discharge of Crescent Creek, below Cold Creek, near Crescent, Oreg., for the year ending September 30, 1923

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	17		17.0	1,050
November	25		18.6	1,110
December 1–6	23	21	21.8	259
June	68	36	62.9	3,740
July	66	57	60.1	3,700
August	222	100	202	12,400
September	202	51	161	9,580

WALKER BASIN CANAL NEAR LAPINE, OREG.

LOCATION.—In NW. ¼ sec. 35, T. 24 S., R. 9 E., a quarter of a mile below intake, 8 miles northeast of Crescent, and 13 miles southwest of Lapine, Deschutes County.

RECORDS AVAILABLE.—May 22, 1922, to September 30, 1923; fragmentary during 1923.

GAGE.—Vertical staff on left side of canal head gate; gage reader, Fred L. Mahn.

DISCHARGE MEASUREMENTS.—Made by wading.

CHANNEL AND CONTROL.—Gravel bar just below gage; shifting. Below this, canal is very sluggish and filled with aquatic growth.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period, 1.78 feet August 17 (discharge, 50 second-feet); canal dry at times.

ICE.—None during period of records.

ACCURACY.—Stage-discharge relation assumed permanent. Rating curve not well defined. Gage read occasionally. Daily discharge ascertained by applying daily gage reading to rating table. Records suffice for an approximate estimate.

Walker Basin (or Morson) Canal diverts water from Little Deschutes River in sec. 35, T. 24 S., R. 9 E., for irrigating the Carey Act tract lying just east of the river near Lapine. Little land was actually irrigated and cropped in 1922 or 1923, and much of the water found its way back to the stream as waste or seepage.

The following discharge measurement was made by Wendell Dawson:

May 2, 1923: Gage height, 1.58 feet; discharge, 37.2 second-feet.

Daily discharge, in second-feet, of Walker Basin Canal near Lapine, Oreg., for 1923

Date	Discharge	Date	Discharge	Date	Discharge
	Sec.-ft.		*Sec.-ft.*		*Sec.-ft.*
May 3	37	Sept. 8	45	Oct. 5	25
15	41	14	47	6	18
Aug. 17	50	22	48		
31	42	28	30		

Monthly discharge of Walker Basin Canal near Lapine, Oreg., for the year ending September 30, 1923

Month	Mean discharge in second-feet	Run-off in acre-feet
May	39	2,400
June	50	2,980
July	50	3,070
August	46	2,830
September	42	2,500
The period	----------	13,800

NOTE.—Monthly discharge estimated.

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, 1923. Information sufficient for an approximate estimate, October, 1912, to March, 1914.

GAGE.—Vertical staff on right side of flume 400 feet below 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 NE. ¼ sec. 27, was used up to April 30, 1915. Gage reader, G. W. Shafer.

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, 2.50 feet August 4 (discharge, 151 second-feet); canal dry at various times during year.

1914–1923: Maximum stage recorded, that of August 4, 1923; canal dry at various times.

ICE.—Canal dry during winter.

ACCURACY.—Stage-discharge relation changed during winter. Rating curve fairly well defined. Staff gage read once a day to hundredths. No gage readings were made from October 1 to April 24. Daily discharge April 25 to September 30 was ascertained by applying daily gage height to rating table; discharge October 1 to April 24 estimated on information furnished by Glen H. Slack, secretary of the district, from two discharge measurements and information obtained by Mr. Dawson. Records good, except during winter, when no gage heights are available, for which they are fair.

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

Discharge measurements of Arnold Canal near Bend, Oreg., during the year ending September 30, 1923

[Made by Wendell Dawson]

Date	Gage height	Discharge	Date	Gage height	Discharge
	Feet	*Sec.-ft.*		*Feet*	*Sec.-ft.*
Nov. 29	1.38	50	July 13	2.12	107
Mar. 26	1.40	48.5	Sept. 12	2.20	114

Daily discharge, in second-feet, of Arnold Canal near Bend, Oreg., for the year ending September 30, 1923

Day	Oct.	Nov.	Dec.	Jan.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	90						55	139	134	145	122
2							55	139	134	145	117
3				50			60	139	139	145	117
4	55						60	139	139	151	117
5		70					60	139	134	145	128
6							60	145	83	145	128
7							60	145	97	145	128
8							83	145	97	145	128
9							90	145	102	145	117
10							90	145	106	145	117
11							94	139	106	145	117
12							102	139	106	145	117
13							102	145	106	145	117
14							97	145	106	145	112
15							117	139	106	145	117
16							117	139	106	145	112
17							117	134	106	145	97
18							117	134	117	145	117
19							117	128	117	145	112
20	80						122	128	117	145	117
21							117	128	117	145	117
22							117	128	117	139	112
23					48		122	122	145	122	106
24							128	122	145	122	97
25						55	128	112	139	122	112
26						55	122	122	139	122	97
27						55	122	128	139	122	90
28		50				55	134	139	139	122	90
29						55	134	134	139	122	83
30						55	134	134	145	122	112
31							134		145	122	

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

Monthly discharge of Arnold Canal near Bend, Oreg., for the year ending September 30, 1923

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	90	0	73.1	4,490
November	70	0	27.0	1,610
December	0	0	.0	0
January	50	0	8.06	496
February	0	0	.0	0
March	48	0	13.9	857
April	55	0	11.0	654
May	134	55	102	6,270
June	145	112	135	8,030
July	145	83	122	7,500
August	151	122	138	8,480
September	128	83	112	6,660
The year	151	0	62.3	45,100

CENTRAL OREGON CANAL NEAR BEND, OREG.

LOCATION.—In NE. ¼ sec. 7, T. 18 S., R. 11 E., at flume section half a mile below point where waters in main diversion canal are divided between this canal and the Pilot Butte Canal and 2 miles south of Bend, Deschutes County.

RECORDS AVAILABLE.—May 11, 1905, to September 30, 1923.

GAGE.—Vertical enameled staff on right side of flume; read by Frank Slattery. Staff gage on left wingwall at entrance to flume section, about 200 yards upstream, used July 1 to September 30, 1922.

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, 390 second-feet most of the time July 1 to September 18. Canal dry at various times during year.

1905–1923: Maximum stage recorded, 4.1 feet at time of current-meter 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 gage is sufficient to maintain open channel at all times.

ACCURACY.—Stage-discharge relation practically permanent; affected by accumulation of sediment in flume October 1 to February 24 and August 1 to September 30. Rating curve fairly well defined. Staff gage read to hundredths twice a day. Daily discharge estimated by applying mean daily gage height to rating table or by shifting-control method for periods when channel was obstructed. Records good.

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

Central Oregon Canal diverts water from right bank of Deschutes River in 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 September 30, 1923

[Made by Wendell Dawson]

Date	Gage height	Discharge
	Feet	*Sec.-ft.*
July 12	3.85	399
Sept. 14	3.90	391

Daily discharge, in second-feet, of Central Oregon Canal near Bend, Oreg., for the year ending September 30, 1923

Day	Oct.	Nov.	Dec.	Feb.	May	June	July	Aug.	Sept.
1	263	93	132			375	390	390	390
2	263		88			375	390	390	260
3	263					375	390	390	
4	277					375	390	390	281
5	277					375	390	390	390
6	284					375	390	390	390
7	284					375	390	390	390
8	284					266	390	390	390
9	277					361	390	390	390
10	277					361	390	390	390
11	256					361	390	390	390
12	221					241	390	390	390
13	221				196	375	390	390	390
14	221				235	375	390	390	390
15	169				333	375	390	390	390
16	110				333	375	390	390	390
17	110			65	347	375	390	390	390
18	110			132	361	375	375	390	390
19	110			110	361	375	361	390	361
20	110			121	361	375	361	390	361
21				150	361	375	361	390	347
22				150	361	375	390	390	333
23				150	361	375	390	390	333
24				44	361	375	390	390	319
25					361	375	390	390	291
26					361	375	390	390	256
27			129		375	375	390	390	221
28	93		182		375	375	390	390	221
29	132	60	182		375	375	390	390	221
30	132	132	122		375	375	390	390	221
31	132				375		390	390	

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

Monthly discharge of Central Oregon Canal near Bend Oreg., for the year ending September 30, 1923

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	284	0	157	9,650
November	132	0	9.50	565
December	182	0	26.9	1,660
January	0	0	0	0
February	150	0	32.9	1,830
March	0	0	0	0
April	0	0	0	0
May	375	0	212	13,000
June	375	241	366	21,800
July	390	361	387	23,800
August	390	390	390	24,000
September	390	0	329	19,600
The year	390	0	160	116,000

PILOT BUTTE CANAL NEAR BEND, OREG.

LOCATION.—In NE. ¼ sec. 7, T. 18 S., R. 11 E., at a point in the canal directly opposite old gage on Central Oregon Canal, half a mile below point where waters are divided between this canal and the Central Oregon Canal and 2 miles south of Bend, Deschutes County.

RECORDS AVAILABLE.—March 6, 1905, to September 30, 1923.

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

DISCHARGE MEASUREMENTS.—Made by wading at gage.

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

EXTREMES OF DISCHARGE.—Maximum discharge recorded during year, 22 second-feet June 30 to July 31 (gage-height, 1.70 feet); canal dry at various times.

1905–1923: Maximum stage recorded, 3.10 feet June 8, 11–16, July 21, 1913 (discharge, 244 second-feet); canal dry at various times.

ICE.—Canal dry during freezing weather.

ACCURACY.—Stage-discharge relation affected by débris on control. Rating curve not well defined. Gage read to half-tenths twice a day and time of opening or closing gates noted. Daily discharge ascertained by applying mean daily gage height to rating table or by shifting-control method. Records fair.

Pilot Butte Canal diverts water from 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 September 30, 1923

[Made by Wendell Dawson]

Date	Gage height	Discharge
	Feet	*Sec.-ft.*
July 12	1.70	22.3
Sept. 14	1.62	17.0

Daily discharge, in second-feet, of Pilot Butte Canal near Bend, Oreg., for the year ending September 30, 1923

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

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

Monthly discharge of Pilot Butte Canal near Bend, Oreg., for the year ending September 30, 1923

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	14	0	6.94	427
November	10	0	.73	43
December	10	0	1.65	101
January	0	0	0	0
February	10	0	2.39	133
March	0	0	0	0
April	0	0	0	0
May	17	0	9.00	553
June	22	8	16.9	1,010
July	22	22	22.0	1,350
August	21	20	20.6	1,270
September	20	0	17.8	1,060
The year	22	0	8.22	5,950

DESCHUTES COUNTY MUNICIPAL IMPROVEMENT DISTRICT CANAL AT BEND, OREG.

LOCATION.—In NE. ¼ sec. 32, T. 17 S., R. 12 E., at Bend, Deschutes County.
RECORDS AVAILABLE.—May 10 to September 30, 1923.
GAGE.—Vertical staff on masonry stream wall of canal, about 100 yards below intake; read by W. Andrews.

DISCHARGE MEASUREMENTS.—Made from footbridge near gage.

CHANNEL AND CONTROL.—Concrete and masonry lined at gage, trapezoidal section, permanent; control is entrance of semicircular metal flume, about 100 yards below gage.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period May 10 to September 30, 3.8 feet on August 17 and August 22 to September 5 (discharge, 215 second-feet); canal dry for long periods.

ICE.—None.

ACCURACY.—Stage-discharge relation apparently permanent. Rating curve well defined. Gage read to tenths once a day July 22 to August 5, twice a day August 6 to September 30. Daily discharge ascertained by applying mean daily gage height to rating table. Discharges May 10 to June 18 estimated by C. M. Redfield, chief engineer of canal. Canal dry practically all of June 19 to July 21. Records for July to September good, for May and June they are made only for purpose of computing total run-off of Deschutes River at Bend.

The Deschutes County Municipal Improvement District Canal diverts from Deschutes River at Bend, using surplus natural flow, and water released from Crescent Lake Reservoir. The canal delivers water to the Tumalo project feed canal, to supplement the flow of Tumalo Creek in irrigating the Tumalo project.

Discharge measurements of Deschutes County Municipal Improvement District Canal at Bend, Oreg., during the year ending September 30, 1923

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
June 9	F. F. Henshaw	2.59	118	Aug. 19	A. P. Cramer[a]	3.50	188
July 11	Wendell Dawson	1.06	35.0	Sept. 13	Wendell Dawson	3.00	142

[a] Engineer for North Canal Co.

Daily discharge, in second-feet, of Deschutes Municipal Improvement District Canal at Bend, Oreg., for the year ending September 30, 1923

Day	May	June	July	Aug.	Sept.	Day	May	June	July	Aug.	Sept.
1		40		146	215	16	5	100		206	
2				146	215	17	5			215	
3		10		146	215	18	5			202	
4		100		54	215	19	5	50		197	
5		100		146	215	20	40	50		206	
6		100		158	146	21	40			210	
7		50		170	146	22	40		54	215	
8		120		179	146	23	40		79	215	
9		119		179	114	24	40		110	215	66
10	2			197	146	25	40		27	215	131
11	5		35	197	146	26	40		45	215	131
12	5	100		197	146	27	40		41	215	97
13	5			197	146	28	40		41	215	79
14	5			197	146	29	40		41	215	79
15	5			197		30	40		79	215	79
						31	40		110	215	

NOTE.—Daily discharge for May and June estimated. Canal dry for periods for which no discharge is given. Braced figures show mean discharge for periods indicated.

Monthly discharge of Deschutes Municipal Improvement District Canal at Bend, Oreg., for the year ending September 30, 1923

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
May 10-31	40	2	24.0	1,050
June	120	0	54.6	3,250
July	110	0	21.4	1,320
August	215	54	190	11,700
September	215	0	101	6,010
The period				23,300

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, 1923.

GAGE.—Inclined staff painted on left side of concrete lining; 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, 7.2 feet August 18 to September 7 (discharge, 450 second-feet); canal dry at various times.

1913–1923: Maximum discharge recorded, that of August 18 to September 7, 1923.

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

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

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

Discharge measurements of North Canal near Bend, Oreg., during the year ending September 30, 1923

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Apr. 18	Wendell Dawson	3.18	131	May 25	Wendell Dawson	6.50	390
May 16	Luper[a] and Redfield[b]	6.40	371	Sept. 14	do	6.85	439
20	do	6.35	366				

[a] Assistant State engineer. [b] Engineer for irrigation district.

Daily discharge, in second-feet, of North Canal near Bend, Oreg., for the year ending September 30, 1923

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	356		164					324	397	374	405	450
2	324							340	397	383	405	450
3	300							340	397	390	397	450
4	268							340	397	397	420	450
5	268							348	397	397	413	450
6	268							356	397	397	420	450
7	268							356	397	397	420	450
8	268					60		356	115	397	420	450
9	268					30		356		397	420	420
10	268							374	68	397	420	435
11	268							374	316	397	420	420
12	244							374	405	390	420	405
13	244							374	405	374	420	405
14	244						8	374	405	374	420	390
15	81						100	374	405	374	420	435
16					62		136	390	405	374	420	450
17					106	64	136	405	405	356	435	428
18					47	136	136	405	405	356	450	428
19	6				47	136	143	405	397	356	450	435
20	26				60	136	136	390	405	356	450	420
21	26				97	136	143	390	397	356	450	413
22	18				97	39	172	390	405	365	450	397
23					97		172	390	405	390	450	397
24				30			172	390	405	397	450	374
25							204	397	405	413	450	348
26			81				268	397	405	420	450	316
27			136				308	397	390	413	450	300
28	48		164				332	397	374	420	450	300
29	164	112	196				316	397	374	420	450	300
30	196	196	131			56	316	397	374	420	450	300
31	73					34		397		420	450	

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

Monthly discharge of North Canal near Bend, Oreg., for the year ending September 30, 1923

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	356	0	145	8,900
November	196	0	10.3	611
December	196	0	29.1	1,790
January	30	0	.97	60
February	106	0	21.9	1,220
March	136	0	26.7	1,640
April	332	0	107	6,340
May	405	324	377	23,200
June	405	0	362	21,500
July	420	356	389	23,900
August	450	397	432	26,600
September	450	300	404	24,000
The year	450	0	193	140,000

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, 1923.

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, 2.35 feet August 16, 19, 20, and 22 (discharge, 103 second-feet); canal dry at various times.

1913–1923: Maximum discharge recorded, 105 second-feet, July 31 and August 3, 1919; canal dry at various times.

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

ACCURACY.—Stage-discharge relation practically permanent. Rating curve fairly well defined. Staff gage read to half-tenths twice a day and time of raising or lowering gates noted. Daily discharge ascertained by applying mean daily gage height to rating table. Records good.

Swalley Canal diverts water from right bank of Deschutes River at North Canal Dam, in 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 September 30, 1923

[Made by Wendell Dawson]

Date	Gage height	Discharge
	Feet	*Sec.-ft.*
Apr. 18	1.12	26.8
July 12	1.80	65

Daily discharge, in second-feet, of Swalley Canal near Bend, Oreg., for the year ending September 30, 1923

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	69	25	29	13	2.8	0.4	2.8	38	55	83	49	99
2	69	25	25	10	2.8	.4	10	38	55	91	55	99
3	69	25	21	8.5	2.8	.4	15	38	55	91	69	91
4	66	25	21	5.8	.4	.4	21	41	58	91	66	95
5	62	21	21	7.0	.4	1.6	21	49	62	87	95	69
6	62	17	21	5.8	1.6	2.8	16	52	66	87	99	25
7	62	17	21	5.8	1.0	4.5	----	46	69	69	99	25
8	62	17	17	7.0	.4	16	-------	49	76	91	99	27
9	62	17	17	13	.4	21	-------	69	76	83	99	27
10	62	17	17	17	.4	13	-------	69	69	64	95	80
11	62	17	10	17	.4	2.8	-------	69	62	39	99	83
12	62	13	10	17	1.6	2.8	21	69	83	69	99	66
13	62	13	5.8	17	1.6	2.8	29	69	91	69	95	56
14	62	13	1.4	15	.4	7.0	29	69	91	83	99	62
15	62	12	-------	13	.4	7.0	29	69	91	83	99	80
16	62	10	-------	13	.4	10	29	39	91	83	103	72
17	62	10	-------	17	.4	13	29	49	91	80	95	72
18	62	10	-------	17	.4	15	29	62	83	83	99	69
19	29	10	13	17	11	17	29	69	76	83	103	72
20	29	10	13	17	17	18	29	45	76	76	103	76
21	29	7	13	13	8.2	21	29	76	76	76	99	65
22	29	7	13	13	.4	24	29	76	76	76	103	56
23	29	17	13	13	1.8	29	29	62	83	76	99	58
24	29	29	13	12	13	29	29	49	48	76	95	55
25	29	29	13	10	13	29	29	49	26	80	61	52
26	29	29	13	10	4.5	29	29	49	72	83	32	49
27	29	29	13	10	.4	31	34	66	80	83	87	29
28	21	29	13	8.5	.4	38	38	43	80	83	95	33
29	25	29	12	7.0	-------	38	38	-------	80	91	95	38
30	25	29	10	7.0	-------	38	38	16	83	87	99	38
31	25	-------	10	7.0	-------	17	-------	49	-------	91	87	-------

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

Monthly discharge of Swalley Canal near Bend, Oreg., for the year ending September 30, 1923

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	69	21	48.3	2,970
November	29	7	18.6	1,110
December	29	0	12.9	793
January	17	5.3	11.7	719
February	13	.4	3.15	175
March	38	.4	15.4	947
April	38	0	22.0	1,310
May	76	0	52.7	3,240
June	91	26	72.7	4,330
July	91	39	80.2	4,930
August	103	32	89.4	5,500
September	99	27	60.6	3,610
The year	103	0	40.9	29,600

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.

RECORDS AVAILABLE.—November 1, 1913, to September 30, 1923, 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 W. Andrew. Records previous to November, 1910, obtained at different site.

DISCHARGE MEASUREMENTS.—At ordinary stages, made by wading near the 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.

EXTREMES OF DISCHARGE.—Maximum stage during year indicated by water-stage recorder (clock stopped), 4.55 feet between December 10 and January 12, probably on January 6 (discharge, 1,420 second-feet); minimum stage from recorder, 0.55 foot at 2 p. m. October 28 (discharge, 4.0 second-feet).

1906–1923: Maximum and minimum discharges recorded, those of the year ending September 30, 1923.

ICE.—Stage-discharge relation affected by ice.

DIVERSIONS.—Columbia Southern Canal diverted water above station almost continuously throughout the year. Water was diverted into head of Tumalo Creek from Crater Creek, tributary of Deschutes River; no record of this diversion in 1923.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed during winter; affected by ice. Two rating curves used, well defined below 200 second-feet. Operation of water-stage recorder satisfactory October 1 to December 10 and March 12 to August 16. Daily discharge ascertained by applying to rating table mean daily gage height obtained by inspecting recorder graph. Records good except for September for which they are fair.

Discharge measurements of Tumalo Creek near Bend, Oreg., during the year ending September 30, 1923

[Made by Wendell Dawson]

Date	Gage height	Discharge	Date	Gage height	Discharge
	Feet	*Sec.-ft.*		*Feet*	*Sec.-ft.*
Nov. 4	0.72	8.1	Mar. 26	0.80	11.2
29	1.26	10.4	July 12	1.88	146
Jan. 12	1.16	24.4	Sept. 14	1.52	71

Daily discharge, in second-feet, of Tumalo Creek near Bend, Oreg., for the year ending September 30, 1923

Day	Oct.	Nov.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	49	4.4		22	23	113	212	50	
2	49	5.0		22	20	155	254	49	
3	53	5.9		22	19	163	227	48	40
4	54	6.8		21	24	197	182	48	
5	52	7.4		22	34	230	137	48	60
6	52	7.4		22	37	260	168	46	70
7	52	8.4		21	47	264	117	46	
8	50	13		19	69	285	97	44	
9	49	11		19	221	310	106	46	
10	48	22		20	233	306	150	54	40
11	62	21		22	230	264	145	55	
12	82	20	11	25	230	209	166	55	
13	74	22	12	25	224	163	188	52	
14	74	48	18	25	140	134	163	52	72
15	74	31	20	32	163	124	155	52	
16	74	19	12	39	179	132	150	51	
17	45	52	12	47	160	129	147		
18	7.7	31	15	41	153	127	124		70
19	7.7	24	11	39	134	142	122		
20	9.2	22	11	32	115	145	118		
21	9.6	19	14	29	140	147	106		
22	5.9	19	11	26	160	171	106	48	
23	4.4	17	12	22	160	168	98		69
24	4.6	17	11	21	158	163	89		60
25	4.6	19	11	20	155	158	80		
26	4.6	17	11	21	124	163	72		
27	4.4	14	13	27	98	171	70		50
28	4.2	12	14	28	97	191	66	45	
29	4.6	10	17	26	102	215	61	45	
30	4.6	10	19	24	93	218	56	45	
31	4.4		22		80		54	45	

Monthly discharge of Tumalo Creek near Bend, Oreg., for the year ending September 30, 1923

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	82	4.2	34.6	2,130
November	52	4.4	17.8	1,060
March 12-31	22	11	13.8	547
April	47	19	26.0	1,550
May	233	19	123	7,560
June	310	113	187	11,100
July	254	54	129	7,930
August	55	44	48.5	2,980
September	72		54.4	3,240

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 November 2, 1921, and April 1 to September 30, 1923.

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 in earth cut about 30 feet wide and 4 feet deep. Control not well defined but fairly permanent.

EXTREMES OF DISCHARGE.—Maximum stage during period April 1 to September 30 from water-stage recorder, 2.06 feet at 10 a. m. May 5 (discharge, 128 second-feet); canal dry at times.

1906–1914; 1916–1921; 1923: Maximum discharge recorded, 165 second-feet July 2, 1921.

ICE.—None during period of record.

DIVERSIONS.—None above gage.

REGULATION.—Flow controlled by head gates.

ACCURACY.—Stage-discharge relation apparently permanent during year. Rating curve fairly well defined. Operation of water-stage recorder intermittent, owing to lack of regular attention. Daily discharge ascertained by applying to rating table mean daily gage height obtained by inspecting recorder graph. Records fair.

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 September 30, 1923

[Made by Wendell Dawson]

Date	Gage height	Discharge
	Feet	*Sec.-ft.*
Apr. 18	1.60	62
July 12	1.60	66
Sept. 13	1.36	42

Daily discharge, in second-feet, of Columbia Southern Canal near Tumalo, Oreg., for the period April 1 to September 30, 1923

Day	Apr.	May	June	July	Aug.	Sept.
1		78	37		36	
2		72	--------		36	30
3		72	--------		35	
4		78	--------	10	35	--------
5		91	--------		35	1
6		112	--------		34	1
7		112	--------		34	
8		120	.1		34	
9		45	21		36	
10	70	.2	60	80	39	29
11		.1	60		40	
12		--------	55	84	40	
13		20	50	78		29
14		98	47	72		.7
15		112	44	72		.1
16		112	46	66		--------
17			46	66		--------
18	66		47	66		--------
19	66		48	66		--------
20	72		49	60		--------
21	72	105	49	60		--------
22	72		16	60	35	--------
23	72		7.2	60		--------
24	72			54		16
25	72	98		49		32
26	72	91	8	47		31
27	78	91		48		29
28	78	84		46		25
29	78	84		43		25
30	78	84		40		23
31	--------	78	--------	39		--------

Note.—Dry for days on which no discharge is given. Braced figures show mean discharge for periods indicated.

Monthly discharge of Columbia Southern Canal near Tumalo, Oreg., for the period April 1 to September 30, 1923

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
April	78	66	71.3	4,240
May	120	0	83.0	5,100
June	60	0	24.6	1,460
July	84	----------	52.7	3,240
August	40	----------	36.6	2,250
September	32	0	16.9	1,010
The period	----------	----------	----------	17,300

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, 1920, to September 30, 1921; May 19 to October 16, 1922, and April 1 to September 30, 1923.

GAGE.—Painted on sloping concrete lining; gage read by W. Andrew.

DISCHARGE MEASUREMENTS.—Made from footbridge at gage.

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

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 3.5 feet June 11, 12, June 24 to July 2, and July 13 (discharge, 179 second-feet); canal dry at times.

1914–1923: Maximum stage recorded, 3.80 feet May 4, 5, and 6, 1916 (discharge, 219 second-feet); canal dry at various times.

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

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined. Gage read to half-tenths twice a day May 8–19 and May 27 to September 30. Readings very uncertain except when canal was carrying nearly full capacity, and not representative of true daily means at times on account of diurnal fluctuation. Daily discharge ascertained as follows: May 9 to June 24, June 27 to July 4, and July 13 by applying mean daily gage height to rating table; April 1 to May 8, June 25, 26, July 7–12, and July 14 to September 30 from record on Tumalo Creek, the whole flow of which was diverted into canal. Discharge, July 5 and 6 estimated from creek record. Records good except those for September, which are fair.

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.

The following measurement was made by Wendell Dawson:

September 14, 1923: Gage height, 2.60 feet; discharge, 71 second-feet.

Daily discharge, in second-feet, of Tumalo feed canal near Bend, Oreg., for the year ending September 30, 1923

Day	Oct.	Apr.	May	June	July	Aug.	Sept.
1	42	22	23	86	179	50	
2	44	22	20	141	158	49	
3	44	22	19	141	88	48	40
4	21	21	24	148	148	48	
5	21	22	34	148	130	48	60
6	21	22	37	148	160	46	70
7	21	21	47	148	117	46	
8	21	19	69	148	97	44	
9	21	19	82	148	106	46	
10	21	20	128	155	150	54	40
11	56	22	134	179	145	55	
12	70	25	110	179	166	55	
13	62	25	91	155	179	52	
14	62	25	44	128	163	52	72
15	62	32	19	110	155	52	
16	30	39	86	105	150	51	
17	------	47	128	110	147		
18	------	41	78	122	124		
19	------	39	96	128	122		70
20	------	32		141	118		
21	------	29		128	106		
22	------	26		155	106	48	
23	------	22	91	163	98		69
24	------	21		163	89		60
25	------	20		158	80		
26	------	21		163	72		
27	------	27	86	171	70		50
28	------	28	78	179	66	45	
29	------	26	86	179	61	45	
30	------	24	66	179	56	45	
31	------	------	62	------	54	45	------

NOTE.—Canal dry Oct. 17–31.

Monthly discharge of Tumalo feed canal near Bend, Oreg., for the year ending September 30, 1923

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	70	0	20.0	1,230
April	47	19	26.0	1,550
May	134	19	73.7	4,530
June	179	86	147	8,750
July	179	54	118	7,260
August	55	44	48.5	2,980
September			54.4	3,240

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.—Irrigation seasons, 1913 to 1921, April 23 to December 15, 1922, and April 13 to September 30, 1923. From July 1, 1906, to May 23, 1913, in sec. 29, at station below intake of McCallister ditch and about 700 feet farther downstream.

GAGE.—Stevens continuous water-stage recorder on right bank; 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 of record from water-stage recorder, 3.22 feet at 9 p. m. July 1 (discharge, 360 second-feet); minimum stage, 1.80 feet at 6 a. m. December 6 (discharge, 19 second-feet).

1906–1923: Maximum stage recorded, 7.5 feet at old station, November 22, 1909 (discharge, estimated from extension of rating curve, 1,940 second-feet); minimum discharge recorded, that of December 6, 1923.

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 practically permanent during year. Rating curve well defined. Operation of water-stage recorder satisfactory October 1 to December 15 and April 13 to September 30. Daily discharge ascertained by applying to rating table mean daily gage height obtained by inspecting recorder graph. Records good.

Discharge measurements of Squaw Creek near Sisters, Oreg., during the year ending September 30, 1923

[Made by Wendell Dawson]

Date	Gage height	Discharge
	Feet	*Sec.ft.*
Nov. 28	2.00	37.1
Apr. 19	2.26	74
Sept. 11	2.25	83

Daily discharge, in second-feet, of Squaw Creek near Sisters, Oreg., for the year ending September 30, 1923

Day	Oct.	Nov.	Dec.	Apr.	May	June	July	Aug.	Sept.
1	69	42	53		72	119	300	156	119
2	72	44	58		69	117	320	151	125
3	69	37	45		69	130	262	146	130
4	62	47	41		77	139	228	144	132
5	62	41	32		94	149	210	139	114
6	58	41	22		106	172	210	132	106
7	58	41	25		112	188	182	130	108
8	58	41	31		128	210	182	132	110
9	58	41	32		164	262	182	137	
10	58	41	28		154	300	210	137	116
11	65	39	28		137	262	228	139	
12	64	38	29		139	197	228	144	
13	60	39	32	67	144	166	245	146	123
14	60	44	39	72	151	146	245	156	110
15	60	41	42	77	196	139	245	154	102
16	58	44		86	210	139	245	151	94
17	52	114		92	197	139	228	159	86
18	58	60		85	177	144	210	151	85
19	57	50		83	169	154	228	139	85
20	52	44		81	164	161	228	132	85
21	50	42		77	169	161	228	132	79
22	52	42		74	182	149	245	134	67
23	52	41		69	185	144	245	128	60
24	52	42		67	185	144	228	128	64
25	58	41		69	177	156	210	125	64
26	53	39		72	159	177	202	119	60
27	47	39		77	137	197	207	121	55
28	44	37		79	132	228	207	123	55
29	42	35		77	151	280	196	128	57
30	44	62		74	128	280	188	128	58
31	49				125		172	125	

Monthly discharge of Squaw Creek near Sisters, Oreg., for the year ending September 30, 1923

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	72	42	56.5	3,470
November	114	35	45.0	2,680
December 1–15	58	22	35.8	1,060
April 13–30	92	67	76.6	2,740
May	210	69	144	8,850
June	300	117	178	10,600
July	320	172	224	13,800
August	159	119	138	8,490
September	132	55	93.2	5,550

CROOKED RIVER NEAR CULVER, OREG.

LOCATION.—In SW. ¼ sec. 11, T. 12 S., R. 12 E., at Cove power plant and 6 miles west of Culver, Jefferson County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—October 1, 1917, to September 30, 1923.

GAGE.—Vertical staff on right bank 100 feet below power house. Prior to February 15, 1922, an inclined gage on left bank, 100 feet below highway bridge, was read. Surge of current made accurate reading of old gage impossible. A. K. McAlpine, observer.

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

CHANNEL AND CONTROL.—Rocky banks. Bed and control of boulders; probably permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 3.7 feet April 1 to 4 (discharge, 3,720 second-feet); minimum stage recorded, 0.38 foot August 17 (discharge, 1,110 second-feet).

1917–1923: Maximum stage recorded, 6.3 feet April 5, 1919 (discharge, 5,200 second-feet); minimum discharge, 970 second-feet July 13 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 practically permanent. Rating curve well defined. Gage read to hundredths once a day below 1 foot and to tenths above that stage. Daily discharge ascertained by applying daily gage reading to rating table. Records good.

Discharge measurements of Crooked River near Culver, Oreg., during the year ending September 30, 1923

[Made by Wendell Dawson]

Date	Gage height	Discharge	Date	Gage height	Discharge
	Feet	*Sec.-ft.*		*Feet*	*Sec.-ft.*
Mar. 29	2.70	2,560	July 16	0.82	1,320
June 16	.55	1,150	Sept. 8	.52	1,120

Daily discharge, in second-feet, of Crooked River near Culver, Oreg., for the year ending September 30, 1923

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	1,120	1,150	1,200	1,280	1,220	1,400	3,720	1,760	1,220	1,180	1,140	1,140
2	1,120	1,150	1,200	1,280	1,220	1,570	3,720	1,630	1,220	1,180	1,140	1,140
3	1,120	1,150	1,200	1,240	1,220	1,760	3,720	1,570	1,220	1,180	1,140	1,140
4	1,120	1,150	1,200	1,240	1,220	1,630	3,720	1,510	1,220	1,180	1,140	1,150
5	1,120	1,150	1,200	1,220	1,200	1,510	2,810	1,450	1,220	1,180	1,140	1,150
6	1,120	1,150	1,200	1,220	1,180	1,400	2,720	1,450	1,200	1,180	1,140	1,150
7	1,150	1,160	1,200	1,400	1,180	1,400	2,720	1,450	1,200	1,260	1,140	1,150
8	1,150	1,160	1,200	2,450	1,180	1,400	2,810	1,450	1,200	1,260	1,140	1,150
9	1,180	1,160	1,200	2,210	1,180	1,450	2,540	1,450	1,180	1,260	1,140	1,150
10	1,180	1,160	1,200	1,760	1,180	1,450	2,450	1,450	1,180	1,260	1,120	1,140
11	1,160	1,160	1,200	1,570	1,180	1,450	2,370	1,510	1,180	1,260	1,120	1,140
12	1,160	1,160	1,200	1,450	1,180	1,450	2,540	1,510	1,180	1,300	1,120	1,150
13	1,180	1,180	1,180	1,400	1,180	1,350	2,810	1,450	1,180	1,300	1,120	1,150
14	1,180	1,180	1,180	1,350	1,180	1,350	2,810	1,450	1,180	1,300	1,120	1,150
15	1,160	1,180	1,180	1,300	1,180	1,350	2,720	1,400	1,180	1,260	1,120	1,150
16	1,160	1,180	1,180	1,300	1,180	1,350	2,720	1,400	1,180	1,260	1,120	1,150
17	1,150	1,180	1,180	1,280	1,180	1,300	2,810	1,400	1,180	1,450	1,120	1,150
18	1,150	1,180	1,180	1,280	1,200	1,350	3,280	1,450	1,180	1,450	1,120	1,150
19	1,150	1,180	1,180	1,280	1,200	1,510	3,280	1,450	1,260	1,400	1,140	1,150
20	1,150	1,180	1,180	1,280	1,200	1,570	3,000	1,400	1,220	1,300	1,140	1,150
21	1,150	1,180	1,180	1,280	1,220	1,760	2,720	1,400	1,220	1,260	1,140	1,150
22	1,150	1,180	1,180	1,280	1,350	1,690	2,290	1,350	1,180	1,220	1,140	1,150
23	1,150	1,180	1,180	1,280	1,450	1,570	2,050	1,350	1,180	1,220	1,120	1,150
24	1,150	1,180	1,180	1,260	1,510	1,570	1,830	1,300	1,180	1,220	1,120	1,150
25	1,150	1,180	1,180	1,260	1,510	1,630	1,760	1,300	1,180	1,180	1,120	1,180
26	1,150	1,180	1,180	1,260	1,450	1,760	1,690	1,300	1,220	1,180	1,120	1,180
27	1,150	1,200	1,180	1,260	1,450	1,900	1,690	1,260	1,180	1,180	1,140	1,180
28	1,150	1,200	1,180	1,240	1,400	2,210	1,630	1,260	1,180	1,150	1,140	1,180
29	1,150	1,200	1,220	1,220	-------	2,340	1,830	1,260	1,180	1,150	1,140	1,180
30	1,150	1,200	1,240	1,220	-------	2,900	1,760	1,220	1,200	1,140	1,120	1,180
31	1,150	-------	1,280	1,220	-------	3,280	-------	1,220	-------	1,140	1,140	-------

Monthly discharge of Crooked River near Culver, Oreg., for the year ending September 30, 1923

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	1,180	1,120	1,150	70,700
November	1,200	1,150	1,170	69,600
December	1,280	1,180	1,190	73,200
January	2,450	1,220	1,370	84,200
February	1,510	1,180	1,260	70,000
March	3,280	1,300	1,670	103,000
April	3,720	1,630	2,620	156,000
May	1,760	1,220	1,410	86,700
June	1,260	1,180	1,200	71,400
July	1,450	1,140	1,240	76,200
August	1,140	1,120	1,130	69,500
September	1,180	1,140	1,150	68,400
The year	3,720	1,120	1,380	999,000

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; February 10 to June 25, 1922; and January 1 to May 31, 1923, when station was discontinued.

GAGE.—Stevens eight-day water-stage recorder on right bank about 100 yards back of Rickman ranch house; inspected by J. A. Rickman. Vertical staff read prior to March 25, 1922.

DISCHARGE MEASUREMENTS.—Made by wading near gage.

CHANNEL AND CONTROL.—Heavy gravel and boulders; practically permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 1.97 feet at 8 p. m. March 19 (discharge, 110 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 pratically permanent. Rating curve well defined below 50 second-feet and fairly well defined below 100 second-feet. Operation of water-stage recorder satisfactory January 6–21 and February 19 to May 24. Daily discharge ascertained by applying to rating table mean daily gage height obtained by inspecting recorder graph. Records good.

Discharge measurements of Bear Creek at Rickman ranch, near Roberts, Oreg., during the year ending September 30, 1923

[Made by Wendell Dawson]

Date	Gage height	Discharge
	Feet	*Sec.-ft.*
Mar. 30	1.26	40.2
31	.85	20.5

Daily discharge, in second-feet, of Bear Creek at Rickman ranch, near Roberts, Oreg., for the year ending September 30, 1923

Day	Jan.	Feb.	Mar.	Apr.	May
1			22	22	4.3
2			15	19	3.4
3	3.0		11	22	3.8
4			9.2	35	3.8
5			7.7	35	3.8
6	5.2		6.9	50	3.4
7	4.3		6.3	38	3.2
8	2.7		5.5	23	3.8
9	1.9		4.8	19	3.8
10	1.9	0.5	5.2	20	3.8
11	1.1		4.8	25	3.8
12	.9		4.3	24	3.8
13	.9		3.4	18	3.6
14	.8		3.4	17	3.6
15	.7		4.1	18	6.0
16	.7		10	19	8.3
17	.7		16	22	3.8
18	.7		20	17	2.6
19	.6	2.3	45	9.5	2.8
20	.5	2.1	20	12	2.6
21	.4	5.5	11	8	1.6
22		8.0	9.5	8.3	1.2
23		10	16	7.4	1.1
24		11	20	7.2	1.0
25		5.8	24	7.2	
26	.4	5.8	28	5.8	
27		10	32	5.2	1.0
28		19	38	5.2	
29		-------	38	4.5	
30		-------	28	4.3	
31		-------	24	-------	

Monthly discharge of Bear Creek at Rickman ranch, near Roberts, Oreg., for the year ending September 30, 1923

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
January	5.2	0.4	1.4	86
February	19	.5	3.2	178
March	45	3.4	15.9	978
April	50	4.3	17.6	1,050
May	8.3	1.0	2.9	178
The period				2,470

METOLIUS RIVER NEAR GRANDVIEW, OREG.

LOCATION.—In NE. ¼ sec. 19, T. 11 S., R. 11 E., at Montgomery ranch, 11 miles above mouth and 10 miles northwest of Grandview post office, Jefferson County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—October 1, 1921, to September 30, 1923.

GAGE.—Vertical staff on right bank; read by E. A. Montgomery.

DISCHARGE MEASUREMENTS.—Made from cable one-fourth mile above gage.

CHANNEL AND CONTROL.—Smooth boulders; current swift; channel straight; river confined to its banks at all stages.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 3.32 feet on January 7 (discharge, estimated from extension of rating curve, 5,780 second-feet); minimum stage recorded, 0.38 foot October 24 to November 16 (discharge, 1,400 second-feet).

1921–1923: Maximum and minimum stages, those of the year ending September 30, 1923.

ICE.—None.

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation practically permanent. Rating curve well defined below 2,000 second-feet. Gage read to hundredths once a day. Daily discharge ascertained by applying daily gage reading to rating table. Records good, except for flood stages of January, for which they are somewhat uncertain.

Discharge measurements of Metolius River near Grandview, Oreg., during the year ending September 30, 1923

[Made by Wendell Dawson]

Date	Gage height	Discharge
	Feet	*Sec.-ft.*
Apr. 20	0.68	1,720
Sept. 20	.50	1,460

Daily discharge, in second-feet, of Metolius River near Grandview, Oreg., for the year ending September 30, 1923

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	1,400	1,400	1,400	1,720	1,610	1,560	1,660	1,660	1,720	1,780	1,610	1,500
2	1,400	1,400	1,400	1,720	1,610	1,560	1,660	1,660	1,720	1,780	1,610	1,500
3	1,400	1,400	1,400	1,660	1,610	1,560	1,660	1,660	1,720	1,780	1,610	1,500
4	1,400	1,400	1,400	1,610	1,610	1,560	1,720	1,610	1,660	1,780	1,610	1,500
5	1,400	1,400	1,400	1,610	1,610	1,560	1,720	1,610	1,660	1,720	1,610	1,500
6	1,400	1,400	1,400	4,030	1,610	1,560	1,720	1,610	1,720	1,720	1,560	1,500
7	1,400	1,400	1,400	4,370	1,610	1,560	1,720	1,660	1,780	1,830	1,560	1,500
8	1,400	1,400	1,400	4,370	1,610	1,560	1,720	1,720	1,780	1,720	1,560	1,500
9	1,400	1,400	1,400	3,390	1,560	1,560	1,720	1,780	1,780	1,720	1,560	1,500
10	1,400	1,400	1,400	3,080	1,560	1,560	1,720	1,830	1,950	1,720	1,560	1,500
11	1,400	1,400	1,400	2,630	1,560	1,560	1,660	1,830	1,830	1,720	1,560	1,500
12	1,400	1,400	1,400	2,480	1,560	1,560	1,660	1,830	1,830	1,720	1,560	1,500
13	1,400	1,400	1,400	2,480	1,560	1,560	1,560	1,830	1,780	1,780	1,560	1,500
14	1,400	1,400	1,400	2,340	1,500	1,560	1,660	1,830	1,720	1,780	1,560	1,500
15	1,400	1,400	1,400	2,200	1,500	1,500	1,660	1,830	1,720	1,720	1,560	1,500
16	1,400	1,400	1,400	2,200	1,500	1,500	1,660	1,830	1,720	1,720	1,560	1,500
17	1,400	1,610	1,400	2,070	1,500	1,500	1,660	1,830	1,720	1,720	1,560	1,500
18	1,400	1,400	1,400	2,070	1,500	1,500	1,660	1,830	1,720	1,720	1,560	1,500
19	1,400	1,400	1,400	1,950	1,500	1,500	1,720	1,830	1,720	1,720	1,560	1,500
20	1,400	1,400	1,400	1,950	1,500	1,500	1,720	1,830	1,720	1,720	1,560	1,500
21	1,400	1,400	1,400	1,950	1,500	1,500	1,720	1,830	1,720	1,720	1,560	1,450
22	1,400	1,400	1,400	1,950	1,500	1,560	1,660	1,830	1,720	1,720	1,560	1,450
23	1,400	1,400	1,450	1,950	1,560	1,560	1,660	1,830	1,720	1,720	1,560	1,450
24	1,400	1,400	1,830	1,830	1,560	1,560	1,660	1,830	1,660	1,720	1,560	1,450
25	1,400	1,400	1,830	1,830	1,560	1,560	1,660	1,830	1,660	1,720	1,560	1,450
26	1,400	1,400	1,830	1,780	1,560	1,560	1,660	1,780	1,660	1,660	1,560	1,450
27	1,400	1,400	1,780	1,720	1,560	1,560	1,660	1,780	1,720	1,660	1,560	1,450
28	1,400	1,400	1,780	1,720	1,560	1,610	1,660	1,780	1,720	1,660	1,560	1,450
29	1,400	1,400	1,780	1,720	-------	1,610	1,660	1,780	1,720	1,660	1,500	1,450
30	1,400	1,400	1,780	1,720	-------	1,610	1,660	1,780	1,720	1,660	1,500	1,450
31	1,400	-------	1,780	1,660	-------	1,610	-------	1,780	-----	1,660	1,500	-------

Monthly discharge of Metolius River near Grandview, Oreg., for the year ending September 30, 1923

Month	Discharge in second-feet			Run-off in acre feet
	Maximum	Minimum	Mean	
October	1,400	1,400	1,400	86,100
November	1,610	1,400	1,410	83,900
December	1,830	1,400	1,500	92,200
January	4,370	1,610	2,250	138,000
February	1,610	1,500	1,550	86,100
March	1,610	1,500	1,550	95,300
April	1,720	1,660	1,680	100,000
May	1,830	1,610	1,770	109,000
June	1,950	1,660	1,730	103,000
July	1,830	1,660	1,720	106,000
August	1,610	1,500	1,560	95,900
September	1,500	1,450	1,480	88,100
The year	1,950	1,400	1,640	1,180,000

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 station in Jefferson County.

DRAINAGE AREA.—20.5 square miles.

RECORDS AVAILABLE.—April 7, 1915, to September 30, 1923, 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, 1923, 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, C. N. Sorenson.

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

EXTREMES OF DISCHARGE.—Maximum stage during year, from water-stage recorder, 2.58 feet 3 to 4 p. m. January 10 (discharge, 302 second-feet); minimum discharge, 30 second-feet October 27.

1911–1913; 1915–1923: Maximum stage recorded, that of January 10, 1923; minimum stage, 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 changes owing to varying amounts of drift on control. Rating curve well defined below and poorly defined above 125 second-feet. Daily discharge ascertained by applying to rating table, by shifting-control method, mean daily gage height determined from recorder graph by inspection except as indicated in footnotes to daily and monthly discharge tables. Records good, except for periods when recorder was not operating and for discharges above 125 second-feet for which they are fair.

Discharge measurements of Lake Creek near Sisters, Oreg., during the year ending September 30, 1923

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Oct. 14	C. N. Sorenson[a]	0.60	37.7	Apr. 19	Wendell Dawson	1.02	65
Nov. 28	Wendell Dawson	.58	33.5	Sept. 11	do	.68	35.7

[a] Deputy water master.

Daily discharge, in second-feet, of Lake Creek near Sisters, Oreg., for the year ending September 30, 1923

Day	Oct.	Nov.	Dec.	Jan.	Apr.	May	June	July	Aug.	Sept.
1		33	33			74	105	64	44	30
2	39	34	33	50		74	105	59	44	30
3		34	33			74	98	59	44	30
4	41	35	35			74	92	59	44	
5	42	35	37			74	92	59	43	
6	42	35	40	175		74	92	59	43	
7	43	36	40			74	92	59	42	33
8	42	37	40			74	92	59	41	
9	41	39	40	298	60	86	92	59	40	
10	40	41	40	298		86	92	59	39	
11	40	40	40	280		98	92	59	37	36
12	39	40	38	227		112	92	59		
13	37	40	38	193		118	92	59		
14	38		38			118	92	56		
15	38		38			126	92	55		
16	39		38			133	92	54		
17	38		37		64	140	86	51		
18	38		40		64	140	74	48		
19	37	36	42		64	140	74	47		
20	36		40		69	140	69	45		
21	36		37		74	140	69	44	34	33
22	35			125	74	140	64	44		
23	34				74	133	64	45		
24	33		50		74	133	64	44		
25	32				74	126	64	44		
26	31	33			74	126	64	44		
27	30	33	50		69	118	64	44		
28	31	33			69	118	64	44		
29	32	33	50		69	112	64	44		
30	32	33			74	112	64	44		
31	33					105		44		

NOTE.—No gage-height record Oct. 1-3, Nov. 14-25, Dec. 22-26, Dec. 28 to Jan. 8, Jan. 14-31, Apr. 1-16, Aug. 12-31, Sept. 4-10, and 12-30; daily discharge estimated or interpolated. Braced figures give mean discharge for periods indicated.

