DEPARTMENT OF THE INTERIOR
FRANKLIN K. LANE, Secretary

UNITED STATES GEOLOGICAL SURVEY
GEORGE OTIS SMITH, Director

Water-Supply Paper 414

# SURFACE WATER SUPPLY OF THE UNITED STATES

## 1915

## PART XII. NORTH PACIFIC DRAINAGE BASINS

### C. LOWER COLUMBIA RIVER AND PACIFIC DRAINAGE BASINS IN OREGON

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Prepared in cooperation with the States of
OREGON AND WASHINGTON


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# CONTENTS.

## ILLUSTRATIONS.

# SURFACE WATER SUPPLY OF LOWER COLUMBIA RIVER AND PACIFIC DRAINAGE BASIN IN OREGON, 1915.

## AUTHORIZATION AND SCOPE OF WORK.

This volume is one of a series of 14 reports presenting results of measurements of flow made on streams in the United States during the year ending September 30, 1915.

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

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

The work was begun in 1888 in connection with special studies relating to irrigation in the arid west. Since the fiscal year ending June 30, 1895, successive sundry bills passed by Congress have carried the following item and appropriations:

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

*Annual appropriations for the fiscal years ending June 30, 1895–1916.*

| | |
|---|---|
| 1895 | $12 500 |
| 1896 | 20 000 |
| 1897 to 1900, inclusive | 50 000 |
| 1901 to 1902, inclusive | 100 000 |
| 1903 to 1906, inclusive | 200 000 |
| 1907 | 150 000 |
| 1908 to 1910, inclusive | 100, 000 |
| 1911 to 1916, inclusive | 150 000 |

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 14.

Measurements of stream-flow have been made at about 3,800 points in the United States and also at many points in Alaska and the Hawaiian Islands. In July, 1915, 1,350 gaging stations were being maintained by the Survey and the cooperating organizations. Many miscellaneous discharge measurements are made at other points. In

connection with this work data were also collected in regard to precipitation, evaporation, storage reservoirs, river profiles, and water power in many sections of the country and will be made available in water-supply papers from time to time. Information in regard to publications relating to water resources is presented in the appendix to this report.

## 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 depth of inches, acre-feet, and millions of cubic feet. The principal terms used in this series of reports are second-feet, second-feet per square mile, run-off in inches, and acre-feet. They may be defined as follows:

"Second-feet" is an abbreviation for "cubic feet per second." A second-foot is the rate of discharge of water flowing in a channel of rectangular cross-section 1 foot wide and 1 foot deep at an average velocity of 1 foot per second. It is generally used as a fundamental unit from which others are computed by the use of the factors given in the tables of convenient equivalents (p. 9).

"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 (depth in inches)" is the depth to which an area would be covered if all the water flowing from it in a given period were uniformly distributed on the surface. It is used for comparing run-off with rainfall, which is usually expressed in depth of 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," "controlling section," and "point of control"; terms used to designate the section or sections of the stream below the gage which determine the stage-discharge relation at the gage. It should be noted that the control may not be the same section or sections at all stages.

The "point of zero flow" for a given gaging station is that point on the gage—the gage height—to which the surface of the river would fall if there were no flow.

## CONVENIENT EQUIVALENTS.

The following is a list of convenient equivalents for use in hydraulic computations:

*Table for converting discharge in second-feet per square mile into run-off in depth in inches over the area.*

| Discharge (second-feet per square mile). | Run-off (depth in inches). | | | | |
|---|---|---|---|---|---|
| | 1 day. | 28 days. | 29 days. | 30 days. | 31 days. |
| 1 | 0.03719 | 1.041 | 1.079 | 1.116 | 1.153 |
| 2 | .07438 | 2.083 | 2.157 | 2.231 | 2.306 |
| 3 | .11157 | 3.124 | 3.236 | 3.347 | 3.459 |
| 4 | .14876 | 4.165 | 4.314 | 4.463 | 4.612 |
| 5 | .18595 | 5.207 | 5.393 | 5.578 | 5.764 |
| 6 | .22314 | 6.248 | 6.471 | 6.694 | 6.917 |
| 7 | .26033 | 7.289 | 7.550 | 7.810 | 8.070 |
| 8 | .29752 | 8.331 | 8.628 | 8.926 | 9.223 |
| 9 | .33471 | 9.372 | 9.707 | 10.041 | 10.376 |

NOTE.—For part of a month multiply the run-off for one day by the number of days.

*Table for converting discharge in second-feet into run-off in acre-feet.*

| Discharge (second-feet). | Run-off (acre-feet). | | | | |
|---|---|---|---|---|---|
| | 1 day. | 28 days. | 29 days. | 30 days. | 31 days. |
| 1 | 1.983 | 55.54 | 57.52 | 59.50 | 61.49 |
| 2 | 3.967 | 111.1 | 115.0 | 119.0 | 123.0 |
| 3 | 5.950 | 166.6 | 172.6 | 178.5 | 184.5 |
| 4 | 7.934 | 222.1 | 230.1 | 238.0 | 246.0 |
| 5 | 9.917 | 277.7 | 287.6 | 297.5 | 307.4 |
| 6 | 11.90 | 333.2 | 345.1 | 357.0 | 368.9 |
| 7 | 13.88 | 388.8 | 402.6 | 416.5 | 430.4 |
| 8 | 15.87 | 444.3 | 460.2 | 476.0 | 491.9 |
| 9 | 17.85 | 499.8 | 517.7 | 535.5 | 553.4 |

NOTE.—For part of a month multiply the run-off for one day by the number of days.

*Table for converting discharge in second-feet into run-off in millions of cubic feet.*

| Discharge (second-feet). | Run-off (millions of cubic feet). | | | | |
|---|---|---|---|---|---|
| | 1 day. | 28 days. | 29 days. | 30 days. | 31 days. |
| 1 | 0.0864 | 2.419 | 2.506 | 2.592 | 2.678 |
| 2 | .1728 | 4.838 | 5.012 | 5.184 | 5.356 |
| 3 | .2592 | 7.257 | 7.518 | 7.776 | 8.034 |
| 4 | .3456 | 9.676 | 10.02 | 10.37 | 10.71 |
| 5 | .4320 | 12.10 | 12.53 | 12.96 | 13.39 |
| 6 | .5184 | 14.51 | 15.04 | 15.55 | 16.07 |
| 7 | .6048 | 16.93 | 17.54 | 18.14 | 18.75 |
| 8 | .6912 | 19.35 | 20.05 | 20.74 | 21.42 |
| 9 | .7776 | 21.77 | 22.55 | 23.33 | 24.10 |

NOTE.—For part of a month multiply the run-off for one day by the number of days.

*Table for converting discharge in second-feet into run-off in millions of gallons.*

| Discharge (second-feet). | Run-off (millions of gallons). | | | | |
|---|---|---|---|---|---|
| | 1 day. | 28 days. | 29 days. | 30 days. | 31 days. |
| 1 | 0.6463 | 18.10 | 18.74 | 19.39 | 20.04 |
| 2 | 1.293 | 36.20 | 37.48 | 38.78 | 40.08 |
| 3 | 1.939 | 54.30 | 56.22 | 58.17 | 60.12 |
| 4 | 2.585 | 72.40 | 74.96 | 77.56 | 80.16 |
| 5 | 3.232 | 90.50 | 93.70 | 96.95 | 100.2 |
| 6 | 3.878 | 108.6 | 112.4 | 116.3 | 120.2 |
| 7 | 4.524 | 126.7 | 131.2 | 135.7 | 140.3 |
| 8 | 5.171 | 144.8 | 149.9 | 155.1 | 160.3 |
| 9 | 5.817 | 162.9 | 168.7 | 174.5 | 180.4 |

NOTE.—For part of a month multiply the run-off for one day by the number of days.

*Table for converting velocity in feet per second into velocity in miles per hour.*

[1 foot per second=0.681818 mile per hour, or two-thirds mile per hour, very nearly; 1 mile per hour=1.4666 feet per second. In computing the table the figures 0.68182 and 1.4667 were used.]

| Feet per second (units). | Miles per hour for tenths of foot per second. | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 0 | 0.000 | 0.068 | 0.136 | 0.205 | 0.273 | 0.341 | 0.409 | 0.477 | 0.545 | 0.614 |
| 1 | .682 | .750 | .818 | .886 | .995 | 1.02 | 1.09 | 1.16 | 1.23 | 1.30 |
| 2 | 1.36 | 1.43 | 1.50 | 1.57 | 1.64 | 1.70 | 1.77 | 1.84 | 1.91 | 1.98 |
| 3 | 2.05 | 2.11 | 2.18 | 2.25 | 2.32 | 2.39 | 2.45 | 2.52 | 2.59 | 2.66 |
| 4 | 2.73 | 2.80 | 2.86 | 2.93 | 3.00 | 3.07 | 3.14 | 3.20 | 3.27 | 3.34 |
| 5 | 3.41 | 3.48 | 3.55 | 3.61 | 3.68 | 3.75 | 3.82 | 3.89 | 3.95 | 4.02 |
| 6 | 4.09 | 4.16 | 4.23 | 4.30 | 4.36 | 4.43 | 4.50 | 4.57 | 4.64 | 4.70 |
| 7 | 4.77 | 4.84 | 4.91 | 4.98 | 5.05 | 5.11 | 5.18 | 5.25 | 5.32 | 5.39 |
| 8 | 5.45 | 5.52 | 5.59 | 5.66 | 5.73 | 5.80 | 5.86 | 5.93 | 6.00 | 6.07 |
| 9 | 6.14 | 6.20 | 6.27 | 6.34 | 6.41 | 6.48 | 6.55 | 6.61 | 6.68 | 6.75 |

*Table for converting discharge in second-feet into theoretical horsepower per foot of fall.*

[1 second-foot=0.1136 theoretical horsepower per foot of fall. Weight of 1 cubic foot of water=62.5 pounds.]

| Tens. | Units. | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 0 | 0.00 | 0.114 | 0.227 | 0.341 | 0.454 | 0.568 | 0.682 | 0.795 | 0.909 | 1.02 |
| 1 | 1.14 | 1.25 | 1.36 | 1.48 | 1.59 | 1.70 | 1.82 | 1.93 | 2.04 | 2.16 |
| 2 | 2.27 | 2.39 | 2.50 | 2.61 | 2.73 | 2.84 | 2.95 | 3.07 | 3.18 | 3.29 |
| 3 | 3.41 | 3.52 | 3.64 | 3.75 | 3.86 | 3.98 | 4.09 | 4.20 | 4.32 | 4.43 |
| 4 | 4.54 | 4.66 | 4.77 | 4.88 | 5.00 | 5.11 | 5.23 | 5.34 | 5.45 | 5.57 |
| 5 | 5.68 | 5.79 | 5.91 | 6.02 | 6.13 | 6.25 | 6.36 | 6.48 | 6.59 | 6.70 |
| 6 | 6.82 | 6.93 | 7.04 | 7.16 | 7.27 | 7.38 | 7.50 | 7.61 | 7.72 | 7.84 |
| 7 | 7.95 | 8.07 | 8.18 | 8.29 | 8.41 | 8.52 | 8.63 | 8.75 | 8.86 | 8.97 |
| 8 | 9.09 | 9.20 | 9.32 | 9.43 | 9.54 | 9.66 | 9.77 | 9.88 | 10.0 | 10.1 |
| 9 | 10.2 | 10.3 | 10.5 | 10.6 | 10.7 | 10.8 | 10.9 | 11.0 | 11.1 | 11.2 |

1 second-foot equals 40 California miner's inches (law of Mar. 23, 1901).

1 second-foot equals 38.4 Colorado miner's inches.

1 second-foot equals 40 Arizona miner's inches.

1 second-foot equals 7.48 United States gallons per second; equals 448.8 gallons per minute; equals 646,317 gallons for one day.

1 second-foot for one year (365 days) covers 1 square mile 1.131 feet, or 13.572 inches deep.

1 second-foot for one year (365 days) equals 31,536,000 cubic feet.

1 second-foot equals about 1 acre-inch per hour.
1 second-foot for one year (365 days) equals 724 acre-feet.
1 second-foot for one day equals 86,400 cubic feet.
1,000,000,000 (1 United States billion) cubic feet equals 11,570 second-feet for one day.
1,000,000,000 cubic feet equals 414 second-feet for one 28-day month.
1,000,000,000 cubic feet equals 399 second-feet for one 29-day month.
1,000,000,000 cubic feet equals 386 second-feet for one 30-day month.
1,000,000,000 cubic feet equals 373 second-feet for one 31-day month.
100 California miner's inches equals 18.7 United States gallons per second.
100 California miner's inches for one day equals 4.96 acre-feet.
100 Colorado miner's inches equals 2.60 second-feet.
100 Colorado miner's inches equals 19.5 United States gallons per second.
100 Colorado miner's inches for one day equals 5.17 acre-feet.
100 United States gallons per minute equals 0.223 second-foot.
100 United States gallons per minute for one day equals 0.442 acre-foot.
1,000,000 United States gallons per day equals 1.55 second-feet.
1,000,000 United States gallons equals 3.07 acre-feet.
1,000,000 cubic feet equals 22.95 acre-feet.
1 acre-foot equals 325,850 gallons.
1 inch deep on 1 square mile equals 2,323,200 cubic feet.
1 inch deep on 1 square mile equals 0.0737 second-foot per year.
1 foot equals 0.3048 meter.
1 mile equals 1.60935 kilometers.
1 mile equals 5,280 feet.
1 acre equals 0.4047 hectare.
1 acre equals 43,560 square feet.
1 acre equals 209 feet square, nearly.
1 square mile equals 2.59 square kilometers.
1 cubic foot equals 0.0283 cubic meter.
1 cubic foot of water weighs 62.5 pounds.
1 cubic meter per minute equals 0.5886 second-foot.
1 horsepower equals 550 foot-pounds per second.
1 horsepower equals 76.0 kilogram-meters per second.
1 horsepower equals 746 watts.
1 horsepower equals 1 second-foot falling 8.80 feet.
1½ horsepower equals about 1 kilowatt.

To calculate water power quickly: $\frac{\text{Second-feet} \times \text{fall in feet}}{11}$ = net horsepower on water wheel realizing 80 per cent of theoretical power.

## EXPLANATION OF DATA.

The data presented in this report cover the year beginning October 1, 1914, and ending September 30, 1915. 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 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, II.)

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

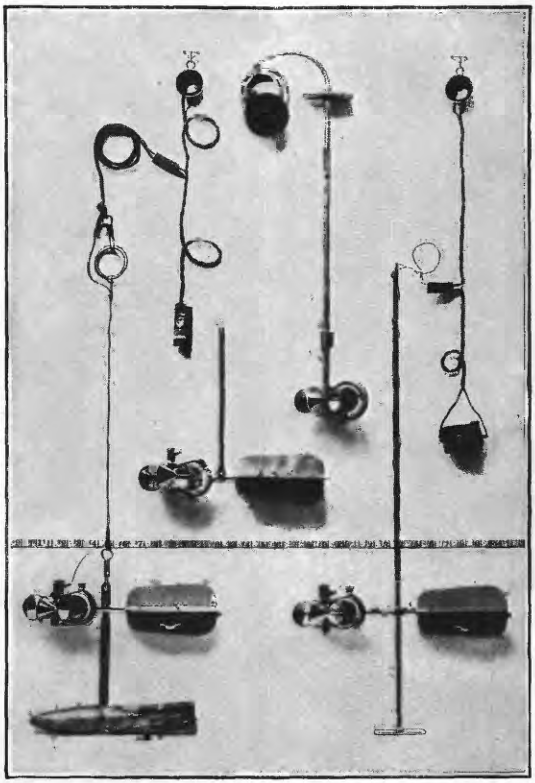
The data presented for each gaging station in the area covered by this report comprise a description of the station, a table giving results of discharge measurements, a table showing the daily discharge of the stream, and a table of monthly and yearly discharge and run-off.

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

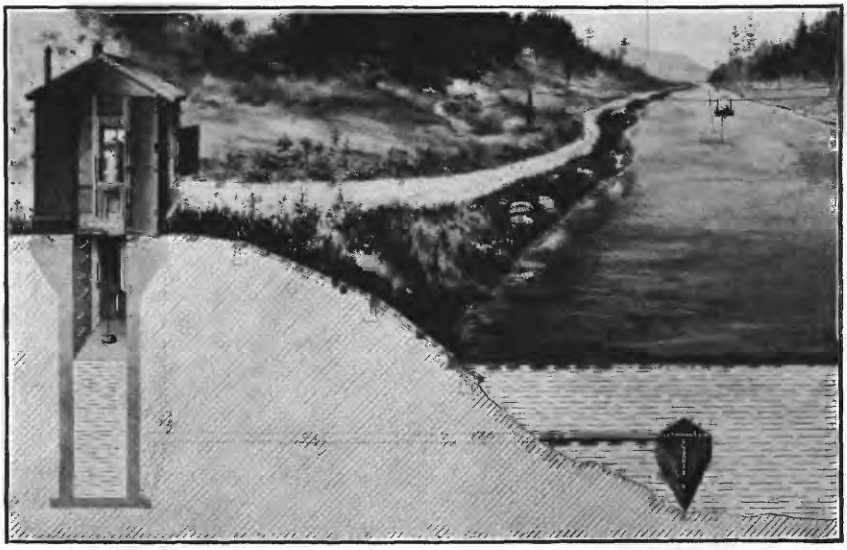
The description of the station gives, in addition to statements regarding location and equipment, information in regard to any conditions that may affect the constancy of the stage-discharge relation, covering such subjects as the occurrence of ice, the use of the stream for log driving, shifting of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

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

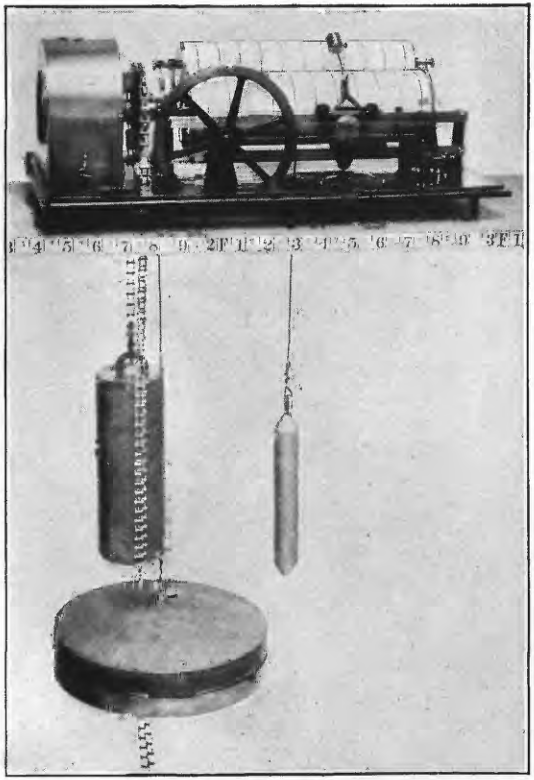
In the table of monthly discharge the column headed "Maximum" gives the mean flow for the day when the mean gage height was highest. As the gage height is the mean for the day it does not indicate correctly the stage when the water surface was at crest height and the corresponding discharge was consequently larger than given in the maximum column. Likewise, in the column headed "Minimum" the quantity given is the mean flow for the day when



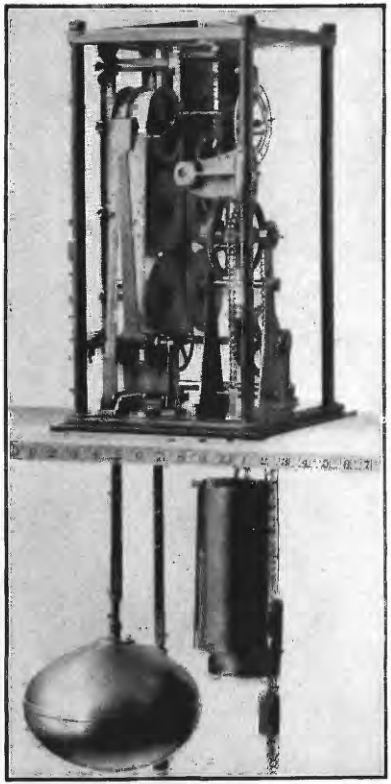
*A*. PRICE CURRENT METERS.



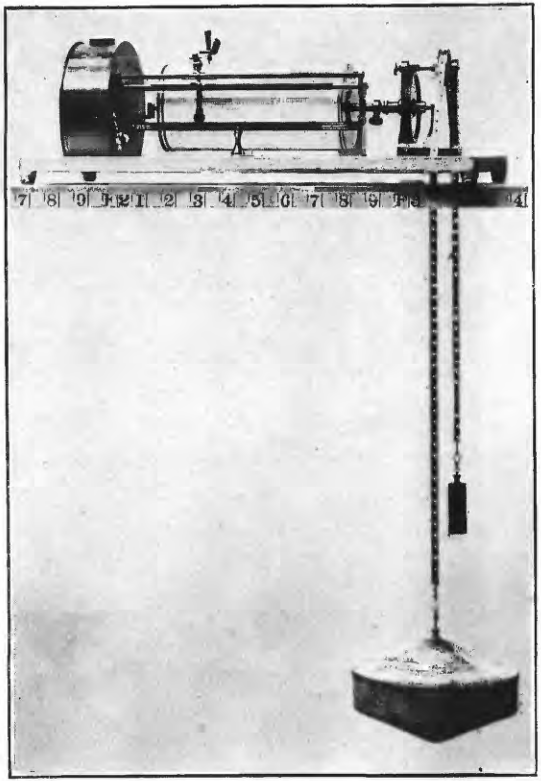
*B*. TYPICAL GAGING STATION.



*A.* STEVENS.



*B.* GURLEY PRINTING.



*C.* FRIEZ.

WATER-STAGE RECORDERS.

the mean gage height was lowest. The column headed "Mean" is the average flow in cubic feet for each second during the month. On this average flow computations recorded in the remaining columns, which are defined on page 8, are based.

## ACCURACY OF FIELD DATA AND COMPUTED RESULTS.

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

Footnotes added to the daily discharge tables give information regarding the probable accuracy of the rating tables used, and an accuracy column is inserted in the monthly discharge table. 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 letter in the column headed "Accuracy," in the table showing monthly discharge, rates the accuracy of the monthly mean and not that of the estimate of maximum or minimum discharge or the discharge for any one day. The rating is determined by considering the accuracy of the rating curve, the probable reliability of the observer, the number of gage readings per day, the range of the fluctuation in stage, and local conditions. In this column, A indicates that the mean monthly flow is probably accurate within 5 per cent; B, within 10 per cent; C, within 15 per cent; D, within 25 per cent. Special conditions are covered by footnotes.

The monthly means for any station may represent with high accuracy the quantity of water flowing past the gage, but the figures showing discharge per square mile and depth of run-off in inches may be subject to gross errors caused by the inclusion of large non-contributing 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 (depth 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 (depth in inches)" previously published by the Survey should be used with caution because of possible inherent sources of error not known to the Survey.

The table of monthly discharge gives only a general idea of the flow at the station and should not be used for other than preliminary

estimates; the 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.

During the year ending September 30, 1915, the work in Oregon and Washington has been done under cooperative agreements between the United States Geological Survey and the respective States.

Cooperation with the States is effected under contracts which are made between the Director of the Federal Survey and the State engineers or other officials and are authorized by legislative acts appropriating moneys. The State contracts are essentially of the same order, the principal provisions being substantially as follows:

1. The United States Geological Survey retains direct supervision of the field work and the preparation of the data for publication.

2. The Federal Survey retains possession of all material collected—field notes, maps, etc.—but this material is open at all times to inspection by the State officials, and if not satisfactory the agreements can be terminated at any time.

3. The salaries of gage observers and the salaries and traveling and field expenses of the engineers are divided between the two parties in some manner agreed upon, the accounts being rendered monthly in accordance with the regulations of the Federal Survey.

4. The streams and localities in which investigations shall be made are determined by conference between the State officials and the representatives of the United States Geological Survey.

5. The cost of publication is borne entirely by the Federal Survey.

In general, the cooperative agreements specify that the United States Geological Survey shall allot from its appropriation a sum equal to that appropriated from the State funds.

Special acknowledgments are due to John H. Lewis, State engineer of Oregon, and to Henry Landes, State geologist of Washington, for the very efficient manner in which they represented their States in the cooperative investigations.

Acknowledgments are also due to the engineers and employees of the United States Reclamation Service, the United States Forest Service, the United States Office of Indian Affairs, and the State Water Board of Oregon, for assistance, suggestions, and the freest use of data gathered exclusively for them and for which they have paid, and to the Corps of Engineers, United States Army, and the officers of the United States Weather Bureau for hydrographic and climatologic data.

Special acknowledgments are due for financial assistance rendered by municipalities, corporations, and individuals as follows: Water bureau of the city of Portland, Tumalo project of the State of Oregon, Teel Irrigation District, Suttles Lake Irrigation District, East Fork Irrigation District, Pacific Power & Light Co., Arnold Irrigation Co., Central Oregon Irrigation Co., Oregon Lumber Co., Northwestern Electric Co., Portland Railway, Light & Power Co., Waldo Lake Irrigation & Power Co., California-Oregon Power Co., Rogue River Valley Canal Co., M. A. Moody, W. E. Herring, and J. G. Kelley.

## DIVISION OF WORK.

The data for stations in Oregon and Washington, with the exception of those noted below, were collected and prepared for publication under the direction of F. F. Henshaw, district engineer, assisted by James E. Stewart, C. L. Batchelder, C. G. Paulsen, and P. V. Hodges, junior engineers.

For stations in Walla Walla River and Cowlitz River basins in Washington the data were collected and prepared for publication under the direction of G. L. Parker, district engineer, assisted by A. H. Tuttle, C. O. Brown, and Lasley Lee, assistant engineers, and J. T. Hartson, James E. Stewart, C. G. Paulsen, and I. L. Collier, junior engineers.

The records were reviewed and assembled for publication by B. D. Wood.

## GAGING-STATION RECORDS.

### COLUMBIA RIVER AT THE DALLES, OREG.

LOCATION.—In sec. 34, T. 2 N., R. 13 E., 2,000 feet below the ferry at The Dalles, about 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, 1915. Maximum stages, 1858 to 1877.

GAGE.—Two gages at The Dalles: The Government or Brooks gage, used by the United States Geological Survey, made up of several sections attached to the piling of viaduct connecting Regulator Dock with the warehouse; the United States Army engineers' gage, similar in form but with a datum 8.9 feet lower than the Brooks gage. Gage at Cascade Locks, 20 miles below The Dalles which was used in working up early records, has been situated at various points but is at present attached to side of wooden fender of upper locks chamber between upper guard and lock gates. Elevation of datum of Brooks 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, by United States Geological Survey engineers with meter from a launch; in 1908, flood measurements by United States Geological Survey engineers 2,000 feet below gage at The Dalles; in 1910 and 1913, measurements by United States Geological Survey engineers on Columbia River above Snake River and on Snake River referred to The Dalles gage, allowance being made for intervening tributaries.

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

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 20.8 feet at 8 a. m. June 1 (discharge, 328,000 second-feet); minimum stage recorded, −1.0 foot at 8 a. m. January 28 (discharge, 56,800 second-feet).

1857–1915: Maximum stage recorded, 59.6 feet June 6, 1894 (discharge, 1,170,000 second-feet); minimum stage recorded, —3.9 feet on gage at Cascade Locks January 7, 1890 (discharge, 41,900 second-feet).

WINTER FLOW.—Stage-discharge relation possibly affected by ice for short periods in December and January.

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.—Results considered good.

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

No discharge measurements during year.

*Daily discharge, in second-feet, of Columbia River at The Dalles, Oreg., for the year ending Sept. 30, 1915.*

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 99,000 | 105,000 | 114,000 | 80,200 | 65,500 | 75,400 | 123,000 | 197,000 | 328,000 | 229,000 | 199,000 | 164,000 |
| 2 | 100,000 | 107,000 | 114,000 | 79,400 | 66,900 | 74,600 | 129,000 | 199,000 | 323,000 | 229,000 | 198,000 | 161,000 |
| 3 | 100,000 | 108,000 | 113,000 | 78,600 | 70,600 | 73,800 | 135,000 | 204,000 | 323,000 | 233,000 | 197,000 | 157,000 |
| 4 | 98,000 | 112,000 | 111,000 | 77,800 | 74,600 | 73,800 | 138,000 | 205,000 | 320,000 | 233,000 | 198,000 | 155,000 |
| 5 | 99,000 | 112,000 | 108,000 | 76,200 | 82,000 | 74,600 | 146,000 | 205,000 | 313,000 | [illegible]3,000 | 199,000 | 154,000 |
| 6 | 100,000 | 120,000 | 106,000 | 74,600 | 75,400 | 73,800 | 161,000 | 202,000 | 303,000 | [illegible]0,000 | 198,000 | 152,000 |
| 7 | 100,000 | 123,000 | 104,000 | 73,800 | 72,200 | 73,800 | 166,000 | 201,000 | 299,000 | 229,000 | 198,000 | 151,000 |
| 8 | 101,000 | 121,000 | 107,000 | 74,600 | 71,400 | 73,800 | 163,000 | 201,000 | 294,000 | 229,000 | 198,000 | 148,000 |
| 9 | 104,000 | 123,000 | 107,000 | 74,600 | 72,200 | 73,000 | 161,000 | 201,000 | 289,000 | 230,000 | 198,000 | 146,000 |
| 10 | 104,000 | 123,000 | 104,000 | 74,600 | 71,400 | 72,200 | 157,000 | 202,000 | 279,000 | [illegible]2,000 | 197,000 | 140,000 |
| 11 | 103,000 | 123,000 | 101,000 | 74,600 | 69,000 | 70,600 | 154,000 | 206,000 | 275,000 | [illegible]4,000 | 197,000 | 135,000 |
| 12 | 102,000 | 123,000 | 96,000 | 73,800 | 68,300 | 69,800 | 151,000 | 215,000 | 275,000 | [illegible]5,000 | 195,000 | 134,000 |
| 13 | 101,000 | 125,000 | 90,100 | 73,000 | 70,600 | 69,800 | 151,000 | 227,000 | 273,000 | 230,000 | 194,000 | 130,000 |
| 14 | 101,000 | 129,000 | 89,200 | 77,000 | 69,000 | 71,400 | 151,000 | 230,000 | 270,000 | [illegible]9,000 | 192,000 | 128,000 |
| 15 | 102,000 | 132,000 | 87,400 | 77,000 | 68,300 | 73,800 | 151,000 | 236,000 | 267,000 | [illegible]7,000 | 191,000 | 125,000 |
| 16 | 102,000 | 135,000 | 84,700 | 73,000 | 67,600 | 74,600 | 161,000 | 245,000 | 264,000 | [illegible]6,000 | 188,000 | 123,000 |
| 17 | 103,000 | 132,000 | 82,000 | 71,400 | 66,900 | 74,600 | 165,000 | 252,000 | 257,000 | [illegible]4,000 | 185,000 | 118,000 |
| 18 | 103,000 | 128,000 | 78,600 | 69,000 | 66,900 | 81,100 | 168,000 | 257,000 | 248,000 | [illegible]0,000 | 181,000 | 113,000 |
| 19 | 104,000 | 125,000 | 77,000 | 67,600 | 66,900 | 85,600 | 170,000 | 258,000 | 243,000 | [illegible]3,000 | 180,000 | 108,000 |
| 20 | 105,000 | 123,000 | 72,200 | 66,900 | 66,200 | 85,600 | 180,000 | 267,000 | 240,000 | [illegible]1,000 | 177,000 | 104,000 |
| 21 | 106,000 | 124,000 | 69,000 | 65,500 | 67,600 | 86,500 | 184,000 | 311,000 | 236,000 | [illegible]5,000 | 177,000 | 103,000 |
| 22 | 106,000 | 125,000 | 64,800 | 65,500 | 69,800 | 90,100 | 192,000 | 318,000 | 236,000 | [illegible]0,000 | 177,000 | 101,000 |
| 23 | 111,000 | 124,000 | 63,400 | 64,800 | 73,000 | 91,000 | 201,000 | 313,000 | 236,000 | [illegible]0,000 | 174,000 | 99,000 |
| 24 | 112,000 | 122,000 | 62,000 | 64,100 | 73,800 | 94,000 | 204,000 | 311,000 | 232,000 | [illegible]0,000 | 177,000 | 96,000 |
| 25 | 111,000 | 118,000 | 70,600 | 62,700 | 77,800 | 96,000 | 198,000 | 311,000 | 230,000 | [illegible]0,000 | 176,000 | 91,000 |
| 26 | 110,000 | 116,000 | 77,800 | 60,600 | 76,200 | 100,000 | 194,000 | 307,000 | 227,000 | [illegible]9,000 | 173,000 | 89,200 |
| 27 | 110,000 | 116,000 | 85,600 | 60,600 | 75,400 | 106,000 | 191,000 | 310,000 | 225,000 | [illegible]6,000 | 170,000 | 87,400 |
| 28 | 110,000 | 115,000 | 92,000 | 56,800 | 75,400 | 110,000 | 190,000 | 308,000 | 223,000 | [illegible]2,000 | 169,000 | 85,600 |
| 29 | 108,000 | 115,000 | 87,400 | 59,200 | ..... | 110,000 | 190,000 | 308,000 | 220,000 | [illegible]9,000 | 166,000 | 83,800 |
| 30 | 108,000 | 114,000 | 78,600 | 64,800 | ..... | 112,000 | 192,000 | 308,000 | 227,000 | [illegible]9,000 | 165,000 | 82,000 |
| 31 | 107,000 | ..... | 78,600 | 66,900 | ..... | 117,000 | ..... | 325,000 | ..... | [illegible]1,000 | 165,000 | ..... |

NOTE.—Discharge determined from rating curve well defined above 80,000 second-feet. Stage-discharge relation affected by ice at times in December and January, but open-water rating curve was used throughout year. Accuracy of determinations for December and January reduced.

*Monthly discharge of Columbia River at The Dalles, Oreg., for the year ending Sept. 30, 1915.*

[Drainage area, 237,000 square miles]

| Month. | Discharge in second-feet. | | | | Run-off. | | Accuracy. |
|---|---|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | Per square mile. | Depth in inches on drainage area. | Total in acre-feet. | |
| October | 112,000 | 98,000 | 104,000 | 0.439 | 0.51 | 6,400 000 | A. |
| November | 135,000 | 105,000 | 121,000 | .511 | .57 | 7,200 000 | A. |
| December | 114,000 | 62,000 | 89,500 | .378 | .44 | 5,500 000 | B. |
| January | 80,200 | 56,800 | 70,300 | .297 | .34 | 4,320 000 | B. |
| February | 82,000 | 65,500 | 71,100 | .300 | .31 | 3,950 000 | A. |
| March | 117,000 | 69,800 | 84,100 | .355 | .41 | 5,170 000 | A. |
| April | 204,000 | 123,000 | 167,000 | .705 | .79 | 9,940 000 | A. |
| May | 325,000 | 197,000 | 253,000 | 1.07 | 1.23 | 15,600 000 | A. |
| June | 328,000 | 220,000 | 266,000 | 1.12 | 1.25 | 15,800 000 | A. |
| July | 239,000 | 199,000 | 224,000 | .945 | 1.09 | 13,800 000 | A. |
| August | 199,000 | 165,000 | 185,000 | .781 | .90 | 11,400 000 | A. |
| September | 164,000 | 82,000 | 122,000 | .515 | .57 | 7,260 000 | A. |
| The year | 328,000 | 56,800 | 147,000 | .620 | 8.41 | 106,000 000 | |

## TRIBUTARIES OF COLUMBIA RIVER BELOW MOUTH OF SNAKE RIVER.

### WALLA WALLA RIVER BASIN.

#### SOUTH FORK OF WALLA WALLA RIVER NEAR MILTON, OREG.

LOCATION.—In the SE. ¼ sec. 9, T. 4 N., R. 37 E., one-fourth mile above headgate of pipe line of Pacific Power & Light Co. and about 12 miles above Milton, Umatilla County.

DRAINAGE AREA.—72 square miles.

RECORDS AVAILABLE.—August 10 to September 15, 1906; January 1, 1907, to March 14, 1908; October 14, 1908, to September 30, 1915. At point 6 miles below present site, February 16, 1903, to May 29, 1906.

GAGE.—Vertical staff; datum is 0.07 foot above that used up to September 30, 1914.

DISCHARGE MEASUREMENTS.—Made by wading near gage.

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

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 4.05 feet at 9 a. m. May 19 (discharge, 595 second-feet); minimum stage recorded, 2.40 feet August 28 to September 10 and September 19 to 30 (discharge, 90 second-feet).

1906–1915: Maximum stage recorded, 4.5 feet March 2 and 20, 1910, and January 24, 1912 (discharge, 760 second-feet). A discharge of 1,650 second-feet was recorded at the old station, 6 miles below, April 14, 1904, but the flow during the flood of May 30, 1906, was much greater. Minimum discharge, 1903–1905, is that of September, 1915 (90 second-feet).

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

DIVERSIONS.—Station above all diversions for irrigation.

REGULATION.—None.

ACCURACY.—Records considered excellent.

*Discharge measurements of South Fork of Walla Walla River near Milton, Oreg., during the year ending Sept. 30, 1915.*

| Date. | Made by— | Gage height. | Discharge. |
|---|---|---|---|
| | | *Feet.* | *Sec.-ft.* |
| Oct. 17 | C. G. Paulsen | 2.60 | 114 |
| Aug. 16 | C. E. Stricklin | 2.42 | 98 |

*Daily discharge, in second-feet, of South Fork of Walla Walla River near Milton, Oreg., for the year ending Sept. 30, 1915.*

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 108 | 117 | 117 | 112 | 230 | 140 | 290 | 183 | 188 | 105 | 98 | 90 |
| 2 | 114 | 112 | 117 | 112 | 230 | 136 | 290 | 183 | 186 | 105 | 98 | 92 |
| 3 | 122 | 114 | 117 | 112 | 215 | 136 | 475 | 183 | 173 | 105 | 98 | 90 |
| 4 | 114 | 117 | 117 | 112 | 193 | 140 | 395 | 186 | 161 | 105 | 98 | 90 |
| 5 | 111 | 114 | 117 | 112 | 168 | 149 | 340 | 193 | 158 | 105 | 98 | 90 |
| 6 | 108 | 114 | 117 | 112 | 152 | 140 | 305 | 188 | 158 | 105 | 98 | 90 |
| 7 | 108 | 112 | 117 | 108 | 145 | 140 | 260 | 188 | 152 | 106 | 98 | 90 |
| 8 | 108 | 112 | 114 | 112 | 152 | 140 | 260 | 183 | 149 | 106 | 96 | 93 |
| 9 | 108 | 112 | 112 | 112 | 166 | 142 | 245 | 183 | 140 | 106 | 93 | 93 |
| 10 | 111 | 112 | 112 | 112 | 168 | 142 | 230 | 188 | 138 | 105 | 93 | 90 |
| 11 | 117 | 130 | 112 | 112 | 161 | 142 | 245 | 199 | 142 | 105 | 93 | 93 |
| 12 | 116 | 193 | 108 | 112 | 163 | 149 | 245 | 202 | 140 | 102 | 93 | 99 |
| 13 | 111 | 188 | 108 | 112 | 154 | 152 | 275 | 230 | 136 | 102 | 93 | 99 |
| 14 | 111 | 168 | 108 | 118 | 145 | 158 | 245 | 290 | 130 | 102 | 93 | 93 |
| 15 | 108 | 158 | 108 | 118 | 140 | 230 | 230 | 275 | 124 | 102 | 93 | 93 |
| 16 | 108 | 149 | 108 | 117 | 140 | 230 | 215 | 260 | 120 | 104 | 93 | 93 |
| 17 | 116 | 138 | 108 | 112 | 136 | 210 | 215 | 260 | 120 | 104 | 93 | 93 |
| 18 | 120 | 130 | 108 | 112 | 152 | 212 | 215 | 415 | 120 | 102 | 93 | 93 |
| 19 | 149 | 128 | 108 | 112 | 163 | 202 | 230 | 575 | 117 | 102 | 93 | 90 |
| 20 | 136 | 130 | 108 | 112 | 161 | 193 | 230 | 435 | 117 | 99 | 93 | 90 |
| 21 | 122 | 124 | 108 | 112 | 163 | 191 | 215 | 322 | 117 | 98 | 93 | 90 |
| 22 | 120 | 128 | 108 | 112 | 161 | 202 | 202 | 275 | 117 | 98 | 93 | 90 |
| 23 | 118 | 124 | 108 | 108 | 158 | 245 | 202 | 245 | 114 | 98 | 93 | 90 |
| 24 | 117 | 124 | 108 | 108 | 152 | 245 | 193 | 230 | 112 | 98 | 93 | 90 |
| 25 | 114 | 120 | 108 | 108 | 152 | 230 | 188 | 210 | 118 | 98 | 93 | 90 |
| 26 | 112 | 120 | 111 | 108 | 145 | 191 | 188 | 202 | 117 | 98 | 93 | 90 |
| 27 | 112 | 120 | 112 | 108 | 140 | 183 | 188 | 188 | 112 | 98 | 92 | 90 |
| 28 | 112 | 120 | 112 | 108 | 140 | 199 | 188 | 245 | 111 | 98 | 90 | 90 |
| 29 | 111 | 120 | 112 | 108 | ..... | 275 | 191 | 215 | 108 | 99 | 90 | 90 |
| 30 | 117 | 118 | 112 | 112 | ..... | 290 | 188 | 210 | 108 | 99 | 90 | 90 |
| 31 | 124 | ..... | 112 | 112 | ..... | 305 | ..... | 202 | ..... | 98 | 90 | ..... |

NOTE.—Discharge determined from a rating curve well defined between 90 and 400 second-feet.

*Monthly discharge of South Fork of Walla Walla River near Milton, Oreg., for the year ending Sept. 30, 1915.*

| Month. | Discharge in second-feet. | | | Run-off (total in acre-feet). | Accuracy. |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | | |
| October | 149 | 108 | 116 | 7,130 | A. |
| November | 193 | 112 | 129 | 7,680 | A. |
| December | 117 | 108 | 111 | 6,820 | A. |
| January | 118 | 108 | 112 | 6,890 | A. |
| February | 230 | 136 | 162 | 9,000 | A. |
| March | 305 | 136 | 188 | 11,600 | A. |
| April | 475 | 188 | 246 | 14,600 | A. |
| May | 575 | 183 | 243 | 14,900 | A. |
| June | 188 | 108 | 133 | 7,910 | A. |
| July | 106 | 98 | 102 | 6,270 | A. |
| August | 98 | 90 | 93.8 | 5,770 | A. |
| September | 99 | 90 | 91.5 | 5,440 | A. |
| The year | 575 | 90 | 144 | 104,000 | |

### MILL CREEK NEAR WALLA WALLA, WASH.

LOCATION.—In sec. 12, T. 6 N., R. 37 E. Willamette meridian, below the Walla Walla waterworks diversion dam, 12 miles east of Walla Walla, in Walla Walla County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—August 27, 1913, to September 30, 1915.

GAGE.—Since October 22, 1913, vertical staff on left bank, 0.5 to 7.0 feet, spiked to roots and overhanging limbs of a cottonwood tree 500 feet below the diversion dam of the Walla Walla waterworks. A temporary gage at the same location and datum was read prior to October 22, 1913. Gage read to quarter-tenths twice a day by Otto Zimmerman, headworks attendant for the Walla Walla waterworks.

DISCHARGE MEASUREMENTS.—Made by wading.

CHANNEL AND CONTROL.—Banks high; not subject to overflow. Control consists of a long gravel and boulder riffle, which shifts at high stages. Zero flow would occur at about zero gage height.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 2.60 feet May 19 (discharge, 440 second-feet); minimum stage recorded, 0.69 foot at 6.30 p. m. August 29 to September 1 (discharge, 21 second-feet).

1913–1915: Maximum stage recorded, 2.60 feet, February 27, 1914 (discharge, 443 second-feet); minimum stage recorded, August 29 to September 1, 1915.

WINTER FLOW.—Stage-discharge relation seriously affected by ice, flow estimated from observers' notes and climatic records.

DIVERSIONS.—The city of Walla Walla diverts 22 to 28 second-feet above the gage for municipal supply. For measurement of this diversion see page 174.

REGULATION.—Gates at intake of water-supply conduit are closed at infrequent intervals for cleaning settling basins.

ACCURACY.—Rating curve well defined between 20 and 350 second-feet. Results excellent except when stage discharge relation was affected by ice.

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

*Discharge measurements of Mill Creek near Walla Walla, Wash., during the year ending Sept. 30, 1915.*

[Made by C. O. Brown.]

| Date. | Gage height. | Discharge. | Date. | Gage height. | Discharge. |
|---|---|---|---|---|---|
| | *Feet.* | *Sec.-ft.* | | *Feet.* | *Sec.-ft.* |
| Nov. 3 | 0.90 | 33.7 | May 18 | 2.19 | 299 |
| Feb. 11 | 1.47 | [a] 108 | Sept. 26 | .72 | 23.5 |

[a] Walla Walla water supply diverting 21.6 second-feet past the gage.

*Daily discharge, in second-feet, of Mill Creek near Walla Walla, Wash., for the year ending Sept. 30, 1915.*

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 43 | 37 | 38 | 34 | 134 | 63 | 269 | 66 | 102 | 32 | 27 | 22 |
| 2 | 41 | 35 | 38 | 37 | 182 | 61 | 238 | 69 | 91 | 32 | 26 | 23 |
| 3 | 41 | 35 | 38 | 37 | 209 | 66 | 334 | 74 | 77 | 31 | 26 | 23 |
| 4 | 37 | 35 | 37 | 43 | 146 | 77 | 301 | 87 | 70 | 31 | 26 | 23 |
| 5 | 35 | 38 | 37 | 41 | 102 | 76 | 254 | 92 | 63 | 31 | 24 | 23 |
| 6 | 35 | 38 | 36 | 41 | 87 | 76 | 196 | 87 | 59 | 31 | 25 | 23 |
| 7 | 34 | 37 | 35 | 40 | 87 | 74 | 182 | 84 | 66 | 32 | 26 | 23 |
| 8 | 34 | 37 | 35 | 40 | 107 | 73 | 146 | 79 | 74 | 33 | 24 | 24 |
| 9 | 34 | 36 | 35 | 45 | 146 | 71 | 121 | 77 | 59 | 32 | 24 | 23 |
| 10 | 37 | 35 | 34 | 43 | 134 | 69 | 113 | 91 | 50 | 31 | 24 | 24 |
| 11 | 37 | 61 | 34 | 42 | 109 | 67 | 105 | 117 | 48 | 31 | 24 | 23 |
| 12 | 41 | 102 | 32 | 45 | 91 | 66 | 107 | 121 | 48 | 29 | 24 | 29 |
| 13 | 41 | 134 | 32 | 44 | 80 | 70 | 130 | 134 | 45 | 29 | 24 | 31 |
| 14 | 39 | 91 | 32 | 51 | 66 | 77 | 109 | 196 | 44 | 30 | 27 | 26 |
| 15 | 37 | 73 | 32 | 52 | 61 | 209 | 100 | 209 | 43 | 30 | 27 | 25 |
| 16 | 35 | 61 | 32 | 47 | 61 | 196 | 94 | 182 | 41 | 32 | 27 | 24 |
| 17 | 38 | 56 | 32 | 45 | 63 | 157 | 94 | 182 | 40 | 37 | 25 | 24 |
| 18 | 37 | 50 | 31 | 41 | 79 | 182 | 94 | 269 | 40 | 30 | 24 | 24 |
| 19 | 52 | 48 | 31 | 41 | 113 | 157 | 92 | 440 | 38 | 29 | 24 | 24 |
| 20 | 44 | 47 | 30 | 40 | 111 | 134 | 87 | 351 | 37 | 29 | 24 | 24 |
| 21 | 40 | 45 | 30 | 40 | 111 | 121 | 84 | 254 | 37 | 28 | 24 | 24 |
| 22 | 39 | 44 | 31 | 38 | 105 | 132 | 77 | 182 | 35 | 27 | 23 | 24 |
| 23 | 38 | 42 | 31 | 38 | 86 | 157 | 77 | 146 | 34 | 27 | 23 | 24 |
| 24 | 37 | 42 | 32 | 38 | 77 | 146 | 71 | 146 | 34 | 27 | 24 | 24 |
| 25 | 36 | 41 | 32 | 37 | 80 | 121 | 69 | 121 | 41 | 27 | 23 | 24 |
| 26 | 36 | 41 | 34 | 37 | 74 | 102 | 69 | 111 | 36 | 27 | 23 | 24 |
| 27 | 35 | 42 | 33 | 36 | 69 | 87 | 67 | 102 | 34 | 27 | 23 | 24 |
| 28 | 35 | 41 | 41 | 35 | 66 | 84 | 64 | 157 | 34 | 27 | 23 | 24 |
| 29 | 37 | 40 | 37 | 35 | ..... | 238 | 74 | 134 | 32 | 29 | 23 | 24 |
| 30 | 38 | 39 | 34 | 34 | ..... | 334 | 77 | 128 | 32 | 28 | 22 | 23 |
| 31 | 35 | ..... | 32 | 40 | ..... | 301 | ..... | 109 | ..... | 28 | 22 | ..... |

NOTE.—Discharge ascertained from rating curve well defined between 20 and 350 second-feet. Discharge estimated, because of ice, from observer's notes and climatic records, Dec. 17–24.

*Monthly discharge of Mill Creek near Walla Walla, Wash., for the year ending Sept. 30, 1915.*

| Month. | Discharge in second-feet. | | | Run-off (total in acre-feet). | Accuracy. |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | | |
| October | 52 | 34 | 38.0 | 2,340 | A. |
| November | 134 | 35 | 50.1 | 2,980 | A. |
| December | 41 | ..... | 33.8 | 2,080 | B. |
| January | 52 | 34 | 40.5 | 2,490 | A. |
| February | 209 | 61 | 101 | 5,610 | A. |
| March | 334 | 61 | 124 | 7,620 | A. |
| April | 334 | 64 | 130 | 7,740 | A. |
| May | 440 | 66 | 148 | 9,100 | A. |
| June | 102 | 32 | 49.5 | 2,950 | A. |
| July | 37 | 27 | 29.8 | 1,830 | A. |
| August | 27 | 22 | 24.4 | 1,500 | A. |
| September | 31 | 22 | 24.1 | 1,430 | A. |
| The year | 440 | 22 | 65.9 | 47,700 | |

## UMATILLA RIVER BASIN.

### UMATILLA RIVER ABOVE FURNISH RESERVOIR, NEAR YOAKUM, OREG.

LOCATION.—Above backwater from Furnish reservoir, about 5 miles above gaging station at Yoakum; no tributaries enter between.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—June 18 to August 28, 1915.

GAGE.—Vertical staff.

DISCHARGE MEASUREMENTS.—Made by wading.

REGULATION.—Water is stored in the Byers mill race at Pendleton, and drawn down several times each day during low water.

ACCURACY.—Results considered good for days on which gage was read: each gage height used is the mean of several readings, made over a considerable period to cover a complete cycle of fluctuation.

COOPERATION.—Records furnished by L. A. Reineman, water master for Umatilla County.

*Discharge measurements of Umatilla River above Furnish reservoir, near Yoakum, Oreg., during the year ending Sept. 30, 1915.*

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---|---|---|---|---|---|---|---|
| | | *Feet.* | *Sec.-ft.* | | | *Feet.* | *Sec.-ft.* |
| July 2 | L. A. Reineman | 2.79 | 81 | July 27 | L. A. Reineman | 2.44 | 33 |
| 9 | W. P. Ward | 2.68 | 64 | Aug. 28 | W. P. Ward | 2.32 | 24 |
| 14 | L. A. Reineman | 2.55 | 46 | | | | |

*Daily discharge, in second-feet, of Umatilla River above Furnish reservoir, near Yoakum, Oreg., for the year ending Sept. 30, 1915.*

| Day. | June. | July. | Aug. | Day. | June. | July. | Aug. | Day. | June. | July. | Aug. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | 11 | | | | 21 | | 51 | |
| 2 | | 80 | 40 | 12 | | | | 22 | 127 | | |
| 3 | | | | 13 | | 62 | 28 | 23 | | | |
| 4 | | | 32 | 14 | | | | 24 | 117 | 44 | |
| 5 | | 80 | | 15 | | 62 | | 25 | | | |
| 6 | | | | 16 | | | | 26 | 117 | | |
| 7 | | 72 | | 17 | | | | 27 | | 41 | |
| 8 | | | | 18 | 164 | | | 28 | | | 24 |
| 9 | | 64 | | 19 | | 60 | | 29 | 107 | | |
| 10 | | | | 20 | | | | 30 | 82 | 41 | |
| | | | | | | | | 31 | | | |

NOTE.—Discharge June 18, 22, 24, 26, and 29 obtained by current-meter measurements unreferred to gage; discharge June 30 to Aug. 5 determined from a well-defined rating curve.

*Monthly discharge of Umatilla River above Furnish reservoir, near Yoakum, Oreg., for the year ending Sept. 30, 1915.*

| Month. | Discharge in second-feet. | | | Run-off (total in acre-feet). | Accuracy. |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | | |
| June 18-30 | 164 | 82 | 124 | 3,200 | B. |
| July | 81 | 41 | 59.2 | 3,640 | B. |
| August 1-5 | 40 | 31 | 35.8 | 355 | B. |

NOTE.—Monthly discharge determined by interpolating between days for which discharge is given.

### UMATILLA RIVER AT YOAKUM, OREG.

LOCATION.—In the SW. ¼ sec. 2, T. 2 N., R. 30 E., at the Yoakum wagon bridge, half a mile east of the Yoakum station of the Oregon-Washington Railroad & Navigation Co. and 18 miles below Pendleton, Umatilla County.

DRAINAGE AREA.—1,200 square miles.

RECORDS AVAILABLE.—May 5, 1903, to September 30, 1915.

GAGE.—Vertical staff spiked to right abutment of highway bridge.

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

CHANNEL AND CONTROL.—Rock and gravel; shifts in extreme floods One channel at all stages. Left bank is overflowed during extreme floods. Control composed of lava boulders.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 7.90 feet at 9.30 p. m. April 2 (discharge, 4,240 second-feet); minimum stage recorded, 2.60 feet August 24 (discharge, 16 second-feet).

1903–1915: Maximum stage (from high-water marks), about 15.0 feet May 31, 1906 (discharge estimated as 23,900 second-feet); minimum stage, 2.45 feet August 10 to 12, 1908 (discharge, 12 second-feet).

WINTER FLOW.—River occasionally freezes for short periods.

DIVERSIONS.—Small tracts aggregating 720 acres are irrigated from Umatilla River above the station, besides some from its tributaries.

REGULATION.—Water is stored during the winter in the Furnish reservoir, 5 miles upstream, and released during low water. Capacity of reservoir, about 5,000 acre-feet.

Release of water was begun 5 p. m. June 17, 1915, and reservoir was practically empty August 5. The difference between discharge above reservoir (p. 21) and at that station indicates that 1,070 acre-feet was released in June, 2,480 acre-feet in July, and 275 August 1 to 5.

ACCURACY.—Results considered good.

*Discharge measurements of Umatilla River at Yoakum, Oreg., during the year ending Sept. 30, 1915.*

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---|---|---|---|---|---|---|---|
| | | *Feet.* | *Sec. ft.* | | | *Feet.* | *Sec. ft.* |
| Oct. 15 | C. G. Paulsen | 3.22 | 93.9 | June 26 | Rhea Luper | a 3.54 | 165. |
| 15 | do | 2.90 | 45.3 | 29 | do | a 3.51 | 140 |
| Apr. 19 | Eriksen and Pearce | a 4.45 | 524 | July 5 | W. P. Ward | a 3.30 | 115 |
| May 1 | E. T. Eriksen | 4.10 | 399 | 9 | do | a 3.25 | 103 |
| June 8 | do | 4.12 | 405 | 15 | L. A. Reineman | a 3.20 | 65.9 |
| 18 | L. A. Reineman | 3.69 | 222 | 21 | W. P. Ward | a 3.27 | 107 |
| 22 | W. P. Ward | a 3.49 | 173 | Aug. 28 | do | a 2.65 | 22.6 |
| 24 | do | a 3.55 | 170 | | | | |

a Measured by wading below Furnish reservoir, about a mile upstream.

*Daily discharge, in second-feet, of Umatilla River at Yoakum, Oreg., for the year ending Sept. 30, 1915.*

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 75 | 108 | 130 | 98 | 128 | 340 | 2,300 | 363 | 1,030 | 114 | 87 | 20 |
| 2 | 78 | 98 | 126 | 100 | 520 | 260 | 2,660 | 363 | 960 | 112 | 88 | 20 |
| 3 | 78 | 98 | 126 | 102 | 640 | 228 | 2,920 | 363 | 855 | 118 | 76 | 22 |
| 4 | 75 | 100 | 126 | 100 | 700 | 242 | 3,640 | 386 | 730 | 112 | 35 | 25 |
| 5 | 82 | 98 | 120 | 106 | 520 | 465 | 2,660 | 610 | 640 | 110 | 31 | 28 |
| 6 | 81 | 102 | 120 | 112 | 318 | 610 | 2,180 | 760 | 520 | 114 | 28 | 34 |
| 7 | 78 | 100 | 120 | 108 | 340 | 580 | 1,750 | 790 | 410 | 120 | 28 | 39 |
| 8 | 72 | 102 | 120 | 100 | 363 | 520 | 1,450 | 700 | 363 | 114 | 31 | 45 |
| 9 | 72 | 106 | 114 | 108 | 363 | 492 | 1,180 | 640 | 340 | 100 | 33 | 45 |
| 10 | 63 | 94 | 114 | 110 | 363 | 492 | 1,030 | 640 | 318 | 100 | 33 | 46 |
| 11 | 82 | 90 | 114 | 120 | 363 | 492 | 960 | 670 | 293 | 100 | 29 | 52 |
| 12 | 94 | 102 | 114 | 114 | 410 | 492 | 890 | 760 | 277 | 100 | 24 | 46 |
| 13 | 106 | 135 | 114 | 108 | 410 | 520 | 890 | 1,030 | 277 | 94 | 28 | 58 |
| 14 | 100 | 158 | 114 | 126 | 363 | 492 | 890 | 1,360 | 277 | 68 | 28 | 57 |
| 15 | 94 | 176 | 114 | 148 | 318 | 670 | 760 | 1,850 | 235 | 78 | 24 | 60 |
| 16 | 94 | 179 | 112 | 163 | 363 | 1,270 | 670 | 1,650 | 208 | 90 | 21 | 60 |
| 17 | 100 | 179 | 110 | 153 | 363 | 1,180 | 610 | 1,450 | 202 | 90 | 20 | 68 |
| 18 | 106 | 174 | 110 | 148 | 386 | 1,100 | 580 | 1,850 | 194 | 90 | 20 | 68 |
| 19 | 126 | 169 | 110 | 135 | 410 | 1,100 | 550 | 2,540 | 179 | 90 | 20 | 68 |
| 20 | 142 | 158 | 108 | 130 | 410 | 960 | 520 | 2,300 | 174 | 90 | 20 | 68 |
| 21 | 142 | 166 | ..... | 130 | 410 | 890 | 465 | 1,850 | 156 | 106 | 20 | 69 |
| 22 | 132 | 166 | ..... | 126 | 465 | 960 | 410 | 1,550 | 163 | 118 | 20 | 68 |
| 23 | 130 | 166 | ..... | 126 | 465 | 1,030 | 410 | 1,360 | 169 | 106 | 19 | 57 |
| 24 | 124 | 144 | ..... | 126 | 465 | 1,180 | 410 | 1,180 | 166 | 100 | 16 | 48 |
| 25 | 110 | 142 | ..... | 120 | 465 | 1,270 | 363 | 1,360 | 174 | 100 | 20 | 58 |
| 26 | 102 | 142 | ..... | 120 | 465 | 1,030 | 318 | 1,270 | 163 | 100 | 20 | 69 |
| 27 | 100 | 130 | ..... | 120 | 465 | 820 | 318 | 1,270 | 158 | 94 | 20 | 60 |
| 28 | 122 | 130 | ..... | 132 | 438 | 760 | 298 | 1,360 | 166 | 90 | 20 | 57 |
| 29 | 122 | 130 | ..... | 153 | ..... | 1,180 | 298 | 1,550 | 156 | 92 | 20 | 57 |
| 30 | 132 | 130 | ..... | 142 | ..... | 2,070 | 386 | 1,450 | 135 | 92 | 20 | 57 |
| 31 | 130 | ..... | ..... | 126 | ..... | 2,300 | ..... | 1,180 | ..... | 87 | 20 | ..... |

NOTE.—Discharge determined from a rating curve well defined above 40 second-feet. Mean discharge Dec. 21–31 estimated 90 second-feet (stage-discharge relation affected by ice).

*Monthly discharge of Umatilla River at Yoakum, Oreg., for the year ending Sept. 30, 1915.*

| Month. | Discharge in second-feet. | | | Run-off (total in acre-feet). | Accuracy. |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | | |
| October | 142 | 63 | 101 | 6,210 | B. |
| November | 179 | 90 | 132 | 7,860 | A. |
| December | 130 | ..... | 107 | 6,580 | B. |
| January | 163 | 98 | 123 | 7,560 | A. |
| February | 700 | 128 | 417 | 23,200 | A. |
| March | 2,300 | 228 | 839 | 51,600 | A. |
| April | 3,640 | 298 | 1,090 | 64,900 | A. |
| May | 2,540 | 363 | 1,180 | 72,600 | A. |
| June | 1,030 | 135 | 336 | 20,000 | A. |
| July | 120 | 68 | 99.6 | 6,120 | A. |
| August | 88 | 16 | 29.6 | 1,820 | B. |
| September | 87 | 20 | 52.0 | 3,090 | B. |
| The year | 3,640 | 16 | 375 | 272,000 | |

### UMATILLA RIVER NEAR UMATILLA, OREG.

LOCATION.—In the NW. ¼ sec. 21, T. 5 N., R. 28 E., near main line of Oregon-Washington Railroad & Navigation Co.'s track, about a mile below diversion point of Oregon Land & Water Co.'s canal, 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, 1915.

GAGE.—Inclined staff in two sections; lower section 1.2 to 3.5 feet, upper 3.5 to 10.8 feet. Gage reader, C. A. Holder.

DISCHARGE MEASUREMENTS.—Made from cable.

CHANNEL AND CONTROL.—Solid rock without gravel or sand. One channel at all stages.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 4.7 feet March 2 (discharge, 2,450 second-feet); minimum stage recorded, 1.90 feet November 29 to December 1 (discharge, 8 second-feet), probably due to filling pond behind new dam of west extension of Umatilla project, United States Reclamation Service.

1903–1915: Maximum stage recorded, 11.0 feet May 31, 1906 (discharge, 19,600 second-feet); minimum stage recorded, 1.0 foot July 25 and August 1 to 9, 1906 (channel dry).

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

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

REGULATION.—Practically none.

ACCURACY.—Results considered excellent.

COOPERATION.—Field data furnished by United States Reclamation Service; records computed by United States Geological Survey.