Monthly discharge of Lake Creek near Sisters, Oreg., for the year ending September 30, 1923

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	43	30	37.0	2,280
November	41	33	35.9	2,140
December		33	41.8	2,570
January	298		147	9,040
February			a 55	3,050
March			a 50	3,070
April	74		64.9	3,860
May	140	74	109	6,700
June	105	64	81.7	4,860
July	64	44	52.0	3,200
August	44		36.8	2,260
September		30	32.8	1,950
The year	298	30	62.2	45,000

a Discharge estimated from maximum and minimum stages indicated by recorder and from records of flow for streams in near-by drainage basins.

SHITIKE CREEK AT WARMSPRING, ORE.

LOCATION.—In NE. ¼ sec. 26, T. 9 S., R. 12 E., at Warmspring, Jefferson County, 2 miles above mouth of creek and below all tributaries.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—June 11, 1911, to October 31, 1916; April 1 to September 30, 1923.

GAGE.—Vertical staff on left bank opposite store; read by L. E. See. Staff gage at practically same location used 1911 to 1916.

DISCHARGE MEASUREMENTS.—Made by wading near gage or from wagon bridges one-fourth mile upstream.

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

EXTREMES OF DISCHARGE.—Maximum stage recorded during period April 1 to September 30, 1.50 feet, May 10 (discharge, 305 second-feet); minimum stage, 0.42 foot September 14–21, 29, and 30 (discharge, 61 second-feet).

1911–1916; 1923: Maximum discharge, 720 second-feet, February 9, 1916; minimum discharge, 36 second-feet, September 4, 1915.

ICE.—None during period of records.

DIVERSIONS.—Probably none above station.

REGULATION.—Practically none. There is a small power plant just above station.

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

Discharge measurements of Shitike Creek at Warmspring, Oreg., during the year ending September 30, 1923

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Apr. 2	Wendell Dawson	1.12	199	July 17	Wendell Dawson	0.94	153
June 10	F. F. Henshaw	1.32	252	Sept. 8	do	.44	62

Daily discharge, in second-feet, of Shitike Creek at Warmspring, Oreg., for the year ending September 30, 1923

Day	Apr.	May	June	July	Aug.	Sept.	Day	Apr.	May	June	July	Aug.	Sept.
1	200	145	141	193	98	69	16	193	275	145	156	82	61
2	193	145	141	193	98	69	17	206	260	145	156	82	61
3		137	141	180	88	69	18	206	232	168	156	82	61
4		137	141	180	88	66	19	193	218	168	145	82	61
5	193	145	145	180	88	66	20	180	218	180	145	82	61
6		145	193	180	88	66	21	168	206	168	145	78	61
7		180	193	180	85	66	22	168	218	168	124	78	64
8	193	193	218	206	85	65	23	145	232	145	141	78	64
9	180	232	218	193	85	66	24	145	218	156	132	75	64
10	168	305	245	180	85	64	25	145	206	156	124	72	64
11	168	260	218	180	85	64	26	145	193	168	120	72	69
12	180	245	193	180	85	64	27	145	180	168	105	72	66
13	180	232	180	168	85	64	28	156	168	180	105	72	64
14	180	232	156	168	85	61	29	156	156	193	102	72	61
15	180	245	145	156	85	61	30	145	145	193	102	72	61
							31	------	145	------	102	69	------

Monthly discharge of Shitike Creek at Warmspring, Oreg., for the year ending September 30, 1923

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
April	206	145	176	10,500
May	305	137	202	12,400
June	245	141	172	10,200
July	206	102	154	9,470
August	98	69	81.7	5,020
September	69	61	64.1	3,810
The period				51,400

WHITE RIVER BELOW TYGH VALLEY, OREG.

LOCATION.—In NW. ¼ sec. 8, T. 4 S., R. 14 E., just below the 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, 1923.

GAGE.—Stevens continuous water-stage recorder on left bank; inspected by M. F. Coberth.

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

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 and checked by high-water marks, 12.9 feet at 11 a. m. January 6 (discharge, 13,300 second-feet); minimum stage, 0.23 foot at 9 a. m. September 30 (discharge, 33 second-feet).

1917–1923: Maximum stage recorded, that of January 6; minimum discharge occurred December 11–14, 1919, owing to extreme cold; estimated from records at power plant at 10 second-feet.

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

DIVERSIONS.—Numerous small irrigation canals divert water above this station.

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

ACCURACY.—Stage-discharge relation changed during October and during flood of January 6. Rating curves used as follows: October 1–4, well defined; October 26 to January 5, fairly well defined; January 6 to September 30, well defined below 2,000 second-feet. Operation of recorder satisfactory except for short periods. Daily discharge ascertained by applying to rating table mean daily gage height obtained by inspecting recorder graph; shifting-control method used October 5–25. Records good, except for January, for which they are fair.

Discharge measurements of White River below Tygh Valley, Oreg., during the year ending September 30, 1923

[Made by Wendell Dawson]

Date	Gage height	Discharge	Date	Gage height	Discharge
	Feet	*Sec.-ft.*		*Feet*	*Sec.-ft.*
Nov. 3	1.04	142	July 17	1.63	266
June 15	2.46	536	Aug. 24	1.16	154

Daily discharge, in second-feet, of White River below Tygh Valley, Oreg., for the year ending September 30, 1923

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	153	167	151	1,040	432	725	1,030	970	650	415	188	136
2	153	159	147	675	468	650	1,060	880	625	415	186	143
3	163	143	159	1,040	415	540	1,030	825	625	380	182	139
4	169	139	153	830	415	502	1,000	880	650	380	182	145
5	171	141	157	1,640	415	520	1,000	1,000	700	398	178	139
6	161	145	161	10,900	415	560	1,000	1,150	775	398	180	145
7	153	145	151	9,800	432		970	1,290	800	450	180	143
8	147	147	145	6,080	398		940	1,430	825	380	176	147
9	145	155	139	3,930	398	560	940	1,590	850	359	173	143
10	145	200	151	3,570	398		940	1,670	910	339	177	141
11	143	185	135	2,890	380		1,030	940	850	333	173	139
12	145	163	107	2,110	376	560	1,150	1,510	800	315	169	141
13		159	96	1,750		700	1,090	1,360	725	309	175	145
14		149	86	1,590		580	1,090	1,290	675	303	165	147
15		145	100	1,360		560	1,090	1,290	625	388	163	145
	147				387							
16		147	113	1,150		540	1,220	1,360	600	273	167	143
17		315	126	1,220		625	1,590	1,360	560	261	159	141
18		280	139	1,090		580	1,360	1,220	540	258	163	141
19	149	220	265	1,000	398	580	1,290	1,150	520	252	159	147
20	151	210	232	910	398	625	1,150	1,090	520	245	165	145
21	141	192	200	850	398	600	1,090	1,060	502	238	155	149
22	143	185	192	800	415	560	940	1,060	485	232	175	147
23	149	175	370	775	485	540	825	970	468	232	161	147
24	151	167	1,040	750	700	520	880	970	450	228	151	157
25	145	163	700	700	675	502	910	940	450	220	153	176
26	185	159	575	650	625	485	1,000	880	432	216	153	165
27	165	155	980	650	600	520	1,090	800	432	202	153	169
28	151	155	800	625	700	625	1,090	750	432	208	151	153
29	143	159	625	580	----	750	1,060	750	450	204	151	147
30	147	147	600	485	-------	850	1,000	700	432	199	147	149
31	157	-------	1,110	502	-------	970	-------	650	-------	195	151	-------

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

Monthly discharge of White River below Tygh Valley, Oreg., for the year ending September 30, 1923

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	185	141	151	9,280
November	315	139	172	10,200
December	1,110	86	326	20,000
January	10,900	485	2,000	123,000
February	700	376	452	25,100
March	970	485	599	36,800
April	1,590	825	1,060	63,100
May	1,670	650	1,090	67,000
June	910	432	612	36,400
July	450	195	298	18,300
August	188	147	166	10,200
September	176	136	147	8,750
The year	10,900	86	591	428,000

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, and October 16, 1921, to June 30, 1923, when station was discontinued. 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 Betty Duncan and Mrs. Edwin E. Wall.

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 extremely high water.

EXTREMES OF DISCHARGE.—Maximum stage during year, from high-water mark, 4.0 feet at 10 a. m. January 6 (discharge, from extension of rating curve, 450 second-feet); minimum stage recorded, 0.27 foot November 4 and 5 (discharge, 1.1 second-feet).

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

DIVERSIONS.—Practically none above station.

REGULATION.—None.

ACCURACY.—Stage-discharge relation practically permanent. Rating curve well defined below 80 second-feet. Gage read to hundredths once a day. Daily discharge ascertained by applying daily gage reading to rating table. Record good, except estimate for flood of January, which is approximate.

Discharge measurements of Gate Creek near Wamic, Oreg., during the year ending September 30, 1923

Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*
Mar. 22	R. J. McKinney	1.39	43.6
June 15	Wendell Dawson	.85	16.6

Daily discharge, in second-feet, of Gate Creek near Wamic, Oreg., for the year ending September 30, 1923

Day	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
1	1.4	1.4	15	27	15	74	34	21
2	1.4	1.4	16	25	15	74	32	19
3	1.3	1.6	19	24	15	64	32	19
4	1.2	1.8	27	23	16	64	32	19
5	1.2	2.1	109	21	18	64	34	19
6	1.3	2.3	410	21	19	74	38	19
7	1.4	2.5	330	19	20	74	36	19
8	1.7	2.5	138	18	20	64	36	19
9	2.1	2.5	123	17	20	64	42	19
10	2.1	2.5	109	16	20	55	42	19
11	2.2	2.5	109	19	23	55	42	19
12	1.8	2.5	116	23	27	55	40	19
13	1.7	2.5	123	24	30	55	40	18
14	1.6	2.5	102	25	32	55	40	18
15	1.6	2.5	96	24	39	55	36	17
16	1.5	2.5	85	23	39	55	38	17
17	1.4	2.5	74	23	44	55	36	16
18	1.4	3.8	64	19	44	52	35	16
19	1.5	5.0	55	15	45	52	30	15
20	1.6	5.0	52	13	44	52	30	15
21	1.8	5.3	48	11	45	48	28	15
22	1.7	5.6	44	12	42	48	28	14
23	1.6	5.6	42	13	43	48	28	14
24	1.5	8.0	40	14	42	48	26	13
25	1.4	9.2	38	14	45	45	26	12
26	1.4	9.8	37	13	46	42	25	11
27	1.4	10	37	12	44	40	25	11
28	1.4	11	36	12	45	38	24	11
29	1.4	11	35	------	47	38	23	8.3
30	1.4	11	34	------	55	38	23	8.3
31	------	12	31	------	55	------	21	------

Monthly discharge of Gate Creek near Wamic, Oreg., for the year ending September 30, 1923

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
November	2.2	1.2	1.55	92
December	12	1.4	4.85	298
January	410	15	83.7	5,150
February	27	11	18.6	1,030
March	55	15	34.0	2,090
April	74	38	54.8	3,260
May	42	21	32.3	1,990
June	21	8.3	16.0	952
The period				14,900

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 the 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, 1923, with gaps in winters of 1921 to 1923. 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, inspected 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 during high water.

EXTREMES OF DISCHARGE.—Maximum stage during period of record from water-stage recorder, 3.74 feet at 11 p. m. May 9 (discharge, 3,160 second-feet); minimum stage, 1.20 feet during winter, clock stopped (discharge, 375 second-feet).

1909–1923: 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 apparently permanent during year. Rating curve fairly well defined. Operation of recorder satisfactory, except for periods shown by breaks in record; no record obtained during winter. Daily discharge ascertained by applying to rating table mean daily gage height determined by inspecting recorder graph; for periods when recorder was not operating, was interpolated or estimated. Records good.

Discharge measurements of Klickitat River near Glenwood, Wash., during the year ending September 30, 1923

[Made by A. G. Hanson]

Date	Gage height	Discharge
	Feet	*Sec.-ft.*
Oct. 8	1.37	440
Apr. 15	2.50	1,360
July 9	2.40	1,180

Daily discharge, in second-feet, of Klickitat River near Glenwood, Wash., for the year ending September 30, 1923

Day	Oct.	Nov.	Apr.	May	June	July	Aug.	Sept.
1		500		1,480	1,460	1,660	738	676
2		481		1,380	1,420	1,600	730	698
3		452		1,330	1,440	1,540	738	648
4		462		1,360	1,540	1,340	746	627
5				1,540		1,270	738	
6				1,720	1,900	1,400	706	
7				1,920		1,660	706	
8	440			2,200		1,360	698	
9	448			2,750		1,250	690	
10	452			3,000	2,280	1,230	690	
11	452			2,670	2,130	1,360	706	
12	462			2,510	1,850	1,270	730	
13	457			2,360	1,720	1,230	706	
14	462			2,280	1,600	1,280	714	
15	462		1,420	2,280	1,480	1,230	706	
16	462		1,540	2,430	1,460	1,110	706	
17	462		1,780	2,510	1,470	1,010	738	
18	466		1,720	2,430	1,460	913	730	
19	466		1,660	2,360	1,480	904	738	
20	471		1,540	2,200	1,480	877	826	
21	471		1,400	2,200	1,460	895	738	
22	481		1,290	2,280	1,460	913	794	
23	481		1,250	2,280	1,360	922	690	
24	481		1,260	2,130	1,350	886	669	
25			1,330	1,990	1,330	826	655	
26			1,480	1,920	1,350	794	655	
27			1,660	1,780	1,370	810	669	
28			1,660	1,660	1,480	810	676	
29			1,660	1,600	1,540	810	676	
30			1,540	1,540	1,660	794	669	
31	516			1,480		762	662	

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

Monthly discharge of Klickitat River near Glenwood, Wash., for the year ending September 30, 1923

[Drainage area, 356 square miles]

Month	Discharge in second-feet				Run-off	
	Maximum	Minimum	Mean	Per square mile	Inches	Acre-feet
April 15–30	1,780	1,250	1,510	4.24	2.52	47,900
May	3,000	1,330	2,050	5.76	6.64	126,000
June	2,280	1,330	1,600	4.49	5.01	95,200
July	1,660	762	1,120	3.15	3.63	68,900
August	826	655	711	2.00	2.31	43,700
The period						382,000

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, 1923.

GAGE.—Gurley seven-day water-stage recorder on right bank near power plant, half a mile above railway bridge; inspected by R. E. Fewel.

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

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

EXTREMES OF DISCHARGE.—Maximum stage during year, determined by leveling to high-water marks, 10.1 feet at 7 a. m. January 6 (discharge, 34,000 second-feet); minimum stage, −0.27 foot September 19 (discharge, 15 second-feet).

1913–1923: Maximum and minimum discharges, those of the year ending September 30, 1923.

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

DIVERSIONS.—Large diversions for irrigation above station; water for power plant is diverted around gage. A record of this diversion has been kept (p. 96).

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

ACCURACY.—Stage-discharge relation changed during flood on January 6. Rating curves before and after change fairly well defined, except below 40 second-feet, which is poorly defined. Operation of water-stage recorder fairly satisfactory, except for short periods up to July 22, when stage fell below intake pipe; July 23 to September 30, staff gage read only once a day, although on some days there was considerable fluctuation due to varying load at power house. Daily discharge ascertained by applying to rating table the daily staff reading or the mean daily gage height determined from recorder graph by inspection. Records good except for periods when recorder was not operating, for which they are fair.

Discharge measurements of Hood River at Powerdale, near Hood River, Oreg., during the year ending September 30, 1923

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Nov. 1	Wendell Dawson	1.96	570	July 18	Wendell Dawson	1.45	473
Mar. 23	R. J. McKinney	2.44	1,270	Aug. 23	do	.79	216
June 14	Wendell Dawson	2.05	879				

Daily discharge, in second-feet, of Hood River at Powerdale, near Hood River, Oreg., for the year ending September 30, 1923

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	454	540	490	3,000	838	822	1,960	1,740	1,140	870	217	110
2	448	490	518	2,620	822	910	1,960	1,530	1,140	830	296	169
3	454	470	578	3,920	774	955	1,960	1,430	1,090	774	223	282
4	485	465	562	2,800	774	854	1,840	1,480	1,230	750	229	148
5	507	460	568	7,580	774	846	1,790	1,580	1,180	694	254	62
6	480	443	540	29,800	750	1,000	1,740	1,840	1,330	774	142	61
7	438	443	524	24,800	750	1,230	1,740	1,790	1,330	1,280	98	148
8	438	443	518	10,600	736	1,140	1,680	2,020	1,280	1,090	50	229
9	396		568	6,900	701	1,090	1,740	2,020	1,280	830	94	247
10	396		655	6,600	708	1,000	1,740	1,580	1,280	830	229	119
11	401		578	5,100	729	1,040	1,740	1,740	1,300	766	223	193
12	396		540	3,840	729	1,230	2,020	1,580	1,100	750	305	169
13	401	635	540	2,900	701	1,530	1,900	1,480	950	715	119	175
14	401		540	2,230	648	1,230	1,790	1,430	830	774	110	199
15	401		545	2,090	648	1,040	1,740	1,480	782	814	86	152
16	416		551	2,090	641	955	1,840	1,580	750	708	79	260
17	480		540	2,160	634	1,000	2,020	1,630	814	544	46	158
18	432	1,000		1,960	634	1,140	1,900	1,380	750	544	79	148
19	438	855		1,840	648	1,180	1,840	1,330	722	500	229	15
20	422	813	940	1,790	660	1,140	1,790	1,330	715	450	79	43
21	390	694		1,680	660	1,180	1,740	1,330	729	470	306	45
22		643		1,530	648	1,230	1,680	1,330	722	400	544	42
23		607	1,770	1,430	660	1,230	1,740	1,330	654	380	278	199
24		573	6,380	1,330	694	1,230	1,680	1,230	654	360	155	100
25		556	3,700	1,230	701	1,180	1,740	1,180	591	320	199	43
26	430	485	3,700	1,140	715	1,140	1,680	1,180	550	320	280	49
27		476	5,570	1,140	715	1,230	1,680	1,090	579	302	142	46
28		529	3,920	1,140	750	1,330	1,680	1,230	666	302	142	48
29		512	2,620	1,040	------	1,530	1,580	1,230	774	268	98	41
30		501	2,160	955	------	1,790	1,530	1,180	830	238	119	220
31		------	3,290	910	------	1,960	------	1,180	------	220	94	------

NOTE.—Because of unsatisfactory operation of recorder, discharge estimated by comparison with record for Sandy River near Marmot Oct. 22–31, Nov. 9–17, Dec. 13–15, June 11–13. Daily discharge on Aug. 8, 12, 26, Sept. 4 and 24, when there was considerable fluctuation in load at the power house of Pacific Power & Light Co., was estimated from gage height reported by observer and daily load curve.

Monthly discharge of Hood River at Powerdale, near Hood River, Oreg., for the year ending September 30, 1923

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	507	390	431	26,500
November	------	------	590	35,100
December	6,380	490	1,520	93,500
January	29,800	910	4,460	274,000
February	838	634	708	39,300
March	1,960	822	1,170	71,900
April	2,020	1,530	1,780	106,000
May	2,020	1,090	1,470	90,400
June	1,330	550	925	55,000
July	1,280	220	609	37,400
August	544	46	179	11,000
September	282	15	129	7,680
The year	29,800	15	1,170	848,000

Combined daily discharge, in second-feet, of Hood River and Pacific Power & Light Co.'s conduit at Powerdale, near Hood River, Oreg., for the year ending September 30, 1923

Day	Oct.	Nov.	Dec.	Jan	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	454	540	490	3,000	838	822	1,960	1,740	1,410	1,090	471	464
2	448	490	518	2,620	822	910	1,960	1,530	1,410	1,120	550	543
3	454	470	578	3,420	774	955	1,960	1,430	1,110	1,100	477	549
4	485	465	562	2,800	774	854	1,840	1,480	1,460	1,000	496	455
5	507	460	568	7,580	774	846	1,790	1,580	1,470	988	521	432
6	480	443	540	29,800	750	1,000	1,740	1,840	1,580	961	396	455
7	438	443	524	24,800	750	1,230	1,740	1,790	1,570	1,570	438	486
8	438	443	518	10,600	736	1,140	1,680	2,020	1,510	1,250	410	556
9	396		568	6,900	701	1,090	1,740	2,020	1,530	1,110	408	471
10	396		655	6,600	708	1,000	1,740	1,580	1,490	1,120	523	453
11	401		578	5,100	729	1,040	1,740	1,740	1,530	1,070	523	567
12	396		540	3,840	729	1,230	2,020	1,670	1,330	1,060	485	583
13	401	635	540	2,900	701	1,530	1,900	1,680	1,190	1,020	433	589
14	401		540	2,230	648	1,230	1,790	1,700	1,080	1,050	437	646
15	401		545	2,090	648	1,040	1,740	1,720	992	1,050	393	532
16	416		551	2,090	641	955	1,840	1,850	990	982	386	490
17	480		540	2,160	634	1,000	2,020	1,810	964	864	366	498
18	432	1,000		1,960	634	1,140	1,900	1,630	960	338	399	548
19	438	855		1,840	648	1,180	1,840	1,580	946	787	456	435
20	422	813	940	1,790	660	1,140	1,790	1,530	955	744	397	463
21	390	694		1,680	660	1,180	1,740	1,560	983	750	555	479
22		643		1,530	648	1,230	1,680	1,600	989	620	748	469
23		607	1,770	1,430	660	1,230	1,740	1,610	921	660	592	443
24		573	6,380	1,320	694	1,230	1,680	1,500	944	680	489	447
25		556	3,700	1,230	701	1,180	1,740	1,470	858	620	506	463
26	430	485	3,700	1,140	715	1,140	1,680	1,470	844	614	487	476
27		476	5,570	1,140	715	1,230	1,680	1,290	833	596	409	489
28		529	3,920	1,140	750	1,330	1,680	1,480	913	556	516	457
29		512	2,620	1,040	-------	1,530	1,680	1,520	1,030	582	478	441
30		501	2,160	955	-------	1,790	1,530	1,430	1,110	558	499	424
31		-------	3,290	910	-------	1,960	-------	1,450	-------	500	494	-------

Combined monthly discharge of Hood River and Pacific Power & Light Co.'s conduit at Powerdale, near Hood River, Oreg., for the year ending September 30, 1923

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	507	390	431	26,500
November	-------	-------	590	35,100
December	6,380	490	1,520	93,500
January	29,800	910	4,460	274,000
February	838	634	708	39,300
March	1,960	822	1,170	71,900
April	2,020	1,530	1,780	106,000
May	2,020	1,290	1,620	99,600
June	1,580	833	1,160	69,000
July	1,570	500	887	54,500
August	748	366	475	29,200
September	646	424	493	29,300
The year	29,800	366	1,280	928,000

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, 1923; 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 SW. ¼ sec. 34, used until October, 1914; and recorder just above road crossing used until 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 year from water-stage recorder, 3.86 feet at 10 p. m. July 28 and noon August 10 (discharge, 144 second-feet); canal dry at times.

1913–1923: Maximum discharge recorded, 153 second-feet July 9, 1919.

ICE.—No water carried in cold weather.

ACCURACY.—Stage-discharge relation changed during winter. Two well-defined rating curves used. Operation of recorder satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height obtained by inspecting recorder graph. Records good.

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 September 30, 1923

[Made by Wendell Dawson]

Date	Gage height	Discharge
	Feet	*Sec.-ft.*
June 13	3.56	120
Aug 25	3.52	117

Daily discharge, in second-feet, of East Fork Irrigation District Canal near Mount Hood, Oreg., for the year ending September 30, 1923

Day	Oct.	Nov.	May	June	July	Aug.	Sept.
1	61	16	34	100	124	140	90
2	61	------	34	100	124	140	90
3	61	------	34	104	120	140	90
4	49	------	34	104	120	140	93
5	34	------	35	108	124	140	100
6	33	------	36	112	124	144	100
7	31	------	36	116	120	144	100
8	31	------	36	120	124	140	100
9	33	------	37	124	128	140	100
10	33	------	37	124	132	140	93
11	33	------	38	124	128	140	79
12	34	19	43	124	128	140	73
13	35	30	45	120	128	140	70
14	35	30		120	128	140	59
15	34	29	49	120	128	140	50
16	33	31		120	124	140	50
17	32	31	53	120	124	140	49
18	31	29	54	120	128	140	49
19	31	29	55	120	128	140	50
20	30	30	56	120	128	140	49
21	30	32	61	120	132	132	49
22		32	76	120	136	124	48
23		32	81	120	136	126	50
24		32	96	120	140	116	49
25	28	32	96	120	140	116	49
26		32	96	120	144	116	
27		11	93	120	144	116	40
28	27	------	96	124	144	112	
29	26	------	100	124	144	93	
30	26	------	100	124	144	93	30
31	26	------	100	------	140	90	------

NOTE.—No water in canal on days for which no discharge is given. Because of no gage-height record discharge interpolated Nov. 22–27, May 1–2, 14–15, and Sept. 26.

Monthly discharge of East Fork Irrigation District Canal near Mount Hood, Oreg., for the year ending September 30, 1923

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	61	26	34.1	2,100
November	32	0	15.9	946
May	100	------	59.3	3,650
June	124	100	118	7,020
July	144	120	131	8,060
August	144	90	130	7,990
September	100	30	65.6	3,900

PACIFIC POWER & LIGHT CO.'S CONDUIT NEAR HOOD RIVER, OREG.

LOCATION.—In NE. ¼ sec. 36, T. 3 N., R. 10 E., at new power house on Hood River, half a mile southeast of Hood River, Hood River County.

RECORDS AVAILABLE.—May 12 to September 30, 1923; also on tailrace of old plant October 1, 1913, to September 30, 1914, and January 1, 1916, to July 31, 1922, when operation of plant was discontinued.

GAGE.—Mean daily electrical output of power plant, as obtained from integrating wattmeter, used for computing discharge.

DISCHARGE MEASUREMENTS.—Made from collar of flume between diversion dam and intake to pipe line, 2½ miles above power house.

EXTREMES OF DISCHARGE.—Maximum load during period May 12 to September 30, 6,600 kilowatts at 1 p. m. August 27 (discharge, 480 second-feet). No water diverted prior to May 12 except a little for testing, of which no record was made.

1913–1914; 1916–1923: Maximum discharge, that of August 27, 1923.

ACCURACY.—Relation of discharge to electrical output probably quite constant, as operating head varies only about 5 feet from an average of about 200 feet. Kilowatt-discharge relation curve fairly well defined. Daily discharge ascertained by applying to kilowatt-discharge rating table mean daily load in kilowatts determined from midnight readings of integrating wattmeter. Records good.

Discharge measurements of Pacific Power & Light Co.'s conduit near Hood River, Oreg., during the year ending September 30, 1923

Date	Made by—	Power-plant load	Discharge
		Kw.	*Sec.-ft.*
Aug. 23	Dawson and Canfield	4,700	330
Sept. 9	Wendell Dawson	2,600	260

Daily discharge, in second-feet, of Pacific Power & Light Co.'s conduit near Hood River, Oreg., for the year ending September 30, 1923

Day	May	June	July	Aug.	Sept.	Day	May	June	July	Aug.	Sept.
1	-------	267	224	254	354	16	274	240	274	327	230
2	-------	267	287	254	374	17	178	150	320	320	340
3	-------	124	327	254	267	18	254	210	294	320	400
4	-------	234	254	267	307	19	254	224	287	227	420
5	-------	287	294	267	380	20	197	240	294	300	420
6	-------	254	287	254	394	21	233	254	280	249	434
7	-------	237	294	340	340	22	267	267	220	204	427
8	-------	227	156	360	327	23	280	267	280	314	274
9	-------	254	280	314	224	24	267	190	320	334	347
10	-------	210	294	294	334	25	294	267	300	307	420
11	-------	227	307	300	374	26	294	294	294	207	427
12	90	230	307	180	414	27	197	254	294	267	434
13	206	240	307	314	414	28	254	247	254	374	414
14	267	247	274	327	447	29	294	254	314	380	400
15	244	210	234	307	380	30	247	280	320	380	204
						31	274	-------	280	400	-------

Monthly discharge of Pacific Power & Light Co.'s conduit near Hood River, Oreg., for the year ending September 30, 1923

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
May	294	0	157	9,650
June	294	124	238	14,200
July	327	156	282	17,300
August	400	180	297	18,300
September	447	204	364	21,700
The year	447	0	112	81,200

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 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, 1923. October 18, 1912, to February 26, 1913, at dam about a mile above.

GAGE.—Stevens continuous water-stage recorder on right bank; 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, 8.00 feet about 4 p. m. January 7 (discharge, from extension of rating curve, 6,800 second-feet); minimum stage, below zero on October 29, November 5 and 30; (discharge, practically zero).

1915–1923: 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 water is used through wheels of power plant. Pond above dam covers about 80 acres; daily discharges have been corrected for storage except continuous high water of December 25 to June 16.

ACCURACY.—Stage-discharge relation changed during high water of January 7. Rating curve for October 1 to January 7 well defined from 300 to 2,000 second-feet; for February 2 to September 30, well defined from 150 to 200 second-feet. Operation of water-stage recorder satisfactory October 1 to January 7, February 2 to September 18, and September 28–30. Daily discharge ascertained by integration October 1 to January 4; by applying mean gage height for periods of one to six hours and determining weighted average, July 17 to September 18 and September 28–30; computed from electrical output of power plant January 29 to February 1, June 27 to July 4, and September 19–26. For January 8–28 discharge over spillway, estimated from gage readings above dam, has been added to that through power plant computed from electrical output. Records good except for January for which they are fair.

Discharge measurements of White Salmon River near Underwood, Wash., during the year ending September 30, 1923

Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*
Mar. 24	R. J. McKinney	3.14	1,260
July 19	Wendell Dawson	2.77	1,000
Sept. 7	----do	1.93	570

Daily discharge, in second-feet, of White Salmon River near Underwood, Wash., for the year ending September 30, 1923

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	573	672	531	1,550	1,130	1,090	1,420	1,420	1,090	916	693	598
2	578	656	549	1,490	1,210	1,120	1,420	1,280	1,120	880	682	635
3	605	646	540	2,000	1,280	1,150	1,420	1,240	1,060	904	695	601
4	585	612	522	1,770	1,280	970	1,420	1,210	1,180	910	670	613
5	601	601	540	2,300	1,420	1,150	1,420	1,280	1,180	914	663	616
6	604	634	526	4,980	1,420	1,150	1,420	1,420	1,180	906	662	613
7	556	640	517	6,280	1,420	1,350	1,420	1,490	1,240	1,030	648	596
8	566	609	522	6,000	1,350	1,280	1,420	1,570	1,240	996	641	628
9	555	628	536	3,200	1,210	1,240	1,420	1,730	1,280	1,020	675	615
10	562	614	513	2,700	1,280	1,240	1,420	1,820	1,210	958	668	604
11	570	628	506	2,300	1,210	1,280	1,350	1,730	1,240	968	638	590
12	546	572	497	1,750	1,280	1,350	1,420	1,570	1,210	923	657	594
13	557	627	502	1,580	1,150	1,420	1,420	1,570	1,150	923	666	596
14	530	548	504	1,290	1,150	1,350	1,350	1,570	1,150	936	646	594
15	538	564	484	1,390	1,180	1,280	1,350	1,490	1,090	915	656	566
16	524	620	517	1,370	1,240	1,240	1,420	1,570	1,060	906	657	582
17	556	612	505	1,450	1,280	1,210	1,490	1,570	1,010	845	641	574
18	564	684	512	1,420	1,180	1,150	1,490	1,570	1,060	846	655	574
19	532	578	540	1,450	1,210	1,240	1,490	1,490	1,010	853	644	556
20	540	604	546	1,440	1,240	1,210	1,420	1,420	994	812	696	556
21	485	588	545	1,310	1,210	1,210	1,420	1,420	1,030	832	675	566
22	505	584	538	1,330	1,180	1,180	1,280	1,420	984	815	772	558
23	516	549	686	1,350	1,030	1,090	1,280	1,420	1,010	831	636	544
24	515	553	1,160	1,320	1,120	1,180	1,240	1,280	922	777	649	566
25	620	588	1,280	1,320	943	943	1,280	1,280	964	773	641	580
26	676	504	1,440	1,320	1,210	1,150	1,280	1,280	944	772	650	582
27	608	542	1,940	1,290	1,030	1,120	1,420	1,140	888	768	650	576
28	593	536	2,310	1,040	1,060	1,150	1,420	1,150	966	765	637	588
29	517	524	1,830	1,110	-------	1,180	1,420	1,090	972	737	629	616
30	672	509	1,480	1,040	-------	1,210	1,420	1,150	1,010	733	618	616
31	652	-------	1,690	1,140	-------	1,420	-------	1,150	-------	737	616	-------

NOTE.—Discharge has been corrected for storage at power plant.

Monthly discharge of White Salmon River near Underwood, Wash., for the year ending September 30, 1923

[Drainage area, 384 square miles]

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	676	485	568	34,900
November	684	504	594	35,360
December	2,310	484	816	50,200
January	6,280	1,040	1,980	122,000
February	1,420	943	1,210	67,200
March	1,420	943	1,200	73,800
April	1,490	1,240	1,400	83,300
May	1,820	1,090	1,410	86,700
June	1,280	888	1,080	64,300
July	1,030	733	868	53,400
August	772	616	659	40,500
September	635	544	590	35,100
The year	6,280	484	1,030	747,000

100941—27—WSP 574——8

SANDY RIVER BASIN

SANDY RIVER NEAR MARMOT, OREG.

LOCATION.—In SE. ¼ sec. 24, T. 2 S., R. 5 E., on Vanderhoof ranch, 2 miles by river above Sandy River Dam of Portland Electric 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, 1919, to September 30, 1923. Combined discharge of Sandy River and canal gives same results for the gap in record.

GAGE.—Stevens eight-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 1 mile below gage.

CHANNEL AND CONTROL.—Bed composed of rocks and gravel; may shift slightly.

EXTREMES OF DISCHARGE.—Maximum stage of year occurred about noon January 6, determined from high-water mark in well as 17.5 feet (discharge, from extension of rating curve, 29,200 second-feet); minimum discharge, 290 second-feet October 21 to 23.

1911–1923: Maximum stage recorded, that of January 6, 1923; minimum discharge, 274 second-feet, September 29, 1919.

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

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed during flood January 6. Affected by ties on control October 5–24 and November 5–15. Rating curves used October 1 to January 5, fairly well defined; January 6 to September 30, well defined below and fairly well defined above 4,000 second-feet. Recorder operated satisfactorily except for a few days when float was frozen in well; daily staffgage readings were used. Discharge ascertained by applying to rating table mean daily gage height determined by inspection of recorder graph; or, for days of considerable fluctuation, by averaging discharge for intervals of day; or for period when channel was obstructed by ties, taken to be the same as the flow in Sandy River Canal plus leakage of 4 second-feet through dam and fish ladder. Records good except for discharges above 4,000 second-feet, for which they are fair.

Discharge measurements of Sandy River near Marmot, Oreg., during the year ending September 30, 1923.

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Dec. 18	Canfield and Dawson	3.24	511	June 8	Wendell Dawson	4.10	1,610
28	McKinney and Dawson	7.10	3,840	Aug. 31	do	2.45	471
Mar. 2	K. N. Phillips	3.82	1,290				

Daily discharge, in second-feet, of Sandy River near Marmot, Oreg., for the year ending September 30, 1923

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	317	810	420	3,440	860	1,450	2,380	1,880	1,950	930	560	398
2	308	675	456	3,570	790	1,450	2,480	1,650	1,880	920	550	402
3	360	595	496	4,420	760	1,170	2,280	1,570	1,830	860	530	406
4	440	520	480	3,200	742	1,060	2,140	1,740	1,830	820	526	387
5	394	446	460	10,600	736	1,170	2,100	2,100	1,830	760	512	372
6	361	429	440	23,500	748	1,740	2,050	2,280	1,830	860	517	376
7	328	438	412	13,800	760	1,920	2,190	2,480	1,700	2,400	522	402
8	320	429	408	7,640	736	1,570	2,140	2,700	1,610	1,610	517	410
9	320	412	420	5,320	712	1,330	1,920	3,110	1,530	1,290	526	387
10	320	397	446	5,000	700	1,210	1,880	3,030	1,490	1,210	522	372
11	312	429	472	4,020	706	1,250	2,050	2,700	1,370	1,100	526	376
12	312	404	376	3,030	700	1,330	2,330	2,380	1,490	1,030	535	391
13	312	378	392	2,590	670	1,740	2,100	2,280	1,830	1,030	483	402
14	312	370	392	2,330	652	1,410	2,010	2,140	1,700	1,060	481	391
15	297	361	408	2,190	640	1,250	2,240	2,190	1,490	1,030	490	372
16	294	720	380	2,100	613	1,740	2,560	2,330	1,490	920	508	358
17	290	2,410	352	2,860	682	2,100	2,480	2,100	1,330	860	517	340
18	290	1,700	620	2,540	1,000	1,700	2,240	1,920	1,210	820	494	340
19	304	1,210	1,030	2,760	1,530	1,650	2,100	1,780	1,170	790	473	340
20	297	1,170	960	2,380	1,490	1,610	2,060	1,700	1,140	790	438	336
21	290	900	930	2,060	1,330	1,410	2,010	1,570	1,100	760	524	344
22	290	780	995	1,830	1,250	1,330	1,780	1,530	1,060	760	643	340
23	290	695	5,730	1,610	1,250	1,250	1,700	1,530	1,030	760	468	330
24	297	595	7,620	1,410	1,370	1,330	1,700	1,490	1,000	733	442	347
25	484	530	4,420	1,290	1,370	1,250	1,780	1,490	960	700	430	368
26	595	488	4,810	1,250	1,250	1,330	1,960	1,450	960	652	422	406
27	540	472	6,100	1,250	1,210	1,610	2,100	1,450	920	624	422	402
28	645	464	4,120	1,140	1,290	2,060	1,830	1,530	920	629	434	340
29	508	452	2,960	1,060	------	2,430	1,740	2,010	1,000	618	434	326
30	452	432	3,080	920	------	2,760	1,610	2,100	1,000	602	422	323
31	870	------	5,400	890	------	2,700	------	1,960	------	575	402	------

Monthly discharge of Sandy River near Marmot, Oreg., for the year ending September 30, 1923

[Drainage area, 267 square miles]

Month	Discharge in second-feet				Run-off	
	Maximum	Minimum	Mean	Per square mile	Inches	Acre-feet
October	870	290	379	1.42	1.64	23,300
November	2,410	361	670	2.51	2.80	39,900
December	7,620	352	1,810	6.78	7.82	111,000
January	23,500	890	3,940	14.8	17.06	242,000
February	1,530	613	948	3.55	3.70	52,600
March	2,760	1,060	1,590	5.96	6.87	97,800
April	2,560	1,610	2,060	7.72	8.61	123,000
May	3,110	1,450	2,010	7.53	8.68	124,000
June	1,960	920	1,390	5.21	5.81	82,700
July	2,400	575	920	3.45	3.98	56,600
August	648	402	493	1.85	2.13	30,300
September	410	323	370	1.39	1.55	22,000
The year	23,500	290	1,390	5.21	70.65	1,010,000

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, 1923; 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 used up to December 30; staff gage at same location read August 7 to September 30; staff gage above spillway of intake dam read in the meantime. Gage inspected by F. O. Radford and John Williams.

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, 12.37 feet at recorder site, about 8 p. m. January 5 (discharge, 18,700 second-feet); minimum stage, 0.25 foot October 18, 19, and 23 (discharge, 95 second-feet).

1895–1923: Maximum discharge recorded, 20,300 second-feet November 20, 1921; minimum discharge, 68 second-feet October 1, 1918.

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

DIVERSIONS.—None above station. The two water-supply pipes divert practically all low-water flow 1½ miles below station.

REGULATION.—None.

ACCURACY.—Stage-discharge relation both at recorder station and at intake dam changed during high water of January. Two fairly well defined rating curves used at both stations. Operation of water-stage recorder satisfactory to December 30; washed away by flood of January 5. Staff gage above dam read three or more times daily January 1 to August 6; subsequently staff gage at the recorder station read three times a week. Daily discharge ascertained by applying rating table to mean daily gage height obtained by inspecting recorder graph or to the mean daily staff gage reading. Records good.

Discharge measurements of Bull Run River near Bull Run, Oreg., during the year ending September 30, 1923

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Dec. 19	Wendell Dawson	1.71	687	May 30	F. F. Henshaw	2.71	1,480
29	Dawson and McKinney	3.24	1,880	Aug. 7	do	.10	125
Jan. 11	Canfield and Phillips	3.87	2,590	21	Wendell Dawson	.18	139
Mar. 1	K. N. Phillips	1.40	636				

Daily discharge, in second-feet, of Bull Run River near Bull Run, Oreg., for the year ending September 30, 1923

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	134	190	228	2,960	330	630	1,320	1,120	1,020	245		148
2	123	586	260	2,830	330	590	1,220	885	975	245		152
3	126	460	311	3,090	300	555	1,220	795	885	230		156
4	296	398	295	2,220	294	485	1,120	840	795	220	125	153
5	274	351	285	10,900	270	520	1,070	885	670	212		150
6	242	323	267	17,200	270	1,320	1,070	930	670	300		148
7	186	315	246	11,800	270	1,530	1,420	1,020	630	1,640	125	145
8	156	288	242	4,600	270	1,120	1,270	1,120	555	1,020	123	143
9	140	267	278	3,300	255	885	1,070	1,220	520	710	124	141
10	129	278	299	3,900	245	750	1,020	1,170	520	590	126	139
11	118	267	256	2,580	240	795	1,070	1,070	450	485	128	136
12	115	246	246	1,750	220	988	1,320	840	450	420	131	134
13	115	225	288	1,320	192	1,320	1,070	750	750	360	134	132
14	112	212	264	1,170	180	930	975	670	630	318	135	131
15	110	202	253	1,270	220	750	1,070	750	555	282	136	128
16	102	398	212	1,320	220	1,160	1,170	840	520	270	139	125
17	100	2,160	218	2,220	220	1,270	1,070	750	485	260	142	128
18	95	1,440	289	1,750	330	975	975	670	420	230	142	120
19	95	1,010	771	2,220	555	885	930	590	342	220	142	118
20	97	842	752	1,640	555	840	1,020	555	318	212	142	136
21	97	631	661	1,220	485	750	1,020	520	342	188	160	156
22	97	510	733	975	450	750	885	555	318	180	272	160
23	95	420	5,600	840	520	710	795	555	270	180	200	165
24	120	363	7,900	670	520	885	750	485	312	180	159	123
25	415	331	3,400	590	630	795	795	520	288	174	155	134
26	576	299	4,520	555	555	750	885	853	282	156	150	145
27	679	278	4,810	520	520	840	975	1,020	245	150	145	127
28	715	270	2,860	485	520	1,120	795	930	230	150	142	109
29	510	253	1,900	420	-------	1,320	930	1,410	235	138	139	112
30	411	239	2,270	390	-------	1,530	795	1,530	270	138	142	114
31	940	-------	3,540	372	-------	1,530	-------	1,220	-------	125	145	-------

Monthly discharge of Bull Run River near Bull Run, Oreg., for the year ending September 30, 1923

[Drainage area, 102 square miles]

Month	Discharge in second-feet				Run-off	
	Maximum	Minimum	Mean	Per square mile	Inches	Acre-feet
October	940	95	243	2.38	2.74	14,900
November	2,160	190	468	4.59	5.12	27,800
December	7,900	212	1,430	14.0	16.14	87,900
January	17,200	372	2,810	27.5	31.70	173,000
February	630	180	356	3.49	3.63	19,800
March	1,530	485	944	9.25	10.66	58,000
April	1,420	750	1,040	10.2	11.38	61,900
May	1,530	485	873	8.56	9.87	53,700
June	1,020	230	498	4.88	5.44	29,600
July	1,640	125	330	3.24	3.74	20,300
August	272	123	143	1.40	1.61	8,790
September	165	109	137	1.34	1.50	8,150
The year	17,200	95	779	7.64	103.53	564,000

LITTLE SANDY RIVER NEAR BULL RUN, OREG.

LOCATION.—In NE. ¼ sec. 10, T. 2 S., R. 5 E., three-eighths mile above Portland Electric 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, 1923.

GAGE.—Stevens eight-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 from water-stage recorder, 8.60 feet at 6 p. m. January 6 (discharge, 3,680 second feet); minimum stage, 1.85 feet September 17–20 (discharge, 12 second-feet).

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

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed on August 21, due to blasting in channel. Rating curve used October 1 to July 29, well defined below 700 second-feet; parallel curve used August 6–21; the curve August 22 to September 30, fairly well defined. Operation of recorder satisfactory except July 29 to August 5; discharge interpolated. Daily discharge ascertained by applying rating table to mean daily gage height obtained by inspection of recorder graph, or for days of considerable variation in stage, by averaging results obtained by applying mean gage heights for shorter intervals. Records good.

Discharge measurements of Little Sandy River near Bull Run, Oreg., during the year ending September 30, 1923

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Dec. 19	G. H. Canfield	2.97	123	Jan. 10	Phillips and Canfield	4.58	643
28	Dawson and McKinney	4.32	516	Mar. 1	Wendell Dawson	3.00	139
Jan. 3	Dawson and Canfield	4.38	530	June 3	G. H. Canfield	3.30	176
				Aug. 20	Wendell Dawson	1.94	21

Daily discharge, in second-feet, of Little Sandy River near Bull Run, Oreg., for the year ending September 30, 1923

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	23	177	48	440	79	130	222	210	197	51	28	15
2	22	132	56	540	74	126	197	157	193	50	26	14
3	23	100	64	590	72	116	195	144	185	51	24	14
4	46	88	62	424	69	106	189	161	165	47	21	14
5	59	79	66	1,840	67	148	183	191	156	48	19	14
6	50	78	62	2,970	65	266	185	199	154	94	17	13
7	35	84	56	1,780	64	266	248	205	136	448	21	13
8	29	72	54	810	62	201	218	245	115	245	24	13
9	26	63	61	665	58	165	175	269	48	165	24	13
10	24	66	65	750	57	141	171	272	103	136	24	13
11	23	63	60	488	58	138	183	218	90	110	24	13
12	24	55	52	364	59	181	245	175	124	94	25	13
13	24	52	53	311	81	254	187	161	175	86	24	13
14	24	48	52	293	68	195	171	144	135	77	24	13
15	22	45	49	284	70	163	195	191	112	70	23	13
16	21	96	45	266	72	275	208	185	104	66	23	13
17	20	440	42	344	79	308	193	156	98	62	23	13
18	20	410	67	311	86	225	171	132	88	58	23	12
19	20	199	132	392	121	193	167	132	81	52	23	13
20	21	171	121	299	140	175	175	121	75	53	22	14
21	20	124	112	239	132	157	165	112	81	49	30	17
22	20	100	130	195	130	152	152	126	80	46	44	16
23	20	95	850	167	135	146	135	138	70	45	25	14
24	23	74	1,550	141	141	161	140	115	77	43	20	17
25	75	65	640	126	157	146	156	115	78	41	19	19
26	127	59	720	116	141	135	181	179	74	39	15	20
27	160	57	750	121	130	146	179	210	66	38	16	18
28	171	58	496	110	126	181	144	185	61	37	16	16
29	120	52	357	102	.....	228	132	311	58	35	15	15
30	93	48	520	92	.....	145	126	260	54	33	15	14
31	215	.....	750	85	.....	242	.....	205	.....	30	15	.....

Monthly discharge of Little Sandy River near Bull Run, Oreg., for the year ending September 30, 1923

[Drainage area, 23.0 square miles]

Month	Discharge in second-feet				Run-off	
	Maximum	Minimum	Mean	Per square mile	Inches	Acre-feet
October	171	20	51.6	2.24	2.58	3,170
November	440	45	108	4.70	5.24	6,430
December	1,550	42	263	11.4	13.14	16,200
January	2,970	85	505	22.0	25.36	31,100
February	157	57	92.6	4.03	4.20	5,140
March	308	106	181	7.87	9.07	11,100
April	248	126	180	7.83	8.74	10,700
May	311	112	181	7.87	9.07	11,100
June	197	48	108	4.70	5.24	6,430
July	448	30	80.6	3.50	4.04	4,960
August	44	15	22.3	.970	1.12	1,370
September	20	12	14.4	.626	.70	857
The year	2,970	12	150	6.52	88.50	109,000

WILLAMETTE RIVER BASIN

MIDDLE FORK OF WILLAMETTE RIVER AT EULA, OREG.

LOCATION.—In sec. 18, T. 20 S., R. 2 E., 8 miles below mouth of North Fork and a quarter of a mile southwest of railroad station and post office of Eula, Lane County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—July 1 to September 30, 1923.

GAGE.—Inclined staff in sections on right bank; gage reader Eula Blakely.

DISCHARGE MEASUREMENTS.—Made from cable about 1 mile above gage or by wading.

CHANNEL AND CONTROL.—Gravel and small boulders; shifting in floods.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of record, 4.5 feet July 7 (discharge, 3,140 second-feet); minimum stage, 2.5 feet September 12 and 17–20 (discharge, 770 second-feet).

ICE.—None.

DIVERSIONS.—None.

REGULATION.—Probably none.

ACCURACY.—Stage-discharge relation practically permanent during period of record. Rating curve fairly well defined. Gage read to tenths once a day. Daily discharge ascertained by applying daily gage reading to rating table. Records good.

The following discharge measurement was made by G. H. Canfield:
June 28, 1923: Gage height, 4.20 feet; discharge, 2,670 second-feet.

Daily discharge, in second-feet, of Middle Fork of Willamette River at Eula, Oreg. for the year ending September 30, 1923

Day	July	Aug.	Sept.	Day	July	Aug.	Sept.	Day	July	Aug.	Sept.
1	2,540	1,210	895	11	2,130	1,030	850	21	1,530	1,030	850
2	2,540	1,120	850	12	2,130	1,030	770	22	1,420	1,120	850
3	2,390	1,120	850	13	2,130	1,030	850	23	1,420	1,030	850
4	2,390	1,120	850	14	2,000	1,030	850	24	1,420	1,030	850
5	2,540	1,120	850	15	1,870	1,030	850	25	1,530	940	940
6	2,540	1,120	850	16	1,750	1,030	850	26	1,530	940	1,030
7	3,140	1,120	850	17	1,750	1,030	770	27	1,310	940	940
8	2,690	1,120	850	18	1,530	940	770	28	1,310	940	940
9	2,540	1,030	850	19	1,530	940	770	29	1,310	940	850
10	2,260	1,030	850	20	1,530	940	770	30	1,210	940	856
								31	1,210	940	----

Monthly discharge of Middle Fork of Willamette River at Eula, Oreg., for the year ending September 30, 1923

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
July	3,140	1,210	1,910	117,000
August	1,210	940	1,030	63,300
September	1,030	770	853	50,800
The period				231,000

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.—2,050 square miles (revised; measured on map of Oregon issued by United States Geological Survey, scale 1:500,000).

RECORDS AVAILABLE.—June 1, 1919, to September 30, 1923. Record at Springfield November 27, 1911, to September 30, 1913.

GAGE.—Vertical staff graduated to tenths, fastened to first pier from left bank of highway bridge; read by Lee Goetschius.

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, 18.0 feet during early morning of January 7 (discharge, 72,500 second-feet); minimum stage recorded, 0.8 foot October 23–25 (discharge, 680 second-feet).

1911–1913; 1919–1923: Maximum stage recorded, that of January 7, 1923. Minimum discharge recorded, 680 second-feet on September 25–26 and October 23–25, 1922.

The maximum stage in recent years from records of United States Weather Bureau, 21.5 feet November 22, 1909 (discharge, about 96,000 second-feet).

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

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed during high water of January 7. Well-defined rating curve prior to January 7, fairly well-defined curve thereafter. Gage read to tenths once a day, twice in floods. Daily discharge ascertained by applying daily gage reading to rating table. Record good.

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

Discharge measurements of Willamette River at Eugene, Oreg., during the year ending September 30, 1923

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Dec. 2	R. J. McKinney	2.02	1,890	Apr. 15	R. J. McKinney	4.60	5,030
Jan. 10	do	8.36	19,100	Aug. 6	Wendell Dawson	1.65	1,280
Mar. 21	K. N. Phillips	5.57	7,530				

Daily discharge, in second-feet, of Willamette River at Eugene, Oreg., for the year ending September 30, 1923

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	840	2,870	1,530	33,400	5,560	5,560	6,000	3,930	7,700	2,900	1,510	1,060
2	840	2,110	1,530	19,400	4,940	5,780	6,000	4,250	7,400	2,770	1,420	1,060
3	840	1,640	1,640	18,400	4,410	5,560	6,820	4,090	5,780	2,770	1,420	1,060
4	840	1,530	3,280	16,400	4,090	5,350	6,000	3,930	4,760	2,520	1,420	1,060
5	1,320	1,420	4,800	17,400	4,090	4,940	7,700	4,090	4,760	2,520	1,420	1,060
6	1,220	1,420	12,200	46,900	3,930	5,560	7,400	4,090	4,760	2,410	1,330	1,060
7	1,220	1,320	10,000	62,000	3,930	8,300	7,700	4,410	4,760	4,090	1,330	1,060
8	1,220	1,320	6,180	40,400	3,930	7,700	8,000	4,940	4,760	4,940	1,330	980
9	930	1,320	4,640	27,400	4,090	7,100	7,700	5,560	4,410	3,930	1,330	980
10	930	1,420	7,640	14,900	3,930	6,000	6,540	6,000	4,410	3,330	1,330	980
11	840	1,870	6,860	16,400	3,930	5,780	5,780	5,780	4,090	3,180	1,240	980
12	840	1,640	5,160	14,000	4,580	6,000	5,350	4,940	4,090	2,770	1,240	980
13	840	1,420	4,000	10,800	3,930	8,000	5,140	4,940	4,410	2,640	1,240	980
14	840	1,420	3,420	10,800	3,930	9,200	4,940	4,580	4,760	2,520	1,240	980
15	840	1,220	3,140	12,000	3,780	8,000	4,760	4,250	4,410	2,410	1,240	900
16	840	1,220	2,870	10,800	3,780	7,400	4,760	4,580	4,090	2,190	1,240	900
17	840	1,420	2,480	14,900	5,560	15,400	5,140	4,580	3,930	2,090	1,150	900
18	840	6,180	2,230	19,900	8,300	12,800	5,140	4,410	3,930	1,990	1,150	900
19	760	3,700	6,400	14,000	10,000	10,000	4,760	4,090	3,780	1,890	1,420	900
20	760	2,480	7,120	10,400	14,000	8,900	4,580	4,090	3,630	1,890	1,240	900
21	760	2,230	5,760	8,900	10,800	7,700	6,000	3,780	3,480	1,890	1,150	900
22	760	1,870	5,560	8,300	10,000	6,820	6,000	3,780	3,780	1,890	1,150	900
23	680	1,750	5,360	7,400	9,600	6,000	5,780	3,780	3,630	1,790	1,420	980
24	680	1,640	10,600	7,100	8,300	5,560	5,140	3,480	3,480	1,790	1,330	980
25	680	1,530	13,800	6,000	7,700	5,140	4,760	3,480	3,630	1,690	1,240	980
26	840	1,530	10,000	6,000	6,820	4,940	4,580	4,090	3,480	1,600	1,240	1,420
27	1,020	1,320	18,400	5,780	6,000	4,760	4,410	4,580	3,480	1,600	1,150	1,420
28	1,320	1,320	17,400	12,000	5,560	4,940	4,250	4,090	3,330	1,600	1,060	1,420
29	1,320	1,990	12,200	8,900	-------	5,560	4,250	4,090	3,330	1,600	1,060	1,150
30	1,320	1,870	11,000	7,400	-------	5,780	4,090	8,300	3,180	1,510	1,060	1,150
31	1,220	-------	19,900	6,000	-------	6,000	-------	7,700	-------	1,510	1,060	-------

Monthly discharge of Willamette River at Eugene, Oreg., for the year ending September 30, 1923

[Drainage area, 2,050 square miles]

Month	Discharge in second-feet				Run-off	
	Maximum	Minimum	Mean	Per square mile	Inches	Acre-feet
October	1,320	680	937	0.457	0.53	57,600
November	6,180	1,220	1,870	.912	1.02	111,000
December	19,900	1,530	7,330	3.58	4.13	451,000
January	62,000	5,780	16,600	8.10	9.34	1,020,000
February	14,000	3,780	6,050	2.95	3.07	336,000
March	15,400	4,760	6,990	3.41	3.93	430,000
April	8,000	4,090	5,650	2.76	3.08	336,000
May	8,300	3,480	4,600	2.24	2.58	283,000
June	7,700	3,180	4,310	2.10	2.34	256,000
July	4,940	1,510	2,390	1.17	1.35	147,000
August	1,510	1,060	1,260	.615	.71	77,500
September	1,420	900	1,030	.502	.56	61,300
The year	62,000	680	4,930	2.40	32.64	3,570,000

WILLAMETTE RIVER AT ALBANY, OREG.

LOCATION.—In SW. ¼ sec. 6, T. 11 S., R. 3 E., 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, 1923; some fragmentary records 1883 to 1888.

GAGE.—Vertical staff in two sections on right bank; read by F. M. French.

DISCHARGE MEASUREMENTS.—Made from Southern Pacific bridge.

CHANNEL AND CONTROL.—Bed composed of sand and fine gravel. Control practically permanent. Above gage height 17 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, 30.0 feet from 8 to 10 a. m. January 8 (discharge, 200,000 second-feet); minimum stage, 0.8 foot October 18–25 (discharge, 2,940 second-feet).

1878–1882; 1892–1923: Maximum stage recorded, 32.8 feet January 14, 1881 (discharge, 245,000 second-feet); minimum stage, 0.2 foot September 21–27, 1879 (discharge, 1,870 second-feet; somewhat uncertain).

The maximum stage ever known was 36.0 feet December 8, 1861 (discharge estimated from extension of rating curve as 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 it into Willamette River above the gage and measuring section since the early nineties. It ordinarily carries between 200 and 250 second-feet.

REGULATION.—Pratically none.

ACCURACY.—Stage-discharge relation permanent during year. Rating curve well defined. Gage read to tenths once a day; twice during floods. 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 Albany, Oreg., during the year ending September 30, 1923

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Oct. 7	R. J. McKinney	1.22	3,810	Jan. 16	K. N. Phillips	10.23	39,200
Jan. 2	do	17.16	70,700	Feb. 22	R. J. McKinney	7.53	24,700
8	do	29.4	193,000	Aug. 7	Wendell Dawson	1.30	3,970

Daily discharge, in second-feet, of Willamette River at Albany, Oreg., for the year ending September 30, 1923

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	3,300	3,880	4,080	53,500	18,700	13,600	14,200	10,300	16,000	7,640	4,080	3,300
2	3,300	5,400	4,280	70,000	15,650	12,800	13,900	10,300	14,600	7,640	3,880	3,120
3	3,300	4,720	4,720	61,000	14,600	13,600	14,600	10,000	13,600	7,380	3,680	3,120
4	3,300	4,080	6,360	53,000	13,600	12,500	15,600	9,760	12,500	7,380	3,680	3,120
5	3,300	4,280	9,200	53,000	12,200	11,500	16,000	9,760	11,200	7,120	3,680	3,120
6	3,300	3,880	14,600	68,200	11,200	11,200	17,500	10,000	10,300	6,860	3,680	3,120
7	3,680	3,480	24,000	128,000	10,900	13,600	17,100	10,600	10,300	6,600	3,880	3,120
8	3,300	3,300	21,900	195,000	10,600	17,100	19,100	11,200	10,000	8,940	3,680	3,120
9	3,300	3,300	18,700	155,000	10,600	17,900	19,500	12,500	10,000	10,000	3,680	3,120
10	3,300	3,880	18,300	115,000	10,300	16,400	17,500	13,200	9,760	9,480	3,680	3,120
11	3,300	4,080	21,500	69,400	10,000	15,300	15,600	13,900	9,760	8,940	3,680	3,120
12	3,300	4,080	18,300	55,500	9,760	15,000	14,200	13,200	9,480	8,160	3,680	3,120
13	3,300	4,080	13,900	45,600	12,500	16,400	13,900	12,500	9,760	7,640	3,480	3,120
14	3,300	3,880	10,900	41,600	13,600	21,500	13,600	11,800	10,300	7,120	3,480	3,120
15	3,300	3,880	9,480	38,800	12,200	21,500	12,800	11,200	10,300	6,600	3,480	3,120
16	3,120	3,880	8,160	36,600	10,900	19,500	12,200	10,600	9,760	6,860	3,480	3,120
17	3,120	3,680	7,380	33,900	10,600	19,100	11,500	11,200	9,760	6,360	3,480	3,120
18	2,940	4,720	6,860	42,400	10,300	2,8000	12,500	11,800	9,200	6,360	3,480	3,120
19	2,940	10,000	7,900	48,500	17,500	25,800	12,500	11,200	8,680	6,360	3,480	3,120
20	2,940	7,640	14,600	40,600	22,700	21,500	12,200	10,600	8,680	6,360	3,300	3,120
21	2,940	6,600	15,300	33,000	27,600	19,100	12,200	10,300	8,420	6,360	3,300	3,120
22	2,940	5,640	13,600	27,200	24,900	17,500	15,000	10,000	8,420	6,360	3,300	3,120
23	2,940	5,160	11,800	24,000	23,100	15,600	14,600	9,760	8,160	6,360	3,300	3,120
24	2,940	4,940	16,700	23,100	20,700	14,200	13,900	9,200	8,420	5,640	3,300	3,120
25	2,940	4,720	32,100	20,300	19,100	13,600	13,200	9,200	8,160	5,400	3,300	3,120
26	3,120	4,280	36,600	18,700	17,500	12,500	12,500	9,200	7,900	5,160	3,300	3,300
27	3,480	4,280	34,800	18,700	15,600	11,500	11,800	9,200	7,640	4,940	3,300	3,300
28	3,480	4,720	48,500	26,200	14,200	10,900	10,900	9,200	7,640	4,720	3,300	3,300
29	3,680	4,500	48,000	33,900	------	12,200	10,900	9,760	7,640	4,500	3,300	3,120
30	3,680	4,280	39,300	28,000	------	13,600	10,600	10,600	7,640	4,500	3,300	3,120
31	3,480	------	40,200	22,300	------	13,900	------	14,600	-----	4,280	3,300	----

Monthly discharge of Willamette River at Albany, Oreg., for the year ending September 30, 1923

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	3,680	2,940	3,240	199,000
November	10,000	3,300	4,640	276,000
December	48,500	4,080	18,800	1,160,000
January	195,000	18,700	54,200	3,330,000
February	27,600	9,760	15,000	833,000
March	28,000	10,900	16,100	990,000
April	19,500	10,600	14,000	833,000
May	14,600	9,200	10,900	670,000
June	16,000	7,640	9,800	583,000
July	10,000	4,280	6,720	413,000
August	4,080	3,300	3,520	216,000
September	3,300	3,120	3,140	187,000
The year	195,000	2,940	13,400	9,690,000

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, 1923.

GAGE.—Vertical staff attached to right abutment of highway bridge at McKenzie Bridge; read by S. L. Taylor.

DISCHARGE MEASUREMENTS.—Made from cable three-eighths mile above ranger station.

CHANNEL AND CONTROL.—Bed rocky; practically permanent.

EXTREMES OF DISCHARGE.—Maximum stage during year, determined from high-water marks, 8.3 feet on January 6 (discharge, from extension of rating curve, 18,000 second-feet); minimum stage recorded, 0.46 foot December 12 and 13 (discharge, 940 second-feet).

1910–1923: Maximum stage recorded, that of January 6, 1923; 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 during year. Rating curve fairly well defined below and poorly defined above 4,000 second-feet. Staff gage read to hundredths once a day, except December 14 to April 7, when no observer was available. Daily discharge ascertained by applying daily gage height to rating table. Records good, except for periods when discharge was estimated, which are fair.

The following discharge measurement was made by R. J. McKinney:
April 14, 1923: Gage height, 1.57 feet; discharge, 2,220 second-feet.

Daily discharge, in second-feet, of McKenzie River at McKenzie Bridge, Oreg., for the year ending September 30, 1923

Day	Oct.	Nov.	Dec.	Apr.	May	June	July	Aug.	Sept.
1	1,040	980	962	-------	2,130	2,340	1,800	1,500	1,320
2	1,060	980	962	-------	2,130	2,200	1,730	1,500	1,320
3	1,070	974	962	-------	2,410	2,130	1,670	1,500	1,320
4		968	962	-------	2,410	2,200	1,610	1,500	1,300
5		962		-------	2,550	2,270	1,610	1,500	1,300
6	1,030	962	980	-------	2,860	2,410	1,670	1,500	1,280
7		962		-------	2,860	2,410	1,800	1,500	1,280
8		962		2,410	4,240	2,410	1,670	1,500	1,280
9	998	962	962	2,410	3,020	2,270	1,610	1,500	1,280
10		962	962	2,340	2,940	2,270	1,610	1,500	1,260
11	998	962	962	2,270	2,780	2,200	1,610	1,500	1,250
12			944	2,340	2,700	2,130	1,610	1,500	1,240
13			944	2,340	2,620	2,130	1,670	1,440	1,240
14	998		-------	2,340	2,480	2,070	1,610	1,440	1,220
15	989	980	-------	2,410	2,620	1,990	1,610	1,440	1,210
16	980		-------	2,410	2,780	1,990	1,610	1,390	1,190
17			-------	2,410	2,700	1,990	1,560	1,390	1,180
18		980	-------	2,410	2,700	1,990	1,560	1,390	1,170
19	980	1,030	-------	2,410	2,550	1,990	1,560	1,390	1,170
20		1,050	-------	2,410	2,410	1,920	1,560	1,390	1,170
21		1,030	-------	2,410	2,340	1,920	1,560	1,390	1,170
22	980	1,030	-------	2,410	2,340	1,860	1,560	1,390	1,170
23	974	1,020	-------	2,340	2,270	1,860	1,500	1,370	1,170
24	968	1,000	-------	2,270	2,270	1,860	1,500	1,370	1,170
25	962	990	-------	2,200	2,270	1,860	1,500	1,370	1,170
26	962	980	-------	2,130	2,340	1,800	1,500	1,350	1,180
27	962	980	-------	2,130	2,270	1,800	1,500	1,350	1,190
28	980	980	-------	2,130	2,200	1,800	1,500	1,350	1,190
29	1,010	980	-------	2,130	2,410	1,800	1,500	1,350	1,190
30	1,040	962	-------	2,130	2,410	1,800	1,500	1,350	1,190
31	1,080	-------	-------	-------	2,410	-------	1,500	1,350	-------

NOTE.—Discharge interpolated Oct. 1, 2, 15, 23, 24, 26, 29, 30, Nov. 3, 4, 8–10, 24, 25, 27, 28, Dec. 2, 3, Sept 11, 12, 14, 17, 19, 20, 22, 25, 26, 28, 29. Braced figures show mean discharge for periods indicated.

Monthly discharge of McKenzie River at McKenzie Bridge, Oreg., for the year ending September 30, 1923

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	1,080	962	1,000	61,500
November	1,050	962	984	58,600
December 1–13		944	965	24,900
April 8–30	2,410	2,130	2,310	105,000
May	4,240	2,130	2,560	157,000
June	2,410	1,800	2,060	123,000
July	1,800	1,500	1,590	97,800
August	1,500	1,350	1,430	87,900
September	1,320	1,170	1,230	73,200

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 September 30, 1923.

GAGE.—Vertical staff on right abutment of bridge; read by William 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 year, 14.4 feet at 4 p. m. January 7 (discharge, 18,600 second-feet); minimum stage recorded, 0.14 foot October 22 (discharge, 12 second-feet).

ICE.—Stage-discharge relation not affected.

DIVERSIONS.—None.

REGULATION.—Probably some fluctuation at low stages due to pondage at mill dam at Monroe.

ACCURACY.—Stage-discharge relation practically permanent. Rating curve well defined below 10,000 second-feet. Gage read once a day to hundredths at low stages and to tenths at high stage. Daily discharge ascertained by applying daily gage reading to rating table. Records good.

Discharge measurements of Long Tom River near Monroe, Oreg., during the year ending September 30, 1923

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Oct. 13	R. J. McKinney	0.40	45	Mar. 10	R. J. McKinney	4.16	1,060
Dec. 15	do	3.77	905	Apr. 28	do	1.46	29
Jan. 9	do	11.60	8,300	July 13	F. F. Henshaw	.56	5
13	Phillips and McKinney	9.28	3,780				

Daily discharge, in second-feet, of Long Tom River near Monroe, Oreg., for the year ending September 30, 1923

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	50	77	109	5,160	2,210	654	374	264	124	71	46	24
2	52	75	109	5,520	1,690	598	430	264	120	68	44	24
3	44	70	160	4,700	1,600	542	514	264	118	66	44	23
4	41	66	430	4,560	1,550	514	682	251	113	66	42	24
5	41	64	1,000	5,160	1,430	514	766	225	111	66	41	24
6	52	66	1,920	7,480	1,000	542	940	212	100	66	41	24
7	54	68	2,320	15,800	880	514	850	186	94	66	40	24
8	44	59	2,730	12,600	822	766	822	160	88	73	40	25
9	41	61	2,800	8,020	738	970	710	160	86	73	38	24
10	42	77	2,550	6,720	710	1,060	654	160	92	73	37	24
11	42	86	2,730	4,700	710	1,000	570	160	90	73	35	24
12	42	92	2,800	4,320	880	1,000	486	160	88	71	35	24
13	41	92	1,870	3,960	1,780	1,060	458	155	92	70	34	25
14	41	88	1,690	3,840	2,020	1,330	402	143	92	70	34	25
15	15	86	940	3,640	1,330	1,360	374	136	92	64	33	24
16	16	86	710	3,260	1,190	1,330	346	134	92	64	33	24
17	16	86	598	3,440	1,100	1,240	318	129	264	56	31	25
18	16	92	570	4,200	1,030	1,160	290	131	92	53	30	25
19	27	150	710	4,440	1,330	970	290	136	92	56	31	24
20	34	238	1,100	3,840	1,470	850	277	134	90	53	30	24
21	34	238	940	3,260	1,260	940	430	131	88	53	30	24
22	12	212	1,000	2,550	1,290	710	570	124	84	53	27	25
23	16	160	1,060	2,210	1,220	654	514	113	82	53	26	23
24	27	113	1,360	1,970	1,060	570	430	111	82	48	26	25
25	33	100	2,310	1,870	940	542	374	111	82	48	26	24
26	27	88	2,800	1,470	850	514	318	113	82	48	25	25
27	41	82	3,340	1,920	766	458	290	113	82	47	25	25
28	61	73	3,740	3,260	710	430	290	115	82	47	25	25
29	86	113	4,200	4,200	-------	430	251	120	81	47	24	25
30	86	115	4,080	3,260	-------	402	264	124	73	46	23	24
31	86	-------	4,200	3,020	-------	374	-------	136	-------	46	24	-------

Monthly discharge of Long Tom River near Monroe, Oreg., for the year ending September 30, 1923

[Drainage area, 400 square miles]

Month	Discharge in second-feet				Run-off	
	Maximum	Minimum	Mean	Per square mile	Inches	Acre-feet
October	86	12	40.6	0.102	0.12	2,500
November	238	59	102	.255	.28	6,070
December	4,200	109	1,840	4.60	5.30	113,000
January	15,800	1,470	4,660	11.6	13.37	287,000
February	2,210	710	1,200	3.00	3.12	66,600
March	1,360	374	774	1.94	2.24	47,600
April	940	251	476	1.19	1.33	28,300
May	264	111	157	.392	.45	9,650
June	264	73	98.3	.246	.27	5,850
July	73	46	59.8	.150	.17	3,680
August	46	23	32.9	.082	.09	2,020
September	25	23	24.3	.061	.07	1,450
The year	15,800	12	791	1.98	26.81	574,000

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; November 1, 1921, to April 30, 1923, when station was discontinued.

GAGE.—Vertical staff nailed to pile of bridge. Chain gage on bridge used for high stages beginning December 10, 1921.

DISCHARGE MEASUREMENTS.—Made from bridge or by wading.

CHANNEL AND CONTROL.—Deep and narrow, very crooked; water 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 October 1 to April 30, 17.53 feet at 9 a. m. January 7 (discharge, 3,500 second-feet); minimum stage, −0.58 foot October 15 (discharge, 15 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, or twice a day when stage exceeded 12 feet. Daily discharge ascertained by applying to rating table mean daily gage height. Records good.

Discharge measurements of Muddy Creek near Corvallis, Oreg., during the year ending September 30, 1923

[Made by R. J. McKinney]

Date	Gage height	Discharge	Date	Gage height	Discharge	Date	Gage height	Discharge
	Feet	*Sec.-ft.*		*Feet*	*Sec.-ft.*		*Feet*	*Sec.-ft.*
Oct. 28	0.69	33.4	Jan. 4	14.51	1,640	Mar. 10	6.51	312
Dec. 15	5.74	267	Feb. 21	8.86	437	Apr. 28	2.03	93

Daily discharge, in second-feet, of Muddy Creek near Corvallis, Oreg., for the period October 1, 1922, to April 30, 1923

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.
1	20	40	43	2,100	545	184	123
2	20	37	44	1,680	444	174	155
3	19	37	54	1,570	387	164	155
4	19	44	88	1,570	344	155	204
5	23	43	179	2,100	308	155	259
6	25	40	444	3,350	284	174	264
7	25	37	468	3,500	264	209	239
8	23	37	640	3,420	244	229	214
9	22	38	1,010	2,160	224	302	179
10	20	46	1,270	1,680	214	290	159
11	18	52	1,170	1,470	234	308	147
12	18	49	808	1,340	344	380	131
13	16	52	468	1,230	387	394	119
14	16	50	320	1,300	509	380	115
15	15	46	254	1,200	452	368	107
16	16	43	194	1,130	380	332	99
17	17	43	164	1,230	350	284	95
18	18	56	204	1,340	350	290	91
19	18	55	214	1,270	408	259	88
20	19	74	239	1,100	429	224	91
21	19	70	234	826	436	179	135
22	20	62	214	652	394	184	139
23	20	56	264	564	368	184	147
24	21	54	718	564	332	169	135
25	24	48	960	500	296	155	111
26	34	43	1,100	452	264	143	99
27	40	43	1,380	760	239	135	91
28	46	43	1,800	1,230	199	131	85
29	50	42	1,520	1,340	-------	123	84
30	44	40	1,340	1,070	-------	115	79
31	42	-------	1,860	740	-------	111	-------

Monthly discharge of Muddy Creek near Corvallis, Oreg., for the period October 1, 1922, to April 30, 1923

[Drainage area, 120 square miles]

Month	Discharge in second-feet				Run-off	
	Maximum	Minimum	Mean	Per square mile	Inches	Acre-feet
October	50	15	24.1	0.201	0.23	1,480
November	74	37	47.3	.394	.44	2,810
December	1,860	43	634	5.28	6.09	39,000
January	3,500	452	1,430	11.9	13.72	87,900
February	545	199	344	2.87	3.00	19,100
March	394	111	222	1.85	2.13	13,600
April	264	79	138	1.15	1.28	8,210
The period						172,000

CALAPOOYA RIVER NEAR TANGENT, OREG.

LOCATION.—In sec. 32, T. 12 S., R. 3 W., at a 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 May 31, 1922, and October 1, 1922, to April 30, 1923, when station was discontinued.

GAGE.—Chain gage on downstream side of highway bridge near center; read by Floyd H. Simon.

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 hardpan 300 feet below gage; fairly permanent; no definite control at high water.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period from high-water mark, 21.68 feet at 4 p. m. January 7 (discharge, 7,410 second-feet); minimum stage recorded, 0.97 foot October 15 (discharge, 2.7 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 apparently permanent. Rating curve fairly well defined. Gage read to hundredths once a day at low and medium stages; twice a day at high stages. Daily discharge ascertained by applying daily gage reading to rating table. Records good.

Discharge measurements of Calapooya River near Tangent, Oreg., during the year ending September 30, 1923

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Oct. 7	R. J. McKinney	2.12	107	Jan. 15	K. N. Phillips	13.72	1,860
21	do	1.46	26.1	27	R. J. McKinney	11.60	1,610
Dec. 9	do	11.77	1,340	May 5	do	4.24	295
Jan. 3	do	18.38	3,610				

Daily discharge, in second-feet, of Calapooya River near Tangent, Oreg., for the year ending September 30, 1923

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.
1		99	353	5,040	862	528	580
2		104	401	4,010	755	489	606
3		104	502	3,400	726	463	684
4	50	116	658	2,470	567	437	755
5		116	1,130	4,640	554	684	1,020
6		110	2,280	5,890	476	894	990
7	88	99	2,100	7,150	450	1,270	974
8	35	116	990	5,890	425	1,050	942
9	68	99	1,460	4,540	425	698	846
10	59	104	2,220	3,610	450	567	770
11	35	116	1,800	2,810	632	846	698
12	27	121	894	2,010	815	1,040	619
13	25	116	554	1,740	684	1,010	567
14	5	104	489	1,980	619	894	502
15	3	116	401	1,800	528	846	425
16	14	353	377	1,130	476	785	425
17	18	740	353	2,350	463	740	413
18	15	698	329	3,470	740	698	401
19	17	658	606	1,300	1,660	658	401
20	16	450	878	1,070	1,470	606	389
21	19	305	910	1,860	1,180	567	671
22	5	281	740	1,220	1,120	476	528
23	11	281	671	1,320	910	463	489
24	7	269	2,040	1,300	846	463	476
25	21	269	1,760	1,090	815	593	450
26	25	257	1,840	1,660	740	593	425
27	49	269	3,220	1,730	671	593	413
28	74	269	5,240	2,430	580	580	389
29	99	293	2,710	1,840	-------	580	329
30	88	329	2,100	1,220	-------	567	305
31	94	-------	4,180	974	-------	554	-------

Monthly discharge of Calapooya River near Tangent, Oreg., for the year ending September 30, 1923

[Drainage area, 262 square miles]

Month	Discharge in second-feet				Run-off	
	Maximum	Minimum	Mean	Per square mile	Inches	Acre-feet
October	94	3	39.3	0.150	0.17	2,420
November	740	99	245	.935	1.04	14,600
December	5,240	329	1,430	5.46	6.30	87,900
January	7,150	974	2,680	10.2	11.76	165,000
February	1,660	425	737	2.81	2.93	40,900
March	1,270	437	685	2.61	3.01	42,100
April	1,020	305	583	2.23	2.49	34,700
The period						388,000

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 April 30, 1923, when station was discontinued.

GAGE.—Enameled vertical staff fixed to downstream side of right abutment of highway bridge; read by Mary Andrews.

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 during year, 6.9 feet on afternoon of January 6, determined from high-water marks (discharge, by extension of rating curve, 1,760 second-feet); no record of minimum.

1921–1923: Maximum stage determined from high-water mark, 7.3 feet November 20, 1921 (discharge, 1,990 second-feet). Creek bed goes dry practically every summer.

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

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed prior to November 1, 1922. Rating curve fairly well defined below 600 second-feet. Gage read to quarter-tenths once a day at low water, twice a day to tenths at high water. Daily discharge ascertained by applying mean of daily gage readings to rating table. Records good, except for extremely high water.

Discharge measurements of Oak Creek near Albany, Oreg., during the year ending September 30, 1923

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Dec. 9	R. J. McKinney	3.73	347	Feb. 22	R. J. McKinney	1.30	52
Jan. 15	K. N. Phillips	1.83	97	Apr. 5	do	1.45	61
27	R. J. McKinney	4.26	540	May 5	do	.43	4.4

Daily discharge, in second-feet, of Oak Creek near Albany, Oreg., for the period November 1, 1922, to April 30, 1923

Day	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.
1		56	455	59	20	9.6
2		59	255	56	15	38
3		140	401	38	15	67
4		215	302	45	10	59
5		359	425	38	15	63
6		490	1,460	32	32	48
7		164	910	32	67	95
8		95	339	32	59	85
9	5	379	152	32	52	42
10		525	270	38	32	32
11		152	285	52	95	32
12		85	140	359	105	35
13		80	116	152	228	32
14		95	215	76	105	15
15		85	100	52	63	14
16		52	80	48	116	11
17	67	32	770	38	72	10
18	52	45	285	105	56	9.6
19	45	202	140	241	38	9.2
20	56	95	95	85	38	11
21	38	67	76	67	32	45
22	24	56	72	52	32	20
23	17	176	85	52	26	15
24	14	339	140	42	20	14
25	12	302	67	38	26	10
26	10	302	95	32	10	9.6
27	12	339	525	26	14	9.2
28	72	228	270	20	10	9.2
29	59	152	176	-------	9.2	8.8
30	29	202	85	-------	8.8	8.0
31	-------	770	67	-------	9.2	-------

Monthly discharge of Oak Creek near Albany, Oreg., for the period November 1, 1922, to April 30, 1923

[Drainage area, 39 square miles]

Month	Discharge in second-feet				Run-off	
	Maximum	Minimum	Mean	Per square mile	Inches	Acre-feet
November	72		19.6	0.503	0.56	1,170
December	770	32	204	5.23	6.03	12,500
January	1,460	67	286	7.33	8.45	17,600
February	359	20	69.2	1.77	1.84	3,840
March	228	8.8	46.1	1.18	1.36	2,830
April	95	8.0	28.9	.741	.83	1,720
The period						39,700

NORTH SANTIAM RIVER AT MEHAMA, OREG.

LOCATION.—In NW. ¼ sec. 18, T. 9 S., R. 2 E., at Mehama, Marion County, half a mile below mouth of Little North Fork and 1 mile north of Lyons railroad station.

DRAINAGE AREA.—740 square miles.

RECORDS AVAILABLE.—July 11, 1905, to March 31, 1907; October 11, 1910, to September 30, 1914; September 9, 1921, to September 30, 1923.

GAGE.—Staff in two sections on right bank, the lower section inclined, the upper vertical.

DISCHARGE MEASUREMENTS.—Made from highway bridge 200 feet above gage.

CHANNEL AND CONTROL.—Bed composed of coarse gravel and boulders; shifting in floods.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 17.5 feet on afternoon of January 6 (discharge, 62,000 second-feet); minimum stage, 1.80 feet October 21 to 25 (discharge, 630 second-feet).

1905–1907; 1910–1914; 1921–1923: Maximum stage, 17.5 feet November 20, 1922, and January 6, 1923 (discharge, 62,000 second-feet); minimum stage, 1.79 feet September 25, 1922 (discharge, 621 second-feet).

ICE.—None.

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed during flood of January 6; backwater from temporary dam July 29 to August 15. Two rating curves well defined below 15,000 second-feet. Gage read once a day to half-tenths at medium and high stages and to hundredths at low water. Daily discharge ascertained by applying daily gage reading to rating table. Records good.

Discharge measurements of North Santiam River at Mehama, Oreg., during the year ending September 30, 1923

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Nov. 4	R. J. McKinney	2.29	1,170	June 21	G. H. Canfield	3.36	2,700
Jan. 1	do	7.00	11,900	Aug. 8	Wendell Dawson	2.82	969
Mar. 17	do	4.48	4,890	24	R. D. Cooper	1.95	902

Daily discharge, in second-feet, of North Santiam River at Mehama, Oreg., for the year ending September 30, 1923

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	720	2,040	960	12,600	2,160	3,510	5,280	4,120	4,340	2,470		830
2	720	1,480	960	10,800	2,010	3,510	5,040	3,900	3,900	2,470		790
3	747	1,130	1,480	15,600	1,940	3,140	5,040	3,510	3,700	2,160		790
4	860	1,060	1,480	12,000	1,870	2,790	4,800	3,510	3,700	2,010		790
5	1,360	1,010	1,680	12,900	1,870	2,790	4,560	4,340	4,340	1,870	{1,160}	790
6	1,240	960	3,090	58,000	1,740	3,140	4,560	4,800	4,560	2,010		790
7	960	960	2,200	46,500	1,740	4,800	5,520	5,280	4,340	2,960		790
8	860	960	1,750	29,000	1,740	3,900	6,300	6,040	4,120	3,320	969	790
9	810	960	1,890	15,600	1,680	3,510	5,520	7,080	3,900	2,630		790
10	765	1,010	2,370	14,800	1,610	2,960	4,560	7,080	3,900	2,630		790
11	720	1,120	1,820	12,600	1,610	3,140	4,560	6,300	3,510	2,790		790
12	720	1,010	1,610	9,000	1,610	3,140	4,800	5,280	3,140	2,310	970	790
13	720	960	1,360	7,340	1,610	5,280	4,800	4,800	3,510	2,310		790
14	720	910	1,360	7,080	1,490	3,900	4,120	4,560	3,140	2,630		790
15	702	910	1,240	6,300	1,490	3,320	4,340	4,340	2,960	2,160		790
16	675	910	1,240	5,520	1,490	3,140	5,780	5,280	3,320	2,160	960	790
17	675	4,340	1,120	9,000	1,870	5,040	5,280	5,280	2,960	2,010	960	790
18	657	5,040	1,120	6,820	2,470	4,120	4,800	4,340	2,960	1,870	960	755
19	648	2,720	5,520	6,820	4,120	3,700	4,560	3,900	2,960	1,870	960	720
20	648	2,540	3,900	6,040	5,280	3,700	4,120	3,700	2,790	1,740	960	720
21	630	2,040	3,490	5,280	4,340	3,320	4,560	3,510	2,630	1,870	915	755
22	630	1,750	3,090	4,800	4,120	3,140	4,120	3,510	2,790	1,870	1,160	755
23	630	1,480	6,820	3,900	3,700	2,790	3,900	3,510	2,630	1,870	960	755
24	630	1,360	26,000	3,510	3,900	2,790	3,510	3,510	2,470	1,870	960	755
25	630	1,240	15,600	3,140	3,700	2,960	3,510	3,320	2,470	1,740	960	830
26	1,060	1,120	12,000	3,140	3,510	2,790	3,900	3,700	2,960	1,610	870	790
27	960	1,010	26,000	3,140	3,140	3,320	4,120	3,900	2,790	1,550	870	830
28	1,240	1,130	15,600	2,960	3,140	4,340	3,900	3,510	2,790	1,490	870	790
29	1,120	1,010	10,800	2,630	-------	5,280	3,510	4,340	3,140	1,440	870	755
30	910	960	9,600	2,470	-------	6,040	3,510	5,520	2,630	1,400	870	755
31	1,130	-------	21,600	2,310	-------	6,040	-------	4,800	-------	1,350	830	-------

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

Monthly discharge of North Santiam River at Mehama, Oreg., for the year ending September 30, 1923

[Drainage area, 740 square miles]

Month	Discharge in second-feet				Run-off	
	Maximum	Minimum	Mean	Per square mile	Inches	Acre-feet
October	1,360	630	823	1.11	1.28	50,600
November	5,040	910	1,500	2.03	2.26	89,300
December	26,000	960	6,060	8.23	9.49	374,000
January	58,000	2,310	11,000	14.9	17.18	676,000
February	5,280	1,490	2,530	3.42	3.56	141,000
March	6,040	2,700	3,720	5.03	5.80	229,000
April	6,300	3,510	4,560	6.16	6.87	271,000
May	7,080	3,510	4,530	6.12	7.06	279,000
June	4,560	2,470	3,310	4.47	4.99	197,000
July	3,320	1,350	2,080	2.81	3.24	128,000
August	-------	830	994	1.34	1.54	61,100
September	830	720	781	1.06	1.18	46,500
The year	58,000	630	3,510	4.74	64.45	2,540,000

SOUTH SANTIAM RIVER AT WATERLOO, OREG.

LOCATION.—In SW. ¼ sec. 28, T. 12 S., R. 1 W., 4 miles above Hamilton Creek, at Lebanon, Linn County.

DRAINAGE AREA.—640 square miles.

RECORDS AVAILABLE.—July 28, 1905, to March 31, 1907; October 31, 1910, to December 31, 1911; July 1 to September 30, 1923.

GAGE.—Inclined staff on left bank, 200 yards below former highway bridge, on which was located the gage used 1905–1911; gage reader, G. P. Stiers.

DISCHARGE MEASUREMENTS.—Made by wading at low water; no equipment for high-water measurements.

CHANNEL AND CONTROL.—Gravel and small boulders; control may shift during extreme floods.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period July 1 to September 30, 4.3 feet July 8 (discharge, 3,240 second-feet); minimum stage, 1.6 feet September 8–24 (discharge, 205 second-feet).

ICE.—None.

DIVERSIONS.—None.

REGULATION.—None.

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

The following measurement was made by Wendell Dawson:
August 7, 1923: Gage height, 1.95 feet; discharge, 400 second-feet.

Daily discharge, in second-feet, of South Santiam River at Waterloo, Oreg., for the year ending September 30, 1923

Day	July	Aug.	Sept.	Day	July	Aug.	Sept.	Day	July	Aug.	Sept.
1	1,050	465	255	11	1,200	365	205	21	650	310	205
2	1,000	465	255	12	1,000	255	205	22	650	310	205
3	955	465	255	13	1,000	282	205	23	690	365	205
4	910	430	255	14	1,000	282	205	24	865	365	205
5	820	430	255	15	910	282	205	25	610	310	255
6	955	430	255	16	910	282	205	26	610	310	430
7	2,040	398	255	17	910	255	205	27	610	310	365
8	3,240	398	205	18	820	255	205	28	535	310	310
9	2,190	398	205	19	730	255	205	29	500	255	255
10	1,900	398	205	20	650	255	205	30	500	255	255
								31	465	255	

Monthly discharge of South Santiam River at Waterloo, Oreg., for the year ending September 30, 1923

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
July	3,240	465	996	61,200
August	465	255	335	20,600
September	430	205	238	14,200

CLACKAMAS RIVER AT BIG BOTTOM, OREG.

LOCATION.—In SE. ¼ sec. 26, T. 6 S., R. 7 E., half a 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.—136 square miles (measured on map of Mount Hood National Forest).

RECORDS AVAILABLE.—April 11, 1920, to September 30, 1923.

GAGE.—Stevens continuous water-stage recorder on right bank referenced to an outside gage; inspected by employees of Portland Electric 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 year, from water-stage recorder, 8.15 feet at 3.30 p. m. January 7 (discharge, 6,600 second-feet); minimum discharge, 255 second-feet at noon September 17.

1920–1923: Maximum and minimum discharges recorded, those of the year ending September 30, 1923.

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

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed during extreme high water January 7; affected by tree on control December 6–23. Rating curves fairly well defined. Operation of recorder satisfactory throughout year. Discharge ascertained by applying to rating table mean daily gage height determined by inspecting recorder graph, or, for days of considerable fluctuation by averaging discharges for intervals of the day. Records good.

COOPERATION.—Field data furnished by the Portland Electric Power Co.

Discharge measurements of Clackamas River at Big Bottom, Oreg., during the year ending September 30, 1923

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Oct. 3	Swanson [a] and Bannister [a]	1.49	270	Apr. 8	F. S. Bannister	2.76	759
Nov. 16	Bannister and Swanson	1.46	282	May 8	do	3.31	1,040
Dec. 13	Bannister and Peavy [a]	1.64	275	8	do	3.32	1,020
Jan. 2	do	2.76	857	9	do	3.75	1,210
3	do	3.44	1,180	June 25	do	2.14	449
4	do	2.99	936	July 25	do	1.69	295
8	do	5.90	3,400	Sept. 11	do	1.53	268

[a] Engineer, Portland Electric Power Co.

Daily discharge, in second-feet, of Clackamas River at Big Bottom, Oreg., for the year ending September 30, 1923

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	262	295	262	965	408	352	565	700	655	430	292	268
2	271	274	265	930	398	358	610	655	632	415	292	268
3	283	268	274	1,420	388	355	655	632	632	401	292	268
4	317	265	268	940	380	352	655	655	678	388	289	265
5	298	265	274	1,580	380	352	655	722	745	380	289	265
6	280	262	274	4,780	377	384	700	795	795	412	289	265
7	268	262	265	5,800	374	391	722	872	770	468	286	262
8	265	262	274	3,600	361	370	722	1,010	795	412	283	262
9	262	268	286	2,190	361	364	655	1,300	820	384	283	262
10	259	280	286	2,040	355	358	678	1,300	820	377	280	262
11	259	280	289	1,550	361	361	678	1,180	745	364	278	262
12	259	271	271	1,240	361	367	722	1,060	700	358	278	262
13	259	268	277	1,060	346	374	700	1,060	700	384	278	260
14	259	265	283	955	334	358	700	1,010	632	377	275	260
15	259	262	283	820	383	352	722	1,060	588	355	275	258
16	259	268	283	770	337	374	795	1,090	610	349	272	258
17	259	421	280	900	334	394	845	1,090	588	337	272	258
18	259	357	320	795	334	380	820	982	565	334	272	258
19	259	317	397	722	358	377	820	928	547	328	272	258
20	259	307	342	678	361	380	770	900	534	322	272	258
21	259	292	320	655	352	377	745	872	520	319	298	260
22	259	283	314	610	349	374	700	845	504	313	298	262
23	259	280	510	565	349	370	655	872	492	310	280	262
24	259	274	1,040	556	349	370	632	820	464	310	278	265
25	268	271	940	524	349	367	655	820	456	307	275	272
26	280	271	1,170	500	349	367	678	795	472	304	272	289
27	277	268	1,880	500	349	380	722	745	456	301	270	270
28	277	268	1,330	472	349	412	722	700	452	298	270	265
29	271	265	915	452	-------	448	700	795	456	298	270	262
30	268	265	815	426	-------	504	655	745	444	295	268	262
31	307	-------	1,300	419	-------	560	-------	678	-------	295	268	-------

Monthly discharge of Clackamas River at Big Bottom, Oreg., for the year ending September 30, 1923

[Drainage area, 136 square miles]

Month	Discharge in second-feet				Run-off	
	Maximum	Minimum	Mean	Per square mile	Inches	Acre-feet
October	307	259	269	1.98	2.28	16,500
November	421	262	282	2.07	2.31	16,800
December	1,880	262	525	3.86	4.45	32,300
January	5,800	419	1,270	9.34	10.77	78,100
February	408	334	360	2.65	2.76	20,000
March	560	352	383	2.82	3.25	23,600
April	845	565	702	5.16	5.76	41,800
May	1,300	632	893	6.57	7.57	54,900
June	820	444	609	4.48	5.00	36,200
July	468	295	352	2.59	2.99	21,600
August	298	268	280	2.06	2.38	17,200
September	289	258	264	1.94	2.16	15,700
The year	5,800	258	518	3.81	51.68	375,000

CLACKAMAS RIVER ABOVE THREE LYNX CREEK, OREG.

LOCATION.—In NE. ¼ sec. 21, T. 5 S., R. 6 E., one-fourth mile above Three Lynx Creek and 25 miles above Estacada, Clackamas County.

DRAINAGE AREA.—488 square miles (measured on Forest Service map).

RECORDS AVAILABLE.—October 1, 1911, to December 31, 1913; October 1, 1921, to September 30, 1923.

GAGE.—Stevens continuous water-stage recorder on right bank; inspected by employees of Portland Electric Power Co. Vertical staff at practically same location used 1909–1913.

DISCHARGE MEASUREMENTS.—Made from cable at gage.

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

EXTREMES OF DISCHARGE.—Maximum stage during year from water-stage recorder, 15.2 feet at 6 p. m. January 6 (discharge, 33,700 second-feet); minimum stage, 1.08 feet at 3 a. m. October 25 (discharge, 700 second-feet).

1911–1913; 1922–1923: Maximum discharge recorded, that of January 6, 1923; minimum discharge, 630 second-feet October 27 to November 3, 1911.

ICE.—Ice never forms.

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed during high water. Rating curves well defined below 8,000 second-feet. Operation of water-stage recorder satisfactory except from February 10 to March 24 and from May 6 to July 31. Staff gage read daily during these periods. Daily discharge ascertained by applying to rating table mean daily gage height obtained by inspecting recorder graph or daily gage reading. Records excellent at low water; good at medium stages; somewhat uncertain for flood of January 6–8.

Discharge measurements of Clackamas River above Three Lynx Creek, Oreg., during the year ending September 30, 1923

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Oct. 8	Johnson[a] and Toby	1.19	762	Apr. 11	Bannister and Henshaw	3.68	3,010
10	do	1.13	728	May 30	F. S. Bannister	3.59	3,150
31	Swanson and Peavy[a]	1.69	1,070	July 19	do	1.61	1,110
Jan. 30	Peavy and Wilson	2.42	1,690	Aug. 14	do	1.23	876
Mar. 27	F. S. Bannister[a]	2.58	1,840	Sept. 15	do	1.10	756

[a] Engineer, Portland Electric Power Co.