*Discharge measurements of Umatilla River near Umatilla, Oreg., during the year ending Sept. 30, 1915.*

[Made by C. G. Paulsen.]

| Date. | Gage height. | Discharge. |
|---|---|---|
| | *Feet.* | *Sec.-ft.* |
| Nov. 10 | 2.52 | 101 |
| Jan. 8 | 2.50 | 83.8 |

*Daily discharge, in second-feet, of Umatilla River near Umatilla, Oreg., for the year ending Sept. 30, 1915.*

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 128 | 120 | 8 | 105 | 160 | 160 | 1,520 | 72 | 770 | 90 | 90 | 79 |
| 2 | 128 | 120 | 120 | 105 | 160 | 240 | 1,660 | 105 | 580 | 90 | 90 | 79 |
| 3 | 140 | 120 | 120 | 90 | 415 | 216 | 2,450 | 90 | 340 | 90 | 90 | 79 |
| 4 | 140 | 120 | 120 | 90 | 495 | 216 | 2,290 | 90 | 270 | 105 | 90 | 79 |
| 5 | 140 | 114 | 79 | 90 | 415 | 240 | 1,970 | 90 | 210 | 120 | 90 | 79 |
| 6 | 136 | 114 | 120 | 90 | 340 | 455 | 1,520 | 90 | 160 | 90 | 86 | 90 |
| 7 | 132 | 105 | 79 | 90 | 140 | 415 | 1,240 | 240 | 120 | 90 | 86 | 90 |
| 8 | 128 | 102 | 79 | 93 | 105 | 270 | 995 | 210 | 105 | 90 | 86 | 90 |
| 9 | 124 | 96 | 79 | 93 | 88 | 270 | 770 | 210 | 90 | 90 | 79 | 90 |
| 10 | 120 | 96 | 90 | 105 | 88 | 140 | 670 | 185 | 90 | 90 | 79 | 86 |
| 11 | 120 | 96 | 120 | 105 | 86 | 140 | 580 | 270 | 90 | 90 | 79 | 90 |
| 12 | 120 | 96 | 120 | 111 | 86 | 124 | 415 | 270 | 105 | 90 | 79 | 90 |
| 13 | 120 | 96 | 120 | 111 | 86 | 124 | 340 | 415 | 120 | 90 | 79 | 90 |
| 14 | 120 | 96 | 140 | 111 | 86 | 124 | 270 | 580 | 120 | 90 | 79 | 90 |
| 15 | 120 | 102 | 160 | 111 | 90 | 124 | 210 | 1,120 | 120 | 90 | 79 | 90 |
| 16 | 136 | 105 | 160 | 111 | 90 | 124 | 185 | 1,240 | 105 | 90 | 79 | 90 |
| 17 | 152 | 114 | 160 | 111 | 90 | 720 | 160 | 1,240 | 105 | 90 | 79 | 90 |
| 18 | 160 | 117 | 160 | 111 | 90 | 670 | 120 | 1,240 | 105 | 90 | 79 | 90 |
| 19 | 185 | 117 | 160 | 111 | 105 | 580 | 90 | 1,520 | 105 | 120 | 86 | 90 |
| 20 | 185 | 117 | 152 | 114 | 120 | 538 | 79 | 1,820 | 105 | 105 | 86 | 90 |
| 21 | 185 | 117 | 152 | 114 | 140 | 495 | 90 | 1,380 | 105 | 90 | 86 | 90 |
| 22 | 185 | 117 | 160 | 120 | 140 | 495 | 79 | 1,240 | 105 | 90 | 79 | 90 |
| 23 | 185 | 114 | 160 | 120 | 140 | 495 | 68 | 1,120 | 105 | 86 | 79 | 90 |
| 24 | 185 | 114 | 160 | 120 | 140 | 495 | 64 | 995 | 90 | 79 | 79 | 86 |
| 25 | 185 | 114 | 160 | 120 | 140 | 580 | 66 | 770 | 90 | 79 | 79 | 88 |
| 26 | 185 | 114 | 160 | 120 | 140 | 580 | 68 | 770 | 90 | 79 | 79 | 90 |
| 27 | 120 | 114 | 90 | 140 | 160 | 415 | 68 | 770 | 90 | 79 | 68 | 90 |
| 28 | 120 | 114 | 90 | 140 | 160 | 415 | 68 | 770 | 90 | 79 | 79 | 90 |
| 29 | 120 | 8 | 90 | 160 | ..... | 415 | 68 | 880 | 90 | 79 | 79 | 88 |
| 30 | 120 | 8 | 90 | 140 | ..... | 1,180 | 68 | 995 | 90 | 90 | 79 | 88 |
| 31 | 120 | ..... | 105 | 140 | ..... | 1,520 | ..... | 995 | ..... | 90 | 79 | ..... |

NOTE.—Discharge determined from a well-defined rating curve.

*Monthly discharge of Umatilla River near Umatilla, Oreg., for the year ending Sept. 30, 1915.*

| Month. | Discharge in second-feet. | | | Run-off (total in acre-feet). | Accuracy. |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | | |
| October | 185 | 120 | 143 | 8,790 | A. |
| November | 120 | 8 | 103 | 6,130 | A. |
| December | 160 | 8 | 121 | 7,440 | B. |
| January | 160 | 90 | 113 | 6,950 | A. |
| February | 495 | 86 | 161 | 8,940 | A. |
| March | 1,520 | 124 | 419 | 25,800 | A. |
| April | 2,450 | 64 | 608 | 36,200 | A. |
| May | 1,820 | 72 | 703 | 43,209 | A. |
| June | 770 | 90 | 159 | 9,460 | A. |
| July | 120 | 79 | 90.6 | 5,570 | A. |
| August | 90 | 68 | 81.8 | 5,030 | A. |
| September | 90 | 79 | 87.7 | 5,220 | A. |
| The year | 2,450 | 8 | 233 | 169,000 | |

### NORTH FORK OF UMATILLA RIVER NEAR GIBBON, OREG.

LOCATION.—In the SW. ¼ NW. ¼ sec. 22, T. 3 N., R. 37 E., just above crossing of the South Fork trail and the junction of North and South forks of Umatilla River, about 3 miles above Weneha Springs, and about 10 miles east of Gibbon.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—June 17, 1912, to December 31, 1915, when station was discontinued.

GAGE.—Vertical staff; read at irregular intervals by employee of Forest Service.

DISCHARGE MEASUREMENTS.—Made by wading near gage.

CHANNEL AND CONTROL.—Gravel and small boulders; probably somewhat shifting.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period October 1, 1914, to December 31, 1915, 1.60 feet December 22 (discharge, 226 second-feet); maximum discharge, 231 second-feet (gage height, 1.52 feet) at 1 p. m. April 2. Minimum stage recorded, 0.55 foot August 22 to September 7 (discharge, 20 second-feet).

1912–1915: Minimum discharge is that of 1915. Maximum not covered by records. The records of maxima do not represent the highest stage during the period, but the minima are probably close to the lowest flow.

WINTER FLOW.—Stage-discharge relation unaffected by ice, as most of water comes from springs.

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Results considered fair for days on which gage was read. Low water records of 1915 uncertain because of questionable gage readings.

COOPERATION.—Gage heights furnished by United States Forest Service, J. M. Schmitz, supervisor.

*Discharge measurements of North Fork of Umatilla River near Gibbon, Oreg., during the year ending Sept. 30, 1915.*

| Date. | Made by— | Gage height. | Discharge. |
|---|---|---|---|
| | | *Feet.* | *Sec.-ft.* |
| Oct. 22 | C. G. Paulsen | 0.65 | 40.4 |
| Aug. 14 | C. E. Stricklin | *a* .68 | 33.6 |

*a* Gage height questionable.

*Daily discharge, in second-feet, of North Fork of Umatilla River near Gibbon, Oreg., from Oct. 1, 1914, to Dec. 31, 1915.*

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1914-15. | | | | | | | | | | | | |
| 1 | | 36 | 34 | 34 | 40 | | 154 | 74 | 92 | 27 | 23 | |
| 2 | | | | | | | 167 | | 81 | | | |
| 3 | 46 | | | | 95 | | 231 | 74 | | | | 20 |
| 4 | | | 32 | | | | 147 | | | | | |
| 5 | | | | | 68 | 60 | | | | | | |
| 6 | | | 34 | 29 | | | | | | | | |
| 7 | | 34 | | | | | 130 | | 61 | 27 | | 20 |
| 8 | | | 34 | 32 | | | | 77 | | 30 | 23 | 23 |
| 9 | | | | | | | 107 | 81 | | | | |
| 10 | | 34 | | | | | | | | 27 | | |
| 11 | 40 | | 34 | | | | 100 | | 54 | | 23 | 25 |
| 12 | | 46 | | 32 | | | | 86 | | | 23 | 27 |
| 13 | | 49 | 34 | 34 | | | 130 | | 47 | | | |
| 14 | | 46 | | | | | 107 | 147 | | | | |
| 15 | | | | | | | 100 | 137 | | 27 | 23 | |
| 16 | | 46 | | | | | | | | | | |
| 17 | | | 34 | 32 | | | | 155 | 41 | | | |
| 18 | | 44 | | | | | 96 | 220 | | 27 | | |
| 19 | | | | | | | | | 37 | | 23 | 25 |
| 20 | | | 34 | 32 | | | 118 | | | | | |
| 21 | | | | | | 95 | | 174 | | | | |
| 22 | | 36 | | | | | 81 | | | 27 | 20 | 25 |
| 23 | | | 32 | 32 | | | | 163 | 33 | 25 | | |
| 24 | | | | | | 113 | | 123 | | | | |
| 25 | | 34 | | | | | 77 | | 41 | 25 | 20 | |
| 26 | | | | 32 | | 106 | | | | | | 25 |
| 27 | 36 | | 32 | | 60 | | | 86 | | | | |
| 28 | | 34 | | | | | 74 | 118 | 30 | 23 | | |
| 29 | | | | | | 129 | | 107 | 27 | 30 | 20 | |
| 30 | | | 32 | 32 | | | 77 | | | | | 25 |
| 31 | | 34 | | | | 141 | | 96 | | | | |

*Daily discharge, in second-feet, of North Fork of Umatilla River, near Gibbon, Oreg., for the year ending Sept. 30, 1916.*

| Day. | Oct. | Nov. | Dec. | Day. | Oct. | Nov. | Dec. | Day. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1915. | | | | | | | | | | | |
| 1 | 25 | | | 11 | | | 61 | 21 | | | 61 |
| 2 | | 27 | | 12 | | 35 | | 22 | | 69 | 226 |
| 3 | 41 | | | 13 | 30 | | | 23 | | 77 | |
| 4 | | | 86 | 14 | | | | 24 | | 61 | |
| 5 | | | 64 | 15 | | | | 25 | | | 77 |
| 6 | 27 | | 69 | 16 | 25 | | 41 | 26 | 25 | 45 | |
| 7 | | 25 | | 17 | | | 35 | 27 | | | |
| 8 | | | | 18 | | | | 28 | | | 50 |
| 9 | 25 | 30 | 100 | 19 | | 64 | | 29 | | 41 | |
| 10 | | | | 20 | 25 | | 37 | 30 | | | |
| | | | | | | | | 31 | 25 | | 35 |

NOTE.—Discharge given only for days on which gage was read; determined from rating curves as follows: Oct. 1 to Apr. 3, fairly well defined between 20 and 150 second-feet; Apr. 4 to Dec. 31, poorly defined.

## JOHN DAY RIVER BASIN.

### JOHN DAY RIVER AT CLARNO, OREG.

LOCATION.—In the NE. ¼ sec. 32, T. 7 S., R. 19 E., at Clarno higl way bridge, 14 miles east of Antelope.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—April 1, 1914, to September 30, 1915, when station was discontinued.

GAGE.—Chain gage on rail of bridge, read by C. T. Craig.

DISCHARGE MEASUREMENTS.—Made from highway bridge.

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

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 6.4 feet April 4 (discharge, 6,250 second-feet); minimum stage recorded, 0.60 foot September 8 and 9 (discharge, 65 second-feet).

A high-water mark of 19.8 feet was determined in 1914 for a flood which occurred about 1894 (discharge estimated from an extension of rating curve as 35,000 second-feet). Minimum for 1915 probably lowest for some time

WINTER FLOW.—Stage-discharge relation affected by ice for short periods.

DIVERSIONS.—Station below practically all diversions from John Day River.

REGULATION.—None.

ACCURACY.—Results good.

*Discharge measurements of John Day River at Clarno, Oreg., during the year ending Sept. 30, 1915.*

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---|---|---|---|---|---|---|---|
| | | *Feet.* | *Sec.-ft.* | | | *Feet.* | *Sec.-ft.* |
| Oct. 13 | C. G. Paulsen | 1.75 | 372 | Aug. 27 | P. V. Hodges | 0.70 | 78.2 |
| Jan. 13 | do | 1.75 | 394 | 27 | do | .70 | 77.7 |
| June 8 | P. V. Hodges | 3.11 | 1,540 | | | | |

*Daily discharge, in second-feet, of John Day River at Clarno, Oreg., for the year ending Sept. 30, 1915.*

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 300 | 420 | 420 | 395 | 480 | 850 | 4,600 | 1,600 | 2,300 | 420 | 270 | 72 |
| 2 | 300 | 420 | 420 | 370 | 850 | 940 | 4,280 | 1,600 | 2,560 | 420 | 370 | 75 |
| 3 | 300 | 420 | 370 | 480 | 1,210 | 940 | 4,280 | 1,600 | 2,430 | 370 | 370 | 81 |
| 4 | 300 | 450 | 370 | 420 | 1,210 | 940 | 6,080 | 1,500 | 2,180 | 345 | 330 | 86 |
| 5 | 370 | 450 | 395 | 420 | 895 | 940 | 4,920 | 1,500 | 1,940 | 345 | 270 | 86 |
| 6 | 420 | 395 | 370 | 395 | 810 | 1,120 | 4,280 | 1,500 | 1,820 | 320 | 270 | 81 |
| 7 | 395 | 395 | 345 | 395 | 690 | 985 | 3,660 | 1,600 | 1,600 | 300 | 270 | 68 |
| 8 | 370 | 395 | 345 | 395 | 620 | 940 | 3,090 | 1,600 | 1,500 | 280 | 275 | 65 |
| 9 | 370 | 395 | 320 | 370 | 620 | 850 | 2,820 | 1,710 | 1,400 | 585 | 275 | 65 |
| 10 | 370 | 395 | 320 | 420 | 620 | 850 | 2,560 | 1,710 | 1,300 | 585 | 275 | 72 |
| 11 | 420 | 420 | 320 | 420 | 690 | 810 | 2,430 | 1,820 | 1,260 | 1,030 | 184 | 72 |
| 12 | 395 | 420 | 300 | 420 | 690 | 810 | 2,430 | 2,180 | 1,260 | 690 | 156 | 81 |
| 13 | 370 | 395 | 300 | 395 | 620 | 810 | 2,690 | 2,430 | 1,400 | 550 | 156 | 86 |
| 14 | 370 | 395 | 280 | 395 | 620 | 985 | 2,690 | 2,690 | 1,500 | 480 | 132 | 93 |
| 15 | 395 | 395 | 280 | 395 | 550 | 1,400 | 2,560 | 3,230 | 1,400 | 450 | 122 | 97 |
| 16 | 370 | 420 | 300 | 370 | 480 | 2,060 | 2,430 | 3,090 | 1,210 | 420 | 122 | 111 |
| 17 | 370 | 420 | 280 | 370 | 515 | 2,060 | 2,180 | 2,820 | 1,030 | 450 | 122 | 200 |
| 18 | 370 | 370 | 230 | 320 | 585 | 2,060 | 2,300 | 2,560 | 895 | 420 | 115 | 200 |
| 19 | 420 | 370 | 262 | 280 | 690 | 2,300 | 2,180 | 2,690 | 850 | 370 | 107 | 200 |
| 20 | 480 | 370 | 184 | 320 | 985 | 2,180 | 2,060 | 2,560 | 770 | 370 | 102 | 200 |
| 21 | 480 | 320 | 245 | 450 | 1,030 | 2,060 | 2,060 | 2,430 | 690 | 370 | 102 | 200 |
| 22 | 550 | 320 | 230 | 420 | 940 | 2,180 | 2,060 | 2,300 | 690 | 370 | 102 | 200 |
| 23 | 550 | 320 | 245 | 280 | 940 | 2,430 | 2,060 | 2,300 | 655 | 320 | 102 | 184 |
| 24 | 480 | 370 | 245 | 450 | 850 | 2,820 | 1,820 | 2,430 | 620 | 320 | 97 | 156 |
| 25 | 550 | 370 | 230 | 420 | 810 | 2,560 | 1,600 | 2,560 | 550 | 280 | 93 | 144 |
| 26 | 480 | 370 | 245 | 280 | 850 | 2,180 | 1,500 | 2,430 | 550 | 262 | 93 | 156 |
| 27 | 450 | 395 | 280 | 395 | 1,030 | 2,060 | 1,300 | 2,300 | 550 | 230 | 86 | 156 |
| 28 | 420 | 395 | 320 | 420 | 940 | 1,940 | 1,260 | 2,300 | 480 | 215 | 75 | 156 |
| 29 | 420 | 395 | 370 | 420 | ..... | 2,560 | 1,210 | 2,300 | 480 | 320 | 72 | 156 |
| 30 | 420 | 420 | 370 | 420 | ..... | 4,920 | 1,210 | 2,820 | 480 | 245 | 72 | 156 |
| 31 | 420 | ..... | 420 | 450 | ..... | 4,600 | ..... | 2,430 | ..... | 245 | 72 | ..... |

NOTE.—Discharge determined from a well-defined rating curve.

*Monthly discharge of John Day River at Clarno, Oreg., for the year ending Sept. 30, 1915.*

| Month. | Discharge in second-feet. | | | Run-off (total in acre-feet). | Accuracy. |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | | |
| October | 550 | 300 | 409 | 25,100 | A. |
| November | 450 | 320 | 393 | 23,400 | A. |
| December | 420 | 184 | 310 | 19,100 | B. |
| January | 480 | 280 | 392 | 24,100 | B. |
| February | 1,210 | 480 | 779 | 43,300 | A. |
| March | 4,920 | 810 | 1,780 | 109,000 | A. |
| April | 6,080 | 1,210 | 2,690 | 160,000 | A. |
| May | 3,230 | 1,500 | 2,210 | 136,000 | A |
| June | 2,560 | 480 | 1,210 | 72,000 | A. |
| July | 1,030 | 215 | 398 | 24,500 | A. |
| August | 370 | 72 | 164 | 10,100 | A. |
| September | 200 | 65 | 125 | 7,440 | B. |
| The year | 6,080 | 65 | 904 | 654,000 | |

### JOHN DAY RIVER AT McDONALD, OREG.

LOCATION.—In the NW. ¼ sec. 11, T. 1 N., R. 19 E., at the 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, 1915.

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

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, 5.1 feet at 6 p. m. April 4 and 6 a. m. April 5 (discharge, 5,870 second-feet); minimum stage recorded, 1.02 feet September 8 to 11 (discharge, 63 second-feet).

1905–1915: Maximum stage recorded, 10.38 feet February 6, 1907 (discharge, 22,800 second-feet). A flood about 20 years ago is said to have reached a height of 12.8 feet (discharge estimated from extension of rating curve as 33,000 second-feet). Minimum is that of 1915.

WINTER FLOW.—Stage-discharge relation affected by ice for short periods.

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

REGULATION.—None.

ACCURACY.—Results excellent except for periods during which river was obstructed by ice or was at extremely low stage.

*Discharge measurements of John Day River at McDonald, Oreg., during the year ending Sept. 30, 1915.*

[Made by P. V. Hodges.]

| Date. | Gage height. | Discharge. |
|---|---|---|
| | *Feet.* | *Sec.-ft.* |
| June 9 | 2.90 | 1,500 |
| Aug. 28 | 1.10 | 84.8 |

*Daily discharge, in second-feet of John Day River at McDonald, Oreg., for the year ending Sept. 30, 1915.*

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 280 | 426 | 418 | 705 | 750 | 1,120 | 4,680 | 1,820 | 2,620 | 474 | 2[illegible] | 70 |
| 2 | 280 | 426 | 450 | 705 | 950 | 1,060 | 5,140 | 1,750 | 2,800 | 396 | 334 | 70 |
| 3 | 292 | 442 | 458 | 660 | 1,060 | 1,120 | 4,680 | 1,680 | 2,800 | 396 | 3[illegible] | 63 |
| 4 | 310 | 450 | 498 | 570 | 1,540 | 1,120 | 5,140 | 1,610 | 2,620 | 382 | 3[illegible] | 68 |
| 5 | 310 | 450 | 490 | 570 | 1,290 | 1,170 | 5,620 | 1,680 | 2,360 | 375 | 3[illegible] | 72 |
| 6 | 334 | 450 | 442 | 570 | 1120 | 1,170 | 4,910 | 1,680 | 2,120 | 361 | 2[illegible] | 72 |
| 7 | 382 | 450 | 396 | 660 | 900 | 1,290 | 4,220 | 1,750 | 1,820 | 334 | 2[illegible] | 70 |
| 8 | 410 | 442 | 347 | 660 | 750 | 1,120 | 3,780 | 1,750 | 1,680 | 328 | 2[illegible] | 63 |
| 9 | 418 | 426 | 340 | 660 | 705 | 1,120 | 3,370 | 1,820 | 1,540 | 340 | 2[illegible] | 63 |
| 10 | 418 | 426 | 347 | 660 | 705 | 1,000 | 3,170 | 1,820 | 1,480 | 660 | 1[illegible] | 63 |
| 11 | 403 | 410 | 368 | 660 | 660 | 950 | 2,800 | 1,820 | 1,410 | 900 | 1[illegible] | 63 |
| 12 | 396 | 410 | ..... | 705 | 750 | 950 | 2,620 | 1,970 | 1,410 | 1,060 | 1[illegible] | 70 |
| 13 | 396 | 410 | ..... | 660 | 750 | 1,000 | 2,620 | 2,200 | 1,540 | 850 | 147 | 70 |
| 14 | 396 | 410 | ..... | 615 | 705 | 1,060 | 2,800 | 2,620 | 1,680 | 705 | 133 | 80 |
| 15 | 410 | 410 | ..... | 490 | 615 | 1,120 | 2,980 | 2,980 | 1,540 | 570 | 133 | 82 |
| 16 | 426 | 410 | ..... | 570 | 570 | 1,610 | 2,620 | 3,780 | 1,410 | 506 | 117 | 82 |
| 17 | 410 | 396 | ..... | 570 | 554 | 2,360 | 2,450 | 3,570 | 1,290 | 458 | 122 | 77 |
| 18 | 396 | 396 | ..... | 522 | 530 | 2,200 | 2,280 | 2,980 | 1,170 | 850 | 110 | 93 |
| 19 | 396 | 375 | ..... | 474 | 570 | 2,200 | 2,200 | 2,980 | 1,060 | 850 | 107 | 117 |
| 20 | 375 | 375 | ..... | 410 | 660 | 2,620 | 2,200 | 2,980 | 1,060 | 750 | 104 | 158 |
| 21 | 418 | 375 | ..... | 570 | 1,060 | 2,280 | 2,280 | 2,980 | 950 | 660 | 102 | 158 |
| 22 | 474 | 354 | ..... | 450 | 1,120 | 2,280 | 2,120 | 2,980 | 850 | 660 | 96 | 147 |
| 23 | 538 | 354 | ..... | 410 | 1,120 | 2,620 | 2,120 | 2,800 | 800 | 570 | 96 | 143 |
| 24 | 615 | 340 | ..... | 375 | 1.120 | 2,800 | 1,970 | 2,620 | 750 | 490 | 96 | 143 |
| 25 | 570 | 340 | ..... | 403 | 1,170 | 3,170 | 1,820 | 2,620 | 705 | 450 | 96 | 143 |
| 26 | 522 | 368 | ..... | 442 | 1,060 | 2,980 | 1,680 | 2,800 | 705 | 347 | 96 | 143 |
| 27 | 506 | 382 | ..... | 474 | 1,060 | 2,620 | 1,540 | 2,620 | 660 | 275 | 85 | 140 |
| 28 | 490 | 396 | ..... | 522 | 1,060 | 2,280 | 1,410 | 2,620 | 615 | 227 | 82 | 136 |
| 29 | 474 | 418 | ..... | 570 | ..... | 2,360 | 1,290 | 2,620 | 570 | 199 | 82 | 143 |
| 30 | 442 | 450 | ..... | 660 | ..... | 3,370 | 1,750 | 2,620 | 530 | 204 | 80 | 143 |
| 31 | 426 | ..... | ..... | 750 | ..... | 5,140 | ..... | 2,620 | ..... | 218 | 72 | ..... |

NOTE.—Discharge determined from a well defined rating curve. Stage-discharge relation affected by ice Dec. 12-31; discharge estimated by comparison with record of flow at Clarno.

*Monthly discharge of John Day River at McDonald, Oreg., for the year ending Sept. 30, 1915.*

| Month. | Discharge in second-feet. | | | Run-off (total in acre-feet). | Accuracy. |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | | |
| October | 615 | 280 | 417 | 25,600 | A. |
| November | 450 | 340 | 406 | 24,200 | A. |
| December | ..... | ..... | 353 | 21,700 | C. |
| January | 750 | 375 | 572 | 35,200 | C. |
| February | 1,540 | 530 | 889 | 49,400 | A. |
| March | 5,140 | 950 | 1,910 | 117,000 | A. |
| April | 5,620 | 1,290 | 2,940 | 175,000 | A. |
| May | 3,780 | 1,610 | 2,420 | 149,000 | A. |
| June | 2,800 | 530 | 1,420 | 84,500 | A. |
| July | 1,060 | 199 | 511 | 31,400 | A. |
| August | 347 | 72 | 165 | 10,100 | A. |
| September | 158 | 63 | 100 | 5,950 | B. |
| The year | 5,620 | 63 | 1,010 | 729,000 | |

### CAMAS CREEK ABOVE CABLE CREEK, NEAR UKIAH, OREG.

LOCATION.—In the 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, 1915.

GAGE.—Vertical staff on abutment of highway bridge.

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

CHANNEL AND CONTROL.—Rock and gravel; probably permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded May 1, 1914, to September 30, 1915, 3.2 feet at 7 a. m. April 3 (discharge, 770 second-feet); minimum stage recorded, 0.50 foot August 29 to 31, 1914 (discharge, 3 second-feet). Discharge estimated to have become as low as 2 second-feet in December, 1914.

WINTER FLOW.—Stream freezes almost solid during severe winter weather.

DIVERSIONS.—Practically none.

REGULATION.—None.

ACCURACY.—Results considered good except for periods during which stream is frozen, for which they are poor.

*Discharge measurements of Camas Creek above Cable Creek, near Ukiah, Oreg., during the year ending Sept. 30, 1915.*

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---|---|---|---|---|---|---|---|
| | | *Feet.* | *Sec.-ft.* | | | *Feet.* | *Sec.-ft.* |
| Oct. 30 | C. G. Paulsen | 0.85 | 12.4 | Mar. 8 | C. G. Paulsen | a0.99 | 20.3 |
| Jan. 10 | do | a2.46 | 3.5 | July 20 | H. M. Nelson | .75 | 9.2 |

a Stage-discharge relation affected by ice.

*Daily discharge, in second-feet, of Camas Creek above Cable Creek, near Ukiah, Oreg., for the years ending Sept. 30, 1914 and 1915.*

| Day. | May. | June. | July. | Aug. | Sept. | Day. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1914. | | | | | | 1914. | | | | | |
| 1 | 122 | 30 | 22 | 5.5 | 3.2 | 16 | 122 | 186 | 11 | 3.2 | 10 |
| 2 | 133 | 30 | 22 | 4.0 | 3.2 | 17 | 94 | 133 | 9.0 | 3.2 | 11 |
| 3 | 158 | 64 | 22 | 4.0 | 3.2 | 18 | 86 | 112 | 9.0 | 3.2 | 9.0 |
| 4 | 158 | 46 | 30 | 4.0 | 3.2 | 19 | 78 | 112 | 7.0 | 3.2 | 9.0 |
| 5 | 146 | 46 | 30 | 4.0 | 3.2 | 20 | 71 | 78 | 7.0 | 3.2 | 10 |
| 6 | 122 | 40 | 19 | 4.0 | 3.5 | 21 | 64 | 64 | 7.0 | 3.2 | 9.0 |
| 7 | 112 | 52 | 16 | 4.0 | 3.5 | 22 | 64 | 64 | 7.0 | 3.5 | 7.0 |
| 8 | 112 | 52 | 19 | 4.0 | 4.6 | 23 | 64 | 52 | 7.0 | 3.5 | 6.4 |
| 9 | 146 | 52 | 16 | 4.0 | 4.6 | 24 | 78 | 52 | 7.0 | 3.5 | 6.4 |
| 10 | 133 | 52 | 16 | 4.0 | 4.0 | 25 | 71 | 52 | 7.0 | 3.5 | 6.4 |
| 11 | 112 | 46 | 14 | 3.5 | 4.0 | 26 | 64 | 46 | 5.5 | 3.5 | 6.4 |
| 12 | 103 | 46 | 19 | 3.5 | 5.5 | 27 | 52 | 40 | 5.5 | 3.2 | 6.4 |
| 13 | 94 | 445 | 14 | 3.5 | 4.6 | 28 | 52 | 30 | 5.5 | 3.0 | 6.4 |
| 14 | 94 | 350 | 12 | 3.5 | 5.5 | 29 | 40 | 30 | 5.5 | 3.0 | 6.4 |
| 15 | 122 | 250 | 11 | 3.5 | 12 | 30 | 40 | 30 | 5.5 | 3.0 | 6.4 |
| | | | | | | 31 | 35 | ..... | 5.5 | 3.0 | ..... |

*Daily discharge, in second-feet, of Camas Creek above Cable Creek, near Ukiah, Oreg., for the years ending Sept. 30, 1914, and 1915*—Continued.

| Day. | Oct. | Nov. | Dec. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|
| 1915. | | | | | | | | | | |
| 1 | 6.4 | 11 | 30 | 7 | 470 | 52 | 172 | 16 | 9.0 | 3.5 |
| 2 | 6.4 | 11 | 26 | 11 | 420 | 52 | 153 | 15 | 9.0 | 3.5 |
| 3 | 10 | 10 | 16 | 16 | 770 | 52 | 133 | 14 | 9.0 | 3.5 |
| 4 | 12 | 10 | 16 | 16 | 520 | 71 | 94 | 11 | 7.8 | 3.5 |
| 5 | 10 | 10 | 22 | 19 | 370 | 133 | 78 | 16 | 6.4 | 3.5 |
| 6 | 9.0 | 9 | 11 | 16 | 290 | 153 | 71 | 14 | 6.4 | 3.5 |
| 7 | 9.0 | 9 | 19 | 22 | 216 | 146 | 64 | 22 | 5.5 | 3.5 |
| 8 | 7.8 | 10 | 15 | 22 | 186 | 133 | 52 | 16 | 5.5 | 3.8 |
| 9 | 7.8 | 10 | 11 | 22 | 158 | 133 | 46 | 17 | 5.5 | 3.8 |
| 10 | 10 | 10 | 11 | 22 | 133 | 133 | 32 | 16 | 5.5 | 3.8 |
| 11 | 11 | 9 | 11 | 26 | 133 | 129 | 52 | 12 | 4.6 | 3.8 |
| 12 | 10 | 9 | 9 | 30 | 122 | 153 | 78 | 11 | 4.6 | 4.6 |
| 13 | 9.0 | 11 | 6 | 35 | 146 | 158 | 58 | 11 | 4.6 | 7.8 |
| 14 | 9.0 | 9 | 6 | 52 | 116 | 350 | 58 | 9.0 | 4.0 | 7.8 |
| 15 | 9.0 | 9 | 4 | 94 | 108 | 330 | 46 | 11 | 4.0 | 7.0 |
| 16 | 7.8 | 9 | 3 | 94 | 94 | 250 | 38 | 11 | 4.0 | 7.0 |
| 17 | 9.0 | 9 | 2 | 112 | 94 | 223 | 32 | 16 | 5.5 | 6.4 |
| 18 | 10 | 9 | 2 | 158 | 86 | 216 | 30 | 15 | 5.5 | 5.5 |
| 19 | 14 | 9 | 2 | 112 | 86 | 186 | 26 | 11 | 5.5 | 5.5 |
| 20 | 14 | 7 | 2 | 112 | 78 | 158 | 26 | 10 | 5.5 | 5.5 |
| 21 | 14 | 7 | 3 | 180 | 78 | 133 | 26 | 10 | 4.0 | 5.5 |
| 22 | 11 | 7 | 3 | 216 | 71 | 158 | 22 | 9.0 | 4.0 | 5.5 |
| 23 | 10 | 7 | 3 | 290 | 64 | 146 | 26 | 7.8 | 4.0 | 5.5 |
| 24 | 10 | 7 | 3 | 250 | 58 | 158 | 22 | 7.0 | 4.0 | 4.6 |
| 25 | 10 | 7 | 3 | 216 | 52 | 192 | 19 | 6.4 | 4.0 | 4.6 |
| 26 | 10 | 7 | 2 | 145 | 52 | 180 | 22 | 6.4 | 4.0 | 4.6 |
| 27 | 10 | 11 | 3 | 133 | 52 | 186 | 19 | 6.4 | 3.8 | 5.5 |
| 28 | 9 | 10 | 3 | 158 | 40 | 290 | 19 | 6.4 | 3.8 | 5.5 |
| 29 | 7.8 | 10 | 3 | 520 | 40 | 233 | 19 | 9.0 | 3.8 | 5.5 |
| 30 | 10 | 12 | 4 | 520 | 58 | 186 | 17 | 14 | 3.8 | 5.5 |
| 31 | 11 | ..... | 7 | 520 | ..... | 158 | ..... | 9.0 | 3.8 | ..... |

NOTE.—Discharge determined from a rating curve fairly well defined between 10 and 700 second-feet; discharge estimated, on account of ice, from observer's notes, current meter measurements, and records of temperature, Nov. 14–24 and Dec. 9 to Mar. 6; mean discharge estimated as 4 second-feet Jan. 1–15 and Feb. 1–10; 3 second-feet Jan. 16–31; 5 second-feet, Feb. 11–20; 6 second-feet, Feb. 21–26.

*Monthly discharge of Camas Creek above Cable Creek, near Ukiah, Oreg., for the years ending Sept. 30, 1914 and 1915.*

| Month. | Discharge in second-feet. | | | Run-off (total in acre-feet). | Accuracy. |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | | |
| 1914. | | | | | |
| May | 158 | 35 | 94.9 | 5,840 | B. |
| June | 445 | 30 | 89.4 | 5,320 | B. |
| July | 30 | 5.5 | 12.7 | 781 | B. |
| August | 5.5 | 3.0 | 3.58 | 220 | C. |
| September | 12 | 3.2 | 6.13 | 365 | C. |
| The period | ..... | ..... | ..... | 12,500 | |
| 1914–15. | | | | | |
| October | 14 | 6.4 | 9.81 | 603 | B. |
| November | 12 | 7.0 | 9.17 | 546 | B. |
| December | 30 | 2.0 | 8.42 | 518 | D. |
| January | ..... | ..... | 3.5 | 215 | D. |
| February | ..... | ..... | 5.0 | 278 | D. |
| March | 520 | 7.0 | 134 | 8,249 | B. |
| April | 770 | 40 | 172 | 10,200 | B. |
| May | 350 | 52 | 169 | 10,400 | B. |
| June | 172 | 17 | 51.7 | 3,080 | B. |
| July | 22 | 6.4 | 11.8 | 729 | B. |
| August | 9.0 | 3.8 | 5.17 | 318 | B. |
| September | 7.8 | 3.5 | 4.97 | 296 | B. |
| The year | 770 | 2.0 | 48.9 | 35,400 | |

### CABLE CREEK NEAR UKIAH, OREG.

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

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—May 1, 1914, to September 30, 1915.

GAGE.—Vertical staff on abutment of bridge.

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

CHANNEL AND CONTROL.—Gravel and rock; uneven, but practically permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 1.40 feet at 5.30 p. m. April 3 (discharge, 156 second-feet); minimum stage recorded, 0.05 foot August 28 to September 11 (discharge, 1.5 second-feet). Discharge estimated to have practically ceased December 22 to 31, when stream was frozen.

WINTER FLOW.—Stream freezes and may go almost dry in extremely cold weather.

DIVERSIONS.—Probably none.

REGULATION.—None.

ACCURACY.—Records considered fair; those for periods during which stream was frozen, poor.

*Discharge measurements of Cable Creek near Ukiah, Oreg., during the year ending Sept. 30, 1915.*

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---|---|---|---|---|---|---|---|
| | | *Feet.* | *Sec. ft.* | | | *Feet.* | *Sec. ft.* |
| Oct. 20 | C. G. Paulsen | 0.26 | 5.3 | Mar. 8 | C. G. Paulsen | [b]0.25 | 6.0 |
| Jan. 10 | do | [a].78 | 1.9 | July 20 | H. M. Nelson | .21 | 4.1 |

[a] Stage-discharge relation affected by ice.
[b] Water running nearly free under ice cover.

*Daily discharge, in second-feet, of Cable Creek near Ukiah, Oreg., for the years ending Sept. 30, 1914 and 1915.*

| Day. | May. | June. | July. | Aug. | Sept. | Day. | May. | June. | July. | Aug, | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1914. | | | | | | 1914. | | | | | |
| 1 | 70 | 16 | 13 | 3.0 | 1.5 | 16 | 46 | 57 | 6.0 | 1.5 | 6.0 |
| 2 | 74 | 16 | 13 | 2.0 | 1.5 | 17 | 42 | 46 | 4.0 | 1.5 | 6.0 |
| 3 | 88 | 28 | 13 | 2.0 | 1.5 | 18 | 37 | 37 | 4.0 | 1.5 | 4.0 |
| 4 | 88 | 20 | 13 | 2.0 | 1.5 | 19 | 37 | 37 | 4.0 | 1.5 | 3.6 |
| 5 | 92 | 20 | 13 | 2.0 | 1.5 | 20 | 32 | 37 | 4.0 | 1.5 | 4.0 |
| 6 | 64 | 20 | 8.0 | 2.0 | 1.5 | 21 | 28 | 32 | 4.0 | 1.5 | 4.0 |
| 7 | 64 | 24 | 8.0 | 2.0 | 1.5 | 22 | 28 | 28 | 4.0 | 1.5 | 3.6 |
| 8 | 70 | 24 | 10 | 2.0 | 2.4 | 23 | 28 | 28 | 4.0 | 1.5 | 3.0 |
| 9 | 70 | 24 | 8.0 | 2.0 | 2.4 | 24 | 32 | 28 | 4.0 | 1.5 | 3.0 |
| 10 | 64 | 24 | 8.0 | 2.0 | 2.0 | 25 | 32 | 28 | 4.0 | 1.5 | 2.4 |
| 11 | 57 | 20 | 8.0 | 1.5 | 1.8 | 26 | 28 | 24 | 3.0 | 1.5 | 2.4 |
| 12 | 48 | 24 | 8.0 | 1.5 | 2.0 | 27 | 20 | 20 | 3.0 | 1.5 | 2.4 |
| 13 | 46 | 132 | 8.0 | 1.5 | 2.0 | 28 | 20 | 20 | 3.0 | 1.5 | 2.4 |
| 14 | 46 | 88 | 6.0 | 1.5 | 2.4 | 29 | 20 | 20 | 3.0 | 1.5 | 2.4 |
| 15 | 52 | 70 | 6.0 | 1.5 | 7.2 | 30 | 20 | 20 | 3.0 | 1.5 | 2.4 |
| | | | | | | 31 | 16 | ..... | 3.0 | 1.5 | ..... |

*Daily discharge, in second-feet, of Cable Creek near Ukiah, Oreg., for the years ending Sept. 30, 1914 and 1915*—Continued.

| Day. | Oct. | Nov. | Dec. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|
| 1915. | | | | | | | | | | |
| 1 | 2.4 | 4.0 | 4 | 4 | 70 | 22 | 64 | 8.0 | 4.8 | 1.5 |
| 2 | 2.4 | 4.0 | 3 | 4 | 70 | 22 | 52 | 8.0 | 4.0 | 1.5 |
| 3 | 7.2 | 3.6 | 4.8 | 4 | 132 | 24 | 46 | 8.0 | 4.0 | 1.5 |
| 4 | 8.0 | 3.6 | 4 | 4 | 88 | 30 | 42 | 7.2 | 3.0 | 1.5 |
| 5 | 6.0 | 3.0 | 4 | 5 | 70 | 32 | 37 | 7.2 | 3.0 | 1.5 |
| 6 | 4.0 | 3.0 | 4 | 5 | 57 | 42 | 32 | 6.0 | 3.0 | 1.5 |
| 7 | 4.0 | 3.0 | 6 | .6 | 57 | 42 | 28 | 10 | 3.0 | 1.5 |
| 8 | 3.6 | 3.0 | 6 | 7.2 | 46 | 46 | 28 | 13 | 3.0 | 1.5 |
| 9 | 3.0 | 3.0 | 6 | 6 | 46 | 46 | 24 | 13 | 3.0 | 1.5 |
| 10 | 4.0 | 3.0 | 6 | 8 | 46 | 55 | 24 | 10 | 2.4 | 1.5 |
| 11 | 4.0 | 3.0 | 4 | 8 | 46 | 52 | 28 | 9.0 | 2.4 | 1.5 |
| 12 | 4.0 | 3.0 | 6 | 8 | 46 | 57 | 42 | 9.0 | 2.4 | 1.8 |
| 13 | 4.0 | 4.0 | 4 | 10 | 57 | 60 | 32 | 6.0 | 2.0 | 4.0 |
| 14 | 3.6 | 4.0 | 4 | 14 | 46 | 99 | 24 | 6.0 | 2.0 | 4.0 |
| 15 | 3.6 | 4.0 | 4 | 35 | 46 | 79 | 24 | 6.0 | 2.0 | 3.0 |
| 16 | 3.0 | 4.0 | 4 | 30 | 44 | 64 | 20 | 6.0 | 2.0 | 3.0 |
| 17 | 3.0 | 4.0 | 3 | 32 | 46 | 64 | 19 | 8.0 | 2.0 | 3.0 |
| 18 | 4.0 | 4.0 | 3 | 37 | 42 | 57 | 19 | 7.2 | 2.0 | 3.0 |
| 19 | 6.0 | 4.0 | 3 | 37 | 42 | 57 | 16 | 6.0 | 2.0 | 2.4 |
| 20 | 7.2 | 4.0 | 3 | 37 | 42 | 55 | 16 | 6.0 | 2.0 | 2.0 |
| 21 | 6.0 | 3.0 | 1 | 35 | 37 | 46 | 14 | 4.8 | 2.0 | 2.0 |
| 22 | 4.0 | 4.0 | 0 | 28 | 42 | 57 | 13 | 6.0 | 2.0 | 2.0 |
| 23 | 4.0 | 4.0 | 0 | 36 | 30 | 52 | 14 | 6.0 | 2.0 | 2.0 |
| 24 | 4.0 | 3.0 | 0 | 32 | 28 | 55 | 13 | 6.0 | 2.0 | 1.8 |
| 25 | 3.6 | 3.6 | 0 | 28 | 28 | 60 | 10 | 6.0 | 2.0 | 1.8 |
| 26 | 3.6 | 4.0 | 0 | 22 | 26 | 57 | 12 | 3.6 | 2.0 | 1.8 |
| 27 | 3.6 | 4.0 | 0 | 20 | 22 | 57 | 9 | 3.0 | 2.0 | 2.0 |
| 28 | 3.0 | 3.6 | 0 | 24 | 20 | 110 | 10 | 3.0 | 1.5 | 2.0 |
| 29 | 3.0 | 3.6 | 0 | 57 | 20 | 70 | 8 | 4.0 | 1.5 | 2.0 |
| 30 | 3.6 | 4.8 | 0 | 70 | 26 | 68 | 8 | 7.2 | 1.5 | 2.0 |
| 31 | 4.0 | ..... | 0 | 88 | ..... | 64 | ..... | 6.0 | 1.5 | ..... |

NOTE.—Discharge determined from a rating curve fairly well defined between 5 and 300 second-feet; not defined outside of these limits. Discharge estimated, on account of ice, from current-meter measurements, observer's notes, and studies of temperature records, Dec. 9 to Mar. 6; mean discharge estimated Jan. 1–10, 1 second-foot; Jan. 11 to Feb. 10, 2 second-feet; Feb. 11–20, 3 second-feet; Feb. 21–28, 4 second-feet.

*Monthly discharge of Cable Creek near Ukiah, Oreg., for the years ending Sept. 30, 1914 and 1915.*

| Month. | Discharge in second-feet. | | | Run-off (total in acre-feet). | Accuracy. |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | | |
| 1914. | | | | | |
| May | 92 | 16 | 47.1 | 2,900 | B. |
| June | 132 | 16 | 33.7 | 2,010 | B. |
| July | 13 | 3.0 | 6.55 | 403 | B. |
| August | 3.0 | 1.5 | 1.69 | 104 | C. |
| September | 7.2 | 1.5 | 2.81 | 167 | C. |
| The period | ..... | ..... | ..... | 5,580 | |
| 1915. | | | | | |
| October | 8.0 | 2.4 | 4.17 | 256 | C. |
| November | 4.8 | 3.0 | 3.63 | 216 | C. |
| December | 6.0 | 0 | 2.8 | 172 | |
| January | ..... | ..... | 1.7 | 105 | |
| February | ..... | ..... | 2.7 | 150 | |
| March | 88 | 4.0 | 23.9 | 1,470 | B. |
| April | 132 | 20 | 47.3 | 2,810 | B. |
| May | 110 | 22 | 54.9 | 3,380 | B. |
| June | 64 | 8.0 | 24.3 | 1,450 | B. |
| July | 13 | 3.0 | 6.94 | 427 | B. |
| August | 4.8 | 1.5 | 2.39 | 147 | C. |
| September | 4.0 | 1.5 | 2.07 | 123 | C. |
| The year | 132 | 0 | 14.8 | 10,700 | |

## DESCHUTES RIVER BASIN.

### DESCHUTES RIVER AT CRANE PRAIRIE, NEAR LAPINE, OREG.

LOCATION.—In sec. 17, T. 21 S., R. 8 E., at outlet of Crane Prairie, above proposed dam site and below mouth of Cultus River, and about 28 miles west of Lapine by road.

DRAINAGE AREA.—Indeterminate.

RECORDS AVAILABLE.—January 1, 1914, to September 30, 1915; fragmentary gage readings 1907 to 1913.

GAGE.—Vertical staff on bent of footbridge; read once a week by George E. Graft.

DISCHARGE MEASUREMENTS.—Made from footbridge or by wading.

CHANNEL AND CONTROL.—Channel, sand, and gravel, somewhat shifting; control some distance below station, rocky and fairly permanent. Stage-discharge relation slightly affected by growth of aquatic plants and by tree felled across river near control.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 1.90 feet October 4 and 8 (discharge, 290 second-feet); minimum stage recorded, 1.20 feet September 26 (discharge, 145 second-feet).

1907–1915: Maximum stage from fragmentary records, 2.75 feet about July 31, 1913 (determined from high-water marks on September 15; discharge, 531 second-feet). Minimum stage, 1.20 feet September 26, 1915 (discharge, 145 second-feet).

WINTER FLOW.—Ice jammed at the fallen tree may affect the stage-discharge relation during extremely cold weather.

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Results good except for periods during which stage-discharge relation is affected by ice.

*Discharge measurements of Deschutes River at Crane Prairie, near Lapine, Oreg., during the year ending Sept. 30, 1915.*

| Date. | Made by— | Gage height. | Discharge. |
|---|---|---|---|
| | | *Feet.* | *Sec.-ft.* |
| Feb. 22 | J. E. Stewart | 1.37 | 161 |
| July 28 | P. V. Hodges | 1.31 | 176 |

*Daily discharge, in second-feet, of Deschutes River at Crane Prairie, near Lapiné, Oreg., for the year ending Sept. 30, 1915.*

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | | | | | 220 | | 190 | 210 | |
| 2 | | | | | 190 | | | | | | | |
| 3 | | | | 196 | | 180 | | | 240 | | | |
| 4 | 290 | | | | | | | | | | | |
| 5 | | | | | | | 252 | | | | | |
| 6 | | | | | | | 220 | | | | | 160 |
| 7 | | | | | | | | | | | | |
| 8 | | 240 | 220 | | | | | | | | 200 | |
| 9 | | | | | | | | 220 | 220 | | | |
| 10 | | | | | 180 | | | | | | | |
| 11 | | | | | | | | | | 180 | | |
| 12 | 265 | | | | | | 210 | | | | | |
| 13 | | | | | | 180 | | 240 | | | | |
| 14 | | | | | | | | | | | | |
| 15 | | | | | | | | | 220 | | | 160 |
| 16 | | 230 | | | | | | | | | | |
| 17 | | | | | 170 | | | | | | | |
| 18 | 290 | | | | | | | 240 | | 180 | 190 | |
| 19 | | | | | 180 | | 240 | | | | | 160 |
| 20 | | | | | | | | | | | | |
| 21 | | | | | | | | | | | | |
| 22 | | 220 | | | 170 | 190 | | | | | | |
| 23 | | | | | | | | | | | | |
| 24 | | | | | | | | | | | | |
| 25 | | | | 180 | | 200 | | | 200 | 180 | | |
| 26 | 278 | | | | 180 | | 220 | 240 | | | | 145 |
| 27 | | | | | | | | | | | | |
| 28 | | | | | | | | | | 160 | 190 | |
| 29 | | | | | | | | | | | | |
| 30 | 252 | 220 | | | | 240 | | | | | | |
| 31 | | | | | | | | | | | | |

NOTE.—Discharge determined from a fairly well-defined rating curve. Stage-discharge relation affected by ice Dec. 15–29 and Jan. 11–18.

*Monthly discharge of Deschutes River at Crane Prairie, near Lapine, Oreg., for the year ending Sept. 30, 1915.*

| Month. | Discharge in second-feet (mean). | Run-off (total in acre-feet). | Accuracy. | Month. | Discharge in second-feet (mean). | Run-off (total in acre-feet). | Accuracy. |
|---|---|---|---|---|---|---|---|
| October | 275 | 16,900 | B. | May | 232 | 14,300 | B. |
| November | 228 | 13,600 | B. | June | 220 | 13,100 | B. |
| December | 200 | 12,300 | C. | July | 178 | 10,900 | B. |
| January | 190 | 11,700 | C. | August | 185 | 11,400 | B. |
| February | 178 | 9,890 | B. | September | 156 | 9,280 | B. |
| March | 198 | 12,200 | B. | | | | |
| April | 228 | 13,600 | B. | The year | 189 | 149,000 | |

NOTE.—Monthly mean discharge is average of discharge determined for days on which gage was read, except that for January and February, which was estimated.

### DESCHUTES RIVER NEAR LAPINE, OREG.

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

DRAINAGE AREA. Indeterminate.

RECORDS AVAILABLE. September 22 to December 21, 1910; February 18 to December 31, 1912; April 7 to October 27, 1913, occasional readings; October 1, 1914, to September 30, 1915.

GAGE. Vertical staff on bent of bridge; gage reader, Burton Oney.

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

CHANNEL AND CONTROL. Stream bed, gravel and sand; no defined control. Channel crooked, apparently permanent; gradient low.

EXTREMES OF DISCHARGE. Maximum unaffected stage recorded during year, 1.4 feet October 1 and 9 (discharge, 1,020 second-feet); minimum stage recorded, 0.5 foot August 9 to September 21 (discharge, 800 second-feet). Maximum stage (ice affected), 4.0 feet December 16 and 17.

For extremes during period 1905 to 1915 see "Deschutes River near Lava" (p. 37).

WINTER FLOW. Stage-discharge relation materially affected by ice in December, 1914, but this condition seldom occurs.

DIVERSIONS. None.

REGULATIONS. None.

ACCURACY. Results considered good.

COOPERATION. Gage readings furnished by United States Forest Service, M. S. Merritt, supervisor.

*Discharge measurements of Deschutes River near Lapine, Oreg., during the year ending Sept. 30, 1915.*

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---|---|---|---|---|---|---|---|
| | | *Feet.* | *Sec.-ft.* | | | *Feet.* | *Sec.-ft.* |
| Nov. 3 | J. E. Stewart | 1.16 | 954 | Feb. 19 | J. E. Stewart | 0.66 | 828 |
| Dec. 16 | do | *a* 4.00 | 854 | Mar. 11 | P. V. Hodges | .55 | 827 |
| Jan. 31 | C. G. Paulsen | .66 | 892 | July 29 | do | .59 | 804 |

*a* Stage-discharge relation affected by ice.

*Daily discharge, in second-feet, of Deschutes River near Lapine, Oreg., for the year ending Sept. 30, 1915.*

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1,020 | 965 | 915 | 890 | 865 | 820 | 865 | 840 | 820 | 820 | 800 |
| 2 | 990 | 965 | 915 | 865 | 865 | 820 | 890 | 840 | 820 | 820 | 800 |
| 3 | 990 | 965 | 915 | 865 | 865 | 820 | 890 | 845 | 820 | 820 | 800 |
| 4 | 990 | 965 | 915 | 865 | 840 | 820 | 890 | 845 | 820 | 820 | 800 |
| 5 | 990 | 965 | 915 | 865 | 840 | 820 | 865 | 845 | 820 | 810 | 800 |
| 6 | 990 | 965 | 915 | 865 | 820 | 820 | 865 | 850 | 840 | 810 | 800 |
| 7 | 990 | 965 | 915 | 865 | 820 | 820 | 865 | 850 | 840 | 810 | 800 |
| 8 | 990 | 965 | 915 | 865 | 820 | 820 | 865 | 850 | 840 | 810 | 800 |
| 9 | 1,020 | 965 | 915 | 865 | 820 | 820 | 865 | 855 | 820 | 800 | 800 |
| 10 | 990 | 965 | 915 | 865 | 820 | 820 | 840 | 855 | 820 | 800 | 800 |
| 11 | 990 | 965 | 915 | 865 | 820 | 820 | 840 | 855 | 820 | 800 | 820 |
| 12 | 990 | 940 | 915 | 865 | 820 | 820 | 840 | 860 | 820 | 800 | 820 |
| 13 | 990 | 940 | 915 | 865 | 820 | 820 | 865 | 860 | 820 | 800 | 820 |
| 14 | 985 | 940 | 940 | 865 | 820 | 820 | 865 | 860 | 820 | 800 | 820 |
| 15 | 985 | 940 | 900 | 865 | 820 | 820 | 865 | 865 | 820 | 800 | 820 |
| 16 | 985 | 935 | ..... | 865 | 820 | 820 | 860 | 865 | 820 | 800 | 800 |
| 17 | 985 | 930 | ..... | 865 | 820 | 820 | 860 | 865 | 820 | 800 | 800 |
| 18 | 980 | 925 | ..... | 865 | 840 | 820 | 855 | 865 | 820 | 800 | 800 |
| 19 | 980 | 920 | ..... | 865 | 820 | 820 | 850 | 865 | 820 | 800 | 800 |
| 20 | 980 | 915 | ..... | 840 | 820 | 820 | 845 | 865 | 820 | 800 | 800 |
| 21 | 980 | 915 | ..... | 840 | 820 | 820 | 845 | 865 | 820 | 800 | 800 |
| 22 | 975 | 915 | ..... | 840 | 820 | 820 | 840 | 860 | 820 | 800 | 800 |
| 23 | 975 | 915 | ..... | 840 | 840 | 825 | 840 | 855 | 820 | 800 | 800 |
| 24 | 975 | 915 | ..... | 840 | 840 | 830 | 840 | 850 | 820 | 800 | 800 |
| 25 | 975 | 915 | ..... | 840 | 840 | 840 | 840 | 845 | 820 | 800 | 800 |
| 26 | 970 | 915 | ..... | 840 | 820 | 850 | 840 | 840 | 820 | 800 | 800 |
| 27 | 970 | 915 | ..... | 840 | 820 | 855 | 840 | 840 | 820 | 800 | 800 |
| 28 | 970 | 915 | ..... | 840 | 820 | 860 | 840 | 840 | 820 | 800 | 800 |
| 29 | 970 | 915 | 915 | 820 | ..... | 865 | 840 | 840 | 820 | 800 | 800 |
| 30 | 965 | 915 | 915 | 820 | ..... | 865 | 840 | 840 | 820 | 800 | 800 |
| 31 | 965 | ..... | 890 | 820 | ..... | 865 | ..... | 840 | 820 | 800 | ..... |

NOTE.—Discharge determined from a well-defined rating curve. Discharge interpolated Oct. 11 to Nov. 1, Sept. 22–30, and for occasional periods of 1 to 6 days when gage was not read; also Jan. 22–24 on account of obstruction by ice. Water backed up by ice jam Dec. 15-28; mean discharge estimated as 850 second-feet. Gage not read June 1–30; mean discharge estimated at 830 second-feet.

*Monthly discharge of Deschutes River near Lapine, Oreg., for the year ending Sept. 30, 1915.*

| Month. | Discharge in second-feet. | | | [illegible] off (acre-feet). | Accuracy. |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | | |
| October | 1,020 | 965 | 984 | 60,500 | B. |
| November | 965 | 915 | 938 | 55,800 | A. |
| December | 940 | ..... | 887 | 54,500 | B. |
| January | 890 | 820 | 854 | 52,500 | A. |
| February | 865 | 820 | 829 | 46,000 | A. |
| March | 865 | 820 | 829 | 51,000 | A. |
| April | 890 | 840 | 855 | 50,800 | A. |
| May | 865 | 840 | 852 | 52,400 | A. |
| June | ..... | ..... | [a] 830 | 49,400 | B. |
| July | 840 | 820 | 822 | 50,500 | A. |
| August | 820 | 800 | 804 | 49,400 | A. |
| September | 820 | 800 | 803 | 47,800 | A. |
| The year | 1,020 | 800 | 858 | 621,000 | |

[a] Estimated.

### DESCHUTES RIVER NEAR LAVA, OREG.

LOCATION.—In the NE ¼ sec. 24, T. 20 S., R. 10 E., about 1½ miles west of the former Lava post office, 1½ miles above the mouth of East Fork (locally called Little River), and about 20 miles south of Bend, Deschutes County.

DRAINAGE AREA.—Indeterminate.

RECORDS AVAILABLE.—February 20, 1905, to April 14, 1907; April 23, 1909, to January 21, 1911; February 23 to May 3, 1912; October 18, 1913, to January 31, 1915, when station was discontinued.

GAGE.—Inclined staff on right bank; read once a week by Mrs. C. B. Allen.

DISCHARGE MEASUREMENTS.—Made from bridge at Big River ranger station, about 3 miles by road above the gage.

CHANNEL AND CONTROL.—River bed, sand, and gravel; somewhat shifting. Control not defined; stage-discharge relation may be affected by growth of aquatic plants and by backwater when East Fork is relatively high.

EXTREMES OF DISCHARGE.—Maximum open-channel stage recorded October 1, 1914, to January 31, 1915, 8.6 feet October 20 (discharge, 1,060 second-feet); maximum ice-affected stage, 10.5 feet December 20. Minimum stage recorded, 7.85 feet January 31 (discharge, 882 second-feet).

1905–1915: Maximum stage recorded, 11.50 feet, November 26, 1909 (discharge 1,700 second-feet); minimum stage recorded, 7.18 feet at time of measurement, November 8, 1911 (discharge, 739 second-feet).

WINTER FLOW.—Ice rarely forms on this stream, but ice jams may form in extremely cold weather.

DIVERSION.—None.

REGULATION.—None.

ACCURACY.—Results good with only slight uncertainties due to effect of backwater.

*Discharge measurements of Deschutes River near Lava, Oreg., during the year ending Sept. 30, 1915.*

| Date. | Made by— | Gage height. | Discharge. |
|---|---|---|---|
| | | *Feet.* | *Sec.-ft.* |
| Nov. 3 | J. E. Stewart | 8.32 | 954 |
| Dec. 16 | ....do | [a] 10.45 | 854 |
| Jan. 31 | C. G. Paulsen | 7.85 | 892 |

[a] Stage-discharge relation affected by ice.

NOTE.—Measurements made at Big River ranger station near Lapine and referred to gage at Lava.

*Daily discharge, in second-feet, of Deschutes River near Lava, Oreg., for the year ending Sept. 30, 1915.*

| Day. | Oct. | Nov. | Dec. | Jan. | Day. | Oct. | Nov. | Dec. | Jan. |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | 1,010 | | | 16 | | | 854 | |
| 2 | | | | | 17 | | | | |
| 3 | | 985 | | 916 | 18 | 1,010 | | | |
| 4 | 1,010 | | | | 19 | | | | |
| 5 | | | | | 20 | 1,060 | | 850 | |
| 6 | | | 939 | | 21 | | | | |
| 7 | | | | | 22 | | 962 | | |
| 8 | | | | | 23 | | | | |
| 9 | | 985 | | 916 | 24 | | | | |
| 10 | | | | | 25 | 1,010 | | | |
| 11 | 1,010 | | | | 26 | | | | |
| 12 | | | | | 27 | | | 870 | |
| 13 | | | 916 | | 28 | | | | |
| 14 | | | | | 29 | | 962 | | |
| 15 | | 962 | | | 30 | | | | |
| | | | | | 31 | | | | 893 |

NOTE.—Discharge given only for days on which gage was read; determined from a well-defined rating curve. Discharge estimated, on account of ice, Dec. 20 and 27, from current-meter measurement made Dec. 16 at Big River ranger station near Lapine.

*Monthly discharge of Deschutes River near Lava, Oreg., for the year ending Sept. 30, 1915.*

| Month. | Mean Discharge in second-feet. | Run-off total in acre-feet. | Accuracy. |
|---|---|---|---|
| October | 1,000 | 62,700 | B. |
| November | 978 | 58,200 | B. |
| December | 876 | 54,500 | B. |
| January | 908 | 55,800 | B. |

NOTE.—Monthly mean discharge is average of discharge determined for days on which gage was read.

### DESCHUTES RIVER AT LAVA ISLAND, NEAR BEND, OREG.

LOCATION.—In the SE. ¼ sec. 27, T. 18 S., R. 11 E., at remains of an old log bridge half a mile above upper end of Lava Island and intake of Arnold canal, and about 10 miles south of Bend, Deschutes County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—January 30 to September 30, 1915. Discharge is the same as at the stations at Benham Falls and West's ranch, January 1, 1905, to January 29, 1915.

GAGE.—Vertical staff nailed to a clump of willows on right bank about 600 feet above the intake of Arnold canal; read three times a week by Joe Stenkamp.

DISCHARGE MEASUREMENTS.—Made from logs of old bridge about three-eighths mile above gage; section relatively deep and narrow; conditions fairly good.

CHANNEL AND CONTROL.—Stream bed rocky; practically permanent. Control is a riffle just above head of Lava Island Falls; stage-discharge relation may be affected by changes in a wing dam used to divert water into Arnold canal.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 2.20 feet April 5 (discharge, 1,540 second-feet); minimum stage recorded, 1.65 feet June 25; minimum discharge, 1.070 second-feet (gage height, 1.68 feet) July 25, 27, August 3 to 8, September 3 to 7, 19 to 30.

1905–1915: Maximum stage recorded, 3.45 feet at pumping plant at Bend at 7.45 a. m. November 27, 1909 (discharge, 4,820 second-feet; no diversions). Minimum stage, 3.2 feet at Benham Falls station January 4, 1912 (discharge, 1,000 second-feet).

WINTER FLOW.—Stage-discharge relation practically never affected by ice.

DIVERSIONS.—Quantity of water diverted for irrigation above station negligible; first diversion of importance, Arnold canal, just below gage. Between the gage and measuring section water from the river passes into Lost Creek, which discharges into the lava beds east of the river. The measured flow of Lost Creek was 42.9 second-feet February 17, 40.2 second-feet April 18, and 30.0 second-feet June 19, varying with the stage. It is believed, though not proved, that the water diverted by Lost Creek is returned to the river near the lower end of Lava Island Falls.

REGULATION.—None.

ACCURACY.—Results good except December to January, for which discharge was determined from a somewhat uncertain record below Bend.

*Discharge measurements of Deschutes River at Lava Island, near Bend, Oreg., during the year ending Sept. 30, 1915.*

| Date. | Made by— | Gage height. | Discharge. |
|---|---|---|---|
| | | *Feet.* | *Sec.-ft.* |
| Feb. 17 | J. E. Stewart | 1.84 | 1,240 |
| Apr. 18 | F. F. Henshaw | 2.00 | 1,370 |
| June 19 | ....do.... | 1.71 | 1,180 |

*Daily discharge, in second-feet, of Deschutes River at Lava Island, near Bend, Oreg., for the year ending Sept. 30, 1915.*

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1,330 | 1,330 | 1,240 | ..... | 1,260 | 1,300 | 1,450 | 1,340 | 1,300 | 1,140 | ..... | 1,080 |
| 2 | 1,380 | 1,350 | 1,300 | ..... | 1,280 | 1,300 | 1,450 | 1,340 | 1,300 | ..... | 1,080 | ..... |
| 3 | 1,330 | 1,350 | 1,300 | ..... | 1,260 | 1,300 | 1,480 | 1,340 | 1,300 | 1,120 | ..... | 1,070 |
| 4 | 1,330 | 1,350 | 1,350 | ..... | 1,240 | 1,300 | 1,510 | 1,360 | 1,300 | ..... | 1,070 | ..... |
| 5 | 1,380 | 1,330 | 1,280 | ..... | 1,230 | 1,300 | 1,540 | 1,370 | 1,260 | 1,120 | ..... | 1,070 |
| 6 | 1,380 | 1,330 | 1,280 | ..... | 1,230 | 1,280 | 1,500 | 1,340 | 1,260 | ..... | 1,070 | ..... |
| 7 | 1,390 | 1,330 | ..... | ..... | 1,230 | 1,260 | 1,470 | 1,310 | 1,240 | 1,100 | ..... | 1,070 |
| 8 | 1,350 | 1,330 | ..... | ..... | 1,230 | 1,240 | 1,460 | 1,310 | 1,230 | ..... | 1,070 | ..... |
| 9 | 1,350 | 1,330 | ..... | ..... | 1,240 | 1,250 | 1,450 | 1,310 | 1,230 | 1,110 | ..... | 1,080 |
| 10 | 1,360 | 1,360 | ..... | 1,530 | 1,240 | 1,260 | 1,420 | 1,310 | 1,230 | ..... | 1,080 | ..... |
| 11 | 1,360 | 1,340 | ..... | 1,520 | 1,240 | 1,250 | 1,400 | 1,310 | 1,230 | 1,080 | ..... | 1,080 |
| 12 | 1,360 | 1,290 | 1,200 | 1,520 | 1,230 | 1,240 | 1,370 | 1,310 | 1,230 | ..... | 1,080 | ..... |
| 13 | 1,380 | 1,330 | ..... | 1,520 | 1,230 | 1,270 | 1,370 | 1,340 | 1,220 | 1,080 | ..... | 1,100 |
| 14 | 1,380 | 1,330 | ..... | 1,520 | 1,230 | 1,290 | 1,370 | 1,370 | 1,220 | ..... | 1,080 | ..... |
| 15 | 1,380 | 1,330 | ..... | 1,450 | 1,230 | 1,320 | 1,380 | 1,370 | 1,220 | 1,080 | ..... | 1,100 |
| 16 | 1,380 | 1,330 | ..... | 1,450 | 1,240 | 1,320 | 1,380 | 1,370 | 1,220 | ..... | 1,080 | ..... |
| 17 | 1,330 | 1,330 | ..... | 1,450 | 1,260 | 1,320 | 1,380 | 1,370 | 1,200 | 1,080 | ..... | 1,080 |
| 18 | 1,360 | 1,330 | 1,110 | 1,450 | 1,280 | 1,320 | 1,370 | 1,360 | 1,180 | ..... | 1,080 | ..... |
| 19 | 1,380 | 1,330 | ..... | 1,460 | 1,290 | 1,320 | 1,370 | 1,340 | 1,170 | 1,080 | ..... | 1,070 |
| 20 | 1,430 | 1,280 | ..... | 1,410 | 1,290 | 1,320 | 1,370 | 1,310 | 1,170 | ..... | 1,080 | ..... |
| 21 | 1,430 | 1,280 | ..... | 1,360 | 1,290 | 1,320 | 1,370 | 1,310 | 1,170 | 1,080 | ..... | 1,070 |
| 22 | 1,480 | 1,280 | ..... | 1,310 | 1,290 | 1,320 | 1,370 | 1,300 | 1,170 | ..... | 1,080 | ..... |
| 23 | 1,430 | 1,280 | ..... | 1,260 | 1,290 | 1,340 | 1,370 | 1,300 | 1,170 | 1,080 | ..... | 1,070 |
| 24 | 1,430 | 1,280 | ..... | 1,320 | 1,290 | 1,350 | 1,380 | 1,310 | 1,160 | ..... | 1,080 | ..... |
| 25 | 1,360 | 1,280 | ..... | 1,320 | 1,300 | 1,370 | 1,380 | 1,340 | 1,140 | 1,070 | ..... | 1,070 |
| 26 | 1,360 | 1,280 | 1,430 | 1,380 | 1,300 | 1,390 | 1,390 | 1,340 | 1,150 | ..... | 1,080 | ..... |
| 27 | 1,360 | 1,290 | ..... | 1,440 | 1,300 | 1,380 | 1,380 | 1,310 | 1,140 | 1,070 | ..... | 1,070 |
| 28 | 1,270 | 1,280 | ..... | 1,350 | 1,300 | 1,380 | 1,370 | 1,300 | 1,150 | ..... | 1,080 | 1,070 |
| 29 | 1,330 | 1,300 | ..... | 1,200 | ..... | 1,380 | 1,360 | 1,300 | 1,140 | 1,080 | ..... | ..... |
| 30 | 1,330 | 1,300 | ..... | 1,260 | ..... | 1,450 | 1,340 | 1,300 | 1,140 | ..... | 1,080 | 1,070 |
| 31 | 1,330 | ..... | ..... | 1,240 | ..... | 1,450 | ..... | 1,300 | ..... | 1,080 | ..... | ..... |

NOTE.—Discharge determined from two well-defined rating curves, one applicable Jan. 20 to June 25, the other July 9 to Sept. 30, respectively; indirect method for shifting channels used June 26 to July 7. Discharge Oct. 1 to Nov. 21 determined as sum of discharge of Deschutes River at Bend and of Arnold, Central Oregon, and Pilot Butte canals; Nov. 22 to Jan. 29, as sum of discharge of Deschutes below Bend and of Arnold, Central Oregon, Pilot Butte, North, and Swalley canals. Mean discharge estimated as follows: 1,250 second-feet Dec. 7–11, 1,150 second-feet Dec. 13–17, 1,200 second-feet Dec. 19–25, 1,450 second-feet Dec. 27–31, and 1,500 second-feet Jan. 1–9. Discharge interpolated between results of readings three times a week Jan. 30 to May 15 and June 24–30.

*Monthly discharge of Deschutes River at Lava Island, near Beno, Oreg., for the year ending Sept. 30, 1915.*

| Month. | Discharge in second-feet. | | | Run-off (total in acre-feet). | Accuracy. |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | | |
| October | 1,480 | 1,270 | 1,370 | 84,200 | B. |
| November | 1,360 | 1,280 | 1,320 | 78,600 | B. |
| December | | | 1,260 | 77,500 | C. |
| January | 1,530 | 1,200 | 1,430 | 87,900 | C. |
| February | 1,300 | 1,230 | 1,260 | 70,000 | A. |
| March | 1,450 | 1,240 | 1,320 | 81,200 | A. |
| April | 1,540 | 1,340 | 1,410 | 83,900 | A. |
| May | 1,370 | 1,300 | 1,330 | 81,800 | A. |
| June | 1,300 | 1,140 | 1,210 | 72,000 | A. |
| July | 1,140 | 1,070 | 1,090 | 67,000 | B. |
| August | 1,080 | 1,070 | 1,080 | 66,400 | A. |
| September | 1,100 | 1,070 | 1,080 | 64,300 | A. |
| The year | 1,540 | 1,070 | 1,260 | 915,000 | |

### DESCHUTES RIVER AT BEND, OREG.

LOCATION.—In the NE. ¼ sec. 32, T. 17 S., R. 12 E., just below the power house of the Bend Water, Light & Power Co. at former city pumping plant at Bend, Deschutes County, a mile above the diversion dam of the North canal of the Central Oregon Irrigation Co.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—April 23, 1907, to October 8, 1910, and October 1, 1911, to November 21, 1914, when station was discontinued, at gage below power house; December 22, 1904, to March 30, 1907, at Sizemore's bridge; October 1, 1910, to April 10, 1912, at gage above dam.

GAGE.—At pumping plant, vertical staff bolted to a boulder; above dam, vertical staff nailed to pier of bridge over pond near right bank; zero level with crest; at Sizemore's bridge (prior to 1907), vertical staff spiked to bent. Gage reader, C. A. Stanburrough.

DISCHARGE MEASUREMENTS.—Made from a bridge a short distance above gage. Prior to August 24, 1912, made from Staat's bridge, three-fourths mile above the gage; October 18, 1912, to June 1, 1913, from a cable at gage.

CHANNEL AND CONTROL.—Gravel and boulders on which logs and drift are lodged; somewhat shifting.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period October 1 to November 21, 1914, 1.55 feet October 22 (discharge, 1,480 second-feet); minimum stage recorded, 1.10 feet October 28 (discharge, 1,060 second-feet).

1905–1915: Maximum stage recorded, 3.45 feet at 7.45 a. m. November 27, 1909 (discharge, 4,820 second-feet; no diversions); minimum discharge, 539 second-feet August 14, 1915 (found by adding discharge of Deschutes River below Bend and that of North and Swalley canals).

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

DIVERSIONS.—The Arnold, Pilot Butte, and Central Oregon canals divert water above station; records available. No other important diversions.

REGULATION.—Discharge fluctuates owing to operation of power plant just above station. Gage has generally been read after load on plant has been steady for a time.

ACCURACY.—Results considered good.

No discharge measurements made October 1 to November 21, 1915.

*Daily discharge, in second-feet, of Deschutes River at Bend, Oreg., for the period Oct. 1 to Nov. 21, 1914.*

| Day. | Oct. | Nov. | Day. | Oct. | Nov. | Day. | Oct. | Nov. |
|---|---|---|---|---|---|---|---|---|
| 1 | 1,280 | 1,330 | 11 | 1,150 | 1,150 | 21 | 1,430 | 1,280 |
| 2 | 1,330 | 1,330 | 12 | 1,150 | 1,100 | 22 | 1,480 | ..... |
| 3 | 1,280 | 1,330 | 13 | 1,380 | 1,330 | 23 | 1,430 | ..... |
| 4 | 1,280 | 1,330 | 14 | 1,380 | 1,330 | 24 | 1,430 | ..... |
| 5 | 1,380 | 1,280 | 15 | 1,380 | 1,330 | 25 | 1,150 | ..... |
| 6 | 1,380 | 1,280 | 16 | 1,380 | 1,330 | 26 | 1,150 | ..... |
| 7 | 1,380 | 1,280 | 17 | 1,330 | 1,330 | 27 | 1,150 | ..... |
| 8 | 1,330 | 1,280 | 18 | 1,360 | 1,330 | 28 | 1,060 | ..... |
| 9 | 1,330 | 1,280 | 19 | 1,380 | 1,330 | 29 | 1,330 | ..... |
| 10 | 1,330 | 1,150 | 20 | 1,430 | 1,280 | 30 | 1,330 | ..... |
| | | | | | | 31 | 1,330 | ..... |

NOTE.—Discharge determined from a well-defined rating curve. Discharge interpolated Oct. 18, Nov. 1 and 15. Discharge estimated, making allowance for change in diversions, Oct. 25, Nov. 8, 9, and 13.

*Monthly discharge of Deschutes River at Bend, Oreg., for the period Oct. 1 to Nov. 21, 1914.*

| Month. | Discharge in second-feet. | | | Run-off (total in acre-feet). | Accuracy. |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | | |
| October | 1,480 | 1,060 | 1,320 | 81,200 | B. |
| November 1–21 | 1,330 | 1,100 | 1,290 | 53,700 | B. |

### DESCHUTES RIVER BELOW BEND, OREG.

LOCATION.—In the 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, 1915.

GAGE.—Lietz water-stage recorder on right bank; inspected by C. Orewiler.

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

CHANNEL AND CONTROL.—Rocky and probably permanent. Some logs and drift lodged on the wide shallow control may affect stage-discharge relation slightly.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 2.15 feet April 5 (discharge, 1,500 second-feet); recorder not working and actual peak may have been higher. Minimum stage from water-stage recorder, 0.51 foot at 2 a. m. July 28 (discharge, 163 second-feet). This is the lowest flow ever known at this point; for maximum recorded see description of station at Bend (p. 40).

WINTER FLOW.—Stage-discharge relation seldom affected by ice.

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

REGULATION.—Flow regulated by a small hydroelectric plant at North canal dam.

ACCURACY.—Rating curve not well defined above 1,000 second-feet and gage record poor for certain periods in December, January, March, and September. Record April to June considered excellent.

*Discharge measurements of Deschutes River below Bend, Oreg., during the year ending Sept. 30, 1915.*

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---|---|---|---|---|---|---|---|
| | | *Feet.* | *Sec.-ft.* | | | *Feet.* | *Sec.-ft.* |
| Nov. 28 | C. G. Paulsen | 2.02 | 1,210 | June 17 | F. F. Henshaw | 1.00 | 354 |
| Dec. 18 | J. E. Stewart | a 2.58 | 1,110 | 20 | do | .92 | 328 |
| Jan. 28 | C. G. Paulsen | 1.87 | 1,190 | July 31 | P. V. Hodges | .91 | 307 |
| Feb. 2 | do | 1.98 | 1,260 | Sept. 30 | Henshaw and Batchelder | 1.18 | 493 |
| Mar. 3 | J. E. Stewart | 1.88 | 1,060 | | | | |

a Stage-discharge relation affected by anchor ice.

*Daily discharge, in second-feet, of Deschutes River below Bend, Oreg., for the year ending Sept. 30, 1915.*

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1,070 | 1,170 | 1,190 | ..... | 1,240 | 1,220 | 1,300 | 750 | 540 | 285 | 240 | ..... |
| 2 | 1,110 | 1,170 | 1,250 | ..... | 1,240 | 1,300 | 1,330 | 750 | 540 | 398 | 240 | ..... |
| 3 | 1,060 | 1,140 | 1,250 | ..... | 1,220 | 1,120 | 1,360 | 710 | 540 | 285 | 220 | ..... |
| 4 | 1,070 | 1,160 | 1,080 | ..... | 1,210 | 1,120 | 1,430 | 700 | 500 | 240 | 220 | ..... |
| 5 | 1,170 | 1,110 | 860 | ..... | 1,200 | 1,120 | 1,500 | 690 | 500 | 220 | 220 | 190 |
| 6 | 1,170 | 1,110 | 1,190 | ..... | 1,180 | 1,240 | 1,460 | 680 | 465 | 220 | 220 | ..... |
| 7 | 1,170 | 1,110 | ..... | ..... | 1,180 | 1,240 | 1,430 | 670 | 430 | 240 | 205 | ..... |
| 8 | 1,220 | 1,110 | ..... | ..... | 1,210 | 1,270 | 1,400 | 660 | 398 | 240 | 205 | ..... |
| 9 | 1,220 | 1,110 | ..... | ..... | 1,240 | 1,300 | 1,360 | 660 | 398 | 240 | 205 | ..... |
| 10 | 1,220 | 980 | ..... | 1,500 | 1,240 | 1,270 | 1,320 | 705 | 398 | 240 | 240 | ..... |
| 11 | 940 | 980 | ..... | 1,500 | 1,240 | 1,240 | 950 | 660 | 398 | 285 | 270 | 285 |
| 12 | 940 | 930 | 1,190 | 1,500 | 1,240 | 1,240 | 985 | 660 | 365 | 285 | 250 | ..... |
| 13 | 1,170 | 1,160 | ..... | 1,500 | 1,240 | 1,240 | 1,020 | 660 | 365 | 220 | 190 | ..... |
| 14 | 1,170 | 1,160 | ..... | 1,500 | 1,120 | 1,240 | 985 | 660 | 450 | 220 | 170 | ..... |
| 15 | 1,170 | 1,160 | ..... | 1,430 | 1,060 | 1,240 | 950 | 705 | 450 | 220 | 190 | ..... |
| 16 | 1,170 | 1,160 | ..... | 1,430 | 1,060 | 1,240 | 950 | 700 | 365 | 220 | 205 | ..... |
| 17 | 1,120 | 1,160 | ..... | 1,430 | 1,060 | 1,180 | 950 | 850 | 365 | 220 | 205 | ..... |
| 18 | 1,150 | 1,160 | 1,110 | 1,430 | 900 | 1,180 | 900 | 700 | 350 | 220 | 190 | 260 |
| 19 | 1,170 | 1,290 | ..... | 1,430 | 860 | 1,120 | 850 | 680 | 340 | 220 | 190 | ..... |
| 20 | 1,220 | 1,240 | ..... | 1,390 | 1,000 | 1,090 | 800 | 660 | 310 | 240 | 190 | ..... |
| 21 | 1,220 | 1,240 | ..... | 1,340 | 1,000 | 1,060 | 750 | 640 | 310 | 220 | 260 | ..... |
| 22 | 1,270 | 1,240 | ..... | 1,290 | 1,060 | 1,090 | 775 | 620 | 310 | 220 | 190 | ..... |
| 23 | 1,320 | 1,240 | ..... | 1,240 | 1,060 | 1,120 | 800 | 620 | 285 | 220 | 190 | ..... |
| 24 | 1,320 | 1,210 | ..... | 1,300 | 1,160 | 1,150 | 850 | 620 | 285 | 220 | 190 | ..... |
| 25 | 1,040 | 1,210 | ..... | 1,300 | 1,150 | 1,180 | 850 | 850 | 285 | 190 | 190 | 310 |
| 26 | 1,030 | 1,200 | 1,430 | 1,240 | 1,140 | 1,320 | 900 | 800 | 285 | 190 | 190 | ..... |
| 27 | 1,030 | 1,190 | 1,450 | 1,180 | 1,120 | 1,360 | 950 | 660 | 260 | 175 | 187 | ..... |
| 28 | 940 | 1,190 | 1,250 | 1,180 | 1,140 | 1,360 | 900 | 620 | 285 | 220 | 184 | ..... |
| 29 | 1,210 | 1,190 | 1,290 | 1,180 | ..... | 1,360 | 850 | 620 | 285 | 190 | 186 | ..... |
| 30 | 1,210 | 1,250 | 1,340 | 1,240 | ..... | 1,330 | 800 | 620 | 285 | 260 | 188 | 338 |
| 31 | 1,210 | ..... | 1,330 | 1,240 | ..... | 1,300 | ..... | 580 | ..... | 310 | 190 | ..... |

NOTE.—Discharge determined as follows: Oct. 1 to Nov. 26, by deducting discharge determined for North and Swalley canals from that of Deschutes River at Bend; Nov. 27 to Dec. 12, from a fairly well defined rating curve; Dec. 26 to Sept. 30, from a rating curve well defined between 300 and 1,000 second-feet and fairly well defined outside of these limits. Discharge interpolated, taking into account changes in diversions, Dec. 27–31, May 3–7, 16–21, June 13–16, Aug. 9–14, and for periods of 1 to 3 days in February, March, and April, when recorder was not working properly.

*Monthly discharge of Deschutes River below Bend, Oreg., for the year ending Sept. 30, 1915.*

| Month. | Discharge in second-feet. | | | Run-off (total in acre-feet). | Accuracy. |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | | |
| October | 1,320 | 940 | 1,149 | 70,100 | B. |
| November | 1,290 | 930 | 1,161 | 69,000 | B. |
| December | 1,450 | 860 | 1,219 | 74,400 | C. |
| January | 1,500 | 1,180 | 1,389 | 84,800 | C. |
| February | 1,240 | 860 | 1,131 | 62,800 | B. |
| March | 1,360 | 1,060 | 1,220 | 75,000 | C. |
| April | 1,500 | 750 | 1,069 | 63,100 | A. |
| May | 850 | 580 | 689 | 42,000 | A. |
| June | 540 | 260 | 379 | 22,500 | A. |
| July | 398 | 175 | 239 | 14,600 | B. |
| August | 270 | 170 | 207 | 12,700 | B. |
| September | 338 | 190 | 277 | 16,500 | C. |
| The year | 1,500 | 170 | 839 | 608,000 | |

### DESCHUTES RIVER AT TUMALO, OREG.

LOCATION.—In the NE. ¼ sec. 31, T. 16 S., R. 12 E., at the highway bridge in Tumalo, Deschutes County, 3 miles below Tumalo Creek, and 9 miles by river below Bend; below all important diversions.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—January 1, 1909, to October 15, 1912; July 14 to October 11, 1914; May 1 to July 31, 1915, when station was discontinued. Records prior to July, 1910, questionable.

GAGE.—Vertical staff on left bank about 200 yards below old gage at highway bridge at Tumalo which was used 1909 to 1914. Gage reader, W. R. Gerking.

DISCHARGE MEASUREMENTS.—Made from wagon bridge 1½ miles above gage in the SE. ¼ sec. 6, T. 17 S., R. 12 E.; fair section.

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

EXTREMES OF DISCHARGE.—Records for 1915 cover neither maximum nor minimum. The maximum stage ever known at the station was in November, 1909, but the records are poor. Minimum practically the same as that at station below Bend.

WINTER FLOW.—Stage-discharge relation probably somewhat affected by ice in extremely cold weather.

DIVERSIONS.—Practically no diversions from Deschutes River between this station and the one below Bend. Practically the entire flow of Tumalo Creek is diverted except at times when there is ice or high water.

REGULATION.—The operation of power plant affects the flow at Tumalo considerably less than at station below Bend. Results considered excellent.

*Discharge measurements of Deschutes River at Tumalo, Oreg., during the year ending Sept. 30, 1915.*

| Date. | Made by— | Gage height. | Discharge. |
|---|---|---|---|
| | | *Feet.* | *Sec.-ft.* |
| Nov. 25 | C. G. Paulsen | 3.21 | 1,360 |
| June 23 | F. F. Henshaw | 1.86 | 292 |
| July 31 | P. V. Hodges | 1.91 | 303 |

*Daily discharge, in second-feet, of Deschutes River at Tumalo, Oreg., for the year ending Sept. 30, 1915.*

| Day. | May. | June. | July. | Day. | May. | June. | July. | Day. | May. | June. | July. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 676 | 618 | 260 | 11 | 511 | ..... | ..... | 21 | 632 | 300 | ..... |
| 2 | 780 | 625 | ..... | 12 | 511 | ..... | ..... | 22 | 660 | 300 | ..... |
| 3 | 780 | 590 | 375 | 13 | 625 | ..... | ..... | 23 | ..... | 284 | ..... |
| 4 | 653 | 590 | ..... | 14 | 632 | ..... | ..... | 24 | 625 | 276 | ..... |
| 5 | 676 | 576 | ..... | 15 | 632 | ..... | ..... | 25 | 618 | 272 | ..... |
| 6 | 716 | ..... | 245 | 16 | ..... | ..... | ..... | 26 | 930 | 268 | ..... |
| 7 | 625 | ..... | ..... | 17 | 930 | ..... | ..... | 27 | 920 | ..... | ..... |
| 7 | 618 | ..... | ..... | 18 | 660 | ..... | ..... | 28 | 659 | 280 | ..... |
| 9 | ..... | ..... | ..... | 19 | 910 | 300 | ..... | 29 | 625 | 260 | ..... |
| 10 | 618 | ..... | ..... | 20 | 625 | ..... | ..... | 30 | ..... | 260 | ..... |
| | | | | | | | | 31 | 618 | ..... | 305 |

NOTE.—Discharge determined from a well-defined rating curve.

### DESCHUTES RIVER AT MECCA, OREG.

LOCATION.—In the 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, 1915.

GAGE.—Vertical staff fastened to tree on right bank, 75 feet above bridge. Gage reader, E. Chaloupka.

DISCHARGE MEASUREMENTS.—Made from highway bridge.

CHANNEL AND CONTROL.—Rock and gravel; practically permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 4.20 feet at noon April 3 (discharge, 7,470 second-feet); minimum stage recorded, 1.95 feet in August and September (discharge, 3,410 second-feet).

1911–1915: Maximum stage recorded, 5.2 feet April 13, 1913 (discharge, 9,410 second-feet); minimum stage recorded, 1.95 feet in August and September, 1915 (discharge, 3,410 second-feet).

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

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

REGULATION.—None.

ACCURACY.—Results considered excellent.

*Discharge measurements of Deschutes River at Mecca, Oreg., during the year ending Sept. 30, 1915.*

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---|---|---|---|---|---|---|---|
| | | *Feet.* | *Sec.-ft.* | | | *Feet.* | *Sec.-ft.* |
| Oct. 25 | P. V. Hodges | 2.76 | 4,680 | June 28 | C. L. Batchelder | 2.12 | 3,630 |
| June 5 | C. L. Batchelder | 2.36 | 4,080 | Sept 4 | do | 1.95 | 3,410 |

*Daily discharge, in second-feet, of Deschutes River at Mecca, Oreg., for the year ending Sept. 30, 1915.*

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 4,560 | 4,740 | 4,740 | 4,560 | 4,560 | 4,740 | 6,850 | 4,380 | 4,050 | 3,610 | 3,470 | 3,470 |
| 2 | 4,740 | 4,740 | 4,740 | 4,740 | 4,560 | 4,740 | 7,050 | 4,380 | 4,050 | 3,470 | 3,470 | 3,470 |
| 3 | 4,560 | 4,740 | 4,920 | 4,740 | 4,560 | 4,740 | 7,470 | 4,380 | 4,050 | 3,610 | 3,470 | 3,470 |
| 4 | 4,560 | 4,740 | 5,100 | 4,740 | 4,740 | 4,740 | 7,050 | 4,380 | 4,050 | 3,610 | 3,750 | 3,470 |
| 5 | 4,380 | 4,740 | 4,740 | 4,740 | 4,740 | 4,740 | 6,650 | 4,380 | 4,050 | 3,750 | 3,610 | 3,470 |
| 6 | 4,560 | 4,740 | 4,740 | 4,740 | 4,740 | 4,740 | 6,250 | 4,210 | 4,050 | 3,750 | 3,610 | 3,470 |
| 7 | 4,740 | 4,560 | 4,740 | 4,920 | 4,560 | 4,740 | 6,250 | 4,210 | 4,050 | 3,750 | 3,470 | 3,470 |
| 8 | 4,560 | 4,560 | 4,740 | 4,740 | 4,560 | 4,740 | 5,860 | 4,210 | 3,900 | 3,750 | 3,470 | 3,470 |
| 9 | 4,380 | 4,740 | 4,740 | 4,740 | 4,380 | 4,740 | 5,860 | 4,210 | 3,750 | 3,750 | 3,610 | 3,470 |
| 10 | 4,380 | 4,740 | 4,560 | 4,740 | 4,380 | 4,740 | 5,860 | 4,380 | 3,750 | 3,610 | 3,610 | 3,470 |
| 11 | 4,380 | 4,560 | 4,560 | 4,740 | 4,380 | 4,740 | 5,670 | 4,380 | 3,750 | 3,610 | 3,470 | 3,470 |
| 12 | 4,380 | 4,380 | 4,560 | 4,740 | 4,380 | 4,740 | 5,860 | 4,380 | 3,750 | 3,610 | 3,470 | 3,470 |
| 13 | 4,560 | 4,740 | 4,380 | 4,740 | 4,380 | 4,740 | 5,860 | 4,380 | 3,750 | 3,750 | 3,470 | 3,470 |
| 14 | 4,560 | 4,560 | 4,380 | 4,740 | 4,380 | 4,920 | 5,480 | 4,380 | 3,750 | 3,750 | 3,470 | 3,610 |
| 15 | 4,560 | 4,740 | 4,560 | 4,920 | 4,380 | 5,100 | 5,480 | 4,380 | 3,750 | 3,750 | 3,470 | 3,610 |
| 16 | 4,560 | 4,740 | 4,380 | 4,740 | 4,380 | 5,480 | 5,100 | 4,560 | 3,750 | 3,610 | 3,470 | 3,750 |
| 17 | 4,560 | 4,740 | 4,380 | 4,740 | 4,380 | 5,480 | 5,100 | 4,740 | 3,750 | 3,610 | 3,470 | 3,750 |
| 18 | 4,740 | 4,740 | 4,380 | 4,740 | 4,560 | 5,480 | 5,100 | 4,740 | 3,750 | 3,610 | 3,470 | 3,750 |
| 19 | 4,740 | 4,740 | 4,380 | 4,740 | 4,380 | 5,290 | 4,920 | 4,560 | 3,750 | 3,470 | 3,470 | 3,750 |
| 20 | 4,740 | 4,740 | 4,380 | 4,740 | 4,380 | 5,100 | 4,740 | 4,380 | 3,750 | 3,470 | 3,470 | 3,750 |
| 21 | 4,740 | 4,740 | 4,380 | 4,740 | 4,560 | 5,290 | 4,740 | 4,380 | 3,750 | 3,470 | 3,470 | 3,750 |
| 22 | 4,740 | 4,740 | 4,210 | 4,560 | 4,560 | 5,480 | 4,740 | 4,380 | 3,750 | 3,470 | 3,470 | 3,750 |
| 23 | 4,740 | 4,740 | 4,380 | 4,560 | 4,560 | 5,480 | 4,740 | 4,380 | 3,750 | 3,470 | 3,470 | 3,610 |
| 24 | 4,740 | 4,740 | 4,380 | 4,380 | 4,740 | 5,860 | 4,740 | 4,380 | 3,750 | 3,470 | 3,470 | 3,610 |
| 25 | 4,740 | 4,740 | 4,740 | 4,380 | 4,740 | 6,050 | 4,740 | 4,210 | 3,750 | 3,470 | 3,470 | 3,610 |
| 26 | 4,560 | 4,740 | 4,740 | 4,380 | 4,740 | 6,050 | 4,560 | 4,380 | 3,750 | 3,470 | 3,470 | 3,610 |
| 27 | 4,560 | 4,740 | 4,740 | 4,380 | 4,740 | 5,860 | 4,560 | 4,380 | 3,750 | 3,470 | 3,470 | 3,610 |
| 28 | 4,380 | 4,740 | 4,740 | 4,380 | 4,740 | 5,670 | 4,380 | 4,380 | 3,610 | 3,470 | 3,470 | 3,610 |
| 29 | 4,560 | 4,740 | 4,560 | 4,380 | ..... | 6,250 | 4,380 | 4,380 | 3,610 | 3,470 | 3,470 | 3,610 |
| 30 | 4,740 | 4,740 | 4,560 | 4,380 | ..... | 7,200 | 4,380 | 4,380 | 3,470 | 3,470 | 3,470 | 3,610 |
| 31 | 4,740 | ..... | 4,560 | 4,380 | ..... | 6,850 | ..... | 4,210 | ..... | 3,470 | 3,470 | ..... |

NOTE.—Discharge determined from a well-defined rating curve.

*Monthly discharge of Deschutes River at Mecca, Oreg., for the year ending Sept. 30, 1915.*

| Month. | Discharge in second-feet. | | | Run-off (total in acre-feet). | Accuracy. |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | | |
| October | 4,740 | 4,380 | 4,590 | 282,000 | A. |
| November | 4,740 | 4,380 | 4,700 | 280,000 | A. |
| December | 5,100 | 4,210 | 4,580 | 282,000 | A. |
| January | 4,920 | 4,380 | 4,640 | 285,000 | A. |
| February | 4,740 | 4,380 | 4,540 | 252,000 | A. |
| March | 7,260 | 4,740 | 5,310 | 326,000 | B. |
| April | 7,470 | 4,380 | 5,480 | 326,000 | B. |
| May | 4,740 | 4,210 | 4,380 | 269,000 | A. |
| June | 4,050 | 3,470 | 3,810 | 227,000 | A. |
| July | 3,750 | 3,470 | 3,580 | 220,000 | A. |
| August | 3,750 | 3,470 | 3,500 | 215,000 | A. |
| September | 3,750 | 3,470 | 3,580 | 213,000 | A. |
| The year | 7,470 | 3,470 | 4,390 | 3,180,000 | |

NOTE.—Accuracy of records for April, 1913, and March, 1914, should be rated C, and April, 1914, B. This rating supercedes that of A given for these months in Water-Supply Papers 362-C and 394.

### DESCHUTES RIVER AT MOODY, NEAR BIGGS, OREG.

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

DRAINAGE AREA.—About 9,180 square miles.

RECORDS AVAILABLE.—July 7, 1906, to September 30, 1915; October 19, 1897, to December 31, 1899, for a station near Moro, 10 miles above mouth of river in the 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. Gage reader, A. C. Osborn. At the Moro station gage was an inclined staff.

DISCHARGE MEASUREMENTS.—Made from a cable about 450 feet above gage. At Moro station made from the "free bridge" 3 miles below gage.

CHANNEL AND CONTROL.—Rock and gravel; shifting only in floods.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 3.7 feet afternoon of April 4 (discharge, 9,850 second-feet); minimum stage recorded, 1.9 feet August 18 to September 16 (discharge, 3,600 second-feet).

1906–1915: Maximum stage recorded, 7.50 feet February 6, 1907 (discharge, 30,600 second-feet); minimum stage recorded, 1.9 feet August 18 to September 16 (discharge, 3,600 second-feet).

WINTER FLOW.—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 this water returns but the net reduction during midsummer is now probably 15 to 20 per cent.

REGULATION.—None.

ACCURACY.—Results considered excellent.

*Discharge measurements of Deschutes River at Moody, near Biggs, Oreg., during the year ending Sept. 30, 1915.*

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---|---|---|---|---|---|---|---|
| | | *Feet.* | *Sec.-ft.* | | | *Feet.* | *Sec.-ft.* |
| Oct. 21 | Stewart and Hodges | 2.50 | 5,290 | Mar. 6 | C. G. Paulsen | 2.62 | 5,720 |
| Nov. 30 | C. G. Paulsen | 2.45 | 5,200 | Aug. 29 | P. V. Hodges | 1.90 | 3,680 |
| Mar. 5 | do | 2.71 | 6,020 | | | | |

*Daily discharge, in second-feet, of Deschutes River at Moody, near Biggs, Oreg., for the year ending Sept. 30, 1915.*

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 4,720 | 5,320 | 5,020 | 5,020 | 5,020 | 5,960 | 9,400 | 5,020 | 5,020 | 3,920 | 3,920 | 3,680 |
| 2 | 4,720 | 5,320 | 5,020 | 5,020 | 5,020 | 5,960 | 9,400 | 5,020 | 5,020 | 3,920 | 3,920 | 3,680 |
| 3 | 4,720 | 5,320 | 5,020 | 5,020 | 5,020 | 5,960 | 9,400 | 5,020 | 4,720 | 3,920 | 3,920 | 3,680 |
| 4 | 4,720 | 5,320 | 5,020 | 5,020 | 5,020 | 5,960 | 9,850 | 5,020 | 4,720 | 3,920 | 3,920 | 3,680 |
| 5 | 4,720 | 5,320 | 5,020 | 5,020 | 5,320 | 5,960 | 9,400 | 5,020 | 4,720 | 3,920 | 3,920 | 3,680 |
| 6 | 4,720 | 5,320 | 4,720 | 5,020 | 5,320 | 5,630 | 8,600 | 5,020 | 4,440 | 3,920 | 3,920 | 3,680 |
| 7 | 4,720 | 5,320 | 4,720 | 5,020 | 5,320 | 5,630 | 8,600 | 5,020 | 4,440 | 3,920 | 3,920 | 3,680 |
| 8 | 4,720 | 5,320 | 4,720 | 5,020 | 5,020 | 5,630 | 8,200 | 5,020 | 4,440 | 3,920 | 3,920 | 3,680 |
| 9 | 4,720 | 5,320 | 5,020 | 5,020 | 5,020 | 5,630 | 7,800 | 5,020 | 4,440 | 3,920 | 3,920 | 3,680 |
| 10 | 4,720 | 5,320 | 5,020 | 5,020 | 5,020 | 5,630 | 7,800 | 5,020 | 4,440 | 3,920 | 3,920 | 3,680 |
| 11 | 4,720 | 5,320 | 5,020 | 5,020 | 5,020 | 5,630 | 7,400 | 5,020 | 4,440 | 3,920 | 3,920 | 3,680 |
| 12 | 4,720 | 5,020 | 5,020 | 5,020 | 5,020 | 5,630 | 7,000 | 5,020 | 4,440 | 3,920 | 3,920 | 3,680 |
| 13 | 4,720 | 5,020 | 5,020 | 5,020 | 5,020 | 5,630 | 7,000 | 5,320 | 4,440 | 3,920 | 3,920 | 3,680 |
| 14 | 4,720 | 5,020 | 4,720 | 5,020 | 5,020 | 5,630 | 6,650 | 5,320 | 4,440 | 3,920 | 3,920 | 3,680 |
| 15 | 5,020 | 5,020 | 4,720 | 5,320 | 5,020 | 5,960 | 6,300 | 5,320 | 4,440 | 3,920 | 3,920 | 3,680 |
| 16 | 5,020 | 5,020 | 4,440 | 5,320 | 5,020 | 6,650 | 6,300 | 5,320 | 4,440 | 3,920 | 3,920 | 3,680 |
| 17 | 5,020 | 5,320 | 4,440 | 5,320 | 5,020 | 6,650 | 6,300 | 5,320 | 4,440 | 3,920 | 3,920 | 3,920 |
| 18 | 5,020 | 5,320 | 4,440 | 5,020 | 5,020 | 6,650 | 6,300 | 5,320 | 4,440 | 3,920 | 3,680 | 3,920 |
| 19 | 5,020 | 5,320 | 4,440 | 5,020 | 5,020 | 6,650 | 6,300 | 5,020 | 4,440 | 3,920 | 3,680 | 3,920 |
| 20 | 5,020 | 5,320 | 4,440 | 5,020 | 5,020 | 6,650 | 5,960 | 5,020 | 4,440 | 3,920 | 3,680 | 3,920 |
| 21 | 5,020 | 5,320 | 4,440 | 5,020 | 5,020 | 6,650 | 5,960 | 5,020 | 4,440 | 3,920 | 3,680 | 3,920 |
| 22 | 5,020 | 5,320 | 4,720 | 5,020 | 5,020 | 6,650 | 5,960 | 5,020 | 4,440 | 3,920 | 3,680 | 3,920 |
| 23 | 5,020 | 5,320 | 4,720 | 5,020 | 5,320 | 6,650 | 5,630 | 5,020 | 4,180 | 3,920 | 3,680 | 3,920 |
| 24 | 5,320 | 5,320 | 4,720 | 5,020 | 5,960 | 7,000 | 5,630 | 5,020 | 4,180 | 3,920 | 3,680 | 3,920 |
| 25 | 5,320 | 5,320 | 5,020 | 5,020 | 7,000 | 7,000 | 5,630 | 5,020 | 4,180 | 3,920 | 3,680 | 3,920 |
| 26 | 5,320 | 5,320 | 5,020 | 5,020 | 6,650 | 7,000 | 5,630 | 5,020 | 3,920 | 3,920 | 3,680 | 3,920 |
| 27 | 5,320 | 5,320 | 5,020 | 5,020 | 6,300 | 7,000 | 5,630 | 5,020 | 3,920 | 3,920 | 3,680 | 3,920 |
| 28 | 5,320 | 5,320 | 5,020 | 5,020 | 5,960 | 7,000 | 5,630 | 5,020 | 3,920 | 3,920 | 3,680 | 3,920 |
| 29 | 5,320 | 5,320 | 5,020 | 5,020 | ..... | 7,000 | 5,320 | 5,020 | 3,920 | 3,920 | 3,680 | 3,920 |
| 30 | 5,320 | 5,020 | 5,020 | 5,020 | ..... | 7,400 | 5,320 | 5,020 | 3,920 | 3,920 | 3,680 | 3,920 |
| 31 | 5,320 | ..... | 5,020 | 5,020 | ..... | 9,400 | ..... | 5,020 | ..... | 3,920 | 3,680 | ..... |

NOTE.—Discharge determined from a well-defined rating curve.

*Monthly discharge of Deschutes River at Moody, near Biggs, Oreg., for the year ending Sept. 30, 1915.*

| Month. | Discharge in second-feet. | | | Run-off (total in acre-feet). | Accuracy. |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | | |
| October | 5,320 | 4,720 | 4,960 | 305,000 | A. |
| November | 5,320 | 5,020 | 5,260 | 313,000 | A. |
| December | 5,020 | 4,440 | 4,830 | 297,000 | A. |
| January | 5,320 | 5,020 | 5,050 | 311,000 | A. |
| February | 7,000 | 5,020 | 5,300 | 294,000 | A. |
| March | 9,400 | 5,630 | 6,400 | 394,000 | A. |
| April | 9,850 | 5,320 | 7,010 | 417,000 | A. |
| May | 5,320 | 5,020 | 5,080 | 312,000 | A. |
| June | 5,020 | 3,920 | 4,390 | 261,000 | A. |
| July | 3,920 | 3,920 | 3,920 | 241,000 | A. |
| August | 3,920 | 3,680 | 3,810 | 234,000 | A. |
| September | 3,920 | 3,680 | 3,790 | 226,000 | A. |
| The year | 9,850 | 3,680 | 4,980 | 3,600,000 | |

### EAST FORK AT MORSON'S INTAKE, NEAR LAPINE, ORE.

LOCATION.—In the NE. ¼ sec. 34, T. 23 S., R. 9 E., at private road bridge about half a mile from river road to Crescent, and 12 miles southwest of Lapine, Deschutes County. Up to July 27, 1915, in the SE. ¼ sec. 33, T. 23 S., R. 9 E., about 500 feet below the mouth of Crescent Creek, and above the proposed intake for the Deschutes Land Co., Carey Act segregation.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—May 26 to November 21, 1914; March 15 to September 30, 1915.

GAGE.—Vertical staff nailed to bent of bridge since July 27, 1915; at old location, Friez water-stage recorder used August 12 to November 21, 1914, and vertical staff nailed to a tree root. Gage reader, George M. Mayfield.

DISCHARGE MEASUREMENTS.—Made by wading or from bridge.

CHANNEL AND CONTROL.—Bed composed of gravel and sand, with steep banks of silt, overgrown with brush; may shift in floods. Channel divided by an island just below bridge.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period March 15 to September 30, 1915, 4.82 feet at 3 p. m. April 3 (discharge, 233 second-feet); minimum stage recorded, 0.40 foot on new gage September 3 to 11 (discharge, 40 second-feet).

1914–15: Maximum stage recorded, 5.40 feet April 3, 1914 (discharge, 384 second-feet); flood of November 25, 1909, may have reached 1,800 second-feet (estimated from records at Allen's ranch). Minimum for 1915 was lowest in years.

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

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

REGULATION.—None.

ACCURACY.—Results good except from March to May, for which time they are only fair on account of lack of daily gage records.

*Discharge measurements of East Fork at Morson's intake, near Lapine, Oreg., during the year ending Sept. 30, 1915.*

| Date. | Made by— | Gage height. | Discharge. |
|---|---|---|---|
| | | *Feet.* | *Sec.-ft.* |
| Feb. 28 | J. E. Stewart | [a] 4.73 | 108 |
| July 27 | P. V. Hodges | [b] 3.91 | 68.1 |

[a] Stage-discharge relation affected by ice. [b] Gage height 0.70 foot on new gage.

*Daily discharge, in second-feet, of East Fork at Morson's intake, near Lapine, Oreg., for the year ending Sept. 30, 1915.*

| Day. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|
| 1 | | | | | | | 44 |
| 2 | | | | 144 | | 74 | |
| 3 | | 233 | | | 85 | | 40 |
| 4 | | | 154 | | | 77 | |
| 5 | | 217 | | 135 | | | 40 |
| 6 | | | | | 85 | 63 | |
| 7 | | | | | | | 40 |
| 8 | | | 144 | 126 | | 60 | |
| 9 | | 184 | | | | | 40 |
| 10 | | | | | | 57 | |
| 11 | | | 174 | | | | 40 |
| 12 | | 184 | | 117 | 81 | 57 | |
| 13 | | | | | | | 48 |
| 14 | | | | | | 51 | |
| 15 | 122 | | 164 | 108 | | | 46 |
| 16 | | 184 | | | | 58 | |
| 17 | | | | | | | 46 |
| 18 | 135 | | 164 | | | 56 | |
| 19 | | 217 | | 95 | 72 | | 42 |
| 20 | | | | | | 53 | |
| 21 | | | | | | | 42 |
| 22 | | | 144 | | | 50 | |
| 23 | 160 | 206 | | | | | 42 |
| 24 | | | | | 62 | 48 | |
| 25 | | | 160 | 92 | | | 42 |
| 26 | | 206 | | | | 46 | |
| 27 | 164 | 184 | | | 67 | | 42 |
| 28 | | 164 | | 89 | | 44 | |
| 29 | | | 148 | | 74 | | 42 |
| 30 | 174 | 184 | | | | 44 | |
| 31 | | | | | 74 | | |

NOTE.—Discharge determined from readings on old gage and a well-defined rating curve, Mar. 15 to July 27; from readings on new gage and a well-defined rating curve July 29 to September 29; given only for days on which gage was read.

*Monthly discharge of East Fork at Morson's intake, near Lapine, Oreg., for the year ending Sept. 30, 1915.*

| Month. | Mean discharge in second-feet. | Run-off (total in acre-feet). | Accuracy. | Month. | Mean discharge in second-feet. | Run-off (total in acre-feet). | Accuracy. |
|---|---|---|---|---|---|---|---|
| March 15-31 | 151 | 4,790 | C. | August | 55.9 | 3,440 | B. |
| April | 197 | 11,700 | C. | September | 42.4 | 2,520 | B. |
| May | 156 | 9,590 | C. | | | | |
| June | 113 | 6,720 | B. | The period | 110 | 43,400 | |
| July | 75.0 | 4,610 | B. | | | | |

NOTE.—Monthly mean is average of discharge determined for days on which gage was read.

### EAST FORK AT ALLEN'S RANCH, NEAR LAVA, OREG.

LOCATION.—In the SW. ¼ SW. ¼ sec. 8, T. 20 S., R. 11 E., on C. B. Allen's ranch, about a mile above mouth of East Fork and about a mile north of former post office of Lava, Oreg., 18 miles south of Bend, Deschutes County.

DRAINAGE AREA.—About 720 square miles.

RECORDS AVAILABLE.—February 17, 1905, to May 4, 1912; May 27, 1913, to September 30, 1915, when station was discontinued.

GAGE.—Inclined staff on east bank of river; datum since January 1, 1912, 0.10 foot higher than previously. Gage reader, Mrs. C. B. Allen.

DISCHARGE MEASUREMENTS.—Made from bridge about 200 feet below gage.

CHANNEL AND CONTROL.—Sand and clay; somewhat shifting; stage-discharge relation may be affected by growth of aquatic plants or by backwater from Deschutes River.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 6.10 feet at 12 noon, April 5 (discharge, 303 second-feet); minimum stage recorded, 4.50 feet August 29 to September 11 and September 20 to 30 (discharge, 43 second-feet).

1905-1915: Maximum stage recorded, 11.1 feet November 25, 1909 (discharge, 2,150 second-feet): minimum stage recorded, 4.50 feet August 29 to September 11 and September 20 to 30, 1915 (discharge, 43 second-feet).

WINTER FLOW.—Stage-discharge relation seriously affected by ice.

DIVERSIONS.—A considerable area, in small tracts, is irrigated above the station.

REGULATION.—None.

ACCURACY.—Results for 1915 considered good; those for earlier years, fair.

*Discharge measurements of East Fork at Allen's ranch, near Lava, Oreg., during the year ending Sept. 30, 1915.*

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---|---|---|---|---|---|---|---|
| | | *Feet.* | *Sec. ft.* | | | *Feet.* | *Sec. ft.* |
| Nov. 3 | James E. Stewart | 5.56 | 148 | May 2 | Mrs. C. B. Allen | 5.75 | 246 |
| Dec. 17 | do | 5.67 | 88.5 | 17 | do | 5.75 | 241 |
| Jan. 9 | Mrs. C. B. Allen | 5.55 | 98.7 | 30 | do | 5.70 | 223 |
| 17 | do | 5.80 | 92.7 | June 13 | do | 5.51 | 175 |
| 22 | do | 5.75 | 106 | 27 | do | 5.19 | 124 |
| Feb. 1 | C. G. Paulsen | 5.95 | 114 | July 11 | do | 5.15 | 107 |
| 6 | Mrs. C. B. Allen | 6.10 | 120 | 25 | do | 4.80 | 74.7 |
| 15 | do | 6.15 | 139 | 29 | P. V. Hodges | 4.85 | 76.8 |
| 18 | J. E. Stewart | 6.21 | 131 | Aug. 8 | Mrs. C. B. Allen | 4.75 | 60.9 |
| Mar. 1 | do | 5.90 | 149 | 22 | do | 4.60 | 48.7 |
| 10 | P. V. Hodges | 5.35 | 172 | Sept. 5 | do | 4.50 | 43.4 |
| 21 | Mrs. C. B. Allen | 5.45 | 195 | 21 | do | 4.51 | 47.6 |
| Apr. 4 | do | 6.05 | 291 | Oct. 1 | Henshaw and Batchelder | 4.55 | 44.5 |
| 18 | do | 5.80 | 245 | | | | |

NOTE.—Stage-discharge relation affected by ice for measurements Dec. 17 to Mar. 1.

*Daily discharge, in second-feet, of East Fork at Allen's ranch, near Lava, Oreg., for the year ending Sept. 30, 1915.*

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 100 | 140 | 110 | 99 | 114 | 149 | 247 | 238 | 248 | 106 | 80 | 43 |
| 2 | 100 | 147 | 110 | 99 | 115 | 169 | 256 | 238 | 236 | 106 | 80 | 43 |
| 3 | 100 | 147 | 110 | 99 | 115 | 184 | 284 | 247 | 223 | 106 | 74 | 43 |
| 4 | 100 | 140 | 110 | 99 | 115 | 200 | 294 | 247 | 223 | 106 | 74 | 43 |
| 5 | 106 | 140 | 110 | 99 | 115 | 218 | 303 | 256 | 210 | 113 | 69 | 43 |
| 6 | 100 | 140 | 110 | 99 | 120 | 192 | 294 | 230 | 198 | 113 | 69 | 43 |
| 7 | 100 | 140 | 110 | 99 | 127 | 199 | 284 | 222 | 186 | 120 | 69 | 43 |
| 8 | 95 | 140 | 110 | 99 | 134 | 184 | 284 | 222 | 175 | 120 | 64 | 43 |
| 9 | 100 | 140 | 110 | 99 | 134 | 170 | 274 | 222 | 175 | 120 | 64 | 43 |
| 10 | 106 | 134 | 110 | 99 | 134 | 170 | 256 | 214 | 186 | 113 | 64 | 43 |
| 11 | 111 | 134 | 110 | 99 | 134 | 170 | 247 | 214 | 175 | 113 | 64 | 43 |
| 12 | 106 | 134 | 110 | 99 | 134 | 170 | 147 | 230 | 175 | 106 | 59 | 46 |
| 13 | 100 | 134 | 104 | 99 | 140 | 177 | 256 | 247 | 175 | 99 | 59 | 46 |
| 14 | 100 | 140 | 99 | 99 | 140 | 184 | 265 | 265 | 175 | 92 | 59 | 50 |
| 15 | 95 | 154 | 94 | 99 | 139 | 184 | 265 | 230 | 175 | 92 | 59 | 50 |
| 16 | 95 | 147 | 89 | 94 | 134 | 184 | 256 | 238 | 164 | 92 | 54 | 50 |
| 17 | 95 | 140 | 88 | 93 | 134 | 192 | 256 | 238 | 164 | 92 | 54 | 50 |
| 18 | 100 | 140 | 89 | 94 | 131 | 199 | 247 | 238 | 154 | 92 | 54 | 46 |
| 19 | 136 | 134 | 89 | 94 | 134 | 199 | 247 | 230 | 145 | 86 | 54 | 46 |
| 20 | 150 | 127 | 89 | 94 | 134 | 192 | 247 | 210 | 145 | 80 | 50 | 43 |
| 21 | 200 | 121 | 89 | 99 | 134 | 192 | 256 | 210 | 128 | 80 | 50 | 43 |
| 22 | 192 | 121 | 89 | 106 | 134 | 192 | 256 | 210 | 120 | 80 | 50 | 43 |
| 23 | 184 | 121 | 94 | 104 | 134 | 199 | 265 | 210 | 120 | 74 | 50 | 43 |
| 24 | 184 | 127 | 94 | 99 | 134 | 206 | 274 | 236 | 120 | 74 | 50 | 43 |
| 25 | 184 | 121 | 99 | 99 | 134 | 214 | 284 | 248 | 120 | 69 | 50 | 43 |
| 26 | 184 | 121 | 99 | 99 | 134 | 222 | 265 | 260 | 120 | 69 | 50 | 43 |
| 27 | 169 | 121 | 99 | 104 | 140 | 222 | 256 | 248 | 120 | 69 | 46 | 43 |
| 28 | 154 | 115 | 99 | 110 | 147 | 214 | 247 | 236 | 120 | 69 | 46 | 43 |
| 29 | 154 | 121 | 99 | 115 | ..... | 214 | 238 | 236 | 113 | 74 | 43 | 43 |
| 30 | 154 | 121 | 99 | 115 | ..... | 230 | 230 | 223 | 105 | 80 | 43 | 43 |
| 31 | 147 | ..... | 99 | 115 | ..... | 256 | ..... | 236 | ..... | 80 | 43 | ..... |

NOTE.—Discharge determined as follows: Oct. 1–20, from a fairly well defined rating curve; Oct. 21–24 by indirect method for shifting control; Oct. 25 to Nov. 29, from a fairly well defined rating curve; Nov 30 to Mar. 5, estimated from discharge measurements, observer's notes, and records of temperature (stage discharge relation affected by ice); Mar. 6 to May 19, from a well-defined rating curve; May 20 to Sept. 30 from a well-defined rating curve.

*Monthly discharge of East Fork at Allen's ranch, near Lava, Oreg., for the year ending Sept. 30, 1915.*

| Month. | Discharge in second-feet. | | | Run-off (total in acre-feet). | Accuracy. |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | | |
| October | 200 | 95 | 129 | 7,930 | C. |
| November | 154 | 115 | 133 | 7,910 | B. |
| December | 110 | 88 | 101 | 6,210 | C. |
| January | 115 | 93 | 101 | 6,210 | B. |
| February | 147 | 114 | 131 | 7,280 | B. |
| March | 256 | 149 | 195 | 12,000 | B. |
| April | 303 | 230 | 263 | 15,600 | A. |
| May | 265 | 210 | 233 | 14,300 | A. |
| June | 248 | 106 | 163 | 9,700 | A. |
| July | 120 | 69 | 93.1 | 5,700 | A. |
| August | 80 | 43 | 57.9 | 3,560 | A. |
| September | 50 | 43 | 44.3 | 2,640 | B. |
| The year | 303 | 43 | 137 | 99,100 | |

## CRESCENT CREEK AT OUTLET OF CRESCENT LAKE, NEAR CRESCENT, OREG.

LOCATION.—In sec. 11, T. 24 S., R. 6 E., at lake outlet, about 16 miles from Crescent, Klamath County.

DRAINAGE AREA.—55 square miles.

RECORDS AVAILABLE.—January 11 to September 6, 1911; January 1, 1912, to July 31, 1915, when station was discontinued.

GAGE.—Vertical staff on left bank. Gage reader, David Lynes. During 1911 a vertical staff gage was maintained by the Hunter Land Co. No determined relation between datum of 1911 and that maintained from 1912 to 1915.

DISCHARGE MEASUREMENTS.—Made by wading near the gage.

CHANNEL AND CONTROL.—Gravel; not likely to shift; some drift logs jammed at gage section at lake.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 1.10 feet May 14 and June 5 to 26 (discharge, 61 second-feet). Records of minimum stage August to October are not available.

1911–1915: Maximum stage recorded, 1.70 feet June 9 and 13, 1912 (discharge, 181 second-feet); peak may have been higher, as gage was read only occasionally. A measurement made July 22, 1904, gave 195 second-feet, and the maximum that year was probably at least 250 or 300 second-feet.

WINTER FLOW.—Stage-discharge relation probably unaffected by ice.

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Results fair.

*Discharge measurements of Crescent Creek at outlet of Crescent Lake, near Crescent, Oreg., during the year ending Sept. 30, 1915.*

| Date. | Made by— | Gage height. | Discharge. |
|---|---|---|---|
| | | *Feet.* | *Sec.-ft.* |
| Feb. 26 | J. E. Stewart | 0.86 | 29.6 |
| July 26 | P. V. Hodges | .65 | 19.8 |

*Daily discharge, in second-feet, of Crescent Creek at outlet of Crescent Lake, near Crescent, Oreg., for the year ending Sept. 30, 1915.*

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | | | | | | | |
| 2 | 35 | | | | | | | | | |
| 3 | | | | 27 | | | | | | |
| 4 | | | | | | | | | | |
| 5 | | | 35 | | | 31 | | | 61 | |
| 6 | 35 | 41 | | | 27 | | | | | 47 |
| 7 | | | | | | | 29 | 41 | | |
| 8 | | | | | | | | | | |
| 9 | | | | | | | | | | |
| 10 | | | | 27 | | | | | | 35 |
| 11 | | 41 | | | | | | | | |
| 12 | | | | | 27 | | | | 61 | |
| 13 | | | | | | | | | | |
| 14 | 35 | | 31 | | | 31 | | 61 | | |
| 15 | | | | | | | 31 | | | |
| 16 | | | | | | | | | | 31 |
| 17 | | | | | | | | | | |
| 18 | | | | 27 | | | | | | |
| 19 | | 35 | | | 29 | | 35 | 58 | 61 | |
| 20 | | | | | | 31 | | | | |
| 21 | | | 31 | | | | | | | |
| 22 | | | | | | | | | | |
| 23 | 35 | | | 27 | | | | | | |
| 24 | | 35 | | | | | | | | |
| 25 | | | | | | | | 58 | | |
| 26 | | | | | 32 | | | | 61 | 20 |
| 27 | | | | | | | | | | |
| 28 | | 35 | | 27 | 31 | 31 | | | | |
| 29 | | | 31 | | | | | | | |
| 30 | 35 | | | | | | 35 | | | |
| 31 | | | | | | | | 57 | | |

NOTE.—Discharge determined from a fairly well-defined rating curve; given only for days on which gage was read.

*Monthly discharge of Crescent Creek at outlet of Crescent Lake, near Crescent, Oreg., for the year ending Sept. 30, 1915.*

| Month. | Mean discharge in second-feet. | Run-off (total in acre-feet). | Accuracy. | Month. | Mean discharge in second-feet. | Run-off (total in acre-feet). | Accuracy. |
|---|---|---|---|---|---|---|---|
| October | 35.0 | 2,150 | B. | April | 32.5 | 1,930 | B. |
| November | 37.4 | 2,230 | B. | May | 55.2 | 3,390 | B. |
| December | 32.0 | 1,970 | B. | June | 61.0 | 3,630 | B. |
| January | 27.0 | 1,660 | B. | July | 33.2 | 2,040 | B. |
| February | 29.2 | 1,620 | B. | | | | |
| March | 31.0 | 1,910 | B. | The period | | 22,500 | |

NOTE.—Monthly mean is average of determinations of discharge for days on which gage was read.

### ARNOLD CANAL NEAR BEND, OREG.

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

RECORDS AVAILABLE.—April 10, 1914, to September 30, 1915; information sufficient for a rough estimate, October, 1912, to March, 1914.

GAGE.—Vertical staff on side of flume. A gage one-half mile above, in the NE. ¼ sec. 27, was used up to April 30, 1915. O. C. Bowman and Joe Stenkamp, gage readers.

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

CHANNEL AND CONTROL.—Flume 12 feet wide; gradient fairly steep.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 2.20 feet August 11 to 14 (discharge, 112 second-feet). This is greatest flow ever diverted. Ditch dry at various times during year.

ACCURACY.—Results considered good.

Arnold Canal diverts water from the right bank of Deschutes River at the head of Lava Island, in the SW. ¼ sec. 27, T. 18 S., R. 11 E., and irrigates land south and east of Bend lying above the Central Oregon Irrigation Co.'s Carey Act segregation. There may be a slight leakage between the old and new stations. The latter is at the point where the canal turns away from the river.

*Discharge measurements of Arnold Canal near Bend, Oreg., during the year ending Sept. 30, 1915.*

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---|---|---|---|---|---|---|---|
| | | *Feet.* | *Sec.-ft.* | | | *Feet.* | *Sec.-ft.* |
| Jan. 30 | C. G. Paulsen | 1.46 | 45.4 | Sept. 29 | Henshaw and Batchelder | 2.05 | 88.7 |
| June 19 | F. F. Henshaw | 2.10 | 97.9 | 29 | do | a1.92 | 88.0 |
| Aug. 1 | P. V. Hodges | a2.15 | 111.0 | 1916. Feb. 21 | P. V. Hodges | 1.30 | 38.9 |

a Referred to new gage one-half mile below former gage.

*Daily discharge, in second-feet, of Arnold canal near Bend, Oreg., for the year ending Sept. 30, 1915.*

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 52 | 0 | 35 | 30 | 0 | 0 | 37 | 0 | 66 | 92 | 108 | 104 |
| 2 | 52 | 21 | 35 | 30 | 0 | 0 | 37 | 36 | 66 | 92 | 108 | 104 |
| 3 | 52 | 21 | 35 | 30 | 0 | 0 | 37 | 36 | 66 | 92 | 108 | 104 |
| 4 | 52 | 21 | 35 | 30 | 0 | 0 | 37 | 38 | 66 | 92 | 108 | 90 |
| 5 | 0 | 46 | 35 | 0 | 0 | 0 | 37 | 38 | 70 | 92 | 108 | 100 |
| 6 | 0 | 46 | 35 | 0 | 0 | 0 | 37 | 38 | 73 | 92 | 108 | 104 |
| 7 | 0 | 46 | 35 | 0 | 0 | 0 | 37 | 38 | 73 | 96 | 108 | 88 |
| 8 | 0 | 46 | 0 | 0 | 0 | 0 | 37 | 48 | 80 | 96 | 108 | 88 |
| 9 | 0 | 46 | 0 | 0 | 0 | 0 | 37 | 48 | 80 | 96 | 108 | 88 |
| 10 | 0 | 23 | 0 | 0 | 0 | 0 | 37 | 48 | 80 | 96 | 108 | 88 |
| 11 | 0 | 0 | 0 | 0 | 0 | 0 | 48 | 48 | 80 | 92 | 112 | 88 |
| 12 | 0 | 0 | 0 | 0 | 0 | 0 | 48 | 54 | 80 | 92 | 112 | 88 |
| 13 | 0 | 0 | 0 | 0 | 40 | 0 | 48 | 54 | 80 | 92 | 112 | 76 |
| 14 | 0 | 0 | 0 | 0 | 40 | 0 | 48 | 54 | 80 | 92 | 112 | 66 |
| 15 | 0 | 0 | 0 | 0 | 40 | 0 | 48 | 54 | 80 | 92 | 96 | 66 |
| 16 | 0 | 0 | 0 | 0 | 20 | 0 | 48 | 43 | 80 | 92 | 96 | 73 |
| 17 | 0 | 0 | 0 | 0 | 0 | 12 | 48 | 48 | 80 | 92 | 96 | 80 |
| 18 | 0 | 0 | 0 | 0 | 0 | 23 | 48 | 48 | 80 | 92 | 96 | 88 |
| 19 | 0 | 0 | 0 | 0 | 0 | 25 | 48 | 48 | 80 | 96 | 104 | 92 |
| 20 | 0 | 0 | 0 | 0 | 0 | 30 | 48 | 48 | 84 | 96 | 104 | 92 |
| 21 | 0 | 0 | 0 | 0 | 0 | 32 | 48 | 60 | 84 | 108 | 104 | 92 |
| 22 | 0 | 0 | 0 | 0 | 0 | 32 | 48 | 66 | 84 | 108 | 104 | 88 |
| 23 | 0 | 0 | 0 | 0 | 0 | 32 | 48 | 66 | 84 | 108 | 104 | 92 |
| 24 | 0 | 35 | 0 | 0 | 0 | 32 | 48 | 66 | 84 | 108 | 96 | 92 |
| 25 | 0 | 35 | 0 | 0 | 21 | 32 | 0 | 66 | 84 | 104 | 96 | 92 |
| 26 | 0 | 35 | 0 | 0 | 21 | 32 | 0 | 66 | 84 | 104 | 96 | 92 |
| 27 | 0 | 35 | 0 | 0 | 0 | 34 | 0 | 66 | 84 | 104 | 96 | 92 |
| 28 | 0 | 35 | 30 | 0 | 0 | 37 | 0 | 66 | 84 | 104 | 96 | 92 |
| 29 | 0 | 35 | 30 | 0 | 0 | 37 | 10 | 66 | 88 | 108 | 96 | 92 |
| 30 | 0 | 35 | 30 | 0 | ..... | 37 | 4 | 66 | 88 | 108 | 96 | 88 |
| 31 | 0 | ..... | 30 | 0 | ..... | 37 | ..... | 66 | ..... | 108 | 104 | ..... |

NOTE.—Discharge determined from rating curves as follows: Oct. 1 to Mar. 16, well defined; Mar. 17 to Apr. 30, fairly well defined; May 1 to Sept. 30, well defined.