Daily discharge, in second-feet, of Clackamas River above Three Lynx Creek, Oreg., for the year ending September 30, 1923

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	740	1,060	860	5,650	1,640	1,770	3,280	3,010	2,520	1,430	910	790
2	740	920	890	5,100	1,640	1,870	3,420	2,760	2,640	1,390	880	790
3	800	860	950	7,500	1,590	1,770	3,280	2,640	2,520	1,320	880	790
4	950	770	920	5,280	1,550	1,720	3,140	2,640	2,410	1,280	880	790
5	920	830	920	7,940	1,510	1,680	3,140	3,010	2,640	1,240	880	790
6	860	800	890	28,800	1,430	2,080	3,280	3,560	2,760	1,390	880	790
7	800	800	860	26,000	1,430	2,240	3,420	3,990	2,880	1,720	880	790
8	770	830	860	17,000	1,350	2,080	3,420	4,450	2,760	1,510	880	790
9	770	860	950	10,600	1,320	1,870	3,140	5,460	2,880	1,390	880	760
10	740	890	1,020	10,300	1,320	1,770	3,010	5,280	2,640	1,350	850	760
11	740	890	920	7,940	1,350	1,820	3,140	4,770	2,520	1,280	850	760
12	740	860	800	6,050	1,320	1,770	3,420	4,140	2,300	1,240	850	760
13	740	830	830	4,770	1,320	2,080	3,280	3,990	2,300	1,280	850	760
14	740	800	830	5,850	1,210	1,870	3,140	3,700	2,020	1,280	850	760
15	740	800	830	3,700	1,280	1,680	3,280	3,840	1,970	1,210	820	760
16	710	890	800	3,560	1,210	1,720	3,700	3,990	2,020	1,140	820	760
17	710	1,770	800	4,610	1,240	2,300	3,840	3,990	1,970	1,140	820	755
18	710	1,620	920	4,140	1,240	2,020	3,560	3,420	1,970	1,100	820	750
19	710	1,320	1,670	3,840	1,470	1,970	3,420	3,280	1,820	1,070	820	755
20	710	1,320	1,400	3,420	1,770	1,870	3,280	3,010	1,680	1,070	820	760
21	710	1,120	1,280	3,140	1,680	1,870	3,280	3,010	1,680	1,040	940	760
22	710	1,060	1,240	2,880	1,640	1,820	3,010	2,880	1,680	1,040	1,040	790
23	710	985	3,680	2,640	1,640	1,770	2,760	3,010	1,590	1,000	880	760
24	705	950	9,070	2,410	1,680	1,770	2,640	2,880	1,590	970	850	790
25	770	920	5,650	2,240	1,680	1,680	2,760	2,880	1,550	970	850	820
26	830	890	8,630	2,190	1,640	1,720	2,880	2,760	1,590	970	820	850
27	860	860	11,600	2,140	1,590	1,920	3,140	2,640	1,550	970	820	790
28	890	860	6,860	2,020	1,590	3,420	3,140	2,520	1,550	940	820	790
29	830	860	4,450	1,870	-------	2,760	3,010	2,880	1,590	940	820	760
30	830	860	4,290	1,770	-------	3,420	2,760	2,880	1,510	910	790	760
31	1,120	-------	8,160	1,720	-------	3,700	-------	2,640	-------	910	790	-------

Monthly discharge of Clackamas River above Three Lynx Creek, Oreg., for the year ending September 30, 1923

[Drainage area, 488 square miles]

Month	Discharge in second-feet				Run-off	
	Maximum	Minimum	Mean	Per square mile	Inches	Acre-feet
October	1,120	705	784	1.61	1.86	48,200
November	1,770	770	970	1.99	2.22	57,700
December	11,600	800	2,700	5.53	6.38	166,000
January	28,800	1,720	6,360	13.0	14.99	391,000
February	1,770	1,210	1,480	3.03	3.16	82,200
March	3,700	1,720	2,060	4.22	4.86	127,000
April	3,840	2,640	3,200	6.56	7.32	190,000
May	5,460	2,520	3,420	7.01	8.08	210,000
June	2,880	1,510	2,100	4.30	4.80	125,000
July	1,430	910	1,180	2.42	2.79	72,600
August	1,040	790	856	1.75	2.02	52,600
September	850	750	776	1.59	1.77	46,200
The year	28,800	705	2,170	4.45	60.25	1,570,000

CLACKAMAS RIVER NEAR CAZADERO, OREG.

LOCATION.—In NW. ¼ sec. 11, T. 4 S., R. 4 E., half a mile above backwater from Cazadero Dam of Portland Electric Power Co. and 3 miles southeast of Cazadero, Clackamas County.

DRAINAGE AREA.—685 square miles.

RECORDS AVAILABLE.—January 1, 1909, to September 30, 1923.

GAGE.—Stevens continuous water-stage recorder on right bank, referred to a vertical staff in well and to an inclined and vertical staff gage on the bank; inspected by employees of Portland Electric Power Co. Prior to October 10, 1922, the record was obtained at former gage half a mile downstream.

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

CHANNEL AND CONTROL.—Bed composed of rocks and gravel. Control subject to shift.

EXTREMES OF DISCHARGE.—Maximum stage from watermark inside of recorder shelter, 56.2 feet about 6 p. m. January 6 (discharge, 60,000 second-feet); minimum stage, 32.32 feet October 23 and 24 (discharge, 760 second-feet).

1909–1923: Maximum recorded, that of January 6, 1923; minimum discharge recorded, 705 second-feet September 21–23 and October 8–10, 1915.

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

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined below and fairly well defined above 25,000 second-feet. Operation of recorder satisfactory from October 10, except for a few days when daily staff gage readings at the new or former gage were used. Daily discharge ascertained by applying to rating table mean daily gage height determined by inspecting recorder graph or at time of considerable fluctuation by subdividing the day. Records good.

Discharge measurements of Clackamas River near Cazadero, Oreg., during the year ending September 30, 1923

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Oct. 10	G. H. Canfield	32.45	846	Apr. 12	Henshaw and Bannister	36.35	4,190
Nov. 1	Swanson[a] and Peavy	33.70	1,520	May 28	F. S. Bannister	35.52	3,060
Jan. 3	K. N. Phillips	39.96	9,960	July 20	do	33.54	1,360
Feb. 27	do	34.62	2,250	Aug. 13	do	32.92	1,030
Mar. 22	F. S. Bannister[a]	35.00	2,670	Sept. 13	do	32.65	946
23	do	34.82	2,510				

[a] Engineer, Portland Electric Power Co.

Daily discharge, in second-feet, of Clackamas River near Cazadero, Oreg., for the year ending September 30, 1923

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	872	1,460	920	8,280	1,990	2,580	4,720	3,660	3,540	1,830	1,140	970
2	865	1,140	970	7,110	1,950	2,580	4,580	3,300	3,420	1,750	1,120	970
3	935	1,020	1,120	10,400	1,870	2,560	4,440	3,080	3,180	1,750	1,120	970
4	1,140	970	1,070	7,320	1,790	2,300	3,920	3,180	3,300	1,600	1,120	945
5	1,140	945	1,070	12,100	1,750	2,390	4,050	3,540	3,540	1,630	1,100	945
6	1,040	920	1,070	49,700	1,750	3,080	4,050	4,180	3,660	1,950	1,100	945
7	970	920	995	42,000	1,750	2,470	4,440	4,580	3,660	3,500	1,100	945
8	900	920	945	22,400	2,580	3,020	4,440	5,300	3,540	2,880	1,070	920
9	886	920	1,070	11,800	1,630	2,650	4,050	6,520	3,420	2,390	1,070	920
10	780	1,020	1,200	11,600	1,630	2,470	3,790	6,360	3,300	2,210	1,040	920
11	820	1,020	1,040	9,800	1,630	2,390	3,660	5,900	3,080	1,990	1,040	920
12	800	945	920	7,160	1,600	2,580	4,180	5,000	3,180	1,830	1,000	900
13	820	920	900	6,840	1,600	3,180	3,920	4,860	3,300	1,790	1,040	900
14	800	900	900	6,050	1,460	3,180	3,790	4,580	2,980	1,830	1,040	900
15	800	880	880	5,450	1,520	2,480	4,050	4,720	2,680	1,630	1,040	900
16	800	945	860	5,450	1,490	2,980	4,580	4,720	2,680	1,560	1,020	880
17	780	2,060	860	7,160	1,560	3,660	4,720	4,860	2,680	1,490	1,020	880
18	780	2,120	970	6,200	1,830	3,180	4,310	4,440	2,580	1,460	995	880
19	780	1,900	1,990	5,600	2,680	2,980	4,180	4,180	2,390	1,420	995	900
20	780	1,850	1,870	5,000	2,880	2,880	4,050	3,920	2,300	1,380	1,020	880
21	780	1,630	1,750	4,310	2,580	2,680	3,920	3,660	2,260	2,120	1,350	970
22	780	1,430	1,710	3,920	2,580	2,480	3,660	3,660	2,210	1,320	1,360	970
23	760	1,320	5,090	3,790	2,480	2,390	3,300	3,660	2,120	1,290	1,100	1,020
24	760	1,180	12,500	3,180	2,580	2,390	3,180	3,420	2,080	1,260	1,070	1,040
25	880	1,040	8,440	2,880	2,480	2,300	3,180	3,300	2,030	1,230	1,040	960
26	1,140	995	9,380	2,780	2,390	2,300	3,420	3,420	2,080	1,230	1,020	1,070
27	1,040	970	15,000	2,780	2,210	2,580	3,020	3,300	1,990	1,200	1,020	970
28	1,140	970	9,440	2,680	2,300	3,220	3,790	3,180	1,950	1,200	995	920
29	995	945	6,520	2,390	-------	3,920	3,420	3,790	1,950	1,170	995	920
30	920	920	5,750	2,210	-------	4,720	3,180	3,920	1,910	1,140	995	900
31	1,490	-------	11,000	2,120	-------	5,900	-------	3,660	-------	1,140	970	-------

Monthly discharge of Clackamas River near Cazadero, Oreg., for the year ending September 30, 1923

[Drainage area, 685 square miles]

Month	Discharge in second-feet				Run-off	
	Maximum	Minimum	Mean	Per square mile	Inches	Acre-feet
October	1,490	760	909	1.33	1.53	55,800
November	2,120	880	1,170	1.71	1.91	69,600
December	15,000	860	3,490	5.09	5.87	215,000
January	49,700	2,120	9,070	13.2	15.22	558,000
February	2,880	1,460	2,020	2.95	3.07	112,000
March	5,900	2,300	2,920	4.26	4.91	180,000
April	4,720	3,180	3,960	5.78	6.45	236,000
May	6,520	3,080	4,190	6.12	7.06	258,000
June	3,660	1,910	2,770	4.04	4.51	165,000
July	3,500	1,140	1,680	2.45	2.82	103,000
August	1,360	970	1,070	1.56	1.80	65,800
September	1,070	880	938	1.37	1.53	55,800
The year	49,700	760	2,860	4.17	56.68	2,070,000

OAK GROVE FORK AT TIMOTHY MEADOWS, OREG.

LOCATION.—In SW. ¼ sec. 23, T. 5 S., R. 8 E., 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, 1923.

GAGE.—Stevens continuous water-stage recorder on right bank; inspected by employees of Portland Electric 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 from high-water mark in well, 3.20 feet about 10 p.m. January 7 (discharge, 970 second-feet); minimum stage from water-stage recorder, 0.62 foot December 16 and 17 (discharge, 127 second-feet).

1913–1916; 1918–1923: Maximum stage recorded, that of January 7, 1923; minimum stage, 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 permanent. Rating curve fairly well defined. 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.

Discharge measurements of Oak Grove Fork at Timothy Meadows, Oreg., during the year ending September 30, 1923

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Oct. 4	Swanson[a] and Bannister[a]	0.70	154	Apr. 30	F. S. Bannister	1.21	285
Nov. 18	Bannister and Peavy	.68	143	May 1	do	1.26	288
20	do	.66	140	30	do	1.60	399
Apr. 28	F. S. Bannister	1.20	279	June 1	do	1.35	323
29	do	1.21	284	22	do	1.03	232
29	do	1.22	299	July 10	do	.90	191
30	do	1.22	279	Sept. 5	do	.70	140

[a] Engineer, Portland Electric Power Co.

Daily discharge, in second-feet, of Oak Grove Fork at Timothy Meadows, Oreg., for the year ending September 30, 1923

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	142	134	130	195	186	160	181	300	332	214	170	152
2	134	132	130	181	181	155	192	292	321	211	170	152
3	134	132	130	205	178	155	200	283	312	208	170	152
4	144	132	130	208	178	155	203	289	309	203	168	150
5	138	132	130	219	178	155	211	303	303	198	168	150
6	135	132	130	481	178	157	214	318	306	214	168	147
7	134	132	130	922	176	163	216	329	318	227	168	147
8	134	132	132	902	176	157	222	350	309	214	168	147
9	132	132	132	680	170	157	227	386	303	205	168	147
10	132	132	132	551	170	155	235	416	300	203	165	147
11	132	130	130	483	168	155	241	426	295	200	165	147
12	134	130	130	413	170	155	249	423	295	200	165	147
13	134	132	130	377	165	155	247	423	306	192	165	147
14	132	130	132	332	163	152	258	423	289	200	165	147
15	132	130	130	306	160	150	266	416	277	192	165	147
16	132	134	130	289	155	155	277	420	272	186	163	144
17	132	144	127	298	155	165	289	423	263	186	163	144
18	130	147	127	275	155	160	283	416	255	186	160	144
19	130	142	130	261	155	157	286	416	252	186	163	144
20	130	138	130	249	157	157	277	401	244	186	163	142
21	130	135	130	244	157	155	277	401	238	184	165	142
22	132	135	130	235	157	155	275	401	232	184	165	142
23	134	132	138	230	157	155	263	386	232	181	163	142
24	135	132	163	222	152	155	269	376	230	178	163	142
25	144	132	168	222	157	152	277	371	227	176	163	144
26	152	132	168	214	157	152	280	365	227	173	160	147
27	144	130	200	211	155	155	292	362	227	173	160	144
28	144	130	214	208	160	157	286	353	222	173	160	142
29	150	130	208	198	-------	163	283	344	219	173	157	142
30	152	130	195	195	-------	165	286	350	216	173	157	140
31	142	-------	200	186	-------	170	-------	338	-------	170	160	-------

Monthly discharge of Oak Grove Fork at Timothy Meadows, Oreg., for the year ending September 30, 1923

[Drainage area, 52 square miles]

Month	Discharge in second-feet				Run-off	
	Maximum	Minimum	Mean	Per square mile	Inches	Acre-feet
October	152	130	137	2.63	3.03	8,420
November	147	130	133	2.56	2.86	7,910
December	214	127	146	2.81	3.24	8,980
January	922	181	329	6.33	7.30	20,200
February	186	152	165	3.17	3.30	9,160
March	170	150	157	3.02	3.48	9,650
April	292	181	252	4.85	5.41	15,000
May	426	283	371	7.13	8.22	22,800
June	332	216	271	5.21	5.81	16,100
July	227	170	192	3.69	4.25	11,800
August	170	157	164	3.15	3.63	10,100
September	152	140	146	2.81	3.14	8,690
The year	922	127	205	3.94	53.67	149,000

OAK GROVE FORK AT PORTLAND ELECTRIC POWER CO.'S INTAKE, OREG.

LOCATION.—In SW. ¼ sec. 4, T. 6 S., R. 7 E., 2,000 feet above intake of Oak Grove power development of Portland Electric Power Co. and 35 miles above Cazadero, Clackamas County.

DRAINAGE AREA.—131 square miles (measured by Portland Electric Power Co.).

RECORDS AVAILABLE.—May 21, 1909, to September 30, 1923, with some breaks.

GAGE.—Stevens water-stage recorder on right bank, inspected by employees of Portland Electric Power Co..

DISCHARGE MEASUREMENTS.—Made from cable at gage.

CHANNEL AND CONTROL.—Bed composed of boulders; irregular, but apparently permanent.

EXTREMES OF DISCHARGE.—Maximum stage during year from water-stage recorder, 5.35 feet at 4 p. m. January 7 (discharge, 5,000 second-feet); minimum stage, 0.81 foot 9 to 10 a.m. December 14 (discharge, 314 second-feet).

1909–1923: Maximum stage recorded, that of January 7, 1923; minimum discharge, 313 second-feet November 12–14, 1920.

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

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent, except as affected by logs on the control. Three fairly well defined rating curves used during year. Operation of water-stage recorder satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height determined by inspection from recorder graph; except January 6–24 and May 23 to June 2 when shifting-control method was used. Records good, except for the two periods of shifting control, for which they are fair.

Discharge measurements of Oak Grove Fork at Portland Electric Power Co.'s intake, Oregon, during the year ending September 30, 1923

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Oct. 5	Swanson[a] and Bannister[a]	0.91	369	Apr. 26	F. S. Bannister	2.19	816
30	Swanson and Peavy[a]	.86	341	May 2	do	2.20	825
Nov. 17	Bannister and Peavy[a]	1.06	488	3	do	2.15	763
21	do	.88	388	10	do	2.75	1,220
22	do	.88	336	19	do	2.45	1,060
Feb. 16	Peavy and Robison	1.57	438	June 3	do	1.92	774
Apr. 3	F. S. Bannister	2.07	690	22	do	1.63	566
8	do	2.10	759	July 11	do	1.47	485
9	do	2.07	715	18	do	1.43	440
11	Henshaw and Bannister	2.15	734	Aug. 11	do	1.34	380
				Sept. 5	do	1.30	373

[a] Engineer, Portland Electric Power Co.

Daily discharge, in second-feet, of Oak Grove Fork of Portland Electric Power Co.'s intake, Oregon, for the year ending September 30, 1923

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	346	364	328	679	528	470	675	876	805	493	403	370
2	342	346	333	685	538	455	724	828	790	486	398	370
3	355	342	333	870	521	441	724	798	776	480	398	370
4	382	337	333	741	506	432	710	844	776	480	398	370
5	360	337	342	1,030	490	441	724	916	776	474	398	370
6	351	337	342	3,420	485	669	731	956	784	500	398	370
7	351	337	337	4,360	486	561	759	1,020	800	601	398	370
8	351	337	337	3,200	475	506	745	1,100	784	519	392	365
9	346	337	342	2,160	465	470	738	1,280	784	500	392	365
10	342	342	337	1,940	465	511	759	1,330	768	480	392	365
11	342	342	333	1,610	470	511	812	1,240	730	464	392	365
12	342	342	324	1,320	480	657	812	1,200	760	458	392	365
13	342	337	324	1,200	455	675	790	1,150	792	469	386	365
14	337	333	324	1,070	675	543	820	1,100	708	464	386	360
15	337	333	328	974	446	495	868	1,150	678	453	386	360
16	337	355	333	974	436	703	900	1,150	664	447	386	360
17	337	425	324	1,010	436	731	932	1,100	650	442	386	360
18	333	391	346	926	549	696	932	1,060	629	436	381	360
19	333	364	364	870	609	639	916	1,010	615	430	381	360
20	333	364	351	800	528	657	884	964	594	430	381	360
21	333	351	342	778	495	627	852	956	580	425	403	360
22	333	342	337	673	500	615	812	916	573	425	403	355
23	333	342	430	673	500	591	790	908	566	425	386	355
24	333	337	661	667	561	561	798	868	552	425	381	370
25	351	333	625	639	567	528	798	860	545	420	381	370
26	368	333	685	633	567	495	836	852	538	414	376	370
27	355	333	998	738	500	538	876	844	526	408	376	365
28	355	333	862	682	490	561	868	844	519	408	376	355
29	342	333	685	627	-------	591	844	836	512	408	376	360
30	337	333	625	650	-------	627	828	820	506	408	376	355
31	387	-------	823	573	-------	657	-------	820	-------	403	370	-------

Monthly discharge of Oak Grove Fork at Portland Electric Power Co.'s intake, Oregon, for the year ending September 30, 1923

[Drainage area, 131 square miles]

Month	Discharge in second-feet				Run-off	
	Maximum	Minimum	Mean	Per square mile	Inches	Acre-feet
October	387	333	346	2.64	3.04	21,300
November	425	333	346	2.64	2.94	20,600
December	998	324	445	3.39	3.91	27,400
January	4,360	573	1,200	9.16	10.56	73,800
February	609	436	507	3.87	4.03	28,200
March	731	432	569	4.34	5.00	35,000
April	932	675	809	6.18	6.90	48,100
May	1,330	820	987	7.53	8.68	60,700
June	805	506	669	5.11	5.70	39,800
July	601	403	454	3.47	4.00	27,900
August	403	370	388	2.96	3.41	23,900
September	370	355	364	2.78	3.10	21,700
The year	4,360	324	591	4.51	61.27	428,000

LEWIS RIVER BASIN

LEWIS RIVER NEAR AMBOY, WASH.

LOCATION.—In sec. 36, T. 6 N., R. 3 E., at a former river crossing known as Cresap's Ferry, 1 mile below new bridge 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, 1923.

GAGE.—Inclined staff with vertical upper section on left bank; read by J. M. Hanley.

DISCHARGE MEASUREMENTS.—Made from cable about 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, 13.0 feet at 4 p. m. January 7 (discharge, 53,600 second-feet); minimum stage, −0.05 foot September 19–23 (discharge, 780 second-feet).

1911–1923: 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, 686 second-feet September 30, 1915.

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

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed during high water of January 7. Two rating curves, well-defined below 15,000 second-feet. Gage read to half-tenths twice a day. Daily discharge ascertained by applying mean daily gage height to rating table. Records good.

Discharge measurements of Lewis River near Amboy, Wash., during the year ending September 30, 1923

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Jan. 7	Dawson and Phillips	11.20	40,000	Feb. 21	K. N. Phillips	1.56	2,380
Feb. 11	K. N. Phillips	1.31	2,060	June 1	Wendell Dawson	2.55	4,100
18	do	1.30	2,000	July 30	do	.70	1,350
19	do	1.70	2,610	Sept. 12	G. H. Canfield	.14	907

Daily discharge, in second-feet, of Lewis River near Amboy, Wash., for the year ending September 30, 1923

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	1,230	3,140	1,600	13,000	2,780	2,860	6,520	5,200	4,100	2,330	1,260	1,010
2	1,230	2,750	1,720	13,400	2,540	2,780	5,960	4,740	3,980	2,330	1,260	1,010
3	1,230	2,600	1,720	17,200	2,470	2,700	6,520	4,410	3,980	2,260	1,260	1,010
4	1,550	2,450	1,780	16,800	2,330	2,540	6,240	4,410	4,300	2,260	1,220	975
5	1,720	2,300	1,660	16,400	2,330	2,470	6,240	5,080	4,740	2,120	1,220	961
6	1,600	2,030	1,600	42,800	2,260	4,300	6,240	5,440	5,080	2,120	1,220	947
7	1,550	2,030	1,660	47,000	2,190	4,630	6,520	5,960	5,080	3,680	1,170	905
8	1,440	1,900	1,720	32,000	2,190	4,520	6,380	7,100	4,960	3,580	1,170	905
9	1,440	1,900	1,780	26,100	2,120	3,780	6,240	8,000	4,960	2,780	1,170	905
10	1,380	1,780	1,660	27,200	2,050	3,210	5,960	8,000	4,740	2,470	1,170	905
11	1,280	1,660	1,550	19,900	2,050	3,580	5,960	7,100	4,300	2,400	1,130	905
12	1,230	1,660	1,440	14,100	2,050	3,580	6,100	5,830	3,680	2,260	1,130	898
13	1,230	1,600	1,440	11,900	1,920	4,080	6,100	5,570	3,490	2,120	1,130	877
14	1,140	1,550	1,380	9,200	1,860	3,880	6,240	5,080	3,210	2,050	1,130	870
15	1,100	1,550	1,330	8,900	1,920	3,580	6,240	5,080	3,120	2,050	1,130	870
16	1,100	1,660	1,380	8,000	1,920	3,300	6,100	5,570	3,040	1,860	1,130	870
17	1,100	2,600	1,380	7,700	1,920	3,120	6,100	5,570	2,950	1,920	1,130	870
18	1,100	2,900	1,330	9,200	2,120	2,950	6,240	5,080	2,780	1,800	1,130	870
19	1,100	2,750	3,140	9,200	2,620	3,040	5,700	4,630	2,780	1,740	1,130	780
20	1,100	2,450	2,900	8,000	2,620	3,120	5,700	4,100	2,620	1,680	1,130	780
21	1,100	2,300	2,520	6,800	2,400	2,950	5,440	4,100	2,620	1,570	1,090	780
22	1,100	2,160	2,300	5,830	2,470	2,950	5,200	4,080	2,400	1,570	1,220	780
23	1,120	2,030	10,000	5,200	2,470	3,120	4,850	3,880	2,330	1,570	1,170	780
24	1,660	1,960	24,500	4,740	2,620	3,490	4,630	3,780	2,330	1,520	1,170	940
25	4,790	1,900	14,100	4,300	2,620	3,490	4,850	3,980	2,330	1,520	1,090	905
26	5,630	1,840	15,600	3,980	2,620	3,580	5,320	3,880	2,330	1,520	1,090	905
27	4,220	1,840	29,600	3,880	2,540	3,880	5,320	3,880	2,330	1,460	1,090	870
28	3,220	1,280	21,800	3,680	2,620	4,630	5,700	3,780	2,330	1,460	1,050	870
29	2,750	1,660	14,400	3,400	-------	5,320	5,200	4,520	2,400	1,360	1,050	1,220
30	2,750	1,660	12,000	3,210	-------	5,960	4,960	4,960	2,400	1,310	1,010	1,220
31	3,140	-------	14,400	2,950	-------	6,800	-------	4,520	-------	1,310	1,010	-------

Monthly discharge of Lewis River near Amboy, Wash., for the year ending September 30, 1923

[Drainage area, 665 square miles]

Month	Discharge in second-feet				Run-off	
	Maximum	Minimum	Mean	Per square mile	Inches	Acre-feet
October	5,630	1,100	1,850	2.78	3.20	114,000
November	3,140	1,550	2,080	3.13	3.49	124,000
December	29,600	1,330	6,300	9.47	10.92	387,000
January	47,000	2,950	13,100	19.7	22.71	806,000
February	2,780	1,860	2,310	3.47	3.61	128,000
March	6,800	2,470	3,680	5.53	6.38	226,000
April	6,520	4,630	5,830	8.77	9.78	347,000
May	8,000	3,780	5,080	7.64	8.81	312,000
June	5,080	2,330	3,390	5.10	5.69	202,000
July	3,680	1,310	2,000	3.01	3.47	123,000
August	1,260	1,010	1,140	1.71	1.97	70,100
September	1,220	780	913	1.37	1.53	54,300
The year	47,000	780	4,000	6.02	81.56	2,890,000

LEWIS RIVER NEAR ARIEL, WASH.

LOCATION.—In SE. ¼ sec. 33, T. 6 N., R. 2 E., 3½ miles southwest of Ariel post office, Cowlitz County, and 12 miles by road above mouth of river.

DRAINAGE AREA.—733 square miles.

RECORDS AVAILABLE.—July 27 to October 28, 1922; July 31 to September 30, 1923, at present site. July 7 to November 30, 1909, for station at Ariel, 3½ miles upstream.

GAGE.—Inclined staff on right bank, read by Idamay Wournel.

DISCHARGE MEASUREMENTS.—Made from boat held in place by light cable near gage.

CHANNEL AND CONTROL.—Bed composed of gravel; smooth and fairly permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of record; 6.45 feet at 2 p. m. October 26 (discharge, 6,120 second-feet); minimum stage, 0.70 foot on September 28 (discharge, 860 second-feet).

ICE.—None.

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation apparently permanent during year. Rating curve well defined. Gage read to quarter-tenths once a day in October and twice a day during August and September. Daily discharge ascertained by applying mean daily gage height to rating table. Records good.

The following measurement was made by G. H. Canfield:

September 13, 1923: Gage height, 0.84 foot; discharge, 958 second-feet.

Daily discharge, in second-feet, of Lewis River near Ariel, Wash., for the year ending September 30, 1923

Day	Oct.	July	Aug.	Sept.	Day	Oct.	July	Aug.	Sept.
1	1,250		1,160	1,000	16	1,160		1,070	920
2	1,200		1,160	1,000	17	1,150		1,070	890
3	1,210		1,160	1,000	18	1,130		1,070	890
4	1,380		1,160	1,000	19	1,120		1,070	920
5	1,780		1,210	1,000	20	1,110		1,070	920
6	1,810		1,210	1,000	21	1,110		1,120	990
7	1,600		1,160	1,000	22	1,070		1,160	920
8	1,460		1,160	1.000	23	1,070		1,120	920
9	1,370		1,160	1,000	24	1,110		1,160	920
10	1,320		1,120	1,000	25	2,710		1,120	920
11	1,260		1,160	1,000	26	6,120		1,160	920
12	1,250		1,070	920	27	4,480		1,160	920
13	1,210		1,070	955	28	3,740		1,160	860
14	1,210		1,070	955	29			1,160	890
15	1,160		1,070	955	30			1,070	890
					31		1,160	1,070	

Monthly discharge of Lewis River near Ariel, Wash., for the year ending September 30, 1923

[Drainage area, 733 square miles]

Month	Discharge in second-feet				Run-off	
	Maximum	Minimum	Mean	Per square mile	Inches	Acre-feet
October 1–28	6,120	1,070	1,700	2.32	2.42	94,400
August	1,210	1,070	1,130	1.54	1.78	69,500
September	------	860	949	1.30	1.45	56,500

CANYON CREEK NEAR AMBOY, WASH.

LOCATION.—In SW. ¼ sec. 4, T. 5 N., R. 4 E., at wagon bridge, 2 miles above mouth and 6 miles northeast of Amboy, Clark County.

DRAINAGE AREA.—64 square miles.

RECORDS AVAILABLE.—July 25, 1922, to September 30, 1923.

GAGE.—Chain gage on bridge; vertical staff on right bank, 20 feet above bridge, used prior to January 5.

DISCHARGE MEASUREMENTS.—Made from cable near bridge or by wading.

CHANNEL AND CONTROL.—Bed composed of gravel and boulders; shifts during floods.

EXTREMES OF DISCHARGE.—Maximum stage during year observed from high-water marks, 11.3 feet December 24 (discharge, 13,000 second-feet); minimum stage, 0.33 foot September 19 (discharge, 20 second-feet).

1922–1923: Maximum and minimum stages same as those for the year ending September 30, 1923.

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

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed July 8. Rating curves used before and after the change, well defined below 500 second-feet. Gage read once a day to hundredths at medium and low stages and to tenths at high water. Daily discharge ascertained by applying daily gage reading to rating table. Records good except for flood period, for which they are fair.

Discharge measurements of Canyon Creek near Amboy, Wash., during the year ending September 30, 1923

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Jan. 6	Phillips and Dawson	9.4	9,200	Feb. 22	K. N. Phillips	1.78	276
Feb. 17	K. N. Phillips	1.20	133	23	do	1.88	297
18	do	1.62	216	May 31	Wendell Dawson	2.23	445
19	do	1.88	295	July 30	do	.80	58
20	do	1.78	272	Sept. 11	G. H. Canfield	.43	25

Daily discharge, in second-feet, of Canyon Creek near Amboy, Wash., for the year ending September 30, 1923

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	54	455	125	3,500		438	730	385	402	100	51	29
2	------	438	145	7,000		438	580	350	385	93	50	29
3	59	350	215	5,000		385	580	315	350	100	49	27
4	178	315	178	4,000		350	490	298	315	93	48	26
5	------	262	165	7,000		350	490	315	298	85	47	26
6	------	215	155	9,200	170	840	472	315	280	280	45	26
7	135	202	135	10,200		900	630	350	262	680	43	25
8	------	190	125	3,880		730	580	402	245	430	42	24
9	93	165	165	3,490		490	472	455	230	270	42	23
10	------	145	245	4,010		438	420	420	215	210	41	23
11	82	145	178	2,800		490	420	385	178	180	41	25
12	------	145	155	1,770	135	630	402	332	165	155	40	25
13	72	125	145	1,220	116	960	385	298	202	135	39	24
14	------	125	135	1,020	120	680	332	262	178	106	38	23
15	64	116	125	1,290	125	455	315	245	155	98	38	22
16	------	116	116	1,150	116	472	315	245	155	98	36	21
17	59	385	108	2,600	125	490	385	230	135	90	36	20
18	------	472	145	2,030	202	420	350	190	125	83	36	20
19	55	402	680	2,210	315	420	332	178	125	80	35	20
20	------	385	730	1,530	280	455	472	155	116	76	35	21
21	54	350	680	1,150	262	402	455	155	108	70	38	20
22	------	280	580	1,020	280	385	402	178	100	73	62	20
23	50	245	4,000	680	315	385	385	145	93	69	38	20
24	------	215	11,000	580	350	580	350	145	116	65	45	24
25	420	190	7,000	420	385	490	350	155	108	64	35	34
26	------	165	3,500	350	530	455	368	178	108	63	33	29
27	680	155	5,000	420	350	580	385	262	100	63	33	23
28	------	155	3,500	385	350	730	368	262	100	60	32	22
29	438	145	2,500	280	------	900	315	438	93	58	32	22
30	------	135	2,500	260	------	1,080	280	530	89	57	32	20
31	472	------	2,500	240	------	900	------	420	------	55	31	------

NOTE.—Water over top of staff gage, Dec. 23 to Jan. 5; daily discharge based on estimated gage heights and comparison with records of flow of near-by streams. Gage could not be read Jan. 30 to Feb. 11; discharge interpolated. Braced figure shows mean discharge for period indicated.

Monthly discharge of Canyon Creek near Amboy, Wash., for the year ending September 30, 1923

[Drainage area, 64 square miles]

Month	Discharge in second-feet				Run-off	
	Maximum	Minimum	Mean	Per square mile	Inches	Acre-feet
October	680	50	185	2.89	3.33	11,400
November	472	116	240	3.75	4.18	14,300
December	11,000	108	1,510	23.6	27.21	92,800
January	10,200	240	2,600	40.6	46.81	160,000
February	530	116	222	3.47	3.61	12,300
March	1,080	350	572	8.94	10.31	35,200
April	730	280	427	6.67	7.44	25,400
May	530	145	290	4.53	5.22	17,800
June	402	89	184	2.88	3.21	10,900
July	680	55	134	2.09	2.41	8,240
August	62	31	40.1	.627	.72	2,470
September	34	20	23.8	.372	.42	1,420
The year	11,000	20	542	8.47	114.87	392,000

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 Mount St. Helens quadrangle and 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, 1923.

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 and E. G. Moser. 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 cable about half a mile below gage or by wading.

CHANNEL AND CONTROL.—Control is rock reef and bar of coarse gravel about 100 feet below gage; gravel may shift in extreme floods.

EXTREMES OF DISCHARGE.—Maximum stage during year, 10.6 feet at 9 a. m. January 6 (discharge, 12,300 second-feet); minimum stage, 0.66 foot September 18 (discharge, 195 second-feet).

1911–1913; 1916–1923: Maximum stage that of January 6, 1923; minimum stage, 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 during high water of January 6. Two well-defined rating curves used, identical above 1,200 second-feet. Gage read once a day to hundredths at low water and to tenths at high water. Mean daily gage heights for December 23 to January 10 derived by a curve of relation from frequent readings on a gage in tailrace of power plant, a few hundred feet upstream. Daily discharge obtained by applying daily gage reading to rating table. Records good.

Discharge measurements of Kalama River near Kalama, Wash., during the year ending September 30, 1923

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Oct. 25	Wendell Dawson	2.65	1,120	June 1	Wendell Dawson	2.20	826
26	do	3.65	1,810	Sept. 13	G. H. Canfield	.71	203
Nov. 9	K. N. Phillips	1.46	516				

Daily discharge, in second-feet, of Kalama River near Kalama, Wash., for the year ending September 30, 1923

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	360	970	395	4,400	885	945	1,550	855	825	475	277	223
2	360	760	415	4,930	855	975	1,340	798	825	455	277	217
3	360	710	435	5,630	825	945	1,410	742	770	475	271	217
4	378	660	395	4,140	770	915	1,340	742	742	435	271	217
5	395	588	435	4,930	770	945	1,200	825	885	435	265	211
6	378	588	498	9,700	742	1,270	1,270	885	770	498	265	211
7	360	565	475	8,010	742	1,340	1,410	885	742	1,000	259	205
8	342	520	455	5,630	742	1,340	1,410	975	715	825	259	205
9	342	520	660	5,210	715	1,340	1,270	1,140	640	770	253	205
10	342	498	635	5,910	690	1,410	1,200	1,070	665	565	253	200
11	325	498	565	4,660	690	1,410	1,140	885	590	435	253	200
12	325	435	520	3,510	665	1,410	1,140	825	565	435	253	205
13	325	415	455	2,950	640	1,550	1,070	770	640	395	253	200
14	310	415	415	2,850	615	1,410	1,000	715	542	378	253	200
15	310	395	395	2,750	615	1,270	975	715	542	360	247	211
16	295	415	360	2,750	615	1,200	1,070	715	498	360	247	205
17	295	475	360	2,750	590	1,140	1,070	690	498	360	247	200
18	295	660	395	3,390	615	1,070	1,000	615	475	342	241	195
19	289	660	1,090	3,160	640	1,070	1,000	590	475	342	241	200
20	283	588	970	2,950	715	1,000	1,070	565	498	325	235	229
21	280	520	910	2,650	945	975	1,070	615	520	325	235	235
22	280	475	910	2,550	945	1,000	975	542	520	325	295	217
23	289	455	3,390	2,150	945	945	945	542	498	310	253	205
24	295	455	7,110	1,950	1,000	1,000	915	520	520	310	235	253
25	1,150	435	4,140	1,770	975	1,000	945	640	520	310	235	229
26	1,860	435	4,660	1,620	945	1,000	1,070	615	498	295	235	217
27	1,030	435	8,370	1,480	915	1,140	1,070	615	520	295	229	205
28	970	415	5,770	1,340	915	1,270	945	590	498	289	223	205
29	760	395	3,880	1,200	-------	1,550	855	1,140	475	289	223	205
30	810	395	3,390	1,070	-------	1,620	825	1,000	475	283	223	200
31	1,030	-------	4,930	975	-------	1,690	-------	825	-------	283	223	-------

Monthly discharge of Kalama River near Kalama, Wash., for the year ending September 30, 1923

[Drainage area, 184 square miles]

Month	Discharge in second-feet				Run-off	
	Maximum	Minimum	Mean	Per square mile	Inches	Acre-feet
October	1,860	280	498	2.71	3.12	30,600
November	970	395	525	2.85	3.18	31,200
December	8,370	360	1,860	10.1	11.64	114,000
January	9,700	975	3,520	19.1	22.02	216,000
February	1,000	590	776	4.22	4.39	43,100
March	1,690	915	1,200	6.52	7.52	73,800
April	1,550	825	1,120	6.09	6.80	66,600
May	1,140	520	763	4.15	4.78	46,900
June	885	475	598	3.25	3.63	35,600
July	1,000	283	419	2.28	2.63	25,800
August	277	223	249	1.35	1.56	15,300
September	253	195	211	1.15	1.28	12,600
The year	9,700	195	983	5.34	72.55	712,000

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 Pl. I, Water-Supply Paper 313).

RECORDS AVAILABLE.—September 2, 1911, to September 30, 1923.

GAGE.—Friez water-stage recorder on left bank, installed August 3, 1918; inspected by J. A. Combs.

DISCHARGE MEASUREMENTS.—Made by wading near gage or from footbridge 200 feet upstream.

CHANNEL AND CONTROL.—Bed composed of gravel and small boulders. Incomplete control about 20 feet downstream from gage formed by several trees felled across stream from both banks. Trees partly broken and wedged against a large boulder in midstream.

EXTREMES OF DISCHARGE.—Maximum stage during year, from water-stage recorder, 3.55 feet on January 9 (discharge, 521 second-feet); minimum stage, 1.12 feet on December 15 (discharge, 32 second-feet).

1911–1923: Maximum stage estimated, 6.0 feet December 18, 1917 (discharge not determined); minimum stage, 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 lake.

ACCURACY.—Stage-discharge relation practically permanent. Rating curve fairly well defined below 500 second-feet. Operation of water-stage recorder satisfactory, except as noted in footnote to table of daily discharge. Daily discharge ascertained by applying to rating table mean daily gage height determined from recorder graph by inspection. Records good.

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

Discharge measurements of Lake Creek at outlet of Packwood Lake, near Lewis, Wash., during the year ending September 30, 1923

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Nov. 2	J. A. Combs	1.31	44.3	Aug. 20	J. A. Combs	151	92.0
2	do	1.31	47.8	Sept. 5	do	139	62.6
May 7	do	1.68	141	15	Kilgore and Combs	131	52.0
7	do	1.68	141				

Daily discharge, in second-feet, of Lake Creek at outlet of Packwood Lake, near Lewis, Wash., for the year ending September 30, 1923

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	48	48	35	125	73	52	81	118	131	268	108	73
2	50	48	36	118	68	50	89	113	129	268	105	68
3	46	48	37	133	65	50	95	102	127	268	102	68
4	46	48	36	120	63	50	95	97	138	237	95	65
5	44	44	36	131	61	48	97	105	177	230	81	63
6	42	42	35	258	61	48	93	124	226	239	78	59
7	43	39	34	368	59	46	89	142	258	288	73	57
8	42	38	34	455	59	46	87	169	288	278	65	57
9	41	37	34	521	57	46	87	218	298	250	63	57
10	41	36	33	488	57	46	89	288	298	250	61	57
11	40	56	33	411	57	45	92	268	288	250	57	54
12	39	35	33	368	56	45	100	239	258	237	54	54
13	38	35	33	338	56	45	105	230	231	235	50	52
14	38	35	33	308	56	45	113	222	210	233	50	50
15	37	39	32	288	54	45	125	213	185	220	48	48
16	36	59	33	258	54	45	138	204	181	198	48	46
17	36	68	33	235	54	45	148	200	173	171	48	44
18	36	60	33	218	56	45	148	190	171	159	50	43
19	35	57	33	204	59	44	140	175	169	155	68	42
20	35	56	33	194	59	44	131	169	171	148	89	42
21	35	52	33	179	57	45	127	169	171	146	95	43
22	35	46	35	167	54	45	122	163	173	148	125	43
23	35	43	56	155	54	45	120	155	169	148	127	42
24	34	42	131	144	54	44	115	157	165	144	108	42
25	35	40	153	136	52	43	113	153	163	133	97	42
26	65	38	140	125	52	42	118	150	169	129	92	42
27	73	37	165	118	52	43	120	148	171	129	88	42
28	61	36	181	105	52	46	122	144	190	129	85	41
29	57	36	161	92	-------	48	127	140	228	127	81	41
30	54	35	144	84	-------	54	120	133	258	125	81	39
31	52	-------	133	76	-------	68	-------	132	-------	118	78	-------

NOTE.—Water-stage recorder not operating Oct. 8–15, Apr. 6, 13–15, 31, May 6, Aug. 27, 28, Sept. 13, and 14; discharge interpolated.

Monthly discharge of Lake Creek at outlet of Packwood Lake, near Lewis, Wash., for the year ending September 30, 1923.

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	73	34	43.5	2,670
November	68	35	43.8	2,610
December	181	32	64.9	3,990
January	521	76	223	13,700
February	73	52	57.5	3,190
March	68	42	46.9	2,880
April	148	81	112	6,660
May	288	97	169	10,400
June	298	127	199	11,800
July	288	118	195	12,000
August	127	48	79.0	4,860
September	73	39	50.5	3,000
The year	521	32	107	77,800

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, Lewis County.

DRAINAGE AREA.—About 30 square miles (measured on Pl. I, Water-Supply Paper 313).

RECORDS AVAILABLE.—August 14, 1907, to September 23, 1914, and October 1, 1918, to September 30, 1923.

GAGE.—Friez water-stage recorder on left bank, installed October 1, 1918; inspected by J. A. Combs. A vertical staff gage about 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; are not overflowed. Channel curved above and fairly straight for 300 feet below gage. Stage of zero flow, according to measurements made August 18, 1922, gage height, −0.70 foot.

EXTREMES OF DISCHARGE.—Maximum stage during year from recorder, 4.07 feet at 4 p.m. January 6 (discharge, 2,610 second-feet); minimum stage, 0.35 foot at midnight October 21 (discharge, 26 second-feet).

1907–1914; 1918–1923: Maximum discharge, 2,800 second-feet December 12, 1921; minimum stage, that of October 21, 1922.

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

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed during high water of December 25 and January 7. Rating curves fairly well defined below 1,500 second-feet. Operation of water-stage recorder fairly satisfactory except as noted in footnote to table of daily discharge. Daily discharge ascertained by applying to rating table mean daily gage height determined from recorder charts by inspection. Records good except for extremely high water and for periods when recorder was not operating.

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

Discharge measurements of Johnson Creek at mouth, near Lewis, Wash., during the year ending September 30, 1923

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Oct. 30	J. A. Combs	0.59	55.7	May 2	J. A. Combs	1.50	257
Nov. 23	do	.66	62.6	Sept. 14	Kilgore and Combs	.59	43.8
Dec. 29	do	1.88	325	14	do	.59	44.
Jan. 27	do	1.28	192				

Daily discharge, in second-feet, of Johnson Creek at mouth, near Lewis, Wash., for the year ending September 30, 1923

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	34	67	50	202	150	153	353	276	279	423	121	58
2	34	58	49	221	148	150	344	257	276	399	116	58
3	34	54	48	261	145	148	331	247	290	358	114	56
4	32	53	46	199	145	140	310	261	362	319	112	56
5	33	51	45	580	140	135	302	323	474	306	112	56
6	33	48	43	1,620	137	137	283	380	546	306	112	55
7	32	48	42	2,330	137	135	279	454	558	358	112	52
8	32	46	42	2,540	135	130	272	582	558	380	112	51
9	32	46	41	2,200	132	123	268	694	594	376	110	50
10	32	45	40	1,560	128	128	279	653	564	358	110	49
11	32	44	40	1,180	128	128	279	613	484	323	110	47
12	31	44	39	926	126	126	279	572	418	306	110	46
13	31	42	38	774	123	121	287	531	385	323	110	45
14	30	41	37	694	121	116	306	490	369	294	107	44
15	30	41	36	622	119	116	344	450	353	276	107	42
16	29	67	36	550	116	123	414	409	362	254	107	42
17	29	119	35	479	110	119	469	459	348	231	107	41
18	28	98	35	407	107	116	428	438	335	212	107	40
19	28	78	34	335	112	119	380	404	335	202	107	40
20	27	69	34	294	130	119	348	371	340	193	132	41
21	27	64	34	272	150	112	323	362	331	176	271	44
22	27	62	33	250	159	105	302	371	319	167	132	41
23	27	61	34	234	153	103	287	366	298	165	92	40
24	32	61	69	221	153	103	294	394	298	163	73	41
25	76	61	468	205	150	103	319	390	298	160	72	40
26	82	61	687	196	150	105	348	371	314	158	70	40
27	68	61	594	187	150	130	376	340	335	156	67	41
28	64	61	404	176	148	190	358	319	404	150	66	39
29	57	60	306	164	-------	254	327	314	464	142	64	36
30	55	54	279	156	-------	340	306	298	454	135	62	35
31	74	-------	240	150	-------	385	-------	283	-------	126	61	-------

NOTE.—Water-stage recorder not operating or gage-height record faulty Oct. 10–18, Dec. 3–6, 9–13, 16–20, Jan. 15–18, Apr. 26, May 10–15, June 14, July 23–26, and Sept. 8–13; discharge interpolated.

Monthly discharge of Johnson Creek at mouth, near Lewis, Wash., for the year ending September 30, 1923

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	82	27	39.1	2,400
November	119	41	58.8	3,500
December	687	33	128	7,870
January	2,540	150	651	40,000
February	159	107	136	7,550
March	385	103	146	8,980
April	469	268	326	19,400
May	694	247	409	25,109
June	594	276	392	23,300
July	423	126	255	15,700
August	271	61	105	6,460
September	58	35	45.5	2,710
The year	2,540	27	225	163,000

TOUTLE RIVER NEAR SILVER LAKE, WASH.

LOCATION.—In sec. 19, T. 10 N., R. 1 E., 300 feet below highway bridge just below Silver Lake outlet 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, Cowlitz County.

DRAINAGE AREA.—472 square miles (measured on Pl. XV, Water-Supply Paper 253).

RECORDS AVAILABLE.—October 1, 1919, to October 25, 1921, and May 10, 1922, to December 14, 1923, when records were discontinued. 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 J. C. Stevens. Au water-stage recorder used May 9 to July 28, 1922. 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 period October 1, 1922, to December 14, 1923, from watermark in well, 18.9 feet on January 6 (discharge, 16,500 second-feet); minimum stage from recorder, 0.40 foot from midnight September 18 to 3 a.m. September 19 (discharge, 327 second-feet).

1910–1912; 1920–1923: Maximum discharge, 35,600 second-feet March 2, 1910; minimum stage, 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 changed during high water January 6. Rating curves well defined below 8,000 second-feet. Operation of water-stage recorder fairly satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height determined from recorder graph by inspection. Records good.

COOPERATION.—Gage-height record furnished by J. C. Stevens of Portland, Oreg.