*Monthly discharge of Arnold canal near Bend, Oreg., for the year ending Sept. 30, 1915.*

| Month. | Discharge in second-feet. | | | Run-off (total in acre-feet). | Accuracy. |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | | |
| October | 52 | 0 | 6.7 | 412 | B. |
| November | 46 | 0 | 18.7 | 1,110 | B. |
| December | 35 | 0 | 11.8 | 726 | B. |
| January | 30 | 0 | 3.9 | 240 | B. |
| February | 40 | 0 | 6.5 | 361 | B. |
| March | 37 | 0 | 15.0 | 922 | B. |
| April | 48 | 0 | 35.2 | 2,090 | B. |
| May | 66 | 0 | 51.2 | 3,150 | B. |
| June | 88 | 66 | 79.1 | 4,710 | A. |
| July | 108 | 92 | 97.9 | 6,020 | A. |
| August | 112 | 96 | 103 | 6,330 | A. |
| September | 104 | 66 | 89.3 | 5,310 | A. |
| The year | 112 | 0 | 43.4 | 31,400 | |

### CENTRAL OREGON CANAL NEAR BEND, OREG.

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

RECORDS AVAILABLE.—May 11, 1905, to September 30, 1915.

GAGE.—Vertical enameled staff nailed to inside of flume on right side. Gage reader, N. P. Vinyard.

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 not to change.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 3.5 feet July 5 to 29, August 1 to 14, 16 to 30, September 1 to 7 (discharge, 341 second-feet). This is the greatest amount ever diverted, but was equaled August 18, 1914. Canal dry at various times.

WINTER FLOW.—Canal operated in winter, but only during periods of moderate cold, for furnishing water for domestic use. The fall through the section at the gage is sufficient to maintain open channel at all times.

ACCURACY.—Results considered good.

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

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

*Discharge measurements of Central Oregon canal near Bend, Oreg., during the year ending Sept. 30, 1915.*

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---|---|---|---|---|---|---|---|
| | | *Feet.* | *Sec.-ft.* | | | *Feet.* | *Sec.-ft.* |
| Apr. 22 | F. F. Henshaw | 2.82 | 266 | Aug. 1 | P. V. Hodges | 3.50 | 341 |
| June 19 | do | 3.37 | 314 | Sept. 29 | Henshaw and Batchelder | 2.98 | 266 |
| 20 | do | 3.38 | 309 | | | | |

*Daily discharge, in second-feet, of Central Oregon canal near Bend, Oreg., for the year ending Sept. 30, 1915.*

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 272 | 272 | 327 | 341 | 341 |
| 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 246 | 285 | 272 | 341 | 341 |
| 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 259 | 285 | 327 | 341 | 341 |
| 4 | 0 | 0 | 170 | 0 | 0 | 0 | 0 | 272 | 285 | 327 | 341 | 341 |
| 5 | 0 | 0 | 170 | 0 | 0 | 0 | 0 | 272 | 299 | 341 | 341 | 341 |
| 6 | 0 | 0 | 85 | 0 | 0 | 0 | 0 | 272 | 313 | 341 | 341 | 341 |
| 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 272 | 327 | 341 | 341 | 341 |
| 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 285 | 327 | 341 | 341 | 327 |
| 9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 299 | 327 | 341 | 341 | 327 |
| 10 | 100 | 170 | 0 | 0 | 0 | 0 | 37 | 299 | 327 | 341 | 341 | 327 |
| 11 | 200 | 170 | 0 | 0 | 0 | 11 | 118 | 299 | 327 | 327 | 341 | 327 |
| 12 | 100 | 85 | 0 | 0 | 0 | 22 | 152 | 299 | 327 | 327 | 341 | 299 |
| 13 | 0 | 0 | 0 | 0 | 0 | 27 | 158 | 313 | 327 | 327 | 341 | 299 |
| 14 | 0 | 0 | 0 | 0 | 0 | 32 | 158 | 299 | 327 | 327 | 341 | 299 |
| 15 | 0 | 0 | 0 | 0 | 0 | 0 | 158 | 299 | 134 | 327 | 327 | 299 |
| 16 | 0 | 0 | 0 | 0 | 0 | 0 | 158 | 299 | 313 | 341 | 341 | 299 |
| 17 | 0 | 0 | 0 | 0 | 0 | 49 | 158 | 272 | 327 | 341 | 341 | 285 |
| 18 | 0 | 0 | 0 | 0 | 67 | 49 | 182 | 220 | 327 | 341 | 341 | 272 |
| 19 | 0 | 0 | 0 | 0 | 134 | 123 | 194 | 220 | 327 | 341 | 341 | 272 |
| 20 | 0 | 0 | 0 | 0 | 0 | 123 | 220 | 246 | 327 | 341 | 341 | 272 |
| 21 | 0 | 0 | 0 | 0 | 134 | 146 | 246 | 246 | 327 | 341 | 341 | 272 |
| 22 | 0 | 0 | 0 | 0 | 134 | 73 | 246 | 246 | 327 | 341 | 341 | 272 |
| 23 | 0 | 0 | 0 | 0 | 134 | 0 | 246 | 246 | 327 | 341 | 341 | 272 |
| 24 | 0 | 0 | 0 | 0 | 25 | 0 | 246 | 246 | 327 | 341 | 341 | 272 |
| 25 | 188 | 0 | 0 | 0 | 12 | 0 | 233 | 246 | 327 | 341 | 341 | 272 |
| 26 | 188 | 0 | 0 | 76 | 12 | 0 | 233 | 246 | 327 | 341 | 341 | 272 |
| 27 | 188 | 0 | 0 | 152 | 6 | 0 | 233 | 246 | 327 | 341 | 341 | 272 |
| 28 | 94 | 0 | 170 | 76 | 0 | 0 | 246 | 246 | 327 | 341 | 341 | 272 |
| 29 | 0 | 0 | 134 | 0 | ..... | 0 | 272 | 259 | 327 | 341 | 341 | 272 |
| 30 | 0 | 0 | 51 | 0 | ..... | 0 | 272 | 272 | 341 | 327 | 341 | 272 |
| 31 | 0 | ..... | 0 | 0 | ..... | 0 | ..... | 272 | ..... | 313 | 327 | ..... |

NOTE.—Discharge determined from a well-defined rating curve.

*Monthly discharge of Central Oregon canal near Bend, Oreg., for the year ending Sept. 30, 1915.*

| Month. | Discharge in second-feet. | | | Run-off (total in acre-feet). | Accuracy. |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | | |
| October | 200 | 0 | 34.1 | 2,100 | D. |
| November | 170 | 0 | 14.2 | 845 | D. |
| December | 170 | 0 | 25.2 | 1,550 | D. |
| January | 152 | 0 | 9.8 | 603 | D. |
| February | 134 | 0 | 23.5 | 1,310 | C. |
| March | 146 | 0 | 21.1 | 1,300 | C. |
| April | 272 | 0 | 139 | 8,270 | B. |
| May | 313 | 220 | 267 | 16,400 | B. |
| June | 341 | 134 | 313 | 18,600 | A. |
| July | 341 | 272 | 334 | 20,500 | A. |
| August | 341 | 327 | 340 | 20,900 | A. |
| September | 341 | 272 | 300 | 17,900 | A. |
| The year | 341 | 0 | 152 | 110,000 | |

### PILOT BUTTE CANAL NEAR BEND, OREG.

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

RECORDS AVAILABLE.—March 6, 1905, to September 30, 1915.

GAGE.—Vertical staff on right bank. Gage reader, N. P. Vinyard.

DISCHARGE MEASUREMENTS.—Made by wading at the gage or from a highway bridge half a mile below the gage.

CHANNEL AND CONTROL.—Channel, gravel and sand; control partly solid rock; practically permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 1.95 feet July 15 to 29 and August 6 to September 11 (discharge, 56 second-feet); canal dry at various times.

1905–1915: Maximum stage recorded, 3.10 feet June 8, 11 to 16, July 19 to 21, 1913 (discharge, 244 second-feet).

WINTER FLOW.—Canal operated intermittently during ice season to provide water for stock and domestic use. Stage-discharge relation not affected by ice.

ACCURACY.—Results good.

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

*Discharge measurements of Pilot Butte canal near Bend, Oreg., during the year ending Sept. 30, 1915.*

| Date. | Made by— | Gage height. | Discharge. |
|---|---|---|---|
| | | *Feet.* | *Sec.-ft.* |
| June 19 | F. F. Henshaw | 1.87 | 48.8 |
| Sept. 29 | Henshaw and Batchelder | 1.71 | 35.2 |

*Daily discharge, in second-feet, of Pilot Butte canal near Bend, Oreg., for the year ending Sept. 30, 1915.*

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 | 0 | 0 | 27 | 0 | 0 | 0 | 27 | 34 | 51 | 42 | 56 |
| 2 | 0 | 0 | 0 | 14 | 0 | 0 | 0 | 27 | 34 | 44 | 42 | 56 |
| 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 27 | 34 | 51 | 42 | 56 |
| 4 | 0 | 0 | 0 | 0 | 0 | 27 | 0 | 27 | 34 | 51 | 42 | 56 |
| 5 | 0 | 0 | 0 | 0 | 0 | 27 | 0 | 27 | 38 | 51 | 49 | 56 |
| 6 | 0 | 0 | 0 | 0 | 0 | 27 | 0 | 34 | 46 | 51 | 56 | 56 |
| 7 | 8 | 0 | 0 | 0 | 0 | 14 | 0 | 34 | 46 | 51 | 56 | 56 |
| 8 | 16 | 0 | 0 | 0 | 0 | 0 | 0 | 34 | 46 | 44 | 56 | 56 |
| 9 | 16 | 0 | 0 | 0 | 0 | 0 | 0 | 34 | 46 | 38 | 56 | 56 |
| 10 | 8 | 16 | 0 | 0 | 0 | 0 | 4 | 34 | 46 | 38 | 56 | 56 |
| 11 | 8 | 16 | 0 | 0 | 0 | 0 | 15 | 34 | 42 | 38 | 56 | 56 |
| 12 | 0 | 8 | 0 | 0 | 0 | 0 | 24 | 34 | 49 | 38 | 56 | 51 |
| 13 | 0 | 0 | 0 | 0 | 0 | 0 | 24 | 34 | 51 | 36 | 56 | 51 |
| 14 | 0 | 0 | 0 | 0 | 0 | 0 | 12 | 34 | 51 | 40 | 56 | 51 |
| 15 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 34 | 44 | 56 | 56 | 51 |
| 16 | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 34 | 49 | 56 | 56 | 51 |
| 17 | 0 | 0 | 0 | 0 | 0 | 0 | 24 | 34 | 51 | 56 | 56 | 42 |
| 18 | 0 | 0 | 0 | 0 | 14 | 0 | 27 | 30 | 51 | 56 | 56 | 34 |
| 19 | 0 | 0 | 0 | 0 | 27 | 0 | 27 | 28 | 51 | 56 | 56 | 34 |
| 20 | 0 | 0 | 0 | 0 | 27 | 10 | 27 | 30 | 51 | 56 | 56 | 34 |
| 21 | 0 | 0 | 0 | 0 | 14 | 24 | 27 | 30 | 51 | 56 | 56 | 34 |
| 22 | 0 | 0 | 0 | 0 | 0 | 12 | 27 | 33 | 51 | 56 | 56 | 34 |
| 23 | 0 | 0 | 0 | 0 | 0 | 0 | 27 | 34 | 51 | 56 | 56 | 34 |
| 24 | 0 | 0 | 0 | 0 | 0 | 0 | 27 | 34 | 51 | 56 | 56 | 34 |
| 25 | 21 | 0 | 0 | 0 | 0 | 0 | 27 | 34 | 51 | 56 | 56 | 34 |
| 26 | 21 | 0 | 0 | 14 | 0 | 0 | 27 | 30 | 51 | 56 | 56 | 34 |
| 27 | 21 | 27 | 0 | 27 | 0 | 0 | 27 | 34 | 51 | 56 | 56 | 34 |
| 28 | 10 | 14 | 0 | 14 | 0 | 0 | 27 | 34 | 51 | 56 | 56 | 34 |
| 29 | 0 | 36 | 0 | 0 | ..... | 0 | 27 | 33 | 51 | 56 | 56 | 34 |
| 30 | 0 | 0 | 0 | 0 | ..... | 0 | 27 | 34 | 51 | 46 | 56 | 34 |
| 31 | 0 | ..... | 27 | 0 | ..... | 0 | ..... | 34 | ..... | 42 | 56 | ..... |

NOTE.—Discharge determined from a rating curve well defined between 15 and 60 second-feet.

*Monthly discharge of Pilot Butte canal near Bend, Oreg., for the year ending Sept. 30, 1915.*

| Month. | Discharge in second-feet. | | | Run-off (total in acre-feet). | Accuracy. |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | | |
| October | 21 | 0 | 4.2 | 258 | D. |
| November | 36 | 0 | 3.9 | 232 | D. |
| December | 27 | 0 | 0.9 | 55 | D. |
| January | 27 | 0 | 3.1 | 191 | D. |
| February | 27 | 0 | 2.9 | 161 | D. |
| March | 27 | 0 | 4.5 | 277 | D. |
| April | 27 | 0 | 15.4 | 916 | B. |
| May | 34 | 27 | 32.1 | 1,970 | A. |
| June | 51 | 34 | 46.8 | 2,780 | A. |
| July | 56 | 36 | 50.0 | 3,070 | A. |
| August | 56 | 42 | 54.0 | 3,320 | A. |
| September | 56 | 34 | 45.2 | 2,690 | A. |
| The year | 56 | 0 | 22.0 | 15,900 | |

### NORTH CANAL NEAR BEND, OREG.

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

RECORDS AVAILABLE.—June 14, 1913, to September 30, 1915.

GAGE.—Painted on left side of concrete lining of flume. Gage reader, C. Orewiler.

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 may affect stage-discharge relation.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 5.95 feet July 24 to 29 (discharge, 300 second-feet). Canal dry at various times.

1913–1915: Maximum discharge recorded, 304 second-feet (gage height, 5.85 feet) August 7 to 18, 1914.

WINTER FLOW.—Only a small quantity of water diverted in winter for stock; stage-discharge relation not affected by ice.

ACCURACY.—Results considered good.

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

*Discharge measurements of North canal near Bend, Oreg., during the year ending Sept. 30, 1915.*

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---|---|---|---|---|---|---|---|
| | | *Feet.* | *Sec.-ft.* | | | *Feet.* | *Sec.-ft.* |
| Apr. 18 | F. F. Henshaw | 3.88 | 153 | Sept. 30 | Henshaw and Batchelder | 5.20 | 237 |
| 22 | do | 4.56 | 201 | | | | |
| June 17 | do | 5.81 | 303 | 30 | do | 3.10 | 106 |
| 20 | do | 5.89 | 294 | 30 | do | 1.20 | 28.6 |

*Daily discharge, in second-feet, of North canal near Bend, Oreg., for the year ending Sept. 30, 1915.*

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 168 | 118 | 0 | 68 | 0 | | 0 | 245 | 245 | 296 | 296 | 296 |
| 2 | 182 | 118 | 0 | 0 | 0 | 0 | 0 | 224 | 259 | 296 | 296 | 296 |
| 3 | 182 | 148 | 0 | 0 | 0 | 51 | 0 | 259 | 259 | 296 | 296 | 296 |
| 4 | 175 | 148 | 54 | 0 | 0 | 102 | 0 | 252 | 266 | 296 | 296 | 296 |
| 5 | 175 | 130 | 107 | 0 | 0 | 102 | 0 | 245 | 273 | 296 | 296 | 296 |
| 6 | 175 | 130 | 54 | 0 | 0 | 0 | 0 | 245 | 288 | 296 | 296 | 296 |
| 7 | 175 | 130 | 0 | 0 | 0 | 0 | 0 | 245 | 288 | 296 | 296 | 296 |
| 8 | 175 | 130 | 0 | 0 | 0 | 0 | 0 | 245 | 288 | 296 | 296 | 288 |
| 9 | 175 | 130 | 0 | 0 | 0 | 0 | 0 | 245 | 288 | 296 | 296 | 273 |
| 10 | 175 | 130 | 0 | 0 | 0 | 0 | 0 | 245 | 288 | 296 | 296 | 273 |
| 11 | 175 | 130 | 0 | 0 | 0 | 0 | 92 | 245 | 288 | 296 | 296 | 238 |
| 12 | 175 | 130 | 0 | 0 | 0 | 0 | 102 | 259 | 288 | 296 | 296 | 238 |
| 13 | 175 | 130 | 0 | 0 | 0 | 0 | 102 | 259 | 288 | 296 | 296 | 238 |
| 14 | 175 | 130 | 0 | 0 | 0 | 0 | 112 | 259 | 288 | 296 | 296 | 231 |
| 15 | 175 | 130 | 0 | 0 | 17 | 0 | 142 | 259 | 288 | 296 | 296 | 224 |
| 16 | 175 | 130 | 0 | 0 | 16 | 0 | 142 | 259 | 288 | 296 | 296 | 224 |
| 17 | 175 | 130 | 0 | 0 | 16 | 0 | 154 | 119 | 288 | 296 | 296 | 217 |
| 18 | 175 | 130 | 0 | 0 | 30 | 0 | 154 | 245 | 288 | 296 | 296 | 217 |
| 19 | 175 | 0 | 16 | 12 | 64 | 0 | 154 | 252 | 296 | 296 | 296 | 217 |
| 20 | 175 | 0 | 16 | 0 | 72 | 0 | 161 | 252 | 296 | 296 | 296 | 217 |
| 21 | 175 | 0 | 0 | 0 | 82 | 0 | 189 | 252 | 296 | 296 | 296 | 231 |
| 22 | 175 | 0 | 0 | 0 | 102 | 59 | 203 | 252 | 296 | 296 | 296 | 231 |
| 23 | 77 | 0 | 0 | 0 | 0 | 112 | 203 | 252 | 296 | 296 | 296 | 245 |
| 24 | 77 | 0 | 0 | 0 | 0 | 130 | 203 | 252 | 296 | 304 | 296 | 245 |
| 25 | 77 | 0 | 0 | 0 | 0 | 130 | 203 | 252 | 296 | 304 | 296 | 245 |
| 26 | 82 | 0 | 0 | 30 | 0 | 0 | 203 | 126 | 296 | 304 | 296 | 245 |
| 27 | 82 | 0 | 0 | 60 | 0 | 0 | 203 | 116 | 296 | 304 | 296 | 245 |
| 28 | 82 | 0 | 0 | 60 | 0 | 0 | 217 | 231 | 296 | 304 | 296 | 245 |
| 29 | 82 | 0 | 0 | 0 | 0 | 0 | 217 | 231 | 296 | 304 | 296 | 245 |
| 30 | 82 | 0 | 28 | 0 | ..... | 0 | 238 | 231 | 296 | 288 | 296 | 245 |
| 31 | 82 | ..... | 64 | 0 | ..... | 0 | ..... | 238 | ..... | 280 | 296 | ..... |

NOTE.—Discharge determined from a well-defined rating curve.

*Monthly discharge of North canal near Bend, Oreg., for the year ending Sept. 30, 1915.*

| Month. | Discharge in second-feet. | | | Run-off (total in acre-feet). | Accuracy. |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | | |
| October | 182 | 77 | 148 | 9,100 | A. |
| November | 148 | 0 | 78.4 | 4,670 | B. |
| December | 107 | 0 | 10.9 | 670 | D. |
| January | 68 | 0 | 7.4 | 455 | D. |
| February | 102 | 0 | 14.2 | 789 | D. |
| March | 130 | 0 | 22.1 | 1,360 | D. |
| April | 238 | 0 | 113 | 6,720 | B. |
| May | 259 | 116 | 235 | 14,400 | A. |
| June | 296 | 245 | 287 | 17,100 | A. |
| July | 304 | 280 | 297 | 18,300 | A. |
| August | 296 | 296 | 296 | 18,200 | A. |
| September | 296 | 217 | 253 | 15,100 | A. |
| The year | 304 | 0 | 147 | 107,000 | |

### SWALLEY CANAL NEAR BEND, OREG.

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

RECORDS AVAILABLE.—June 1, 1913, to September 30, 1915.

GAGE.—Vertical staff on right bank at lower end of intake flume. Gage reader, Charles Orewiler.

DISCHARGE MEASUREMENTS.—Made from plank laid across flume.

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

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 2.1 feet August 27 to 30 and September 2 to 4 (discharge, 87 second-feet). This is probably the maximum quantity ever diverted. Canal dry at various times.

ACCURACY.—Results considered good.

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

*Discharge measurements of Swalley canal near Bend, Oreg., during the year ending Sept. 30, 1915.*

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---|---|---|---|---|---|---|---|
| | | *Feet.* | *Sec.-ft.* | | | *Feet.* | *Sec.-ft.* |
| Nov. 24 | C. G. Paulsen | 1.12 | 28.6 | June 20 | F. F. Henshaw | 1.92 | 75.5 |
| 28 | do | .79 | 13.8 | Sept. 30 | C. L. Batchelder | 1.80 | 65.6 |
| Apr. 18 | F. F. Henshaw | 1.44 | 44.3 | | | | |

*Daily discharge, in second-feet, of Swalley canal near Bend, Oreg., for the year ending Sept. 30, 1915.*

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 43 | 38 | 14 | 6 | 5 | 23 | 28 | 43 | 57 | 80 | 18 | 66 |
| 2 | 38 | 38 | 14 | 19 | 5 | 2 | 28 | 38 | 57 | 80 | 46 | 87 |
| 3 | 38 | 38 | 14 | 28 | 5 | 2 | 28 | 38 | 57 | 80 | 80 | 87 |
| 4 | 38 | 38 | 14 | 28 | 5 | 2 | 28 | 38 | 57 | 80 | 80 | 87 |
| 5 | 38 | 38 | 14 | 28 | 5 | 2 | 28 | 38 | 57 | 80 | 80 | 80 |
| 6 | 38 | 38 | 14 | 28 | 5 | 12 | 28 | 38 | 60 | 80 | 80 | 80 |
| 7 | 38 | 38 | 14 | 28 | 5 | 33 | 28 | 38 | 60 | 80 | 80 | 80 |
| 8 | 38 | 38 | 14 | 28 | 5 | 38 | 28 | 38 | 60 | 80 | 80 | 73 |
| 9 | 38 | 38 | 14 | 28 | 5 | 38 | 28 | 38 | 60 | 80 | 80 | 73 |
| 10 | 38 | 38 | 14 | 28 | 5 | 38 | 28 | 0 | 63 | 80 | 40 | 73 |
| 11 | 38 | 38 | 14 | 23 | 5 | 38 | 28 | 57 | 66 | 80 | 0 | 73 |
| 12 | 38 | 38 | 14 | 18 | 5 | 38 | 28 | 57 | 66 | 40 | 23 | 73 |
| 13 | 38 | 38 | 14 | 18 | 5 | 38 | 28 | 57 | 66 | 12 | 80 | 73 |
| 14 | 38 | 38 | 2 | 18 | 5 | 38 | 28 | 57 | 66 | 48 | 73 | 73 |
| 15 | 38 | 38 | 2 | 18 | 5 | 28 | 28 | 57 | 66 | 80 | 73 | 73 |
| 16 | 38 | 38 | 2 | 18 | 18 | 28 | 28 | 57 | 66 | 76 | 46 | 73 |
| 17 | 38 | 38 | 2 | 18 | 18 | 23 | 45 | 48 | 66 | 80 | 23 | 73 |
| 18 | 38 | 38 | 2 | 23 | 18 | 18 | 45 | 54 | 66 | 80 | 73 | 73 |
| 19 | 38 | 38 | 0 | 23 | 18 | 28 | 43 | 63 | 80 | 80 | 73 | 73 |
| 20 | 38 | 38 | 0 | 23 | 18 | 28 | 43 | 60 | 80 | 80 | 73 | 73 |
| 21 | 38 | 38 | 0 | 23 | 20 | 28 | 43 | 57 | 80 | 80 | 0 | 73 |
| 22 | 38 | 38 | 0 | 23 | 23 | 23 | 43 | 57 | 80 | 80 | 73 | 73 |
| 23 | 38 | 38 | 0 | 23 | 23 | 23 | 43 | 57 | 80 | 80 | 73 | 73 |
| 24 | 38 | 38 | 0 | 23 | 23 | 28 | 43 | 57 | 80 | 80 | 73 | 73 |
| 25 | 38 | 38 | 0 | 23 | 23 | 28 | 43 | 57 | 80 | 80 | 73 | 73 |
| 26 | 38 | 38 | 0 | 23 | 23 | 28 | 43 | 57 | 80 | 80 | 73 | 73 |
| 27 | 38 | 38 | 0 | 23 | 23 | 28 | 43 | 57 | 80 | 80 | 87 | 73 |
| 28 | 38 | 38 | 0 | 23 | 23 | 0 | 43 | 57 | 80 | 0 | 87 | 73 |
| 29 | 38 | 38 | 0 | 23 | ..... | 0 | 43 | 57 | 80 | 80 | 87 | 73 |
| 30 | 38 | 14 | 0 | 23 | ..... | 0 | 43 | 57 | 80 | 40 | 87 | 73 |
| 31 | 38 | ..... | 6 | 5 | ..... | 0 | ..... | 57 | ..... | 0 | 66 | ..... |

NOTE.—Discharge determined from a well-defined rating curve.

*Monthly discharge of Swalley canal near Bend, Oreg., for the year ending Sept. 30, 1915.*

| Month. | Discharge in second-feet. | | | Run-off (total in acre-feet). | Accuracy. |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean | | |
| October | 43 | 38 | 38.2 | 2,350 | A. |
| November | 38 | 14 | 37.2 | 2,210 | A. |
| December | 14 | 0 | 6.4 | 394 | B. |
| January | 28 | 5 | 22.1 | 1,360 | A. |
| February | 23 | 5 | 12.4 | 689 | B. |
| March | 38 | 0 | 22.0 | 1,350 | A. |
| April | 45 | 28 | 35.1 | 2,090 | A. |
| May | 63 | 0 | 49.7 | 3,060 | A. |
| June | 80 | 57 | 69.2 | 4,120 | A. |
| July | 80 | 0 | 68.9 | 4,240 | A. |
| August | 87 | 0 | 63.9 | 3,930 | A. |
| September | 87 | 66 | 74.9 | 4,460 | A. |
| The year | 87 | 0 | 41.8 | 30,300 | |

### TUMALO CREEK NEAR BEND, OREG.

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

DRAINAGE AREA.—57 square miles.

RECORDS AVAILABLE.—October 6, 1906, to September 30, 1915 (fragmentary). Until May, 1914, this station was maintained in winter months only to insure a year-long record on the stream. The upper station is somewhat isolated and sometimes inaccessible in winter.

GAGE.—Since April 27, 1915, Stevens continuous water-stage recorder referred to vertical staff nailed to overhanging stump. Staff gage read November, 1910, to April 26, 1915. J. C. Stiles, gage reader. Previous records at different site.

DISCHARGE MEASUREMENTS.—At ordinary stages, made by wading near the gage; at flood stages, from a large tree fallen across stream about 200 yards blow gage.

CHANNEL AND CONTROL.—Rocks and gravel; not likely to shift greatly.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 2.11 feet at midnight June 7 (discharge, 221 second-feet; total, including diversions, 223 second-feet). Minimum stage recorded, 1.17 feet at 6 p. m. September 18 (discharge, 41 second-feet; total, including diversions, 44 second-feet).

1906–1915: Maximum stage recorded, 3.8 feet at old gage November 14, 1906 (discharge, estimated from extension of rating curve, 820 second-feet). The peak of the flood of November, 1909, was probably considerably greater. Minimum stage was that of 1915.

WINTER FLOW.—Stage-discharge relation considerably affected by ice during extremely cold weather.

DIVERSIONS.—Wimer and Columbia Southern canals and Anderson ditch divert water above the station. Wimer canal was measured June 18, at which time it carried 12.5 second-feet and Anderson ditch 4.6 second-feet. From information furnished by engineers of the Tumalo project, an estimate of the monthly mean discharge of the two canals has been prepared (p. 61). Water was turned into Columbia Southern canal September 24 and turned out October 14, 1914, when the discharge of the creek increased about 18 second-feet; the mean for period October 1 to 14 has been estimated as 12 second-feet.

ACCURACY.—Results good.

*Discharge measurements of Tumalo Creek near Bend, Oreg., during the year ending Sept. 30, 1915.*

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---|---|---|---|---|---|---|---|
| | | *Feet.* | *Sec.-ft.* | | | *Feet.* | *Sec.-ft.* |
| Nov. 25 | C. G. Paulsen | 1.36 | 70.4 | June 18 | F. F. Henshaw | 1.60 | 110 |
| Jan. 29 | do | a 3.65 | 68.5 | Sept. 9 | Dubuis and Wallace | 1.20 | 45.5 |
| Apr. 22 | F. F. Henshaw | 1.66 | 132 | | | | |

a Stage-discharge relation affected by ice.

*Daily discharge, in second-feet, of Tumalo Creek near Bend, Oreg., for the year ending Sept. 30, 1915.*

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 62 | 103 | 78 | 62 | 70 | 68 | 103 | 121 | 161 | 110 | 61 | 50 |
| 2 | 72 | 130 | 80 | 65 | 76 | 68 | 112 | 121 | 150 | 110 | 62 | 50 |
| 3 | 64 | 121 | 78 | 65 | 70 | 68 | 112 | 112 | 140 | 100 | 64 | 50 |
| 4 | 62 | 103 | 75 | 65 | 70 | 70 | 103 | 103 | 150 | 100 | 61 | 48 |
| 5 | 62 | 92 | 78 | 68 | 72 | 65 | 94 | 103 | 161 | 91 | 61 | 48 |
| 6 | 65 | 84 | 78 | 70 | 72 | 64 | 94 | 112 | 172 | 100 | 62 | 51 |
| 7 | 65 | 78 | 78 | 68 | 68 | 62 | 94 | 112 | 194 | 91 | 62 | 48 |
| 8 | 64 | 81 | 76 | 65 | 70 | 62 | 94 | 121 | 172 | 100 | 61 | 50 |
| 9 | 65 | 78 | 75 | 65 | 68 | 56 | 86 | 140 | 150 | 100 | 60 | 47 |
| 10 | 62 | 78 | 75 | 65 | 67 | 59 | 94 | 140 | 130 | 82 | 60 | 47 |
| 11 | 64 | 80 | 75 | 65 | 67 | 64 | 112 | 130 | 110 | 73 | 58 | 47 |
| 12 | 62 | 84 | 75 | 67 | 67 | 65 | 121 | 130 | 100 | 78 | 58 | 47 |
| 13 | 64 | 78 | 74 | 72 | 67 | 67 | 112 | 130 | 110 | 77 | 55 | 47 |
| 14 | 72 | 78 | 74 | 65 | 67 | 65 | 103 | 121 | 120 | 68 | 52 | 48 |
| 15 | 78 | 76 | 73 | 65 | 67 | 65 | 103 | 112 | 120 | 66 | 54 | 47 |
| 16 | 78 | 78 | 73 | 64 | 68 | 62 | 112 | 112 | 120 | 68 | 54 | 48 |
| 17 | 80 | 78 | 72 | 64 | 72 | 62 | 121 | 121 | 130 | 70 | 55 | 44 |
| 18 | 81 | 78 | 72 | 65 | 75 | 62 | 130 | 130 | 120 | 66 | 52 | 44 |
| 19 | 81 | 78 | 71 | 65 | 72 | 59 | 140 | 121 | 110 | 64 | 52 | 44 |
| 20 | 81 | 78 | 70 | 62 | 73 | 61 | 150 | 112 | 100 | 68 | 51 | 44 |
| 21 | 81 | 78 | 69 | 65 | 70 | 62 | 140 | 112 | 110 | 68 | 51 | 44 |
| 22 | 78 | 78 | 68 | 64 | 68 | 68 | 130 | 112 | 110 | 72 | 51 | 44 |
| 23 | 78 | 78 | 67 | 63 | 68 | 68 | 121 | 121 | 130 | 66 | 50 | 44 |
| 24 | 76 | 75 | 66 | 63 | 72 | 76 | 112 | 121 | 120 | 66 | 50 | 44 |
| 25 | 75 | 73 | 65 | 63 | 72 | 81 | 121 | 112 | 100 | 66 | 50 | 44 |
| 26 | 75 | 75 | 65 | 63 | 70 | 76 | 121 | 121 | 91 | 64 | 50 | 45 |
| 27 | 78 | 78 | 64 | 63 | 70 | 75 | 130 | 140 | 91 | 62 | 51 | 45 |
| 28 | 78 | 78 | 64 | 63 | 68 | 84 | 140 | 161 | 91 | 62 | 50 | 47 |
| 29 | 78 | 78 | 63 | 63 | ..... | 91 | 150 | 161 | 100 | 66 | 51 | 45 |
| 30 | 89 | 78 | 63 | 63 | ..... | 81 | 130 | 150 | 100 | 66 | 51 | 45 |
| 31 | 94 | ..... | 62 | 62 | ..... | 78 | ..... | 161 | ..... | 64 | 51 | ..... |

NOTE.—Discharge determined from well-defined rating curves applicable October 1 to May 31 and June 1 to September 30. Discharge interpolated, on account of ice, December 12–3 and January 23–30.

*Monthly discharge of Tumalo Creek near Bend Oreg., for the year ending Sept. 30, 1915.*

| Month. | Discharge in second-feet. | | | Run-off (total in acre-feet). | Accuracy. |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | | |
| October | 94 | 62 | 73.0 | 4,490 | A. |
| November | 130 | 73 | 83.4 | 4,960 | A. |
| December | 80 | 62 | 71.5 | 4,400 | B. |
| January | 72 | 62 | 64.7 | 3,980 | B. |
| February | 76 | 67 | 69.9 | 3,880 | A. |
| March | 91 | 56 | 68.2 | 4,190 | A. |
| April | 150 | 86 | 116 | 6,900 | A. |
| May | 161 | 103 | 125 | 7,690 | A. |
| June | 194 | 91 | 125 | 7,440 | A. |
| July | 110 | 62 | 77.5 | 4,770 | A. |
| August | 64 | 50 | 55.2 | 3,390 | A. |
| September | 50 | 44 | 46.5 | 2,770 | A. |
| The year | 194 | 44 | 81.4 | 58,900 | |

*Combined monthly discharge of Tumalo Creek, Wimer canal, Columbia Southern canal, and Anderson ditch, for the year ending Sept. 30, 1915.*

| Month. | Discharge in second-feet. | | | | | | Run-off, total in acre-feet. | Accuracy. |
|---|---|---|---|---|---|---|---|---|
| | Tumalo Creek. | | | Mean, Wimer ditch. | Mean, Anderson ditch. | Total. | | |
| | Maximum. | Minimum. | Mean. | | | | | |
| October | 94 | 62 | 73.0 | [a] 5.4 | ..... | 78.4 | 4,820 | A. |
| November | 130 | 73 | 83.4 | ..... | ..... | 83.5 | 4,960 | A. |
| December | 80 | 62 | 71.5 | ..... | ..... | 71.5 | 4,400 | B. |
| January | 72 | 62 | 64.7 | ..... | ..... | 64.7 | 3,980 | B. |
| February | 76 | 67 | 69.9 | ..... | ..... | 69.9 | 3,880 | A. |
| March | 91 | 56 | 68.2 | ..... | ..... | 68.2 | 4,190 | A. |
| April | 150 | 86 | 116 | ..... | 2.0 | 118 | 7,020 | A. |
| May | 161 | 103 | 125 | ..... | 4.0 | 129 | 7,930 | A. |
| June | 194 | 91 | 125 | 5.0 | 5.0 | 135 | 8,030 | B. |
| July | 110 | 64 | 77.5 | ..... | 3.0 | 80.5 | 4,950 | A. |
| August | 64 | 50 | 55.2 | ..... | 3.0 | 58.2 | 3,580 | A. |
| September | 50 | 44 | 46.5 | ..... | 2.5 | 49.0 | 2,920 | A. |
| The year | 194 | 44 | 81.4 | ..... | ..... | 83.3 | 60,600 | |

[a] Columbia Southern canal.

### TUMALO FEED CANAL NEAR BEND, OREG.

LOCATION.—In the SE. ¼ sec. 23, T. 17 S., R. 11 E., in concrete-lined section about 300 feet below diversion dam, half a mile below bridge across Tumalo Creek on 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, 1915.

GAGE.—Painted on sloping concrete lining; read twice daily by J. C. Stiles.

DISCHARGE MEASUREMENTS.—Made from a footbridge at gage.

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

EXTREMES OF DISCHARGE.—Maximum stage recorded during period May 21, 1914, to September 30, 1915, 3.70 feet at 6 a. m. June 7, 1915 (discharge, 182 second-feet). Canal dry during part of the winter.

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

ACCURACY.—Results considered good.

Tumalo feed canal diverts water from Tumalo Creek in the SE. ¼ sec. 23, T. 17 S., R. 11 E., into the Tumalo project reservoir. Some land is also watered directly from the canal.

*Discharge measurements of Tumalo feed canal near Bend, Oreg., during the year ending Sept. 30, 1915.*

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---|---|---|---|---|---|---|---|
| | | *Feet.* | *Sec. ft.* | | | *Feet.* | *Sec. ft.* |
| Nov. 25 | C. G. Paulsen | 1.74 | 22.6 | Jan. 29 | C. G. Paulsen | [a] 2.23 | 3.7 |
| 25 | do | 1.34 | 8.6 | Apr. 22 | F. F. Henshaw | 3.08 | 120 |
| 25 | do | 1.87 | 28.7 | June 18 | do | 3.00 | 108 |
| 25 | do | 1.97 | 33.4 | | | | |

[a] Stage-discharge relation affected by ice.

*Daily discharge, in second-feet, of Tumalo feed canal near Bend, Oreg., for the year ending Sept. 30, 1915.*

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 52 | 52 | 13 | 35 | 32 | 56 | 83 | 83 | 150 | 110 | 52 | 48 |
| 2 | 56 | 52 | 23 | 35 | 32 | 56 | 96 | 47 | 140 | 110 | 52 | 47 |
| 3 | 53 | 52 | 43 | 25 | 48 | 50 | 101 | 52 | 135 | 106 | 56 | 47 |
| 4 | 7.5 | 51 | 13 | 30 | 53 | 32 | 92 | 66 | 135 | 125 | 52 | 46 |
| 5 | 7.5 | 49 | 30 | 38 | 56 | 24 | 88 | 59 | 150 | 88 | 52 | 45 |
| 6 | 8.0 | 48 | 0 | 48 | 56 | 24 | 88 | 66 | 170 | 96 | 53 | 50 |
| 7 | 8.0 | 48 | 0 | 63 | 56 | 24 | 88 | 101 | 170 | 92 | 53 | 48 |
| 8 | 7.5 | 49 | 0 | 66 | 56 | 23 | 83 | 120 | 170 | 101 | 52 | 47 |
| 9 | 7.5 | 48 | 0 | 33 | 55 | 13 | 83 | 130 | 160 | 96 | 52 | 47 |
| 10 | 7.5 | 48 | 0 | 0 | 56 | 11 | 88 | 130 | 120 | 74 | 51 | 47 |
| 11 | 52 | 47 | 0 | 0 | 56 | 10 | 101 | 120 | 106 | 70 | 51 | 47 |
| 12 | 52 | 47 | 30 | 12 | 56 | 6 | 106 | 135 | 106 | 74 | 50 | 47 |
| 13 | 52 | 47 | 83 | 49 | 56 | 58 | 106 | 130 | 101 | 74 | 49 | 46 |
| 14 | 52 | 47 | 55 | 66 | 56 | 60 | 88 | 115 | 120 | 66 | 48 | 47 |
| 15 | 52 | 15 | 0 | 60 | 56 | 62 | 96 | 110 | 125 | 66 | 49 | 47 |
| 16 | 52 | 16 | 0 | 35 | 56 | 60 | 101 | 110 | 110 | 66 | 48 | 47 |
| 17 | 52 | 16 | 0 | 65 | 58 | 60 | 110 | 120 | 115 | 65 | 47 | 47 |
| 18 | 51 | 13 | 0 | 65 | 59 | 60 | 125 | 130 | 125 | 65 | 47 | 46 |
| 19 | 51 | 21 | 0 | 0 | 58 | 59 | 130 | 62 | 106 | 66 | 47 | 46 |
| 20 | 51 | 23 | 0 | 0 | 58 | 58 | 140 | 110 | 101 | 65 | 47 | 45 |
| 21 | 50 | 23 | 0 | 12 | 56 | 58 | 130 | 110 | 106 | 66 | 47 | 46 |
| 22 | 50 | 23 | 0 | 59 | 56 | 62 | 120 | 110 | 110 | 66 | 47 | 46 |
| 23 | 50 | 23 | 0 | 30 | 56 | 65 | 110 | 110 | 120 | 62 | 47 | 46 |
| 24 | 50 | 23 | 0 | 5 | 58 | 65 | 110 | 115 | 120 | 62 | 47 | 46 |
| 25 | 52 | 19 | 0 | 5 | 57 | 66 | 110 | 96 | 101 | 62 | 47 | 46 |
| 26 | 52 | 15 | 0 | 4 | 56 | 65 | 115 | 110 | 92 | 59 | 47 | 46 |
| 27 | 52 | 15 | 0 | 4 | 56 | 65 | 125 | 125 | 88 | 58 | 48 | 46 |
| 28 | 57 | 15 | 35 | 4 | 56 | 70 | 140 | 145 | 88 | 56 | 48 | 46 |
| 29 | 72 | 14 | 35 | 4 | ..... | 74 | 140 | 72 | 92 | 56 | 48 | 46 |
| 30 | 72 | 13 | 35 | 5 | ..... | 74 | 135 | 37 | 110 | 56 | 48 | 46 |
| 31 | 59 | ..... | 35 | 24 | ..... | 70 | ..... | 140 | ..... | 54 | 47 | ..... |

NOTE.—Discharge determined from a rating curve well defined between 8 and 140 second-feet. Discharge estimated, on account of ice, Dec. 28–31 and Jan. 17, 24–30.

*Monthly discharge of Tumalo feed canal near Bend, Oreg., for the year ending Sept. 30, 1915.*

| Month. | Discharge in second-feet. | | | Run-off (total in acre-feet). | Accuracy. |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | | |
| October | 72 | 7.5 | 43.5 | 2,670 | B. |
| November | 52 | 13 | 32.4 | 1,930 | B. |
| December | 83 | 0 | 13.9 | 855 | C. |
| January | 66 | 0 | 28.4 | 1,750 | C. |
| February | 59 | 32 | 54.3 | 3,020 | A. |
| March | 74 | 6 | 49.7 | 3,060 | A. |
| April | 140 | 83 | 108 | 6,430 | A. |
| May | 145 | 37 | 102 | 6,270 | A. |
| June | 170 | 88 | 121 | 7,200 | A. |
| July | 125 | 54 | 75.2 | 4,620 | A. |
| August | 53 | 47 | 49.3 | 3,030 | B. |
| September | 50 | 45 | 46.6 | 2,770 | B. |
| The year | 170 | 0 | 60.2 | 43,600 | |

### SQUAW CREEK NEAR SISTERS, OREG.

LOCATION.—In the NW. ¼ sec. 30, T. 15 S., R. 10 E., immediately above the intake of McCallister ditch, and about 5 miles by road above Sisters, Deschutes County.

DRAINAGE AREA.—63 square miles.

RECORDS AVAILABLE.—May 30 to December 31, 1913; April 7 to September 12, 1914; May 9 to September 2, 1915. From July 1, 1906, to May 29, 1913, in section 20, at station below the intake of McCallister ditch, about 700 feet farther downstream.

GAGE.—Vertical staff on right bank; read by George Brewster, water master.

DISCHARGE MEASUREMENTS.—Made from a footbridge above gage, or by wading.

CHANNEL.—Gravel and rock; fairly permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded May 9 to September 2, 2.60 feet August 4 and 5 (discharge, 235 second-feet); minimum stage recorded, 1.85 feet May 26 (discharge, 54 second-feet).

1906–1915: Maximum stage recorded, 7.5 feet at old station November 22, 1909 (discharge estimated from extension of rating curve as 1,940 second-feet); minimum stage recorded, 2.65 feet at old station March 19, 1912 (discharge, 32 second-feet).

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

REGULATION.—None.

ACCURACY.—Results considered good except for high-water periods, for which they may be somewhat in error on account of fluctuation due to melting snow.

*Discharge measurements of Squaw Creek near Sisters, Oreg., during the year ending Sept. 30, 1915.*

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---|---|---|---|---|---|---|---|
| | | *Feet.* | *Sec. ft.* | | | *Feet.* | *Sec. ft.* |
| June 25 | H. G. Kennard | 2.43 | 197 | Aug. 4 | G. H. Brewster | 2.24 | 127 |
| July 16 | do | 2.26 | 137 | Sept. 28 | Henshaw and Kennard | 1.83 | 51.7 |

*Daily discharge, in second-feet, of Squaw Creek near Sisters, Oreg., for the year ending Sept. 30, 1915.*

| Day | May | June | July | Aug. | Day | May | June | July | Aug. |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | 125 | 170 | 118 | 16 | 69 | 120 | 125 | 130 |
| 2 | | 112 | 190 | 130 | 17 | 71 | 138 | 112 | 120 |
| 3 | | 100 | 205 | 150 | 18 | 78 | 142 | 121 | 112 |
| 4 | | 125 | 181 | 122 | 19 | 86 | 125 | 129 | 112 |
| 5 | | 112 | 162 | 205 | 20 | 62 | 138 | 138 | 112 |
| 6 | | 158 | 184 | 128 | 21 | 62 | 138 | 150 | 108 |
| 7 | | 175 | 190 | 145 | 22 | 62 | 145 | 150 | 110 |
| 8 | | 150 | 190 | 145 | 23 | 64 | 148 | 150 | 112 |
| 9 | 125 | 140 | 205 | 125 | 24 | 67 | 152 | 150 | 155 |
| 10 | 125 | 130 | 150 | 138 | 25 | 62 | 155 | 138 | 100 |
| 11 | 112 | 127 | 145 | 132 | 26 | 54 | 120 | 165 | 105 |
| 12 | 100 | 123 | 155 | 118 | 27 | 102 | 112 | 128 | 105 |
| 13 | 100 | 120 | 145 | 125 | 28 | 150 | 121 | 126 | 100 |
| 14 | 100 | 125 | 112 | 130 | 29 | 112 | 130 | 125 | 129 |
| 15 | 67 | 125 | 100 | 130 | 30 | 125 | 150 | 120 | 158 |
| | | | | | 31 | 125 | ..... | 112 | 105 |

NOTE.—Discharge determined from a well-defined rating curve. Discharge interpolated for days for which gage was not read as follows: Mar. 13, 16, 18, 21, 23, 27; June 9, 11, 12, 23, 24, 28; July 18, 19, 22, 28; Aug. 15, 22, 29.

*Monthly discharge of Squaw Creek near Sisters, Oreg., for the year ending Sept. 30, 1915.*

| Month. | Discharge in second-feet. | | | Run-off (total in acre-feet). |
|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | |
| May 9–31 | 150 | 54 | 90.4 | 4,120 |
| June | 175 | 100 | 133 | 7,910 |
| July | 205 | 100 | 149 | 9,160 |
| August | 205 | 100 | 126 | 7,750 |
| The period | | | | 28,900 |

### OCHOCO CREEK AT ELLIOTT'S RANCH, NEAR PRINEVILLE, OREG.

LOCATION. In the NE. ¼ sec. 5, T. 15 S., R. 17 E., at dam site of proposed reservoir for Ochoco project, below all tributaries; 6½ miles east of Prineville, Crook County, on road to Mitchell.

DRAINAGE AREA.—300 square miles.

RECORDS AVAILABLE.—November 1, 1908, to April 30, 1910, and November 23, 1914, to June 30, 1915.

GAGE.—Vertical staff on left bank. Gage reader, David Elliott.

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

CHANNEL AND CONTROL.—Gravel and boulders; somewhat shifting.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 2.4 feet at noon April 3 (discharge, 290 second-feet); minimum stage recorded, 0.59 foot October 26 (discharge, 0.1 second foot).

1908-1910 and 1915: Maximum stage recorded, 4.50 feet at 4 p. m. November 23, 1909 (discharge, 1,160 second-feet). Creek dry at various times on account of diversions above.

WINTER FLOW.—Stage-discharge relation slightly affected during periods of cold weather; discharge can generally be estimated.

DIVERSIONS.—Considerable land irrigated along Ochoco Creek and tributaries above the station. Tableland and Elliott ditches divert water around the station. (See pp. ——.)

REGULATION.—None.

ACCURACY.—Results considered fair; gage readings somewhat questionable.

*Discharge measurements of Ochoco Creek at Elliott's ranch, near Prineville, Oreg., during the year ending Sept. 30, 1915.*

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---|---|---|---|---|---|---|---|
| | | *Feet.* | *Sec. ft.* | | | *Feet.* | *Sec. ft.* |
| Oct. 26 | J. E. Stewart | 0.59 | 0.1 | Mar. 8 | P. V. Hodges | 1.22 | 34.1 |
| Jan. 27 | C. G. Paulsen | .82 | 6.5 | Apr. 17 | F. F. Henshaw | 1.53 | 82.2 |
| Mar. 8 | P. V. Hodges | 1.10 | 23.4 | June 15 | ....do | .92 | 12.0 |

*Daily discharge, in second-feet, of Ochoco Creek at Elliott's ranch, near Prineville, Oreg., for the year ending Sept. 30, 1915.*

| Day. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. |
|---|---|---|---|---|---|---|---|---|
| 1 | | 15 | | 28 | 60 | 200 | 15 | 19 |
| 2 | | 15 | | 45 | 76 | 245 | 15 | 15 |
| 3 | | 15 | | 34 | 93 | 290 | 15 | 15 |
| 4 | | 15 | | 23 | 112 | 232 | 15 | 15 |
| 5 | | 15 | | 21 | 130 | 175 | 15 | 10 |
| 6 | | 14 | | 19 | 120 | 162 | 15 | 6 |
| 7 | | 12 | | 17 | 111 | 150 | 15 | 3 |
| 8 | | 11 | 8 | 15 | 23 | 140 | 15 | 1 |
| 9 | | 10 | 10 | 19 | 23 | 130 | 15 | 2 |
| 10 | | 8 | 11 | 23 | 34 | 130 | 8 | 3 |
| 11 | | 6 | 12 | 21 | 45 | 130 | 6 | 3 |
| 12 | | | 14 | 19 | 60 | 120 | 15 | 3 |
| 13 | | | 15 | 17 | 76 | 111 | 15 | 3 |
| 14 | | | 15 | 15 | 84 | 102 | 30 | 3 |
| 15 | | | 15 | 15 | 93 | 93 | 45 | 11 |
| 16 | | | 14 | 15 | 102 | 87 | 39 | 6 |
| 17 | | | | 24 | 111 | 81 | 33 | 4 |
| 18 | | | | 33 | 120 | 70 | 33 | 3 |
| 19 | | | | 34 | 130 | 60 | 33 | 3 |
| 20 | | | | 39 | 130 | 46 | 28 | 3 |
| 21 | | | | 36 | 130 | 33 | 23 | 3 |
| 22 | | | | 33 | 165 | 24 | 19 | 3 |
| 23 | 19 | | | 39 | 200 | 15 | 15 | 3 |
| 24 | 19 | | | 45 | 188 | 30 | 24 | 3 |
| 25 | 19 | | | 52 | 175 | 45 | 33 | 3 |
| 26 | 19 | | 7 | 60 | 152 | 30 | 33 | 3 |
| 27 | 19 | | 7 | 60 | 130 | 15 | 33 | 6 |
| 28 | 19 | | 8 | 60 | 165 | 10 | 28 | 10 |
| 29 | 19 | | 10 | | 200 | 6 | 23 | 10 |
| 30 | 17 | | 11 | | 200 | 10 | 23 | 10 |
| 31 | | | 12 | | 200 | | 23 | |

NOTE.—Discharge determined from a well-defined rating curve. Gage read every other day and discharge interpolated for intervening days. Mean discharge estimated as 5 second-feet Dec. 12–31; 6 second-feet Jan. 1–7; 8 second-feet Jan. 17–25.

*Monthly discharge of Ochoco Creek at Elliott's ranch, near Prineville, Oreg., for the year ending Sept. 30, 1915.*

| Month. | Discharge in second-feet. | | | Run-off (total in acre-feet). | Accuracy. |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | | |
| November 23–30 | 19 | 17 | 18.8 | 298 | B. |
| December | 15 | | 7.61 | 468 | C. |
| January | 15 | | 9.13 | 561 | C. |
| February | 60 | 15 | 30.8 | 1,710 | B. |
| March | 200 | 23 | 117 | 7,190 | B. |
| April | 290 | 6 | 99.1 | 5,900 | B. |
| May | 45 | 6 | 22.1 | 1,360 | B. |
| June | 19 | 1 | 6.17 | 367 | C. |
| The period | 290 | | 41.0 | 17,900 | |

### OCHOCO CREEK AT PRINEVILLE, OREG.

LOCATION.—In the SE. ¼ sec. 31, T. 14 S., R. 16 E., at the highway bridge in Prineville, Crook County, about 3 miles above the mouth of the creek.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—May 14 to June 13, 1912; December 15, 1913, to June 25, 1914; March 7 to April 30, 1915.

GAGE.—Vertical staff on bridge abutment; read daily. Gage reader, Hobart Reams.

DISCHARGE MEASUREMENTS.—Made from bridge or by wading.

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

EXTREMES OF DISCHARGE.—Maximum stage recorded during period March 7 to April 30, 2.30 feet at 4 p. m. March 30 (discharge, 160 second-feet). Creek dry April 28 to 30 and probably all summer.

The highest flood in recent years occurred in April, 1901, and reached a stage of about 9.0 feet on present gage (discharge estimated from a partly developed rating curve as 4,000 second-feet).

DIVERSIONS.—Station is below all diversions and shows only the unappropriated flow; the Rye Grass ditch diverts water within a mile above and carries water around the gage.

REGULATION.—None.

ACCURACY.—Results good.

*Discharge measurements of Ochoco Creek at Prineville, Oreg., during the year ending Sept. 30, 1915.*

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---|---|---|---|---|---|---|---|
| | | *Feet.* | *Sec.-ft.* | | | *Feet.* | *Sec.-ft.* |
| Oct. 23 | J. E. Stewart | 1.24 | 1.3 | Apr. 17 | F. F. Henshaw | 1.61 | 26.9 |
| Jan. 27 | C. G. Poulsen | 1.32 | 4.3 | June 15 | ....do | 1.09 | 1.0 |
| Mar. 7 | P. V. Hodges | 1.66 | 30.2 | | | | |

*Daily discharge, in second-feet, of Ochoco Creek at Prineville, Oreg., for the year ending Sept. 30, 1915.*

| Day. | Mar. | Apr. | Day. | Mar. | Apr. | Day. | Mar. | Apr. |
|---|---|---|---|---|---|---|---|---|
| 1 | | 143 | 11 | 17 | 98 | 21 | 92 | 15 |
| 2 | | 143 | 12 | 20 | 74 | 22 | 98 | 12 |
| 3 | | 149 | 13 | 20 | 56 | 23 | 100 | 9 |
| 4 | | 149 | 14 | 25 | 52 | 24 | 105 | 8 |
| 5 | | 138 | 15 | 61 | 43 | 25 | 117 | 8 |
| 6 | | 122 | 16 | 66 | 34 | 26 | 130 | 2 |
| 7 | 30 | 117 | 17 | 81 | 26 | 27 | 130 | 1 |
| 8 | 23 | 105 | 18 | 85 | 23 | 28 | 127 | 0 |
| 9 | 18 | 98 | 19 | 85 | 20 | 29 | 132 | 0 |
| 10 | 16 | 98 | 20 | 85 | 18 | 30 | 154 | 0 |
| | | | | | | 31 | 149 | |

NOTE.—Discharge determined from a well-defied rating curve. Discharge interpolated Apr. 15 and 18–22.

*Monthly discharge of Ochoco Creek at Prineville, Oreg., for the year ending Sept. 30, 1915.*

| Month. | Discharge in second-feet. | | | Run-off (total in acre-feet). | Accuracy. |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | | |
| March 7-31 | 154 | 16 | 78.6 | 3,900 | B. |
| April | 149 | 0 | 58.7 | 3,490 | B. |

### TABLELAND DITCH NEAR PRINEVILLE, OREG.

LOCATION.—In the NW. ¼ sec. 5, T. 15 S., R. 16 E., at Elliott's ranch, about 1½ miles below intake, one-fourth mile upstream from station on Ochoco Creek, and about 6½ miles east of Prineville, Crook County.

RECORDS AVAILABLE.—February 24 to June 9, 1915; that is, the irrigating season.

GAGE.—Vertical staff on right bank just below a wasteway from which the surplus flow is returned to the creek; read every other day by David Elliott.

DISCHARGE MEASUREMENTS.—Made by wading.

CHANNEL AND CONTROL.—Canal is well made in solid material and shifts only slightly; no defined control.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 2.4 feet February 26 to March 1 (discharge, 20 second-feet). Canal dry most of year.

WINTER FLOW.—Water turned out during winter.

ACCURACY.—Results considered fair.

Tableland ditch diverts water from the left bank of Ochoco Creek in the NW. ¼ sec. 4, T. 15 S., R. 16 E., and extends northwestward for about 8 miles, irrigating bench land lying north of Ochoco Creek and Crooked River.

*Discharge measurements of Tableland ditch near Prineville, Oreg., during the year ending Sept. 30, 1915.*

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by — | Gage height. | Discharge. |
|---|---|---|---|---|---|---|---|
| | | *Feet.* | *Sec.-ft.* | | | *Feet.* | *Sec.-ft.* |
| Mar. 8 | P. V. Hodges | 2.00 | 12.5 | Apr. 1 | G. H. Brewster | 2.07 | 14.1 |
| 8 | do | 1.49 | 4.4 | June 15 | F. F. Henshaw | .83 | *a* .2 |

*a* Estimated.

*Daily discharge, in second-feet, of Tableland ditch near Prineville, Oreg., for the year ending Sept. 30, 1915.*

| Day. | Feb. | Mar. | Apr. | May. | June. | Day. | Feb. | Mar. | Apr. | May. | June. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | ..... | 20 | 12 | 12 | 14 | 16 | ..... | 13 | 14 | 14 | ..... |
| 2 | ..... | 20 | 13 | 12 | 14 | 17 | ..... | 14 | 14 | 14 | ..... |
| 3 | ..... | 0 | 14 | 12 | 13 | 18 | ..... | 14 | 14 | 14 | ..... |
| 4 | ..... | 0 | 14 | 12 | 12 | 19 | ..... | 14 | 14 | 14 | ..... |
| 5 | ..... | 0 | 14 | 12 | 12 | 20 | ..... | 14 | 14 | 14 | ..... |
| 6 | ..... | 0 | 14 | 12 | 12 | 21 | ..... | 14 | 14 | 14 | ..... |
| 7 | ..... | 16 | 14 | 12 | 12 | 22 | ..... | 14 | 14 | 14 | ..... |
| 8 | ..... | 14 | 14 | 12 | 12 | 23 | ..... | 14 | 14 | 14 | ..... |
| 9 | ..... | 12 | 14 | 12 | 6 | 24 | 18 | 13 | 14 | 14 | ..... |
| 10 | ..... | 12 | 14 | 13 | ..... | 25 | 19 | 12 | 14 | 14 | ..... |
| 11 | ..... | 11 | 14 | 14 | ..... | 26 | 20 | 13 | 14 | 14 | ..... |
| 12 | ..... | 12 | 14 | 14 | ..... | 27 | 20 | 14 | 14 | 14 | ..... |
| 13 | ..... | 12 | 14 | 14 | ..... | 28 | 20 | 14 | 14 | 14 | ..... |
| 14 | ..... | 12 | 14 | 14 | ..... | 29 | ..... | 14 | 14 | 14 | ..... |
| 15 | ..... | 12 | 14 | 14 | ..... | 30 | ..... | 14 | 13 | 14 | ..... |
| | | | | | | 31 | ..... | 14 | ..... | 14 | ..... |

NOTE.—Discharge determined from a fairly well defined rating curve. Mean discharge June 10-30 estimated as 0.2 second-foot.

*Monthly discharge of Tableland ditch near Prineville, Oreg., for the year ending Sept. 30, 1915.*

| Month. | Discharge in second-feet. | | | Run-off (in acre-feet). |
|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | |
| February 24-28 | 20 | 18 | 19.4 | 192 |
| March | 20 | 0 | 12.0 | 738 |
| April | 14 | 12 | 13.9 | 827 |
| May | 14 | 12 | 13.4 | 824 |
| June | 14 | .2 | 3.71 | 221 |
| The period | ..... | ..... | ..... | 2,800 |

### ELLIOTT DITCH NEAR PRINEVILLE, OREG.

LOCATION.—In the NE. ¼ sec. 5, T. 15 S., R. 17 E., about 200 yards below intake, opposite gage on Ochoco Creek, and 6½ miles east of Prineville, Crook County.

RECORDS AVAILABLE.—November 3, 1908, to April 30, 1910, and October 26, 1914, to June 30, 1915.

GAGE.—Vertical staff driven in the right bank of canal; different gage was used 1908–1910. Gage reader, David Elliott.

DISCHARGE MEASUREMENTS.—Made by wading or from a foot plank near the gage.

CHANNEL AND CONTROL.—Ditch flat and badly silted up; shifting.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 1.88 feet June 15 (discharge, 7.9 second-feet).

1908–1910 and 1915: Maximum stage recorded, 1.6 feet April 26 to 30, 1909 (discharge, 8.5 second-feet). Canal dry at times.

WINTER FLOW.—Stage-discharge relation affected by ice at times.

ACCURACY.—Results poor.

Elliott ditch diverts from the left bank of Ochoco Creek and irrigates 160 acres of land, mostly in alfalfa. Probably a considerable part of the water returns to the stream a short distance below.

*Discharge measurements of Elliott ditch near Prineville, Oreg., during the year ending Sept. 30, 1915.*

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---|---|---|---|---|---|---|---|
| | | *Feet.* | *Sec.-ft.* | | | *Feet.* | *Sec.-ft.* |
| Oct. 26 | J. E. Stewart | 1.53 | 1.1 | June 15 | F. F. Henshaw | 1.88 | 7.9 |
| Jan. 7 | C. G. Paulsen | [a]1.03 | 1.2 | 16 | Kennard and Luper | 1.80 | 6.1 |
| Mar. 8 | P. V. Hodges | 1.15 | 2.8 | | | | |

[a] Stage-discharge relation affected by ice.

*Daily discharge, in second-feet, of Elliott ditch near Prineville, Oreg., for the year ending Sept. 30, 1915.*

| Day. | Oct. | Jan. | Feb. | Mar. | Apr. | May. | June. |
|---|---|---|---|---|---|---|---|
| 1 | ..... | ..... | 0.2 | 2.6 | 0 | 4.5 | 4.5 |
| 2 | ..... | ..... | .2 | 2.9 | 0 | 4.5 | 4.5 |
| 3 | ..... | ..... | .2 | 3.2 | 0 | 4.5 | 4.2 |
| 4 | ..... | ..... | .2 | 2.6 | 0 | 4.5 | 3.8 |
| 5 | ..... | ..... | .2 | 2.1 | 0 | 4.5 | 2.7 |
| 6 | ..... | ..... | .1 | 1.8 | 0 | 4.5 | 1.6 |
| 7 | ..... | ..... | .1 | 1.6 | 0 | 4.5 | 1.0 |
| 8 | ..... | ..... | 0 | 2.9 | 0 | 4.5 | .5 |
| 9 | ..... | ..... | .2 | 0 | 0 | 4.5 | 3.2 |
| 10 | ..... | ..... | .5 | 0 | 0 | 4.2 | 5.9 |
| 11 | ..... | ..... | .4 | 0 | 0 | 3.8 | 5.9 |
| 12 | ..... | ..... | .4 | 0 | 0 | 4.5 | 5.9 |
| 13 | ..... | ..... | .3 | 0 | 0 | 5.2 | 6.2 |
| 14 | ..... | ..... | .2 | 0 | 0 | 5.0 | 6.6 |
| 15 | ..... | ..... | .9 | 0 | 0 | 0 | 7.9 |
| 16 | ..... | ..... | 1.6 | 0 | 0 | 5.0 | 6.6 |
| 17 | ..... | ..... | 1.6 | 0 | 0 | 5.9 | 6.6 |
| 18 | ..... | ..... | 1.6 | 0 | 0 | 5.9 | 6.6 |
| 19 | ..... | ..... | 1.8 | 0 | 8.7 | 5.9 | 6.6 |
| 20 | ..... | ..... | 2.1 | 0 | 8.7 | 5.6 | 6.6 |
| 21 | ..... | ..... | 2.1 | 0 | 8.7 | 5.2 | 6.6 |
| 22 | ..... | ..... | 2.1 | 0 | 8.7 | 4.8 | 6.6 |
| 23 | ..... | ..... | 2.4 | 0 | 8.7 | 4.5 | 5.9 |
| 24 | ..... | ..... | 2.6 | 0 | 8.0 | 5.6 | 5.2 |
| 25 | ..... | ..... | 2.9 | 0 | 7.3 | 6.6 | 5.2 |
| 26 | 1.1 | ..... | 3.2 | 0 | 7.3 | 5.9 | 5.2 |
| 27 | ..... | 1.2 | 3.2 | 0 | 7.3 | 5.2 | 4.5 |
| 28 | ..... | ..... | 3.2 | 0 | 5.9 | 5.6 | 3.8 |
| 29 | ..... | ..... | ..... | 0 | 4.5 | 5.9 | 2.0 |
| 30 | ..... | ..... | ..... | 0 | 4.5 | 5.2 | 0 |
| 31 | ..... | ..... | ..... | 0 | ..... | 4.5 | ..... |

NOTE.—Discharge determined from a poorly defined rating curve. Gage read about every other day discharge interpolated for intervening days.

*Monthly discharge of Elliott ditch near Prineville, Oreg., for the year ending Sept. 30, 1915.*

| Month. | Discharge in second-feet. | | | Run-off (total in acre-feet). | Accuracy. |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | | |
| October | | | a 1.0 | 61.5 | |
| November | | | a 1.0 | 59.5 | |
| December | | | a .8 | 49.2 | |
| January | | | a 1.0 | 61.5 | |
| February | 3.2 | 0 | 1.23 | 68.3 | |
| March | 3.2 | 0 | .64 | 39.4 | |
| April | 8.7 | 0 | 2.94 | 175 | C. |
| May | 6.6 | 0 | 4.85 | 298 | C. |
| June | 7.9 | 0 | 4.75 | 283 | C. |
| The period | | | | 1,100 | |

a Estimated from two current-meter measurements and observer's notes.

### McKAY CREEK NEAR PRINEVILLE, OREG.

LOCATION.—On line between secs. 7 and 8, T. 14 S., R. 16 E., on main road to Shaniko, 4½ miles north of Prineville, Crook County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE. February 25 to May 31, 1915.

GAGE.—Vertical staff on downstream end of left abutment; read once daily by Mrs. J. C. Pritchett.

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

CHANNEL AND CONTROL.—Gravel; somewhat shifting.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 2.0 feet March 23 and April 3 (discharge, 88 second-feet). Stream bed dry up to February 24 and practically dry after June 1.

WINTER FLOW.—Practically none.

DIVERSIONS.—Considerable land irrigated above the station. Two canals divert around the gage, one on either side. The discharge of the creek above diversions on March 8 was 13.2 second-feet. The combined flow of the two ditches on April 16 was 10 second-feet. The total diversion past the gage has been estimated.

REGULATION.—None.

ACCURACY.—Results considered fair.

*Discharge measurements of McKay Creek near Prineville, Oreg., during the years ending Sept. 30, 1915 and 1916.*

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---|---|---|---|---|---|---|---|
| | | *Feet.* | *Sec. ft.* | 1916. | | *Feet.* | *Sec. ft.* |
| Mar. 8 | P. V. Hodges | 1.19 | 2.6 | Feb. 27 | P. V. Hodges | 2.10 | 106 |
| Apr. 16 | F. F. Henshaw | 1.26 | 4.6 | Mar. 31 | Hodges and Kennard | 1.85 | 63.9 |
| | | | | June 19 | H. G. Kennard | .97 | .9 |

NOTE.—Measurements made in 1916, after station was discontinued, were used to define the curve for 1915.

*Daily discharge, in second-feet, of McKay Creek near Prineville, Oreg., for the year ending Sept. 30, 1915.*

| Day. | Feb. | Mar. | Apr. | May. | Day. | Feb. | Mar. | Apr. | May. |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | 6.0 | 64 | 1.2 | 16 | | 44 | 4.2 | 1.2 |
| 2 | | 2.5 | 80 | 1.2 | 17 | | 57 | 6.0 | 1.2 |
| 3 | | 2.5 | 88 | 1.2 | 18 | | 57 | 6.0 | 1.2 |
| 4 | | 12 | 57 | 1.2 | 19 | | 59 | 6.0 | 1.2 |
| 5 | | 9.0 | 57 | 1.2 | 20 | | 59 | 6.0 | 1.2 |
| 6 | | 4.2 | 44 | 1.2 | 21 | | 57 | 6.0 | 1.2 |
| 7 | | 2.5 | 44 | 1.2 | 22 | | 72 | 6.0 | 1.2 |
| 8 | | 2.5 | 38 | 1.2 | 23 | | 83 | 4.2 | 1.2 |
| 9 | | 1.2 | 32 | 1.2 | 24 | 0 | 72 | 2.5 | 1.2 |
| 10 | | 1.8 | 32 | 1.2 | 25 | 2.5 | 57 | 6.0 | 1.2 |
| 11 | | 2.5 | 26 | 1.2 | 26 | 2.5 | 33 | 1.8 | .8 |
| 12 | | 0 | 9 | .8 | 27 | 1.2 | 33 | 1.8 | .8 |
| 13 | | 10 | 12 | .8 | 28 | 6.0 | 33 | 1.8 | .8 |
| 14 | | 16 | 16 | 1.2 | 29 | | 72 | 1.8 | .8 |
| 15 | | 57 | 12 | 1.2 | 30 | | 72 | 1.2 | .8 |
| | | | | | 31 | | 64 | | .8 |

NOTE.—Discharge determined from a fairly well defined rating curve.

*Monthly discharge of McKay Creek near Prineville, Oreg., for the year ending Sept. 30, 1915.*

| Month. | Discharge in second-feet. | | | Run-off (total in acre-feet). | Accuracy. |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | | |
| February | 6.0 | 0 | 0.44 | 24 | C. |
| March | 88 | 0 | 33.5 | 2,060 | B. |
| April | 88 | 1.2 | 22.4 | 1,330 | C. |
| May | 1.2 | .8 | 1.10 | 68 | C. |
| The period | | | | 3,480 | |

NOTE.—The quantity of water diverted past the station has been estimated as 6 second-feet Feb. 25–28 (48 acre-feet); 10 second-feet for 25 days in March (496 acre-feet); 10 second-feet for April (595 acre-feet); 5 second-feet for May (307 acre-feet); total, 1,450 acre-feet. Total run-off of creek February to May, inclusive, 4,930 acre-feet.

### METOLIUS RIVER AT ALLINGHAM RANGER STATION, NEAR SISTERS, OREG.

LOCATION.—In the NE. ¼ sec. 3, T. 13 S., R. 9 E., at Allingham ranger station, 1½ miles below mouth of Lake Creek, 3 miles below head of river, and about 17 miles northwest of Sisters. Station in Jefferson County.

DRAINAGE AREA.—50 square miles.

RECORDS AVAILABLE.—September 15, 1910, to October 31, 1913; June 21 to September 30, 1915.

GAGE.—Vertical staff on left bank 100 yards below bridge at ranger station; read by L. W. Zumwalt.

DISCHARGE MEASUREMENTS.—Made by wading near gage.

CHANNEL AND CONTROL.—Gravel; slightly shifting.

EXTREMES OF DISCHARGE.—Maximum stage recorded June 21 to September 30, 0.56 foot at 5 p. m., June 21 (discharge, 327 second-feet), due to a heavy thunder shower. Minimum stage recorded, 0.40 foot September 28 (discharge, 264 second-feet).

1910–1913 and 1915: Maximum stage recorded, 0.97 foot February 16, 1912 (discharge, 566 second-feet); minimum stage recorded, 0.40 foot September 28, 1915 (discharge, 264 second-feet).

WINTER FLOW.—Stage-discharge relation unaffected by ice, as water comes from springs.

DIVERSIONS.—Practically none.
REGULATION.—None.
ACCURACY.—Results excellent.
COOPERATION.—Gage-height record furnished by M. L. Merritt, supervisor.

*Discharge measurements of Metolius River at Allingham ranger station, near Sisters, Oreg., during the year ending Sept. 30, 1915.*

[Made by F. F. Henshaw.]

| Date. | Gage height. | Discharge. |
|---|---|---|
| | *Feet.* | *Sec.-ft.* |
| June 21 | 0.55 | 329 |
| Sept. 28 | .40 | 264 |

*Daily discharge, in second-feet, of Metolius River at Allingham ranger station, near Sisters, Oreg., for the year ending Sept. 30, 1915.*

| Day. | June. | July. | Aug. | Sept. | Day. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | 296 | 284 | 284 | 16 | | 284 | 284 | 290 |
| 2 | | 296 | 284 | 284 | 17 | | 284 | 284 | 284 |
| 3 | | 296 | 284 | 284 | 18 | | 284 | 284 | 284 |
| 4 | | 290 | 284 | 284 | 19 | | 290 | 284 | 284 |
| 5 | | 284 | 284 | 284 | 20 | | 296 | 284 | 284 |
| 6 | | 284 | 284 | 284 | 21 | 327 | 296 | 284 | 284 |
| 7 | | 284 | 284 | 284 | 22 | 300 | 296 | 284 | 278 |
| 8 | | 284 | 284 | 284 | 23 | 296 | 296 | 284 | 272 |
| 9 | | 284 | 284 | 284 | 24 | 296 | 296 | 284 | 272 |
| 10 | | 284 | 284 | 284 | 25 | 296 | 296 | 284 | 272 |
| 11 | | 284 | 284 | 290 | 26 | 296 | 296 | 284 | 272 |
| 12 | | 284 | 284 | 296 | 27 | 296 | 296 | 284 | 272 |
| 13 | | 284 | 284 | 296 | 28 | 296 | 296 | 284 | 264 |
| 14 | | 284 | 284 | 296 | 29 | 296 | 284 | 284 | 264 |
| 15 | | 284 | 284 | 296 | 30 | 296 | 284 | 284 | 264 |
| | | | | | 31 | | 284 | 284 | |

NOTE.—Daily discharge determined from a well-defined rating curve. Gage read about every other day; discharge interpolated for intervening days; discharge June 22 estimated.

*Monthly discharge of Metolius River at Allingham ranger station, near Sisters, Oreg., for the year ending Sept. 30, 1915.*

| Month. | Discharge in second-feet. | | | Run-off (total in acre-feet). | Accuracy. |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | | |
| June 21–30 | 327 | 296 | 300 | 5 950 | A. |
| July | 296 | 284 | 289 | 17,800 | A. |
| August | 284 | 284 | 284 | 17,500 | A. |
| September | 296 | 264 | 282 | 16 800 | A. |
| The period | | | | | |

### LAKE CREEK NEAR SISTERS, OREG.

LOCATION.—In the 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 about 15 miles northwest of Sisters. Station is in Jefferson County.
DRAINAGE AREA.—20.5 square miles.
RECORDS AVAILABLE.—May to November, 1911; March to September, 1912; May to October, 1913, occasional readings; April 7 to September 30, 1915.

GAGE.—Vertical staff on left bank, about 20 feet above weir; read two or three times a week by Harry Heising. Gage in natural channel used 1911 to 1913.

DISCHARGE MEASUREMENTS.—Made by wading near gage.

CHANNEL AND CONTROL.—Trapezoidal weir 15 feet long, crest not quite level and somewhat rounded; some velocity of approach; rather unstable.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 1.33 feet April 22 (discharge, 81 second-feet); minimum stage recorded, 0.63 foot September 27 (discharge, 29 second-feet).

1911–1913 and 1915: Maximum discharge, 145 second-feet for a stage of 1.22 feet on old gage May 29, 1913.

WINTER FLOW.—Stage-discharge relation unaffected by ice.

DIVERSIONS.—None above station; one small ditch takes out of Lake Creek.

REGULATION.—None.

ACCURACY.—Results considered fair.

*Discharge measurements of Lake Creek near Sisters, Oreg., during the year ending Sept. 30, 1915.*

[Made by F. F. Henshaw.]

| Date. | Gage height. | Discharge. |
|---|---|---|
| | *Feet.* | *Sec.-feet.* |
| June 22 | 0.82 | 46.3 |
| Sept. 27 | .63 | 25.0 |

*Daily discharge, in second-feet, of Lake Creek near Sisters, Oreg., for the year ending Sept. 30, 1915.*

| Day. | Apr. | May. | June. | July. | Aug. | Sept | Day. | Apr. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | ..... | ..... | 55 | ..... | 35 | ..... | 16 | ..... | ..... | 43 | ..... | ..... | ..... |
| 2 | ..... | 72 | ..... | ..... | ..... | 32 | 17 | 76 | 69 | ..... | ..... | 32 | ..... |
| 3 | ..... | ..... | 55 | ..... | 32 | ..... | 18 | ..... | ..... | 47 | 38 | ..... | ..... |
| 4 | ..... | 78 | ..... | 40 | ..... | ..... | 19 | 78 | 65 | ..... | ..... | 32 | 35 |
| 5 | ..... | ..... | ..... | ..... | 32 | 32 | 20 | ..... | ..... | 47 | 38 | ..... | ..... |
| 6 | ..... | 75 | 52 | 38 | ..... | ..... | 21 | ..... | 61 | ..... | ..... | ..... | 35 |
| 7 | 63 | ..... | ..... | ..... | ..... | ..... | 22 | 81 | ..... | 43 | 35 | 32 | ..... |
| 8 | ..... | 69 | 52 | 38 | 32 | ..... | 23 | ..... | 61 | ..... | ..... | ..... | 35 |
| 9 | ..... | ..... | ..... | ..... | ..... | ..... | 24 | ..... | ..... | 43 | ..... | 32 | ..... |
| 10 | 77 | 69 | 55 | ..... | 32 | ..... | 25 | 80 | 65 | ..... | 35 | ..... | ..... |
| 11 | ..... | ..... | ..... | 38 | ..... | 32 | 26 | ..... | ..... | 43 | ..... | 32 | 35 |
| 12 | ..... | ..... | 52 | ..... | 32 | ..... | 27 | 75 | 61 | ..... | 35 | ..... | 29 |
| 13 | 78 | 72 | ..... | 38 | ..... | 35 | 28 | ..... | ..... | 43 | ..... | ..... | ..... |
| 14 | ..... | ..... | 47 | ..... | ..... | ..... | 29 | 72 | 65 | ..... | 35 | 32 | ..... |
| 15 | 80 | 69 | ..... | 38 | 32 | 35 | 30 | ..... | 61 | 40 | ..... | ..... | 32 |
| | | | | | | | 31 | ..... | ..... | ..... | ..... | 32 | ..... |

NOTE.—Discharge determined from a poorly defined rating curve; given only for days on which gage was read.

*Monthly discharge of Lake Creek near Sisters, Oreg., for the year ending Sept. 30, 1915.*

| Month. | Mean discharge in second-feet. | Run-off (total in acre-feet). | Accuracy. | Month. | Mean discharge in second-feet. | Run-off (total in acre-feet). | Accuracy. |
|---|---|---|---|---|---|---|---|
| April | 76.0 | 4,520 | C. | August | 32.2 | 1,980 | C. |
| May | 67.5 | 4,150 | C. | September | 33.4 | 1,990 | C. |
| June | 47.8 | 2,840 | C. | | | | |
| July | 37.2 | 2,290 | C. | The period | ..... | 17,800 | |

NOTE.—Monthly mean is average of determinations of discharge for days on which gage was read.

### FIRST CREEK NEAR SISTERS, OREG.

LOCATION.—In the SW. ¼ sec. 12, T. 13 S., R. 8 E., just above a trail crossing 1½ miles from road leading to Suttle Lake, about 15 miles northeast of Sisters. Station is in Jefferson County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—April 7 to September 30, 1915.

GAGE.—Vertical staff on left bank about 5 feet above weir; read two or three times a week. Gage reader, Harry Heising.

DISCHARGE MEASUREMENTS.—Made by wading.

CHANNEL AND CONTROL.—Control is a trapezodial weir 14.8 feet long, crest rounded; considerable velocity of approach.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 0.81 foot April 22 (discharge, 42 second-feet); minimum stage recorded, 0.12 foot September 19 to 21, 23, and 26 (discharge, 0.6 second-foot).

WINTER FLOW.—Records do not cover period when stream was frozen.

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Results fair.

*Discharge measurements of First Creek near Sisters, Oreg., during the year ending Sept. 30, 1915.*

[Made by F. F. Henshaw.]

| Date. | Gage height. | Discharge. |
|---|---|---|
| | *Feet.* | *Sec.-ft.* |
| June 22 | 0.30 | 7.1 |
| Sept. 27 | .16 | .8 |

*Daily discharge, in second-feet, of First Creek near Sisters, Oreg., for the year ending Sept. 30, 1915.*

| Day. | Apr. | May. | June. | July. | Aug. | Sept. | Day. | Apr. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | 25 | | 4.8 | | 16 | | | 14 | | | |
| 2 | | 34 | | | | 3.0 | 17 | 34 | 27 | | | 4.8 | |
| 3 | | | 22 | | 4.8 | | 18 | | | 14 | 4.8 | | |
| 4 | | 34 | | 4.8 | | | 19 | 39 | 25 | | | 3.0 | 0.6 |
| 5 | | | | | 4.8 | 3.0 | 20 | | | 11 | 4.8 | | |
| 6 | | 31 | 22 | 4.8 | | | 21 | | | | | | .6 |
| 7 | 27 | | | | | | 22 | 42 | | 11 | 4.8 | 3.0 | |
| 8 | | 37 | 22 | 4.8 | 4.8 | | 23 | | 25 | | | | .6 |
| 9 | | | | | | | 24 | | | 8.8 | | 3.0 | |
| 10 | 27 | 37 | 25 | | 4.8 | | 25 | 34 | 27 | | 4.8 | | |
| 11 | | | | 4.8 | | 3.0 | 26 | | | 8.8 | | 3.0 | .6 |
| 12 | | | 22 | | 4.8 | | 27 | 34 | 25 | | 4.8 | | 1.2 |
| 13 | 27 | 31 | | 4.8 | | 3.0 | 28 | | | 6.6 | | | |
| 14 | | | 14 | | | | 29 | 40 | 25 | | 4.8 | 3.0 | |
| 15 | 32 | 27 | | 4.8 | 4.8 | 3.0 | 30 | | 26 | 6.6 | | | 1.5 |
| | | | | | | | 31 | | | | | 3.0 | |

NOTE.—Discharge determined from a rating curve well defined between 1 and 50 second-feet; given only for days on which gage was read.

*Monthly discharge of First Creek near Sisters, Oreg., for the year ending Sept. 30, 1915.*

| Month. | Mean discharge in second-feet. | Run-off (total in acre-feet). | Accuracy. | Month. | Mean discharge in second-feet. | Run-off (total in acre-feet). | Accuracy. |
|---|---|---|---|---|---|---|---|
| April | 33.6 | 2,000 | C. | August | 4.03 | 248 | B. |
| May | 29.3 | 1,800 | B. | September | 1.83 | 109 | C. |
| June | 15.5 | 922 | B. | | | | |
| July | 4.80 | 295 | B. | The period | | 5,370 | |

NOTE.—Mean is the average of determinations of discharge for days on which gage was read.

### JACK CREEK NEAR SISTERS, OREG.

LOCATION.—In the SE. ¼ sec. 28, T. 12 S., R. 9 E., at road crossing about half a mile north of Heising's ranch and 19 miles northeast of Sisters. Station is in Jefferson County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—June 21 to September 27, 1915.

GAGE.—Vertical staff on left bank just above bridge; read about once a week. Gage reader, L. W. Zumwalt.

DISCHARGE MEASUREMENTS.—Made by wading.

CHANNEL AND CONTROL.—Loose gravel; shifting.

EXTREMES OF STAGE.—Maximum observed gage height, 0.62 foot September 27; minimum, 0.50 foot June 21 and 26. Discharge not a direct function of gage height.

WINTER FLOW.—Stage-discharge relation probably unaffected.

DIVERSIONS.—Heising's ditch diverts 1 second-foot or less above station for irrigation.

REGULATION.—None.

ACCURACY.—Results somewhat uncertain.

*Discharge measurements of Jack Creek near Sisters, Oreg., during the year ending Sept. 30, 1915.*

[Made by F. F. Henshaw.]

| Date. | Gage height. | Discharge. |
|---|---|---|
| | *Feet.* | *Sec.-ft.* |
| June 21 | 0.50 | 45.4 |
| Sept. 27 | .62 | 35.2 |

*Daily discharge, in second-feet, of Jack Creek near Sisters, Oreg., for the year ending Sept. 30, 1915.*

| Day. | June. | July. | Aug. | Sept. | Day. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | | 16 | | 44 | | |
| 2 | | | | | 17 | | | | |
| 3 | | 47 | | | 18 | | | | |
| 4 | | | | 40 | 19 | | | | 37 |
| 5 | | | | | 20 | | | | |
| 6 | | | | | 21 | 46 | | 42 | |
| 7 | | | 42 | | 22 | | | | |
| 8 | | | | | 23 | | | | |
| 9 | | | | | 24 | | 45 | | |
| 10 | | 43 | | | 25 | | | | 34 |
| 11 | | | | | 26 | 46 | | | |
| 12 | | | | 38 | 27 | | | | 35 |
| 12 | | | 42 | | 28 | | | 39 | |
| 14 | | | | | 29 | | | | |
| 15 | | | | | 30 | | | | |
| | | | | | 31 | | 45 | | |

NOTE.—Daily discharge determined by indirect method for shifting control; given only for days on which gage was read.

*Monthly discharge of Jack Creek near Sisters, Oreg., for the year ending Sept. 30, 1915.*

| Month. | Mean discharge in second-feet. | Run-off (total in acre-feet). | Accuracy. | Month. | Mean discharge in second-feet. | Run-off (total in acre-feet). | Accuracy. |
|---|---|---|---|---|---|---|---|
| June 21-30 | 46.0 | 912 | B. | September | 36.8 | 2,190 | C. |
| July | 44.8 | 2,750 | C. | | | | |
| August | 41.2 | 2,530 | C. | The period | | 8,380 | |

NOTE.—Mean is the average of determinations of discharge for days on which gage was read.

### CANYON CREEK NEAR SISTERS, OREG.

LOCATION.—In the NW. ¼ sec. 27, T. 12 S., R. 9 E., about three-fourths mile above mouth, a mile north of Heising's ranch and 20 miles northwest of Sisters station is in Jefferson County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—June 21 to September 27, 1915.

GAGE.—Vertical staff nailed to a tree on left bank about 100 feet below new bridge; read about once a week. Gage reader, L. W. Zumwalt.

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

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of records, 1.98 feet at 11 a. m. June 26 (discharge, 76 second-feet); minimum stage recorded, 1.80 feet at 12 m. September 4 (discharge 56 second-feet).

WINTER FLOW.—Stage-discharge relation unaffected by ice, as most of water is from springs.

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Results good.

COOPERATION.—Records furnished by United States Forest Service, M. L. Merritt, supervisor.

*Discharge measurements of Canyon Creek near Sisters, Oreg., during the year ending Sept. 30, 1915.*

[Made by F. F. Henshaw.]

| Date. | Gage height. | Discharge. |
|---|---|---|
| | *Feet.* | *Sec.-ft.* |
| June 21 | 1.92 | 68.6 |
| Sept. 27 | 1.82 | 57.7 |

*Daily discharge, in second-feet, of Canyon Creek near Sisters, Oreg., for the year ending Sept. 30, 1915.*

| Day. | June. | July. | Aug. | Sept. | Day. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | | 16 | | 66 | | |
| 2 | | | | | 17 | | | | |
| 3 | | 70 | | | 18 | | | | |
| 4 | | | | 56 | 19 | | | | 57 |
| 5 | | | | | 20 | | | | |
| 6 | | | | | 21 | 69 | | 58 | |
| 7 | | | 58 | | 22 | | | | |
| 8 | | | | | 23 | | | | |
| 9 | | | | | 24 | | 66 | | |
| 10 | | 70 | | | 25 | | | | 57 |
| 11 | | | | | 26 | 76 | | | |
| 12 | | | | 58 | 27 | | | | 58 |
| 13 | | | 58 | | 28 | | | 58 | |
| 14 | | | | | 29 | | | | |
| 15 | | | | | 30 | | | | |
| | | | | | 31 | | 62 | | |

NOTE.—Daily discharge determined from a well-defined rating curve; given only for days on which gage was read.

*Monthly discharge of Canyon Creek near Sisters, Oreg., for the year ending Sept. 30, 1915.*

| Month. | Mean discharge in second-feet. | Run-off (total in acre-feet). | Accuracy. | Month. | Mean discharge in second-feet. | Run-off (total in acre-feet). | Accuracy. |
|---|---|---|---|---|---|---|---|
| June 21–30 | 72.5 | 1,440 | B. | September | 57.2 | 3,400 | B. |
| July | 66.8 | 4,110 | B. | | | | |
| August | 58.0 | 3,570 | B. | The period | | 12,500 | |

NOTE.—Mean is the average of determinations of discharge for days on which gage was read.

### SHITIKE CREEK AT WARM SPRING, OREG.

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

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—June 11, 1911, to September 30, 1915.

GAGE.—Vertical staff on left bank opposite store; read once a day. Gage reader, Will H. See.

DISCHARGE MEASUREMENTS.—Made by wading or from temporary footbridge near gage.

CHANNEL AND CONTROL.—Gravel and sand; likely to shift somewhat.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 1.50 feet at 2.15 p. m. May 13 (discharge, 175 second-feet); minimum stage recorded, 0.81 foot September 4 (discharge, 36 second-feet).

1911–1915: Maximum stage recorded, 2.50 feet January 14, 1912 (discharge, 593 second-feet); minimum is that of 1915.

WINTER FLOW.—Stage-discharge relation somewhat affected by ice during short periods of cold weather.

DIVERSIONS.—Probably none above station.

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

ACCURACY.—Results for 1915 considered excellent except for period when ice was present, for which time they are poor.

*Discharge measurements of Shitike Creek at Warm Spring, Oreg., during the year ending Sept. 30, 1915.*

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---|---|---|---|---|---|---|---|
| | | *Feet.* | *Sec. ft.* | | | *Feet.* | *Sec. ft.* |
| Oct. 25 | P. V. Hodges | 1.00 | 61.5 | June 28 | C. L. Batchelder | 1.07 | 72.3 |
| June 3 | C. L. Batchelder | 1.28 | 120 | Sept. 4 | ....do | .81 | 35.8 |

*Daily discharge, in second-feet, of Shitike Creek at Warm Spring, Oreg., for the year ending Sept. 30, 1915.*

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 90 | 100 | 62 | 100 | 90 | 80 | 111 | 100 | 122 | 71 | 47 | 41 |
| 2 | 100 | 122 | 111 | 90 | 90 | 100 | 122 | 100 | 134 | 80 | 47 | 41 |
| 3 | 100 | 147 | 100 | 80 | 80 | 80 | 111 | 111 | 118 | 80 | 47 | 41 |
| 4 | 90 | 122 | 100 | 71 | 62 | 71 | 111 | 111 | 118 | 90 | 47 | 36 |
| 5 | 90 | 100 | 90 | 62 | 54 | 62 | 111 | 111 | 118 | 90 | 41 | 41 |
| 6 | 90 | 90 | 90 | 54 | 54 | 59 | 111 | 111 | 100 | 80 | 41 | 41 |
| 7 | 90 | 71 | 90 | 54 | 54 | 62 | 111 | 111 | 100 | 80 | 41 | 41 |
| 8 | 94 | 80 | 100 | 54 | 54 | 62 | 111 | 111 | 90 | 80 | 41 | 41 |
| 9 | 90 | 80 | 100 | 54 | 54 | 62 | 111 | 122 | 90 | 90 | 41 | 41 |
| 10 | 90 | 90 | 100 | 54 | 54 | 62 | 111 | 122 | 84 | 90 | 41 | 41 |
| 11 | 80 | 100 | 100 | 62 | 54 | 62 | 122 | 122 | 84 | 80 | 41 | 41 |
| 12 | 80 | 111 | 100 | 100 | 54 | 62 | 122 | 134 | 84 | 71 | 41 | 41 |
| 13 | 71 | 122 | 90 | 90 | 54 | 62 | 122 | 175 | 80 | 62 | 41 | 47 |
| 14 | 62 | 122 | 90 | 62 | 54 | 80 | 122 | 147 | 80 | 62 | 41 | 45 |
| 15 | 62 | 111 | 90 | 54 | 54 | 90 | 122 | 134 | 71 | 59 | 41 | 41 |
| 16 | 62 | 100 | ..... | 47 | 62 | 100 | 134 | 111 | 71 | 59 | 41 | 41 |
| 17 | 62 | 100 | ..... | 54 | 54 | 100 | 134 | 100 | 71 | 59 | 41 | 41 |
| 18 | 80 | 100 | ..... | 54 | 54 | 100 | 122 | 100 | 71 | 59 | 41 | 41 |
| 19 | 122 | 100 | ..... | 54 | 54 | 100 | 122 | 100 | 62 | 59 | 41 | 41 |
| 20 | 100 | 90 | ..... | 54 | 54 | 100 | 122 | 100 | 62 | 54 | 41 | 41 |
| 21 | 80 | 90 | ..... | 62 | 62 | 100 | 111 | 111 | 62 | 54 | 41 | 41 |
| 22 | 80 | 80 | ..... | 54 | 62 | 111 | 122 | 111 | 62 | 54 | 41 | 41 |
| 23 | 66 | 80 | ..... | 62 | 62 | 111 | 122 | 111 | 62 | 54 | 41 | 41 |
| 24 | 62 | 80 | ..... | 62 | 62 | 122 | 122 | 111 | 62 | 47 | 41 | 41 |
| 25 | 62 | 80 | ..... | 62 | 62 | 122 | 111 | 122 | 62 | 62 | 41 | 41 |
| 26 | 62 | 71 | ..... | 54 | 62 | 111 | 111 | 161 | 62 | 62 | 41 | 41 |
| 27 | 62 | 71 | ..... | 62 | 62 | 111 | 111 | 122 | 71 | 62 | 41 | 41 |
| 28 | 62 | 62 | ..... | 62 | 62 | 122 | 100 | 122 | 71 | 62 | 41 | 41 |
| 29 | 62 | 62 | ..... | 62 | ..... | 122 | 100 | 122 | 71 | 62 | 41 | 41 |
| 30 | 71 | 62 | ..... | 62 | ..... | 111 | 100 | 111 | 80 | 62 | 41 | 41 |
| 31 | 71 | ..... | 95 | 71 | ..... | 111 | ..... | 111 | ..... | 62 | 41 | ..... |

NOTE.—Daily discharge determined from a well-defined rating curve. Mean discharge Dec. 16–30 estimated as 80 second-feet, on account of ice.

*Monthly discharge of Shitike Creek at Warm Spring, Oreg., for the year ending Sept. 30, 1915.*

| Month. | Discharge in second-feet. | | | Run-off (total in acre-feet). | Accuracy. |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | | |
| October | 122 | 62 | 78.9 | 4,850 | A. |
| November | 147 | 62 | 93.2 | 5,550 | A. |
| December | 111 | ..... | 87.4 | 5,370 | C. |
| January | 100 | 47 | 63.8 | 3,920 | B. |
| February | 90 | 54 | 60.4 | 3,350 | A. |
| March | 122 | 59 | 90.6 | 5,570 | A. |
| April | 134 | 100 | 116 | 6,900 | A. |
| May | 175 | 100 | 118 | 7,260 | A. |
| June | 134 | 62 | 82.5 | 4,910 | A. |
| July | 90 | 47 | 67.7 | 4,160 | A. |
| August | 47 | 41 | 41.8 | 2,570 | A. |
| September | 47 | 36 | 41.2 | 2,450 | A. |
| The year | 175 | 36 | 78.5 | 56,900 | |

### TROUT CREEK NEAR ANTELOPE, OREG.

LOCATION.—In the NE. ¼ sec. 2, T. 9 S., R. 15 E., at J. H. Priday's ranch, about 2 miles above mouth of Antelope Creek, 15 miles east of Gateway, Jefferson County, and about 16 miles southwest of Antelope, Wasco County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—March 24 to August 31, 1915.

GAGE.—Vertical staff on right bank about 60 feet below a flume crossing and about 600 feet from Priday ranch house. Gage reader, Mrs. J. H. Priday.

DISCHARGE MEASUREMENTS.—Made by wading near gage.

CHANNEL AND CONTROL.—Stream bed of gravel and silt; one channel at all stages; no defined control.

EXTREMES OF DISCHARGE.—Maximum stage during period March to September was 2.7 feet April 3 (discharge 92 second-feet). Minimum discharge recorded, 0.2 second-foot (gage height, 0.55 foot), August 6 to September 18.

ICE.—No record secured during winter.

DIVERSIONS.—Several canals divert water for irrigation above station, mostly in the vicinity of Ashwood.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent between floods. Rating curve fairly well defined. Gage read twice a day to nearest tenth. Records fair.

COOPERATION.—Field data furnished by State engineer of Oregon.

*Discharge measurements of Trout Creek near Antelope, Oreg., during the year ending Sept. 30, 1915.*

[Made by Rhea Luper.]

| Date. | Gage height. | Discharge. |
|---|---|---|
| | *Feet.* | *Sec.-ft.* |
| Mar. 24 | 2.58 | 80 |
| May 18 | *a* 1.75 | 28.6 |
| June 15 | *a* 1.45 | 12.5 |

*a* Observer's reading; gage hard to read.

*Daily discharge, in second-feet, of Trout Creek near Antelope, Oreg., during the year ending Sept. 30, 1915.*

| Day. | Mar. | Apr. | May. | June. | July. | Aug. | Day. | Mar. | Apr. | May. | June. | July. | Aug. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | ..... | 80 | 29 | 12 | 1.5 | 0.5 | 16 | ..... | 40 | 28 | 7 | 0.8 | 0.2 |
| 2 | ..... | 88 | 32 | 12 | 1.5 | .5 | 17 | ..... | 34 | 26 | 3 | .8 | .2 |
| 3 | ..... | 92 | 32 | 8 | 1.2 | .5 | 18 | ..... | 34 | 26 | 3.5 | .8 | .2 |
| 4 | ..... | 84 | 29 | 8 | 1.2 | .5 | 19 | ..... | 34 | 24 | 3.5 | .8 | .2 |
| 5 | ..... | 68 | 29 | 7 | 1.0 | .5 | 20 | ..... | 34 | 24 | 3.5 | .5 | .2 |
| 6 | ..... | 50 | 26 | 7 | 1.0 | .5 | 21 | ..... | 29 | 22 | 2.5 | .5 | .2 |
| 7 | ..... | 54 | 24 | 7 | 1.0 | .5 | 22 | ..... | 29 | 22 | 2.5 | .5 | .2 |
| 8 | ..... | 54 | 22 | 6 | 1.0 | .5 | 23 | ..... | 29 | 2[illegible] | 2.5 | .5 | .2 |
| 9 | ..... | 50 | 15 | 6 | 1.0 | .5 | 24 | 84 | 29 | 23 | 1.5 | .5 | .2 |
| 10 | ..... | 47 | 15 | 7 | 1.0 | .5 | 25 | 76 | 29 | 23 | 1.5 | .5 | .2 |
| 11 | ..... | 44 | 15 | 9 | 1.0 | .5 | 26 | 64 | 29 | 2[illegible] | 2.0 | .5 | .2 |
| 12 | ..... | 54 | 10 | 9 | 1.0 | .5 | 27 | 61 | 29 | 2[illegible] | 2.0 | .5 | .2 |
| 13 | ..... | 58 | 12 | 9 | 1.0 | .5 | 28 | 61 | 26 | 22 | 1.5 | .5 | .2 |
| 14 | ..... | 47 | 29 | 14 | 1.0 | .5 | 29 | 88 | 26 | 2[illegible] | 1.5 | .5 | .2 |
| 15 | ..... | 47 | 29 | 14 | .8 | .5 | 30 | 84 | 26 | 22 | 1.5 | .5 | .2 |
| | | | | | | | 31 | 84 | ..... | 9 | ..... | .5 | .2 |

*Monthly discharge of Trout Creek near Antelope, Oreg., for the year ending Sept. 30, 1915.*

| Month. | Discharge in second-feet. | | | Run-off (total in acre-feet). |
|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | |
| March 24–31 | 88 | 61 | 75.2 | 1,190 |
| April | 92 | 26 | 45.8 | 2,730 |
| May | 32 | 9 | 23.1 | 1,420 |
| June | 14 | 1.5 | 5.82 | 346 |
| July | 1.5 | .5 | .82 | 50 |
| August | .5 | .2 | .35 | 22 |
| The period | ..... | ..... | ..... | 5,760 |

### TROUT CREEK NEAR GATEWAY, OREG.

LOCATION.—In the SE. ¼ sec. 18, T. 9 S., R 15. E., at Cram's lower ranch, just above mouth of Hay Creek, about 10 miles east of Gateway, Jefferson County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—March 25 to August 7, 1915.

GAGE.—Inclined staff on right bank. Gage reader, Mrs. F. A. Moore.

DISCHARGE MEASUREMENTS.—Made by wading at gage.

CHANNEL AND CONTROL.—Gravel; shifting during floods.

EXTREMES OF DISCHARGE.—Maximum stage during period of records, 2.6 feet March 31 (discharge, 130 second-feet). Stream bed practically dry in April and August, 1915.

ICE.—No record during period when stream was frozen.

DIVERSIONS.—Large area irrigated above station.

REGULATION.—None.

ACCURACY.—Stage-discharge relation fairly permanent between floods; fairly well defined rating curve used. Gage read once daily to half tenths. Records good for days when gage was read except those above 25 second-feet, which are fair.

COOPERATION.—Field data furnished by State Engineer of Oregon.

*Discharge measurements of Trout Creek near Gateway, Oreg., during the year ending Sept. 30, 1915.*

[Made by Rhea Luper.]

| Date. | Gage height. | Discharge. |
|---|---|---|
| | *Feet.* | *Sec.-ft.* |
| Mar. 25 | 2.17 | 74 |
| May 18 | 1.69 | 20.5 |

*Daily discharge, in second-feet, of Trout Creek near Gateway, Oreg., during the year ending Sept. 30, 1915.*

| Day. | Mar. | Apr. | May. | June. | July. | Aug. | Day. | Mar. | Apr. | May. | June. | July. | Aug. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | ..... | 102 | 2 | ..... | 4 | 11 | 16 | ..... | 28 | ..... | 11 | 20 | ..... |
| 2 | ..... | 102 | 2 | ..... | 4 | 108 | 17 | ..... | 11 | ..... | 11 | 20 | ..... |
| 3 | ..... | 115 | 11 | ..... | 4 | 11 | 18 | ..... | ..... | 21 | 28 | 20 | ..... |
| 4 | ..... | 64 | 11 | ..... | 9 | 11 | 19 | ..... | ..... | ..... | 35 | 20 | ..... |
| 5 | ..... | 96 | 11 | ..... | 11 | 2 | 20 | ..... | ..... | ..... | 35 | 23 | ..... |
| 6 | ..... | 55 | 11 | ..... | 13 | 2 | 21 | ..... | ..... | ..... | 33 | 16 | ..... |
| 7 | ..... | 44 | 11 | ..... | 13 | ..... | 22 | ..... | 4 | ..... | 24 | 13 | ..... |
| 8 | ..... | 33 | 11 | ..... | 16 | ..... | 23 | ..... | 2 | ..... | 9 | 13 | ..... |
| 9 | ..... | 22 | ..... | ..... | 22 | ..... | 24 | ..... | 2 | ..... | 2 | 11 | ..... |
| 10 | ..... | 22 | ..... | ..... | 22 | ..... | 25 | 78 | 2 | ..... | 4 | 11 | ..... |
| 11 | ..... | 22 | ..... | ..... | 22 | ..... | 26 | 60 | 13 | ..... | 2 | 11 | ..... |
| 12 | ..... | 33 | ..... | ..... | 22 | ..... | 27 | 55 | 2 | ..... | 2 | 11 | ..... |
| 13 | ..... | 33 | ..... | ..... | 20 | ..... | 28 | 55 | ..... | ..... | 2 | 13 | ..... |
| 14 | ..... | 33 | ..... | 25 | 20 | ..... | 29 | 115 | ..... | ..... | 2 | 13 | ..... |
| 15 | ..... | 22 | ..... | 13 | 16 | ..... | 30 | 57 | 2 | ..... | 2 | 13 | ..... |
| | | | | | | | 31 | 130 | ..... | ..... | ..... | 13 | ..... |

### HAY CREEK NEAR HAY CREEK, OREG.

LOCATION.—In the N. ½ sec. 5, T. 11 S., R. 15 E., at McCue's ranch, 5 miles above mouth, 1½ miles north of Hay Creek post office, Jefferson County.

RECORDS AVAILABLE.—March 26 to September 30, 1915.

GAGE.—Inclined staff on right bank. Gage reader, Mrs. C. E. McCue.

DISCHARGE MEASUREMENTS.—Made by wading near gage.

CHANNEL AND CONTROL.—Rocky and permanent; control about 18 feet below gage.

EXTREMES OF DISCHARGE.—Maximum stage recorded March 26 to August 10, 1915, 4.6 feet July 30 (discharge, 1.2 second-feet); minimum stage recorded, 4.4 feet July 17 to 24 (discharge, 0.4 second-foot).

ICE.—No records during winter.

DIVERSIONS.—Considerable water diverted for irrigation above the station.

REGULATION.—None.

ACCURACY.—Stage-discharge relation fairly permanent. Rating curve poorly defined. Gage read daily to quarter tenths. Records poor.

A weir measurement of 0.5 second-foot on September 21 was made by C. E. Stricklin, assistant to State Engineer of Oregon.

*Daily discharge, in second-feet, of Hay Creek near Hay Creek, Oreg., during the year ending Sept. 30, 1915.*

| Day. | Mar. | Apr. | May. | June. | July. | Aug. | Day. | Mar. | Apr. | May. | June. | July. | Aug. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | ..... | 0.8 | 1.0 | 1.1 | 0.7 | 0.7 | 16 | ..... | 1.0 | 1.0 | 1.0 | 0.7 | ..... |
| 2 | ..... | .8 | 1.0 | 1.1 | .7 | ..... | 17 | ..... | 1.0 | 1.0 | 1.0 | .4 | ..... |
| 3 | ..... | .8 | 1.0 | .7 | .7 | ..... | 18 | ..... | 1.0 | 1.0 | 1.0 | .4 | ..... |
| 4 | ..... | .8 | 1.0 | .7 | .7 | .7 | 19 | ..... | 1.0 | 1.0 | 1.0 | .4 | ..... |
| 5 | ..... | .8 | 1.0 | .7 | .7 | ..... | 20 | ..... | 1.0 | 1.0 | .7 | .4 | ..... |
| 6 | ..... | .8 | .7 | .7 | .7 | ..... | 21 | ..... | 1.0 | 1.1 | .7 | .4 | ..... |
| 7 | ..... | .8 | .8 | .7 | .7 | .7 | 22 | ..... | 1.0 | 1.1 | .7 | .4 | ..... |
| 8 | ..... | .8 | .8 | .8 | .7 | ..... | 23 | ..... | 1.0 | 1.1 | .7 | .4 | ..... |
| 9 | ..... | .8 | .8 | .8 | .7 | ..... | 24 | ..... | 1.0 | 1.1 | .7 | .4 | ..... |
| 10 | ..... | .8 | 1.0 | .8 | .7 | .7 | 25 | ..... | 1.0 | 1.1 | .7 | .5 | ..... |
| 11 | ..... | .8 | 1.0 | .9 | .7 | ..... | 26 | 1.0 | 1.0 | 1.1 | .7 | .6 | ..... |
| 12 | ..... | .8 | 1.0 | .9 | .7 | ..... | 27 | .8 | 1.0 | 1.1 | .7 | .7 | ..... |
| 13 | ..... | 1.0 | .8 | 1.0 | .7 | ..... | 28 | .8 | 1.0 | 1.1 | .7 | .7 | ..... |
| 14 | ..... | 1.0 | .8 | 1.0 | .7 | ..... | 29 | .8 | 1.0 | 1.1 | .7 | 1.0 | ..... |
| 15 | ..... | 1.0 | 1.0 | 1.0 | .7 | ..... | 30 | 1.0 | 1.0 | 1.1 | .7 | 1.2 | ..... |
| | | | | | | | 31 | .8 | ..... | 1.1 | ..... | 1.0 | ..... |

*Monthly discharge of Hay Creek near Hay Creek, Oreg., for the year ending Sept. 30, 1915.*

| Month. | Discharge in second-feet. | | | Run-off (total in acre-feet). |
|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | |
| March 26–31 | 1.0 | 0.8 | 0.87 | 10 |
| April | 1.0 | .8 | .92 | 55 |
| May | 1.1 | .7 | .99 | 61 |
| June | 1.1 | .7 | .82 | 49 |
| July | 1.2 | .4 | .65 | 40 |
| August | .7 | ..... | a.6 | 37 |
| September | ..... | ..... | a.5 | 28 |
| The period | ..... | ..... | ..... | 280 |

a Estimated.

### WARM SPRINGS RIVER AT HE HE SAWMILL, NEAR WARM SPRING, OREG.

LOCATION.—In the SW. ¼ sec. 7, T. 7 S., R. 11 E., at new sawmill above Badger Creek and about 23 miles northwest of Warm Spring; station is in Wasco County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—June 4 to 27, 1915, and a few measurements during summer.

GAGE.—Vertical staff on right bank 200 feet above sawmill. Gage reader, Paul Queakpama.

DISCHARGE MEASUREMENTS.—Made by wading.

CHANNEL AND CONTROL.—Gravel and small boulders; may shift in extreme floods.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of record, 1.20 feet June 4 to 6, 15 to 17, 19 (discharge, 123 second-feet); minimum stage recorded, 1.10 feet at times of measurement in July and September (discharge, 97 second-feet.)

WINTER FLOW.—No data.

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Results good for days when gage was read.

*Discharge measurements of Warm Springs River at He He sawmill, near Warm Spring, Oreg., during the year ending Sept. 30, 1915.*

[Made by C. L. Batchelder.]

| Date. | Gage height. | Discharge. | Date. | Gage height. | Discharge. |
|---|---|---|---|---|---|
| | *Feet.* | *Sec.-ft.* | | *Feet.* | *Sec.-ft.* |
| June 4 | 1.19 | 120 | June 30 | 1.14 | [a] 109 |
| 30 | 1.14 | 102 | Sept. 5 | 1.10 | 97.1 |

[a] Better measurement than previous one.

*Daily discharge, in second-feet, of Warm Springs River at He He sawmill, near Warm Spring, Oreg., for the year ending Sept. 30, 1915.*

| Day. | June. | July. | Aug. | Sept. | Day. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | | 16 | 102 | | | |
| 2 | | | | | 17 | 102 | | | |
| 3 | | | | | 18 | 109 | | | |
| 4 | 123 | | | | 19 | 109 | | | |
| 5 | 123 | | | 97 | 20 | 109 | | | |
| 6 | 123 | | | | 21 | 109 | | | |
| 7 | 117 | | | | 22 | 109 | | | |
| 8 | 109 | | | | 23 | 109 | | | |
| 9 | 123 | | | | 24 | 109 | | | |
| 10 | 109 | | | | 25 | 109 | | | |
| 11 | 117 | | | | 26 | 117 | | | |
| 12 | 117 | | | | 27 | 117 | | | |
| 13 | 117 | | | | 28 | | | | |
| 14 | 109 | | | | 29 | | | | |
| 15 | 102 | | | | 30 | 106 | 97 | 97 | |
| | | | | | 31 | | | | |

NOTE.—Discharge determined from a rating curve well defined for range of stage observed.

### WARM SPRINGS RIVER NEAR WARM SPRING, OREG.

LOCATION.—In the NE. ¼ sec. 19, T. 8 S., R. 13 E., at bridge on road between Warm Spring and Simnasho, 9 miles from the former and 15 miles from the latter; station is in Wasco County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—July 29, 1911, to September 30, 1915 (fragmentary prior to July 1, 1914).

GAGE.—Stevens water-stage recorder since July 1, 1914; fastened to downstream side of right abutment. Gage reader, Willie Palmer. Vertical staffs spiked to upstream side of right abutment of old bridge July 29, 1911, to July 1, 1914.

DISCHARGE MEASUREMENTS.—Made from upstream side of bridge or by wading.

CHANNEL AND CONTROL.—Gravel; practically permanent.

EXTREMES OF DISCHARGE.—Maximum stage during year from water-stage recorder, 1.62 feet from 3 to 7 a. m. April 4 (discharge, 642 second-feet); minimum stage from water-stage recorder, 0.73 foot January 15 (discharge, 192 second-feet).

1911–1915: Maximum stage recorded, 2.2 feet May 14, 1912 (discharge, 940 second-feet). This may have been exceeded between readings.

WINTER FLOW.—River probably never freezes, as there are hot springs just above bridge.

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Results since recorder was installed are considered excellent; earlier records poor on account of fragmentary and uncertain gage records.

*Discharge measurements of Warm Springs River near Warm Spring, Oreg., during the year ending Sept. 30, 1915.*

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---|---|---|---|---|---|---|---|
| | | *Feet.* | *Sec.-ft.* | | | *Feet.* | *Sec.-ft.* |
| Oct. 24 | P. V. Hodges | 0.93 | 266 | June 3 | C. L. Batchelder | 1.06 | 340 |
| Nov. 29 | C. G. Paulsen | .95 | 250 | 28 | do | .91 | 264 |
| Mar. 6 | P. V. Hodges | 1.18 | 384 | Sept. 4 | do | .84 | 232 |

*Daily discharge, in second-feet, of Warm Springs River near Warm Spring, Oreg., for the year ending Sept. 30, 1915.*

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 264 | 258 | 252 | 270 | 249 | 328 | 486 | 415 | 336 | 266 | 249 | 241 |
| 2 | 264 | 258 | 255 | 264 | 258 | 324 | 528 | 410 | 341 | 266 | 254 | 241 |
| 3 | 267 | 261 | 255 | 264 | 252 | 355 | 606 | 400 | 332 | 266 | 254 | 241 |
| 4 | 274 | 261 | 255 | 252 | 246 | 480 | 630 | 400 | 336 | 266 | 254 | 237 |
| 5 | 274 | 261 | 255 | 249 | 246 | 445 | 600 | 385 | 336 | 266 | 254 | 237 |
| 6 | 264 | 264 | 249 | 243 | 249 | 410 | 576 | 370 | 332 | 266 | 254 | 237 |
| 7 | 261 | 264 | 346 | 240 | 249 | 400 | 564 | 365 | 323 | 266 | 249 | 237 |
| 8 | 258 | 264 | 246 | 240 | 249 | 400 | 552 | 365 | 323 | 266 | 249 | 241 |
| 9 | 258 | 261 | 243 | 234 | 252 | 375 | 540 | 375 | 318 | 266 | 249 | 237 |
| 10 | 255 | 261 | 240 | 234 | 252 | 346 | 516 | 390 | 305 | 266 | 249 | 241 |
| 11 | 252 | 261 | 237 | 231 | 252 | 346 | 516 | 456 | 310 | 266 | 249 | 245 |
| 12 | 249 | 261 | 234 | 246 | 252 | 341 | 528 | 510 | 314 | 266 | 249 | 254 |
| 13 | 240 | 286 | 228 | 255 | 246 | 365 | 540 | 528 | 310 | 266 | 249 | 262 |
| 14 | 234 | 310 | 213 | 234 | 246 | 400 | 528 | 492 | 305 | 266 | 249 | 266 |
| 15 | 219 | 298 | 208 | 198 | 249 | 425 | 516 | 462 | 292 | 266 | 245 | 266 |
| 16 | 213 | 286 | 219 | 240 | 249 | 435 | 510 | 430 | 292 | 266 | 245 | 262 |
| 17 | 219 | 278 | 222 | 246 | 246 | 435 | 510 | 425 | 288 | 266 | 245 | 258 |
| 18 | 222 | 274 | 219 | 243 | 261 | 440 | 510 | 420 | 288 | 262 | 245 | 254 |
| 19 | 234 | 270 | 222 | 243 | 267 | 435 | 510 | 415 | 288 | 262 | 241 | 249 |
| 20 | 258 | 267 | 222 | 240 | 275 | 420 | 516 | 410 | 284 | 262 | 241 | 249 |
| 21 | 261 | 261 | 222 | 234 | 270 | 420 | 510 | 400 | 284 | 258 | 241 | 249 |
| 22 | 255 | 258 | 222 | 231 | 278 | 430 | 486 | 390 | 284 | 258 | 241 | 249 |
| 23 | 255 | 255 | 228 | 216 | 274 | 456 | 468 | 385 | 284 | 258 | 241 | 249 |
| 24 | 252 | 255 | 228 | 219 | 332 | 486 | 450 | 380 | 279 | 258 | 241 | 254 |
| 25 | 252 | 255 | 228 | 213 | 390 | 498 | 450 | 380 | 275 | 258 | 241 | 254 |
| 26 | 252 | 255 | 228 | 228 | 346 | 486 | 420 | 375 | 275 | 254 | 241 | 254 |
| 27 | 252 | 255 | 228 | 234 | 324 | 456 | 410 | 365 | 271 | 254 | 241 | 254 |
| 28 | 252 | 255 | 228 | 234 | 310 | 425 | 410 | 365 | 266 | 254 | 241 | 254 |
| 29 | 249 | 255 | 228 | 234 | ..... | 456 | 410 | 370 | 266 | 254 | 241 | 254 |
| 30 | 249 | 255 | 228 | 234 | ..... | 474 | 415 | 360 | 266 | 249 | 241 | 254 |
| 31 | 249 | ..... | 246 | 237 | ..... | 486 | ..... | 350 | ..... | 249 | 241 | ..... |

NOTE.—Discharge determined from two well-defined rating curves, applicable Oct. 1 to Mar. 3 and Mar. 4 to Sept. 30, respectively. Discharge interpolated July 3–10 and Aug. 19 to Sept. 3.

*Monthly discharge of Warm Springs River near Warm Spring, Oreg., for the year ending Sept. 30, 1915.*

| Month. | Discharge in second-feet. | | | Run-off (total in acre-feet). | Accuracy. |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | | |
| October | 274 | 213 | 250 | 15,400 | B. |
| November | 310 | 255 | 265 | 15,800 | A. |
| December | 255 | 208 | 233 | 14,300 | B. |
| January | 270 | 198 | 238 | 14,600 | B. |
| February | 390 | 246 | 270 | 15,000 | B. |
| March | 498 | 324 | 419 | 25,800 | A. |
| April | 630 | 410 | 507 | 30,200 | A. |
| May | 528 | 350 | 405 | 24,900 | A. |
| June | 341 | 266 | 300 | 17,900 | A. |
| July | 266 | 249 | 262 | 16,100 | A. |
| August | 254 | 241 | 246 | 15,100 | A. |
| September | 266 | 237 | 249 | 14,800 | A. |
| The year | 630 | 198 | 304 | 220,000 | |

### MILL CREEK NEAR WARM SPRING, OREG.

LOCATION.—In or near sec. 20, T. 8 S., R. 10 E., unsurveyed, 500 feet below Indian Office sawmill, about 6 miles above mouth of Boulder Creek, and 20 miles northwest of Warm Spring, Jefferson County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—June 5 to September 30, 1915.

GAGE.—Vertical staff about 30 feet above wagon bridge; read occasionally. Gage reader, C. R. Garvey.

DISCHARGE MEASUREMENTS.—Made by wading.

CHANNEL AND CONTROL.—Heavy gravel; fairly permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of records, 1.35 feet June 5 (discharge, 71 second-feet); minimum stage recorded, 0.88 foot and 19 (discharge, 37 second-feet).

WINTER FLOW.—No data.

DIVERSIONS.—None.

REGULATION.—None; mill not used at present.

ACCURACY.—Daily discharge records for days when gage was read, good.

*Discharge measurements of Mill Creek near Warm Spring, Oreg., during the year ending Sept. 30, 1915.*

[Made by L. C. Batchelder.]

| Date. | Gage height. | Discharge. |
|---|---|---|
| | *Feet.* | *Sec.-ft.* |
| June 5 | 1.35 | 70.5 |
| 29 | 1.00 | 46.2 |
| Sept. 5 | .89 | 36.8 |

*Daily discharge, in second-feet, of Mill Creek near Warm Spring, Oreg., for the year ending Sept. 30, 1915.*

| Day. | June. | July. | Aug. | Sept. | Day. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | | 16 | | | | |
| 2 | | | | | 17 | 52 | | | |
| 3 | | | | | 18 | | | | |
| 4 | | | 38 | | 19 | | | 37 | |
| 5 | 71 | | 37 | 37 | 20 | | | 38 | |
| 6 | | 45 | | | 21 | | | | |
| 7 | | 44 | | | 22 | | | | |
| 8 | 63 | 45 | | | 23 | | | | |
| 9 | | 45 | | | 24 | | | | |
| 10 | 58 | | | | 25 | 48 | | | |
| 11 | | | | | 26 | | | | |
| 12 | | | | | 27 | | | | |
| 13 | | | | | 28 | | | | |
| 14 | | | | | 29 | 45 | 38 | | |
| 15 | | | | | 30 | | 38 | | 38 |
| | | | | | 31 | | | | |

NOTE.—Discharge determined from well-defined rating curve; given only for days on which gage was read.

### WHITE RIVER NEAR TYGH VALLEY, OREG.

LOCATION.—In the SW. ¼ sec. 10, T. 4 S., R. 13 E., a mile south of Tygh Valley, Wasco County, a mile above mouth of Tygh Creek, and 4 miles above the Tygh Valley plant of Pacific Power & Light Co. at the fall of White River.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—June 18, 1911, to September 30, 1915.

GAGE.—Vertical staff on lower corner of left pier of highway bridge; read once daily. Gage reader, Gertrude Brown.

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

CHANNEL AND CONTROL.—Gravel and sand; slightly shifting. White River carries a heavy load of glacial sediment at times.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 1.92 feet at 8 a. m. April 3 (discharge, 797 second-feet); minimum stage recorded, 0.30 foot September 7, 20, 24, and 27 (discharge, 82 second-feet).

1911–1915: Maximum stage recorded, 5.3 feet January 9, 1912 (probably ice-affected); maximum when channel was clear, 3.5 feet January 13, 1912 (discharge, 2,050 second-feet). Minimum is that of 1915.

WINTER FLOW.—Stage-discharge relation affected by ice for short periods; ice jams occasionally form during extremely cold weather.

DIVERSIONS.—Probably no diversion from White River above station, although diversion of water for irrigation of lands south of lower White River is feasible.

REGULATION.—None.

ACCURACY.—Results considered good.

*Discharge measurements of White River near Tygh Valley, Oreg., during the year ending Sept. 30, 1915.*

| Date. | Made by— | Gage height. | Discharge. |
|---|---|---|---|
| | | *Feet.* | *Sec.-ft.* |
| Oct. 22 | P. V. Hodges | 0.60 | 180 |
| Aug. 17 | C. L. Batchelder | .44 | 127 |
| Sept. 3 | ....do | .37 | 96.7 |

*Daily discharge, in second-feet, of White River near Tygh Valley, Oreg., for the year ending Sept. 30, 1915.*

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 130 | 156 | 180 | 180 | 210 | 410 | 485 | 320 | 245 | 152 | 142 | 104 |
| 2 | 165 | 156 | 180 | 180 | 245 | 410 | 560 | 300 | 228 | 152 | 136 | 96 |
| 3 | 180 | 195 | 180 | 165 | 245 | 360 | 785 | 300 | 228 | 152 | 136 | 104 |
| 4 | 165 | 186 | 180 | 180 | 238 | 410 | 642 | 308 | 228 | 152 | 129 | 104 |
| 5 | 150 | 180 | 180 | 180 | 228 | 385 | 560 | 300 | 228 | 152 | 129 | 96 |
| 6 | 150 | 217 | 180 | 186 | 238 | 360 | 535 | 300 | 210 | 152 | 129 | 96 |
| 7 | 150 | 180 | 180 | 180 | 228 | 320 | 560 | 300 | 210 | 162 | 129 | 82 |
| 8 | 150 | 180 | 180 | 195 | 210 | 300 | 510 | 300 | 210 | 169 | 129 | 96 |
| 9 | 150 | 180 | 180 | 204 | 217 | 280 | 485 | 340 | 210 | 169 | 129 | 96 |
| 10 | 145 | 186 | 180 | 180 | 238 | 245 | 460 | 360 | 200 | 152 | 129 | 96 |
| 11 | 165 | 180 | 180 | 180 | 228 | 245 | 460 | 340 | 210 | 152 | 129 | 96 |
| 12 | 186 | 195 | 165 | 180 | 238 | 245 | 510 | 360 | 228 | 152 | 129 | 110 |
| 13 | 180 | 195 | 165 | 180 | 262 | 245 | 510 | 385 | 193 | 152 | 129 | 116 |
| 14 | 165 | 228 | 195 | 485 | 238 | 300 | 485 | 340 | 193 | 152 | 129 | 126 |
| 15 | 156 | 210 | 195 | 238 | 228 | 340 | 435 | 300 | 193 | 152 | 129 | 110 |
| 16 | 150 | 210 | 195 | 180 | 248 | 385 | 460 | 308 | 186 | 152 | 120 | 110 |
| 17 | 150 | 180 | 195 | 195 | 280 | 360 | 460 | 300 | 186 | 169 | 126 | 96 |
| 18 | 150 | 186 | 195 | 180 | 340 | 360 | 460 | 300 | 176 | 152 | 126 | 110 |
| 19 | 228 | 186 | 150 | 180 | 320 | 360 | 485 | 280 | 176 | 152 | 126 | 116 |
| 20 | 210 | 195 | 150 | 180 | 340 | 340 | 460 | 280 | 176 | 152 | 116 | 82 |
| 21 | 195 | 195 | 150 | 186 | 410 | 360 | 435 | 262 | 159 | 176 | 126 | 88 |
| 22 | 180 | 180 | 150 | 180 | 360 | 410 | 410 | 262 | 159 | 169 | 110 | 88 |
| 23 | 165 | 195 | 150 | 174 | 340 | 460 | 385 | 262 | 159 | 152 | 116 | 96 |
| 24 | 156 | 195 | 165 | 165 | 410 | 535 | 410 | 280 | 159 | 152 | 110 | 82 |
| 25 | 156 | 180 | 195 | 165 | 535 | 485 | 360 | 262 | 159 | 152 | 116 | 88 |
| 26 | 150 | 180 | 195 | 150 | 410 | 435 | 340 | 262 | 176 | 152 | 110 | 88 |
| 27 | 150 | 180 | 195 | 180 | 385 | 385 | 360 | 280 | 166 | 152 | 110 | 82 |
| 28 | 150 | 186 | 210 | 180 | 340 | 360 | 385 | 320 | 159 | 152 | 110 | 88 |
| 29 | 150 | 180 | 180 | 186 | ..... | 460 | 340 | 280 | 152 | 152 | 110 | 96 |
| 30 | 150 | 180 | 180 | 195 | ..... | 435 | 320 | 262 | 159 | 153 | 110 | 96 |
| 31 | 150 | ..... | 180 | 195 | ..... | 460 | ..... | 262 | ..... | 136 | 110 | ..... |

NOTE.—Discharge determined as follows: Oct. 1 to Apr. 3 from a well-defined rating curve; Apr. 4 to Sept. 30, from a fairly well-defined rating curve; curves are the same above 2,000 second-feet. Discharge estimated as 150 second-feet Dec. 19–23, when stage-discharge relation was affected by ice.