Discharge measurements of Toutle River near Silver Lake, Wash., during the year ending September 30, 1923

Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*
Sept. 17	R. B. Kilgore	0.45	345
18	do	.43	337

Daily discharge, in second-feet, of Toutle River near Silver Lake, Wash., for the period October 1, 1922, to December 14, 1923

Day	Oct.	Nov.	Jan.	Feb.	Mar.	Apr.	May	June	Aug.	Sept.	Oct.	Nov.	Dec.
1	484	1,560	-------	1,890	1,890	2,800	2,100	2,030	-------	420	344	515	1,320
2	446	1,270	-------	1,820	1,890	2,590	2,030	2,030	-------	420	344	710	1,270
3	472	1,120	-------	1,720	1,820	2,730	1,890	2,240	-------	428	351	666	1,200
4	539	1,070	-------	1,680	1,720	2,520	1,820	2,240	-------	410	388	580	1,240
5	559	972	-------	1,650	1,720	2,520	1,820	2,310	580	388	374	539	1,650
6	539	923	-------	1,590	2,170	2,450	1,960	2,380	580	385	480	515	3,790
7	480	923	-------	1,590	2,590	2,590	2,100	2,520	580	382	519	500	5,230
8	450	874	-------	1,560	2,450	2,450	2,310	2,450	559	385	442	488	4,190
9	435	826	-------	1,530	2,240	2,310	2,870	2,380	539	382	399	476	3,150
10	413	779	-------	1,500	2,170	2,170	3,010	2,310	539	378	385	469	2,730
11	406	733	-------	1,470	2,590	2,100	2,800	2,170	519	374	368	457	2,520
12	402	710	-------	1,470	2,730	2,240	2,520	2,030	515	374	354	453	2,310
13	388	688	-------	1,470	2,730	2,240	2,450	1,960	511	374	334	457	2,100
14	371	644	-------	1,440	2,450	2,100	2,310	2,030	507	374	337	465	2,240
15	368	644	-------	1,410	2,240	2,100	2,240	1,890	503	371	539	438	-------
16	361	733	5,310	1,410	2,170	2,170	2,310	1,750	500	351	1,140	431	-------
17	347	1,100	6,560	1,530	2,170	2,240	2,380	1,680	500	347	2,890	428	-------
18	340	-------	6,200	2,170	2,030	2,240	2,240	1,620	496	334	1,560	420	-------
19	337	-------	5,750	2,730	1,960	2,240	2,100	1,590	480	334	1,120	420	-------
20	364	-------	4,750	2,520	1,960	2,240	1,960	1,530	472	382	972	446	-------
21	354	-------	4,110	2,310	1,890	2,380	1,820	1,500	496	539	898	435	-------
22	337	-------	3,570	2,240	1,960	2,170	1,820	1,500	923	431	948	469	-------
23	344	-------	3,220	2,240	1,960	2,100	1,820	1,500	644	385	874	1,220	-------
24	424	-------	2,940	2,170	2,030	1,960	1,720	1,470	539	385	779	3,010	-------
25	1,840	-------	2,730	2,170	1,960	1,960	1,750	1,470	503	417	710	2,310	-------
26	2,380	-------	2,520	2,100	1,960	2,030	1,890	1,440	492	417	666	1,750	-------
27	1,960	-------	2,520	1,960	1,960	2,240	2,030	1,440	472	392	622	1,410	-------
28	1,500	-------	2,450	1,890	2,170	2,240	1,890	1,440	457	368	601	1,470	-------
29	1,170	-------	2,240	-------	2,660	2,100	2,240	1,440	457	357	580	1,680	-------
30	1,100	-------	2,100	-------	3,010	2,030	2,380	1,470	450	351	539	1,500	-------
31	1,750	-------	1,960	-------	3,080	-------	2,170	-------	431	-------	519	-------	-------

Monthly discharge of Toutle River near Silver Lake, Wash., for the period October 1, 1922, to December 14, 1923

[Drainage area, 472 square miles]

Month	Discharge in second-feet				Run-off	
	Maximum	Minimum	Mean	Per square mile	Inches	Acre-feet
1922–23						
October	2,380	337	699	1.48	1.71	43,000
November 1–17	1,560	644	916	1.94	1.23	30,900
January 16–31	6,560	1,960	3,680	7.80	4.64	117,000
February	2,730	1,410	1,830	3.88	4.04	102,000
March	3,080	1,720	2,200	4.66	5.37	135,000
April	2,800	1,960	2,280	4.83	5.39	136,000
May	3,010	1,720	2,150	4.56	5.26	132,000
June	2,520	1,440	1,860	3.94	4.40	111,000
August 5–31	923	431	528	1.12	1.12	28,300
September	539	334	388	.822	.92	23,100
1923						
October	2,890	334	690	1.46	1.68	42,400
November	3,010	420	838	1.78	1.99	49,900
December 1–14	5,230	1,200	2,500	5.30	2.76	69,400

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 South 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, 1923.

GAGE.—Vertical staff on right bank about 100 feet above power house; read by E. B. Price and William Stinson.

DISCHARGE MEASUREMENTS.—Made from cable about 500 feet above gage.

CHANNEL AND CONTROL.—Control composed of large boulders; fairly permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 5.3 feet at 4 p. m. January 6 (discharge, 2,780 second-feet; total including discharge of flume, 2,960 second-feet); minimum stage, 2.44 feet September 15–20 (discharge, 420 second-feet; minimum including flume, 582 second-feet September 15–17).

1913–1923: Maximum discharge recorded, 4,800 second-feet, November 30, 1921 (including flume, 4,980 second-feet); minimum stage, 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. 148.)

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed during high water of January 6. Rating curves used as follows: October 1 to January 6, fairly well defined; January 7 to September 30, well defined below 1,500 second-feet. Staff gage read once or twice a day to hundredths. Daily discharge obtained by applying mean gage height to rating table. Records good.

Discharge measurements of Rogue River below Prospect, Oreg., during the year ending September 30, 1923

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Jan. 4	J. F. Partridge*	3.20	910	June 29	K. N. Phillips	3.16	836
May 4	K. N. Phillips	3.71	1,170	July 14	do	2.80	635
23	do	3.88	1,320	Aug. 18	do	2.54	472

* Engineer for the California Oregon Power Co.

Daily discharge, in second-feet, of Rogue River below Prospect, Oreg., for the year ending September 30, 1923

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	570	620	525	890	555	975	1,390	1,180	1,250	855	500	472
2	570	620	525	830	615	975	1,390	1,110	1,180	735	472	445
3	570	570	525	960	615	855	1,320	1,110	1,180	735	472	445
4	620	570	525	890	615	855	1,180	1,180	1,180	735	500	445
5	620	570	570	890	585	855	1,180	1,390	1,250	705	472	445
6	595	570	595	2,350	585	855	1,250	1,550	1,250	735	472	445
7	570	570	570	1,870	585	795	1,250	1,550	1,250	795	472	445
8	570	570	525	1,710	585	795	1,110	1,710	1,250	735	472	445
9	548	595	525	1,390	500	735	1,110	1,870	1,250	735	445	445
10	595	595	525	1,250	555	705	1,040	1,790	1,250	705	445	445
11	570	570	525	1,180	555	735	1,040	1,550	1,180	705	420	445
12	595	570	570	1,040	555	735	1,180	1,550	1,110	675	472	420
13	570	525	595	975	555	705	1,250	1,470	1,040	675	472	420
14	570	525	570	915	555	675	1,250	1,470	975	615	472	420
15	570	525	620	855	555	675	1,320	1,470	915	675	472	420
16	548	525	620	855	555	675	1,470	1,550	915	615	472	420
17	548	720	570	1,110	555	855	1,550	1,630	915	615	472	420
18	548	720	570	975	585	855	1,390	1,550	915	615	472	420
19	548	595	620	855	615	855	1,390	1,470	915	615	472	420
20	548	645	570	795	735	855	1,390	1,390	855	585	472	420
21	548	570	570	795	735	855	1,390	1,390	855	555	472	420
22	548	570	570	795	735	795	1,320	1,320	855	555	472	445
23	548	548	595	735	795	795	1,110	1,320	855	555	472	445
24	548	548	860	735	855	795	1,110	1,390	855	528	472	472
25	548	525	770	675	855	795	1,110	1,390	855	500	472	472
26	548	548	745	705	795	795	1,180	1,250	855	500	472	472
27	570	525	1,330	735	795	855	1,250	1,180	855	500	472	500
28	595	548	1,170	675	795	1,040	1,320	1,110	795	500	472	472
29	570	525	890	675	-------	1,180	1,250	1,550	855	500	472	445
30	548	525	800	555	-------	1,250	1,110	1,390	795	500	472	445
31	620	-------	1,250	555	-------	1,320	-------	1,250	-------	500	472	-------

Monthly discharge of Rogue River below Prospect, Oreg., for the year ending September 30, 1923

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	620	548	569	35,000
November	720	525	573	34,100
December	1,330	525	671	41,300
January	2,350	555	975	60,000
February	855	500	642	35,700
March	1,320	675	855	52,600
April	1,550	1,040	1,250	74,400
May	1,870	1,110	1,420	87,300
June	1,250	795	1,020	60,700
July	855	500	631	38,800
August	500	420	470	28,900
September	500	420	443	26,400
The year	2,350	420	794	575,000

Combined monthly discharge of Rogue River and California Oregon Power Co.'s flume near Prospect, Oreg., for the year ending September 30, 1923

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	811	732	757	46,500
November	918	709	763	45,400
December	1,500	620	832	51,200
January	2,520	687	1,140	70,100
February	1,030	632	797	44,300
March	1,480	825	1,020	62,700
April	1,710	1,200	1,420	84,500
May	2,030	1,270	1,590	97,800
June	1,420	970	1,190	70,800
July	1,030	662	804	49,400
August	675	595	644	39,600
September	675	582	615	36,600
The year	2,520	582	964	699,000

ROGUE RIVER AT RAYGOLD, NEAR CENTRAL POINT, OREG.

LOCATION.—In sec. 18, T. 36 S., R. 2 W., at Raygold railroad station, just below dam and power house of the California Oregon Power Co., half a mile below mouth of Bear Creek, and 6 miles northwest of Central Point, Jackson County.

DRAINAGE AREA.—2,020 square miles.

RECORDS AVAILABLE.—August 30, 1905, to September 30, 1923.

GAGE.—Friez water-stage recorder referred to vertical staff bolted to concrete pier of bridge near right bank; 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, 8.78 feet at 10 a. m. December 31 (discharge, 18,600 second-feet); minimum stage, 0.20 foot at 11 a. m. September 20 (discharge, 710 second-feet).

1905–1923: Maximum stage recorded, 20.00 feet at 7.30 a. m. November 23, 1909 (discharge, estimated by extension of rating curve, 60,000 second-feet); minimum stage indeterminate, as water fell below intake pipe of well (gage height, 0.20 foot) probably 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 not permanent. Fairly well-defined rating curve used October 1 to April 16 and July 26 to September 30; shifting-control method used April 17 to July 25. Operation of water-stage recorder satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height obtained by inspecting recorder graph. Records good.

Discharge measurements of Rogue River at Raygold, near Central Point, Oreg., during the year ending September 30, 1923

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Oct. 29, 30	F. W. Scheffel [a]	0.84	1,160	May 23	K. N. Phillips	2.37	2,560
Nov. 8	Henshaw and Partridge	1.20	1,490	June 22	do	1.70	1,890
				27	do	1.76	1,960
Mar. 23	K. N. Phillips	2.13	2,450	Aug. 6	do	.92	1,210
Apr. 4	do	2.61	3,200	23	Henshaw and Phillips	.88	1,240
May 17	do	2.79	3,100				

[a] Engineer, Medford Irrigation District.

Daily discharge, in second-feet, of Rogue River at Raygold, near Central Point, Oreg., for the year ending September 30, 1923

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	1,390	1,390	1,440	8,460	2,060	2,820	3,430	2,610	2,740	1,730	1,210	1,130
2	1,340	1,440	1,440	5,130	2,110	2,870	3,430	2,610	2,610	1,680	1,260	1,130
3	1,390	1,390	1,390	5,730	2,110	2,820	3,430	2,420	2,540	1,680	1,300	1,130
4	1,440	1,390	1,440	5,320	2,000	2,740	3,280	2,480	2,480	1,630	1,300	1,130
5	1,480	1,440	1,630	7,040	2,000	2,540	3,580	2,820	2,540	1,580	1,210	1,090
6	1,480	1,440	3,140	7,720	2,000	2,610	3,740	2,940	2,480	1,580	1,210	1,090
7	1,390	1,440	2,350	8,720	2,060	2,680	3,740	3,000	2,540	1,780	1,210	1,090
8	1,390	1,440	1,840	6,380	2,110	2,480	3,430	3,280	2,540	1,840	1,210	1,090
9	1,390	1,390	1,680	5,130	2,000	2,480	3,280	3,580	2,420	1,680	1,260	1,090
10	1,390	1,530	1,680	4,410	1,940	2,350	3,140	3,580	2,350	1,630	1,210	1,090
11	1,480	1,530	1,780	3,900	2,000	2,290	3,000	3,430	2,350	1,580	1,210	1,090
12	1,440	1,480	1,580	3,430	2,060	2,290	3,140	3,140	2,230	1,530	1,210	1,050
13	1,480	1,440	1,730	3,140	2,060	2,290	3,280	3,000	2,170	1,480	1,210	1,050
14	1,340	1,390	1,680	3,140	2,000	2,350	3,280	2,940	2,110	1,480	1,210	1,050
15	1,260	1,390	1,630	3,140	2,000	2,290	3,280	2,870	2,060	1,480	1,210	1,050
16	1,390	1,390	1,480	2,870	2,110	2,290	3,280	3,000	2,000	1,480	1,210	1,050
17	1,390	1,440	1,390	4,760	2,740	3,000	3,580	3,140	1,890	1,480	1,170	1,050
18	1,340	1,940	1,440	4,410	2,870	3,140	3,580	3,140	1,940	1,440	1,170	1,050
19	1,340	1,630	1,530	3,580	3,140	2,940	3,430	2,870	1,940	1,390	1,170	1,050
20	1,390	1,580	1,630	3,140	3,430	2,820	3,140	2,820	1,940	1,390	1,170	1,050
21	1,340	1,580	1,580	3,000	3,430	2,820	3,430	2,680	1,890	1,340	1,170	1,050
22	1,260	1,530	1,480	2,870	3,430	2,680	3,280	2,540	1,890	1,260	1,170	1,130
23	1,210	1,440	1,530	2,820	3,280	2,540	3,000	2,540	1,890	1,390	1,170	1,210
24	1,260	1,390	2,000	2,680	3,140	2,480	2,940	2,540	2,060	1,300	1,170	1,170
25	1,260	1,390	2,680	2,480	3,140	2,480	2,870	2,540	2,060	1,260	1,170	1,170
26	1,260	1,390	2,420	2,350	2,940	2,480	2,870	2,540	2,000	1,300	1,170	1,300
27	1,260	1,390	5,070	2,820	2,820	2,540	2,820	2,480	1,940	1,300	1,170	1,210
28	1,260	1,440	8,720	3,140	2,740	2,680	2,940	2,350	1,890	1,300	1,130	1,210
29	1,210	1,390	4,940	2,820	-------	2,870	2,870	2,680	1,890	1,210	1,130	1,210
30	1,340	1,390	4,410	2,420	-------	3,000	2,870	3,000	1,840	1,340	1,130	1,170
31	1,260	-------	15,600	2,110	-------	3,140	-------	2,740	-------	1,300	1,130	-------

Monthly discharge of Rogue River at Raygold, near Central Point, Oreg., for the year ending September 30, 1923

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	1,480	1,210	1,350	83,000
November	1,940	1,390	1,460	86,900
December	15,600	1,390	2,720	167,000
January	8,720	2,110	4,160	256,000
February	3,430	1,940	2,490	138,000
March	3,140	2,290	2,640	162,000
April	3,740	2,820	3,250	193,000
May	3,580	2,420	2,850	175,000
June	2,740	1,840	2,170	129,000
July	1,840	1,210	1,480	91,000
August	1,300	1,130	1,190	73,200
September	1,300	1,050	1,110	66,000
The year	15,600	1,050	2,240	1,620,000

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, 1923.

GAGE.—Vertical staff in stilling box on right side of flume, 500 feet above forebay, used after August 17, 1915. Prior to August 17, 1915, gage was located 1 mile above forebay.

DISCHARGE MEASUREMENTS.—Made from collar of flume.

CHANNEL AND CONTROL.—Wooden flume at end of which there is a free fall into forebay.

EXTREMES OF DISCHARGE.—Maximum discharge recorded, 198 second-feet December 6; flume dry December 16.

1913–1923: 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 changed December 16, when water was turned out for repairs. Rating curve for October 1 to December 15, poorly defined; for December 17 to September 30, well defined above 150 second-feet. Gage read to hundredths once a day. Daily discharge ascertained by applying daily gage reading to rating table. Records fair to December 15; good thereafter.

Discharge measurements of California Oregon Power Co.'s flume near Prospect Oreg., during the year ending September 30, 1923

[Made by K. N. Phillips]

Date	Gage height	Discharge	Date	Gage height	Discharge
	Feet	*Sec.-ft.*		*Feet*	*Sec.-ft.*
May 4	2.60	176	June 29	2.57	171
23	2.52	165	Aug. 21	2.56	171

Daily discharge, in second-feet, of California Oregon Power Co.'s flume near Prospect, Oreg., for the year ending September 30, 1923

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	191	184	191	175	138	175	162	175	162	175	175	175
2	191	184	191	162	162	175	162	162	162	175	175	175
3	191	191	191	175	132	162	162	175	175	175	175	175
4	191	191	191	162	126	162	162	175	175	175	175	175
5	191	191	191	175	126	162	162	175	175	175	175	175
6	191	191	198	175	138	162	175	175	175	175	175	175
7	191	191	191	175	144	162	162	162	162	188	162	175
8	191	191	191	175	150	150	162	162	175	175	162	175
9	191	191	191	150	132	150	162	162	162	175	175	175
10	191	184	191	162	126	150	162	162	175	175	175	175
11	191	184	170	162	175	150	162	162	175	175	175	175
12	191	191	103	162	175	150	175	175	175	175	175	162
13	191	191	120	150	175	150	175	162	175	175	175	162
14	191	191	120	150	132	150	162	162	162	175	175	162
15	191	191	120	150	138	162	175	162	162	175	175	162
16	184	191	0	162	175	162	175	175	175	175	175	162
17	184	184	132	175	162	175	162	175	175	175	175	162
18	184	198	132	150	175	162	162	162	175	175	175	175
19	191	191	162	162	162	162	150	162	162	175	175	175
20	191	191	162	162	162	162	162	162	162	162	162	175
21	184	191	162	162	162	162	162	175	175	162	175	175
22	184	191	162	162	175	162	162	175	175	162	175	175
23	191	191	162	162	175	162	162	162	175	175	175	175
24	184	191	175	162	175	162	162	162	175	162	162	175
25	184	191	175	162	162	162	162	162	175	162	175	175
26	184	191	162	162	162	162	162	162	175	175	175	175
27	184	184	175	150	162	162	175	162	175	175	175	175
28	184	191	175	175	162	175	175	162	175	175	175	175
29	184	191	162	175	-------	175	162	175	175	175	175	175
30	191	191	162	132	-------	162	162	175	175	175	175	162
31	184	-------	175	132	-------	162	-------	175	-------	175	175	-------

Monthly discharge of California Oregon Power Co.'s flume near Prospect, Oreg., for the year ending September 30, 1923

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	191	184	188	11,600
November	198	184	190	11,300
December	198	0	161	9,900
January	175	132	162	9,960
February	175	126	155	8,610
March	175	150	161	9,900
April	175	150	165	9,820
May	175	162	167	10,300
June	175	162	172	10,200
July	188	162	173	10,600
August	175	162	173	10,600
September	175	162	172	10,200
The year	198	0	170	123,000

SOUTH FORK OF BIG BUTTE CREEK AT BUTTE FALLS, OREG.

LOCATION.—In NE. ¼ sec. 10, T. 35 S., R. 2 E., one-fourth of a mile north of Butte Falls, Jackson County, one-fourth of a mile below falls of creek, and 1 mile above mouth of North Fork.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—August 23, 1922, to September 30, 1923. At station in section 11, about 1 mile upstream and above some inflow from springs, September 20, 1910, to October 5, 1911; August 5 to October 10, 1915; and October 31, 1917, to September 30, 1922.

GAGE.—Stevens continuous recorder on left bank; inspected by engineers of Eagle Point Irrigation District.

DISCHARGE MEASUREMENTS.—Made by wading near gage.

CHANNEL AND CONTROL.—Bed rocky and practically permanent under normal conditions; affected by accumulation of drift during low water; changeable during 1923 due to encroachment of channel by spoil from canal excavation.

EXTREMES OF DISCHARGE.—Maximum stage during period from water-stage recorder, 3.32 feet at 7 p. m. December 31, 1922 (discharge, 780 second-feet); minimum stage, 0.65 foot (discharge, 70 second-feet).

ICE.—None.

DIVERSIONS.—None.

REGULATION.—Flow fluctuates occasionally for short periods due to manipulation of dam at crest of falls, a quarter of a mile upstream.

ACCURACY.—Stage-discharge relation unstable. Current-meter measurements can not be made with a high degree of accuracy due to rough channel. Rating curves used as follows: August 23 to September 6, 1922, fairly well defined; October 11 to December 31, 1922, shifting-control method used; January 1 to September 30, 1923, fairly well defined below 200 second-feet, poorly defined above. Operation of water-stage recorder satisfactory, except for a few gaps when flow of stream is known to have been fairly steady. Records good for low water, poor for high water.

Discharge measurements of South Fork of Big Butte Creek at Butte Falls, Oreg., during the years ending September 30, 1922 and 1923

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
1922		*Feet*	*Sec.-ft.*	1923		*Feet*	*Sec.-ft.*
Aug. 23	Henshaw and Cowgill	1.09	124	May 18	K. N. Phillips	1.54	150
23	do	1.08	119	July 20	do	1.33	123
23	do	.68	73	Aug. 7	do	1.24	118
				Sept. 6	do	1.23	105

Daily discharge, in second-feet, of South Fork of Big Butte Creek at Butte Falls, Oreg., for the years ending September 30, 1922 and 1923

Day	Aug.	Sept.
1922		
1	-------	119
2	-------	118
3	-------	116
4	-------	115
5	-------	119
6	-------	119
7	-------	
8	-------	
9	-------	
10	-------	
11	-------	
12	-------	
13	-------	
14	-------	
15	-------	
16	-------	
17	-------	
18	-------	
19	-------	118
20	-------	
21	-------	
22	-------	
23	115	
24	117	
25	118	
26	120	
27	119	
28	119	
29	118	
30	118	
31	119	-------

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr	May	June	July	Aug.	Sept.
1922–23												
1		150	126	500	152	240	265	200	200	131	112	108
2		149	126	400	152	240	265	190	190	127	112	108
3		146	129	300	152	230	265	180	180	122	112	109
4		140	129	295	145	220	252	180	170	121	112	110
5		138	127	480	145	230	252	180	170	119	112	108
6	117	138	225	480	145	252	295	180	180	131	112	108
7		142	168	440	145	230	280	180	180	131	110	110
8		140	144	400	145	220	265	180	170	124	110	110
9		138	136	330	138	220	252	180	160	119	109	109
10		150	131	295	138	210	240	180	160	118	109	108
11		160	131	280	138	200	240	170		115	109	104
12	116	143	127	265	138	210	240	170		115	109	101
13	115	138	133	240	138	210	240	160		115	108	97
14	113	136	136	240	138	190	240	160		114	106	93
15	113	133	126	220	138	190	240	152		115	105	
16	111	133	122	210	145	210	240	152		128	105	
17	111	137	119	330	145	252	252	138	156	131	104	
18	113	146	123	280	152	252	252	152		124	104	93
19	113	142	130	265	170	252	230	160		122	104	
20	114	137	129	240	210	265	252	160		122	104	
21	115	142	127	230	240	252	265	152		121	104	
22	118	131	124	220	252	240	252	145		119	106	
23	119	131	124	220	265	230	240	145		118	108	
24	123	129	140	200	265	230	230	145	152	117		
25	127	127	176	190	252	220	220	145	145	115		
25	130	127	160	190	240	220	220	160	170	115		100
27	138	127	185	190	240	220	220	170	152	115	108	
28	143	129	280	180	230	220	210	160	145	114		
29	142	129	280	180	-------	230	210	190	145	112		
30	137	124	215	152	-------	230	200	190	138	112		
31	140	-------	400	152	-------	230	-------	190	-------	110		-------

Monthly discharge of South Fork of Big Butte Creek at Butte Falls, Oreg., for the years ending September 30, 1922 and 1923

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1922				
August 23–31	120	115	118	2,110
September	----------	----------	118	7,020
1922–23				
October	143	111	121	7,440
November	160	124	138	8,210
December	400	119	159	9,780
January	500	152	277	17,000
February	265	138	177	9,830
March	265	190	227	14,000
April	295	200	244	14,500
May	200	138	168	10,300
June	200	138	161	9,580
July	131	110	120	7,380
August	112	104	108	6,640
September	110	----------	101	6,010
The year	500	----------	167	121,000

SOUTH FORK OF LITTLE BUTTE CREEK NEAR LAKE CREEK, OREG.

LOCATION.—In SE. ¼ sec. 29, T. 36 S., R. 2 E.,[2] one-fourth mile above intake of Rogue River Valley Canal Co.'s South Fork Canal and 1½ miles southeast of Lake Creek post office, Jackson County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—April 29, 1921, to September 30, 1923. 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.—Stevens eight-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 during year from water-stage recorder, 3.80 feet at 3 a. m. on December 31 (discharge, 1,180 second-feet); minimum stage, 0.98 foot September 10 (discharge, 9.0 second-feet).

1910–1913; 1921–1923: Maximum discharge recorded, 1,580 second-feet February 17, 1912; minimum discharge, 5 second-feet, December 8, 1911.

ICE.—None during period of records.

DIVERSIONS.—Several hundred acres irrigated in small tracts above station.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed December 31. Rating curves used as followed: October 1 to December 31, fairly well defined below 500 second-feet; January 1 to September 30 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 good.

[2] Location revised on basis of map made by R. P. Cowgill for office of State engineer during 1925.

Discharge measurements of South Fork of Little Butte Creek near Lake Creek, Oreg., during the year ending September 30, 1923

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Dec. 4	L. S. Brophy[a]	1.25	22.7	June 28	K. N. Phillips	1.61	70
Mar. 26	Phillips and Cummings	1.74	101	July 11	do	1.36	37.4
31	Brophy and Jennings[a]	1.85	128	24	Brophy and Smith	1.18	22.7
Apr. 16	K. N. Phillips	2.02	173	28	K. N. Phillips	1.16	20.7
24	do	1.96	155	Aug. 9	Brophy and Smith	1.11	15.0
May 9	do	2.00	172	11	K. N. Phillips	1.08	14.6
21	Brophy and Smith[a]	1.76	107	23	Brophy and Smith	1.11	17.2
29	Phillips and Cummings	1.80	113	Sept. 20	K. N. Phillips	1.04	11.8

[a] Employees of Rogue River Valley Canal Co.

Daily discharge, in second-feet, of South Fork of Little Butte Creek near Lake Creek, Oreg., for the year ending September 30, 1923

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	17	31	26	227	51	75	159	148	134	62	17	14
2	19	27	25	178	43	81	162	136	126	57	15	14
3	21	25	26	159	42	73	151	124	116	52	15	13
4	22	26	26	148	40	68	142	129	112	50	15	13
5	20	25	72	142	38	72	142	142	107	48	17	13
6	20	25	84	136	38	73	154	148	107	62	17	13
7	19	26	54	129	38	72	136	154	96	66	17	15
8	20	26	39	124	38	68	134	156	88	55	15	13
9	22	28	34	110	42	67	126	168	84	48	15	13
10	23	36	39	101	36	64	129	171	79	44	15	11
11	25	33	34	86	35	61	134	165	73	41	15	12
12	32	29	34	82	35	60	165	162	79	37	15	13
13	26	27	41	75	33	61	168	154	92	35	16	12
14	23	27	41	72	35	58	171	145	81	35	16	13
15	21	26	34	67	37	55	168	136	77	38	16	12
16	20	26	31	67	48	64	178	134	75	37	15	12
17	19	30	32	162	55	112	198	132	70	32	14	13
18	19		34	105	61	110	205	122	68	30	16	14
19	19		52	86	67	105	178	122	68	29	17	13
20	19		45	73	72	105	198	116	61	30	17	12
21	19	26	41	67	73	99	205	103	67	29	18	15
22	19		37	66	73	94	188	96	73	27	18	23
23	19		36	66	70	94	171	88	82	23	17	20
24	19		69	55	70	96	159	81	110	22	16	19
25	19		66	55	70	99	148	82	88	22	16	23
26	19	23	73	52	68	107	145	96	90	22	15	33
27	23	25	103	61	70	116	145	94	79	20	13	27
28	25	28	208	57	72	122	151	82	73	22	12	22
29	23	26	130	55	-------	132	156	107	66	20	15	21
30	23	24	134	51	-------	142	145	116	66	20	15	20
31	27	-------	622	57	-------	154	-------	139	-------	20	14	-------

Monthly discharge of South Fork of Little Butte Creek near Lake Creek, Oreg., for the year ending September 30, 1923

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	32	17	21.3	1,310
November	36	23	26.9	1,600
December	622	25	74.9	4,610
January	227	51	95.8	5,890
February	73	33	51.8	2,880
March	154	55	89.0	5,470
April	205	126	160	9,520
May	171	81	127	7,810
June	134	61	86.2	5,130
July	66	20	36.6	2,250
August	18	12	15.6	959
September	33	11	16.0	952
The year	622	11	66.9	48,400

LITTLE BUTTE CREEK ABOVE EAGLE POINT, OREG.

LOCATION.—In NW. ¼ sec. 5, T. 36 S., R. 1 E., at Bieberstedt ranch, half a mile above intake of Eagle Point Canal and 3 miles east of Eagle Point, Jackson County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—April 24, 1916, to September 30, 1923. Station at Tronson ranch, maintained July 13, 1907, to April 30, 1916, was below intake of Eagle Point Canal.

GAGE.—Vertical staff on right bank; gage reader, Carl Bieberstedt. A staff gage one-fourth mile below was used April 24, 1916, to February 9, 1920.

CHANNEL AND CONTROL.—Bedrock overlain on one side by firm gravel; practically permanent. Control for old station was diversion dam of Eagle Point Canal which changed occasionally.

EXTREMES OF DISCHARGE.—Maximum stage during year from high-water mark, 8.2 feet during night of December 30–31 (discharge, 4,050 second-feet); minimum stage, 0.16 foot at 8 p. m. July 2 (discharge, 9.2 second-feet).

1916–1923: Maximum stage recorded, 11.3 feet at lower station January 12, 1918 (discharge, 6,200 second-feet); minimum discharge, 6.4 second-feet July 8 and 9, 1922.

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

DIVERSIONS.—The Rogue River Valley Canal, Medford Irrigation District Canal and the municipal water supply (about 7.5 second-feet) for Medford divert water above station. For records of Rogue River Valley and Medford Irrigation District Canals see pp. 163 and 165, the combined flow of which show the quantity of water carried past the gage. Several hundred acres are irrigated along the creek above the station. Eagle Point Canal diverts just below this station, but above old station at Tronson ranch. For records see p. 167.

REGULATION.—Water was being stored in Fish Lake Reservoir during December to June and released during October, November, July, August, and September. See record of stage of reservoir, p. 156.

ACCURACY.—Stage-discharge relation changed during high water of December 31. Rating curves used as follows: October 1 to December 31, well defined below 2,000 second-feet; January 1 to September 30 well defined between 15 and 200 second-feet. Gage read to hundredths twice a day. Daily 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 September 30, 1923

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Dec. 20	L. S. Brophy	1.07	95	July 11	K. N. Phillips	0.38	19.5
Apr. 9	K. N. Phillips	1.28	170	Aug. 1	Scheffel and Phillips	.38	20.2
27	do	1.31	178	14	Phillips and Hunter	.36	17.8
May 9	do	1.12	125	24	F. F. Henshaw	.36	16.5
25	do	.53	32.6	Sept. 24	K. N. Phillips	.56	32.7
June 16	do	.41	22.2				

Daily discharge, in second-feet, of Little Butte Creek above Eagle Point, Oreg., for the year ending September 30, 1923

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	92	107	90	720	81	120	220	169	96	10	21	16
2	80	98	88	510	85	133	220	155	69	10	19	16
3	70	90	96	435	74	120	190	130	58	12	17	15
4	70	92	82	435	73	109	190	125	49	14	18	15
5	66	86	349	630	76	116	175	125	40	16	20	16
6	66	86	357	435	77	125	265	128	44	22	20	17
7	84	88	180	330	81	120	220	113	41	40	20	17
8	80	88	118	265	77	118	190	113	29	27	18	16
9	88	94	109	235	68	111	166	125	24	24	19	17
10	90	162	152	205	69	111	172	130	18	21	19	17
11	86	112	88	172	69	109	169	120	14	21	17	14
12	112	96	94	155	77	105	205	123	15	20	15	16
13	118	88	116	141	74	107	220	125	34	20	16	17
14	88	86	92	136	73	102	220	111	27	20	18	16
15	86	88	73	120	102	98	220	105	26	20	17	16
16	84	86	44	116	220	111	235	98	22	27	16	16
17	88	96	68	550	169	205	250	96	21	21	16	16
18	86	105	65	220	172	190	265	90	20	20	16	14
19	80	96	114	166	190	175	250	109	18	20	18	14
20	82	96	77	133	190	172	280	100	17	20	19	14
21	84	94	78	120	172	160	280	74	16	20	20	15
22	80	86	70	118	175	155	265	60	14	20	18	55
23	78	84	66	136	155	152	235	46	26	19	17	33
24	77	84	254	105	143	141	205	36	76	18	17	31
25	82	86	128	100	141	125	190	30	44	16	16	43
26	82	80	190	102	130	125	175	50	41	16	15	74
27	94	82	350	302	125	141	175	46	33	19	16	54
28	92	102	1,640	190	120	158	190	43	25	20	16	47
29	86	88	575	152	-------	152	190	63	19	21	16	44
30	84	82	471	98	-------	166	169	66	14	21	16	42
31	96	-------	3,070	87	-------	190	-------	94	-------	20	15	-------

100941—27—WSP 574——11

Monthly discharge of Little Butte Creek above Eagle Point, Oreg., for the year ending September 30, 1923

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	118	66	84.9	5,220
November	162	80	93.6	5,570
December	3,070	44	301	18,500
January	720	87	246	15,100
February	220	68	116	6,440
March	205	98	136	8,360
April	280	166	213	12,700
May	169	30	96.7	5,950
June	96	14	33.0	1,960
July	40	10	19.8	1,220
August	21	15	17.5	1,080
September	74	14	25.1	1,490
The year	3,070	10	116	83,600

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, 1923.

GAGE.—Vertical staff on outside of new outlet tower graduated to read heights above sea level; read by Arthur Jeldness. Prior to September 30, 1921, readings were made on gages with zero at elevation 4,799 feet.

EXTREMES OF STAGE.—Maximum stage recorded during year, 4,820.35 feet July 4 (storage, 5,348 acre-feet); minimum stage, 4,801.38 feet September 30 (storage, 135 acre-feet).

1915–1923: Maximum stage recorded, that of July 4, 1923.

COOPERATION.—Gage readings and storage table furnished by Rogue River Valley Canal Co.

Gage height and contents of Fish Lake Reservoir near Lake Creek, Oreg., for the year ending September 30, 1923

Date	Gage height	Contents	Loss or gain during month	Date	Gage height	Contents	Loss or gain during month
	Feet	*Acre-feet*	*Acre-feet*		*Feet*	*Acre-feet*	*Acre-feet*
Oct. 31	4,801.70	166	−268	May 31	4,818.85	4,817	+883
Nov. 30	4,801.35	132	−34	June 30	4,820.30	5,329	+512
Dec. 31	4,807.74	1,366	+1,234	July 31	4,816.03	3,848	−1,481
Jan. 31	4,811.35	2,378	+1,012	Aug. 31	4,805.92	912	−2,936
Feb. 28	4,813.10	2,908	+530	Sept. 30	4,801.38	135	−777
Mar. 31	4,814.35	3,302	+394				
Apr. 30	4,816.44	3,984	+682	The year			−299

NORTH FORK OF LITTLE BUTTE CREEK AT FISH LAKE, NEAR LAKE CREEK, OREG.

LOCATION.—In SE. ¼ sec. 4, 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, 1923.

GAGE.—Stevens eight-day water-stage recorder about 500 yards below dam, installed July 10, 1918; inspected by employees of Rogue River Valley Canal Co.

DISCHARGE MEASUREMENTS.—Made by wading.

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

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 2.81 feet at 5 p. m. July 30 (discharge, 90 second-feet); practically dry December 10–31.

1914–1923: Maximum discharge, 115 second-feet September 28, 1922; minimum discharge, that of December 10–31, 1923.

ICE.—Stage-discharge relation unaffected by ice.

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 unstable. Rating curves used as follows: October 1 to December 9, fairly well defined; January 1 to February 5 and July 18 to September 30 well defined between 11 and 80 second-feet; February 6 to July 17, shifting-control method used. Daily discharge ascertained by applying to rating table mean daily gage height obtained by inspecting recorder graph. Records good.

Discharge measurements of North Fork of Little Butte Creek at Fish Lake, near Lake Creek, Oreg., during the year ending September 30, 1923

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
May 21	Chadwick and Jeldness[a]	1.70	16.7	July 27	Brophy, Phillips, and Smith	1.525	13.5
June 20	Phillips and Scheffel	1.76	17.6	27	do	1.775	24.8
July 12	Scheffel and Powell[b]	2.13	29.9	28	K. N. Phillips	2.72	78.2
14	do	2.10	40.2	Aug. 14	do	2.65	78.0
26	Brophy and Smith[a]	2.66	78.7	27	Henshaw and Chadwick	2.50	68.0
27	Brophy, Phillips, and Smith	2.50	68.0	Sept. 14	K. N. Phillips	2.06	43.7
27	do	2.03	38.7				

[a] Employees of Rogue River Valley Canal Co. [b] Employees of Medford Irrigation District.

Daily discharge, in second-feet, of North Fork of Little Butte Creek at Fish Lake, near Lake Creek, Oreg., for the year ending September 30, 1923

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	68	35	30	2.5	2.9	6.0	8.0	13	17	16	88	60
2	49	35	29	3.1	3.1	6.2	7.5	13	18	16	88	60
3	41	34	30		3.1	6.4	7.3	14	18	15	88	57
4	37	32	12		3.2	6.4	7.5	15	18	19	88	56
5	35	32	15		3.3	6.6	7.5	15	17	31	88	54
6	35	32	27		3.4	6.6	7.8	15	17	31	86	52
7	33	32	28		3.4	6.8	7.8	15	17	32	84	50
8	32	31	28		3.5	7.0	7.8	16	18	30	82	49
9	33	32	15		3.6	7.3	8.0	16	18	29	77	48
10	33	34	------		4.0	7.0	8.3	16	18	30	74	46
11	33	34	------		4.1	6.8	8.3	17	18	29	73	45
12	35	32	------		4.1	6.8	8.8	17	18	28	76	44
13	34	31	------		4.2	7.0	9.1	17	18	35	78	42
14	32	30	------		4.2	7.0	9.1	17	18	45	78	41
15	32	30	------	1.0	4.4	7.0	9.1	17	18	48	78	39
16	32	31	------		4.6	7.3	9.6	16	18	49	78	37
17	32	32	------		4.4	7.5	9.6	16	17	50	77	36
18	31	34	------		4.7	7.3	9.9	16	17	54	77	33
19	31	32	------		4.7	6.8	10	17	18	59	78	30
20	32	33	------		4.7	6.6	11	17	18	64	77	30
21	32	32	------		4.8	6.6	11	16	18	66	77	29
22	30	30	------		4.8	6.8	11	16	17	68	77	30
23	29	29	------		4.8	6.8	11	16	18	67	76	29
24	31	30	------		5.2	7.0	11	16	17	69	74	28
25	31	29	------		5.4	7.0	11	16	17	71	73	29
26	30	28	------		5.6	6.0	12	16	17	76	71	32
27	30	28	------		5.8	6.2	12	16	17	70	69	31
28	32	29	------	2.5	5.8	6.4	12	16	16	83	67	30
29	32	32	------	2.6	------	6.8	12	17	16	83	67	29
30	31	30	------	2.6	------	7.3	12	17	16	86	64	28
31	33	------	------	2.8	------	8.0	------	17	------	89	62	------

NOTE.—Creek practically dry Dec. 10-31. Mean discharge Jan. 3-27 estimated.

Monthly discharge of North Fork of Little Butte Creek at Fish Lake, near Lake Creek, Oreg., for the year ending September 30, 1923

Month	Discharge in second-feet			Run-off in acre-feet		
	Maximum	Minimum	Mean	Observed	Gain or loss in storage	Corrected for storage
October	68	29	34.2	2,100	−268	1,830
November	35	28	31.5	1,870	−34	1,840
December	30	------	6.90	424	+1,234	1,660
January	3.1	------	1.33	82	+1,012	1,090
February	5.8	2.9	4.28	238	+530	768
March	8.0	6.0	6.82	419	+394	813
April	12	7.3	9.57	569	+682	1,250
May	17	13	15.9	978	+833	1,810
June	18	16	17.4	1,040	+512	1,550
July	89	15	49.6	3,050	−1,481	1,570
August	88	62	77.1	4,740	−2,936	1,800
September	60	28	40.1	2,390	−777	1,610
The year	89	------	24.7	17,900	−299	17,600

NORTH FORK OF LITTLE BUTTE CREEK ABOVE MEDFORD INTAKE, NEAR LAKE CREEK, OREG.

LOCATION.—In SW. ¼ sec. 25, T. 36 S., R. 2 E., 200 yards above intake of city of Medford water supply pipe and 5 miles above Lake Creek post office and mouth of South Fork.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—September 10, 1911, to March 31, 1913; May 26, 1922, to September 30, 1923.

GAGE.—Stevens eight-day water-stage recorder on right bank, inspected by employees of Rogue River Valley Canal Co. Vertical staff 700 feet above intake used 1911–1913.

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

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

EXTREMES OF DISCHARGE.—Maximum stage during the year from water-stage recorder, 2.03 feet July 31, August 1, 4, and 5 (discharge, 115 second-feet); minimum stage recorded, 1.32 feet at noon December 17 (discharge, 21 second-feet).

1911–1913; 1922–1923: Maximum discharge recorded, 435 second-feet, February 17, 1912; minimum discharge, that of December 17, 1922.

ICE.—None.

DIVERSIONS.—Some minor diversions for irrigation above station. Hanley ditches and water supply pipe line of city of Medford divert just below gage.

REGULATION.—Affected by storage in Fish Lake, about 12 miles upstream. Monthly run-off determinations corrected.

ACCURACY.—Stage-discharge relation changed about December 31. Rating curve used October 1 to December 23, fairly well defined; curve used January 14 to September 30, well defined. Operation of water-stage recorder satisfactory, except for short periods, and from December 24 to January 13, when it was removed for repairs. Daily discharge ascertained by applying to rating table mean daily discharge obtained by inspecting recorder graph. Records good.

Discharge measurements of North Fork of Little Butte Creek above Medford intake, near Lake Creek, Oreg., during the year ending September 30, 1923

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Dec. 13	L. S. Brophy[a]	1.40	26.5	June 9	K. N. Phillips	1.67	52
Mar. 26	Phillips and Cummings[b]	1.61	47.9	28	do	1.65	51
Apr. 14	Brophy and Smith	1.63	49.4	July 26	do	1.95	100
24	K. N. Phillips	1.70	56	Aug. 14	do	1.99	108
May 22	Brophy and Smith[a]	1.66	54	28	do	1.92	94
29	Phillips and Cummings	1.74	60	Sept. 7	Brophy and Smith	1.78	76
				15	K. N. Phillips	1.72	61

[a] Employees of Rogue River Valley Canal Co. [b] County water master.

Daily discharge, in second-feet, of North Fork of Little Butte Creek above Medford intake, near Lake Creek, Oreg., for the year ending September 30, 1923

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	100	65	58		34	46	53	55	66	53	115	83
2	87	64	58			46	53	54	61	52	113	83
3	74	64	58		33	45	50	55	60	52	113	83
4	72	64	50	60		44	50	55	58	54	115	80
5	69	64	33		33	45	53	55	58	67	115	76
6	68	65	61		33	46	57	57	58	75	113	73
7	67	64	60		33	46	57	57	57	72	111	72
8	67	64	55		35	45	55	57	55	67	109	70
9	65	65	49		35	45	54	57	53	66	103	70
10	65	67	28	42	35	44	54	57	52	66	100	68
11	66	66	25		35	44	55	57	50	64	98	68
12	67	65	24		35	44	53	57	53	66	100	67
13	65	64	25		34	44	52	57	55	73	103	64
14	66	64	25	35	34	44	50	57	53	76	105	64
15	67	64	24	35	36	45	52	55	54	83	103	62
16	66	65	22	37	39	50	52	55	53	82	103	61
17	67	67	21	48	42	64	54	55	53	82	101	60
18	66	66		42	43	60	54	55	53	83	103	58
19	64	65		39	46	57	53	57	53	88	105	57
20	67	65	28	37	48	57	60	55	52	94	105	55
21	65	65		36	50	55	66	55	54	96	105	55
22	61	62		36	50	54	62	55	54	98	105	57
23	65	60	24	37	49	53	58	57	57	96	101	53
24	67	60		36	49	52	58	57	57	98	100	53
25	73	58	35	35	48	52	60	57	57	98	98	57
26	72	58		36	46	52	58	57	57	103	98	60
27	73	58			46	52	58	57	54	96	96	57
28	74	59	100	35	46	53	58	57	53	111	92	54
29	67	60		34	------	53	55	67	52	111	87	54
30	62	59	60	34	------	55	54	62	53	113	87	54
31	64	------	130		------	53	------	68	------	115	85	------

Monthly discharge of North Fork of Little Butte Creek above Medford intake, near Lake Creek, Oreg., for the year ending September 30, 1923

Month	Discharge in acre-feet			Run-off in acre-feet		
	Maximum	Minimum	Mean	Observed	Gain or loss in storage	Corrected for storage
October	100	61	69.0	4,240	−268	3,970
November	67	58	63.2	3,760	−34	3,730
December	------	21	42.9	2,640	+1,234	3,870
January	------	------	42.4	2,610	+1.012	3,620
February	50	33	39.8	2,210	+530	2,740
March	64	44	49.8	3,060	+394	3,450
April	66	50	55.3	3,290	+682	3,970
May	68	54	57.0	3,500	+833	4,330
June	66	50	55.2	3,280	+512	3,790
July	115	52	82.3	5,060	−1,481	3,580
August	115	85	103	6,330	−2,936	3,390
September	83	53	64.3	3,830	−277	3,050
The year	------	21	60.5	43,800	−299	43,500

NORTH FORK OF LITTLE BUTTE CREEK ABOVE INTAKE OF ROGUE RIVER VALLEY CANAL, NEAR LAKE CREEK, OREG.

LOCATION.—In NW. ¼ 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, 1921, to September 30, 1923.

GAGE.—Stevens eight-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 stage during year from water-stage recorder, 2.60 feet at 1 a. m. December 31 (discharge, 483 second-feet); minimum stage, 0.74 foot from 3 p. m. December 16 to 2 a. m. December 17 (discharge, 18 second-feet).

1916–1919; 1921–1923: 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 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. 156.)

ACCURACY.—Stage-discharge relation changed at time of high water December 31. Two rating curves well defined. Operation of water-stage recorder satisfactory. Daily discharge obtained by applying to rating table mean daily gage height obtained by inspecting recorder graph. Records good.

Discharge measurements of North Fork of Little Butte Creek above intake of Rogue River Valley Canal, near Lake Creek, Oreg., during the year ending September 30, 1923

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Dec. 4	L. S. Brophy[a]	1.06	49.3	June 28	K. N. Phillips	0.92	32.5
Mar. 26	K. N. Phillips	1.03	45.0	July 11	do	1.08	52
30	Brophy and Jennings[a]	1.06	49.0	26	Brophy and Smith[a]	1.27	78.1
Apr. 24	K. N. Phillips	1.08	49.0	Aug. 11	K. N. Phillips	1.26	76.4
May 9	do	1.00	41.9	28	do	1.21	68.5
June 9	do	.94	36.0	Sept. 20	do	.96	36.1

[a] Employee of Rogue River Valley Canal Co.