*Monthly discharge of White River near Tygh Valley, Oreg., for the year ending Sept. 30, 1915.*

| Month. | Discharge in second-feet. | | | Run-off (total in acre-feet). | Accuracy. |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | | |
| October | 228 | 130 | 162 | 9,960 | B. |
| November | 228 | 156 | 188 | 11,200 | B. |
| December | 210 | 150 | 179 | 11,000 | B. |
| January | 485 | 150 | 192 | 11,800 | B. |
| February | 535 | 210 | 293 | 16,300 | B. |
| March | 535 | 245 | 369 | 22,700 | B. |
| April | 785 | 320 | 468 | 27,800 | B. |
| May | 385 | 262 | 300 | 18,400 | B. |
| June | 245 | 152 | 191 | 11,400 | B. |
| July | 176 | 136 | 155 | 9,530 | B. |
| August | 142 | 110 | 123 | 7,560 | B. |
| September | 126 | 82 | 97.8 | 5,820 | B. |
| The year | 785 | 82 | 226 | 163,000 | |

## KLICKITAT RIVER BASIN.

### KLICKITAT RIVER NEAR GLENWOOD, WASH.

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

DRAINAGE AREA.—356 square miles.

RECORDS AVAILABLE.—December 16, 1910, to September 30, 1915, at present site; October 9, 1909, to December 15, 1910, at a point a mile above, in section 11.

GAGE.—Stevens continuous water-stage recorder referred to vertical staff on left bank. Gage reader, A. G. Hanson. Prior to July 19, 1910, several vertical staffs were used.

DISCHARGE MEASUREMENTS.—Made at a cable bridge just below gage.

CHANNEL AND CONTROL.—Heavy gravel; may shift during high water.

EXTREMES OF DISCHARGE.—Maximum stage during year from water-stage recorder, 2.62 feet at 1 a. m. April 3 (discharge, 2,200 second-feet); minimum stage from water-stage recorder, 0.55 foot at 11 a.m. January 22 (discharge, 302 second-feet).

1909–1915: Maximum stage recorded, 5.20 feet on original gage November 24, 1909 (discharge, estimated by extension of rating curve, 6,250 second-feet). Minimum, that of 1915.

WINTER FLOW.—Stage-discharge relation unaffected by ice.

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Results considered excellent.

*Discharge measurements of Klickitat River near Glenwood, Wash., during the year ending Sept. 30, 1915.*

[Made by A. G. Hanson.]

| Date. | Gage height. | Discharge. | Date. | Gage height. | Discharge. |
|---|---|---|---|---|---|
| | *Feet.* | *Sec.-ft.* | | *Feet.* | *Sec.-ft.* |
| Feb. 20 | 0.74 | 376 | July 25 | 1.09 | 545 |
| April 18 | 2.22 | 1680 | Aug. 29 | 1.08 | 581 |
| May 23 | 1.62 | 900 | Sept. 18 | .82 | 393 |
| June 13 | 1.35 | 716 | | | |

*Daily discharge, in second-feet, of Klickitat River near Glenwood, Wash., for the year ending Sept. 30, 1915.*

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 527 | 719 | ..... | 452 | 419 | 436 | 1,280 | 1,110 | 965 | 692 | 532 | 436 |
| 2 | 551 | 839 | ..... | 441 | 408 | 430 | 1,960 | 1,110 | 920 | 700 | 563 | 424 |
| 3 | 539 | 1,280 | ..... | 430 | 402 | 424 | 2,100 | 1,060 | 880 | 708 | 538 | 436 |
| 4 | 515 | 1,120 | ..... | 424 | 392 | 446 | 1,820 | 1,010 | 880 | 692 | 502 | 460 |
| 5 | 515 | 938 | ..... | 424 | 402 | 441 | 1,610 | 1,010 | 880 | 671 | 502 | 448 |
| 6 | 515 | 839 | ..... | 424 | 397 | 441 | 1,470 | 1,010 | 920 | 636 | 526 | 402 |
| 7 | 515 | 762 | ..... | 424 | 397 | 441 | 1,470 | 1,060 | 880 | 615 | 502 | 392 |
| 8 | 509 | 712 | ..... | 430 | 397 | 441 | 1,400 | 1,110 | 840 | 692 | 496 | 402 |
| 9 | 503 | 691 | ..... | 419 | 397 | 441 | 1,280 | 1,280 | 800 | 629 | 490 | 386 |
| 10 | 551 | 657 | ..... | 414 | 397 | 441 | 1,280 | 1,280 | 760 | 582 | 496 | 370 |
| 11 | 551 | 684 | ..... | 414 | 380 | 441 | 1,400 | 1,220 | 738 | 570 | 496 | 364 |
| 12 | 612 | 785 | ..... | 419 | 392 | 446 | 1,470 | 1,160 | 723 | 576 | 490 | 370 |
| 13 | 618 | 1,120 | ..... | 419 | 392 | 463 | 1,470 | 1,110 | 723 | 550 | 478 | 358 |
| 14 | 599 | 938 | ..... | 424 | 370 | 551 | 1,340 | 1,010 | 723 | 538 | 478 | 358 |
| 15 | 593 | 808 | ..... | 414 | 380 | 664 | 1,340 | 965 | 715 | 520 | 490 | 370 |
| 16 | 581 | 740 | ..... | 370 | 397 | 684 | 1,400 | 920 | 723 | 526 | 490 | 380 |
| 17 | 587 | 684 | ..... | 402 | 414 | 684 | 1,540 | 1,110 | 745 | 526 | 478 | 397 |
| 18 | 624 | 657 | ..... | 402 | 414 | 691 | 1,680 | 1,110 | 715 | 530 | 478 | 402 |
| 19 | 785 | 664 | ..... | 397 | 402 | 677 | 1,750 | 1,060 | 685 | 534 | 496 | 402 |
| 20 | 726 | 698 | ..... | 380 | 397 | 677 | 1,750 | 1,010 | 671 | 540 | 496 | 397 |
| 21 | 670 | 670 | ..... | 386 | 397 | 740 | 1,540 | 965 | 664 | 545 | 508 | 402 |
| 22 | 638 | 650 | ..... | 335 | 408 | 808 | 1,400 | 965 | 671 | 550 | 520 | 397 |
| 23 | 605 | 644 | ..... | 360 | 408 | 938 | 1,280 | 965 | 678 | 555 | 532 | 392 |
| 24 | 593 | 638 | ..... | 350 | 452 | 938 | 1,220 | 965 | 671 | 559 | 526 | 392 |
| 25 | 575 | 631 | ..... | 360 | 463 | 895 | 1,220 | 920 | 643 | 563 | 508 | 397 |
| 26 | 569 | 625 | ..... | 397 | 441 | 831 | 1,160 | 920 | 629 | 538 | 508 | 397 |
| 27 | 563 | 618 | 446 | 419 | 430 | 778 | 1,160 | 1,010 | 615 | 508 | 496 | 386 |
| 28 | 557 | 612 | 446 | 424 | 436 | 823 | 1,160 | 1,220 | 602 | 490 | 514 | 386 |
| 29 | 551 | 606 | 441 | 419 | ..... | 887 | 1,220 | 1,110 | 622 | 502 | 526 | 397 |
| 30 | 569 | 600 | 441 | 414 | ..... | 988 | 1,160 | 1,010 | 657 | 526 | 538 | 397 |
| 31 | 612 | ..... | 441 | 408 | ..... | 895 | ..... | 965 | ..... | 520 | 460 | ..... |

NOTE.—Discharge determined as follows: Oct. 1 to Apr. 3, from a well-defined rating curve; Apr. 4 to Sept. 30, from a rating curve well defined between 375 and 1,000 second-feet. Discharge Nov. 25–26, interpolated; Nov. 28–30, estimated. Mean discharge Dec. 1–26, estimated as 500 second-feet by comparison with records of White Salmon River (recorder not working during this period).

*Monthly discharge of Klickitat River near Glenwood, Wash., for the year ending Sept. 30, 1915.*

[Drainage area, 356 square miles.]

| Month. | Discharge in second-feet. | | | | Run-off. | | Accuracy. |
|---|---|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | Per square mile. | Depth in inches on drainage area. | Total in acre-feet. | |
| October | 785 | 503 | 581 | 1.63 | 1.88 | 35,700 | B. |
| November | 1,280 | 600 | 754 | 2.12 | 2.36 | 44,900 | A. |
| December | | 441 | 491 | 1.38 | 1.59 | 30,200 | C. |
| January | 452 | 335 | 406 | 1.14 | 1.31 | 25,000 | A. |
| February | 463 | 370 | 406 | 1.14 | 1.19 | 22,500 | A. |
| March | 938 | 424 | 640 | 1.80 | 2.08 | 39,400 | A. |
| April | 2,100 | 1,160 | 1,440 | 4.04 | 4.51 | 85,700 | B. |
| May | 1,280 | 920 | 1,060 | 2.98 | 3.44 | 65,200 | A. |
| June | 965 | 602 | 745 | 2.09 | 2.33 | 44,300 | A. |
| July | 708 | 490 | 577 | 1.62 | 1.87 | 35,500 | A. |
| August | 563 | 460 | 505 | 1.42 | 1.64 | 31,100 | A. |
| September | 460 | 358 | 397 | 1.12 | 1.25 | 23,600 | A. |
| The year | 2,100 | 335 | 667 | 1.87 | 25.45 | 483,000 | |

### KLICKITAT RIVER BELOW GLENWOOD, WASH.

LOCATION.—In sec. 12, T. 5 N., R. 13 E., at county bridge on road between Glenwood and Goldendale, about 11 miles southeast of Glenwood.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—July 16, 1914, to October 24, 1914, when station was discontinued.

GAGE.—Vertical staff 40 feet above highway bridge. Read once daily by L. Leidl.

DISCHARGE MEASUREMENTS.—Made from upstream side of bridge.

CHANNEL AND CONTROL.—Channel composed of gravel and small boulders; likely to shift during floods.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period, 1.40 feet July 16 and 18 (discharge, 1,190 second-feet); minimum stage, 0.88 foot at 6 p. m. September 16 (discharge 766 second-feet).

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

DIVERSIONS.—A small quantity is diverted for irrigation near Glenwood.

REGULATION.—None.

ACCURACY.—Records excellent.

COOPERATION.—Gage heights and two measurements furnished by L. Leidl.

*Discharge measurements of Klickitat River below Glenwood, Wash.*

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---|---|---|---|---|---|---|---|
| 1914. | | *Feet.* | *Sec. ft.* | 1915. | | *Feet.* | *Sec. ft.* |
| July 19 | Louis Leidl | 1.37 | 1,170 | May 26 | A. G. Hanson | 1.15 | 1,320 |
| 27 | Charles Leidl | 1.20 | 1,010 | June 20 | ....do | 1.15 | 94.7 |

*Daily discharge, in second-feet, of Klickitat River below Glenwood, Wash., for the period July 16 to Oct. 24, 1914.*

| Day. | July. | Aug. | Sept. | Oct. | Date. | July. | Aug. | Sept. | Oct. |
|---|---|---|---|---|---|---|---|---|---|
| 1 | ..... | 1,010 | 866 | 780 | 16 | 1,190 | 930 | 766 | ..... |
| 2 | ..... | 1,060 | 866 | 780 | 17 | 1,140 | 930 | 815 | ..... |
| 3 | ..... | 1,060 | 850 | 815 | 18 | 1,190 | 930 | 890 | 890 |
| 4 | ..... | 970 | 850 | 850 | 19 | 1,170 | 930 | 930 | 890 |
| 5 | ..... | 970 | 890 | 850 | 20 | 1,170 | 914 | 1,030 | 1,140 |
| 6 | ..... | 970 | 890 | 815 | 21 | 1,140 | 890 | 1,010 | 1,100 |
| 7 | ..... | 970 | 890 | 815 | 22 | 1,060 | 866 | 930 | 1,100 |
| 8 | ..... | 970 | 866 | 815 | 23 | 1,060 | 890 | 850 | 1,060 |
| 9 | ..... | 946 | 866 | ..... | 24 | 1,060 | 866 | 850 | 930 |
| 10 | ..... | 946 | 850 | ..... | 25 | 1,060 | 850 | 815 | ..... |
| 11 | ..... | 944 | 850 | ..... | 26 | 1,060 | 850 | 815 | ..... |
| 12 | ..... | 941 | 836 | ..... | 27 | 1,010 | 914 | 815 | ..... |
| 13 | ..... | 938 | 836 | ..... | 28 | 1,060 | 890 | 780 | ..... |
| 14 | ..... | 935 | 815 | ..... | 29 | 1,040 | 850 | 780 | ..... |
| 15 | ..... | 932 | 780 | ..... | 30 | 1,060 | 850 | 780 | ..... |
| | | | | | 31 | 1,010 | 890 | ..... | ..... |

NOTE.—Discharge determined from a rating curve well defined between 850 and 1,400 second-feet.

*Monthly discharge of Klickitat River below Glenwood, Wash., for the period July 16 to Oct. 24, 1914.*

| Month. | Discharge in second-feet. | | | Run-off (total in acre-feet). |
|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | |
| July 16–31 | 1,190 | 1,010 | 1,090 | 34,600 |
| August | 1,060 | 850 | 929 | 57,100 |
| September | 1,030 | 766 | 855 | 50,900 |

## HOOD RIVER BASIN.

### HOOD RIVER AT DEE, OREG.

LOCATION.—In the SW. ¼ sec. 7, T. 1 N., R. 10 E., just above the backwater of the milldam at Dee, Hood River County, and half a mile below the junction of East and Middle forks.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—May 21, 1913, to December 31, 1914; February 1 to September 30, 1915.

GAGE.—Vertical staff attached to wooden crib on left bank just above railroad trestle. Gage reader, J. W. West. Gage 400 feet below dam was used 1913 to December 31, 1914.

DISCHARGE MEASUREMENTS.—Made from cable about 25 feet above gage.

CHANNEL AND CONTROL.—Control of boulders, stumps, and gravel; probably permanent between floods.

EXTREMES OF DISCHARGE.—Maximum stage recorded during the period February 1 to September 30 at upper station, 2.4 feet at 1 p. m. April 1 (discharge can not be computed); minimum stage recorded, 0.58 foot September 7, 10, and 11 (discharge, 134 second-feet); this is probably about as low a stage as the river ever reaches. No record of extreme flood.

WINTER FLOW.—Stage-discharge relation unaffected by ice.

DIVERSIONS.—Several small ditches divert water for irrigation above station. The East Fork Irrigation District canal diverts water through a divide to lands outside the drainage area.

REGULATION.—None. The flow at former station is quite irregular, especially during low water, owing to changes in load in power plant at mill of Oregon Lumber Co. just above gage.

ACCURACY.—Records considered good for low stages; no estimates for high stages at present gage; good for old gage except for extremely low water.

*Discharge measurements of Hood River at Dee, Oreg., during the year ending Sept., 30, 1915.*

[Made by C. L. Batchelder.]

| Date. | Gage height. | Discharge. |
|---|---|---|
| | *Feet.* | *Sec.-ft.* |
| July 27 | 0.81 | 226 |
| Aug. 21 | .80 | 232 |
| Sept. 17 | .72 | 186 |

*Daily gage height, in feet, of Hood River at Dee, Oreg., for the year ending Sept. 30, 1915.*

| Day. | Feb. | Mar. | Apr. | May. | Day. | Feb. | Mar. | Apr. | May. |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 1.22 | 1.28 | 2.40 | 1.35 | 16 | 1.05 | 1.70 | 1.65 | 1.45 |
| 2 | 1.20 | 1.25 | 2.30 | 1.35 | 17 | 1.05 | 1.65 | 1.80 | 1.50 |
| 3 | 1.15 | 1.25 | 2.30 | 1.35 | 18 | 1.08 | 1.65 | 1.75 | 1.50 |
| 4 | 1.05 | 1.30 | 2.10 | 1.35 | 19 | 1.08 | 1.65 | 1.75 | 1.50 |
| 5 | 1.10 | 1.30 | 2.00 | 1.35 | 20 | 1.08 | 1.55 | 1.77 | 1.50 |
| 6 | 1.10 | 1.25 | 2.00 | 1.35 | 21 | 1.08 | 1.55 | 1.65 | 1.60 |
| 7 | 1.05 | 1.22 | 2.00 | 1.35 | 22 | 1.08 | 1.55 | 1.60 | 1.55 |
| 8 | 1.05 | 1.20 | 1.80 | 1.35 | 23 | 1.10 | 1.70 | 1.77 | 1.40 |
| 9 | 1.05 | 1.18 | 1.90 | 1.50 | 24 | 1.30 | 1.70 | 1.77 | 1.55 |
| 10 | 1.02 | 1.20 | 1.90 | 1.55 | 25 | 1.28 | 1.65 | 1.60 | 1.45 |
| 11 | 1.02 | 1.20 | 1.90 | 1.55 | 26 | 1.18 | 1.65 | 1.60 | 1.35 |
| 12 | 1.02 | 1.20 | 1.85 | 1.50 | 27 | 1.20 | 1.58 | 1.65 | 1.45 |
| 13 | 1.02 | 1.22 | 1.85 | 1.40 | 28 | 1.28 | 1.58 | 1.65 | 1.70 |
| 14 | 1.05 | 1.22 | 1.70 | 1.45 | 29 | ..... | 1.58 | 1.55 | 1.40 |
| 15 | 1.05 | 1.60 | 1.70 | 1.45 | 30 | ..... | 1.58 | 1.50 | 1.45 |
| | | | | | 31 | ..... | 1.70 | ..... | 1.45 |

NOTE.—No current-meter measurements were made during this period and a shift in control occurred before any high-water measurements were made; daily discharge not determined.

*Daily discharge, in second-feet, of Hood River at Dee, Oreg., for the year ending Sept. 30, 1915.*

| Day. | Oct. | Nov. | Dec. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|
| 1 | 260 | 515 | 330 | 625 | 265 | 225 | 250 |
| 2 | 449 | 416 | 355 | 400 | 305 | 348 | 180 |
| 3 | 330 | 570 | 330 | 400 | 335 | 305 | 180 |
| 4 | 282 | 405 | 345 | 400 | 348 | 250 | 225 |
| 5 | 355 | 380 | 251 | 400 | 305 | 250 | 180 |
| 6 | 355 | 330 | 260 | 400 | 348 | 287 | 140 |
| 7 | 380 | 365 | 282 | 400 | 287 | 250 | 134 |
| 8 | 355 | 330 | 260 | 335 | 456 | 225 | 140 |
| 9 | 365 | 365 | 260 | 335 | 456 | 235 | 140 |
| 10 | 355 | 380 | 282 | 275 | 305 | 265 | 134 |
| 11 | 282 | 449 | 260 | 305 | 305 | 250 | 134 |
| 12 | 405 | 416 | 260 | 275 | 275 | 216 | 140 |
| 13 | 355 | 690 | 215 | 275 | 250 | 202 | 160 |
| 14 | 380 | 460 | 238 | 275 | 250 | 202 | 160 |
| 15 | 355 | 395 | 251 | 275 | 225 | 202 | 180 |
| 16 | 405 | 405 | 251 | 400 | 368 | 250 | 225 |
| 17 | 365 | 395 | 215 | 265 | 275 | 225 | 202 |
| 18 | 305 | 345 | 215 | 235 | 235 | 202 | 202 |
| 19 | 504 | 315 | 215 | 235 | 235 | 225 | 202 |
| 20 | 405 | 330 | 206 | 225 | 265 | 265 | 202 |
| 21 | 380 | 345 | 200 | 414 | 305 | 275 | 216 |
| 22 | 380 | 330 | 200 | 435 | 287 | 275 | 225 |
| 23 | 395 | 345 | 200 | 387 | 265 | 287 | 216 |
| 24 | 355 | 315 | 200 | 287 | 265 | 265 | 202 |
| 25 | 305 | 355 | 224 | 250 | 275 | 250 | 202 |
| 26 | 449 | 315 | 238 | 265 | 235 | 287 | 225 |
| 27 | 416 | 365 | 260 | 202 | 225 | 250 | 202 |
| 28 | 416 | 330 | 260 | 202 | 225 | 323 | 189 |
| 29 | 405 | 305 | 224 | 202 | 216 | 368 | 202 |
| 30 | 380 | 355 | 238 | 225 | 225 | 400 | 216 |
| 31 | 380 | ..... | 238 | ..... | 225 | 250 | ..... |

NOTE.—Discharge Oct. 1 to Dec. 31 obtained from readings on gage below dam and a well-defined rating curve; June 1 to Sept. 30, from readings above dam and a rating curve well defined between 180 and 250 second-feet. Discharge Feb. 1 to May 31 can not be computed.

*Monthly discharge of Hood River at Dee, Oreg., for the year ending Sept. 30, 1915.*

| Month. | Discharge in second-feet. | | | Run-off (total in acre-feet). | Accuracy. |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean | | |
| October | 504 | 260 | 371 | 22,800 | B. |
| November | 690 | 305 | 387 | 23,000 | B. |
| December | 355 | 200 | 256 | 15,400 | B. |
| June | 625 | 202 | 320 | 19,000 | C. |
| July | 456 | 216 | 285 | 17,500 | B. |
| August | 400 | 202 | 263 | 16,100 | B. |
| September | 250 | 134 | 187 | 11,100 | B. |

### HOOD RIVER AT TUCKER BRIDGE, NEAR HOOD RIVER, OREG.

LOCATION.—In the SW. ¼ sec. 15, T. 2 N., R. 10 E., one-third mile above intake of power flume, about three-fourths mile above Tucker Bridge, and 5 miles south of the town of Hood River, Hood River County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—July 24 to September 30, 1915; October 20, 1897, to December 31, 1899, and August 27, 1913, to September 30, 1914, from gage at highway bridge.

GAGE.—Stevens water-stage recorder on right bank. Gage reader, Fred Knoblock. Chain gage attached to highway bridge, used 1913 and 1914. Gage used 1897 to 1899 was of wire type and was attached to older bridge.

DISCHARGE MEASUREMENTS.—Made from highway bridge; flow of flume included with that of river; conditions only fair.

CHANNEL AND CONTROL.—Rocks and boulders; practically permanent.

EXTREMES OF DISCHARGE.—Maximum stage from water-stage recorder July 24 to September 30, 1915, 1.60 feet at 9 a. m. August 7 (discharge, 580 second-feet); minimum stage recorded, 0.62 foot at 1 a. m. September 16 (discharge, 136 second-feet).

1897–1899 and 1913–1915: Maximum stage recorded, 11.0 feet on old wire gage January 21, 1899 (discharge, 12,200 second-feet); minimum is that of 1915.

WINTER FLOW.—Stage-discharge relation unaffected by ice.

DIVERSIONS.—Several large diversions for irrigation above station. Power flume diverts a few hundred feet above the bridge and discharges directly below it; quantity diverted included in determinations.

REGULATION.—Water stored at sawmill at Dee. During low water the pond was filled and emptied as many as six times daily, causing fluctuations of as much as 0.8 foot at Tucker Bridge.

ACCURACY.—Results for 1915 considered good.

*Discharge measurements of Hood River at Tucker Bridge, near Hood River, Oreg., during the year ending Sept. 30, 1915.*

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---|---|---|---|---|---|---|---|
| | | *Feet.* | *Sec.-ft.* | | | *Feet.* | *Sec.-ft.* |
| Oct. 6 | Hodges and Stewart | [a]1.82 | 619 | Aug. 20 | C. L. Batchelder | [b]1.40 | 467 |
| Nov. 18 | Paulsen and Hanson | [a]2.41 | 819 | Sept. 2 | do | [b].70 | 159 |
| July 28 | C. L. Batchelder | [b]1.45 | 479 | | | | |

[a] From chain gage. [b] From water-stage record.

*Daily discharge, in second-feet, of Hood River at Tucker Bridge, near Hood River, Oreg., for the year ending Sept. 30, 1915.*

| Day. | July. | Aug. | Sept. | Day. | July. | Aug. | Sept. | Day. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | 375 | 305 | 11 | | 415 | 280 | 21 | | 335 | 316 |
| 2 | | 453 | 290 | 12 | | 400 | 300 | 22 | | 360 | 315 |
| 3 | | 430 | 284 | 13 | | 420 | 300 | 23 | | 376 | 301 |
| 4 | | 400 | 278 | 14 | | 320 | 295 | 24 | 395 | 349 | 287 |
| 5 | | 375 | 272 | 15 | | 310 | 274 | 25 | 378 | 346 | 315 |
| 6 | | 415 | 266 | 16 | | 345 | 291 | 26 | 385 | 351 | 310 |
| 7 | | 420 | 260 | 17 | | 350 | 302 | 27 | 356 | 350 | 305 |
| 8 | | 390 | 312 | 18 | | 322 | 286 | 28 | 340 | 341 | 293 |
| 9 | | 442 | 332 | 19 | | 334 | 298 | 29 | 328 | 364 | 292 |
| 10 | | 400 | 320 | 20 | | 380 | 312 | 30 | 316 | 390 | 292 |
| | | | | | | | | 31 | 355 | 336 | ..... |

NOTE.—Discharge determined from a rating curve well defined above 150 second-feet; discharge integrator used.

*Monthly discharge of Hood River at Tucker Bridge, near Hood River, Oreg., for the year ending Sept. 30, 1915.*

| Month. | Discharge in second-feet. | | | Run-off (total in acre-feet). | Accuracy. |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | | |
| July 24–31 | 395 | 316 | 357 | 5,660 | A. |
| August | 453 | 310 | 374 | 23,000 | A. |
| September | 332 | 260 | 296 | 17,600 | A. |

**HOOD RIVER AT POWERDALE, NEAR HOOD RIVER, OREG.**

LOCATION.—In the NE. ¼ sec. 36, T. 3 N., R. 10 E., at bridge of Mount Hood Railway about one-third mile southeast of the town of Hood River, Hood River County, below discharge of tailrace of Powerdale plant of Pacific Power & Light Co., and a mile above mouth of stream.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—March 31, 1913, to September 30, 1915.

GAGE.—Fuller water-stage recorder on left bank just below bridge, installed July 27, 1915; vertical staff prior to that date. Four readings daily before recorder was installed. Gage reader, A. Rogers. Readings on vertical staff on right bank opposite power plant about one-half mile above railroad bridge, in SE. ¼ sec. 36, used up to September 30, 1914.

DISCHARGE MEASUREMENTS.—Made from cable 100 feet above gage at power plant.

CHANNEL AND CONTROL.—Rock and boulders; practically permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 4.7 feet November 13, April 1 and 3 (discharge, 2,840 second-feet); minimum stage from water-stage recorder, 1.33 feet September 4 (discharge, estimated from downward extension of rating curve, 176 second-feet).

1913–1915: Maximum stage recorded, 5.0 feet January 5, 1914 (discharge, 4,800 second-feet); minimum is that of 1915.

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

DIVERSIONS.—Large diversions for irrigation above station; water for power plant is diverted around upper gage but is returned above the bridge gage; diversion was included in estimate for 1913 but was computed separately for 1914.

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

ACCURACY.—Results considered good.

*Discharge measurements of Hood River at Powerdale, near Hood River, Oreg., during the year ending Sept. 30, 1915.*

| Date. | Made by— | Gage height opposite power house. | Discharge. | | | Gage height at bridge. |
|---|---|---|---|---|---|---|
| | | | At cable. | At tailrace. | At bridge. | |
| | | *Feet.* | *Sec.-ft.* | *Sec.-ft.* | *Sec.-ft.* | *Feet.* |
| Oct. 7 | J. E. Stewart | 1.82 | 533 | 78.9 | 612 | ..... |
| 7 | do | 1.80 | 482 | 78.9 | 561 | ..... |
| Nov. 18 | Paulsen and Hanson | 2.41 | 883 | 95.6 | 979 | a 3.02 |
| July 27 | C. L. Batchelder | 1.47 | 284 | 99.5 | 383 | 2.17 |
| Aug. 18 | do | 1.66 | 409 | 65.7 | 475 | 2.36 |
| 18 | do | 1.20 | 241 | 93.7 | 335 | 1.90 |

a Gage read two hours after measurement was made and stage was apparently falling.

*Daily discharge, in second-feet, of Hood River at Powerdale, near Hood River, Oreg., for the year ending Sept. 30, 1915.*

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 560 | 865 | 760 | 725 | 980 | 980 | 2,530 | 865 | 865 | 495 | 408 | 334 |
| 2 | 1,020 | 980 | 760 | 725 | 980 | 980 | 2,390 | 830 | 830 | 560 | 465 | 340 |
| 3 | 830 | 1,550 | 725 | 760 | 980 | 940 | 2,530 | 795 | 725 | 495 | 435 | 322 |
| 4 | 760 | 1,160 | 690 | 690 | 830 | 1,020 | 2,250 | 690 | 690 | 495 | 380 | 325 |
| 5 | 725 | 1,160 | 658 | 690 | 900 | 1,120 | 1,940 | 690 | 690 | 528 | 380 | 340 |
| 6 | 658 | 1,200 | 690 | 658 | 900 | 1,120 | 1,720 | 725 | 725 | 528 | 360 | 325 |
| 7 | 658 | 980 | 625 | 625 | 865 | 980 | 1,770 | 690 | 725 | 495 | 340 | 290 |
| 8 | 625 | 940 | 658 | 625 | 830 | 980 | 1,600 | 725 | 690 | 560 | 340 | 302 |
| 9 | 625 | 900 | 625 | 658 | 795 | 980 | 1,500 | 690 | 625 | 625 | 340 | 334 |
| 10 | 690 | 865 | 625 | 658 | 760 | 980 | 1,400 | 1,160 | 592 | 495 | 340 | 325 |
| 11 | 658 | 980 | 592 | 625 | 795 | 940 | 1,500 | 1,160 | 560 | 435 | 360 | 340 |
| 12 | 830 | 1,160 | 592 | 658 | 760 | 980 | 1,450 | 1,120 | 560 | 435 | 340 | 310 |
| 13 | 690 | 2,600 | 528 | 790 | 760 | 1,070 | 1,550 | 1,070 | 560 | 435 | 334 | 316 |
| 14 | 725 | 1,770 | 528 | 1,250 | 760 | 1,770 | 1,350 | 980 | 528 | 495 | 331 | 325 |
| 15 | 658 | 1,450 | 528 | 1,160 | 725 | 2,120 | 1,250 | 865 | 528 | 495 | 340 | 310 |
| 16 | 625 | 1,200 | 528 | 940 | 725 | 2,120 | 1,250 | 865 | 560 | 495 | 348 | 325 |
| 17 | 725 | 1,070 | 495 | 940 | 760 | 1,770 | 1,350 | 865 | 528 | 625 | 360 | 340 |
| 18 | 725 | 980 | 465 | 860 | 830 | 1,770 | 1,350 | 900 | 690 | 495 | 360 | 340 |
| 19 | 1,600 | 940 | 435 | 795 | 830 | 1,550 | 1,250 | 980 | 560 | 495 | 360 | 364 |
| 20 | 1,160 | 980 | 435 | 725 | 865 | 1,450 | 1,250 | 940 | 560 | 495 | 380 | 380 |
| 21 | 1,020 | 830 | 528 | 690 | 900 | 1,450 | 1,200 | 900 | 495 | 495 | 380 | 380 |
| 22 | 900 | 900 | 560 | 658 | 900 | 1,500 | 1,120 | 865 | 495 | 495 | 380 | 380 |
| 23 | 830 | 900 | 560 | 658 | 830 | 1,770 | 1,070 | 865 | 560 | 465 | 435 | 290 |
| 24 | 760 | 830 | 528 | 625 | 1,120 | 1,770 | 1,070 | 865 | 658 | 495 | 380 | 340 |
| 25 | 690 | 830 | 625 | 625 | 1,250 | 1,550 | 1,020 | 830 | 592 | 435 | 380 | 360 |
| 26 | 690 | 795 | 658 | 592 | 1,250 | 1,400 | 1,020 | 830 | 528 | 408 | 380 | 340 |
| 27 | 625 | 760 | 625 | 592 | 1,070 | 1,250 | 980 | 900 | 658 | 360 | 435 | 340 |
| 28 | 625 | 830 | 830 | 592 | 900 | 1,250 | 980 | 1,250 | 495 | 435 | 465 | 334 |
| 29 | 625 | 830 | 625 | 592 | ..... | 1,450 | 980 | 940 | 495 | 380 | 408 | 347 |
| 30 | 690 | 760 | 760 | 592 | ..... | 1,500 | 900 | 940 | 495 | 376 | 408 | 360 |
| 31 | 690 | ..... | 725 | 658 | ..... | 1,450 | ..... | 865 | ..... | 380 | 408 | ..... |

NOTE.—Discharge determined from a rating curve well defined between 350 and 2,000 second-feet. Records from water-stage recorder July 27 to Sept. 30 not so good as those at Tucker Bridge.

*Monthly discharge of Hood River at Powerdale, near Hood River, Oreg., for the year ending Sept. 30, 1915.*

| Month. | Discharge in second-feet. | | | Run-off (total in acre-feet). | Accuracy. |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | | |
| October | 1,600 | 560 | 764 | 47,000 | B. |
| November | 2,600 | 760 | 1,070 | 63,700 | B. |
| December | 830 | 435 | 612 | 37,600 | B. |
| January | 1,250 | 592 | 724 | 44,500 | B. |
| February | 1,250 | 725 | 888 | 49,300 | B. |
| March | 2,120 | 940 | 1,350 | 83,000 | A. |
| April | 2,530 | 900 | 1,450 | 86,300 | A. |
| May | 1,250 | 690 | 892 | 54,800 | B. |
| June | 865 | 495 | 609 | 36,200 | B. |
| July | 625 | 360 | 481 | 29,600 | B. |
| August | 465 | 331 | 379 | 23,300 | B. |
| September | 380 | 290 | 335 | 19,900 | B. |
| The year | 2,600 | 290 | 795 | 575,000 | |

**EAST FORK OF HOOD RIVER ABOVE INTAKE, NEAR MOUNT HOOD, OREG.**

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

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—July 22, to September 30, 1915.

GAGE. Stevens eight-day water-stage recorder installed on left bank. Gage reader, Angus McDonald.

DISCHARGE MEASUREMENTS.—Made from cable 15 feet below gage.

CHANNEL AND CONTROL.—Heavy boulders; practically permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded July 22 to September 30, 1.73 feet at 10 p. m. August 30 (discharge, 201 second-feet); minimum stage recorded, 1.25 feet at 5 p. m. September 28 (discharge, 115 second-feet).

WINTER FLOW.—No winter records have yet been obtained.

DIVERSIONS.—The Glacier ditch and other small ditches divert water for irrigation above the station.

REGULATION.—None.

ACCURACY.—Results considered excellent.

*Discharge measurements of East Fork of Hood River above intake, near Mount Hood, Oreg., during the year ending Sept. 30, 1915.*

[Made by C. L. Batchelder.]

| Date. | Gage height. | Discharge. | Date. | Gage height. | Discharge. |
|---|---|---|---|---|---|
| | *Feet.* | *Sec.-ft.* | | *Feet.* | *Sec.-ft.* |
| July 22 | 1.50 | 154 | Aug. 22 | 1.52 | 155 |
| 24 | 1.48 | 152 | Sept. 17 | 1.30 | 122 |

*Daily discharge, in second-feet, of East Fork or Hood River above intake, near Mount Hood, Oreg., for the year ending Sept. 30, 1915.*

| Day. | July. | Aug. | Sept. | Day. | July. | Aug. | Sept. | Day. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | 156 | 142 | 11 | | 160 | 133 | 21 | | 161 | 133 |
| 2 | | 169 | 138 | 12 | | 156 | 135 | 22 | 167 | 165 | 132 |
| 3 | | 165 | 142 | 13 | | 152 | 132 | 23 | 165 | 165 | 127 |
| 4 | | 156 | 145 | 14 | | 151 | 128 | 24 | 165 | 163 | 122 |
| 5 | | 161 | 143 | 15 | | 151 | 125 | 25 | 161 | 156 | 125 |
| 6 | | 169 | 136 | 16 | | 160 | 133 | 26 | 158 | 156 | 124 |
| 7 | | 163 | 132 | 17 | | 156 | 132 | 27 | 152 | 151 | 121 |
| 8 | | 158 | 132 | 18 | | 152 | 133 | 28 | 151 | 156 | 122 |
| 9 | | 160 | 132 | 19 | | 156 | 132 | 29 | 149 | 163 | 125 |
| 10 | | 165 | 136 | 20 | | 160 | 132 | 30 | 142 | 180 | 128 |
| | | | | | | | | 31 | 147 | 161 | |

NOTE.—Discharge determined from a well-defined rating curve. Discharge Sept. 13–14 interpolated.

*Monthly discharge of East Fork of Hood River above intake, near Mount Hood, Oreg., for year ending Sept. 30, 1915.*

| Month. | Discharge in second-feet. | | | Run-off (total in acre-feet). | Accuracy. |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | | |
| July 22-31 | 167 | 142 | 156 | 3,090 | A. |
| August | 180 | 151 | 160 | 9,840 | A. |
| September | 145 | 121 | 127 | 7,560 | A. |

### EAST FORK OF HOOD RIVER NEAR MOUNT HOOD, OREG.

LOCATION.—In the NE. ¼ sec. 5, T. 1 S., R. 10 E., about 5 miles above mouth of East Fork, 2 miles south of Mount Hood post office, Hood River County, and 2 miles east of Parkdale station on the Mount Hood Railroad.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—June 17, 1913, to November 14, 1914, when station was discontinued.

GAGE.—Vertical staff on right bank. Gage reader, J. A. Robertson.

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

CHANNEL AND CONTROL.—Gravel and small boulders; somewhat shifting.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period October 1 to November 14, 1914, 5.55 feet November 12 and 13 (discharge, 224 second-feet); minimum stage recorded, 5.25 feet October 6 and 7 (discharge, 139 second-feet).

1913–1914: Maximum stage recorded, 6.65 feet June 22, 1913 (discharge, 762 second-feet); minimum stage recorded, 4.85 feet September 8, 1914 (discharge, 66 second-feet).

WINTER FLOW.—Stage-discharge relation unaffected by ice.

DIVERSIONS.—The East Fork Irrigation District canal diverts water about three-fourths mile and the Mount Hood ditch about one-fourth mile above gage and carry their water past the gage. The Glacier ditch diverts water about 6 miles above gage and waters lands above station.

REGULATION.—None.

ACCURACY.—Results considered good.

The following discharge measurement was made by Paulsen and Hanson:

Nov. 19: Gage height, 5.40 feet; discharge, 172 second-feet.

*Daily discharge in second-feet, of East Fork of Hood River near Mount Hood, Oreg., for the period Oct. 1 to Nov. 14, 1914.*

| Day. | Oct. | Nov. | Day. | Oct. | Nov. | Day. | Oct. | Nov. |
|---|---|---|---|---|---|---|---|---|
| 1 | 193 | 193 | 11 | 164 | 208 | 21 | 151 | |
| 2 | 193 | 193 | 12 | 164 | 224 | 22 | 151 | |
| 3 | 208 | 193 | 13 | 139 | 224 | 23 | 151 | |
| 4 | 178 | 193 | 14 | 151 | 208 | 24 | 178 | |
| 5 | 151 | 178 | 15 | 151 | | 25 | 178 | |
| 6 | 139 | 193 | 16 | 164 | | 26 | 193 | |
| 7 | 139 | 193 | 17 | 178 | | 27 | 208 | |
| 8 | 151 | 193 | 18 | 178 | | 28 | 193 | |
| 9 | 164 | 178 | 19 | 164 | | 29 | 208 | |
| 10 | 178 | 193 | 20 | 164 | | 30 | 208 | |
| | | | | | | 31 | 208 | |

NOTE.—Discharge determined from a well-defined rating curve.

*Monthly discharge of East Fork of Hood River near Mount Hood, Oreg., for the period Oct. 1 to Nov. 14, 1914.*

| Month. | Discharge in second-feet. | | | Run-off (total in acre-feet). | Accuracy. |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | | |
| October | 208 | 139 | 172 | 10,600 | B. |
| November 1–14 | 224 | 178 | 197 | 5,480 | B. |

**EAST FORK IRRIGATION DISTRICT CANAL NEAR MOUNT HOOD, OREG.**

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

RECORDS AVAILABLE.—June 17, 1913, to October 26, 1914; July 21 to September 30, 1915.

GAGE.—Stevens eight-day water-stage recorder on left side of canal just above road crossing. Gage reader, Angus McDonald. Vertical staff on side of flume, 1,000 feet below, in the SW. ¼ sec. 34, used up to October, 1914.

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

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

EXTREMES OF DISCHARGE.—Maximum stage during period July 21 to September 30, 1915, from water-stage recorder, 2.93 feet August 14 at 8 p. m. (discharge, 106 second-feet). Canal dry throughout winter and at various other times.

WINTER FLOW.—No water carried in cold weather.

ACCURACY.—Results considered excellent.

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

*Discharge measurements of East Fork Irrigation District canal near Mount Hood, Oreg., during the year ending Sept. 30, 1915.*

[Made by C. L. Batchelder.]

| Date. | Gage height. | Discharge. | Date. | Gage height. | Discharge. |
|---|---|---|---|---|---|
| | *Feet.* | *Sec.-ft.* | | *Feet.* | *Sec.-ft.* |
| July 22 | 2.56 | 77.7 | July 24 | 2.34 | 65.7 |
| 24 | 1.78 | 36.0 | Aug. 22 | 2.75 | 95.6 |

*Daily discharge, in second-feet, of East Fork Irrigation District canal near Mount Hood, Oreg., for the year ending Sept. 30, 1915.*

| Day. | Oct. | July. | Aug. | Sept. | Day. | Oct. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 20 | ..... | 71 | 77 | 16 | 23 | ..... | 96 | 40 |
| 2 | 20 | ..... | 42 | 76 | 17 | 23 | ..... | 79 | 40 |
| 2 | 20 | ..... | 82 | 75 | 18 | 23 | ..... | 92 | 41 |
| 4 | 22 | ..... | 85 | 74 | 19 | 22 | ..... | 93 | 42 |
| 5 | 22 | ..... | 86 | 73 | 20 | 22 | ..... | 95 | 44 |
| 6 | 22 | ..... | 88 | 72 | 21 | 13 | 82 | 95 | 41 |
| 7 | 22 | ..... | 92 | 71 | 22 | 7.0 | 81 | 95 | 35 |
| 8 | 22 | ..... | 93 | 70 | 23 | 13 | 78 | 96 | 36 |
| 9 | 22 | ..... | 94 | 63 | 24 | 3.0 | 57 | 95 | 35 |
| 10 | 23 | ..... | 96 | 61 | 25 | 5.0 | 76 | 94 | 35 |
| 11 | 23 | ..... | 95 | 61 | 26 | 13 | 80 | 94 | 35 |
| 12 | 22 | ..... | 95 | 61 | 27 | 0 | 82 | 93 | 35 |
| 13 | 22 | ..... | 95 | 58 | 28 | 0 | 82 | 91 | 35 |
| 14 | 23 | ..... | 98 | 38 | 29 | 0 | 83 | 88 | 36 |
| 15 | 23 | ..... | 97 | 38 | 30 | 0 | 82 | 86 | 35 |
| | | | | | 31 | 0 | 83 | 77 | ..... |

NOTE.—Discharge for October determined from readings on gage in flume and a well-defined rating curve; for July to September, from records of water-stage recorder and a well-defined rating curve. Discharge Sept. 1–7 interpolated. Water probably turned in about May 1; no record obtained until July 21.

*Monthly discharge of East Fork Irrigation District canal near Mount Hood, Oreg., for the year ending Sept. 30, 1915.*

| Month. | Discharge in second-feet. | | | Run-off (total in acre-feet). | Accuracy. |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | | |
| October | 23 | 0 | 16.0 | 984 | A. |
| July 21–31 | 83 | 57 | 72.7 | 1,720 | A. |
| August | 98 | 42 | 88.3 | 5,490 | A. |
| September | 77 | 35 | 54.1 | 3,040 | A. |

### WEST FORK OF HOOD RIVER NEAR DEE, OREG.

LOCATION.—In the SW. ¼ sec. 1, T. 1 N., R. 9 E., about 500 feet below an old bridge, about a mile from mouth, and 2 miles by road west of Dee, Hood River County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—August 26, 1913, to September 30, 1914; January 1 to September 30, 1915.

GAGE.—Vertical staff on right bank attached to stump. Gage reader, Fred Pilling.

DISCHARGE MEASUREMENTS.—Made by wading at low water. No equipment for high-water measurement.

CHANNEL AND CONTROL.—Rocky; probably permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 3.00 feet at 7 a. m. April 3 (discharge not determined); minimum stage recorded, 1.00 foot September 29 and 30 (discharge, 100 second-feet).

1913–1915: Maximum stage recorded, 4.00 feet January 5, 1914 (discharge not determined); minimum is that of 1915.

WINTER FLOW.—Stage-discharge relation unaffected by ice.

DIVERSIONS.—Some water is diverted for irrigation near Dee, and some from Greenpoint Creek for fluming logs.

REGULATION.—None.

ACCURACY.—Results for low water considered excellent; no estimates for high stages.

*Discharge measurements of West Fork of Hood River near Dee, Oreg., during the year ending Sept. 30, 1915.*

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---|---|---|---|---|---|---|---|
| | | *Feet.* | *Sec.-ft.* | | | *Feet.* | *Sec.-ft.* |
| Dec. 29 | W. D. Peaslee | 1.40 | 283 | Aug. 21 | C. L. Batchelder | 1.15 | 165 |
| July 27 | C. L. Batchelder | 1.22 | 171 | Sept. 17 | do | 1.04 | 111 |

*Daily gage height, in feet, of West Fork of Hood River near Dee, Oreg., for the year ending Sept. 30, 1915.*

| Day. | Jan. | Feb. | Mar. | Apr. | May. | Day. | Jan. | Feb. | Mar. | Apr. | May. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1.55 | 1.52 | 1.70 | 2.20 | 1.58 | 16 | 1.72 | 1.48 | 2.30 | 1.80 | 1.60 |
| 2 | 1.55 | 1.52 | 1.70 | 2.60 | 1.55 | 17 | 1.62 | 1.48 | 2.02 | 1.80 | 1.60 |
| 3 | 1.55 | 1.58 | 1.70 | 3.00 | 1.55 | 18 | 1.60 | 1.60 | 2.05 | 1.75 | 1.60 |
| 4 | 1.52 | 1.55 | 1.75 | 2.70 | 1.52 | 19 | 1.58 | 1.58 | 2.00 | 1.72 | 1.60 |
| 5 | 1.52 | 1.52 | 1.80 | 2.30 | 1.52 | 20 | 1.50 | 1.58 | 1.95 | 1.72 | 1.60 |
| 6 | 1.52 | 1.55 | 1.78 | 2.10 | 1.52 | 21 | 1.48 | 1.58 | 1.95 | 1.70 | 1.60 |
| 7 | 1.50 | 1.55 | 1.75 | 2.10 | 1.50 | 22 | 1.48 | 1.58 | 1.95 | 1.70 | 1.60 |
| 8 | 1.48 | 1.52 | 1.72 | 2.00 | 1.50 | 23 | 1.48 | 1.58 | 2.15 | 1.75 | 1.60 |
| 9 | 1.48 | 1.52 | 1.70 | 1.90 | 1.52 | 24 | 1.45 | 1.72 | 2.15 | 1.72 | 1.60 |
| 10 | 1.48 | 1.52 | 1.70 | 1.90 | 1.62 | 25 | 1.45 | 1.85 | 2.00 | 1.65 | 1.58 |
| 11 | 1.45 | 1.52 | 1.70 | 1.90 | 1.65 | 26 | 1.48 | 1.80 | 1.95 | 1.65 | 1.58 |
| 12 | 1.42 | 1.50 | 1.70 | 1.95 | 1.65 | 27 | 1.40 | 1 72. | 1.95 | 1.62 | 1.58 |
| 13 | 1.42 | 1.50 | 1.72 | 1.90 | 1.62 | 28 | 1.40 | 1.70 | 1.90 | 1.62 | 1.85 |
| 14 | 1.82 | 1.48 | 2.15 | 1.85 | 1.60 | 29 | 1.40 | ..... | 1.95 | 1.60 | 1.70 |
| 15 | 1.85 | 1.48 | 2.50 | 1.80 | 1.60 | 30 | 1.38 | ..... | 1.95 | 1.60 | 1.65 |
| | | | | | | 31 | 1.45 | ..... | 2.00 | ..... | 1.60 |

*Daily discharge, in second-feet, of West Fork of Hood River near Dee, Oreg., for the years ending Sept. 30, 1913, 1914, and 1915.*

| Day. | Sept. | Day. | Sept. | Day. | Sept. |
|---|---|---|---|---|---|
| 1913 | | 1913. | | 1913. | |
| 1 | 220 | 11 | 232 | 21 | 244 |
| 2 | 220 | 12 | 232 | 22 | 268 |
| 3 | 430 | 13 | 250 | 23 | 226 |
| 4 | 530 | 14 | 226 | 24 | 200 |
| 5 | 390 | 15 | 220 | 25 | 195 |
| 6 | 315 | 16 | 232 | 26 | 200 |
| 7 | 280 | 17 | 232 | 27 | 195 |
| 8 | 268 | 18 | 226 | 28 | 215 |
| 9 | 268 | 19 | 215 | 29 | 215 |
| 10 | 268 | 20 | 220 | 30 | 200 |
| | | | | 31 | ..... |

*Daily discharge, in second-feet, of West Fork of Hood River near Dee, Oreg., for the years ending Sept. 30, 1913, 1914, and 1915*—Continued.

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|
| 1914. | | | | | | | | | | |
| 1 | 200 | 315 | ..... | 336 | ..... | ..... | 490 | 336 | 220 | 150 |
| 2 | 195 | 268 | ..... | 343 | ..... | ..... | ..... | 336 | 215 | 150 |
| 3 | 195 | 268 | ..... | 350 | ..... | ..... | 510 | 336 | 220 | 154 |
| 4 | 195 | 256 | ..... | ..... | ..... | ..... | 470 | 336 | 215 | 154 |
| 5 | 200 | 350 | 480 | ..... | ..... | ..... | 440 | 308 | 210 | 150 |
| 6 | 226 | ..... | 430 | ..... | ..... | ..... | 430 | 294 | 210 | 150 |
| 7 | ..... | ..... | 430 | ..... | 530 | ..... | ..... | 294 | 215 | 166 |
| 8 | 470 | ..... | 414 | ..... | 530 | ..... | ..... | 294 | 210 | 166 |
| 9 | 510 | ..... | 390 | ..... | 480 | ..... | ..... | 287 | 200 | 180 |
| 10 | 530 | ..... | 366 | ..... | 470 | ..... | ..... | 287 | 195 | 150 |
| 11 | ..... | 470 | 398 | ..... | 470 | ..... | 490 | 294 | 195 | 162 |
| 12 | 450 | 430 | 414 | ..... | ..... | ..... | 480 | 308 | 200 | 195 |
| 13 | ..... | 414 | 366 | ..... | ..... | ..... | 480 | 294 | 200 | 170 |
| 14 | ..... | 366 | 390 | ..... | 510 | ..... | 430 | 274 | 200 | 280 |
| 15 | ..... | 350 | 382 | ..... | 490 | ..... | 422 | 280 | 210 | 520 |
| 16 | ..... | 358 | 366 | ..... | 480 | ..... | 414 | 274 | 200 | 350 |
| 17 | 520 | 382 | 350 | ..... | 430 | ..... | 398 | 256 | 175 | 390 |
| 18 | 430 | 358 | 350 | ..... | 422 | ..... | 382 | 280 | 175 | 336 |
| 19 | 414 | 390 | 343 | 520 | 414 | ..... | 358 | 268 | 170 | 430 |
| 20 | 366 | 390 | 336 | 490 | 414 | ..... | 350 | 268 | 170 | 450 |
| 21 | 358 | 398 | 315 | ..... | 450 | ..... | 382 | 226 | 175 | 343 |
| 22 | 343 | 414 | 336 | ..... | ..... | ..... | 358 | 220 | 180 | 308 |
| 23 | 322 | ..... | 308 | ..... | ..... | ..... | 350 | 220 | 170 | 280 |
| 24 | 336 | ..... | 280 | ..... | ..... | ..... | 366 | 220 | 166 | 256 |
| 25 | 294 | ..... | 308 | ..... | ..... | ..... | 366 | 220 | 166 | 244 |
| 26 | 287 | ..... | 315 | ..... | ..... | ..... | 358 | 220 | 170 | 250 |
| 27 | 268 | ..... | 294 | ..... | ..... | ..... | 350 | 220 | 170 | 274 |
| 28 | 256 | ..... | 315 | ..... | ..... | ..... | 350 | 215 | 166 | 232 |
| 29 | 256 | ..... | 287 | ..... | ..... | 530 | 343 | 215 | 170 | 226 |
| 30 | 244 | ..... | 287 | ..... | ..... | 510 | 336 | 215 | 166 | 220 |
| 31 | 256 | ..... | 336 | ..... | ..... | 510 | ..... | 220 | 154 | ..... |

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|
| 1915. | | | | | | | | | |
| 1 | 390 | 366 | 530 | ..... | 414 | 414 | 250 | 170 | 150 |
| 2 | 390 | 366 | 530 | ..... | 390 | 390 | 250 | 170 | 150 |
| 3 | 390 | 414 | 530 | ..... | 390 | 366 | 250 | 170 | 138 |
| 4 | 366 | 390 | ..... | ..... | 366 | 366 | 250 | 170 | 130 |
| 5 | 366 | 366 | ..... | ..... | 366 | 350 | 250 | 170 | 130 |
| 6 | 366 | 390 | ..... | ..... | 366 | 336 | 250 | 170 | 130 |
| 7 | 350 | 390 | ..... | ..... | 350 | 315 | 280 | 170 | 130 |
| 8 | 336 | 366 | ..... | ..... | 350 | 315 | 268 | 170 | 130 |
| 9 | 336 | 366 | 530 | ..... | 366 | 294 | 280 | 170 | 124 |
| 10 | 336 | 366 | 530 | ..... | 450 | 280 | 278 | 170 | 124 |
| 11 | 315 | 366 | 530 | ..... | 480 | 280 | 270 | 162 | 115 |
| 12 | 294 | 350 | 530 | ..... | 480 | 280 | 270 | 162 | 124 |
| 13 | 294 | 350 | ..... | ..... | 450 | 280 | 270 | 162 | 124 |
| 14 | ..... | 336 | ..... | ..... | 430 | 280 | 270 | 162 | 124 |
| 15 | ..... | 336 | ..... | ..... | 430 | 280 | 270 | 162 | 115 |
| 16 | ..... | 336 | ..... | ..... | 430 | 280 | 270 | 162 | 115 |
| 17 | 450 | 336 | ..... | ..... | 430 | 280 | 294 | 162 | 115 |
| 18 | 430 | 430 | ..... | ..... | 430 | 280 | 270 | 162 | 115 |
| 19 | 414 | 414 | ..... | ..... | 430 | 280 | 268 | 162 | 115 |
| 20 | 350 | 414 | ..... | ..... | 430 | 280 | 268 | 162 | 115 |
| 21 | 336 | 414 | ..... | 530 | 430 | 280 | 250 | 162 | 106 |
| 22 | 336 | 414 | ..... | 530 | 430 | 280 | 250 | 162 | 106 |
| 23 | 336 | 414 | ..... | ..... | 430 | 268 | 272 | 162 | 106 |
| 24 | 315 | ..... | ..... | ..... | 430 | 268 | 272 | 162 | 106 |
| 25 | 315 | ..... | ..... | 480 | 414 | 268 | 220 | 162 | 106 |
| 26 | 336 | ..... | ..... | 480 | 414 | 315 | 270 | 162 | 106 |
| 27 | 280 | ..... | ..... | 450 | 414 | 294 | 180 | 162 | 106 |
| 28 | 280 | 530 | ..... | 450 | ..... | 280 | 170 | 162 | 100 |
| 29 | 280 | ..... | ..... | 430 | 530 | 268 | 170 | 162 | 100 |
| 30 | 268 | ..... | ..... | 430 | 480 | 250 | 170 | 162 | 100 |
| 31 | 315 | ..... | ..... | ..... | 430 | ..... | 170 | 162 | ..... |

NOTE.—Daily discharge determined from a well-defined rating curve. On days for which discharge is not given the flow exceeded 530 second-feet.

## WHITE SALMON RIVER BASIN.

### WHITE SALMON RIVER AT SPLASH DAM, NEAR TROUT LAKE, WASH.

LOCATION.—In the NE. ¼ sec. 6, T. 5 N., R. 11 E., at splash dam formerly used by Wind River Lumber Co., 2½ miles south of Trout Lake, Klickitat County, 4 miles below mouth of Trout Creek, and about 10 miles north of Husum.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—June 1, 1912, to September 30, 1915.

GAGE.—Vertical staffs in the pond above the dam, except June 1 to September 30, 1912, and May 23 to June 28, 1913, during which periods gage readings were made on vertical staff on right bank just below dam. Gage read twice daily by H. G. Williams, sr.

DISCHARGE MEASUREMENTS.—Made from a cable 800 feet below the dam.

CHANNEL AND CONTROL.—For the gage above the dam the control is formed by two sharp-crested weirs and an overflow opening; below the dam, rocks and gravel; somewhat shifting.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 7.65 feet at 7 a. m. April 3 (discharge, 2,160 second-feet); minimum stage recorded, 1.05 feet August 1, 4, 5, and 6 (discharge, 52 second-feet).

1912–1915: Same as for 1915.

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

DIVERSIONS.—An unmeasured quantity of water is diverted for irrigation above the station.

REGULATION.—None.

ACCURACY.—Results considered good.

COOPERATION.—Gage-height record furnished by Northwestern Electric Co.

*Discharge measurements of White Salmon River at splash dam, near Trout Lake, Wash., during the year ending Sept. 30, 1915.*

| Date. | Made by— | Gage height. | Discharge. |
|---|---|---|---|
| | | *Feet.* | *Sec.-ft.* |
| Oct. 7 | P. V. Hodges | 2.37 | 197 |
| June 27 | A. G. Hanson | 1.65 | 132 |
| July 25 | C. L. Batchelder | 1.44 | 82.6 |

*Daily discharge, in second-feet, of White Salmon River at splash dam, near Trout Lake, Wash., for the year ending Sept. 30, 1915.*

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 198 | 385 | 360 | 275 | 220 | 255 | 1,210 | 575 | 385 | 95 | 55 | 56 |
| 2 | 235 | 545 | 360 | 255 | 212 | 255 | 1,990 | 545 | 360 | 105 | 63 | 56 |
| 3 | 255 | 890 | 360 | 235 | 205 | 275 | 2,140 | 515 | 295 | 115 | 67 | 56 |
| 4 | 220 | 850 | 335 | 235 | 198 | 315 | 1,890 | 515 | 255 | 115 | 55 | 63 |
| 5 | 212 | 670 | 335 | 235 | 205 | 315 | 1,490 | 515 | 235 | 115 | 55 | 80 |
| 6 | 250 | 670 | 315 | 235 | 198 | 295 | 1,170 | 515 | 235 | 110 | 59 | 71 |
| 7 | 198 | 545 | 315 | 235 | 198 | 295 | 1,170 | 515 | 220 | 110 | 59 | 71 |
| 8 | 190 | 485 | 295 | 235 | 198 | 295 | 1,290 | 515 | 198 | 126 | 63 | 80 |
| 9 | 190 | 460 | 295 | 235 | 205 | 295 | 1,130 | 605 | 182 | 126 | 59 | 71 |
| 10 | 235 | 410 | 275 | 220 | 205 | 295 | 1,090 | 705 | 168 | 100 | 67 | 71 |
| 11 | 255 | 460 | 275 | 220 | 198 | 295 | 1,050 | 705 | 168 | 95 | 76 | 71 |
| 12 | 315 | 575 | 235 | 220 | 190 | 295 | 1,090 | 635 | 175 | 95 | 76 | 71 |
| 13 | 275 | 1,050 | 255 | 235 | 190 | 315 | 1,090 | 575 | 175 | 90 | 71 | 71 |
| 14 | 235 | 1,010 | 255 | 235 | 190 | 515 | 1,010 | 515 | 152 | 95 | 71 | 75 |
| 15 | 235 | 740 | 295 | 235 | 190 | 670 | 970 | 460 | 132 | 95 | 67 | 75 |
| 16 | 220 | 635 | 315 | 220 | 190 | 705 | 1,050 | 410 | 132 | 95 | 63 | 80 |
| 17 | 235 | 545 | 315 | 220 | 198 | 670 | 1,090 | 545 | 126 | 105 | 59 | 75 |
| 18 | 315 | 515 | 275 | 220 | 212 | 705 | 1,170 | 545 | 115 | 100 | 63 | 75 |
| 19 | 740 | 360 | 275 | 220 | 205 | 635 | 1,170 | 515 | 110 | 100 | 67 | 75 |
| 20 | 670 | 485 | 198 | 212 | 205 | 635 | 1,170 | 515 | 115 | 100 | 67 | 71 |
| 21 | 545 | 460 | 220 | 235 | 205 | 670 | 1,010 | 460 | 105 | 105 | 59 | 71 |
| 22 | 460 | 460 | 220 | 198 | 205 | 740 | 930 | 435 | 105 | 105 | 59 | 71 |
| 23 | 385 | 460 | 220 | 205 | 205 | 810 | 850 | 410 | 105 | 95 | 59 | 71 |
| 24 | 360 | 460 | 235 | 212 | 255 | 890 | 810 | 460 | 110 | 90 | 59 | 67 |
| 25 | 315 | 435 | 275 | 190 | 335 | 810 | 810 | 460 | 105 | 90 | 56 | 67 |
| 26 | 315 | 410 | 235 | 190 | 295 | 740 | 740 | 460 | 100 | 85 | 59 | 67 |
| 27 | 275 | 410 | 235 | 198 | 275 | 670 | 740 | 460 | 105 | 80 | 59 | 63 |
| 28 | 275 | 435 | 235 | 168 | 255 | 670 | 705 | 635 | 95 | 80 | 63 | 63 |
| 29 | 255 | 410 | 220 | 190 | ..... | 740 | 740 | 515 | 85 | 71 | 67 | 67 |
| 30 | 275 | 385 | 235 | 198 | ..... | 810 | 635 | 435 | 95 | 59 | 71 | 67 |
| 31 | 315 | ..... | 255 | 205 | ..... | 810 | ..... | 410 | ..... | 63 | 63 | ..... |

NOTE.—Discharge determined as follows: Oct. 1, 1914, to Aug. 9, 1915, from a rating curve well defined between 150 and 800 second-feet; Aug. 10–21, by indirect method for shifting control; Aug. 22 to Sept. 30, from a fairly well-defined rating curve; Dec. 22–23, estimated, on account of ice.

*Monthly discharge of White Salmon River at splash dam, near Trout Lake, Wash., for the year ending Sept. 30, 1915.*

| Month. | Discharge in second-feet. | | | Run-off (total in acre-feet). | Accuracy. |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | | |
| October | 740 | 190 | 303 | 18,600 | A. |
| November | 1,050 | 360 | 554 | 33,000 | A. |
| December | 360 | 198 | 275 | 16,900 | A. |
| January | 275 | 168 | 220 | 13,500 | A. |
| February | 335 | 190 | 216 | 12,000 | A. |
| March | 890 | 255 | 538 | 33,100 | A. |
| April | 2,140 | 635 | 1,110 | 66,000 | B. |
| May | 705 | 410 | 519 | 31,900 | B. |
| June | 385 | 85 | 165 | 9,820 | B. |
| July | 126 | 59 | 97.1 | 5,970 | B. |
| August | 76 | 55 | 63.1 | 3,880 | B. |
| September | 80 | 56 | 69.6 | 4,140 | B. |
| The year | 2,140 | 55 | 344 | 248,000 | |

### WHITE SALMON RIVER AT HUSUM, WASH.

LOCATION.—In the SE. ¼ sec. 25, T. 4 N., R. 10 E., 1,000 feet above falls and power house at Husum, Klickitat County, and three-fourths mile above Rattlesnake Creek.

DRAINAGE AREA.—300 square miles.

RECORDS AVAILABLE.—September 23, 1909, to September 30, 1915.

GAGE.—Vertical staff on right bank; read daily by John Wassell. Fuller water-stage recorder used October, 1912, to February, 1915.

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

CHANNEL AND CONTROL.—Gravel and lava boulders; practically permanent. Control is crest of falls, which is sometimes obstructed by logs, causing backwater.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 5.6 feet at 11 a. m. April 3 (discharge, 2,260 second-feet); minimum stage recorded, 2.66 feet at 2 p. m. September 30 (discharge, 432 second-feet).

1909–1915: Maximum stage recorded, 7.65 feet at 7 a. m. November 24, 1909 (discharge, 4,840 second-feet); minimum stage recorded, 2.66 feet at 2 p. m. September 30, 1915 (discharge, 432 second-feet).

WINTER FLOW.—Stage-discharge relation practically unaffected by ice.

DIVERSIONS.—Several ditches divert water for irrigation in Trout Lake Valley.

REGULATION.—None. Flow formerly affected at times by operation of splash dam 10 miles upstream; no logging on stream at present.

ACCURACY.—Results considered good. Some uncertainty owing to diurnal fluctuation on account of melting glaciers and gaps in gage-height record.

*Discharge measurements of White Salmon River at Husum, Wash., during the year ending Sept. 30, 1915.*

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---|---|---|---|---|---|---|---|
| | | *Feet.* | *Sec.-ft.* | | | *Feet.* | *Sec.-ft.* |
| Oct. 8 | P. V. Hodges | 3.05 | 623 | July 25 | C. L. Batchelder | 3.05 | 625 |
| Feb. 5 | C. G. Paulsen | 3.06 | 580 | Sept. 18 | do | 2.86 | 507 |
| June 6 | C. L. Batchelder | 3.55 | 835 | | | | |

*Daily discharge, in second-feet, of White Salmon River at Husum, Wash., for the year ending Sept. 30, 1915.*

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 675 | 720 | 770 | 620 | 555 | 820 | 1,470 | 1,080 | 970 | 675 | 540 | 540 |
| 2 | 675 | 820 | 770 | 630 | 585 | 870 | 2,100 | 1,080 | 920 | 720 | 540 | 540 |
| 3 | 675 | 1,120 | 720 | 630 | 600 | 820 | 2,260 | 1,020 | 870 | 675 | 630 | 540 |
| 4 | 675 | 1,170 | 720 | 630 | 615 | 970 | 2,100 | 1,020 | 870 | 675 | 585 | 540 |
| 5 | 630 | 970 | 720 | 630 | 630 | 870 | 1,620 | 1,020 | 870 | 675 | 540 | 540 |
| 6 | 630 | 920 | 675 | 630 | 630 | 770 | 1,620 | 1,020 | 870 | 675 | 540 | 540 |
| 7 | 630 | 870 | 630 | 630 | 630 | 770 | 1,620 | 1,020 | 820 | 675 | 540 | 540 |
| 8 | 630 | 870 | 630 | 608 | 608 | 770 | 1,540 | 1,020 | 820 | 675 | 540 | 540 |
| 9 | 630 | 870 | 630 | 585 | 585 | 770 | 1,470 | 1,080 | 770 | 675 | 540 | 540 |
| 10 | 630 | 820 | 630 | 585 | 595 | 770 | 1,400 | 1,140 | 770 | 675 | 540 | 540 |
| 11 | 652 | 820 | 630 | 600 | 605 | 770 | 1,400 | 1,140 | 770 | 675 | 585 | 540 |
| 12 | 675 | 970 | 630 | 615 | 620 | 770 | 1,400 | 1,140 | 770 | 675 | 630 | 495 |
| 13 | 675 | 1,320 | 625 | 630 | 630 | 770 | 1,400 | 1,080 | 770 | 675 | 540 | 495 |
| 14 | 675 | 1,220 | 620 | 630 | 608 | 970 | 1,330 | 1,020 | 720 | 630 | 585 | 495 |
| 15 | 675 | 970 | 615 | 630 | 585 | 970 | 1,260 | 970 | 720 | 630 | 585 | 540 |
| 16 | 675 | 940 | 600 | 585 | 585 | 1,140 | 1,330 | 970 | 720 | 630 | 540 | 540 |
| 17 | 675 | 910 | 595 | 585 | 585 | 1,400 | 1,330 | 1,400 | 720 | 675 | 540 | 540 |
| 18 | 848 | 870 | 590 | 585 | 585 | 1,620 | 1,330 | 1,080 | 720 | 630 | 585 | 495 |
| 19 | 1,020 | 830 | 585 | 585 | 585 | 1,400 | 1,330 | 1,080 | 720 | 630 | 540 | 495 |
| 20 | 970 | 800 | 585 | 585 | 585 | 1,400 | 1,470 | 1,020 | 720 | 630 | 585 | 495 |
| 21 | 870 | 770 | 585 | 585 | 630 | 1,620 | 1,470 | 1,020 | 720 | 630 | 585 | 495 |
| 22 | 770 | 770 | 585 | 585 | 630 | 1,400 | 1,330 | 970 | 675 | 630 | 585 | 495 |
| 23 | 770 | 770 | 585 | 585 | 750 | 1,200 | 1,200 | 970 | 675 | 630 | 585 | 495 |
| 24 | 770 | 770 | 585 | 585 | 870 | 1,260 | 1,200 | 970 | 720 | 585 | 540 | 495 |
| 25 | 720 | 770 | 585 | 570 | 770 | 1,200 | 1,200 | 970 | 675 | 585 | 540 | 495 |
| 26 | 710 | 770 | 585 | 555 | 770 | 1,140 | 1,200 | 970 | 675 | 585 | 540 | 450 |
| 27 | 700 | 770 | 585 | 540 | 770 | 1,080 | 1,200 | 970 | 675 | 585 | 540 | 450 |
| 28 | 700 | 770 | 590 | 530 | 770 | 1,080 | 1,140 | 1,080 | 675 | 585 | 585 | 450 |
| 29 | 695 | 770 | 590 | 515 | ..... | 1,080 | 1,140 | 1,080 | 675 | 585 | 540 | 450 |
| 30 | 685 | 770 | 600 | 495 | ..... | 1,200 | 1,080 | 970 | 720 | 540 | 540 | 450 |
| 31 | 675 | ..... | 610 | 530 | ..... | 1,200 | ..... | 970 | ..... | 540 | 540 | ..... |

NOTE.—Discharge determined from a rating curve well defined below and fairly well defined above 1,000 second-feet. Discharge interpolated Oct. 26–30, Nov. 16–20, 22–27, Dec. 8–10, 13–18, 20–25, Dec. 27 to Jan. 1, Jan. 5–6, 11, 12, 17–21, 25–29, Feb. 3–4, 10–12.

*Monthly discharge of White Salmon River at Husum, Wash., for the year ending Sept. 30, 1915.*

| Month. | Discharge in second-feet. | | | Run-off (total in acre-feet). | Accuracy. |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | | |
| October | 1,020 | 630 | 7'2 | 43,800 | B. |
| November | 1,320 | 720 | 8?3 | 52,500 | B. |
| December | 770 | 585 | 6?8 | 38,600 | C. |
| January | 630 | 495 | 5?0 | 36,300 | B. |
| February | 870 | 555 | 6?2 | 35,700 | B. |
| March | 1,620 | 770 | 1,060 | 65,200 | B. |
| April | 2,260 | 1,080 | 1,430 | 85,100 | B. |
| May | 1,400 | 970 | 1,040 | 64,000 | B. |
| June | 970 | 675 | 760 | 45,200 | A. |
| July | 720 | 540 | 637 | 39,200 | A. |
| August | 630 | 540 | 560 | 34,400 | A. |
| September | 540 | 450 | 508 | 30,200 | A. |
| The year | 2,260 | 450 | 7?8 | 570,000 | |

## SANDY RIVER BASIN.

### SANDY RIVER NEAR MARMOT, OREG.

LOCATION.—In sec. 24, T. 2 S., R. 5 E., at the Van der Hoof ranch, about 1½ miles south of Marmot, Clackamas County, 2 miles by river above the Sandy River dam of the Portland Railway, Light & Power Co., and about 5 miles below the mouth of Salmon River.

DRAINAGE AREA.—267 square miles (measured on topographic maps and Forest Service map).

RECORDS AVAILABLE.—August 15, 1911, to September 30, 1915.

GAGE.—Friez water-stage recorder on right bank, referred to a vertical staff on the stilling well. Observer, A. D. Cahill.

DISCHARGE MEASUREMENTS.—Made from cable about a mile below gage, just within the backwater of the dam.

CHANNEL AND CONTROL.—Rocks and gravel; may shift slightly.

EXTREMES OF DISCHARGE.—Maximum stage during year from water-stage recorder, 5.00 feet at 10 a. m. November 13 (discharge, 4,000 second-feet); minimum stage from water-stage recorder, 0.95 foot at 4 p. m. September 29 and 30 (discharge, 285 second-feet).

1911–1915: Maximum stage recorded, 9.25 feet January 13, 1912 (discharge, 12,700 second-feet); minimum stage is that of 1915.

WINTER FLOW.—Stage-discharge relation practically unaffected by ice.

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Results considered excellent.

*Discharge measurements of Sandy River near Marmot, Oreg., during the year ending Sept. 30, 1915.*

| Date. | Made by— | Gage height. | Discharge. |
|---|---|---|---|
| | | *Feet.* | *Sec.-ft.* |
| Jan. 15 | P. V. Hodges | 2.48 | 1,060 |
| Apr. 1 | Batchelder and Kelley | 3.58 | 2,020 |
| Aug. 12 | C. L. Batchelder | 1.32 | 406 |

*Daily discharge, in second-feet, of Sandy River near Marmot, Oreg., for the year ending Sept. 30, 1915.*

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 460 | 940 | 760 | 975 | 1,440 | 1,150 | 1,990 | 730 | 1,570 | 700 | 500 | 377 |
| 2 | 1,080 | 1,310 | 760 | 975 | 1,270 | 1,080 | 2,380 | 700 | 1,480 | 675 | 525 | 365 |
| 3 | 1,190 | 1,440 | 760 | 975 | 1,310 | 1,010 | 2,630 | 730 | 1,310 | 650 | 500 | 352 |
| 4 | 1,010 | 1,270 | 700 | 975 | 1,190 | 1,520 | 2,320 | 730 | 1,190 | 650 | 450 | 340 |
| 5 | 940 | 1,310 | 675 | 996 | 1,270 | 1,480 | 1,940 | 675 | 1,080 | 625 | 460 | 327 |
| 6 | 910 | 1,700 | 675 | 1,020 | 1,310 | 1,270 | 1,700 | 675 | 1,010 | 675 | 465 | 315 |
| 7 | 820 | 1,390 | 650 | 1,040 | 1,190 | 1,150 | 1,700 | 675 | 975 | 700 | 446 | 312 |
| 8 | 730 | 1,120 | 625 | 1,060 | 1,120 | 1,080 | 1,520 | 650 | 910 | 760 | 426 | 330 |
| 9 | 700 | 1,080 | 625 | 1,080 | 1,150 | 1,010 | 1,350 | 730 | 880 | 760 | 434 | 318 |
| 10 | 850 | 1,040 | 600 | 1,100 | 1,120 | 1,010 | 1,310 | 940 | 910 | 650 | 450 | 318 |
| 11 | 820 | 1,390 | 575 | 1,120 | 1,040 | 975 | 1,270 | 940 | 1,310 | 600 | 450 | 309 |
| 12 | 1,010 | 1,890 | 550 | 1,080 | 975 | 975 | 1,230 | 1,010 | 1,390 | 575 | 434 | 366 |
| 13 | 910 | 3,500 | 525 | 1,390 | 910 | 1,120 | 1,270 | 1,080 | 1,150 | 575 | 402 | 438 |
| 14 | 820 | 2,560 | 550 | 2,500 | 850 | 1,700 | 1,190 | 1,080 | 1,040 | 730 | 394 | 398 |
| 15 | 760 | 1,890 | 550 | 2,040 | 820 | 2,150 | 1,080 | 1,010 | 940 | 675 | 394 | 342 |
| 16 | 700 | 1,570 | 525 | 1,480 | 820 | 1,890 | 1,120 | 940 | 880 | 790 | 406 | 334 |
| 17 | 760 | 1,390 | 560 | 1,300 | 975 | 1,800 | 1,080 | 1,120 | 880 | 1,080 | 390 | 324 |
| 18 | 880 | 1,270 | 595 | 1,120 | 1,230 | 1,750 | 1,080 | 1,390 | 820 | 880 | 382 | 318 |
| 19 | 1,800 | 1,150 | 630 | 1,120 | 1,120 | 1,570 | 1,040 | 1,750 | 880 | 760 | 390 | 312 |
| 20 | 1,700 | 1,120 | 665 | 1,080 | 1,040 | 1,480 | 1,010 | 1,620 | 850 | 730 | 402 | 312 |
| 21 | 1,310 | 1,080 | 700 | 975 | 1,010 | 1,570 | 910 | 1,440 | 760 | 700 | 402 | 315 |
| 22 | 1,120 | 1,010 | 739 | 910 | 975 | 1,660 | 880 | 1,350 | 760 | 650 | 402 | 309 |
| 23 | 940 | 1,010 | 778 | 850 | 975 | 1,750 | 880 | 1,310 | 760 | 600 | 406 | 300 |
| 24 | 850 | 975 | 817 | 760 | 1,270 | 1,660 | 850 | 1,350 | 730 | 575 | 390 | 300 |
| 25 | 760 | 910 | 856 | 730 | 1,480 | 1,440 | 820 | 1,310 | 730 | 550 | 390 | 306 |
| 26 | 700 | 880 | 896 | 730 | 1,310 | 1,270 | 790 | 1,570 | 940 | 550 | 402 | 300 |
| 27 | 675 | 850 | 936 | 675 | 1,270 | 1,150 | 760 | 1,660 | 820 | 525 | 390 | 324 |
| 28 | 625 | 850 | 975 | 650 | 1,270 | 1,270 | 730 | 2,380 | 730 | 525 | 386 | 297 |
| 29 | 625 | 850 | 975 | 625 | ..... | 1,570 | 790 | 1,940 | 700 | 525 | 386 | 294 |
| 30 | 650 | 790 | 975 | 625 | ..... | 1,660 | 730 | 1,570 | 675 | 525 | 402 | 294 |
| 31 | 700 | ..... | 975 | 700 | ..... | 1,570 | ..... | 1,390 | ..... | 525 | 389 | ..... |

NOTE.—Discharge determined from a rating curve well defined between 300 and 8,000 second-feet. Ice in gage well disconnected float and caused break in record of stage Dec. 16 to Jan. 11; discharge for this period interpolated. Discharge interpolated also Apr. 11 and Sept. 1–5.

*Monthly discharge of Sandy River near Marmot, Oreg., for the year ending Sept. 30, 1915.*

[Drainage area, 267 square miles.]

| Month. | Discharge in second-feet. | | | | Run-off. | | Accuracy. |
|---|---|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | Per square mile. | Depth in inches on drainage area. | Total in acre-feet. | |
| October | 1,800 | 460 | 897 | 3.36 | 3.87 | 55,200 | A. |
| November | 3,500 | 790 | 1,320 | 4.94 | 5.51 | 78,600 | A. |
| December | 975 | 525 | 715 | 2.68 | 3.09 | 44,000 | B. |
| January | 2,500 | 625 | 1,050 | 3.93 | 4.53 | 64,600 | B. |
| February | 1,480 | 820 | 1,130 | 4.23 | 4.40 | 62,800 | A. |
| March | 2,150 | 975 | 1,410 | 5.28 | 6.09 | 86,700 | A. |
| April | 2,630 | 730 | 1,280 | 4.79 | 5.34 | 76,200 | A. |
| May | 2,380 | 650 | 1,180 | 4.42 | 5.10 | 72,600 | A. |
| June | 1,570 | 675 | 969 | 3.63 | 4.05 | 57,700 | A. |
| July | 1,080 | 525 | 661 | 2.48 | 2.86 | 40,600 | A. |
| August | 525 | 382 | 421 | 1.58 | 1.82 | 25,900 | A. |
| September | 438 | 294 | 328 | 1.23 | 1.37 | 19,500 | A. |
| The year | 3,500 | 294 | 945 | 3.54 | 48.03 | 674,000 | |

### CLEAR FORK OF SANDY RIVER NEAR WELCHES, OREG.

LOCATION.—In the SW. ¼ sec. 19, T. 2 S., R. 8 E., 100 yards below Clear Fork ranger cabin, about half a mile above the mouth of stream and about 7 miles northeast of Welches, Clackamas County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—August 15 to October 15, 1913; July 18 to September 18, 1914; July 2 to September 20, 1915, when station was discontinued.

GAGE.—Vertical staff on left bank. Gage reader, E. W. Schmeer.

DISCHARGE MEASUREMENTS.—Made by wading.

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

EXTREMES OF DISCHARGE.—Maximum stage recorded during period July 2 to September 20, 1915, 0.65 foot July 19 (discharge, 31 second-feet); minimum stage recorded, 0.20 foot September 20 (discharge, 6 second-feet).

1913–1915: Minimum stage recorded, 0.20 foot September 2 and 4, 1914, and September 20, 1915 (discharge, 6 second-feet). No records during winter flood periods.

WINTER FLOW.—No records

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Results considered good.

*Discharge measurements of Clear Fork of Sandy River near Welches, Oreg., during the year ending Sept. 30, 1915.*

[Made by C. L. Batchelder.]

| Date. | Gage height. | Discharge. |
|---|---|---|
| | *Foot.* | *Sec.-ft.* |
| Aug. 15 | 0.31 | 11.5 |
| Sept. 8 | .26 | 9.2 |

*Daily discharge, in second-feet, of Clear Fork of Sandy River near Welches, Oreg., for the year ending Sept. 30, 1915.*

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

NOTE.—Discharge determined from a well-defined rating curve; given only for days on which gage was read.

### LOST CREEK NEAR BRIGHTWOOD, OREG.

LOCATION.—In the NE. ¼ sec. 25, T. 2 S., R. 7 E., about 100 yards above mouth, a mile southeast of Truman's ranch, and about 8 miles east of Brightwood, Clackamas County.

DRAINAGE AREA.—11.2 square miles (measured on topographic map).

RECORDS AVAILABLE.—September 17, 1913, to September 30, 1915.

GAGE.—Stevens water-stage recorder referred to a vertical staff on left bank. Gage reader, Carl Raithel.

DISCHARGE MEASUREMENTS.—Made from foot log or by wading.

CHANNEL AND CONTROL.—Gravel and boulders; may shift in floods.

EXTREMES OF DISCHARGE.—Maximum stage during year from water-stage recorder, 1.75 feet 11 a. m. to 8 p. m. April 1 (discharge, 208 second-feet); minimum stage from water-stage recorder, 0.38 foot September 25 (discharge, 15 second-feet).

1913–1915 Maximum stage, 2.46 feet at 10 a. m. January 5, 1914 (discharge, 495 second-feet). Minimum stage occurred in 1915.

WINTER FLOW.—Stage-discharge relation unaffected by ice.

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Results considered excellent except during extremely high water.

*Discharge measurements of Lost Creek near Brightwood, Oreg., during the year ending Sept. 30, 1915.*

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---|---|---|---|---|---|---|---|
| | | *Feet.* | *Sec.-ft.* | | | *Feet.* | *Sec.-ft.* |
| Nov. 9 | P. V. Hodges | 1.12 | 66.1 | Mar. 31 | Kelley and Batchelder | 1.30 | 98.3 |
| 10 | do | 1.07 | 58.8 | Aug. 15 | C. L. Batchelder | .48 | 18.8 |
| Mar. 31 | C. L. Batchelder | 1.30 | 97.8 | Sept. 8 | do | .42 | 15.3 |

*Daily discharge, in second-feet, of Lost Creek near Brightwood, Oreg., for the year ending Sept. 30, 1915.*

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 29 | 64 | 40 | 65 | 80 | ..... | 179 | 37 | 84 | 32 | 23 | 15 |
| 2 | 80 | 84 | 40 | 60 | ..... | ..... | 182 | 36 | 75 | 31 | 22 | 16 |
| 2 | 77 | 94 | 39 | 55 | ..... | ..... | 176 | 35 | 67 | 30 | 21 | 15 |
| 4 | 67 | 85 | 37 | 50 | ..... | ..... | 140 | 36 | 60 | 29 | 20 | 15 |
| 5 | 67 | 91 | 37 | 45 | ..... | ..... | 114 | 37 | 57 | 29 | 20 | 15 |
| 6 | 60 | 100 | 36 | 45 | ..... | ..... | 100 | 40 | 51 | 34 | 19 | 15 |
| 7 | 51 | 87 | 34 | 53 | ..... | ..... | 102 | 43 | 47 | 31 | 19 | 15 |
| 8 | 47 | 75 | 33 | 102 | ..... | ..... | 87 | 42 | 42 | 36 | 18 | 15 |
| 9 | 46 | 67 | 33 | 89 | ..... | ..... | 78 | 48 | 40 | 32 | 18 | 15 |
| 10 | 64 | 60 | 32 | 72 | ..... | ..... | 77 | 66 | 41 | 29 | 18 | 15 |
| 11 | 64 | 94 | 31 | 64 | ..... | ..... | 78 | 63 | 58 | 27 | 18 | 15 |
| 12 | 84 | 118 | 29 | 57 | ..... | ..... | 82 | 64 | 69 | 26 | 18 | 18 |
| 13 | 70 | 176 | 28 | 72 | ..... | ..... | 77 | 66 | 54 | 27 | 18 | 24 |
| 14 | 60 | 136 | 28 | 102 | ..... | ..... | 66 | 69 | 46 | 33 | 18 | 19 |
| 15 | 51 | 106 | 28 | 84 | ..... | ..... | 58 | 64 | 44 | 31 | 17 | 18 |
| 16 | 47 | 89 | 26 | 64 | ..... | ..... | 61 | 60 | 42 | 36 | 17 | 17 |
| 17 | 48 | 77 | 26 | 60 | ..... | ..... | 67 | 67 | 41 | 42 | 17 | 16 |
| 18 | 63 | 69 | 26 | 56 | ..... | ..... | 66 | 87 | 39 | 36 | 17 | 16 |
| 19 | 148 | 64 | 28 | 52 | ..... | ..... | 64 | 120 | 40 | 33 | 17 | 15 |
| 20 | 122 | 61 | 25 | 49 | ..... | ..... | 61 | 112 | 40 | 31 | 16 | 15 |
| 21 | 96 | 61 | 24 | 46 | ..... | ..... | 51 | 96 | 36 | 29 | 16 | 15 |
| 22 | 80 | 57 | 24 | 42 | ..... | ..... | 48 | 87 | 35 | 27 | 16 | 15 |
| 23 | 66 | 58 | 24 | 38 | ..... | ..... | 46 | 82 | 34 | 26 | 16 | 15 |
| 24 | 57 | 56 | 24 | 34 | ..... | ..... | 47 | 85 | 32 | 24 | 16 | 15 |
| 25 | 50 | 53 | 25 | 34 | ..... | ..... | 43 | 82 | 34 | 24 | 16 | 15 |
| 26 | 45 | 48 | 37 | 33 | ..... | 64 | 42 | 106 | 46 | 24 | 16 | 15 |
| 27 | 41 | 47 | 34 | 32 | ..... | 60 | 43 | 110 | 39 | 24 | 15 | 16 |
| 28 | 39 | 46 | 39 | 31 | ..... | 85 | 44 | 125 | 36 | 24 | 15 | 16 |
| 29 | 36 | 44 | 34 | 31 | ..... | 112 | 45 | 104 | 34 | 24 | 15 | 15 |
| 30 | 37 | 40 | 40 | 30 | ..... | 116 | 40 | 89 | 33 | 24 | 15 | 15 |
| 31 | 42 | ..... | 40 | 36 | ..... | 102 | ..... | 77 | ..... | 24 | 15 | ..... |

NOTE.—Discharge determined from a rating curve well defined between 15 and 150 second-feet. Discharge Dec. 30 to Jan. 5 estimated by comparison with records of flow of Little Sandy River. Gage out for repairs, no record, Feb. 2 to Mar. 25.

*Monthly discharge of Lost Creek near Brightwood, Oreg., for the year ending Sept. 30, 1915.*

[Drainage area, 11.2 square miles.]

| Month. | Discharge in second-feet. | | | | Run-off. | | Accuracy. |
|---|---|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | Per square mile. | Depth in inches on drainage area. | Total in acre-feet. | |
| October | 148 | 29 | 62.4 | 5.57 | 6.42 | 3,840 | A. |
| November | 176 | 40 | 76.9 | 6.87 | 7.66 | 4,580 | A. |
| December | 40 | 24 | 31.6 | 2.82 | 3.25 | 1,940 | A. |
| January | 102 | 30 | 54.3 | 4.85 | 5.59 | 3,340 | B. |
| February | ..... | ..... | *a* 90.0 | 8.04 | 8.37 | 5,000 | |
| March | ..... | ..... | *a* 100 | 8.93 | 10.30 | 6,150 | |
| April | 182 | 40 | 78.8 | 7.04 | 7.86 | 4,690 | A. |
| May | 125 | 35 | 72.1 | 6.44 | 7.42 | 4,430 | A. |
| June | 84 | 32 | 46.5 | 4.15 | 4.63 | 2,770 | A. |
| July | 42 | 24 | 29.3 | 2.62 | 3.02 | 1,800 | A. |
| August | 23 | 15 | 17.5 | 1.56 | 1.80 | 1,080 | A. |
| September | 24 | 15 | 15.9 | 1.42 | 1.58 | 946 | A. |
| The year | 182 | 15 | 56.0 | 5.00 | 67.90 | 40,600 | |

*a* Mean discharge estimated by comparison with record of flow of Little Sandy River; roughly approximate.

### BULL RUN RIVER NEAR BULL RUN, OREG.

LOCATION.—In sec. 25, T. 1 S., R. 5 E., 1¼ 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, 1915; also readings on a gage installed by city water department, January 5, 1895, to November 13, 1906.

GAGE.—Friez water-stage recorder referred to vertical staff on left bank. Prior to July 28, 1909, an inclined staff at headworks 1¼ miles below present gage. Gage readers, gatemen at headworks.

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

CHANNEL AND CONTROL.—Rocks and gravel; shifting in extreme floods.

EXTREMES OF DISCHARGE.—Maximum stage, estimated by comparison with readings on staff gage at headworks, 6.80 feet at 1 p. m. November 13 (discharge, 3,400 second-feet). Minimum stage from water-stage recorder, 2.55 feet September 25 (discharge, 74 second-feet).

1895–1915: Maximum stage recorded, 10.6 feet on gage at headworks November 13, 1906 (discharge, 15,400 second-feet); minimum stage recorded, 2.54 feet August 29 to September 4, 1914 (discharge, 72 second-feet) and 2.60 feet September 3 to 4, 1910 (discharge, 72 second-feet).

WINTER FLOW.—Stage-discharge relation unaffected by ice.

DIVERSIONS.—None above station. The two water-supply pipes divert practically all the low-water flow 1¼ miles below the station.

REGULATION.—None.

ACCURACY.—Results excellent except for extremely high stages for which they are somewhat uncertain.

*Discharge measurements of Bull Run River near Bull Run, Oreg., during the year ending Sept. 30, 1915.*

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---|---|---|---|---|---|---|---|
| | | *Feet* | *Sec.-ft.* | | | *Feet.* | *Sec.-ft.* |
| Oct. 7 | F. F. Henshaw | 3.67 | 460 | Aug. 31 | C. L. Batchelder | 2.62 | 95.8 |
| Aug. 13 | C. L. Batchelder | 2.77 | 125 | 31 | do | 2.62 | 91.7 |

*Daily discharge, in second-feet, of Bull Run River near Bull Run, Oreg., for the year ending Sept. 30., 1915.*

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 292 | 480 | 338 | 1,190 | 1,240 | 644 | 1,360 | 215 | 655 | 285 | 215 | 91 |
| 2 | 1,190 | 865 | 359 | 965 | 910 | 567 | 1,460 | 212 | 556 | 263 | 207 | 90 |
| 3 | 1,040 | 2,350 | 372 | 769 | 965 | 515 | 1,640 | 203 | 478 | 246 | 198 | 88 |
| 4 | 763 | 1,300 | 351 | 661 | 817 | 817 | 1,460 | 200 | 425 | 237 | 190 | 87 |
| 5 | 627 | 925 | 330 | 577 | 965 | 739 | 1,040 | 194 | 380 | 221 | 181 | 88 |
| 6 | 535 | 1,340 | 319 | 525 | 1,110 | 650 | 817 | 191 | 346 | 256 | 173 | 89 |
| 7 | 459 | 817 | 292 | 599 | 884 | 588 | 799 | 185 | 318 | 277 | 164 | 90 |
| 8 | 394 | 865 | 274 | 1,460 | 769 | 525 | 695 | 182 | 299 | 402 | 159 | 91 |
| 9 | 372 | 710 | 253 | 1,190 | 706 | 483 | 583 | 188 | 285 | 342 | 153 | 92 |
| 10 | 530 | 620 | 240 | 917 | 644 | 483 | 515 | 326 | 299 | 299 | 148 | 90 |
| 11 | 468 | 1,420 | 230 | 841 | 561 | 449 | 494 | 351 | 483 | 274 | 143 | 84 |
| 12 | 567 | 1,340 | 212 | 793 | 489 | 439 | 515 | 384 | 515 | 256 | 137 | 90 |
| 13 | 463 | 3,320 | 200 | 1,320 | 459 | 509 | 551 | 435 | 449 | 263 | 132 | 112 |
| 14 | 407 | 1,780 | 197 | 2,480 | 416 | 965 | 483 | 515 | 398 | 412 | 126 | 115 |
| 15 | 363 | 1,240 | 191 | 1,740 | 389 | 1,110 | 435 | 494 | 359 | 384 | 124 | 102 |
| 16 | 363 | 910 | 188 | 1,000 | 376 | 853 | 416 | 425 | 334 | 660 | 122 | 97 |
| 17 | 454 | 751 | 206 | 805 | 605 | 787 | 389 | 530 | 322 | 865 | 120 | 92 |
| 18 | 782 | 650 | 253 | 748 | 689 | 787 | 367 | 793 | 307 | 660 | 118 | 87 |
| 19 | 2,120 | 567 | 263 | 691 | 588 | 661 | 346 | 1,260 | 449 | 520 | 116 | 86 |
| 20 | 1,410 | 520 | 250 | 634 | 535 | 616 | 326 | 986 | 420 | 425 | 114 | 84 |
| 21 | 965 | 483 | 250 | 577 | 515 | 622 | 307 | 823 | 372 | 372 | 112 | 82 |
| 22 | 757 | 494 | 250 | 515 | 546 | 633 | 292 | 745 | 346 | 326 | 110 | 80 |
| 23 | 588 | 515 | 250 | 449 | 588 | 639 | 307 | 695 | 267 | 299 | 107 | 78 |
| 24 | 473 | 483 | 250 | 402 | 930 | 588 | 281 | 711 | 318 | 277 | 104 | 76 |
| 25 | 416 | 439 | 292 | 367 | 1,070 | 499 | 263 | 700 | 330 | 256 | 101 | 74 |
| 26 | 372 | 398 | 572 | 351 | 853 | 439 | 237 | 1,150 | 509 | 243 | 98 | 74 |
| 27 | 330 | 367 | 641 | 322 | 787 | 407 | 230 | 1,360 | 425 | 237 | 95 | 74 |
| 28 | 307 | 380 | 970 | 307 | 723 | 439 | 218 | 1,730 | 367 | 230 | 92 | 74 |
| 29 | 281 | 394 | 751 | 288 | ..... | 622 | 250 | 1,150 | 334 | 227 | 92 | 74 |
| 30 | 299 | 355 | 872 | 285 | ..... | 793 | 218 | 865 | 307 | 221 | 92 | 74 |
| 31 | 439 | ..... | 917 | 435 | ..... | 723 | ..... | 706 | ..... | 224 | 92 | ..... |

NOTE.—Daily discharge determined from a well-defined rating curve. Discharge Nov. 1–6 and 8–13 determined from readings on staff gage at headworks and is somewhat doubtful owing to uncertainty as to amount of backwater from temporary dam. Discharge estimated Dec. 20–24, as float was frozen in well. Discharge interpolated Jan. 18–20, Aug. 1–6, 8–12, 15–20, 22–27, 29–30, Sept. 1–3, 4–8, 19–24, and 26–30; recorder not working properly at extremely low water.

*Monthly discharge of Bull Run River near Bull Run, Oreg., for the year ending Sept. 30, 1915.*

[Drainage area, 102 square miles.]

| Month. | Discharge in second-feet. | | | | Run-off. | | Accuracy. |
|---|---|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | Per square mile. | Depth in inches on drainage area. | Total in acre-feet. | |
| October | 2,120 | 281 | 607 | 5.95 | 6.86 | 37,300 | A. |
| November | 3,320 | 355 | 903 | 8.85 | 9.87 | 53,700 | C. |
| December | 970 | 188 | 366 | 3.59 | 4.14 | 22,500 | B. |
| January | 2,480 | 285 | 781 | 7.66 | 8.83 | 48,000 | A. |
| February | 1,240 | 376 | 719 | 7.05 | 7.34 | 39,900 | A. |
| March | 1,110 | 407 | 632 | 6.20 | 7.15 | 38,900 | A. |
| April | 1,640 | 218 | 576 | 5.65 | 6.30 | 34,300 | A. |
| May | 1,730 | 182 | 610 | 5.98 | 6.89 | 37,500 | A. |
| June | 655 | 267 | 388 | 3.80 | 4.24 | 23,100 | A. |
| July | 865 | 221 | 337 | 3.30 | 3.80 | 20,700 | A. |
| August | 215 | 92 | 133 | 1.30 | 1.50 | 8,180 | B. |
| September | 115 | 74 | 86.8 | .85 | .95 | 5,160 | B. |
| The year | 3,320 | 74 | 510 | 5.02 | 67.90 | 369,000 | |

### LITTLE SANDY RIVER NEAR MARMOT, OREG.

LOCATION.—In the SW. ¼ sec. 6, T. 2 S., R. 6 E., at trail bridge at Little Sandy ranger station and 1½ miles north of Marmot, Clackamas County.

DRAINAGE AREA.—17.2 square miles (measured on topographic map).

RECORDS AVAILABLE:—August 14, 1913, to September 30, 1915.

GAGE.—Stevens water-stage recorder referred to vertical staff on left bank just below bridge. Gage reader, Carl Aschoff.

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

CHANNEL AND CONTROL.—Gravel and boulders; may shift somewhat.

EXTREMES OF DISCHARGE.—Maximum stage during year from water-stage recorder, 2.56 feet at 2 a. m., November 13 (discharge, 514 second-feet); minimum stage from water-stage recorder, 0.27 foot September 24 and 25 (discharge, 12 second-feet).

1913–1915: Maximum stage recorded, 3.22 feet, January 5, 1914 (discharge, 934 second-feet); minimum stage recorded, 0.21 foot August 28, 1914 (discharge, 12 second-feet).

WINTER FLOW.—Stage-discharge relation never affected by ice.

DIVERSIONS.—None above station.

REGULATION.—None.

ACCURACY.—Results considered excellent except for periods during which stage was extremely high or recorder was not working properly.

*Discharge measurements of Little Sandy River near Marmot, Oreg., during the year ending Sept. 30, 1915.*

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---|---|---|---|---|---|---|---|
| | | *Feet.* | *Sec.-ft.* | | | *Feet.* | *Sec.-ft.* |
| Oct. 7 | F. F. Henshaw | 1.04 | 59.1 | Mar. 30 | Batchelder and Felley. | 1.97 | 260 |
| Nov. 6 | P. V. Hodges | 1.60 | 148 | Apr. 1 | do | 2.25 | 376 |
| Dec. 3 | do | .89 | 56.0 | July 5 | Henshaw and Batchelder | .70 | 36.4 |
| Jan. 11 | do | 1.56 | 155 | Aug. 13 | C. L. Batchelder | .44 | 20.0 |
| Mar. 30 | Batchelder and Kelley. | 1.92 | 236 | | | | |

*Daily discharge, in second-feet, of Little Sandy River near Marmot, Oreg., for the year ending Sept. 30, 1915.*

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 35 | 80 | 53 | 228 | 216 | 122 | 288 | 38 | 143 | 48 | 36 | 14 |
| 2 | 250 | 200 | 52 | 180 | 161 | 109 | 270 | 40 | 114 | 44 | 32 | 14 |
| 3 | 210 | 400 | 51 | 141 | 175 | 105 | 342 | 40 | 94 | 40 | 31 | 13 |
| 4 | 180 | 300 | 49 | 117 | 146 | 175 | 270 | 36 | 81 | 37 | 29 | 13 |
| 5 | 140 | 200 | 47 | 103 | 175 | 154 | 188 | 32 | 71 | 36 | 27 | 13 |
| 6 | 100 | 144 | 44 | 104 | 175 | 131 | 150 | 31 | 63 | 48 | 25 | 13 |
| 7 | 61 | 154 | 42 | 114 | 150 | 112 | 150 | 30 | 57 | 54 | 24 | 13 |
| 8 | 52 | 124 | 40 | 389 | 133 | 101 | 126 | 29 | 52 | 85 | 23 | 13 |
| 9 | 51 | 95 | 40 | 216 | 128 | 89 | 104 | 37 | 52 | 73 | 22 | 13 |
| 10 | 73 | 66 | 38 | 173 | 114 | 98 | 92 | 80 | 62 | 64 | 22 | 13 |
| 11 | 68 | 180 | 36 | 156 | 96 | 89 | 89 | 90 | 152 | 56 | 21 | 13 |
| 12 | 63 | 240 | 33 | 135 | 82 | 89 | 96 | 90 | 175 | 52 | 20 | 15 |
| 13 | 58 | 418 | 32 | 204 | 76 | 112 | 103 | 107 | 128 | 51 | 20 | 23 |
| 14 | 53 | 270 | 32 | 350 | 66 | 194 | 88 | 130 | 104 | 104 | 20 | 19 |
| 15 | 48 | 188 | 32 | 294 | 62 | 194 | 74 | 109 | 88 | 86 | 19 | 16 |
| 16 | 48 | 143 | 26 | 194 | 64 | 183 | 69 | 90 | 78 | 121 | 18 | 14 |
| 17 | 60 | 126 | 27 | 148 | 117 | 172 | 64 | 143 | 82 | 188 | 17 | 14 |
| 18 | 200 | 109 | 28 | 135 | 135 | 161 | 61 | 213 | 74 | 126 | 17 | 14 |
| 19 | 350 | 94 | 29 | 130 | 106 | 150 | 57 | 335 | 148 | 98 | 16 | 13 |
| 20 | 280 | 89 | 29 | 119 | 92 | 138 | 52 | 231 | 117 | 78 | 15 | 13 |
| 21 | 170 | 90 | 28 | 106 | 88 | 126 | 48 | 175 | 94 | 65 | 15 | 13 |
| 22 | 82 | 94 | 28 | 94 | 90 | 114 | 46 | 150 | 82 | 47 | 15 | 13 |
| 23 | 76 | 80 | 28 | 83 | 96 | 102 | 54 | 135 | 76 | 50 | 15 | 12 |
| 24 | 70 | 70 | 29 | 73 | 202 | 90 | 51 | 143 | 72 | 45 | 15 | 12 |
| 25 | 64 | 62 | 29 | 65 | 219 | 79 | 48 | 135 | 74 | 41 | 15 | 12 |
| 26 | 58 | 60 | 94 | 64 | 166 | 68 | 42 | 237 | 106 | 39 | 15 | 12 |
| 27 | 52 | 59 | 81 | 58 | 154 | 70 | 40 | 257 | 83 | 38 | 15 | 18 |
| 28 | 46 | 58 | 170 | 55 | 148 | 102 | 37 | 354 | 66 | 40 | 14 | 16 |
| 29 | 40 | 56 | 121 | 53 | ..... | 135 | 38 | 231 | 59 | 40 | 14 | 14 |
| 30 | 40 | 54 | 170 | 51 | ..... | 180 | 39 | 166 | 53 | 39 | 14 | 13 |
| 31 | 55 | ..... | 166 | 76 | ..... | 152 | ..... | 133 | ..... | 40 | 14 | ..... |

NOTE.—Discharge determined from rating curves as follows: Oct. 1 to Nov. 13, well defined; Nov. 14 to Sept. 30, well defined above 15 second-feet. Discharge estimated from highest and lowest stages indicated by recorder and by comparative study of records of Bull Run River, as follows: Oct 1–6, 11–21, Oct. 23 to Nov. 5, Nov. 7–10, 21–24, Nov. 26 to Dec. 2, Dec. 4–7. Discharge interpolated Mar. 16–25, Aug. 14–20, Aug. 22 to Sept. 8, and Sept. 18–23.

*Monthly discharge of Little Sandy River near Marmot, Oreg., for the year ending Sept. 30, 1915.*

[Drainage area, 17.2 square miles.]

| Month. | Discharge in second-feet. | | | | Run-off. | | Accuracy. |
|---|---|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | Per square mile. | Depth in inches on drainage area. | Total in acre-feet. | |
| October | 350 | 40 | 101 | 5.87 | 6.77 | 6,210 | C. |
| November | 418 | 54 | 143 | 8.31 | 9.27 | 8,510 | B. |
| December | 170 | 26 | 55.0 | 3.20 | 3.69 | 3,380 | B. |
| January | 389 | 51 | 142 | 8.26 | 9.52 | 8,730 | A. |
| February | 219 | 62 | 130 | 7.56 | 7.87 | 7,220 | A. |
| March | 194 | 68 | 126 | 7.33 | 8.45 | 7,750 | A. |
| April | 342 | 37 | 106 | 6.16 | 6.87 | 6,310 | A. |
| May | 354 | 29 | 131 | 7.62 | 8.78 | 8,060 | A. |
| June | 175 | 52 | 90.0 | 5.23 | 5.84 | 5,360 | A. |
| July | 188 | 36 | 63.8 | 3.71 | 4.28 | 3,920 | A. |
| August | 36 | 14 | 19.8 | 1.15 | 1.33 | 1,220 | B. |
| September | 23 | 12 | 14.0 | .814 | .91 | 833 | B. |
| The year | 418 | 12 | 93.2 | 5.42 | 73.58 | 67,500 | |

## WILLAMETTE RIVER BASIN.

### MIDDLE FORK OF WILLAMETTE RIVER AT JASPER, OREG.

LOCATION.—In the NW. ¼ sec. 23, T. 18 S., R. 2 W., just below Jasper post office, Lane County, 2 miles above Natron and 3 miles below Fall Creek.

DRAINAGE AREA.—1,450 square miles.

RECORDS AVAILABLE.—September 16, 1905, to February 6, 1912; July 26, 1913, to September 30, 1915.

GAGE.—Vertical staff on right bank; read daily. Gage reader, B. F. Sylvester.

DISCHARGE MEASUREMENTS.—Made from new highway bridge a short distance above the gage.

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

EXTREMES OF DISCHARGE.—Maximum stage recorded, 6.8 feet at 8 a. m. January 14 (discharge, 12,600 second-feet); minimum stage recorded, 2.80 feet September 9 to 12, 21 to 23, and 30 (discharge, 610 second-feet).

1905–1912 and 1913–1915: Maximum stage recorded, 16.6 feet at 9 a. m. November 23, 1909 (discharge, estimated from extension of rating curve, 122,000 second-feet); minimum authentic discharge is that of 1915; a minimum of 530 second-feet, September to November, 1907, is uncertain.

DIVERSONS.—None.

REGULATION.—Some storage developed on Waldo Lake, but no storage operations since 1909.

ACCURACY.—Results considered excellent.

*Discharge measurements of Middle Fork of Willamette River at Jasper, Oreg., during the year ending Sept. 30, 1915.*

[Made by P. V. Hodges.]

| Date. | Gage height. | Discharge. |
|---|---|---|
| | *Feet.* | *Sec.-ft.* |
| Feb. 3 | 6.30 | 9,820 |
| Sept. 1 | 2.85 | 653 |

*Daily discharge, in second-feet, of Middle Fork of Willamette River at Jasper, Oreg., for the year ending Sept. 30, 1915.*

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 860 | 1,300 | 1,680 | 1,620 | 3,420 | 3,420 | 2,500 | 1,890 | 3,680 | 1,300 | 860 | 645 |
| 2 | 1,020 | 1,680 | 1,820 | 2,210 | 9,300 | 3,170 | 2,600 | 1,820 | 3,680 | 1,190 | 860 | 680 |
| 3 | 3,170 | 1,680 | 2,500 | 1,960 | 9,300 | 2,820 | 3,170 | 1,820 | 3,170 | 1,190 | 860 | 680 |
| 4 | 1,960 | 1,550 | 2,120 | 2,210 | 8,300 | 2,930 | 3,680 | 1,750 | 2,710 | 1,190 | 860 | 645 |
| 5 | 1,620 | 1,420 | 1,820 | 2,120 | 6,480 | 3,680 | 3,420 | 1,680 | 2,500 | 1,080 | 860 | 610 |
| 6 | 1,420 | 1,820 | 1,750 | 1,960 | 5,660 | 3,420 | 1,960 | 1,620 | 2,300 | 1,080 | 810 | 610 |
| 7 | 1,240 | 1,680 | 1,750 | 2,040 | 4,920 | 2,930 | 2,930 | 1,550 | 2,120 | 1,550 | 760 | 645 |
| 8 | 1,190 | 1,550 | 1,680 | 3,680 | 4,260 | 2,710 | 2,500 | 1,550 | 2,040 | 1,360 | 760 | 610 |
| 9 | 1,360 | 1,420 | 1,680 | 4,920 | 3,680 | 2,500 | 2,500 | 1,680 | 1,960 | 1,620 | 760 | 610 |
| 10 | 1,300 | 1,420 | 1,550 | 3,680 | 3,420 | 2,400 | 2,300 | 1,960 | 1,820 | 1,480 | 760 | 610 |
| 11 | 1,420 | 1,300 | 1,550 | 3,170 | 3,170 | 2,210 | 2,300 | 2,600 | 2,040 | 1,300 | 760 | 610 |
| 12 | 1,360 | 1,360 | 1,420 | 2,820 | 2,710 | 2,120 | 2,500 | 2,500 | 2,500 | 1,190 | 760 | 610 |
| 13 | 1,300 | 1,550 | 1,420 | 1,960 | 2,500 | 2,210 | 2,120 | 2,930 | 2,300 | 1,190 | 760 | 680 |
| 14 | 1,190 | 3,170 | 1,300 | 12,600 | 2,300 | 1,960 | 3,170 | 4,260 | 1,960 | 1,190 | 760 | 760 |
| 15 | 1,190 | 2,930 | 1,240 | 10,400 | 2,120 | 2,120 | 2,820 | 4,920 | 1,890 | 1,190 | 760 | 720 |
| 16 | 1,080 | 2,210 | 1,190 | 6,060 | 2,040 | 2,220 | 2,600 | 3,680 | 1,820 | 1,080 | 760 | 680 |
| 17 | 1,190 | 2,040 | 1,190 | 4,260 | 2,040 | 2,040 | 2,500 | 3,420 | 1,680 | 1,190 | 760 | 680 |
| 18 | 1,620 | 1,960 | 1,140 | 3,680 | 2,500 | 3,550 | 2,600 | 5,660 | 1,680 | 1,080 | 760 | 645 |
| 19 | 4,260 | 1,820 | 1,190 | 3,680 | 2,710 | 2,120 | 2,710 | 8,300 | 1,620 | 1,080 | 720 | 610 |
| 20 | 4,260 | 1,680 | 1,190 | 3,680 | 2,600 | 1,960 | 2,710 | 6,480 | 1,550 | 1,020 | 720 | 610 |
| 21 | 3,680 | 1,550 | 1,080 | 3,680 | 2,710 | 2,710 | 2,710 | 5,660 | 1,480 | 970 | 680 | 610 |
| 22 | 3,170 | 1,550 | 1,080 | 3,170 | 2,500 | 2,930 | 2,500 | 6,480 | 1,420 | 970 | 680 | 610 |
| 23 | 2,500 | 1,480 | 1,080 | 2,710 | 2,600 | 3,170 | 2,120 | 5,660 | 1,420 | 970 | 680 | 610 |
| 24 | 2,120 | 1,420 | 1,080 | 2,500 | 2,820 | 3,420 | 2,040 | 6,480 | 1,420 | 970 | 680 | 645 |
| 25 | 1,960 | 1,360 | 1,080 | 2,300 | 3,170 | 3,170 | 1,890 | 6,480 | 1,480 | 920 | 680 | 645 |
| 26 | 1,680 | 1,300 | 1,140 | 2,120 | 2,930 | 2,820 | 1,820 | 6,480 | 1,550 | 860 | 680 | 610 |
| 27 | 1,620 | 1,300 | 1,480 | 1,960 | 2,820 | 2,500 | 1,820 | 6,480 | 1,480 | 860 | 680 | 645 |
| 28 | 1,550 | 1,300 | 1,420 | 1,960 | 3,420 | 2,300 | 1,820 | 6,900 | 1,360 | 860 | 680 | 720 |
| 29 | 1,420 | 1,820 | 1,620 | 2,040 | ..... | 2,500 | 1,820 | 6,480 | 1,300 | 860 | 680 | 645 |
| 30 | 1,360 | 1,960 | 1,550 | 2,040 | ..... | 2,500 | 1,960 | 5,280 | 1,300 | 920 | 645 | 610 |
| 31 | 1,420 | ..... | 1,550 | 2,120 | ..... | 2,600 | ..... | 4,260 | ..... | 970 | 645 | ..... |

NOTE.—Discharge determined from a well-defined rating curve.

*Monthly discharge of Middle Fork of Willamette River at Jasper, Oreg., for the year ending Sept. 30, 1915.*

[Drainage area, 1,450 square miles.]

| Month. | Discharge in second-feet. | | | | Run-off. | | Accuracy. |
|---|---|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | Per square mile. | Depth in inches on drainage area. | Total in acre-feet. | |
| October | 4,260 | 860 | 1,820 | 1.26 | 1.45 | 112,000 | A. |
| November | 3,170 | 1,300 | 1,690 | 1.17 | 1.30 | 101,000 | A. |
| December | 2,500 | 1,080 | 1,460 | 1.01 | 1.16 | 89,800 | A. |
| January | 12,600 | 1,620 | 3,400 | 2.34 | 2.70 | 209,000 | A. |
| February | 9,300 | 2,040 | 3,800 | 2.62 | 2.73 | 211,000 | A. |
| March | 3,680 | 1,960 | 2,680 | 1.85 | 2.13 | 165,000 | A. |
| April | 3,680 | 1,820 | 2,470 | 1.70 | 1.90 | 147,000 | A. |
| May | 8,300 | 1,550 | 4,150 | 2.86 | 3.30 | 255,000 | A. |
| June | 3,680 | 1,300 | 1,970 | 1.36 | 1.52 | 117,000 | A. |
| July | 1,620 | 860 | 1,120 | .772 | .89 | 68,900 | A. |
| August | 860 | 645 | 745 | .514 | .59 | 45,800 | A. |
| September | 760 | 610 | 643 | .443 | .49 | 38,300 | A. |
| The year | 12,600 | 610 | 2,150 | 1.48 | 20.16 | 1,560,000 | |

## WILLAMETTE RIVER AT ALBANY, OREG.

LOCATION.—In the SW. ¼ sec. 6, T. 11 S., R. 3 W., at the end of Broadalbin Street, Albany, Linn County, about half a mile above the Southern Pacific Railroad bridge (formerly Corvallis & Eastern) just below the mouth of Calapooya Creek, and 7 miles above Santiam River.

DRAINAGE AREA.—4,860 square miles.

RECORDS AVAILABLE.—November 24, 1878, to April 30, 1882, and January 21, 1892, to September 30, 1915; some fragmentary records 1883 to 1888.

GAGE.—Vertical staff in two sections on right bank.

DISCHARGE MEASUREMENTS.—Made from Southern Pacific bridge.

CHANNEL AND CONTROL.—Sand and fine gravel; control practically permanent. About gage height 17.0 feet, water begins to flow through a slough several hundred feet to the left of the main channel.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 13.9 feet at 8 a. m. January 16 (discharge, 48,000 second-feet); minimum stage recorded, 0.5 foot September 5 to 14 (discharge, 2,400 second-feet).

1878–1882 and 1892–1915: Maximum stage recorded, 32.8 feet January 14, 1881 (discharge, 245,000 second-feet); minimum stage recorded, 0.2 foot September 21 to 27, 1879 (discharge, 1,870 second-feet), but this is somewhat uncertain; lowest stages recorded in recent years are 0.4 foot October 30 to November 10, 1895 (discharge, 2,220 second-feet), and 0.5 foot August 26 to September 25, 190[illegible], and September 5 to 14, 1915 (discharge, 2,400 second-feet). The maximum stage ever known was 36.0 feet December 4, 1861 (discharge, 302,000 second-feet).

DIVERSIONS.—The Albany power canal has diverted water from South Santiam River near Lebanon and discharged into Willamette River above the gage and measuring section since the early 90's. The following measurements have been made of this diversion: November 9, 1911, at Albany, 210 second feet; September 21, 1912, at intake, 262 second-feet; at Albany, 242 second-feet; July 15, 1913, at intake, 247 second-feet. Figures representing run-off per square mile and depth in inches, published in Water-Supply Papers 312, 332, 362, 370, and 394, are in error.

REGULATION.—Practically none.

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

The following discharge measurement was made by P. V. Hodges:
September 4 and 5, 1915: Gage height, 0.58 foot; discharge, 2,640 second-feet.

*Daily discharge, in second-feet, of Willamette River at Albany, Oreg., for the year ending Sept. 30, 1915.*

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 3,730 | 5,730 | 14,700 | 9,490 | 10,300 | 13,500 | 10,300 | 5,730 | 13,800 | 4,810 | 3,530 | 2,580 |
| 2 | 3,730 | 5,970 | 13,200 | 11,500 | 18,100 | 12,900 | 10,000 | 6,690 | 12,300 | 4,580 | 3,530 | 2,580 |
| 3 | 4,150 | 6,450 | 13,500 | 12,900 | 27,100 | 12,300 | 11,200 | 6,450 | 11,800 | 4,580 | 3,530 | 2,580 |
| 4 | 7,920 | 6,690 | 15,300 | 12,300 | 27,800 | 11,500 | 12,600 | 6,450 | 10,900 | 4,360 | 3,530 | 2,580 |
| 5 | 7,170 | 6,690 | 13,500 | 11,800 | 27,800 | 12,000 | 13,200 | 6,210 | 10,000 | 4,360 | 3,530 | 2,400 |
| 6 | 5,970 | 6,930 | 12,300 | 11,800 | 23,800 | 12,600 | 12,300 | 6,210 | 9,220 | 4,360 | 3,530 | 2,400 |
| 7 | 5,500 | 6,930 | 11,200 | 11,200 | 21,100 | 12,000 | 11,500 | 5,970 | 8,430 | 4,360 | 3,330 | 2,400 |
| 8 | 5,040 | 7,170 | 11,200 | 12,300 | 18,700 | 11,200 | 11,200 | 5,730 | 7,920 | 5,040 | 3,330 | 2,400 |
| 9 | 4,580 | 6,690 | 13,800 | 19,100 | 16,500 | 10,600 | 10,600 | 5,730 | 7,670 | 5,040 | 3,140 | 2,400 |
| 10 | 5,040 | 6,450 | 14,400 | 21,400 | 15,300 | 10,000 | 10,000 | 5,970 | 7,420 | 5,500 | 3,140 | 2,400 |
| 11 | 5,040 | 6,210 | 12,900 | 18,400 | 13,800 | 9,490 | 9,490 | 6,930 | 7,170 | 5,270 | 3,140 | 2,400 |
| 12 | 5,500 | 5,730 | 11,800 | 17,800 | 12,600 | 9,220 | 9,220 | 8,950 | 7,420 | 5,040 | 2,950 | 2,400 |
| 13 | 5,270 | 6,210 | 10,300 | 17,800 | 11,800 | 8,950 | 9,220 | 8,950 | 8,430 | 4,580 | 2,950 | 2,400 |
| 14 | 5,270 | 8,430 | 8,950 | 23,100 | 10,900 | 9,490 | 8,950 | 9,490 | 7,920 | 4,360 | 2,950 | 2,400 |
| 15 | 5,040 | 13,200 | 7,920 | 42,800 | 10,000 | 11,200 | 10,300 | 11,500 | 7,420 | 4,360 | 2,950 | 2,760 |
| 16 | 5,040 | 11,800 | 7,670 | 48,000 | 9,490 | 11,800 | 9,760 | 13,800 | 7,170 | 4,360 | 2,950 | 2,950 |
| 17 | 4,580 | 10,300 | 7,420 | 33,400 | 9,490 | 12,000 | 9,220 | 12,300 | 6,690 | 4,150 | 2,950 | 2,760 |
| 18 | 5,040 | 9,220 | 6,690 | 24,900 | 9,490 | 11,500 | 9,220 | 11,500 | 6,450 | 4,150 | 2,950 | 2,760 |
| 19 | 6,450 | 8,430 | 5,970 | 20,400 | 10,600 | 12,000 | 8,950 | 14,700 | 6,210 | 4,150 | 2,950 | 2,580 |
| 20 | 16,200 | 7,920 | 5,970 | 18,100 | 11,200 | 11,500 | 8,950 | 20,400 | 6,210 | 4,150 | 2,950 | 2,580 |
| 21 | 18,700 | 7,670 | 5,730 | 16,800 | 11,200 | 10,600 | 8,690 | 18,400 | 6,210 | 3,940 | 2,950 | 2,580 |
| 22 | 13,800 | 6,930 | 5,500 | 15,900 | 11,500 | 10,300 | 8,690 | 15,900 | 5,970 | 3,940 | 2,950 | 2,580 |
| 23 | 11,200 | 6,690 | 5,270 | 13,800 | 11,800 | 10,000 | 8,170 | 16,500 | 5,500 | 3,940 | 2,950 | 2,580 |
| 24 | 9,490 | 6,450 | 5,040 | 12,300 | 12,300 | 10,600 | 7,920 | 15,900 | 5,500 | 3,730 | 2,760 | 2,580 |
| 25 | 8,430 | 6,210 | 5,040 | 11,500 | 13,200 | 10,600 | 7,420 | 16,200 | 5,270 | 3,730 | 2,760 | 2,580 |
| 26 | 7,670 | 5,970 | 5,730 | 10,600 | 13,800 | 10,300 | 7,170 | 16,500 | 5,270 | 3,730 | 2,760 | 2,580 |
| 27 | 6,930 | 5,730 | 7,920 | 9,490 | 13,200 | 9,490 | 6,930 | 16,500 | 5,500 | 3,530 | 2,760 | 2,580 |
| 28 | 6,450 | 5,970 | 10,000 | 9,220 | 12,900 | 8,950 | 6,930 | 17,500 | 5,500 | 3,530 | 2,760 | 2,580 |
| 29 | 5,970 | 8,170 | 10,000 | 9,220 | ..... | 8,690 | 6,690 | 18,700 | 5,270 | 3,530 | 2,760 | 2,580 |
| 30 | 5,730 | 12,600 | 10,000 | 8,950 | ..... | 9,490 | 6,450 | 17,800 | 5,040 | 3,530 | 2,760 | 2,580 |
| 31 | 5,500 | ..... | 9,490 | 8,950 | ..... | 9,760 | ..... | 15,900 | ..... | 3,530 | 2,760 | ..... |

NOTE.—Discharge determined from a well-defined rating curve.

*Monthly discharge of Willamette River at Albany, Oreg., for the year ending Sept. 30, 1915.*

[Drainage area, 4,860 square miles.]

| Month. | Discharge in second-feet. | | | Run-off (total in acre-feet). | Accuracy. |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean | | |
| October | 18,700 | 3,730 | 6,970 | 429,000 | A. |
| November | 13,200 | 5,730 | 7,520 | 447,000 | A. |
| December | 15,300 | 5,040 | 9,630 | 592,000 | A. |
| January | 48,000 | 8,950 | 16,900 | 1,040,000 | A. |
| February | 27,800 | 9,490 | 14,800 | 822,000 | A. |
| March | 13,500 | 8,690 | 10,800 | 664,000 | A. |
| April | 13,200 | 6,450 | 9,370 | 558,000 | A. |
| May | 20,400 | 5,730 | 11,800 | 726,000 | A. |
| June | 13,800 | 5,040 | 7,520 | 447,000 | A. |
| July | 5,500 | 3,530 | 4,270 | 263,000 | A. |
| August | 3,530 | 2,760 | 3,060 | 188,000 | A. |
| September | 2,950 | 2,400 | 2,550 | 152,000 | A. |
| The year | 48,000 | 2,400 | 8,740 | 6,330,000 | |

### WILLAMETTE RIVER AT SALEM, OREG.

LOCATION.—In the NW. ¼ sec. 27, T. 7 S., R. 3 W., at the foot of Trade Street, Salem, Marion County, about a mile above mouth of Mill Creek.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—January 1, 1892, to September 30, 1915. Records continuous through the summer low-water periods since 1904 only. Discharge records have been computed only for period beginning October 1, 1909.

GAGE.—Vertical staff in four sections on Oregon Washington Railroad & Navigation Co. dock on right bank of a slough, near its mouth.

DISCHARGE MEASUREMENTS.—Made from Southern Pacific bridge about one-half mile below gage. From 1910 to 1912, from highway bridge a short distance above the railroad bridge. Conditions favorable except for low velocities at low stages.

CHANNEL AND CONTROL.—Channel deep at bridge; overflows at high stages over left bank. Control of gravel and sand; somewhat shifting during floods.