Daily discharge, in second-feet, of North Fork of Little Butte Creek above intake of Rogue River Valley Canal, near Lake Creek, Oreg., for the year ending September 30, 1923

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	110	59	54	102	42	43	54	52	61	34	98	69
2	88	60	52	78	32	43	52	49	56	32	96	70
3	66	56	55	69	31	43	51	48	56	32	98	69
4	60	55	47	67	30	40	51	47	47	33	96	63
5	59	55	50	106	30	42	51	46	39	40	98	61
6	56	55	84	78	31	45	60	45	39	64	96	60
7	56	54	64	60	31	43	57	41	37	69	96	57
8	55	54	55	57	31	42	54	41	36	60	94	52
9	55	59	50	51	32	42	53	41	36	53	91	51
10	55	86	35	47	31	41	53	43	35	52	83	51
11	60	61	25	43	31	40	54	42	37	52	80	49
12	68	55	26	40	32	40	52	45	46	51	81	51
13	61	52	29	38	31	40	52	43	49	61	87	51
14	61	51	24	36	33	40	51	43	40	64	89	49
15	59	51	21	33	36	39	51	42	40	77	89	48
16	56	52	19	33	45	42	52	41	40	73	85	47
17	57	55	18	59	47	63	54	39	39	67	83	42
18	57	56	24	42	49	56	59	36	37	69	85	38
19	55	55	33	38	51	53	51	49	37	73	85	38
20	55	54	25	35	49	53	45	45	35	78	85	38
21	56	55	23	33	51	52	56	39	40	81	83	39
22	55	52	21	33	51	52	60	36	39	83	81	72
23	55	51	20	36	48	49	54	36	48	83	81	46
24	51	50	36	32	49	48	52	35	49	80	80	45
25	56	52	29	32	48	48	47	39	46	81	78	61
26	55	50	37	33	45	47	47	48	49	83	78	72
27	56	52	37	41	43	46	52	41	45	75	75	53
28	57	57	173	42	43	47	52	41	38	92	70	51
29	55	54	78	39	-------	47	51	60	36	89	72	48
30	54	52	71	37	-------	48	52	56	36	92	70	48
31	59	-------	295	46	-------	51	-------	63	-------	98	67	-------

Monthly discharge of North Fork of Little Butte Creek above intake of Rogue River Valley Canal, near Lake Creek, Oreg., for the year ending September 30, 1923

Month	Discharge in second-feet			Run-off in acre-feet		
	Maximum	Minimum	Mean	Observed	Gain or loss in storage	Corrected for storage
October	110	51	59.9	3,680	−268	3,410
November	86	50	55.3	3,290	−34	3,260
December	295	18	51.9	3,190	+1,234	4,420
January	106	32	48.9	3,010	+1,012	4,020
February	51	30	39.4	2,190	+530	2,720
March	63	39	46.0	2,830	+394	3,220
April	60	45	52.7	3,140	+682	3,820
May	63	35	44.3	2,720	+833	3,550
June	61	35	42.3	2,520	+512	3,030
July	98	32	66.8	4,110	−1,481	2,630
August	98	67	84.8	5,210	−2,936	2,270
September	70	38	53.0	3,150	−777	2,370
The year	295	18	53.9	39,000	−299	38,700

ROGUE RIVER VALLEY CANAL NEAR BROWNSBORO, OREG.

LOCATION.—In SW. ¼ sec. 8, T. 36 S., R. 1 E., at head of Bradshaw Drop, 50 feet below intake of Medford Irrigation District Canal, 2 miles southwest of Brownsboro, 8 miles below intake, and 16 miles from Medford, Jackson County.

RECORDS AVAILABLE.—Irrigation seasons of 1913; 1915–1919; and 1921–1923.

GAGE.—Stevens eight-day water-stage recorder on right bank; inspected by J. Smith.

DISCHARGE MEASUREMENTS.—Made by wading or from a plank.

CHANNEL AND CONTROL.—Control solid rock reef, about 50 feet below gage; practically permanent.

EXTREMES OF DISCHARGE.—Maximum stage during period from water-stage recorder, 2.13 feet at 5 p. m. June 1 (discharge, 65 second-feet); canal dry October 8 to May 28.

1913–1923: Maximum discharge, that of June 1, 1923. Canal dry each winter.

ACCURACY.—Stage-discharge relation practically permanent. 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.

The Rogue River Valley Canal diverts water from North Fork of Little Butte Creek in NE. ¼ sec. 20, 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 year ending September 30, 1923

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Apr. 3	Brophy and Smith[a]	1.03	9.52	June 13	K. N. Phillips	1.78	43.0
13	do	1.03	9.24	16	do	1.60	32.3
27	do	1.31	18.4	19	do	1.59	31.6
27	K. N. Phillips	1.32	19.0	28	do	1.87	48.0
May 19	do	1.67	35.1	28	Brophy and Smith	1.96	53.2
11	Brophy and Smith	1.76	40.0	Aug. 11	K. N. Phillips	1.40	22.8
25	K. N. Phillips	1.75	39.3	Sept. 7	Brophy and Smith	1.38	22.4
June 4	Brophy and Smith	2.06	59.8	20	K. N. Phillips	1.07	10.0
5	K. N. Phillips	1.95	52.7	29	Brophy and Smith	1.37	20.9

[a] Employees of Rogue River Valley Canal Co.

Daily discharge, in second-feet, of Rogue River Valley Canal near Brownsboro, Oreg., for the year ending September 30, 1923

Day	Oct.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	31		11	20	64	39	45	27
2	27		11	23	62	30	40	26
3	23		10	23	62	22	38	25
4	21		10	18	60	20	40	22
5	20		11	25	52	22	40	22
6	16		12	42	55	43	42	20
7	4		10	52	51	51	41	21
8			9.8	55	39	44	40	20
9			9.8	44	29	35	36	15
10			9.5	39	26	28	30	16
11			9.0	40	28	36	23	15
12			9.0	49	30	32	22	15
13			9.2	60	41	32	27	14
14			9.2	57	30	36	28	14
15			9.2	54	30	35	27	13
16			9.2	50	30	38	26	12
17			9.8	53	29	32	24	12
18			10	51	24	25	24	10
19			11	57	26	30	24	10
20			13	57	30	32	27	11
21			15	40	39	36	30	26
22			13	23	47	35	30	36
23			14	40	49	32	27	28
24			14	42	45	30	26	29
25			14	41	52	28	25	32
26			18	49	50	26	23	32
27			20	47	47	25	18	22
28			20	45	47	30	16	22
29		1.3	19	54	46	30	20	21
30		6.9	20	60	44	29	22	21
31		10		61		37	19	

NOTE.—Canal dry Oct. 8 to Mar. 28.

Monthly discharge of Rogue River Valley Canal near Brownsboro, Oreg., for the year ending September 30, 1923

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October 1–7	31	4	20.3	282
March 29–31	10	1.3	6.07	36
April	20	9.2	12.3	732
May	61	18	44.2	2,720
June	64	26	42.1	2,510
July	51	20	32.3	1,990
August	45	16	29.0	1,780
September	36	16	20.3	1,210

MEDFORD IRRIGATION DISTRICT CANAL NEAR BROWNSBORO, OREG.

LOCATION.—In SW. ¼ sec. 8, T. 36 S., R. 1 E., 100 yards below diversion from Rogue River Valley Canal, 2 miles southwest of Brownsboro, Jackson County.

RECORDS AVAILABLE.—May 14, 1922, to September 30, 1923.

GAGE.—Lietz water-stage recorder on right bank; inspected by L. S. Brophy.

DISCHARGE MEASUREMENTS.—Made from a footbridge near gage.

EXTREMES OF DISCHARGE.—Maximum stage during year from water-stage recorder, 2.31 feet at 5 p. m. June 13 (discharge, 69.7 second-feet); canal dry at times.

1922–1923: Maximum discharge, that of June 13, 1923; canal dry at times.

REGULATION.—Flow regulated at diversion from Rogue River Valley Canal.

ACCURACY.—Stage-discharge relation affected by growth of moss. Rating curve very well defined. Daily readings used to April 30; operation of recorder satisfactory, May 1 to September 30, except for short periods. Records excellent.

Medford Irrigation District Canal diverts water from Rogue River Valley Canal in SW. ¼ sec. 8, T. 36 S., R. 1 E., just above Bradshaw Drop, and extends along east side of Rogue River Valley to Phoenix, where its waters are conducted across Bear Creek in a siphon into the Phoenix Canal. About 6,800 acres were irrigated in 1923.

Discharge measurements of Medford Irrigation District Canal near Brownsboro, Oreg., during the year ending September 30, 1923

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Mar. 28	Scheffel[a] and Smith[b]	1.26	24.2	June 19	K. N. Philips	2.26	62.6
28	Brophy and Jennings[b]	1.26	24.0	28	do	1.85	44.2
Apr. 13	Brophy, Jennings, and Smith	1.04	17.1	28	Brophy and Smith	1.87	44.9
27	do	.98	15.4	July 2	do	1.81	43.0
27	K. N. Phillips	.98	13.2	2	K. N. Phillips	1.82	43.7
May 9	do	1.88	49.8	16	do	2.09	52.9
11	Brophy and Smith	1.82	46.6	16	Brophy and Smith	2.09	53.0
25	K. N. Phillips	1.85	45.7	16	F. W. Scheffel	2.09	51.2
31	Brophy and Smith	1.92	48.8	Aug. 10	Scheffel and Leach[a]	1.98	43.8
June 5	K. N. Phillips	1.89	46.5	13	Brophy and Smith	2.08	48.4
5	F. W. Scheffel	1.89	46.1	16	do	2.06	47.6
5	Brophy and Smith	1.89	47.4	16	Scheffel and Leach	2.06	47.6
12	do	2.23	62.7	16	K. N. Phillips	2.06	47.9
13	K. N. Phillips	2.29	65.3	Sept. 11	do	1.56	27.0
19	Brophy and Smith	2.26	62.2	11	Brophy and Smith	1.56	27.4
19	F. W. Scheffel	2.26	62.3	20	K. N. Phillips	1.54	26.1

[a] Employees of Medford Irrigation District. [b] Employees of Rogue River Valley Canal Co.

Daily discharge, in second-feet, of Medford Irrigation District Canal near Brownsboro, Oreg., for the year ending September 30, 1923

Day	Mar.	Apr.	May	June	July	Aug.	Sept.
1		15.8		48.4	42.7	41.4	39.2
2		15.8	16	48.0	42.2	45.3	33.4
3		15.8		47.5	40.1	44.9	33.4
4		15.8	20.5	47.1	39.7	41.4	33.0
5		15.8	20.0	46.6	39.7	40.5	31.2
6		17.0	12.8	47.1	41.4	40.5	29.2
7		16.4	23.0	46.6	47.8	40.1	27.7
8		16.4	23.3	53.6	48.0	40.1	27.7
9		16.4	40.5	60.5	46.6	43.6	27.3
10		17.0	47.0	60.5	45.3	44.0	27.3
11		18.2	47.5	61.0	35.2	46.6	27.3
12		17.6	28.0	62.0	35.9	49.3	27.3
13		17.6	17.3	64.8	38.4	47.5	26.9
14		17.0	17.0	62.4	40.5	47.5	27.3
15		17.0	20.5	62.0	39.7	48.0	27.3
16		17.0	22.6	62.4	47.6	47.5	27.3
17		17.6	17.2	61.5	50.2	47.1	27.3
18		17.0	16.1	60.1	48.0	46.6	26.9
19		14.6	15.5	61.5	49.3	47.1	26.6
20		14.0	15.5	50.9	48.8	47.1	26.2
21		17.6	33.9	45.4	46.2	44.9	11.0
22		17.0	43.1	47.1	48.0	47.1	1.3
23		15.8	45.3	46.6	48.4	48.4	
24		15.8	45.3	45.3	47.5	48.4	
25		15.8	44.4	47.1	46.6	48.4	
26		13.4	45.3	52.4	45.8	48.4	
27		15.8	45.8	51.9	45.3	47.2	
28	24.4	15.2	45.3	46.6	48.0	46.2	
29	24	15.2	46.6	44.9	51.0	48.0	
30	19	15.2	46.6	42.7	47.5	48.4	
31	17		48.8		48.0	48.0	

NOTE.—Canal dry Sept. 23–30.

Monthly discharge of Medford Irrigation District Canal near Brownsboro, Oreg., for the year ending September 30, 1923

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
March 28–31	24.4		21.1	167
April	18.2	13.4	16.2	964
May	48.8		30.4	1,870
June	64.8	42.7	52.8	3,140
July	51.0	35.2	44.8	2,750
August	49.3	40.1	45.8	2,820
September	39.2	0	19.7	1,170
The period				12,900

EAGLE POINT CANAL NEAR EAGLE POINT, OREG.

LOCATION.—In SE. ¼ sec. 31, T. 35 S., R. 1 E., halfway between point of diversion and point where canal crosses Eagle Point-Brownsboro road, 100 feet above intake of Pelouze lateral, and 2½ miles east of Eagle Point, Jackson County.

RECORDS AVAILABLE.—Irrigation seasons 1920 to 1923.

GAGE.—Vertical staff fixed to an alder tree on left bank; read by Carl Bieberstedt and assistant water master.

DISCHARGE MEASUREMENTS.—Made by wading or from downstream side of highway bridge.

CHANNEL AND CONTROL.—Artificial earth channel; banks high and uniform; no definite control. A fish-wheel structure just above head gate of Pelouze lateral acts as control; changes in this structure or accumulation of moss on the screens may change stage-discharge relation.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period, 2.20 feet May 29 and 30 (discharge, 27 second-feet); canal dry at times during winter.

1920–1923: Maximum discharge that of May 29 and 30, 1923. Canal dry at times.

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

DIVERSIONS.—None.

REGULATION.—Flow in canal regulated by head gates.

ACCURACY.—Stage-discharge relation unstable owing to operation of flashboards and fish wheel. Fairly well-defined rating curve used May 5 to June 29; shifting-control method, May 1 to 4 and June 30 to September 24. Gage read to hundredths daily. Daily discharge ascertained by applying daily gage height to rating table. Records good.

The Eagle Point Canal of the Little Butte Irrigation Co. diverts water from Little Butte Creek, in SE. ¼ sec. 31, T. 35 S., R. 1 E.; water is used for irrigating near Eagle Point.

Discharge measurements of Eagle Point Canal near Eagle Point, Oreg., during the year ending September 30, 1923

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Apr. 16	K. N. Phillips	1.34	11.5	June 29	Brophy and Smith	1.82	16.7
24	do	1.32	10.7	July 9	do	2.05	21.0
27	Brophy and Smith [a]	1.32	10.8	11	K. N. Phillips	1.91	18.0
May 9	K. N. Phillips	1.97	21.1	Aug. 1	Scheffel [b] and Phillips	1.92	18.5
10	Brophy and Smith	1.98	21.1	14	K. N. Phillips	1.86	16.8
25	K. N. Phillips	1.64	13.6	22	Brophy and Smith	1.93	18.7
June 13	do	1.93	19.8	23	F. F. Henshaw	1.88	17.1
16	do	1.68	14.8	Sept. 24	K. N. Phillips	1.52	10.2
28	do	1.78	15.7				

[a] Employees of Rogue River Valley Canal Co. [b] Employee of Medford Irrigation District.

Daily discharge, in second-feet, of Eagle Point Canal near Eagle Point, Oreg., for the year ending September 30, 1923

Day	Apr.	May	June	July	Aug.	Sept.
1			25.9	10.3	18.6	15.4
2		25.0	24.2	9.6	19.1	15.6
3			23.7	9.8	15.8	15.2
4		22.0	21.9	12.5	14.9	14.9
5		18.1	21.9	13.1	17.7	16.0
6		18.0	21.6	20.4	18.6	16.0
7		17.4	21.9	25.6	18.6	17.4
8		19.0	16.7	21.4	18.9	15.2
9		20.6	16.7	20.6	17.7	15.6
10		20.8	12.1	19.4	16.3	15.6
11		20.8	10.6	17.7	17.2	15.2
12		21.1	12.1	18.1	14.3	14.7
13		21.1	19.8	18.1	14.9	15.6
14		20.6	16.5	18.6	16.5	14.7
15			16.5	18.1	16.5	15.2
16	11.5	20.1	14.1	23.9	15.8	17.7
17			13.9	19.1	14.9	8.9
18		19.6	12.1	18.9	14.3	13.7
19		20.1	12.1	19.6	17.7	12.9
20		20.1	13.7	19.6	18.9	12.7
21		19.6	16.3	17.7	16.7	
22		18.1	15.4	16.3	19.1	11.6
23		16.3	18.1	17.7	18.1	
24	10.7	14.5	18.6	16.3	17.7	10.3
25		12.9	18.1	14.1	16.7	
26		19.4	18.1	13.3	15.4	
27	10.8	22.6	17.9	16.0	17.2	
28		22.6	17.4	15.8	16.3	
29		27.0	16.7	18.1	17.2	
30		27.0	12.7	18.6	16.3	
31		25.6		16.7	15.8	

Monthly discharge of Eagle Point Canal near Eagle Point Oreg., for the year ending September 30, 1923

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
May	27.0	12.9	20.7	1,270
June	25.9	10.6	17.2	1,020
July	25.6	9.6	17.3	1,060
August	19.1	14.3	16,9	1,040
September 1-24	17.7	8.9	14.3	681
The period				5,070

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; November 23, 1920, to July 15, 1921; November 1, 1921, to July 1, 1922; and February 14 to July 8, 1923.

GAGE.—Stevens continuous 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; fairly straight.

EXTREMES OF DISCHARGE.—Maximum stage during period, from water-stage recorder, 4.70 feet at 8 a. m. February 20 (discharge, 52 second-feet); stream reported dry beginning July 9.

1920–1923: Maximum stage, from water-stage recorder, 7.65 feet February 13, 1921 (discharge, 900 second-feet); creek dry each summer.

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

DIVERSIONS.—Station is above practically all diversions except East lateral of Talent Irrigation District, which diverts just above station. Water from Hyatt Prairie Reservoir on Keene Creek, a tributary in the Klamath River Basin, is diverted into Emigrant Creek by Keene Creek Canal. Records of diversion by Keene Creek Canal are published in Water-Supply Paper 571.

REGULATION.—None.

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

Discharge measurements of Emigrant Creek near Ashland, Oreg., during the year ending September 30, 1923

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Apr. 6	K. N. Phillips	4.43	27.5	Apr. 28	Phillips and Henshaw	4.09	9.4
12	Phillips and Brophy	4.57	38.9	May 7	K. N. Phillips	3.79	1.9
21	K.N.Phillips	4.41	28.8	June 8	do	3.75	1.4

Daily discharge, in second-feet, of Emigrant Creek near Ashland, Oreg., for the year ending September 30, 1923

Day	Feb.	Mar.	Apr.	May	June	July	Day	Feb.	Mar.	Apr.	May	June	July
1		32	32	14		0.1	16	18	16	35	2.6	1.7	
2		32	32	9.0		.1	17	26	35	36	2.2	1.6	
3		24	30	11		.1	18	27	31	38	2.2	1.6	
4		21	26	9.4	1.6	.2	19	32	30	32	2.2	1.4	
5		21	31	3.7		.2	20	41	31	28	2.2	1.2	
6		21		3.3		.4	21	44	27	25	1.7	1.3	
7		21	30	2.8		.5	22	43	24	24	1.3	1.1	
8		20		3.0	1.3	.2	23	38	23	23	1.7	1.6	
9		18	29	3.1	1.3		24	34	22	20	1.6	1.1	
10			32	2.8	1.2		25	31	23	18	1.7	.7	
11		16	33	3.1	1.6		26	27	24	15	1.7	.4	
12			38	3.3	1.9		27	25	26	10	1.7	.5	
13		14	38	3.1	2.4		28	27	27	11	1.7	.5	
14	10	14	36	3.0	1.7		29		31	13	2.0	.2	
15	11	13	34	3.0	1.7		30		31	15	1.7	.1	
							31		31				

Monthly discharge of Emigrant Creek near Ashland, Oreg., for the year ending September 30, 1923

Month	Discharge in second-feet			Run-off in acre-feet	
	Maximum	Minimum	Mean	Emigrant Creek	Emigrant Creek plus East lateral diversion [a]
November				[b] 238	238
December				[b] 1,540	1,540
January				[b] 2,640	2,640
February	44	10		[b] 1,190	1,190
March	35	13	23.6	1,450	1,450
April	38	10	27.5	1,640	1,960
May	14	1.3	3.47	213	652
June	2.4	.1	1.31	78	311
July 1–10	.5	.1	.22	3.4	20
The year					10,000

[a] Water diverted from Keene Creek by Keene Creek Canal not included. Diversion from Keene Creek began June 17, 1923. See "Diversion"
[b] Estimated by comparison with records for Bear Creek at Medford.

BEAR CREEK NEAR ASHLAND, OREG.

LOCATION.—In sec. 31, T. 38 S., R. 1 E., 300 yards below mouth of Butler Creek, 3 miles southeast of Talent, and 3 miles northwest of Ashland, Jackson County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—April 30 to August 31, 1923.

GAGE.—Stevens eight-day recorder on left bank; inspected by employees of Talent Irrigation District.

DISCHARGE MEASUREMENTS.—Made by wading near gage.

CHANNEL AND CONTROL.—Gravel bar, 200 feet below gage, acts as control. Channel divided at low stages, shifting at high stages. Left bank low, right bank high; both wooded.

EXTREMES OF DISCHARGE.—Maximum stage recorded, 2.00 feet at noon June 24 (discharge, 42 second-feet); minimum stage, 1.09 feet at 5 p. m. August 24 (discharge, 0.4 second-foot).

ICE.—None.

DIVERSIONS.—Station is below diversions of Talent Irrigation District and above point of return of seepage water from area irrigated.

REGULATION.—None, except by irrigation diversions.

ACCURACY.—Stage-discharge relation not permanent. Rating curves well defined. Gage-height record poor April 30 to June 24; excellent June 25 to August 31. Daily discharge ascertained by applying to rating table mean gage height obtained by inspecting recorder graph. Records fair April 30 to June 24; excellent thereafter.

Discharge measurements of Bear Creek near Ashland, Oreg., during the year ending September 30, 1923

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Apr. 30	K. N. Phillips	1.79	25.4	June 8	K. N. Phillips	1.51	8.6
May 3	do	1.75	21.8	26	do	1.79	27.0
7	do	1.48	7.9	July 13	do	1.26	2.2
16	do	1.60	13.4	31	do	1.15	[a].8
June 1	do	1.87	31.4	Aug. 24	Phillips and Henshaw	1.09	[a].4

[a] Estimated.

Daily discharge, in second-feet, of Bear Creek near Ashland, Oreg., for the year ending September 30, 1923

Day	May	June	July	Aug.	Day	May	June	July	Aug.
1	24	33	7.1	0.7	16	18	6.6	1.0	0.6
2		25	4.4	.7	17	20	7	1.2	.6
3	22	25	3.6	.7	18	20	7.4	1.4	.6
4	18	19	5.3	.9	19	19	13	2.8	.6
5	14	16	5.6	1.0	20	18	7	2.6	.6
6	12	17	5.9	1.0	21	18	7.8	2.3	.6
7	11	18	16	.9	22	17	8.5	2.1	.5
8	9.8	11	13	.7	23	18	26	3.3	.4
9	9.4	11	9.9	.8	24	17	39	1.9	.4
10	11	7.2	5.3	.9	25	17	30	1.9	
11	9.8	7.4	3.6	.9	26	18	25	1.7	
12	12	5.9	3.3	.9	27	19	19	1.6	.4
13	17	11	2.1	1.0	28	17	15	1.1	
14	18	8.1	1.6	.8	29	28	11	1.0	
15	20	9	1.1	.6	30	27	9.1	1.0	
					31	33		.8	

Monthly discharge of Bear Creek near Ashland, Oreg., for the year ending September 30, 1923

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
May	33	9.4	17.9	1,100
June	39	5.9	15.2	904
July	16	.8	3.73	229
August	1.0		.65	40
The period	39			2,270

BEAR CREEK BELOW PHOENIX CANAL, NEAR TALENT, OREG.

LOCATION.—In sec. 23, T. 38 S., R. 1 W., 500 feet below intake of Phoenix Canal and 1 mile north of Talent, Jackson County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—May 11 to September 30, 1923.

GAGE.—Stevens eight-day water-stage recorder on left bank; inspected by employees of Medford Irrigation District.

DISCHARGE MEASUREMENTS.—Made by wading near gage.

CHANNEL AND CONTROL.—Channel fairly straight; banks high and are not overflowed except during extremely high water. Riffle 100 feet downstream forms a well-defined and practically permanent control. Bed composed of gravel and boulders.

EXTREMES OF DISCHARGE.—Maximum stage during year from water-stage recorder, 1.50 feet at 7 a. m. on June 26 (discharge, 42 second-feet); minimum stage, 0.56 foot at 6 a. m. June 12 (discharge, 0.1 second-foot).

DIVERSIONS.—Many diversions for irrigation above.

REGULATION.—None except by irrigation diversions.

ACCURACY.—Stage-discharge relation permanent. Rating curve fairly well defined. Operation of water-stage recorder satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height determined by inspection from recorder graph or, for days of considerable variation in stage, by averaging results obtained by applying mean gage height for shorter intervals. Records good.

Discharge measurements of Bear Creek below Phoenix Canal, near Talent, Oreg., during the year ending September 30, 1923

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Apr. 28	K. N. Phillips	1.13	11.6	June 26	K. N. Phillips	1.38	29.0
May 8	do	.67	.4	July 27	F. W. Scheffel	1.13	14.1
11	Phillips and Scheffel*	.62	.2	Aug. 24	K. N. Phillips	.64	.2
June 1	K. N. Phillips	1.10	9.8				

* Employee of Medford Irrigation District.

Daily discharge, in second-feet, of Bear Creek below Phoenix Canal, near Talent, Oreg., for the year ending September 30, 1923

Day	May	June	July	Aug.	Sept.	Day	May	June	July	Aug.	Sept.
1		14	1.7	0.4	0.2	16		0.1	0.5	0.3	0.2
2		9.6	.7	.5	.2	17		.1	.6	.4	.2
3		6.9	.5	.6	.2	18		.1	.5	.4	.2
4		2.0	.6	.7	.2	19		.6	.5	.3	.1
5		.6	.6	.7	.2	20		.2	.4	.3	.1
6		.4	2.3	.7	.2	21		.2	.4	.5	.1
7		.3	9.3	.6	.2	22		1.3	.3	.4	4.6
8		.2	5.0	.3	.2	23		19	.3	.4	5.8
9		.2	2.0	.2	.2	24		30	.3	.3	5.0
10		.1	1.7	.5	.2	25		25	.3		9.9
11	0.3	.1	1.0	.6	.2	26		25	.4		16
12	.4	.1	.6	.6	.2	27		19	.4	.2	12
13	1.8	.2	.4	.6	.2	28		14	.4		9.9
14	1.2	.1	.3	.6	.2	29		5.6	.3		8.6
15		.2	.3	.5	.2	30		3.2	.3		7.9
						31	13		.5		

Monthly discharge of Bear Creek below Phoenix Canal, near Talent, Oreg., for the year ending September 30, 1923

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
June	30	0.1	5.95	354
July	9.3	.3	1.08	66
August	.7	------	.41	25
September	16	.1	2.79	166
The period	------	------	------	611

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, 1923, with some breaks during low-water periods.

GAGE.—Lietz water-stage recorder at southeast corner of Page theater building, on left bank beginning September 20, 1918. Vertical staff prior to that date, with datum 1 foot lower. Gage inspected by employees of Rogue River Valley Canal Co.

DISCHARGE MEASUREMENTS.—Made from bridge or by wading.

CHANNEL AND CONTROL.—Bed composed of loose gravel. A concrete sewer passing under stream forms an incomplete control.

EXTREMES OF DISCHARGE.—Maximum stage during year from water-stage recorder, 5.35 feet at 8 a. m. December 31 (discharge, 1,430 second-feet); minimum stage, 0.67 foot at 10 p. m. September 15 (discharge, 1.2 second-feet).

1915–1923: 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 station.

REGULATION.—None.

ACCURACY.—Stage-discharge relation somewhat unstable. Well-defined rating curve used October 1 to May 11; shifting-control method thereafter. Operation of water-stage recorder satisfactory, except for short periods. Daily discharge ascertained by applying to rating table mean daily gage height obtained by inspecting recorder graph. Records good for October to June, fair for July to September.

Discharge measurements of Bear Creek at Medford, Oreg., during the year ending September 30, 1923

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Dec. 19	L. S. Brophy [a]	1.15	31.7	May 26	K. N. Phillips	1.08	22.0
Mar. 23	K. N. Phillips	1.50	74.8	June 4	do	1.18	29.6
Apr. 14	do	1.69	101	26	do	1.50	60.0
May 2	do	.99	16.7	Aug. 4	do	.71	2.6
3	do	.89	11.2	Sept. 19	do	.78	3.3
8	do	.78	5.6	24	do	.91	7.3

[a] Employee of Rogue River Valley Canal Co.

Daily discharge, in second-feet, of Bear Creek at Medford, Oreg., for the year ending September 30, 1923

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	3.7	22	22	428	52	89	96	19	41	14	3.0	6.0
2	3.7	22	21	322	56	96	96	20	42	13	3.2	6.0
3	3.7	21	21	260	49	82	96	13	39	9.7	3.4	5.6
4	4.4	18	38	202	48	72	89	9.2	34	8.8	3.2	4.7
5	8.8	19	79	190	49	79	103	7.0	28	9.2		2.4
6	8.4	22	89	154	49	76	121	6.3	22	19		2.1
7	7.0	24	60	148	54	72	121	7.0	19	31	3.8	1.9
8	7.0	23	40	142	56	71	103	5.6	15	29		1.5
9	7.0	23	34	132	47	67	96	5.3	14	23		1.5
10	9.7	29	35	121	47	65	96	14	15	21		1.5
11	9.7	33	32	103	48	62	96	11	16	13	4.4	1.5
12	11	31	32	96	53	61	103	5.6	16	8.4	3.2	1.5
13	12	25	33	83	51	61	103	5.6	15	8.4	3.4	1.5
14	11	22	34	76	47	61	103	5.3	15	7.9	3.7	1.5
15	11	21	31	72	48	56	96	6.0	17	5.6	2.8	1.3
16	10	21	28	72	53	61	89	6.0	15		3.2	
17	9.2	22	26	208	76	96	88	6.0	16		1.9	2.4
18	7.0	26	27	132	79	96	89	6.0	16	8.3	4.4	
19	9.2	24	28	103	86	89	76	6.6	15		10	3.4
20	9.7	22	31	89	96	96	75	6.6	14		10	5.4
21	10	22	31	79	112	88	79	7.0	13	11	10	
22	11	20	31	75	121	79	82	10	17	7.9	9.7	7.5
23	11	20	30	78	103	75	72	13	41	5.3	9.2	6.0
24	10	18	51	71	103	75	57	13	67	4.0	9.7	6.6
25	11	17	72	65	96	75	44	18	65	3.4	8.4	7.5
26	11	18	61	62	89	75	39	22	64	3.0	7.9	18
27	11	22	143	72	85	82	29	29	51	3.4	9.7	16
28	12	23	290	79	83	89	23	33	38	3.2	10	12
29	15	23	178	68	------	89	23	35	30	3.4	9.7	11
30	16	22	121	53	------	89	23	37	20	4.7	11	11
31	20	------	862	49	------	89	------	40	------	3.0	6.6	------

Monthly discharge of Bear Creek at Medford, Oreg., for the year ending September 30, 1923

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	20	3.7	9.72	598
November	33	17	22.5	1,340
December	862	21	84.2	5,180
January	428	49	125	7,690
February	121	47	69.1	3,840
March	96	56	77.8	4,780
April	121	23	80.2	4,770
May	40	5.3	13.8	848
June	67	13	27.7	1,650
July	31	3.0	10.2	627
August	11	1.9	5.95	366
September	18	1.3	5.25	312
The year	862	1.3	44.2	32,000

BEAR CREEK NEAR CENTRAL POINT, OREG.

LOCATION.—In sec. 2, T. 37 S., R. 2 W., 1 mile northeast of Central Point, Jackson County, on road to Agate station.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—March 23 to September 30, 1923.

GAGE.—Barrett & Lawrence recorder on right bank 600 feet above highway bridge; inspected by L. S. Brophy.

DISCHARGE MEASUREMENTS.—Made by wading near gage.

CHANNEL AND CONTROL.—Bed composed of gravel, with cobblestone riffle 300 feet below gage; somewhat shifting in floods. Left bank may be overflowed in extreme high water.

EXTREMES OF DISCHARGE.—Maximum stage during period March 23 to September 30, from water-stage recorder, 2.20 feet at 8 p. m. April 6 (discharge, 138 second-feet); minimum stage, 1.05 feet at noon August 13 (discharge, 2.2 second-feet).

ICE.—No record during winter.

DIVERSIONS.—Station below all present diversions, at intake of proposed Oakliegh Canal. During irrigation season practically all water is diverted, the flow being mostly return water.

REGULATION.—Only by head gates of irrigation canals.

ACCURACY.—Stage-discharge relation somewhat unstable. Rating curve well defined. Operation of water-stage recorder satisfactory, except for a short period. Daily discharge ascertained by applying mean daily gage height to rating table. Records good.

Discharge measurements of Bear Creek near Central Point, Oreg., during the year ending September 30, 1923

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Dec. 1	L. S. Brophy[a]	1.47	20.8	May 31	Brophy and Smith	1.76	60
Mar. 29	do	1.99	101	June 13	K. N. Phillips	1.45	21.6
Apr. 4	K. N. Phillips	1.95	88	22	Brophy and Smith	1.39	16.8
14	do	2.02	107	27	K. N. Phillips	1.77	56
27	do	1.51	33.0	July 9	Brophy and Smith	1.50	28.2
28	Brophy and Smith[a]	1.46	30.2	Aug. 4	K. N. Phillips	1.07	2.6
May 8	K. N. Phillips	1.12	5.1	24	Brophy and Smith	1.16	5.3
9	Brophy and Smith	1.20	10.0	Sept. 24	K. N. Phillips	1.40	16.6
26	K. N. Phillips	1.50	26.4				

[a] Employee of Rogue River Valley Canal Co.

Daily discharge, in second-feet, of Bear Creek near Central Point, Oreg., for the year ending September 30, 1923

Day	Mar.	Apr.	May	June	July	Aug.	Sept.
1		102	27	64	16	3.9	3.5
2		106	27	66	17	3.5	4.6
3		107	25	59	16	3.5	6.4
4		94	15	51	14	3.9	5.9
5		106	11	36	14	3.9	4.6
6		124	8.8	29	15	3.5	3.5
7		124	6.9	26	28	3.9	3.2
8		113	6.4	22	38	3.5	2.9
9		104	8.8	20	34	3.5	
10		100	14	17	26	3.5	2.9
11		100	23	22	20	3.5	
12		102	14	22	14	3.2	2.9
13		109	10	21	9.3	2.5	2.5
14		106	9.8	25	9.3	2.9	2.5
15		100	10	22	9.3	2.5	2.5
16		92	9.3	20	14	2.5	2.5
17		88	7.8	19	13	2.5	2.5
18		94	10	19	11	2.9	2.5
19		84	12	19	10	3.2	2.5
20		79	15	17	12	3.2	2.2
21		80	15	16	8.3	4.2	2.9
22		82	15	17	7.8	15	10
23	84	80	20	26	7.8	8.8	16
24	84	67	21	52	6.9	7.8	16
25	84	51	27	60	5.4	6.4	17
26	82	44	32	56	4.6	4.6	24
27	82	35	39	52	4.2	3.5	27
28	88	32	43	36	4.2	3.5	23
29	95	31	48	31	4.2	3.2	21
30	97	31	52	20	3.5	3.2	20
31	92		57		3.5	3.5	

Monthly discharge of Bear Creek near Central Point, Oreg., for the year ending September 30, 1923

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
March 23-31	97	82	87.6	1,560
April	124	31	85.6	5,090
May	57	6.4	20.6	1,270
June	66	16	32.1	1,910
July	38	3.5	12.9	793
August	15	2.5	4.17	256
September	27	2.2	8.09	481
The period				11,400

EAST LATERAL NEAR ASHLAND, OREG.

LOCATION.—In SE. ¼ sec. 20, T. 39 S., R. 2 E., 500 feet below proposed Emigrant Gap Dam and 7 miles southeast of Ashland, Jackson County.

RECORDS AVAILABLE.—April 23 to September 19, 1923.

GAGE.—Stevens eight-day recorder on left bank, inspected by employees of Talent Irrigation District.

DISCHARGE MEASUREMENTS.—Made from footbridge at gage.

CHANNEL AND CONTROL.—Concrete-lined section for short distance at gage; bottom below grade and some sediment may collect; earth section above and below. No definite control; aquatic plants cause unstable conditions.

EXTREMES OF DISCHARGE.—Maximum stage recorded, 1.84 feet at 2.45 p. m. August 9 (discharge, 38 second-feet); canal dry at times.

ICE.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation not permanent. Rating curve well defined. Operation of water-stage recorder satisfactory except for short periods. Records good.

East lateral of Talent Irrigation District diverts water from Emigrant Creek in SE. ¼ sec. 20, half a mile above proposed Emigrant Gap Dam, for the irrigation of about 4,000 acres of land lying along the right or east side of Bear Creek Valley and extending to a point nearly opposite Medford.

Discharge measurements of East lateral near Ashland, Oreg., during the year ending September 30, 1923

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Apr. 21	K. N. Phillips	0.51	4.3	July 19	K. N. Phillips	0.79	9.1
28	Phillips and Henshaw	.93	10.7	31	Phillips and Arnspiger	1.71	32.4
May 7	K. N. Phillips	1.01	12.5	Aug. 9	Phillips and Hunter	1.84	37.1
June 8	do	.51	4.3	24	Henshaw and Phillips	1.35	16.2
25	Phillips and Arnspiger	1.46	24.7	Sept. 10	K. N. Phillips	1.39	14.6
25	do	1.45	23.6				

Daily discharge, in second-feet, of East lateral near Ashland, Oreg., for the year ending September 30, 1923

Day	Apr.	May	June	July	Aug.	Sept.
1		6.6	10.7	14.2	32	16.3
2		9.2	8.0	14.0	32	16.3
3		6.1	6.0	13.7	35	16.1
4		7.7	5.4	14.0	33	15.8
5		13.5	5.3	13.5	36	15.6
6		14.0	5.1	19.4		15.6
7		12.9	5.1	17.1	36	15.4
8		11.6	4.2	15.6		15.4
9		11.4	3.9	14.9	37	14.9
10		10.3	3.4	12.2	35	14.9
11		9.6	3.1	11.6	29	14.6
12	5.0	9.6	3.6	9.9	27	14.2
13		9.4	5.4	10.9	26	13.7
14		8.2	4.5	11.2	25	13.5
15		7.9	4.6	11.6	25	12.9
16		7.2	4.2	11.4	25	7.6
17		6.0	7.2	11.1	26	.9
18		5.4	10.7	9.4	27	.5
19		5.1	19.9	8.5	27	.4
20		4.4	20	8.0	27	-------
21		3.9	23	8.7	24	-------
22		3.1	23	9.0	19.7	-------
23	3.9	2.3	26	12.0	16.8	-------
24	3.8	2.8	28	14.9	16.6	-------
25	3.2	3.9	24	19.1	16.3	-------
26	6.2	3.6	16.8	21	16.3	-------
27	10.5	3.7	14.9	25	16.3	-------
28	11.2		14.2	32	16.8	-------
29	13.1	3.8	15.6	32	17.6	-------
30	6.4	3.9	15.1	31	16.8	-------
31	-------	9.9	-------	30	16.6	-------

Monthly discharge of East lateral near Ashland, Oreg., for the year ending September 30, 1923

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
April			5.61	334
May	14.0	2.3	7.12	438
June	28	3.1	11.4	678
July	32	8.0	15.7	965
August		16.3	26.0	1,600
September 1–19	16.3	.4	12.3	464
The period			13.1	4,480

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 to 1923.

GAGE.—Stevens eight-day recorder; inspected by employees of Talent Irrigation District; staff gage prior to 1923.

DISCHARGE MEASUREMENTS.—Made by wading near gage.

CHANNEL AND CONTROL.—Channel excavated in earth and gravel; slightly shifting due to growth on aquatic plants.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 2.62 feet at 7 a. m. June 24 (discharge, 25.7 second-feet); canal dry at times.

1920–1923: Maximum stage, 2.27 feet at midnight, May 6, 1922 (discharge, 26 second-feet).

ACCURACY.—Stage-discharge relation affected by moss beginning May 31. Fairly well-defined rating curve used April 17 to May 30; shifting-control method thereafter. Operation of water-stage recorder satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height obtained by inspecting recorder graph. Records good.

Talent lateral diverts water from Bear Creek in SW. ¼ sec. 33, T. 38 S., R. 1 E., above mouth of Ashland Creek, but Ashland Creek may be diverted to enter Bear Creek above Talent lateral. Water from Talent lateral irrigated about 2,600 acres of Bear Creek Valley land in 1923, lying principally on the left or southwest side of Bear Creek.

Discharge measurements of Talent lateral near Ashland, Oreg., during the year ending September 30, 1923

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Apr. 20	K. N. Phillips	1.18	6.2	June 8	K. N. Phillips	2.04	17.3
28	Brophy and Smith[a]	1.67	14.3	12	do	2.45	24.7
30	K. N. Phillips	1.80	15.9	25	Phillips and Arnspiger[a]	2.34	19.3
May 7	do	1.84	16.5	July 2	Arnspiger and Dillard[b]	1.94	9.4
9	Brophy and Smith	2.00	20.0	6	Phillips and Cummings	2.28	16.0
16	K. N. Phillips	1.89	17.4	14	Arnspiger and Dillard	1.70	6.6
June 1	do	1.83	15.6	19	K. N. Phillips	1.69	10.3
1	do	1.83	15.6				

[a] Employees of Rogue River Valley Canal Co. [b] Employees of Talent Irrigation District

Daily discharge, in second-feet, of Talent lateral near Ashland, Oreg., for the year ending September 30, 1923

Day	Apr.	May	June	July	Day	Apr.	May	June	July
1		17.2	14.1	10.7	16		17.6	23.9	9.2
2		17.0	14.4	9.8	17	3.0	18.0	23.0	10.0
3		16.2	13.5	10.9	18	4.4	18.0	22.1	9.1
4		16.6	13.0	7.0	19	6.5	17.8	22.8	10.4
5		17.2	13.3	7.7	20	9.2	17.6	21.3	8.9
6		16.0	14.9	15.6	21	9.2	17.6	21.3	6.0
7		17.2	14.9	14.5	22	9.2	17.8	20.8	4.5
8		16.8	16.6	13.7	23	9.2	17.2	21.5	3.2
9		19.8	18.0	13.7	24	11.3	18.8	22.6	2.4
10		17.8	19.4	12.1	25	10.9	18.8	19.6	2.4
11		19.8	20.6	10.2	26	12.3	18.4	16.8	2.0
12		19.8	24.3	7.2	27	11.5	17.6	14.0	1.7
13		19.4	25.5	7.9	28	13.5	9.8	12.3	1.7
14		17.8	24.6	6.7	29	15.2	11.5	11.8	
15		18.2	24.3	6.6	30	17.0	14.4	11.3	
					31		15.6		

Monthly discharge of Talent lateral near Ashland, Oreg., for the year ending September 30, 1923

Month	Discharge in second-feet			Run off in acre-feet
	Maximum	Minimum	Mean	
April 17-30	17.0	3.0	10.2	283
May	19.8	9.8	17.2	1,060
June	25.5	11.3	18.6	1,110
July 1-28	15.6	1.7	8.06	448
The period				2,900

PHOENIX CANAL AT TALENT, OREG.

LOCATION.—In NW. ¼ sec. 23, T. 38 S., R. 1 W., 80 feet below intake, one-fourth mile below old bridge across Bear Creek and half a mile north of Talent, Jackson County.

RECORDS AVAILABLE.—April 19, 1916, to September 30, 1923.

GAGE.—Lietz water-stage recorder on right bank referred to vertical staff at end of concrete-lined section 50 feet downstream. Gage inspected by employees of Rogue River Valley Canal Co.

DISCHARGE MEASUREMENTS.—Made from footbridge.

CHANNEL AND CONTROL.—Concrete lining extends only a few feet below gage; no well-defined control; earth channel subject to moss growth.

EXTREMES OF DISCHARGE.—Maximum discharge recorded during year, 41 second-feet at 1 p. m. May 24; canal dry in winter.

1916-1923: Maximum discharge, 48 second-feet May 28, 1921. Canal dry at various times.

ACCURACY.—Stage-discharge relation permanent to about May 17 and continually changing thereafter, owing to growth of moss and flat gradient of canal. Well-defined rating curve used to May 17 and method of shifting-control used thereafter. Operation of water-stage recorder satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height determined by inspecting recorder graph or, for days of considerable fluctuation, by averaging results obtained by applying to rating table mean gage height for subdivision of the day. Records fair.

The Phoenix Canal diverts water from Bear Creek in the NW. ¼ sec. 23, T. 38 S., R. 1 W., and furnishes a supplemental water supply for that portion of the Medford Irrigation District lands lying west of Bear Creek.

Discharge measurements of Phoenix Canal at Talent, Oreg., during the year ending September 30, 1923

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Apr. 20	K. N. Phillips	1.24	14.8	June 11	F. W. Scheffel	1.07	9.30
28	do	1.70	23.2	12	K. N. Phillips	1.40	10.5
28	Brophy and Smith[a]	1.66	24.2	15	do	1.50	12.8
May 5	K. N. Phillips	1.52	19.6	15	do	1.53	14.0
5	do	1.52	19.4	22	Brophy and Smith	1.82	16.4
8	do	.99	11.5	26	K. N. Phillips	1.58	13.4
9	Brophy and Smith	1.18	15.5	27	Scheffel and Chadwick[a]	2.37	24.4
15	K. N. Phillips	1.59	21.7	July 6	K. N. Phillips	1.97	15.1
16	do	1.88	28.2	14	Dillard and Arnspiger[c]	1.20	4.7
16	do	1.85	26.7	23	K. N. Phillips	1.11	4.00
June 1	do	2.03	29.7	25	do	1.00	3.2
2	do	2.02	29.0	Aug. 7	do	1.27	4.6
7	do	1.82	25.0	25	F. F. Henshaw	.82	2.0
7	F. W. Scheffel[b]	1.81	22.9	Sept. 19	K. N. Phillips	.63	1.0
11	K. N. Phillips	1.08	10.5				

[a] Employees of Rogue River Valley Canal Co.
[b] Employees of Medford Irrigation District.
[c] Employees of Talent Irrigation District.

Daily discharge, in second-feet, of Phoenix Canal at Talent, Oreg., for the year ending September 30, 1923

Day	Apr.	May	June	July	Aug.	Sept.	Day	Apr.	May	June	July	Aug.	Sept.
1		24	31	9.9	2.6	2.3	16	14	24	14	6.6	8.0	1.8
2		24	28	8.5	4.9		17	14	25	15	9.2	8.1	2.1
3		21	27	8.0	6.7		18	14	26	14	6.6	6.4	1.4
4		21	25	7.0	7.9	1.2	19	14	28	17	7.2	5.0	.9
5		17	23	8.9	8.2		20	14	30	15	6.6	5.3	1.0
6		16	21	11	9.0		21	15	27	14	5.1	7.7	1.6
7		15	20	16	7.0		22	14	27	16	4.4	5.8	1.7
8		12	15	14	6.3	.2	23	14	23	19	4.2	5.6	
9		12	13	15	7.2	1.2	24	23	23	21	3.7	4.3	
10		14	9.3	12	8.6	1.0	25	22	25	20	3.3	1.9	
11		13	9.7	11	10	.4	26	21	28	15	2.6	1.5	
12		28	13	8.9	12	1.2	27	21	28	13	2.3	1.1	
13		27	17	5.2	12	2.3	28	22	30	13	2.6		
14		24	16	4.4	12	2.3	29	25	31	14	1.8	1.7	
15		25	15	4.3	11	1.8	30	22	29	13	2.0		
							31		32		1.9		

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

Monthly discharge of Phoenix Canal at Talent, Oreg., for the year ending September 30, 1923

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
April 16–30	25	14	17.9	533
May	32	12	23.5	1,440
June	31	9.3	17.2	1,020
July	16	1.8	6.91	425
August	12		6.22	382
September 1–22			1.38	60
The period				3,860

McDONALD CREEK CANAL NEAR TALENT, OREG.

LOCATION.—In SE. ¼ sec. 34, T. 39 S., R. 1 W., 8 miles by road south of Talent, Jackson County.

RECORDS AVAILABLE.—April 1 to August 10, 1923.

GAGE.—Vertical staff on left bank 150 feet above weir at end of canal, where water is discharged into Wagner Creek; read by employee of Talent Irrigation District.

DISCHARGE MEASUREMENTS.—Made from footbridge 20 feet above gage.

CHANNEL AND CONTROL.—Channel is in smooth earth section. Control at low stages is a slight riffle 20 feet below gage; at higher stages, is probably the weir 150 feet below gage. Slight changes in rating may be caused by shifting sand dunes.

EXTREMES OF DISCHARGE.—Maximum stage recorded, 1.45 feet at 7.30 a. m. July 6 (discharge, 24.2 second-feet). Canal dry at times.

ICE.—None.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined. Gage read to tenths once a day April 1 to May 25 and to hundredths twice a day May 26 to August 10. Daily discharge ascertained by applying mean daily gage height to rating table. Records fair April 1 to May 25 and good May 26 to August 10.

McDonald Creek Canal diverts water from McDonald Creek, tributary to Little Applegate River, in SW. ¼ sec. 11, T. 40 S., R. 1, W., and discharges it into head of Wagner Creek, from which it is again diverted for irrigation of about 1,500 acres near Talent.

Discharge measurements of McDonald Creek Canal near Talent, Oreg., during the year ending September 30, 1923

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
May 26	Phillips and Arnspiger[a]	1.15	14.0	July 13	Phillips and Arnspiger	0.99	9.8
26	do	1.14	13.5	25	Olen Arnspiger	.83	6.9
June 27	Olen Arnspiger	1.14	14.3	Aug. 8	Phillips and Hunter	.70	4.4
July 10	Phillips and Arnspiger	1.04	10.9				

[a] Engineer, Talent Irrigation District.

Daily discharge, in second-feet, of McDonald Creek Canal near Talent, Oreg., for the year ending September 30, 1923

Day	Apr.	May	June	July	Aug.	Day	Apr.	May	June	July	Aug.
1	4.4	11.3	15.1	13.7	4.8	16	4.4	16.4	15.1	11.1	-------
2	4.4	11.3	15.1	13.1	4.8	17	4.4	16.1	14.5	9.9	-------
3	4.4	12.5	14.0	13.1	5.1	18	0	15.4	15.4	9.3	-------
4	4.4	12.5	14.2	12.3	4.9	19	10.1	15.4	14.8	10.6	-------
5	5.3	15.4	14.0	12.3	4.8	20	9.1	15.4	14.8	9.3	-------
6	4.4	15.4	14.0	18.0	4.6	21	10.1	15.4	14.8	8.5	-------
7	4.4	15.4	14.0	13.1	4.8	22	9.1	15.4	14.5	7.7	-------
8	4.4	17.0	14.0	13.4	4.6	23	10.1	15.4	15.1	7.3	-------
9	6.2	17.0	14.0	12.3	4.6	24	10.1	15.4	0	6.8	-------
10	6.2	17.0	15.4	11.5	2.8	25	10.1	15.4	15.1	6.4	-------
11	1.7	15.4	16.1	10.8	-------	26	12.5	14.0	14.0	6.2	-------
12	1.7	15.4	17.4	10.1	-------	27	12.5	14.0	14.0	5.8	-------
13	2.9	16.1	15.4	9.5	-------	28	12.5	13.7	14.0	6.5	-------
14	3.6	15.7	15.1	9.3	-------	29	11.3	14.0	14.0	5.3	-------
15	6.2	16.4	15.1	9.3	-------	30	11.3	14.0	13.4	5.1	-------
						31	-------	14.8	-------	4.8	-------

Monthly discharge of McDonald Creek Canal near Talent, Oreg., for the year ending September 30, 1923

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
April	12.5	0	6.74	401
May	17.0	11.3	15.0	922
June	17.4	0	14.2	845
July	18.0	4.8	9.72	598
August 1–10	5.1	2.8	4.58	91
The period				2,860

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, the present terminal 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, 1923.

GAGE.—Inclined staff in three sections on left bank under footbridge; 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, 10.6 feet at 10 a. m. December 31 (discharge, 9,260 second-feet); minimum stage, 2.39 feet September 20 (discharge, 24 second-feet).

1916–1923: Maximum stage recorded, 13.0 feet 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 permanent. Rating curve well defined. Gage read daily to half-tenths at medium and high stages and to hundredths at low stages. Daily discharge ascertained by applying daily gage reading to rating table. Records good.

Discharge measurements of South Fork of Coquille River at Powers, Oreg., during the year ending September 30, 1923

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Apr. 16	Ray Brown	3.95	355	July 19	F. F. Henshaw	2.89	78
May 11	do	3.43	190	Sept. 9	Ray Brown	2.40	25
24	do	3.20	144				

Daily discharge, in second-feet, of South Fork of Coquille River at Powers, Oreg., for the year ending September 30, 1923

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	42	245	158	5,570	600	213	292	450	650	135	54	32
2	42	213	158	2,820	525	114	304	400	500	130	53	31
3	42	184	213	3,240	500	114	315	355	400	124	52	30
4	64	135	355	2,820	500	104	1,030	315	355	130	52	30
5	95	114	890	6,120	475	114	1,240	280	315	135	52	29
6	114	104	3,240	5,390	450	124	1,030	264	245	146	52	28
7	71	500	1,480	5,030	450	191	2,240	229	213	158	50	26
8	52	298	1,030	2,820	450	158	1,830	213	198	146	49	25
9	42	264	770	2,240	450	315	1,100	213	184	135	48	25
10	52	355	3,390	1,560	450	550	890	198	184	124	47	25
11	78	315	2,030	1,930	450	500	600	198	184	114	46	26
12	64	280	830	1,740	770	600	550	184	213	110	45	26
13	58	184	770	1,320	625	1,030	500	184	198	106	44	26
14	52	135	710	2,960	600	830	450	171	184	95	43	27
15	42	114	625	2,350	575	800	450	158	184		42	26
16	42	114	500	1,480	600	770	378	158	171	90	42	26
17	38	315	400	5,210	575	625	355	146	158	86	42	26
18	33	500	400	3,540	600	600	315	146	158	82	42	25
19	33	450	1,030	2,600	625	600	355	213	146	78	40	24
20	33	400	830	1,560	625	550	355	184	135	76	39	24
21	33	315	650	1,320	650	500	450	158	135	74	38	28
22	29	245	625	960	650	450	625	146	174	72	37	31
23	29	213	600	890	710	400	600	146	213	70	36	39
24	29	158	2,580	650	770	400	550	135	198	68	35	47
25	29	114	1,740	600	710	355	500	146	184	67	34	64
26	114	114	1,240	650	600	315	450	184	171	66	34	58
27	280	114	6,690	960	450	315	400	198	158	64	33	52
28	213	213	5,390	1,830	355	315	378	184	146	62	33	45
29	158	184	3,540	1,100	-------	280	335	135	135	59	33	38
30	86	158	2,580	710	-----	280	298	400	135	58	32	38
31	135	-----	9,260	650	-------	280	-------	600	-------	56	32	-----

Monthly discharge of South Fork of Coquille River at Powers, Oreg., for the year ending September 30, 1923

[Drainage area, 168 square miles]

Month	Discharge in second-feet				Run-off	
	Maximum	Minimum	Mean	Per square mile	Inches	Acre-feet
October	280	29	71.7	0.427	0.49	4,410
November	500	114	235	1.40	1.56	14,000
December	9,260	158	1,770	10.5	12.11	109,000
January	6,120	600	2,340	13.9	16.03	144,000
February	770	450	564	3.36	3.50	31,300
March	1,030	104	413	2.46	2.84	25,400
April	2,240	292	639	3.80	4.24	38,000
May	600	135	235	1.40	1.61	14,400
June	650	135	221	1.32	1.47	13,200
July	158	56	97.3	.579	.68	5,980
August	54	32	42.3	.252	.29	2,600
September	64	24	32.6	.194	.22	1,940
The year	9,260	24	558	3.32	45.04	404,000

UMPQUA RIVER BASIN

UMPQUA RIVER NEAR ELKTON, OREG.

LOCATION.—In sec. 8, T. 23 S., R. 7 W., at ferry crossing, 8 miles above Elk Creek, and 4 miles south (by road) from Elkton, Douglas County.

DRAINAGE AREA.—3,680 square miles.

RECORDS AVAILABLE.—October 18, 1905, to December 31, 1906; May 12, 1907, to September 30, 1923.

GAGE.—Staff in five sections. Low-water section inclined, the others vertical. Datum lowered 0.52 foot September 2, 1910. Gage read by H. H. Gilbreth.

DISCHARGE MEASUREMENTS.—Made from car on ferry cable 100 feet below gage.

CHANNEL AND CONTROL.—Channel 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, 26.0 feet January 6 (discharge, 96,000 second-feet); minimum stage, 0.20 foot August 27 to September 19 (discharge, 1,040 second-feet).

1905–1923: 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, 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 apparently permanent during year, except as affected by growth of aquatic plants. Rating curve well defined; corrections made to gage readings for effect of aquatic plants July to September. Gage read to tenths twice a day. Daily discharge ascertained by applying daily gage reading to rating table; shifting-control method used July 23 to September 30. Records good.

Discharge measurements of Umpqua River near Elkton, Oreg., during the year ending September 30, 1923

Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*
Oct. 2	Wendell Dawson	0.20	1,170
July 17	Fred F. Henshaw	.88	1,820

Daily discharge, in second-feet, of Umpqua River near Elkton, Oreg., for the year ending September 30, 1923

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	1,160	1,780	2,550	29,100	10,500	12,000	9,900	5,080	6,400	2,990	1,340	1,040
2	1,160	1,520	2,180	25,500	9,350	10,800	10,800	5,080	5,630	2,550	1,340	1,040
3	1,300	1,430	3,590	35,100	7,220	9,600	10,800	4,900	4,900	2,180	1,250	1,040
4	1,250	1,680	12,000	47,100	6,800	8,600	9,600	4,560	4,560	1,050	1,250	1,040
5	1,340	1,680	9,100	69,200	6,010	8,600	11,400	4,900	4,560	1,840	1,250	1,040
6	1,340	1,680	7,660	93,500	6,600	9,600	10,800	5,260	4,900	2,060	1,160	1,040
7	1,430	1,950	9,350	69,200	6,800	11,400	9,600	6,010	4,730	2,180	1,250	1,040
8	1,430	2,060	8,600	37,100	6,600	12,600	9,100	6,400	4,900	1,840	1,200	1,040
9	1,430	1,950	7,220	23,800	6,010	10,200	9,000	5,820	4,900	1,900	1,120	1,040
10	1,430	1,900	6,400	18,500	6,400	8,120	8,600	5,440	4,900	1,900	1,120	1,040
11	1,430	1,780	5,820	23,400	6,800	7,660	8,120	4,900	4,560	1,840	1,120	1,040
12	1,380	1,680	5,440	19,200	7,890	7,220	7,220	4,730	4,730	1,950	1,120	1,040
13	1,380	1,950	4,900	15,400	7,660	7,660	6,800	4,560	4,900	1,900	1,120	1,040
14	1,340	2,420	4,560	14,400	7,010	9,350	6,800	5,440	4,900	1,840	1,120	1,040
15	1,200	2,690	5,080	13,200	6,800	10,200	6,400	6,200	4,560	1,900	1,120	1,040
16	1,250	2,420	5,080	12,600	6,800	8,600	5,630	5,630	4,300	1,780	1,120	1,040
17	1,200	1,900	4,900	13,800	8,120	7,890	5,260	5,260	4,230	1,730	1,120	1,040
18	1,160	1,730	4,560	18,500	9,600	7,220	4,730	4,900	4,730	1,730	1,120	1,040
19	1,160	1,680	5,260	15,700	13,200	7,220	4,500	5,260	4,560	1,620	1,120	1,040
20	1,200	1,730	6,400	14,700	17,100	8,600	5,260	4,560	4,230	1,730	1,120	1,080
21	1,160	2,180	6,800	13,200	18,500	10,800	6,400	4,730	4,070	1,620	1,120	1,080
22	1,160	2,060	6,400	12,000	16,400	14,400	7,660	5,080	3,910	1,620	1,200	1,080
23	1,250	1,680	6,010	10,800	14,400	12,000	6,800	5,080	3,910	1,680	1,160	1,080
24	1,250	1,680	6,200	9,600	12,300	9,600	6,800	4,900	3,910	1,620	1,120	1,080
25	1,340	1,730	15,400	8,600	10,200	9,100	6,200	4,730	3,750	1,570	1,120	1,080
26	1,340	1,570	23,800	11,400	11,400	9,100	5,820	4,900	3,590	1,570	1,120	1,120
27	1,340	1,780	15,000	16,400	13,500	11,100	6,400	5,260	3,290	1,480	1,040	1,250
28	1,340	2,180	14,400	21,600	12,600	12,000	5,820	4,900	3,290	1,480	1,040	1,200
29	1,340	2,060	18,500	15,700	-------	10,800	5,630	4,900	3,290	1,380	1,040	1,200
30	1,680	2,420	21,000	13,800	-------	10,200	4,900	7,220	2,990	1,380	1,040	1,200
31	1,950	-------	25,800	12,000	-------	9,350	-------	7,010	-------	1,380	1,040	-------

Monthly discharge of Umpqua River near Elkton, Oreg., for the year ending September 30, 1923

[Drainage area, 3,680 square miles]

Month	Discharge in second-feet				Run-off	
	Maximum	Minimum	Mean	Per square mile	Inches	Acre-feet
October	1,950	1,160	1,330	0.362	0.42	81,800
November	2,690	1,430	1,900	.516	.58	113,000
December	25,800	2,180	9,030	2.45	2.82	555,000
January	93,500	8,600	24,300	6.60	7.61	1,490,000
February	18,500	6,010	9,730	2.64	2.76	540,000
March	14,400	7,220	9,740	2.65	3.06	599,000
April	11,400	4,730	7,430	2.02	2.25	442,000
May	7,220	4,560	5,280	1.43	1.65	325,000
June	6,400	2,990	4,410	1.20	1.34	262,000
July	2,990	1,380	1,810	.492	.57	111,000
August	1,340	1,040	1,150	.313	.36	70,700
September	1,250	1,040	1,070	.291	.32	63,700
The year	93,500	1,040	6,440	1.75	23.74	4,650,000

LAKE CREEK AT DIAMOND LAKE, NEAR FORT KLAMATH, OREG.

LOCATION.—In SW. ¼ sec. 30, T. 27 S., R. 6 E., 150 yards below outlet of Diamond Lake, Douglas County, and 35 miles north of Fort Klamath.

DRAINAGE AREA.—56 square miles.

RECORDS AVAILABLE.—May 24 to November 17, 1922; April 12 to September 30, 1923.

GAGE.—Vertical staff on right bank; gage readers, J. E. Erickson and P. B. Motschenbacher.

DISCHARGE MEASUREMENTS.—Made by wading near gage.

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

EXTREMES OF DISCHARGE.—Maximum stage recorded during period April 12 to September 30, 1.83 feet, June 4 and 5 (discharge, 78 second-feet); minimum stage, 1.09 feet September 26–29 (discharge, 19 second-feet).

ICE.—None.

DIVERSIONS.—None.

REGULATION.—Temporary wooden dam about 100 yards above gage may cause some fluctuation in discharge.

ACCURACY.—Stage-discharge relation apparently permanent. Rating curve well defined above 30 second-feet. Gage read to hundredths once or twice a day. Daily discharge ascertained by applying mean daily gage reading to rating table. Records good.

COOPERATION.—Gage-height record furnished by State Fish Commission.

Discharge measurements of Lake Creek at Diamond Lake, near Fort Klamath, Oreg., during the year ending September 30, 1923

Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*
July 10	Jones and Guy	1.56	51
26	Henshaw and Guy	1.46	42

Daily discharge, in second-feet, of Lake Creek at Diamond Lake, near Fort Klamath, Oreg., for the year ending September 30, 1923

Day	Oct.	Nov.	Apr.	May	June	July	Aug.	Sept.
1	45	42	------	38	56	53	37	28
2	45	42	------	38	56	52	36	28
3	45	42	------	38	56	51	35	28
4	45	42	------	39	66	50	35	28
5	45	42	------	40	78	50	35	28
6	45	44	------	40	75	50	34	28
7	44	46	------	41	73	50	34	27
8	44	45	------	41	70	50	34	27
9	44	43	------	43	70	50	33	26
10	44	45	------	43	70	50	33	26
11	44	45	------	44	70	50	32	26
12	43	45	53	44	68	50	32	26
13	43	44	53	45	68	50	32	26
14	43	44	51	45	66	50	32	25
15	43	44	47	45	64	50	31	25
16	43	44	44	46	63	50	31	25
17	43	46	42	46	62	50	31	24
18	42	------	41	47	62	47	31	22
19	42	------	39	48	62	46	31	22
20	42	------	37	49	62	44	30	21
21	42	------	37	48	61	44	30	21
22	43	------	37	49	61	43	29	21
23	43	------	37	50	61	42	29	20
24	44	------	37	50	60	42	29	20
25	43	------	36	50	60	42	29	20
26	42	------	37	52	59	41	28	19
27	42	------	37	53	58	40	28	19
28	44	------	38	50	57	40	28	19
29	42	------	38	52	56	39	29	19
30	42	------	38	56	54	38	29	19
31	42	------	------	56	------	38	29	------

Monthly discharge of Lake Creek at Diamond Lake, near Fort Klamath, Oreg., for the year ending September 30, 1923

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	45	42	43.3	2,660
November 1–17	46	42	43.8	1,480
April 12–30	53	36	41.0	1,540
May	56	38	46.0	2,830
June	78	54	63.5	3,780
July	53	38	46.5	2,860
August	37	28	31.5	1,940
September	28	19	23.8	1,420

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 September 30, 1923

Umatilla River Basin

Date	Stream	Tributary to—	Locality	Gage height	Discharge
				Feet	*Sec.-ft.*
July 5	Umatilla River	Columbia River	NW. ¼ sec. 12, T. 2 N., R. 30 E., below Furnish Reservoir, Oregon	0.89	251
8	do	do	do	.98	306
10	do	do	do	.79	217
15	do	do	do	.67	171
Jan. 20	Stanfield drain	Umatilla River	Near outlet, at Stanfield, Oreg.	.65	3.2
Feb. 28	do	do	do		6.8
Mar. 26	do	do	do		7.4
26	do	do	do		7.1
Apr. 11	do	do	do	.70	6.8
May 14	do	do	do	1.13	13.6
June 7	do	do	do	1.25	18.7
25	do	do	do	1.30	17.0
Aug. 1	do	do	do	1.16	15.2
15	do	do	do	1.08	11.4
Feb. 6	Hermiston drain	do	Near outlet, near Hermiston, Oreg.	.89	23.4
Mar. 26	do	do	do	.48	21.0
Apr. 23	do	do	do	1.62	31
May 31	do	do	do	1.52	48
June 6	do	do	do	1.64	48

Deschutes River Basin

Nov. 21	Deschutes River	Columbia River	Graft ranch above Davis Creek, sec. 3, T. 22 S., R. 8 E., Oregon.	1.28	561
Apr. 25	do	do	do	.48	334
Sept. 17	do	do	do	.68	412
June 20	Charlton Creek	Quinn River	Above Crane Prairie, Oreg.	.41	4.6
Nov. 21	Davis Creek	Deschutes River	Bridge at mouth, sec. 10, T. 22 S., R. 8 E., Oregon		237
Apr. 25	do	do	do		249
June 25	do	do	do		228
Sept. 24	do	do	do		224
Nov. 20	Fall River	do	Above fall in SW. ¼ sec. 34, T. 20 S., R. 10 E., Oregon (including canal).	.60	117
June 26	do	do	do	.64	120
21	Cultus Creek	Cultus River	In two channels near mouth above Crane Prairie, Oreg.		68
Aug. 28	do	do	do		9.2
July 14	Crescent Creek	East Fork	Outlet of Crescent Lake, Oreg.	1.26	75
14	do	do	do	.91	38

Miscellaneous discharge measurements in lower Columbia River and Pacific slope drainage basins in Oregon during the year ending September 30, 1923—Con.

Middle Columbia River Basin

Date	Stream	Tributary to—	Locality	Gage height	Discharge
				Feet	*Sec.-ft.*
May 24	Horsetail Creek	Columbia River	In NE. ¼ sec. 9, T. 1 N., R. 6 E., 50 feet above Columbia River backwater, Oregon		14.8
24	Oneonta Creek	do	NE. ¼ sec. 9, T. 1 N., R. 6 E., 150 feet above highway bridge, Oregon.		13.5
24	Multnomah Creek	do	NE. ¼ sec. 18, T. 1 N., R. 6 E., 20 feet below highway arch, Oregon.		8.5
24	Latourell Creek	do	Discontinued gaging station at Latourell, Oreg.		6.5

Willamette River Basin

Feb. 3	Willamette River	Columbia River	Morrison Street Bridge, Portland, Oreg.	4.06	25,000
Jan. 8	do	do	do	23.51	334,000
9	do	do	do	25.24	383,000
Apr. 14	McKenzie River	Willamette River	Discontinued gaging station at Hendricks Bridge near Springfield, Oreg.	4.50	5,790
13	Horse Creek	McKenzie River	Sec. 23, T. 16 S., R. 5 E., near McKenzie, Oreg.		642
Feb. 17	Santiam River	Willamette River	Jefferson, Oreg.	2.92	4,940
	Luckiamute River	do	Discontinued gaging station at Helmick Bridge near Suver, Oreg.		949
4					
Aug. 8	Molalla River	do	Near Molalla, Oreg.	1.50	126
Sept. 12	Collowash River	Clackamas River	1 mile above mouth, Oregon.		64
15	Three Lynx Creek	do	Mouth, Oregon		14
13	Roaring River	do	Wagon bridge at mouth, Oregon		56
13	Fish Creek	do	A quarter of a mile above mouth, Oregon		14

Cowlitz River Basin

Sept. 13	Cowlitz River	Columbia River	Nesika Bridge near Kosmos, Wash.		1,460

Rogue River Basin

July 18	Boundary Springs	Rogue River	NE. ¼ sec. 4, T. 29 S., R. 5 E., Oregon.		42.3
Sept. 5	do	do	do		27.5
July 18	Minnehaha Creek	do	SW. ¼ sec. 11, T. 29 S., R. 4 E., Oregon.		14.1
Sept. 5	do	do	do		5.2
July 18	Hamaker Creek	do	NE. ¼ sec. 15, T. 29 S., R. 4 E., Oregon.		1.6
18	Hurryon Creek	do	SE. ¼ sec. 15, T. 29 S., R. 4 E., Oregon.		4.
Sept. 5	do	do	do		1.7
July 18	National Creek	do	NE. ¼ sec. 32, T. 29 S., R. 4 E., Oregon.		45.3
Sept. 10	do	do	do		35.0
July 16	Crater Creek	do	NE. ¼ sec. 5, T. 30 S., R. 4 E., Oregon.		65.6
Sept. 10	do	do	do		45.8
July 16	Copeland Creek	do	NE. ¼ sec. 8, T. 30 S., R. 4 E., Oregon.		49.4
Sept. 10	do	do	do		37.1
July 16	Bybee Creek	do	NE. ¼ sec. 26, T. 30 S., R. 3 E., Oregon.		39.2
Sept. 10	do	do	do		25.8
July 16	Castle Creek	do	SE. ¼ sec. 25, T. 30 S., R. 3 E., Oregon.		30.5
Sept. 10	do	do	do		14.1

Miscellaneous discharge measurements in lower Columbia River and Pacific slope drainage basins in Oregon during the year ending September 30, 1923—Con.

Rogue River Basin—Continued

Date	Stream	Tributary to—	Locality	Gage height	Discharge
				Feet	*Sec.-ft.*
July 11	Union Creek	Rogue River	NE. ¼ sec. 3, T. 31 S., R. 3 E., Oregon.		62
Sept. 10	do	do	do		49.3
July 11	Mill Creek	do	Sec. 32, T. 32 S., R. 3 E., Oregon.		29.9
Sept. 10	do	do	do		23.3
July 17	Bar Creek	do	Sec. 32, T. 32 S, R. 3 E., Oregon.		4.9
July 19	Middle Fork of Rogue River	do	NE. ¼ sec. 3, T. 33 S., R. 3 E., Oregon.		164
Sept. 6	do	do	do		123
July 17	Red Blanket Creek	Middle Fork of Rogue River	Sec. 33, T. 32 S., R. 3 E., Oregon.		91
Sept. 9	do	do	do		62.8
July 19	South Fork of Rogue River	do	SE. ¼ sec. 12, T. 33 S., R. 3 E., Oregon.		185
Sept. 6	do	do	do		75
July 21	Rancheria Creek	Big Butte Creek	NE. ¼ sec. 20, T. 35 S., R. 3 E., Oregon.		58
21	Willow Creek	do	do		71
Aug. 7	Big Butte Spring	South Fork of Big Butte Creek	SE. ¼ sec. 20, T. 35 S., R. 3 E., near Butte Falls, Oreg.		13.4
Sept. 6	do	do	do		13.5
July 14	Elk Creek	Rogue River	Sec. 30, T. 33 S., R. 1 E., Oregon.		17.8
14	North Fork of Little Butte Creek.	Little Butte Creek	Sec. 5, T. 37 S., R. 4 E., below Cold Spring Creek near Fish Lake, Oreg.		72
May 21	Tunnel leak	North Fork of Little Butte Creek.	At Fish Lake Dam in SW. ¼ sec. 3, T. 37 S., R. 4 E., Oregon.	[a] 18.18	7.02
June 20	do	do	do	[a] 19.85	6.28
July 27	do	do	do	[a] 17.32	4.59
Aug. 15	do	do	do	[a] 10.98	.1
July 14	Cold Spring Creek	do	Mouth in sec. 5, T. 37 S., R. 4 E., Oregon		14.8
27	do	do	do		14.8
Aug. 15	do	do	do		14.4
22	do	do	do		10.8
28	do	do	do		14.4
28	do	do	do		11.8
Sept. 15	do	do	do		12.7
15	do	do	¼ mile above mouth, Oregon		8.4
Apr. 12	Emigrant Creek	Bear Creek	SE. ¼ sec. 12, T. 39 S., R 1 E., above Walker Creek, Oreg.	1.57	39.2
30	do	do	do	1.31	19.2
Sept. 10	Bear Creek	Rogue River	Sec. 15, T. 38 S., R. 1 W., near Phoenix, Oreg.		.4
24	Bear Creek ditch	Diverts from Bear Creek	NE. ¼ sec. 24, T. 37 S., R. 2 W., at Medford, Oreg.	1.56	5.9
May 1	Little Applegate River	Applegate River	SE. ¼ sec. 13, T. 39 S., R. 3 W., above Farmers' ditch, near Ruch, Oreg.	.80	24.8
28	do	do	do	.72	44.8
June 18	do	do	do	.86	38.1
July 10	do	do	do	.85	17.0
25	do	do	do	.74	7.4
Aug. 8	do	do	do	.77	8.9
May 1	Buck ditch	Diverts from Little Applegate River.	SE. ¼ S. 13, T. 39 S., R. 3 W., near Ruch, Oreg.		1.7
1	Farmers ditch	do	Center of sec. 13, T. 39 S., R. 3 W., near Ruch, Oreg.	.80	17.5
28	do	do	do	.14	8.6
July 10	do	do	do	.26	8.8
Mar. 22	Jump-off-Joe Creek	Rogue River	Discontinued gaging station near Merlin, Oreg.	.77	14.5
22	Louse Creek	Jump-off-Joe Creek	Sec. 22, T. 35 S., R. 6 W., near Merlin, Oreg.	1.52	6.2
July 13	Illinois River	Rogue River	Kerby, Oreg.		98
23	do	do	do	.81	65
Sept. 1	do	do	do		29

[a] Fish Lake Reservoir gage, datum 4,800 feet above sea level.

Miscellaneous discharge measurements in lower Columbia River and Pacific slope drainage basins in Oregon during the year ending September 30, 1923—Con.

Umpqua River Basin

Date	Stream	Tributary to—	Locality	Gage height	Discharge
				Feet	*Sec.-ft.*
Sept. 26	Calapooya Creek	Umpqua	Sec. 10, T. 25 S., R. 4 W., near Sutherlin, Oreg.	2.03	56
26	Sutherlin Canal	Diverts from Calapooya Creek.	do	1.56	5

Nestucca River Basin

Aug. 24	Nestucca River	Pacific Ocean	Outlet of Meadow Lake, sec. 17, T. 3 S., R. 6 W., Oregon.		1.6
21	do	do	Mina Creek sec. 12, T. 4 S., R. 8 W., Oregon.		34.4
22	do	do	Above East Creek sec. 30, T. 3 S., R. 8 W., Oregon.		38.6
22	do	do	Sec. 1, T. 4 S., R. 10 W., Oregon.		88
22	East Fork of Nestucca River.	Nestucca River	Above mouth of Moon Creek sec. 30, T. 3 S., R. 8 W., Oregon.		5.9
22	Moon Creek	do	Mouth, sec. 29, T. 3 S., R. 8 W., Oregon.		3.0

Trask River Basin

Aug. 20	Trask River	Pacific Ocean	Sec. 35, T. 1 S., R. 9 W., Oregon.		92
23	North Fork of Trask River	Trask River	Junction with South Fork of Trask River, Oregon.		47.4
23	South Fork of Trask River	do	Junction with North Fork of Trask River, Oregon.		37.4

Wilson River Basin

Aug. 23	Wilson River	Pacific Ocean	Above North Fork, sec. 24, T. 1 S., R. 9 W., Oregon.		94
21	North Fork of Wilson River.	Wilson River	Junction with Wilson River, sec. 24, T. 1 S., R. 9 W., Oregon.		14.1

Nehalem River Basin

Aug. 30	Nehalem River	Pacific Ocean	Vernonia, Oreg.		13.4
28	do	do	Salmonberry, Oreg., above Salmonberry Creek.		76
28	Salmonberry Creek	Nehalem River	Salmonberry, Oreg.		31.0

INDEX

STREAM-GAGING STATIONS

AND

PUBLICATIONS RELATING TO WATER RESOURCES

PART XII.—NORTH PACIFIC SLOPE BASINS

100941—27—WSP 574——14

STREAM-GAGING STATIONS AND PUBLICATIONS RELATING TO WATER RESOURCES

INTRODUCTION

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, monographs, professional papers, and annual reports.

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

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

HOW GOVERNMENT REPORTS MAY BE OBTAINED OR CONSULTED

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

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

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

Boston, Mass., 2500 Customhouse.
Albany, N. Y., 704 Journal Building.
Trenton, N. J., Statehouse.
Charlottesville, Va., University of Virginia.
Asheville, N. C., 316 Jackson Building.
Chattanooga, Tenn. 830 Power Building.
Columbus, Ohio, Engineering Experiment Station, Ohio State University.
Chicago, Ill., 940 Transportation Building.
Madison, Wis., care of Railroad Commission of Wisconsin.
Ames, Iowa, State Highway Commission Building.
Rolla, Mo., Rolla Building, School of Mines and Metallurgy.
Topeka, Kans., 23 Federal Building.
Helena, Mont., 45–46 Federal Building.
Denver, Colo., 403 Post Office Building.
Salt Lake City, Utah, 313 Federal Building.
Idaho Falls, Idaho, 228 Federal Building.
Boise, Idaho, Federal Building.
Tacoma, Wash., 404 Federal Building.
Portland, Oreg., 606 Post Office Building.
San Francisco, Calif., 303 Customhouse.
Los Angeles, Calif., 600 Federal Building.
Tucson, Ariz., 210 Agricultural Building, University of Arizona.
Austin, Tex., State Capitol.
Honolulu, Hawaii, Territorial Office Building.

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

STREAM-FLOW REPORTS

Stream-flow records have been obtained at more than 4,800 points in the United States, and the data obtained have been published in the reports tabulated below:

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 September, 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. 2	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.

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

Report	Character of data	Year
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	919–20.
W 521 to 534	do	19 1.
W 541 to 554	do	1922.
W 561 to 574	do	1923.

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 1918. The data for any particular station will, as a rule, be found in the reports covering the years during which the station was maintained. For example, data for Machias River at Whitneyville, Maine, 1903 to 1921, are published in Water-Supply Papers 97, 124, 165, 201, 241, 261, 281, 301, 321, 351, 381, 401, 431, 451, 471, 501, and 521, which contain records for the New England streams from 1903 to 1921. Results of miscellaneous measurements are published by drainage basins.

In these papers and in the following lists the stations are arranged in downstream order. The main stem of any river is determined by measuring or estimating its drainage area—that is, the headwater stream having the largest drainage area is considered the continuation of the main stream, and local changes in name and lake surface are disregarded. All stations from the source to the mouth of the main stem of the river are presented first, and the tributaries in regular order from source to mouth follow, the streams in each tributary basin being listed before those of the next basin below.

In exception to this rule the records for Mississippi River are given in four parts, as indicated on page III, and the records for large lakes are presented in order of the streams around the rim of the lake.

Numbers of water-supply papers containing results of stream measurements, 1899–1923

[For basins included see p. III]

Year	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII		
												A	B	C
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 [l]	[b] 82, 83	83	[h] 82, 83	[k] 83, 85	84	[k] 83, 84	84	85	85	85	85	85	85
1903	97	[b] 97, 98	98	97	[k] 98, 99, [m] 100	99	[k] 98, 99	99	100	100	100	100	100	100
1904	[n] 124, [o] 125, [p] 126	[p] 126, 127	128	129	[k] 128, 130	130, [q] 131	[k] 128, 131	132	133	133, [r] 134	134	135	135	135
1905	[n] 165, [o] 166, [p] 167	[p] 167, 168	169	170	171	172	[k] 169, 173	174	175, [s] 177	176, [r] 177	177	178	178	[t] 177, 178
1906	[n] 201, [o] 202, [p] 203	[p] 203, 204	205	206	207	208	[k] 205, 209	210	211	212, [r] 213	213	214	214	214
1907–8	241	242	243	244	245	246	247	248	249	250, [r] 251	251	252	252	252
1909	261	262	263	264	265	266	267	268	269	270, [r] 271	271	272	272	272
1910	281	282	283	284	285	286	287	288	289	290	291	292	292	292
1911	301	302	303	304	305	306	307	308	309	310	311	312	312	312
1912	321	322	323	324	325	326	327	328	329	330	331	332–A	332–B	332–C
1913	351	352	353	354	355	356	357	358	359	360	361	362–A	362–B	362–C
1914	381	382	383	384	385	386	387	388	389	390	391	392	393	394
1915	401	402	403	404	405	406	407	408	409	410	411	412	413	414
1916	431	432	433	434	435	436	437	438	439	440	441	442	443	444
1917	451	452	453	454	455	456	457	458	459	460	461	462	463	464
1918	471	472	473	474	475	476	477	478	479	480	481	482	483	484
1919–20	501	502	503	504	505	506	507	508	509	510	511	512	513	514
1921	521	522	523	524	525	526	527	528	529	530	531	532	533	534
1922	541	542	543	544	545	546	547	548	549	550	551	552	553	554
1923	561	562	563	564	565	566	567	568	569	570	571	572	573	574

[a] Rating tables and index to Water-Supply Papers 35–39 contained in Water-Supply Paper 39. Tables for monthly discharge for 1899 in Twenty-first Annual Report, Part IV.
[b] James River only.
[c] Gallatin River
[d] Green and Gunnison rivers and Grand River above junction with Gunnison.
[e] Mohave River only.
[f] Kings and Kern rivers and south Pacific slope basins.
[g] Rating tables and index to Water-Supply Papers 47–52 and data on precipitation, wells, and irrigation in California and Utah contained in Water-Supply Paper 52. Tables for 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.

PRINCIPAL STREAMS

The largest rivers discharging into the Pacific Ocean in Oregon and Washington are Rogue, Umpqua, and Columbia rivers and streams that reach the ocean through Puget Sound. The principal tributaries of the Columbia are Kootenai, Clark Fork, Spokane, Wenatchee, Yakima, Snake, Walla Walla, Umatilla, John Day, Deschutes, Klickitat, Willamette, Lewis, and Cowlitz rivers. Nisqually, Puyallup, White, Snohomish, and Skagit rivers flow into Puget Sound. The streams of this division drain wholly or in part the States of Idaho, Montana, Nevada, Oregon, Utah, Washington, and Wyoming.

In addition to the list of gaging stations and the annotated list of publications relating specifically to the section, these pages contain also brief references to reports published by State and other organizations (p. xxxix).

GAGING STATIONS

NOTE.—Dash after date indicates that station was being maintained September 30, 1923. Period after a date indicates discontinuance.

BETWEEN COLUMBIA RIVER AND PUGET SOUND

Chehalis River at Centralia, Wash., 1910–11.
Quinault River at Quinault Lake, Wash., 1911–1922.
Soleduck River (head of Quillayute River) near Fairholm, Wash., 1917–1921.
Soleduck River at Snider ranger station, near Beaver, Wash., 1921–
Soleduck River near Quillayute, Wash., 1897–1901.
Bogachiel River:
Kalawa River near Forks, Wash., 1897–1901.
Lake Crescent (head of Lyre River) at Piedmont, Wash., 1919–
Lyre River at Piedmont, Wash., 1917–1922; 1923–
Elwha River at McDonald, Wash., 1897–1901; 1918–
Elwha River near Port Angeles, Wash., 1911–12.
Dungeness River at Sequim, Wash., 1897–98.
Dungeness River at Dungeness, Wash., 1898–1901.

PUGET SOUND DRAINAGE BASINS

Dosewallips River at Brinnon, Wash., 1910–11.
Duckabush River near Duckabush, Wash., 1910–11.
Skokomish River, North Fork (head of Skokomish River), near Hoodsport, Wash., 1910–11; 1913–
Nisqually River near Ashford, Wash., 1910–1914.
Nisqually River near La Grande, Wash., 1906–1911; 1919–
East Creek near Elbe, Wash., 1918–1922.
Little Nisqually River near Alder, Wash., 1920–
Tacoma power conduit near La Grande, Wash., 1919–
Puyallup River near Electron, Wash., 1909–
Puyallup River at Alderton, Wash., 1914–

Puyallup River at Puyallup, Wash., 1914–
Carbon River at Fairfax, Wash., 1910–1912.
White River below Forks, near Enumclaw, Wash., 1911–12.
White River at Buckley, Wash., 1899–1903; 1910–11; 1913–
Greenwater River at mouth, near Enumclaw, Wash., 1911–12.
White River flume at Buckley, Wash., 1913–
Green River [1] (head of Duwamish River) at Kanaskat, Wash., 1911.
Lake Washington:
Cedar River [2] at Vaughn Bridge, near Cedar Lake, Wash., 1898–99.
Cedar River at Cedar Lake, near North Bend, Wash., 1902–3.
Cedar River at Cedar Falls, Wash., 1914–
Cedar River near Landsberg, Wash., 1914–
Cedar River near Ravensdale, Wash., 1901–1912.
Cedar River at Clifford Bridge, near Ravensdale, Wash., 1895–1898.
Cedar River at Renton, Wash., 1901–1907. (Published in Water-Supply Paper 313.)
Skykomish River, South Fork (head of Snohomish River), near Berlin, Wash., 1910–11.
Skykomish River, South Fork, near Index, Wash., 1902–1905; 1911–12; 1913–
Skykomish River at Sultan, Wash., 1910–11.
Foss River near Skykomish, Wash., 1911.
East Fork of Foss River near Skykomish, Wash., 1911.
Miller Creek near Miller River (Berlin), Wash., 1911–1919.
West Fork of Miller Creek near Miller River (Berlin), Wash., 1911.
North Fork of Skykomish River at Index, Wash., 1910–1922.
Wallace River:
Olney Creek near Startup, Wash., 1922–
Sultan River near Sultan, Wash., 1911–
Snoqualmie River, Middle Fork (head of Snoqualmie River), near North Bend, Wash., 1907– (Records up to 1915 for all stations in Snoqualmie River basin published in Water-Supply Paper 412.)
Snoqualmie River near Snoqualmie, Wash., 1898–99; 1900; 1902–1904. (Revised records published in Water-Supply Paper 412.)
North Fork of Snoqualmie River at cable bridge, near North Bend, Wash., 1913–1915.
North Fork of Snoqualmie River near North Bend, Wash., 1907–
South Fork of Snoqualmie River near Garcia, Wash., 1910–1915.
South Fork of Snoqualmie River at North Bend, Wash., 1907–
Tokul Creek near Snoqualmie, Wash., 1907–1914.
Pilchuck Creek near Granite Falls, Wash., 1911.
Stilaguamish River, South Fork (head of Stilaguamish River), near Silverton, Wash., 1910–1917.
Stilaguamish River, South Fork, near Robe, Wash., 1902–3.
Stilaguamish River, South Fork at Granite Falls, Wash., 1911; 1913–1915.
Canyon Creek near Granite Falls, Wash., 1911–1913.
North Fork of Stilaguamish River:
Deer Creek at Oso, Wash., 1917–
Skagit River below Ruby Creek, near Marblemount, Wash., 1919–
Skagit River at Reflector Bar, near Marblemount, Wash., 1913–1922.
Skagit River near Marblemount, Wash., 1908–1914; 1920–

[1] Green River now flows to the sea through Duwamish River.
[2] Cedar River, formerly tributary to Duwamish River, now flows to the sea through Lake Washington and Lake Washington canal.

Skagit River near Sedro Woolley, Wash., 1908–1919; 1921–1923.
Ruby Creek near Marblemount, Wash., 1919–20.
Thunder Creek near Marblemount, Wash., 1919–
Stetattle Creek near Marblemount, Wash., 1913–1915.
Cascade River near Marblemount, Wash., 1909–1913.
Sauk River, North Fork (head of Sauk River), near Barlow Pass, Wash., 1917–1920.
Sauk River above Whitechuck River, near Darrington, Wash., 1910; 1917–1922.
Sauk River above Clear Creek, near Darrington, Wash., 1910–1913.
Sauk River at Darrington, Wash., 1914–
Sauk River near Suiattle Crossing, near Sauk, Wash., 1910–1912.
South Fork of Sauk River near Barlow Pass, Wash., 1917–1921.
Whitechuck River near Darrington, Wash., 1910; 1919–1921.
Clear Creek near Darrington, Wash., 1910–11.
Suiattle River below Lime Creek, near Darrington, Wash., 1920–21.
Baker Lake (on Baker River) near Concrete, Wash., 1910–1915.
Baker River below Anderson Creek, near Concrete, Wash., 1910–
Baker River at Concrete, Wash., 1910–1915.
Whatcom Lake near Bellingham, Wash., 1913–14.
Whatcom Creek near Bellingham, Wash., 1910–1914.
Nooksack River [3] at Excelsior, Wash., 1920–21.
Nooksack River near Glacier, Wash., 1910–11.
Nooksack River near Deming, Wash., 1910–11.
Middle Fork of Nooksack River at ranger station, near Deming, Wash., 1910.
Middle Fork of Nooksack River near Deming, Wash., 1910–11; 1920–21.
South Fork of Nooksack River at Saxon Bridge, Wash., 1920–21.

COLUMBIA RIVER BASIN

Columbia River at Trail, British Columbia, 1913–
Columbia River at Kettle Falls, Wash., 1913–
Columbia River at Grand Coulee, near Nespelem, Wash., 1923.
Columbia River at Wenatchee, Wash., 1910; 1913–1916.
Columbia River at Vernita, Wash., 1917–
Columbia River near Julia, Wash., 1905.
Columbia River at Hanford, Wash., 1910.
Columbia River at Pasco, Wash., 1904–1910.
Columbia River at Cascade Locks and The Dalles, Oreg., 1878–
Kootenai River at Libby, Mont., 1910–
Kootenai River at Crossport, Idaho, 1904.
Kootenai River near Bonners Ferry, Idaho, 1904.
Kootenai River near Porthill, Idaho, 1904.
Tobacco River:
Grave Creek near Fortine, Mont., 1923–
Callahan Creek at Troy, Mont., 1911–1916.
Yaak River near Troy, Mont., 1910–1916.
Moyie River at Snyder, Idaho, 1911–1916; 1919–1923.
Clark Fork at Missoula, Mont., 1898–1907.
Clark Fork at St. Regis, Mont., 1910–1923.
Clark Fork near Plains, Mont., 1910–
Pend Oreille Lake at Hope, Idaho, 1921–
Pend Oreille Lake at Sandpoint, Idaho, 1914–1922.

[3] Revised decision of United States Geographic Board rendered Oct. 3, 1917.

Columbia River tributaries—Continued.
Keechelus Lake (on Yakima River) near Martin, Wash., 1906–
Yakima River near Martin, Wash., 1903–
Yakima River at Easton, Wash., 1904; 1910–1915.
Yakima River at Cle Elum, Wash., 1906–
Yakima River at Umtanum, Wash., 1906–1921.
Yakima River at Selah Gap, near North Yakima, Wash., 1897; 1904–5; 1911; 1912.
Yakima River at Union Gap, near Yakima City, Wash., 1894–1919.
Yakima River near Parker (Wapato), Wash., 1908–1921.
Yakima River near Mabton, Wash., 1911–12.
Yakima River near Prosser, Wash., 1904–1906; 1913–1922.
Yakima River at Kiona, Wash., 1895–1915.
Yakima River near Richland, Wash., 1906–1911 (irrigation seasons).
Cabin Creek near Easton, Wash., 1909–1911.
Kachess Lake (on Kachess River) near Easton, Wash., 1905–
Kachess River near Easton, Wash., 1903–
Big Creek near Cle Elum, Wash., 1909.
Cle Elum River, North Fork (head of Cle Elum River), at Galena, Wash., 1907; 1911.
Cle Elum Lake near Roslyn, Wash., 1906–
Cle Elum River near Roslyn, Wash., 1903–
Teanaway River below Forks, near Cle Elum, Wash., 1911–12.
Teanaway River near Cle Elum, Wash., 1909–1911; 1912–1914.
Swauk Creek near Cle Elum, Wash., 1909–1912.
Cascade canal near Ellensburg (Thorp), Wash., 1905; 1909–1911.
West Kittitas canal near Thorp, Wash., 1904–5; 1909–1911.
Ellensburg Water Co.'s canal near Ellensburg, Wash., 1904–5; 1909–1911.
Taneum Creek near Thorp, Wash., 1909–1912.
Manastash Creek near Ellensburg, Wash., 1909–1914.
Wilson Creek at Thrall, Wash., 1911.
Selah Moxee canal near Selah, Wash., 1904–5; 1909–1911.
Wenas Creek near Selah, Wash., 1909–1912.
Naches River at Anderson's ranch, near Nile, Wash., 1909–1914.
Naches River at Oak Flat, near Nile, Wash., 1904–1917.
Naches River below Tieton River, near Naches, Wash., 1905; 1909–1912; 1915–
Naches River near North Yakima, Wash., 1893–1897; 1898–1912.
Bumping Lake (on Bumping River) near Nile, Wash., 1909; 1910–
Bumping River at Bumping Lake, near Nile, Wash., 1906; 1909–
American River near Nile, Wash., 1909; 1910; 1911; 1913; 1914; 1915.
Selah Valley canal near Naches, Wash., 1904–5; 1909–1911.
Tieton River, North Fork, below Clear Creek, near Naches, Wash., 1914–15.
Tieton River at Rimrock,[4] Wash., 1908–1914; 1918–19.
Tieton River at headworks of Tieton canal, near Naches, Wash., 1906–
Tieton River at Cobb's ranch, near Naches, Wash., 1902–1913.
Tieton canal near Naches, Wash., 1910–
Wapatox canal near Naches, Wash., 1904–5; 1909–1911.
Naches Canal Co.'s (Gleed) canal near Naches, Wash., 1904–5; 1909–1911.

[4] Records, 1908–1914, published as "Tieton River at McAllister Meadows, near Naches, Wash."

[5] Decision of United States Geographic Board; formerly called South Fork of Snake River.

Columbia River tributaries—Continued.
Snake River tributaries—Continued.
Fall Creek near Swan Valley, Idaho, 1917–18.
Rainy Creek at Swan Valley, Idaho, 1917–18.
Pine Creek near Swan Valley, Idaho, 1917–18.
Burns Creek near Heise, Idaho, 1917.
Henrys Fork[6] near Lake, Idaho, 1920–
Henrys Fork at Warm River, Idaho, 1910–1915; 1918–
Henrys Fork near Ashton,[7] Idaho, 1902–1909; 1920–
Henrys Fork in canyon above Fall River, Idaho, 1890–91.
Diversions from Henrys Fork between Ashton and St. Anthony gaging stations, Idaho, 1919–
Henrys Fork at St. Anthony, Idaho, 1919–
Diversions from Henrys Fork between St. Anthony and Rexburg gaging stations, Idaho, 1919–
Henrys Fork near Rexburg, Idaho, 1909–
Warm River at Warm River, Idaho, 1912–1915; 1918–
Robinson Creek at Warm River, Idaho, 1912–1915; 1918–
Fall River near Marysville, Idaho, 1902–3.
Diversions from Fall River above gaging station near Squirrel, Idaho, 1919–
Fall River near Squirrel,[8] Idaho, 1904–1909; 1918–
Fall River at Canyon, Idaho, 1890–1901.
Diversions from Fall River between Squirrel and Chester gaging stations, Idaho, 1919–
Fall River near Chester, Idaho, 1920–
Teton River near St. Anthony, Idaho, 1903–1909; 1920–
Teton River at Chase's ranch, Idaho, 1890–1893.
Diversions from Teton River between gaging station near St. Anthony and mouth of river, Idaho, 1919–
Canyon Creek near Newdale, Idaho, 1920–
Willow Creek near Prospect, Idaho, 1903–4.
Willow Creek near Ririe, Idaho, 1916–
Willow Creek near Ionia, Idaho, 1916–
Grays Lake outlet near Herman, Idaho, 1916–
Idaho (Government) canal near Shelley, Idaho, 1912–
Blackfoot River above reservoir, near Henry, Idaho, 1914–
Blackfoot-Marsh reservoir (Blackfoot River) near Henry, Idaho, 1912–
Blackfoot River below reservoir, near Henry (near Rossfork), Idaho, 1908–
Blackfoot River near Shelley, Idaho, 1909–
Blackfoot River near Presto, Idaho, 1903–1909.
Blackfoot River near Blackfoot, Idaho (fragmentary), 1913; 1914; 1915–
Little Blackfoot River at Henry, Idaho, 1914–
Meadow Creek near Henry, Idaho, 1914–
Idaho (Government) canal near Firth, Idaho, 1914–
Sand Creek near Firth, Idaho, 1916–
Fort Hall upper canal near Blackfoot, Idaho, 1912–
Fort Hall lower canal near Blackfoot, Idaho, 1912–

[6] Decision of United States Geographic Board; formerly called North Fork of Snake River.
[7] Records, 1902-1909, published as "North Fork of Snake River near Ora, Idaho."
[8] Records, 1904-1909, published as "Fall River at Fremont, Idaho."

Columbia River tributaries—Continued.
Snake River tributaries—Continued.
Mud Lake at Terreton, Idaho, 1921–
Camas Creek near Dubois, Idaho, 1921–
Camas Creek near Camas, Idaho, 1921–
Camas Creek near Hamer, Idaho, 1912–13.
Beaver Creek at Dubois, Idaho, 1921–
Beaver Creek at Camas, Idaho, 1921–
Medicine Lodge Creek near Small, Idaho, 1921–
Birch Creek near Reno,[9] Idaho, 1910–1912; 1921–1923.
Little Lost River near Clyde, Idaho, 1910–1913.
Little Lost River at Raymond's ranch, near Howe, Idaho, 1921–
Little Lost River near Howe, Idaho, 1921–
Wet Creek at Clyde school, near Howe, Idaho, 1921–1923.
Big Lost River at Howell's ranch, near Chilly, Idaho, 1904–1906; 1907–1914; 1920–
Big Lost River below Chilly canal, near Chilly, Idaho, 1921–22.
Big Lost River at Chilly Bridge, near Chilly, Idaho, 1920.
Big Lost River below Chilly Sinks, near Chilly, Idaho, 1921–22.
Big Lost River (back channel) below Chilly Sinks, near Chilly, Idaho, 1921.
Big Lost River (east channel) above Mackay reservoir, near Mackay, Idaho, 1919–
Big Lost River (west channel) above Mackay reservoir, near Mackay, Idaho, 1919–
Mackay reservoir (Big Lost River) near Mackay, Idaho, 1919–
Big Lost River below Mackay reservoir, near Mackay, Idaho, 1903–1906; 1912–1915; 1919–
Big Lost River at Leslie, Idaho, 1919–1922.
Big Lost River near Moore, Idaho, 1919–
Thousand Springs Creek near Chilly, Idaho, 1912–13; 1914; 1920–1922.
Warm Spring Creek (east channel) near Mackay, Idaho, 1919–
Warm Spring Creek (west channel) near Mackay, Idaho, 1919–
Sharp ditch near Mackay, Idaho, 1912–1914; 1919–
Streeter ditch near Mackay, Idaho, 1913–14.
Cedar Creek above forks, near Mackay, Idaho, 1911–1913.
Cedar Creek below forks, near Mackay, Idaho, 1911–1913.
Cedar Creek below power plant, near Mackay, Idaho, 1920–1922.
Clark ditch near Mackay, Idaho, 1920–1922.
Alder Creek near Mackay, Idaho, 1920–1922.
Antelope Creek near Darlington, Idaho, 1913–1916; 1920–1922.
Pass Creek near Leslie, Idaho, 1920–1922.
Portneuf River above reservoir, near Chesterfield, Idaho, 1912–1914.
Portneuf diversion channel near Chesterfield, Idaho, 1914.
Portneuf River below reservoir, near Chesterfield, Idaho, 1912–1915.
Portneuf River near Pebble, Idaho, 1910–1913.
Portneuf River at Topaz, Idaho, 1913–1915; 1919–
Portneuf River near McCammon, Idaho, 1896.
Portneuf River at Pocatello, Idaho, 1897–1899; 1911–
Topons Creek near Chesterfield, Idaho, 1912–1914.
Pebble Creek near Pebble, Idaho, 1911–1914.
Birch Creek near Downey, Idaho, 1911–1914.

[9] Records, 1910–1912, published as "Birch Creek near Kaufman, Idaho."

Columbia River tributaries—Continued.
Snake River tributaries—Continued.
Raft River near Bridge, Idaho, 1909–1915.
Clear Creek near Naf, Idaho, 1910–11; 1912–13.
Cassia Creek near Conant, Idaho, 1909–1912.
North Side Minidoka canal near Minidoka, Idaho, 1909–
South Side Minidoka canal near Minidoka, Idaho, 1909–
Goose Creek above Trapper Creek, near Oakley, Idaho, 1911–1916; 1919–
Goose Creek near Oakley, Idaho, 1909–1911.
Trapper Creek near Oakley, Idaho, 1911–1916; 1919–
Birch Creek near Oakley, Idaho, 1912–13; 1914–1916.
P. A. lateral near Milner, Idaho, 1919–
Milner[10] Low Lift canal near Milner, Idaho, 1921–
North Side Twin Falls canal at Milner, Idaho, 1909–
South Side Twin Falls canal at Milner, Idaho, 1909–
Big Cottonwood Creek near Oakley, Idaho, 1909–1915.
Dry Creek near Artesian City, Idaho, 1912.
Blue Lakes outlet near Twin Falls, Idaho, 1917–1920.
Rock Creek near Rock Creek, Idaho, 1909–1913.
Rock Creek near Twin Falls, Idaho, 1922–
McMullen Creek near Rock Creek, Idaho, 1910; 1912.
Clear Lakes outlet near Buhl, Idaho, 1917–1920.
Salmon Falls Creek above upper Vineyard ditch, near Contact, Nev., 1914–15.
Salmon Falls Creek below upper Vineyard ditch, near Contact, Nev., 1914.
Salmon Falls Creek below High Line canal, near San Jacinto, Nev., 1914.
Salmon Falls Creek near San Jacinto, Nev., 1909–1916; 1918–
Salmon Falls Creek near Twin Falls, Idaho, 1909–10.
Upper Vineyard ditch near Contact, Nev., 1914.
Lower Vineyard ditch near Contact, Nev., 1914.
Jakes Creek above Hubbard ranch, near Contact, Nev., 1914.
Jakes Creek below Hubbard ranch, near Contact, Nev., 1914.
Willow Creek near Contact, Nev., 1914.
Bird's Nest ditch near Contact, Nev., 1914.
Harrell ditch near Contact, Nev., 1914.
High Line canal near San Jacinto, Nev., 1914.
San Jacinto ditch near San Jacinto, Nev., 1914.
Island ditch near San Jacinto, Nev., 1914.
West Boar's Nest ditch near San Jacinto, Nev., 1914.
Trout Creek near San Jacinto, Nev., 1914.
East Boar's Nest ditch near San Jacinto, Nev., 1914.
Shoshone Creek near San Jacinto, Nev., 1914–15.
North Side ditch near San Jacinto, Nev., 1914.
Cedar Creek near Roseworth, Idaho, 1909–1914; 1916.
Devil Creek near Three Creek, Idaho, 1912–14; 1916.
Big Wood River at Ketchum, Idaho, 1920–21.
Big Wood River at Gimlet, Idaho, 1904–5; 1920–21.
Big Wood River at Hailey, Idaho, 1889; 1915–
Big Wood River at Glendale Bridge, near Bellevue, Idaho, 1920–21.
Big Wood River near Bellevue, Idaho, 1911–
Magic reservoir (Big Wood River) near Richfield, Idaho, 1909–

[10]Formerly known as Murtaugh canal.

Columbia River tributaries—Continued.
Snake River tributaries—Continued.
Big Wood River below Magic dam, near Richfield, Idaho, 1911–
Big Wood River above North Gooding canal, near Shoshone, Idaho, 1921–
Big Wood River below North Gooding canal, near Shoshone, Idaho, 1911–
Big Wood River near Shoshone, Idaho, 1905–6; 1908–1913.
Big Wood River at Gooding, Idaho, 1896–1899; [11] 1921–
Big Wood River near Gooding, Idaho, 1916–
Big Wood River near Bliss, Idaho, 1899.
Warm Springs Creek near Ketchum, Idaho, 1920–21.
Trail Creek at Ketchum, Idaho, 1920–21.
East Fork of Big Wood River at Gimlet, Idaho, 1920–21.
Big Wood Slough at Hailey, Idaho, 1915–
Camas Creek near Blaine, Idaho, 1912–
Dry Creek near Blanche, Idaho, 1911–1914.
Little Wood River near Carey, Idaho, 1904–5; 1920–
Little Wood River near Richfield, Idaho, 1911–
Little Wood River at Shoshone, Idaho, 1922–
Little Wood River at Toponis (Gooding), Idaho, 1896–1899.
Fish Creek above dam, near Carey, Idaho, 1920–
Fish Creek near Carey, Idaho, 1919–20; 1923–
West Fork of Fish Creek near Carey, Idaho, 1920–1922.
Silver Creek near Picabo, Idaho, 1920–
King Hill Creek near King Hill, Idaho, 1913.
Little Canyon Creek at Glenns Ferry, Idaho, 1909–1913.
Alkali Creek near Glenns Ferry, Idaho, 1909–1913.
Cold Springs Creek near Hammett, Idaho, 1909–1913.
Bennett Creek near Hammett, Idaho, 1909–1913.
Rattlesnake Creek near Mountain Home, Idaho, 1917.
Canyon Creek near Mountain Home, Idaho, 1917.
Long Tom Creek below reservoir, near Bennett, Idaho, 1917.
Willowdale Creek near Bennett, Idaho, 1917.
Syrup Creek near Mountain Home, Idaho, 1917.
Bruneau River near Rowland, Nev., 1913–1918.
Bruneau River near Tindall, Idaho, 1910–1912.
Bruneau River near Hot Spring, Idaho, 1909–1915.
Bruneau River near Grandview, Idaho, 1895–1903; 1909–1916.
Sheep Creek near Tindall, Idaho, 1910–1913.
Marys Creek near Owyhee, Nev., 1913–1915.
Marys Creek at Tindall, Idaho, 1910–1913.
Louse Creek near Wickahoney, Idaho, 1911.
East Fork of Bruneau River near Three Creek, Idaho, 1912–1914; 1916.
East Fork of Bruneau River near Hot Spring, Idaho, 1910–1915.
Three Creek near Three Creek, Idaho, 1912–1914; 1916.
Cherry Creek near Three Creek, Idaho, 1912–1914; 1916.
Deadwood Creek near Three Creek, Idaho, 1912–1914; 1916.
Buckaroo ditch at Hot Spring, Idaho, 1912–1914.
Grandview canal near Grandview, Idaho, 1912–1915.
Castle Creek near Castle Creek, Idaho, 1910–11.

[11] Records 1896–1899, published as "Malade River near Toponis, Idaho."

Columbia River tributaries—Continued.
Snake River tributaries—Continued.
Malheur River near Hope, Oreg., 1919–
Malheur River near Little Valley, Oreg., 1914.
Malheur River at McLaughlin Bridge, near Vale, Oreg., 1904–1906.
Malheur River at Vale, Oreg., 1890–91; 1895–96; 1903–1914; 1919.
Malheur River at Halliday Bridge, near Ontario, Oreg., 1904–5.
Malheur River near Ontario, Oreg., 1903–4.
South Fork of Malheur River at Riverside, Oreg., 1910–1915; 1919–20.
North Fork of Malheur River at Scott's ranch, near Beulah, Oreg., 1914.
North Fork of Malheur River at Foley's ranch, near Beulah, Oreg., 1909–1912; 1913–14.
North Fork of Malheur River at Juntura, Oreg., 1919–20.
Vines ditch near Little Valley, Oreg., 1904–5; 1914.
Malheur Farmers' canal above Vale, Oreg., 1904–5.
McLaughlin ditch above Vale, Oreg., 1904–5.
"J. H." ditch above Vale, Oreg., 1904–5.
Gellerman & Frohman ditch above Vale, Oreg., 1904–5.
Sand Hollow ditch above Vale, Oreg., 1904–5.
Bully Creek near Westfall, Oreg., 1911–1913; 1923.
Bully Creek at Warmsprings, near Vale, Oreg., 1903–4; 1905–1907; 1911–1917; 1922–23.
Bully Creek at Vale, Oreg., 1904–5.
Cottonwood Creek near Westfall, Oreg., 1922–23.
Hope Mill ditch at Vale, Oreg., 1904–5.
Willow Creek near Malheur, Oreg., 1904–1906; 1910–11; 1912–1915; 1921–
Willow Creek near Brogan, Oreg., 1912–1914.
Willow Creek at Dell, Oreg., 1904–1906; 1910–11.
Cow Creek near Brogan, Oreg., 1912–1914.
Pole Creek near Brogan, Oreg., 1912–13.
Nevada ditch below Vale, Oreg., 1904–5.
Payette River at Banks, Idaho, 1922–
Payette River near Horseshoe Bend, Idaho, 1906–1916; 1919–
Payette River at Payette, Idaho, 1895–1897.
Payette Lake (North Fork of Payette River) at Lardo, Idaho, 1921–
North Fork of Payette River at Lardo, Idaho, 1908–1917; 1919–
North Fork of Payette River at Van Wyck, Idaho, 1912–1916; 1920–
Lake Fork of Payette River near McCall, Idaho, 1909–1914.
Gold Fork of Payette River near Roseberry, Idaho, 1920–21.
South Fork of Payette River near Garden Valley, Idaho, 1921–
South Fork of Payette River near Banks, Idaho, 1921–
Deadwood River near Lowman, Idaho, 1921–
Shafer Creek near Horseshoe Bend, Idaho, 1911–12.
Harris Creek near Horseshoe Bend, Idaho, 1911–12.
Weiser River at Starkey, Idaho, 1920.
Weiser River above Crane Creek, near Weiser, Idaho, 1920–
Weiser River near Weiser, Idaho, 1890–91; 1894–1904; 1910–1914.
West Fork of Weiser River near Fruitvale, Idaho, 1910–1913; 1919–
Lost Creek near Tamarack, Idaho, 1910–1914; 1920–21.
Middle Fork of Weiser River at Middle Fork, Idaho, 1910–1913.

Columbia River tributaries—Continued.
Snake River tributaries—Continued.
Imnaha River:
Big Sheep Creek near Joseph, Oreg., 1920.
Salmon River near Pierson, Idaho, 1910–1913.
Salmon River at Stanley, Idaho, 1921–
Salmon River below Yankee Fork, near Clayton, Idaho, 1921–
Salmon River at Salmon, Idaho, 1912–1916; 1919–
Salmon River at Whitebird, Idaho, 1910–1917; 1919–
Lake Creek near Stanley, Idaho, 1910–1913.
Valley Creek at Stanley, Idaho, 1910–1913; 1921–
Yankee Fork of Salmon River near Clayton, Idaho, 1921–
Warm Springs Creek at Robinson Bar, near Clayton, Idaho, 1921–1923.
Pahsimeroi River near Goldburg, Idaho, 1910–1913.
Pahsimeroi River below the sinks, near Goldburg, Idaho, 1913.
Goldburg Creek near Goldburg, Idaho, 1910.
Goldburg Creek at mouth, near Goldburg, Idaho, 1913.
Big Creek near Patterson, Idaho, 1910–1912.
Lemhi River:
Timber Creek near Leadore, Idaho, 1912.
West Fork of Timber Creek near Leadore, Idaho, 1912.
Eightmile Creek near Leadore, Idaho, 1912.
North Fork of Salmon River near North Fork, Idaho, 1912.
Middle Fork of Salmon River:
Marsh Creek near Cape Horn, Idaho, 1922.
Beaver Creek at Cape Horn, Idaho, 1922.
Bear Valley Creek near Cape Horn, Idaho, 1921–
Grande Ronde River at Hilgard, Oreg., 1903–1915.
Grande Ronde River at LaGrande, Oreg., 1918–1923.
Grande Ronde River at Elgin, Oreg., 1903–1912; 1918–19.
Grande Ronde River at Zindel, Wash., 1904–1912.
Ladd Creek near Hot Lake, Oreg., 1918.
Catherine Creek near Union, Oreg., 1906–7; 1911–12; 1915; 1918–19.
Little Creek near Union, Oreg., 1915; 1918.
Mill Creek near Cove, Oreg., 1918; 1920–21.
State ditch near Alicel, Oreg., 1918.
Willow Creek:
Mill Creek near Summerville, Oreg., 1914–15.
Wallowa Lake (on Wallowa River) near Joseph, Oreg., 1905–6; 1912–1914; 1915.
Wallowa River at Joseph, Oreg., 1903–1914; 1915.
Wallowa River near Wallowa, Oreg., 1903–1907.
Wallowa River at Minam (near Elgin), Oreg., 1903–1914.
Silver Lake ditch near Joseph, Oreg., 1905; 1915.
Farmers' and Citizens' ditch near Joseph, Oreg., 1905; 1915.
Granger ditch at Joseph, Oreg., 1905; 1915.
Big Bend ditch at Joseph, Oreg., 1905; 1915.
Hurricane Creek near Joseph, Oreg., 1915.
Lostine River near Lostine, Oreg., 1912–1914; 1915.
Company ditch near Wallowa, Oreg., 1905.
Bear Creek near Wallowa, Oreg., 1915.
Minam River at Minam, Oreg., 1912–1914.
Asotin Creek near Shelmans ranch, near Asotin, Wash., 1904–1906.

Columbia River tributaries—Continued.
White Salmon River at Condit dam, near Underwood, Wash., 1912–13.
White Salmon River near Underwood, Wash., 1915–
Trout Creek at Guler, Wash., 1909–1911.
Little White Salmon River below Lava Creek, near Cook, Wash., 1903–1906.[13]
Little White Salmon River near Cook, Wash., 1909.
Gorton Creek near Wyeth, Oreg., 1917–1920.
Latourell Creek at Latourell, Oreg., 1912–13.
Sandy River above Salmon River, at Brightwood, Oreg., 1910–1914.
Sandy River below Salmon River, near Brightwood, Oreg., 1907–1911.
Sandy River near Marmot, Oreg., 1911–1915; 1919–
Sandy River at and below dam near Marmot, Oreg., 1915–1919.
Sandy River above Bull Run River, near Bull Run, Oreg., 1910–1912.
Sandy River below Bull Run River, near Bull Run, Oreg., 1910–1914.
Clear Fork of Sandy River near Welches, Oreg., 1913; 1914–15.
Lost Creek near Brightwood, Oreg., 1913–1918.
Zigzag River at Zigzag, Oreg., 1920–21.
Still Creek near Rowe, Oreg., 1910–1912.
Still Creek at Zigzag, Oreg., 1920–21.
Salmon River near Rowe, Oreg., 1910–1912.
Salmon River at Welches, Oreg., 1913–14; 1920–21.
Salmon River at Fish Hatchery, near Brightwood, Oreg., 1912–13.
Sandy River canal near Marmot, Oreg., 1916–1920.
Bull Run River near Bull Run, Oreg., 1895–
Little Sandy River near Marmot, Oreg., 1913–1919.
Little Sandy River near Bull Run, Oreg., 1911–1913; 1919–
Little Sandy flume near Bull Run, Oreg., 1912–13.
Willamette River, Middle Fork (head of Willamette River), above Salt Creek, near Oakridge, Oreg., 1913–14.
Willamette River, Middle Fork, below North Fork, near Oakridge, Oreg., 1911–12.
Willamette River, Middle Fork, at Eula, Oreg., 1923–
Willamette River, Middle Fork, at Jasper, Oreg., 1905–1912; 1913–1917.
Willamette River at Springfield, Oreg., 1911–1913.
Willamette River at Eugene, Oreg., 1919–
Willamette River at Albany, Oreg., 1878–1888; 1892–
Willamette River at Salem, Oreg., 1909–1916.
Willamette River at Oregon City, Oreg., 1909–1912.
Salt Creek near Oakridge, Oreg., 1913–14.
Salmon Creek near Oakridge, Oreg., 1913–1919.
North Fork of Middle Fork of Willamette River near Oakridge (Hazeldell), Oreg., 1909–1912; 1913–1916.
Fall Creek near Fall Creek, Oreg., 1911.
Coast Fork of Willamette River near Goshen, Oreg., 1905–1912.
Row River near Disston, Oreg., 1910–1913.
McKenzie River at Clear Lake, Oreg., 1912–1915.
McKenzie River at McKenzie Bridge, Oreg., 1910–
McKenzie River at Martins Rapids, near Vida, Oreg., 1910–11.
McKenzie River near Springfield, Oreg., 1905–1915.
Eugene power canal near Walterville, Oreg., 1912–1915.
Long Tom River near Monroe, Oreg., 1920–

[13] Records published in U. S. Geol. Survey Water-Supply Paper 272, pp. 428–429.

[14] Formerly published as "Rogue River near Tolo, Oreg." Tolo is a discontinued post office.

REPORTS ON WATER RESOURCES OF THE NORTH PACIFIC SLOPE DRAINAGE BASINS

PUBLICATIONS OF UNITED STATES GEOLOGICAL SURVEY

WATER-SUPPLY PAPERS

Water-supply papers may be purchased (at price quoted below) from the SUPERINTENDENT OF DOCUMENTS, Washington, D. C. An asterisk (*) indicates that the report is out of print. Water-supply papers are of octavo size.

*4. A reconnaissance in southeastern Washington, by I. C. Russell, 1897. 96 pp., 7 pls.

Describes an area "bordered on the south by Oregon, on the east by Idaho, on the north by Snake River, and on the west by the Columbia," and "briefly designated as lying south of Snake River," discusses climate, vegetation, topography and drainage, geologic formations—including the river terraces and soils—irrigation, and the artesian water supply, and gives an outline of the geological history of the region.

*44. Profiles of rivers in the United States, by Henry Gannett. 1901. 100 pp. 11 pls.

Gives elevations and distances along Columbia, Willamette, Flathead, and Snake rivers.

53. Geology and water resources of Nez Perce County, Idaho, Part I, by I. C. Russell. 1901. 85 pp., 10 pls. 10c.

*54. Geology and water resources of Nez Perce County, Idaho, Part II, by I. C. Russell. 1901. 55 pp. (87–141).

Nos. 53 and 54 relate to an area "in western Idaho, bordered on the west by portions of Washington and Oregon, "drained through Snake River to the Columbia; they describe the topography, geology, and soils of the region, discuss the relation of the surface features—plateaus, canyons, streams, etc.—to the geology and the climate, the source and quantity of the water supply, including springs and artesian wells, and refer briefly to the occurrence of building stones, lignite, gold, silver, and copper. They include also a short bibliography of artesian waters and two appendixes—one giving list of elevations, and the other notes concerning Portland cement.

55. Geology and water resources of a portion of Yakima County, Wash., by G. O. Smith. 1901. 68 pp., 7 pls. 10c.

Describes topography, climate, soil, agriculture, geology, and surface and ground waters of an area comprising about 50 square miles in the vicinity of North Yakima; discusses in some detail the artesian basins and wells.

*57. Preliminary list of deep borings in the United States, Part I (Alabama-Montana), by N. H. Darton. 1902. 60 pp.

*61. Preliminary list of deep borings in the United States, Part II (Nebraska-Wyoming), by N. H. Darton. 1902. 67 pp.

Nos. 57 and 61 contain information as to depth, diameter, yield, and head of water in borings more than 400 feet deep; under head "Remarks" gives information concerning temperature, quality of water, purposes of boring, etc. The lists are arranged by States, and the States are arranged alphabetically. A second, revised, edition was published in 1905 as Water-Supply Paper 149 (q. v.). 5c.

78. Preliminary report on artesian basins in southwestern Idaho and southeastern Oregon, by I. C. Russell. 1903 53 pp., 2 pls. 5c.

Discusses briefly the rocks and geologic structure of a part of the Snake River Plains in Canyon and Owyhee counties, Idaho, and Malheur and Harney counties, Oreg.; described briefly the conditions on which artesian flow depends, and in some detail the springs and drilled wells in the Lewis, Otis, Harney, and Whitehorse artesian basins; also describes artesian wells in alluvial deposits and discusses the size of drill holes, casings, etc., the preservation of well records, and the importance of laws to control the use of artesian waters; gives list of publications bearing on artesian waters.

*93. Proceedings of first conference of engineers of the Reclamation Service, with accompanying papers, compiled by F. H. Newell, chief engineer, 1904. 361 pp. [Inquiries concerning this report should be addressed to the Reclamation Service.] Contains:

Investigations in Idaho, by D. W. Ross. Describes the irrigable lands in the area drained by Snake River.

Investigations in Oregon, by J. T. Whistler. Mentions the Umatilla, Malheur, and Harney projects.

Work in Washington, by T. A. Noble. Describes the plains of Columbia River

96. Destructive floods in the United States in 1903, by E. C. Murphy. 1904. 81 pp., 13 pls. 15c.

Gives an account of a flood (commonly spoken of as the "Heppner disaster") on Willow Creek, a tributary of Columbia River, in Morrow County, Oreg.

*103. A review of the laws forbidding pollution of inland waters in the United States, by E. B. Goodell. 1904. 120 pp. [Superseded by No. 152, q. v.]

Cites statutory restrictions of water pollution in Idaho, Nevada, Oregon, Utah, Washington, and Wyoming.

111. Preliminary report on the underground waters of Washington, by Henry Landes. 1905. 85 pp., 1 pl. 10c.

Describes, by counties, the municipal water supplies, deep wells, and springs in the State, giving also for each county a brief account of the climate, rainfall, topography, drainage, and geology.

118. Geology and water resources of a portion of east-central Washington, by F. C. Calkins. 1905. 96 pp., 4 pls. 5c.

Describes briefly the topography, geology, climate, vegetation, grazing, and agriculture on the Columbia Plains and in Kittitas Valley; discusses the streams, springs, and shallow and deep wells.

*122. Relation of the law to underground waters, by D. W. Johnson. 1905. 55 pp.

Cites legislative acts relating to ground waters in Idaho, Nevada, Oregon, Utah, Washington, and Wyoming.

149. Preliminary list of deep borings in the United States, second edition, with additions, by N. H. Darton. 1905. 175 pp. 10c.

Gives, by States (and within the States by counties), location, depth, diameter, yield, height of water, and other available information, concerning wells 400 feet or more in depth; includes all wells listed in Water-Supply Papers 57 and 61; mentions also principal publications relating to deep borings.

*152. A review of the laws forbidding pollution of inland waters in the United States (second edition), by E. B. Goodell. 1905. 149 pp.

Cites statutory restrictions of water pollution in Idaho, Nevada, Oregon, Utah, Washington and Wyoming.

*162. Destructive floods in the United States in 1905, with a discussion of flood discharge and frequency and an index to flood literature, by E. C. Murphy and others. 1906. 105 pp., 4 pls.

Gives estimates (p. 85) of flood discharge and frequency for Boise River at Boise and Weise River at Weiser, Idaho.

231. Geology and water resources of the Harney Basin region, Oreg., by G. A. Waring. 1909. 93 pp., 5 pls. 25c.

The greater part of the area covered by this report is in the Great Basin, but a small tract in the northeastern corner is drained by a number of small streams that are tributary to Malheur River.

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253. Water powers of the Cascade Range, Part I, Southern Washington, by J. C. Stevens. 1910. 94 pp., 21 pls. 40c.

Discusses conditions governing hydraulic development, water laws of Washington, and variations in streams; describes the drainage basins of Klickitat, White Salmon, Little White Salmon, Lewis, and Toutle rivers; gives results of observations at gaging stations, and estimates of average minimum discharge and of the available horsepower at the power sites.

*274. Some stream waters of the western United States, with chapters on sediment carried by the Rio Grande and the industrial application of water analyses, by Herman Stabler. 1911. 188 pp.

Describes collection of samples, plan of analytical work, and methods of analyses; discusses soap-consuming power of waters, water softening, boiler waters, and water for irrigation; gives results of analyses of waters of Boise, Malheur, Payette, and Palouse rivers, and Salmon Creek.

313. Water powers of the Cascade Range, Part II, Cowlitz, Nisqually, Puyallup, White, Green, and Cedar drainage basins, by F. F. Henshaw and G. L. Parker. 1913. 170 pp., 16 pls. 55c.

Describes the geological features and history of the drainage basins, topography and drainage, soils and vegetation, and precipitation; gives stream-flow records and discusses water powers, storage, and power sites; discusses also natural resources and harbors of the Pacific coast, central electric stations, and power utilization, and gives commercial and residential rates. See also 253.

316. Geology and water resources of a portion of south-central Washington, by G. A. Waring. 1913. 46 pp., 1 pl. 5c.

Describes settlements, climate and vegetation, agriculture, grazing, geographic provinces, relation of surface features and structure, and geology; discusses shallow and artesian waters and irrigation enterprises in Sunnyside and Reservation valleys, Horse Heaven Plateau, and the Columbia River Plains, and irrigation along lower Yakima River; gives tabulated data concerning wells and springs.

339. Quality of the surface waters of Washington, by Walton Van Winkle. 1914. 105 pp., 2 pls. 15c.

Discusses briefly the natural and economic features of the State, the constituents and uses of the natural waters, purification of water, methods of analysis, and industrial and geochemical interpretation of the results of analysis; describes the general features of the principal drainage basins and gives the results of an investigation of the character of the river waters; treats briefly of the average chemical composition of river water, the economic value of the rivers, denudation, and the influence of natural features on the character of the waters.

344. Deschutes River, Oreg., and its utilization, by F. F. Henshaw, John H. Lewis, and E. J. McCaustland. 1914. 200 pp., 28 pls. 50c.

A report, prepared in cooperation with the State of Oregon, containing the results of measurements of stream flow, a discussion of the economic distribution of the water, and chapters on the quality of the water, the availability of the water supply, the developed water powers, undeveloped power sites, water rights and appropriations, the relation of the Federal Government to the development of water power, and Government permits for power and reservoir sites.

346. Profile surveys in the basin of Clark Fork of Columbia River, Montana-Idaho-Washington, prepared under the direction of R. B. Marshall, chief geographer. 1914. 6 pp., 3 pls. (22 sheets). 50c.

347. Profile surveys in Snake River basin, Idaho, prepared under the direction of R. B. Marshall, chief geographer. 1914. 12 pp., 3 pls. (37 sheets). 55c.

348. Profile surveys in Hood and Sandy River basins, Oreg., prepared under the direction of R. B. Marshall, chief geographer. 1914. 8 pp., 2 pls. (6 sheets). 30c.

349. Profile surveys in Willamette River basin, Oreg., prepared under the direction of R. B. Marshall, chief geographer. 1914. 8 pp., 3 pls. (16 sheets). 30c.

363. Quality of the surface waters of Oregon, by W. Van Winkle. 1914. 137 pp., 2 pls. 20c.

Describes the topography, drainage, rocks and soils, climate, population, and industries of the State, the constituents of natural waters, water for domestic and industrial uses, and purification of water, methods of analysis, and interpretation of results of analysis; describes the general features of the river basins and the character of the river waters, discusses the conditions influencing the quality of the surface waters, average chemical composition, geochemical character, denudation, industrial value, and value for irrigation.

364. Water analyses from the laboratory of the United States Geological Survey, tabulated by F. W. Clarke, chief chemist. 1914. 40 pp. 5c.

Contains analyses of Soap and Omak lakes, Wash., and of mine waters from Butte, Mont.

366. Profile surveys of Snoqualmie, Sultan, and Skykomish rivers, Wash., prepared under the direction of R. B. Marshall, chief geographer. 1914. 7 pp., 3 pls. (12 sheets.) 20c.

368. Profile surveys in Wenatchee River basin, Wash., prepared under the direction of R. B. Marshall, chief geographer. 1914. 7 pp., 1 pl. (8 sheets.) 20c.

369. Water powers of the Cascade Range, Part III, Yakima River basin, by G. L. Parker and F. B. Storey, 1916. 169 pp., 20 pls. 45c.

Describes the geography of the basin, the geologic history, physiography and river history, climate, settlement, and development, population, and transportation; gives stream-flow records and discusses natural conditions affecting stream flow; storage reservoirs, developed and undeveloped power sites; treats also of the industrial development of the region, discussing irrigation by gravity systems and by pumping, the production of coal and other minerals, and manufacturing; presents a scheme of development and utilization of stored water. The report was prepared under the direction of the Washington State Board of Geological Survey, and is based on data consisting of "stream-flow records, river plans and profiles, reservoir surveys, and field reconnaissance of the rivers and their various tributaries," obtained by the United States Geological Survey and the United States Reclamation Service, supplemented by a large amount of information furnished by private parties.

370. Surface water supply of Oregon, 1878–1910, by F. F. Henshaw and H. J. Dean. 1915. 829 pp., 1 pl. 45c.

Describes briefly the natural features of Oregon and in greater detail the general features of the river basins; consists principally of records of stream flow that have been carefully studied and recomputed when necessary to insure their best possible interpretation.

376. Profile surveys in Chelan and Methow River basins, Wash., prepared under the direction of R. B. Marshall, chief geographer. 1915. 8 pp., 5 pls. 15c.

377. Profile surveys in Spokane River basin, Wash., and John Day River basin, Oreg., prepared under the direction of R. B. Marshall, chief geographer. 1915. 7 pp., 10 pls. 15c.

378. Profile surveys in 1914 on Middle Fork of Willamette River and White River, Oreg., prepared under the direction of R. B. Marshall, chief geographer. 1915. 8 pp., 6 pls. 15c.

379. Profile surveys in 1914 in Umpqua River basin, Oreg., prepared under the direction of R. B. Marshall, chief geographer. 1915. 7 pp., 13 pls. 20c.

400. Contributions to the hydrology of the United States, 1916, Nathan C. Grover, chief hydraulic engineer, 1917. 108 pp., 7 pls. 15c. Contains:

*(b) Artesian water for irrigation in Little Bitterroot Valley, Mont., by O. E. Meinzer.

419. Profile surveys in 1915 in Skagit River basin, Wash., prepared under the direction of W. H. Herron, acting chief geographer. 1916. 8 pp., 12 pls. 15c.

420. Profile surveys along Henrys Fork, Idaho, and Logan River and Blacksmith Fork, Utah, prepared under the direction of W. H. Herron, acting chief geographer. 1916. 8 pp., 10 pls. 10c.

*425. Contributions to the hydrology of the United States, 1917; N. C. Grover, chief hydraulic engineer. 1918. Contains:

(e) Ground water in Quincy Valley, Wash., by A. T. Schwennesen and O. E. Meinzer. 5c.

469. Surface waters of Wyoming and their utilization, by Robert Follansbee. 1923. 331 pp., 1 pl. 40c.

Contains a brief discussion of the general features and power and irrigation possibilities of that part of the Snake River basin that lies in Wyoming.

486. Water powers of the Cascade Range, Part IV, Wenatchee and Entiat basins, by G. L. Parker and Lasley Lee. 1922. iv, 76 pp., 3 pls. 30c.

Describes the topography, drainage areas, climate, and forestation of these basins. Gives stream-flow records and discusses the conditions affecting stream flow. Discusses, also, irrigation and developed and undeveloped water power.

489. The occurrence of ground water in the United States, with a discussion of principles, by O. E. Meinzer. 1923. xi, 321 pp., 31 pls. 60c.

Discusses principles of occurrence of ground water; kinds of rocks and their water-bearing properties; structure of rocks and its influence on ground water; and water-bearing formations in the United States.

492. Summary of hydrometric data in Washington, 1878–1919, by G. L. Parker and Lasley Lee. 1923. viii, 363 pp., 9 pls. 40c.

Contains gaging-station records and a bibliography of hydrometric data in the State of Washington.

*500. Contributions to the hydrology of the United States, 1921; N. C. Grover, chief hydraulic engineer. 1922. iv, 74 pp., 4 pls. Contains:

*(a) Coeur d' Alene Lake, Idaho, and the overflow lands, by R. W. Davenport, pp. 1–31, pls. i–iii.

520. Contributions to the hydrology of the United States, 1923–24; N. C. Grover, chief hydraulic engineer. 1925. iv, 129 pp., 23 pls. 25c. Contains:

(c) Power resources of Snake River between Huntington, Oreg., and Lewiston, Idaho, by W. G. Hoyt, pp. 27–51. 10c.

PROFESSIONAL PAPERS

Professional papers may be purchased (at price quoted below) from the Superintendent of Documents, Washington, D. C. An asterisk (*) indicates that the report is out of print. Professional papers are of quarto size.

*135. The composition of the river and lake waters of the United States, by F. W. Clarke. 1924. iv, 199 pp.

Contains analyses of principal streams and lakes.

BULLETINS

Bulletins may be purchased (at price quoted below) from the SUPERINTENDENT OF DOCUMENTS, WASHINGTON, D. C. An asterisk (*) indicates that the report is out of print. Bulletins are of octavo size.

*199. Geology and water resources of the Snake River Plains of Idaho, by I. C. Russell. 1902. 192 pp., 25 pls.

Describes the topography, geology, climate, vegetation, fauna, and soils of an area extending entirely across the southern part of Idaho; discusses streams, springs, water powers, irrigation and agriculture, industries, and routes of transportation and highways; treats of the origin of surface and subsurface waters, the requisite conditions for artesian wells and the quantity of water available.

252. Preliminary report on the geology and water resources of central Oregon, by I. C. Russell. 1905. 138 pp., 24 pls. 15c.

Describes a portion of the extreme northern part of the Great Basin and a part of the drainage area of Deschutes River and its principal tributary, Crooked River; gives an account of the topography, drainage, rainfall and temperature, winds, and forests; describes the volcanic sedimentary rock formations, and discusses by counties the geology and topography, the surface and ground waters; treats of artesian conditions in the Deschutes basin and makes suggestions concerning artesian well records.

*264. Record of deep-well drilling for 1904, by M. L. Fuller, E. F. Lines, and A. C. Veatch. 1905. 106 pp.

*298. Record of deep-well drilling for 1905, by M. L. Fuller and Samuel Sanford. 1906. 299 pp.

Bulletins 264 and 298 give an account of progress in the collection of well records and samples, and contain tabulated records of wells in Idaho, Montana, Nevada, Oregon, Washington, and Wyoming. No. 298 gives detailed records of wells in Flathead County, Mont., and Benton, Jefferson, and Walla Walla counties, Wash. The wells of which detailed sections are given were selected because they afford valuable stratigraphic information.

ANNUAL REPORTS

Each of the papers contained in the annual reports was also issued in separate form.

Annual reports may be purchased (at price quoted below) from the SUPERINTENDENT OF DOCUMENTS, WASHINGTON, D. C. An asterisk (*) indicates that the report is out of print.

Tenth Annual Report of the Director of the United States Geological Survey, 1888–89, J. W. Powell, Director. 1890. 2 parts. Pt. II. Irrigation, viii, 123 pp. 35c.

Makes a preliminary report on the organization and prosecution of the survey of the arid lands for purposes of irrigation; includes an account of the methods of topographic and hydraulic work, the segregation work on reservoir sites and irrigable lands, field and office methods, and brief descriptions of the topography of some of the river basins.

Eleventh Annual Report of the United States Geological Survey, 1889–90, J. W. Powell, Director. 1891. 2 parts. Pt. II. Irrigation, xiv, 395 pp., 30 pls. and maps. $1.25. Contains:

*Hydrography, pp. 1–110. Discusses scope of work, methods of stream measurement, rainfall, and evaporation, and describes the more important streams.

*Engineering, pp. 111–200. Defines the scope of the work and gives an account of the survey in the Sun River basin and in the Arkansas, Rio Grande, California, Lahontan, Utah, and Snake River divisions.

*Topography, pp. 291–343. Comprises reports of the topographic surveys in California, Nevada, Colorado, Idaho, Montana, and New Mexico, and a report on reservoir sites.

*Irrigation literature, pp. 345–388. Gives a list of books and pamphlets on irrigation and allied subjects, mainly contained in the library of the United States Geological Survey.

Twelfth Annual Report of the Director of the United States Geological Survey, 1890–91, J. W. Powell, Director. 1891. 2 parts. Pt. II, Irrigation, xviii, 576 pp., 93 pls. $2. Contains:

*Hydrography of the arid regions, by F. H. Newell, pp. 213–361, Pls. 58–106. Discusses the available water supply of the arid regions, the duty of water, flood waters, relation of rainfall to river flow; classifies the drainage basins; and describes the rivers of the Missouri, Arkansas, Rio Grande, Colorado, Sacramento, and San Joaquin basins, and the principal streams of the Great Basin in Nevada and Utah and the Snake River basin.

Thirteenth Annual Report of the United States Geological Survey, 1891–92. J. W. Powell, Director. 1892. (Pts. II and III, 1893.) 3 parts. Pt. III, Irrigation, xi, 486 pp., 77 pls. $1.85. Contains:

*Engineering results of irrigation survey, by H. M. Wilson, pp. 351–427, Pls. 147–182. Describes structures on the Pocatello canal, Idaho.

*Sixteenth Annual Report of the United States Geological Survey, 1894–95, Charles D. Walcott, Director. 1896. (Pts. II, III, and IV, 1895.) 4 parts. Pt. II. Papers of an economic character, xix, 598 pp., 43 pls. $1.25. Contains:

The public lands and their water supply, by F. H. Newell, pp. 457–533, Pls. 35–39. Describes general character of the public lands, the lands disposed of (railroad, grant, and swamp lands, and private miscellaneous entries), lands reserved (Indian, forest, and military reservations), the vacant lands, and the rate of disposal of vacant land; discusses the streams, wells, and reservoirs as sources of water supply; gives details for each State.

*Nineteenth Annual Report of the United States Geological Survey, 1897–98, Charles D. Walcott, Director. 1898. (Pts. II, III, and V, 1899.) 6 parts in 7 vols. and separate case for maps with Pt. V. Pt. V, Forest reserves, xvii, 400 pp., 110 pls. (16 maps in separate case.) $2.25. Contains:

*Priest River Forest Reserve, by J. B. Leiberg, pp. 217–252, Pls. 48–61.
*Bitterroot Forest Reserve, by J. B. Leiberg, pp. 253–282, Pls. 62–73.
*Washington Forest Reserve, by H. B. Ayres, pp. 283–313, Pls. 76–100.
*Eastern part of Washington Forest Reserve, by M. W. Gorman, pp. 315–350, Pl. 101.
*Forest conditions of northern Idaho, by J. B. Leiberg, pp. 373–386, Pls. 109–110.
These reports describe the topography and the streams of the forest reserves.

*Twentieth Annual Report of the United States Geological Survey, 1898–99, Charles D. Walcott, Director. 1899. (Pts. II, III, IV, V, and VII 1900.) 7 parts in 8 vols. and separate case for maps with Pt. V. Pt. V, Forest reserves, xix, 498 pp., 159 pls., 8 maps in separate case. $2.80. Contains:

*The Flathead Forest Reserve, by H. B. Ayres, pp. 245–316, Pls. 77–113.
*Bitterroot Forest Reserve, by J. B. Leiberg, pp. 317–409, Pls. 115–142. Contains brief descriptions of the streams and lakes in the reserves.

*Twenty-first Annual Report of the United States Geological Survey, 1899–1900, Charles D. Walcott, Director. 1900. (Pts. III, IV, VI, VI continued, and VII, 1901.) 7 parts in 8 vols. and separate case for maps with Pt. V. Pt. V, Forest reserves, 711 pp., 143 pls., 39 maps in separate case. $3.85. Contains:

*Mount Rainier Forest Reserve, Wash., by F. G. Plummer, pp. 81–143, Pls. 33–50.
*Olympic Forest Reserve, Wash., from field notes by Arthur Dodwell and T. F. Rixon, pp. 145–208, Pls. 51–70.
*Cascade Range Forest Reserve, Oreg., from T. 28 S. to T. 37 S., inclusive, together with the Ashland Forest Reserve and adjacent forest regions from T. 28 S. to T. 41 S., inclusive, and from R. 2 W. to R. 14 E., Willamette meridian, inclusive, by J. B. Lieberg, pp. 209–498, Pls. 71–84. Contains descriptions of many of the streams flowing through the forest reserves.

GEOLOGIC FOLIOS

Under the plan adopted for the preparation of a geologic map of the United States the entire area is divided into small quadrangles, bounded by certain meridians and parallels, and these quadrangles, which number several thousand, are separately surveyed and mapped.[15] The unit of survey is also the unit of publication, and the maps and description of each quadrangle are issued in the form of a folio. When all the folios are completed they will constitute the Geologic Atlas of the United States.

A folio is designated by the name of the principal town or of a prominent natural feature within the quadrangle. Each folio includes maps showing the topography, geology, underground structure, and mineral deposits of the area mapped and several pages of descriptive text. The text explains the maps and describes the

[15] Index maps showing areas in the North Pacific slope basins covered by topographic maps and by geologic folios will be mailed on receipt of request addressed to the Director, U. S. Geological Survey, Washington, D .C.

topographic and geologic features of the country and its mineral products. The topographic map shows roads, railroads, waterways, and, by contour lines, the shapes of the hills and valleys and the height above sea level of all points in the quadrangle. The areal-geology map shows the distribution of the various rocks at the surface. The structural-geology map shows the relations of the rocks to one another underground. The economic-geology map indicates the location of mineral deposits that are commercially valuable. The artesian-water map shows the depth to underground-water horizons. Economic-geology and artesian-water maps are included in folios if the conditions in the areas mapped warrant their publication. The folios are of special interest to students of geography and geology and are valuable as guides in the development and utilization of mineral resources.

The folios numbered from 1 to 163, inclusive, are published in only one form (18 by 22 inches), called the library edition. Some of the folios that bear numbers higher than 163 are published also in an octavo edition (6 by 9 inches). Owing to a fire in the Geological Survey building May 18, 1913, the stock of geologic folios was more or less damaged by fire and water, but the folios are usable and are sold at the uniform price of 5 cents each, with no reduction for wholesale orders. This rate applies to folios in stock from 1 to 184, inclusive (except reprints), also the library edition of folio 186. The library edition of folios 185, 187, and higher numbers sells for 25 cents a copy, except that some folios which contain an unusually large amount of matter sell at higher prices. The octavo edition of folio 185 and higher numbers sells for 50 cents a copy, except folio 193, which sells for 75 cents a copy. If 34 folios selling at 25 cents each (or their equivalent in higher-priced folios) are ordered at one time, a discount of 40 per cent is allowed; $5.10 is the minimum amount accepted at this rate.

All the folios contain descriptions of the drainage of the quadrangles. The folios in the following list contain also brief discussions of the underground waters in connection with the economic resources of the areas and more or less information concerning the utilization of the water resources.

An asterisk (*) indicates that the folio is out of print.

*45. Boise, Idaho.

*86. Ellensburg, Wash.

*103. Nampa, Idaho-Oregon.

Describes the relief, drainage, climate, and vegetation of the area; discusses the geologic history and geologic formations, and, under "Economic geology," the surface waters available for irrigation, the springs and shallow wells, and the artesian wells; indicates areas of possible artesian flow.

*104. Silver City, Idaho.

*106. Mount Stuart, Wash.

*139. Snoqualmie, Wash.

218. Riddle, Oreg. 25c.

MISCELLANEOUS REPORTS

Other Federal bureaus and State and other organizations have from time to time published reports relating to the water resources of various sections of the country. Notable among those pertaining to the northern Pacific coast drainage basins are the reports of the commissioner of conservation of the State of Montana; the State land commission; the State engineer of Idaho; the Bureau of Industry, Agriculture, and Irrigation of Nevada; the State engineers of Nevada, Oregon, Utah, and Washington; the annual reports of the United States Bureau of Reclamation; and the reports of the Chief

of Engineers, United States Army. The following reports deserve special mention:

The Oregon system of water titles, by John H. Lewis: Oregon State Engineer Bull. 2, 1912.

State and National water laws, with a detailed statement of the Oregon system of water titles, by John H. Lewis, with a discussion by Clarence T. Johnston and L. J. Le Conte: Am. Soc. Civil Eng. Trans., vol. 76, pp. 637–758, 1913.

Report of the commission on conservation [State of Montana] on bills relating to public lands, water rights, and the protection and preservation of the forests: Helena, 1911; also report of the governor of the State of Montana on the same subject.

How to appropriate the public waters of the State of Nevada, compiled by W. M. Kearney, State engineer, 1911.

Requirements and regulations, including suggestions and instructions in relation to the appropriation, use, and measurement of water in the State of Nevada State engineer of Nevada, 1912.

Irrigation pumping in Nevada, etc., by Charles Norcross: Nevada Bur. of Industry, Agr., and Irr. Bull. 8, 1913.

The water resources of Washington: Potable and mineral water, by H. G. Byers; artesian water, by C. A. Ruddy; water power, by R. E. Heine: Washington Geol. Survey Ann. Rept. for 1901, vol. 1, pt. 5, 1902.

Preliminary report on the Quincy Valley irrigation project, by Henry Landes and others: Washington Geol. Survey Bull. 14, 1912.

Biennial Report of the State Commissioner of Arid Lands [Washington], 1895–96 and 1897–98.

The irrigated lands of the State of Washington, by George M. Allen, deputy commissioner: State Bureau of Statistics and Immigration, 1910.

Irrigation laws of the State of Wyoming, prepared for publication in the office of the State engineer, 1909.

INDEX BY AREAS AND SUBJECTS

(A=Annual Reports; M=Monograph; B=Bulletin; P=Professional Paper; W=Water-Supply Paper; G F=Geologic folio]

[16] Many analyses of river, spring, and well waters are scattered through publications, as noted in abstracts.

INDEX OF STREAMS