EXTREMES OF STAGE.—The maximum stages recorded each year, 1895 to 1915, are shown in the following table:

*Maximum recorded stages of Willamette River at Salem, Oreg.*

| Year ending Sept. 30— | Day. | Hour. | Stage. | Discharge. |
|---|---|---|---|---|
| | | | *Feet.* | *Sec.-ft.* |
| 1895 | Jan. 14 | 8 a. m. | 20.4 | 165,000 |
| 1896 | Jan. 23 | 8 a. m. | 21.3 | 176,000 |
| 1897 | Feb. 17 | 8 a. m. | 17.6 | 136,000 |
| 1898 | Dec. 15 | 8 a. m. | 17.7 | 137,000 |
| 1899 | Mar. 3 | 8 a. m. | 20.4 | 165,000 |
| 1900 | Jan. 16 | 8 a. m. | 21.5 | 173,000 |
| 1901 | Jan. 15 | 5 p. m. | 30.0 | 306,000 |
| 1902 | Feb. 12 | 8 a. m. | 16.2 | 122,000 |
| 1903 | Jan. 27 | 8 a. m. | 28.6 | 283,000 |
| 1904 | Feb. 18 | 8 a. m. | 19.5 | 155,000 |
| 1905 | Dec. 31 / Jan. 1 | 8 a. m. | 15.3 | 113,000 |
| 1906 | Feb. 26 | 8 a. m. | 13.2 | 92,000 |
| 1907 | Feb. 6 | 6 p. m. | 31.1 | 325,000 |
| 1908 | Dec. 7 | 1 p. m. | 24.7 | 224,000 |
| 1909 | Jan. 22 | 5 p. m. | 22.0 | 185,000 |
| 1910 | Nov. 25 | 8 a. m. | 30.5 | 315,000 |
| 1911 | Jan. 20 | 8 a. m. | 19.5 | 155,000 |
| 1912 | Jan. 15 | 8 a. m. | 24.5 | 221,000 |
| 1913 | Mar. 31 | 4 p. m. | 19.8 | 158,000 |
| 1914 | Jan. 25 | 8 a. m. | 16.3 | 123,000 |
| 1915 | Jan. 16 | 8 a. m. | 13.2 | 92,000 |

Minimum stage recorded during period October 1, 1909, to September 30, 1915, —1.46 feet September 8, 1915 (discharge, 3,310 second-feet).

Maximum stage ever known, about 39 feet December 4, 1861 (discharge, estimated from an extension of rating curve as 500,000 second-feet). The flood of January 16, 1881, reached a stage of 36.3 feet (discharge, 427,000 second-feet).

DIVERSIONS.—Water is diverted from North Santiam River near Stayton into Mill Creek. Within the city limits it is again diverted into a power canal which discharges just above the gage. Thus the flow past the gage may be more or less than its natural run-off, but by an amount too slight to be appreciable.

REGULATION.—None.

ACCURACY.—Results good in general. Those for October, 1909, uncertain, as channel may have shifted during the flood of November.

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

*Discharge measurements of Willamette River at Salem, Oreg., during the years ending Sept. 30, 1910 to 1915.*

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge |
|---|---|---|---|---|---|---|---|
| 1910. | | *Feet.* | *Sec.-ft.* | 1913. | | *Feet.* | *Sec.-ft.* |
| Sept. 18 | F. F. Henshaw | −0.58 | 3,550 | Aug. 13–14 | H. M. Nelson | *b*.35 | 6,080 |
| Oct. 14 | F. C. Ebert | +.15 | 5,720 | 1914. | | | |
| 1911. | | | | June 17 | P. V. Hodges | 1.46 | 9,970 |
| May 20 | Charles Leidl | 8.35 | 54,600 | Aug. 1 | H. J. Dean | −.76 | 4,230 |
| 22 | do | 6.30 | 35,300 | 1915. | | | |
| 1912. | | | | Jan. 27–28 | P. V. Hodges | 3.18 | 17,100 |
| Jan. 9 | R. C. Pierce | 14.26 | *a*103,000 | Sept. 9 | do | −1.44 | 3,320 |
| 16 | do | 20.46 | *a*157,000 | | | | |
| Apr. 20 | do | 3.33 | 16,200 | | | | |

*a* Results published in Water-Supply Paper 332, p. 656, have been corrected, by use of a coefficient of 0.90 instead of 0.85 to reduce surface velocities to the mean in vertical.

*b* Gage reading published in Water-Supply Paper 362, p. 655, was evidently on United States Engineer gage which reads 0.4 foot higher than the Weather Bureau gage.

*Daily discharge, in second-feet, of Willamette River at Salem, Oreg., for the years ending Sept. 30, 1910 to 1915.*

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1909-10. | | | | | | | | | | | | |
| 1 | 5,940 | 9,500 | 87,300 | 25,800 | 49,600 | 104,000 | 18,200 | 15,700 | 9,500 | 6,200 | 4,240 | 3,910 |
| 2 | 6,740 | 20,700 | 79,200 | 25,800 | 42,400 | 141,000 | 17,700 | 15,200 | 9,500 | 6,200 | 4,240 | 3,910 |
| 3 | 5,940 | 46,400 | 62,400 | 22,200 | 36,500 | 170,000 | 21,200 | 14,700 | 9,120 | 6,200 | 4,240 | 3,910 |
| 4 | 5,700 | 32,400 | 50,400 | 19,700 | 31,800 | 156,000 | 22,800 | 15,700 | 8,740 | 5,940 | 4,240 | 3,910 |
| 5 | 5,220 | 23,400 | 42,400 | 18,700 | 28,200 | 123,000 | 21,700 | 18,200 | 8,380 | 5,700 | 4,240 | 3,910 |
| 6 | 5,220 | 19,200 | 37,200 | 17,700 | 26,400 | 91,000 | 21,700 | 18,200 | 8,020 | 5,700 | 4,070 | 3,910 |
| 7 | 5,000 | 16,700 | 33,700 | 17,200 | 25,200 | 72,000 | 21,700 | 17,200 | 8,020 | 5,700 | 4,070 | 3,750 |
| 8 | 5,220 | 16,700 | 35,100 | 20,700 | 24,000 | 57,600 | 22,200 | 16,200 | 8,020 | 5,460 | 4,070 | 3,750 |
| 9 | 5,460 | 21,700 | 47,200 | 22,200 | 22,800 | 48,000 | 24,000 | 16,200 | 7,680 | 5,460 | 4,070 | 3,750 |
| 10 | 5,220 | 23,400 | 71,200 | 21,700 | 22,200 | 42,400 | 23,400 | 15,700 | 7,360 | 5,460 | 4,070 | 3,750 |
| 11 | 5,220 | 30,000 | 71,200 | 20,700 | 23,400 | 38,600 | 24,600 | 19,700 | 7,360 | 5,220 | 4,070 | 3,750 |
| 12 | 4,800 | 31,800 | 76,500 | 19,700 | 26,400 | 36,500 | 25,200 | 25,200 | 8,020 | 5,220 | 4,070 | 3,750 |
| 13 | 4,800 | 26,400 | 90,000 | 918,700 | 27,600 | 36,500 | 24,000 | 22,800 | 8,740 | 5,220 | 4,070 | 3,750 |
| 14 | 4,610 | 23,400 | 105,000 | 17,700 | 25,600 | 37,900 | 23,400 | 20,700 | 8,020 | 5,220 | 4,070 | 3,750 |
| 15 | 4,610 | 20,700 | 87,300 | 17,700 | 49,600 | 37,900 | 22,200 | 18,200 | 7,680 | 5,220 | 4,070 | 3,750 |
| 16 | 4,610 | 17,700 | 64,000 | 17,700 | 46,400 | 37,200 | 20,200 | 16,700 | 7,360 | 4,800 | 4,070 | 3,750 |
| 17 | 4,610 | 15,700 | 50,400 | 17,200 | 38,600 | 35,100 | 19,700 | 15,700 | 7,040 | 4,800 | 3,910 | 3,750 |
| 18 | 4,420 | 15,200 | 41,600 | 16,700 | 35,100 | 33,000 | 19,200 | 14,700 | 7,360 | 4,800 | 3,910 | 3,910 |
| 19 | 4,610 | 30,000 | 35,800 | 25,800 | 42,400 | 32,400 | 19,700 | 13,700 | 7,360 | 4,800 | 3,910 | 3,910 |
| 20 | 4,800 | 68,000 | 31,200 | 33,000 | 53,600 | 33,700 | 20,700 | 13,200 | 7,040 | 4,800 | 3,910 | 3,910 |
| 21 | 6,200 | 108,000 | 28,200 | 30,000 | 53,600 | 31,800 | 21,200 | 12,800 | 7,360 | 4,800 | 3,910 | 3,910 |
| 22 | 8,020 | 104,000 | 25,200 | 32,400 | 49,600 | 28,800 | 20,700 | 11,900 | 7,360 | 4,800 | 3,910 | 4,420 |
| 23 | 8,020 | 152,000 | 22,800 | 46,400 | 44,800 | 30,000 | 19,700 | 11,900 | 8,020 | 4,800 | 3,910 | 4,420 |
| 24 | 7,040 | 224,000 | 21,700 | 68,000 | 54,400 | 33,700 | 19,700 | 11,500 | 8,020 | 4,610 | 3,910 | 4,240 |
| 25 | 6,200 | 315,000 | 20,200 | 74,700 | 72,900 | 31,200 | 20,200 | 11,500 | 7,680 | 4,610 | 3,910 | 4,240 |
| 26 | 5,940 | 238,000 | 19,700 | 64,800 | 85,500 | 27,600 | 20,700 | 11,500 | 7,360 | 4,610 | 3,910 | 4,070 |
| 27 | 5,460 | 157,000 | 19,200 | 54,400 | 85,500 | 25,200 | 19,700 | 11,500 | 6,740 | 4,610 | 3,910 | 3,910 |
| 28 | 5,220 | 93,000 | 18,200 | 60,000 | 85,500 | 23,400 | 18,200 | 11,100 | 6,740 | 4,420 | 3,910 | 3,750 |
| 29 | 5,220 | 78,300 | 17,700 | 64,000 | ..... | 21,700 | 16,700 | 10,700 | 6,460 | 4,420 | 3,910 | 3,750 |
| 30 | 5,700 | 78,300 | 16,700 | 61,600 | ..... | 20,200 | 15,700 | 10,300 | 6,460 | 4,420 | 3,910 | 3,750 |
| 31 | 6,740 | ..... | 18,700 | 53,600 | ..... | 19,200 | ..... | 9,900 | ..... | 4,420 | 3,910 | ..... |

*Daily discharge, in second-feet, of Willamette River at Salem, Oreg., for the years ending Sept. 30, 1910 to 1915*—Continued.

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1910–11. | | | | | | | | | | | | |
| 1 | 3,750 | 4,240 | 115,000 | 27,000 | 35,800 | 15,200 | 22,800 | 15,700 | 19,200 | 10,700 | 4,800 | 3,750 |
| 2 | 3,750 | 4,240 | 95,000 | 26,400 | 40,000 | 14,700 | 24,000 | 15,700 | 20,200 | 10,700 | 4,800 | 3,750 |
| 3 | 4,240 | 4,070 | 70,400 | 24,000 | 40,000 | 13,700 | 23,400 | 16,700 | 20,200 | 10,300 | 4,800 | 3,750 |
| 4 | 6,740 | 4,070 | 87,300 | 22,800 | 36,500 | 13,200 | 21,700 | 18,700 | 19,200 | 9,500 | 4,800 | 4,070 |
| 5 | 11,100 | 4,070 | 95,000 | 21,200 | 32,400 | 13,700 | 20,700 | 20,700 | 17,700 | 8,740 | 4,800 | 4,610 |
| 6 | 11,900 | 4,420 | 82,800 | 20,700 | 33,000 | 15,700 | 18,700 | 22,200 | 16,700 | 8,380 | 4,800 | 5,700 |
| 7 | 9,500 | 4,800 | 62,400 | 20,200 | 31,800 | 17,200 | 17,200 | 21,700 | 15,700 | 8,020 | 4,800 | 10,700 |
| 8 | 7,360 | 14,200 | 52,000 | 19,700 | 30,000 | 18,700 | 16,200 | 20,700 | 15,200 | 8,020 | 4,610 | 9,500 |
| 9 | 6,200 | 28,200 | 50,400 | 19,700 | 27,600 | 19,700 | 15,700 | 20,200 | 14,700 | 7,680 | 4,610 | 7,360 |
| 10 | 5,700 | 33,000 | 52,800 | 24,000 | 25,200 | 20,200 | 15,700 | 20,700 | 14,700 | 7,360 | 4,420 | 6,200 |
| 11 | 5,460 | 39,300 | 46,400 | 27,600 | 25,800 | 19,700 | 18,200 | 20,700 | 14,200 | 7,040 | 4,240 | 6,740 |
| 12 | 5,220 | 36,500 | 38,600 | 32,400 | 27,600 | 19,700 | 20,200 | 20,200 | 14,700 | 6,740 | 4,240 | 6,200 |
| 13 | 5,220 | 27,000 | 33,700 | 28,200 | 29,400 | 20,200 | 20,200 | 20,200 | 15,200 | 6,740 | 4,240 | 5,940 |
| 14 | 5,000 | 20,700 | 30,000 | 24,000 | 33,000 | 19,200 | 19,700 | 22,200 | 15,200 | 6,460 | 4,070 | 5,460 |
| 15 | 5,220 | 16,700 | 26,400 | 22,200 | 32,400 | 19,200 | 18,700 | 21,700 | 14,700 | 6,460 | 4,070 | 5,460 |
| 16 | 5,220 | 14,200 | 24,000 | 19,700 | 29,400 | 20,700 | 18,200 | 20,700 | 14,200 | 6,200 | 4,070 | 5,220 |
| 17 | 4,800 | 12,700 | 24,000 | 19,700 | 25,800 | 21,700 | 19,200 | 20,200 | 13,200 | 6,200 | 4,070 | 6,740 |
| 18 | 4,800 | 11,500 | 31,200 | 59,200 | 24,600 | 21,700 | 19,700 | 22,800 | 12,300 | 5,940 | 4,070 | 7,040 |
| 19 | 6,740 | 12,700 | 31,800 | 138,000 | 26,400 | 21,200 | 20,200 | 41,600 | 11,900 | 5,700 | 4,070 | 6,460 |
| 20 | 6,200 | 13,700 | 27,600 | 155,000 | 25,200 | 21,200 | 21,200 | 52,000 | 11,100 | 5,700 | 4,070 | 5,940 |
| 21 | 5,700 | 24,000 | 25,200 | 135,000 | 24,000 | 22,800 | 20,200 | 44,000 | 10,700 | 5,460 | 3,910 | 5,460 |
| 22 | 5,220 | 48,000 | 22,800 | 89,100 | 22,200 | 23,400 | 19,700 | 36,500 | 10,300 | 5,460 | 3,910 | 5,220 |
| 23 | 4,800 | 56,000 | 21,200 | 59,200 | 20,700 | 23,400 | 20,200 | 31,800 | 9,900 | 5,220 | 3,910 | 5,000 |
| 24 | 4,800 | 72,900 | 20,700 | 44,000 | 19,700 | 25,200 | 19,700 | 28,800 | 9,500 | 5,220 | 3,910 | 4,800 |
| 25 | 4,610 | 65,600 | 25,200 | 37,900 | 18,200 | 26,400 | 20,200 | 26,400 | 9,120 | 5,220 | 3,750 | 4,800 |
| 26 | 4,610 | 44,000 | 25,200 | 37,200 | 17,700 | 25,800 | 21,200 | 23,400 | 9,120 | 5,000 | 3,750 | 4,800 |
| 27 | 4,420 | 32,400 | 24,000 | 35,800 | 17,200 | 22,800 | 20,700 | 21,700 | 9,120 | 4,800 | 3,750 | 5,220 |
| 28 | 4,420 | 33,000 | 23,400 | 33,700 | 15,700 | 20,700 | 19,700 | 20,200 | 10,300 | 4,800 | 3,750 | 8,380 |
| 29 | 4,240 | 64,000 | 22,800 | 31,800 | ..... | 18,700 | 17,700 | 19,200 | 10,700 | 4,800 | 3,750 | 8,020 |
| 30 | 4,240 | 102,000 | 22,200 | 30,000 | ..... | 18,200 | 16,700 | 18,700 | 10,300 | 4,800 | 3,750 | 7,040 |
| 31 | 4,240 | ..... | 25,800 | 31,200 | ..... | 19,700 | ..... | 18,700 | ..... | 4,800 | 3,750 | ..... |
| 1911–12. | | | | | | | | | | | | |
| 1 | 6,460 | 4,420 | 17,200 | 30,000 | 56,000 | 39,200 | 19,000 | 25,600 | 31,900 | 14,100 | 5,700 | 8,900 |
| 2 | 6,200 | 4,420 | 15,700 | 27,600 | 48,000 | 34,700 | 18,400 | 36,100 | 26,800 | 15,100 | 5,700 | 14,100 |
| 3 | 6,740 | 4,420 | 14,700 | 23,400 | 40,800 | 31,200 | 18,400 | 45,600 | 24,400 | 14,600 | 5,700 | 14,100 |
| 4 | 8,380 | 4,420 | 14,200 | 21,700 | 35,400 | 28,000 | 19,000 | 40,800 | 22,600 | 14,600 | 5,700 | 15,600 |
| 5 | 9,120 | 4,240 | 13,700 | 20,700 | 36,100 | 25,600 | 18,400 | 33,300 | 20,800 | 14,100 | 5,240 | 14,100 |
| 6 | 9,120 | 4,240 | 14,700 | 26,400 | 38,400 | 24,400 | 17,800 | 31,200 | 19,600 | 13,100 | 5,240 | 12,100 |
| 7 | 8,020 | 7,040 | 20,200 | 54,400 | 36,800 | 25,000 | 16,600 | 29,200 | 19,600 | 12,100 | 5,240 | 11,200 |
| 8 | 7,360 | 16,700 | 20,200 | 97,000 | 36,100 | 25,600 | 16,600 | 28,000 | 19,600 | 11,600 | 5,240 | 12,100 |
| 9 | 6,740 | 26,400 | 18,700 | 102,000 | 36,100 | 25,000 | 16,600 | 27,400 | 19,000 | 11,200 | 5,240 | 17,200 |
| 10 | 6,200 | 31,200 | 18,200 | 104,000 | 46,400 | 24,000 | 19,600 | 28,000 | 17,800 | 10,400 | 5,460 | 17,800 |
| 11 | 6,740 | 25,800 | 18,200 | 97,000 | 56,800 | 22,600 | 20,200 | 26,800 | 16,100 | 10,000 | 5,460 | 15,100 |
| 12 | 7,040 | 19,700 | 17,700 | 88,200 | 60,800 | 20,800 | 19,600 | 24,400 | 15,100 | 9,620 | 5,020 | 12,100 |
| 13 | 6,740 | 16,700 | 17,200 | 144,000 | 55,200 | 19,000 | 19,000 | 23,200 | 15,100 | 9,260 | 5,020 | 10,400 |
| 14 | 6,740 | 20,700 | 16,700 | 199,000 | 49,600 | 17,800 | 19,000 | 23,200 | 19,600 | 8,900 | 4,800 | 9,620 |
| 15 | 6,740 | 56,000 | 15,700 | 214,000 | 47,200 | 17,200 | 18,400 | 24,400 | 29,200 | 8,560 | 4,800 | 8,560 |
| 16 | 7,360 | 78,300 | 17,700 | 168,000 | 58,400 | 26,800 | 16,600 | 24,400 | 28,000 | 8,220 | 5,020 | 7,600 |
| 17 | 7,040 | 82,800 | 21,200 | 124,000 | 91,000 | 36,800 | 15,600 | 22,600 | 23,800 | 8,220 | 8,560 | 7,020 |
| 18 | 6,460 | 84,600 | 21,700 | 84,600 | 106,000 | 36,800 | 15,100 | 20,800 | 20,800 | 7,900 | 10,400 | 7,020 |
| 19 | 6,200 | 71,200 | 19,700 | 66,400 | 114,000 | 35,400 | 15,600 | 19,600 | 18,400 | 7,600 | 8,900 | 6,740 |
| 20 | 5,940 | 56,000 | 21,700 | 55,200 | 113,000 | 32,600 | 16,100 | 19,600 | 17,200 | 7,300 | 7,600 | 6,200 |
| 21 | 5,700 | 43,200 | 24,600 | 48,800 | 83,700 | 29,200 | 15,600 | 20,800 | 17,800 | 7,020 | 6,740 | 5,940 |
| 22 | 5,460 | 36,500 | 22,800 | 44,000 | 61,600 | 25,600 | 15,100 | 22,000 | 23,800 | 7,020 | 5,940 | 5,700 |
| 23 | 5,220 | 31,200 | 21,700 | 39,200 | 53,600 | 23,200 | 15,100 | 19,600 | 23,200 | 7,020 | 5,700 | 5,460 |
| 24 | 5,220 | 27,000 | 27,600 | 36,800 | 53,600 | 22,000 | 14,600 | 18,400 | 20,200 | 7,020 | 5,460 | 5,460 |
| 25 | 5,000 | 22,800 | 28,200 | 42,400 | 48,000 | 21,400 | 16,100 | 17,200 | 19,000 | 7,020 | 5,460 | 5,460 |
| 26 | 5,000 | 21,200 | 25,800 | 67,200 | 41,600 | 20,800 | 18,400 | 16,100 | 17,800 | 6,740 | 5,240 | 5,240 |
| 27 | 4,800 | 24,000 | 24,000 | 74,700 | 40,000 | 20,200 | 19,000 | 19,600 | 16,600 | 6,740 | 5,020 | 5,240 |
| 28 | 4,800 | 22,200 | 30,600 | 73,800 | 44,800 | 19,600 | 17,800 | 24,400 | 17,200 | 6,740 | 5,020 | 5,020 |
| 29 | 4,610 | 19,700 | 34,400 | 72,000 | 44,800 | 19,600 | 17,800 | 26,200 | 16,600 | 6,460 | 5,020 | 5,020 |
| 30 | 4,610 | 18,700 | 30,600 | 68,000 | ..... | 20,800 | 19,600 | 32,600 | 15,100 | 6,200 | 5,020 | 5,020 |
| 31 | 4,610 | ..... | 28,800 | 64,800 | ..... | 20,200 | ..... | 37,600 | ..... | 5,940 | 5,240 | ..... |

*Daily discharge, in second-feet, of Willamette River at Salem, Oreg., for the years ending Sept. 30, 1910 to 1915*—Continued.

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1912–13. | | | | | | | | | | | | |
| 1 | 5,020 | 15,100 | 14,100 | 97,000 | 29,200 | 15,100 | 151,000 | 22,800 | 22,800 | 23,400 | 7,?60 | 4,800 |
| 2 | 5,020 | 13,100 | 14,100 | 94,000 | 28,000 | 14,100 | 145,100 | 21,200 | 24,000 | 24,000 | 7,?60 | 4,800 |
| 3 | 5,240 | 12,100 | 13,600 | 66,400 | 26,800 | 15,100 | 112,000 | 20,200 | 25,200 | 22,800 | 7,040 | 5,460 |
| 4 | 5,020 | 13,600 | 17,200 | 68,800 | 25,000 | 18,400 | 75,600 | 19,700 | 25,200 | 21,700 | 7,040 | 6,740 |
| 5 | 5,020 | 20,800 | 23,200 | 66,400 | 25,600 | 20,800 | 68,000 | 18,700 | 23,400 | 25,200 | 6,740 | 13,700 |
| 6 | 5,020 | 32,600 | 23,200 | 54,400 | 24,400 | 22,000 | 77,400 | 18,700 | 21,700 | 25,200 | 6,460 | 11,900 |
| 7 | 5,020 | 48,000 | 22,000 | 42,400 | 22,600 | 22,600 | 76,500 | 20,700 | 19,700 | 22,800 | 6,200 | 8,740 |
| 8 | 5,020 | 61,600 | 19,000 | 46,400 | 20,800 | 23,200 | 66,400 | 24,600 | 19,200 | 20,700 | 6,200 | 7,360 |
| 9 | 4,800 | 64,000 | 17,200 | 57,600 | 19,600 | 25,000 | 57,600 | 27,000 | 19,200 | 18,700 | 5,940 | 6,460 |
| 10 | 4,800 | 68,800 | 16,600 | 53,600 | 18,400 | 25,600 | 49,600 | 28,800 | 18,700 | 17,700 | 5,940 | 6,200 |
| 11 | 4,800 | 70,400 | 15,600 | 45,600 | 17,800 | 26,200 | 44,000 | 30,000 | 17,700 | 16,700 | 5,940 | 5,940 |
| 12 | 4,800 | 66,400 | 15,100 | 40,800 | 17,800 | 25,600 | 44,000 | 32,400 | 16,700 | 15,200 | 5,940 | 5,700 |
| 13 | 4,800 | 104,000 | 14,600 | 44,000 | 17,800 | 23,800 | 43,200 | 30,600 | 15,700 | 14,200 | 5,940 | 5,460 |
| 14 | 4,600 | 101,000 | 16,100 | 52,000 | 18,400 | 22,000 | 42,400 | 28,200 | 15,700 | 13,700 | 5,940 | 5,220 |
| 15 | 4,600 | 83,700 | 21,400 | 55,200 | 22,000 | 20,800 | 37,900 | 25,800 | 16,200 | 12,700 | 5,940 | 5,000 |
| 16 | 4,400 | 67,200 | 26,200 | 51,200 | 30,500 | 19,000 | 35,100 | 25,800 | 15,700 | 11,900 | 5,940 | 4,800 |
| 17 | 4,400 | 51,200 | 34,000 | 47,200 | 31,900 | 19,000 | 33,000 | 27,600 | 14,700 | 11,500 | 5,700 | 4,800 |
| 18 | 4,400 | 40,800 | 42,400 | 52,800 | 37,600 | 20,200 | 30,600 | 28,800 | 13,700 | 11,100 | 5,700 | 4,800 |
| 19 | 5,020 | 33,300 | 54,400 | 79,200 | 36,100 | 25,600 | 31,800 | 35,100 | 13,700 | 10,700 | 5,700 | 4,420 |
| 20 | 5,240 | 31,900 | 53,600 | 85,500 | 31,200 | 29,200 | 31,800 | 35,100 | 15,200 | 10,300 | 5,700 | 4,420 |
| 21 | 7,900 | 30,500 | 44,000 | 67,200 | 28,000 | 28,000 | 30,000 | 81,200 | 16,700 | 9,900 | 5,460 | 4,240 |
| 22 | 8,220 | 28,000 | 34,700 | 62,400 | 25,600 | 25,600 | 31,200 | 28,800 | 17,200 | 9,500 | 5,460 | 4,240 |
| 23 | 14,100 | 25,000 | 29,200 | 57,600 | 23,200 | 24,400 | 30,600 | 27,600 | 25,800 | 9,500 | 5,220 | 4,240 |
| 24 | 23,800 | 22,600 | 26,800 | 47,200 | 20,800 | 23,800 | 28,200 | 28,200 | 33,700 | 9,120 | 5,220 | 4,240 |
| 25 | 22,000 | 20,200 | 30,500 | 41,600 | 19,000 | 22,600 | 25,800 | 28,800 | 31,200 | 9,120 | 5,220 | 4,240 |
| 26 | 18,400 | 18,400 | 30,500 | 46,400 | 17,200 | 20,800 | 25,800 | 28,200 | 35,800 | 8,740 | 5,000 | 4,240 |
| 27 | 16,600 | 17,200 | 29,200 | 47,200 | 17,200 | 19,600 | 27,600 | 27,600 | 32,400 | 8,740 | 5,000 | 4,240 |
| 28 | 14,600 | 15,600 | 29,200 | 42,400 | 16,100 | 19,000 | 27,600 | 28,200 | 27,600 | 8,380 | 4,800 | 4,240 |
| 29 | 13,100 | 14,600 | 31,200 | 40,800 | ..... | 25,600 | 25,800 | 27,000 | 28,800 | 8,020 | 4,800 | 4,240 |
| 30 | 13,100 | 14,100 | 48,000 | 35,400 | ..... | 88,200 | 24,000 | 25,200 | 26,400 | 7,680 | 4,800 | 4,420 |
| 31 | 15,600 | ..... | 83,700 | 32,600 | ..... | 135,000 | ..... | 22,800 | ..... | 7,360 | 4,800 | ..... |
| 1913–14. | | | | | | | | | | | | |
| 1 | 4,800 | 6,460 | 50,400 | 37,900 | 51,200 | 77,400 | 25,600 | 17,800 | 11,000 | 7,480 | 4,360 | 3,510 |
| 2 | 4,800 | 7,040 | 40,800 | 51,200 | 46,600 | 84,600 | 25,000 | 16,800 | 10,600 | 7,200 | 4,360 | 3,510 |
| 3 | 4,610 | 7,040 | 33,700 | 50,400 | 41,000 | 77,400 | 23,800 | 16,800 | 10,600 | 6,920 | 4,210 | 3,510 |
| 4 | 4,420 | 7,040 | 28,200 | 55,200 | 36,100 | 66,400 | 24,400 | 16,800 | 10,200 | 6,920 | 4,210 | 3,510 |
| 5 | 4,420 | 6,740 | 25,200 | 64,000 | 33,400 | 66,400 | 26,800 | 16,300 | 10,200 | 6,660 | 4,060 | 3,510 |
| 6 | 4,240 | 9,120 | 22,800 | 91,000 | 31,000 | 70,400 | 28,000 | 15,300 | 10,200 | 6,400 | 4,060 | 3,510 |
| 7 | 4,610 | 30,600 | 20,700 | 77,400 | 28,600 | 70,400 | 25,600 | 14,800 | 11,400 | 6,160 | 4,060 | 3,510 |
| 8 | 31,800 | 31,800 | 19,700 | 65,600 | 26,200 | 63,200 | 23,200 | 14,800 | 16,300 | 6,160 | 3,920 | 3,780 |
| 9 | 28,800 | 25,800 | 18,200 | 60,000 | 24,400 | 54,400 | 22,600 | 15,300 | 19,300 | 5,920 | 3,920 | 4,210 |
| 10 | 20,200 | 21,200 | 16,700 | 53,600 | 23,200 | 47,300 | 24,400 | 16,300 | 18,300 | 5,920 | 3,920 | 4,700 |
| 11 | 16,700 | 20,200 | 16,200 | 45,600 | 25,000 | 41,700 | 31,000 | 15,800 | 15,800 | 5,920 | 3,920 | 4,360 |
| 12 | 15,200 | 18,700 | 15,700 | 38,600 | 32,800 | 37,500 | 34,000 | 14,800 | 13,800 | 5,920 | 3,780 | 4,210 |
| 13 | 13,700 | 16,200 | 15,200 | 33,700 | 37,500 | 34,700 | 32,200 | 14,300 | 13,000 | 5,700 | 3,780 | 4,060 |
| 14 | 14,200 | 14,700 | 14,700 | 31,200 | 39,600 | 32,800 | 33,400 | 14,300 | 12,600 | 5,700 | 3,780 | 4,060 |
| 15 | 16,700 | 13,700 | 13,700 | 29,400 | 36,800 | 31,000 | 35,400 | 14,300 | 11,800 | 5,480 | 3,780 | 4,060 |
| 16 | 18,200 | 11,900 | 13,200 | 29,400 | 32,800 | 29,200 | 52,000 | 14,300 | 11,000 | 5,480 | 3,780 | 8,400 |
| 17 | 19,700 | 11,500 | 12,700 | 29,400 | 30,400 | 28,000 | 57,600 | 14,300 | 10,600 | 5,280 | 3,640 | 11,800 |
| 18 | 17,200 | 13,200 | 12,700 | 28,800 | 28,600 | 26,800 | 48,800 | 13,000 | 9,820 | 5,280 | 3,640 | 15,300 |
| 19 | 14,700 | 13,200 | 13,200 | 27,000 | 28,000 | 25,600 | 39,600 | 12,600 | 9,440 | 5,080 | 3,640 | 14,300 |
| 20 | 12,300 | 13,200 | 12,700 | 25,800 | 27,400 | 25,000 | 35,400 | 12,200 | 9,080 | 4,880 | 3,610 | 19,300 |
| 21 | 11,100 | 15,200 | 11,900 | 30,600 | 26,800 | 23,800 | 32,800 | 11,800 | 8,740 | 4,880 | 3,640 | 17,800 |
| 22 | 10,300 | 19,200 | 11,500 | 60,000 | 28,600 | 22,600 | 29,200 | 11,400 | 8,400 | 4,880 | 3,640 | 13,800 |
| 23 | 9,500 | 25,200 | 13,700 | 94,000 | 31,600 | 21,400 | 26,800 | 11,800 | 8,080 | 4,880 | 3,640 | 11,000 |
| 24 | 8,380 | 40,000 | 14,200 | 115,000 | 34,000 | 20,800 | 25,000 | 12,600 | 8,080 | 4,880 | 3,640 | 8,740 |
| 25 | 7,680 | 37,200 | 14,700 | 123,000 | 68,000 | 20,300 | 23,200 | 13,000 | 9,440 | 4,880 | 3,640 | 7,480 |
| 26 | 7,360 | 31,800 | 20,700 | 119,000 | 83,700 | 19,300 | 22,000 | 13,400 | 10,600 | 4,700 | 3,640 | 6,920 |
| 27 | 7,040 | 30,000 | 26,400 | 118,000 | 76,500 | 18,300 | 20,800 | 13,400 | 9,440 | 4,520 | 3,640 | 6,400 |
| 28 | 6,740 | 32,400 | 25,200 | 109,000 | 72,900 | 18,300 | 20,300 | 13,000 | 8,740 | 4,360 | 3,510 | 6,400 |
| 29 | 6,740 | 35,100 | 22,800 | 86,400 | ..... | 18,300 | 19,800 | 13,000 | 8,080 | 4,360 | 3,510 | 6,400 |
| 30 | 6,740 | 48,000 | 20,700 | 64,800 | ..... | 19,800 | 18,800 | 12,200 | 7,780 | 4,360 | 3,510 | 5,920 |
| 31 | 6,460 | ..... | 21,700 | 56,800 | ..... | 22,600 | ..... | 11,400 | ..... | 4,360 | 3,510 | ..... |

*Daily discharge, in second-feet, of Willamette River at Salem, Oreg., for the year ending Sept. 30, 1910 to 1915*—Continued.

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1914–15. | | | | | | | | | | | | |
| 1 | 5,700 | 10,600 | 25,000 | 19,300 | 19,300 | 25,000 | 19,300 | 10,200 | 26,200 | 6,660 | 4,700 | 3,510 |
| 2 | 5,700 | 11,400 | 23,800 | 26,200 | 40,300 | 24,400 | 20,300 | 10,200 | 24,400 | 6,400 | 4,700 | 3,510 |
| 3 | 7,780 | 15,300 | 24,400 | 26,800 | 50,400 | 22,000 | 22,600 | 9,440 | 22,000 | 6,400 | 4,700 | 3,510 |
| 4 | 13,400 | 18,800 | 26,800 | 25,000 | 51,200 | 20,800 | 26,200 | 9,440 | 19,300 | 6,160 | 4,520 | 3,510 |
| 5 | 13,800 | 16,800 | 25,000 | 23,200 | 52,000 | 22,000 | 26,800 | 9,080 | 17,800 | 5,920 | 4,520 | 3,510 |
| 6 | 11,000 | 15,800 | 22,000 | 23,800 | 46,600 | 23,200 | 24,400 | 9,080 | 15,800 | 5,920 | 4,360 | 3,510 |
| 7 | 9,440 | 17,300 | 20,300 | 22,600 | 40,300 | 22,000 | 22,000 | 8,740 | 14,300 | 6,160 | 4,360 | 3,510 |
| 8 | 8,400 | 15,800 | 19,300 | 25,000 | 35,400 | 20,300 | 20,800 | 8,400 | 13,400 | 6,920 | 4,360 | 3,310 |
| 9 | 7,480 | 14,300 | 25,000 | 41,000 | 32,200 | 18,800 | 19,800 | 8,400 | 12,600 | 7,480 | 4,210 | 3,330 |
| 10 | 7,480 | 12,600 | 26,200 | 44,500 | 28,600 | 17,800 | 18,300 | 8,400 | 11,800 | 8,080 | 4,210 | 3,510 |
| 11 | 7,480 | 11,800 | 23,200 | 38,900 | 26,800 | 17,300 | 16,800 | 11,000 | 11,400 | 7,480 | 4,060 | 3,510 |
| 12 | 9,080 | 11,000 | 20,300 | 37,500 | 23,800 | 16,300 | 16,300 | 14,800 | 12,200 | 6,920 | 4,060 | 3,510 |
| 13 | 9,440 | 13,800 | 19,300 | 37,500 | 22,000 | 15,800 | 16,300 | 16,800 | 13,800 | 6,660 | 4,060 | 3,510 |
| 14 | 9,080 | 29,200 | 15,800 | 51,200 | 20,300 | 16,800 | 18,300 | 16,800 | 13,400 | 6,400 | 4,060 | 3,510 |
| 15 | 8,400 | 31,000 | 14,300 | 85,500 | 18,800 | 20,800 | 18,300 | 20,300 | 12,200 | 6,400 | 3,920 | 3,510 |
| 16 | 7,480 | 27,400 | 13,000 | 92,000 | 17,300 | 24,400 | 17,300 | 24,400 | 11,400 | 6,160 | 3,920 | 3,510 |
| 17 | 7,480 | 23,200 | 11,800 | 68,800 | 16,800 | 23,800 | 16,300 | 22,600 | 10,600 | 6,160 | 3,920 | 3,640 |
| 18 | 8,740 | 20,300 | 11,000 | 50,400 | 17,300 | 22,600 | 15,300 | 20,800 | 10,200 | 5,920 | 3,920 | 3,640 |
| 19 | 11,800 | 17,800 | 10,200 | 40,300 | 19,300 | 23,200 | 15,300 | 25,000 | 9,440 | 6,400 | 3,920 | 3,640 |
| 20 | 34,000 | 16,800 | 9,820 | 36,100 | 20,300 | 21,400 | 14,300 | 34,700 | 9,080 | 5,920 | 3,920 | 3,510 |
| 21 | 41,700 | 15,800 | 9,440 | 32,800 | 20,300 | 19,300 | 14,300 | 34,000 | 8,740 | 5,700 | 3,780 | 3,510 |
| 22 | 31,000 | 13,800 | 9,080 | 30,400 | 20,800 | 18,800 | 13,800 | 29,800 | 8,400 | 5,700 | 3,780 | 3,510 |
| 23 | 23,800 | 13,400 | 8,400 | 26,800 | 20,800 | 19,300 | 13,000 | 29,200 | 8,080 | 5,480 | 3,780 | 3,510 |
| 24 | 19,300 | 12,600 | 7,780 | 23,800 | 22,600 | 19,800 | 12,600 | 28,600 | 7,780 | 5,280 | 3,780 | 3,510 |
| 25 | 15,800 | 11,800 | 7,480 | 21,400 | 25,000 | 19,300 | 11,800 | 28,600 | 7,480 | 5,080 | 3.780 | 3,380 |
| 26 | 14,300 | 11,400 | 6,660 | 19,300 | 26,800 | 18,300 | 11,400 | 29,800 | 7,480 | 4,880 | 3,640 | 3,380 |
| 27 | 12,200 | 10,600 | 18,800 | 18,300 | 25,000 | 16,800 | 10,600 | 32,200 | 7,480 | 4,880 | 3,640 | 3,380 |
| 28 | 11,000 | 10,200 | 19,800 | 17,300 | 24,400 | 15,300 | 10,200 | 33,400 | 8,080 | 4,880 | 3,640 | 3,380 |
| 29 | 10,200 | 14,800 | 21,400 | 16,300 | ..... | 14,800 | 10,200 | 37,500 | 7,480 | 4,880 | 3,640 | 3,640 |
| 30 | 9,440 | 21,400 | 20,300 | 15,800 | ..... | 16,800 | 9,820 | 34,000 | 6,920 | 4,880 | 3,640 | 3,640 |
| 31 | 9,080 | ..... | 19,800 | 15,800 | ..... | 18,800 | ..... | 30,400 | ..... | 4,700 | 3,510 | ..... |

NOTE.—Discharge determined from rating curves as follows: Oct. 1, 1909, to Jan. 15, 1912, and Apr. 1, 1913, to Jan. 25, 1914, fairly well defined; Jan. 16, 1912, to Mar. 31, 1913, well defined between 5,000 and 25,000 second-feet; Jan. 26, 1914, to Sept. 30, 1915, well defined between 3,200 and 30,000 secor d-feet and fairly well defined above 30,000 second-feet.

*Monthly discharge of Willamette River at Salem, Oreg., for the years ending Sept. 30, 1910 to 1915.*

| Month. | Discharge in second-feet. | | | Run-off (total in acre-feet). | Accuracy. |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | | |
| 1909–10. | | | | | |
| October | 8,020 | 4,420 | 5,567 | 342,000 | C. |
| November | 315,000 | 9,500 | 68,600 | 4,080,000 | B. |
| December | 105,000 | 16,700 | 46,000 | 2,830,000 | B. |
| January | 74,700 | 16,700 | 33,100 | 2,040,000 | B. |
| February | 85,500 | 22,200 | 43,900 | 2,440,000 | B. |
| March | 170,000 | 19,200 | 53,400 | 3,280,000 | B. |
| April | 25,200 | 15,700 | 20,900 | 1,240,000 | B. |
| May | 25,200 | 9,900 | 15,100 | 928,000 | B. |
| June | 9,500 | 6,460 | 7,757 | 461,000 | B. |
| July | 6,200 | 4,420 | 5,120 | 315,000 | B. |
| August | 4,240 | 3,910 | 4,020 | 247,000 | B. |
| September | 4,420 | 3,750 | 3,900 | 232,000 | B. |
| The year | 315,000 | 3,750 | 25,500 | 18,400,000 | |
| 1910–11. | | | | | |
| October | 11,900 | 3,750 | 5,669 | 348,000 | B. |
| November | 102,000 | 4,070 | 28,400 | 1,690,000 | B. |
| December | 115,000 | 20,700 | 43,100 | 2,650,000 | B. |
| January | 155,000 | 19,700 | 42,500 | 2,610,000 | B. |
| February | 40,000 | 15,700 | 27,400 | 1,520,000 | B. |
| March | 26,400 | 13,200 | 19,800 | 1,220,000 | B. |
| April | 24,000 | 15,700 | 19,600 | 1,170,000 | B. |
| May | 52,000 | 15,700 | 24,000 | 1,480,000 | B. |
| June | 20,200 | 9,120 | 13,600 | 809,000 | B. |
| July | 10,700 | 4,800 | 6,710 | 413,000 | B. |
| August | 4,800 | 3,750 | 4,200 | 258,000 | C. |
| September | 10,700 | 3,750 | 5,980 | 356,000 | B. |
| The year | 155,000 | 3,750 | 20,100 | 14,500,000 | |

*Monthly discharge of Willamette River at Salem, Oreg., for the years ending Sept. 30, 1910 to 1915*—Continued.

| Month. | Discharge in second-feet. | | | Run-off (total in acre-feet). | Accuracy. |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | | |
| 1911–12. | | | | | |
| October | 9,120 | 4,610 | 6,330 | 389,000 | B. |
| November | 84,600 | 4,240 | 29,500 | 1,760,000 | B. |
| December | 34,400 | 13,700 | 21,100 | 1,300,000 | B. |
| January | 214,000 | 20,700 | 76,800 | 4,720,000 | B. |
| February | 114,000 | 35,400 | 56,300 | 3,240,000 | B. |
| March | 39,200 | 17,200 | 25,500 | 1,570,000 | B. |
| April | 20,200 | 14,600 | 17,500 | 1,040,000 | B. |
| May | 45,600 | 16,100 | 26,100 | 1,600,000 | B. |
| June | 31,900 | 15,100 | 20,400 | 1,210,000 | B. |
| July | 15,100 | 5,940 | 9,370 | 576,000 | B. |
| August | 10,400 | 4,800 | 5,800 | 357,000 | B. |
| September | 17,800 | 5,020 | 9,370 | 558,000 | B. |
| The year | 214,000 | 4,240 | 25,200 | 18,300,000 | |
| 1912–13. | | | | | |
| October | 23,800 | 4,400 | 8,530 | 524,000 | B. |
| November | 104,000 | 12,100 | 40,200 | 2,390,000 | B. |
| December | 83,700 | 13,600 | 28,700 | 1,760,000 | B. |
| January | 97,000 | 32,600 | 55,500 | 3,410,000 | B. |
| February | 37,600 | 16,100 | 23,900 | 1,330,000 | B. |
| March | 135,000 | 14,100 | 27,900 | 1,720,000 | B. |
| April | 151,000 | 24,000 | 51,000 | 3,030,000 | B. |
| May | 35,100 | 18,700 | 26,600 | 1,640,000 | B. |
| June | 35,800 | 13,700 | 21,700 | 1,290,000 | B. |
| July | 25,200 | 7,360 | 14,400 | 885,000 | B. |
| August | 7,360 | 4,800 | 5,820 | 358,000 | B. |
| September | 13,700 | 4,240 | 5,640 | 336,000 | B. |
| The year | 151,000 | 4,240 | 25,800 | 18,700,000 | |
| 1913–14. | | | | | |
| October | 31,800 | 4,240 | 11,600 | 713,000 | B. |
| November | 48,000 | 6,460 | 20,400 | 1,210,000 | B. |
| December | 50,400 | 11,500 | 20,000 | 1,230,000 | B. |
| January | 123,000 | 25,800 | 61,300 | 3,770,000 | B. |
| February | 83,700 | 23,200 | 38,700 | 2,150,000 | B. |
| March | 84,600 | 18,300 | 39,200 | 2,410,000 | B. |
| April | 57,600 | 18,800 | 29,600 | 1,760,000 | B. |
| May | 17,800 | 11,400 | 14,100 | 867,000 | B. |
| June | 19,300 | 7,780 | 11,100 | 660,000 | B. |
| July | 7,480 | 4,360 | 5,530 | 340,000 | B. |
| August | 4,360 | 3,510 | 3,810 | 234,000 | B. |
| September | 19,300 | 3,510 | 7,270 | 433,000 | B |
| The year | 123,000 | 3,510 | 21,800 | 15,800,000 | |
| 1914–15. | | | | | |
| October | 41,700 | 5,700 | 12,900 | 793,000 | B. |
| November | 31,000 | 10,200 | 16,200 | 964,000 | B. |
| December | 26,800 | 6,660 | 17,300 | 1,060,000 | B. |
| January | 92,000 | 15,800 | 34,000 | 2,090,000 | B. |
| February | 52,000 | 16,800 | 28,000 | 1,560,000 | B. |
| March | 25,000 | 14,800 | 19,900 | 1,220,000 | B. |
| April | 26,800 | 9,820 | 16,800 | 1,000,000 | B. |
| May | 37,500 | 8,400 | 20,800 | 1,280,000 | B. |
| June | 26,200 | 6,920 | 12,300 | 732,000 | B. |
| July | 8,080 | 4,700 | 6,030 | 371,000 | B. |
| August | 4,700 | 3,510 | 4,030 | 248,000 | B. |
| September | 3,640 | 3,310 | 3,500 | 208,000 | B. |
| The year | 92,000 | 3,310 | 15,900 | 11,500,000 | |

### SALMON CREEK NEAR OAKRIDGE, OREG.

LOCATION.—In the NW. ¼ sec. 13, T. 21 S., R. 3 E., about a mile above Southern Pacific Railroad bridge 1½ miles east of Oakridge, Lane County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—February 6, 1913, to September 30, 1915.

GAGE.—Stevens continuous water-stage recorder on right bank about a mile above the railway bridge. Vertical staff on right bank was read up to November 21, 1913; new inclined gage, at different datum, 300 feet below present site, used November 22, 1913, to September 30, 1914. Gage reader. Flora Warner.

DISCHARGE MEASUREMENTS.—Made by wading or from bridge.

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

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 1.94 feet at 8 a. m., October 19 (discharge, 872 second-feet); minimum stage recorded, 0. 38 foot September 25 (discharge, 117 second-feet); stage continued to fall until end of year.

1913–1915: Maximum stage recorded, 5.3 feet on original vertical staff March 30, 1913 (discharge, 2,500 second-feet); minimum stage recorded, 1.61 feet on inclined gage September 4 to 6, 1914 (discharge, 112 second-feet).

WINTER FLOW.—Stage-discharge relation unaffected by ice.

DIVERSIONS.—None.

REGULATIONS.—None.

ACCURACY.—Results considered good except for higher stages, when recorder did not operate properly.

*Discharge measurements of Salmon Creek near Oakridge, Oreg., during the year ending Sept. 30, 1915.*

| Date. | Made by— | Gage height. | Discharge. |
|---|---|---|---|
| | | *Feet.* | *Sec.-ft.* |
| Feb. 4 | P. V. Hodges | 1.50 | 562 |
| June 25 | C. L. Batchelder | .78 | 208 |
| Sept. 23 | P. V. Hodges | .39 | 119 |

*Daily discharge, in second-feet, of Salmon Creek near Oakridge, Oreg., for year ending Sept. 30, 1915.*

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 129 | 167 | 180 | 210 | 595 | 230 | 390 | 280 | 415 | 166 | 142 | 120 |
| 2 | 230 | 195 | 167 | 230 | 665 | 195 | 440 | 270 | 405 | 164 | 141 | 120 |
| 3 | 340 | 195 | 167 | 230 | 665 | 180 | 470 | 260 | 396 | 164 | 140 | 120 |
| 4 | 270 | 195 | 167 | 250 | 560 | 250 | 470 | 250 | 387 | 164 | 139 | 120 |
| 5 | 230 | 180 | 167 | 250 | 530 | 270 | 470 | 240 | 378 | 166 | 138 | 120 |
| 6 | 230 | 180 | 167 | 250 | 500 | 230 | 457 | 230 | 369 | 222 | 137 | 120 |
| 7 | 195 | 180 | 167 | 250 | 470 | 210 | 444 | 230 | 360 | 242 | 136 | 120 |
| 8 | 210 | 210 | 167 | 340 | 440 | 180 | 430 | 210 | 351 | 226 | 134 | 120 |
| 9 | 210 | 210 | 167 | 365 | 420 | 167 | 417 | 230 | 342 | 230 | 133 | ..... |
| 10 | 230 | 210 | 172 | 340 | 415 | 154 | 404 | 415 | 333 | 218 | 132 | ..... |
| 11 | 210 | 210 | 180 | 315 | 365 | 142 | 391 | 415 | 324 | 201 | 131 | ..... |
| 12 | 210 | 195 | 167 | 315 | 340 | 131 | 378 | 470 | 315 | 190 | 130 | ..... |
| 13 | 195 | 195 | 180 | 390 | 270 | 167 | 365 | 530 | 306 | 181 | 129 | ..... |
| 14 | 195 | 180 | 167 | 630 | 250 | 340 | 372 | 630 | 297 | 176 | 128 | ..... |
| 15 | 180 | 180 | 154 | 630 | 250 | 415 | 379 | 530 | 288 | 171 | 126 | 120 |
| 16 | 180 | 180 | 167 | 500 | 230 | 390 | 386 | 415 | 279 | 168 | 125 | 120 |
| 17 | 210 | 180 | 167 | 415 | 230 | 390 | 394 | 390 | 270 | 179 | 125 | 120 |
| 18 | 250 | 210 | 167 | 390 | 250 | 415 | 401 | 500 | 262 | 164 | 123 | 119 |
| 19 | 805 | 315 | 167 | 415 | 270 | 365 | 408 | 665 | 254 | 156 | 123 | 119 |
| 20 | 630 | 290 | 154 | 440 | 250 | 315 | 415 | 665 | 246 | 154 | 120 | 119 |
| 21 | 470 | 270 | 154 | 470 | 250 | 340 | 403 | 665 | 237 | 152 | 117 | 118 |
| 22 | 365 | 250 | 154 | 440 | 230 | 415 | 391 | 709 | 228 | 150 | 117 | 118 |
| 23 | 290 | 250 | 154 | 365 | 210 | 500 | 378 | 665 | 220 | 148 | 119 | 118 |
| 24 | 270 | 230 | 154 | 290 | 195 | 530 | 365 | 700 | 212 | 146 | 120 | 117 |
| 25 | 230 | 230 | 154 | 250 | 210 | 500 | 352 | 665 | 204 | 144 | 120 | 117 |
| 26 | 210 | 210 | 154 | 210 | 195 | 470 | 339 | 700 | 218 | 138 | 120 | 117 |
| 27 | 195 | 210 | 167 | 210 | 210 | 340 | 326 | 700 | 204 | 133 | 120 | 116 |
| 28 | 180 | 210 | 180 | 230 | 250 | 365 | 314 | 735 | 193 | 126 | 120 | 115 |
| 29 | 167 | 195 | 180 | 230 | ..... | 415 | 302 | 630 | 179 | 125 | 120 | 114 |
| 30 | 180 | 180 | 180 | 250 | ..... | 390 | 290 | 560 | 171 | 136 | 120 | 113 |
| 31 | 167 | ..... | 180 | 270 | ..... | 365 | ..... | 500 | ..... | 140 | 120 | ..... |

NOTE.—Discharge determined from two well-defined rating curves, one applicable Oct. 1 to May 28 and the other May 29 to Sept. 30. Discharge interpolated for days when gage was not working as follows: Apr. 6–12, 14–19, 21–29, May 1–5, June 2–16, 18–24, July 20–24, Aug. 1–13, Sept. 1–2, 4–7, 16–24, and 26–30. Mean discharge Sept. 9–14 estimated as 125 second-feet.

*Monthly discharge of Salmon Creek near Oakridge, Oreg., for the year ending Sept. 30, 1915.*

| Month. | Discharge in second-feet. | | | Run-off (total in acre-feet). | Accuracy. |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | | |
| October | 805 | 129 | 260 | 16,000 | B. |
| November | 315 | 167 | 210 | 12,500 | B. |
| December | 180 | 154 | 167 | 10,200 | B. |
| January | 630 | 210 | 335 | 20,600 | C. |
| February | 665 | 195 | 347 | 19,200 | C. |
| March | 530 | 131 | 315 | 19,400 | C. |
| April | 470 | ..... | 391 | 23,200 | C. |
| May | 735 | 210 | 485 | 29,800 | B. |
| June | 415 | 171 | 288 | 17,100 | B. |
| July | 242 | 125 | 169 | 10,400 | B. |
| August | 142 | 117 | 127 | 7,810 | B. |
| September | ..... | 113 | 120 | 7,140 | B. |
| The year | 805 | 113 | 267 | 194,000 | |

**NORTH FORK OF MIDDLE FORK OF WILLAMETTE RIVER NEAR OAKRIDGE, OREG.**

LOCATION.—In the SE. ¼ sec. 7, T. 21 S., R. 3 E., just below highway bridge about 2 miles north of Oakridge and about a mile above former station.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—October 1, 1913, to September 30, 1915, when station was discontinued. Fragmentary records, October 12, 1909, to September 30, 1912, at former station.

GAGE.—Stevens continuous water-stage recorder just below highway bridge; also inclined staff in the SW. ¼ sec. 8, 100 feet above railroad bridge. Gage reader, Flora Warner.

DISCHARGE MEASUREMENTS.—Made from cable at old gage, a mile below present site, or by wading at low water.

CHANNEL AND CONTROL.—Rock overlain with heavy gravel; fairly permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 4.0 feet about October 19, from high mark indicated by recorder, which was not running (discharge, 1,800 second-feet); minimum stage from water-stage recorder, 0.45 foot September 8 to 11 (discharge, 138 second-feet).

1909–1912 and 1913–1915: Maximum stage recorded, 12.4 feet November 22, 1909; minimum stage recorded, that of 1915.

DIVERSIONS.—None.

REGULATION.—None at present; storage reservoir on Waldo Lake not being used.

ACCURACY.—Results considered excellent for periods when recorder was working; estimates have been made for other periods.

*Discharge measurements of North Fork of Middle Fork of Willamette River near Oakridge, Oreg., during the year ending Sept. 30, 1915.*

| Date. | Made by— | Gage height. | Discharge. |
|---|---|---|---|
| | | *Feet.* | *Sec.-ft.* |
| Feb. 5 | P. V. Hodges | 2.89 | 1,090 |
| June 25 | C. L. Batchelder | 1.24 | 324 |
| Sept. 2 | P. V. Hodges | .51 | 148 |

*Daily discharge, in second-feet, of North Fork of Middle Fork of Willamette River near Oakridge, Oreg., for the year ending Sept. 30, 1915.*

| | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | ..... | 262 | 352 | ..... | ..... | 744 | 822 | 418 | 770 | 252 | 200 | 147 |
| 2 | ..... | 265 | 386 | ..... | ..... | 700 | 930 | 406 | 718 | 255 | 196 | 147 |
| 3 | ..... | 268 | 422 | ..... | ..... | 700 | 1,090 | 375 | 644 | 259 | 192 | 145 |
| 4 | ..... | 271 | 390 | ..... | 1,150 | 900 | 1,090 | 349 | 583 | 262 | 189 | 144 |
| 5 | 301 | 274 | 375 | ..... | 1,090 | 1,000 | 1,010 | 334 | 542 | 265 | 187 | 142 |
| 6 | 285 | 276 | 359 | ..... | 1,040 | 850 | 930 | 334 | 506 | 268 | 185 | 140 |
| 7 | 242 | 279 | 359 | ..... | 984 | 700 | 903 | 331 | 476 | 268 | 183 | 139 |
| 8 | 261 | 282 | 359 | ..... | 930 | 620 | 822 | 327 | 448 | 269 | 180 | 138 |
| 9 | 264 | 285 | 363 | ..... | 903 | 592 | 770 | 345 | 430 | 270 | 176 | 138 |
| 10 | 279 | 288 | 359 | ..... | 822 | 574 | 718 | 442 | 433 | 271 | 172 | 138 |
| 11 | 282 | 291 | 356 | ..... | 770 | 556 | 718 | 476 | 537 | 271 | 172 | 138 |
| 12 | 270 | 294 | 349 | ..... | 693 | 565 | 796 | 510 | 560 | 268 | 168 | 142 |
| 13 | 256 | ..... | 334 | ..... | 644 | 718 | 903 | 560 | 497 | 264 | 164 | 160 |
| 14 | ..... | ..... | 327 | ..... | 597 | 957 | 849 | 693 | 456 | 261 | 164 | 168 |
| 15 | ..... | ..... | 327 | ..... | 565 | 1,010 | 770 | 693 | 430 | 257 | 164 | 152 |
| 16 | ..... | ..... | 324 | ..... | 560 | 1,010 | 744 | 644 | 412 | 254 | 164 | 148 |
| 17 | ..... | ..... | 317 | ..... | 620 | 1,010 | 744 | 644 | 394 | 251 | 164 | 145 |
| 18 | ..... | ..... | 310 | ..... | 744 | 1,060 | 744 | 957 | 377 | 247 | 164 | 144 |
| 19 | ..... | 379 | 310 | ..... | 744 | 1,010 | 744 | 1,150 | 371 | 244 | 162 | 142 |
| 20 | ..... | 375 | 314 | ..... | 718 | 930 | 718 | 1,040 | 355 | 237 | 160 | 142 |
| 21 | ..... | 363 | 324 | ..... | 668 | 930 | 644 | 1,040 | 342 | 230 | 157 | 142 |
| 22 | ..... | 349 | ..... | ..... | 644 | 1,010 | 588 | 1,150 | 336 | 223 | 156 | 142 |
| 23 | ..... | 349 | ..... | ..... | 668 | 1,090 | 542 | 1,060 | 327 | 216 | 154 | 142 |
| 24 | ..... | 338 | ..... | ..... | 693 | 1,090 | 502 | 1,150 | 315 | 209 | 153 | 145 |
| 25 | 279 | 327 | ..... | ..... | 693 | 984 | 471 | 1,060 | 312 | 201 | 152 | 145 |
| 26 | 270 | 324 | 367 | ..... | 668 | 876 | 455 | 1,170 | 283 | 193 | 150 | 144 |
| 27 | 260 | 320 | 402 | ..... | 693 | 770 | 463 | 1,170 | 254 | 186 | 149 | 150 |
| 28 | 250 | 345 | 450 | ..... | 719 | 770 | 484 | 1,170 | 252 | 186 | 148 | 148 |
| 29 | 253 | 367 | 438 | ..... | ..... | 796 | 467 | 1,060 | 251 | 186 | 147 | 142 |
| 30 | 256 | 359 | 438 | ..... | ..... | 822 | 442 | 930 | 249 | 190 | 146 | 140 |
| 31 | 259 | ..... | 436 | ..... | ..... | 796 | ..... | 822 | ..... | 200 | 145 | ..... |

NOTE.—Discharge determined from two well-defined rating curves applicable Oct. 1 to May 27 and May 28 to Sept. 30, respectively. Discharge interpolated Oct. 26, 27, Oct. 30 to Nov. 11, June 28, 29, July 1–5, 7–10, 12–15, 17–18, 20–22, 24–26, and Aug. 22–30. Discharge estimated Mar. 1–7 and July 28 to Aug. 9. Mean discharge estimated Oct. 1–4, 300 second-feet; Oct. 14–24, 650 second-feet; Nov. 13–18, 290 second-feet; Dec. 22–25, 300 second-feet; Feb. 1–3, 1,000 second-feet.

*Monthly discharge of North Fork of Middle Fork of Willamette River near Oakridge, Oreg., for the year ending Sept. 30, 1915.*

| Month. | Discharge in second-feet. | | | Run-off (total in acre-feet). | Accuracy. |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | | |
| October | ..... | 242 | 407 | 25,000 | C. |
| November | 379 | ..... | 309 | 18,400 | C. |
| December | 450 | ..... | 356 | 21,900 | B. |
| January | ..... | ..... | [a] 800 | 49,200 | D. |
| February | ..... | 560 | 786 | 43,790 | B. |
| March | 1,090 | 556 | 843 | 51,800 | B. |
| April | 1,090 | 442 | 729 | 43,400 | A. |
| May | 1,170 | 327 | 736 | 45,300 | A. |
| June | 770 | 249 | 429 | 25,500 | A. |
| July | 271 | 186 | 239 | 14,700 | B. |
| August | 200 | 145 | 167 | 10,300 | B. |
| September | 168 | 138 | 145 | 8,630 | A. |
| The year | ..... | ..... | 494 | 358,000 | |

[a] Estimated.

### McKENZIE RIVER AT CLEAR LAKE, OREG.

LOCATION.—In sec. 8, T. 14 S., R. 7 E., at the outlet of Clear Lake in Linn County, about 20 miles northeast of McKenzie Bridge, the nearest post office.

DRAINAGE AREA.—90 square miles.

RECORDS AVAILABLE.—June 20, 1912, to July 31, 1915, when station was discontinued.

GAGE.—A float gage in the lake and a vertical staff at the outlet, the latter for checking purposes only.

DISCHARGE MEASUREMENTS.—Made from a suspension footbridge at the outlet.

CHANNEL AND CONTROL.—Closely compacted volcanic sand and gravel bound together with fine silt. Timber bulkheads on each side. Practically permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 9.50 feet April 4 (discharge, 645 second-feet); minimum stage recorded, 7.53 feet September 28 (discharge, 165 second-feet).

1912–1915: Maximum stage recorded, 10.69 feet May 27 and June 3, 1913 (discharge, 1,130 second-feet); minimum is that of 1915.

WINTER FLOW.—Stage-discharge relation unaffected by ice.

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Results considered excellent.

COOPERATION.—Gage-height record furnished by the Oregon Electric Railway Co.

The following discharge measurement was made by C. L. Batchelder:
September 28, 1915: Gage height, 7.53 feet (discharge, 165 second-feet).

*Daily discharge, in second-feet, of McKenzie River at Clear Lake, Oreg., for the year ending Sept. 30, 1915.*

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June | July. |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 256 | 319 | 292 | 209 | 250 | 274 | 500 | 406 | 448 | 281 |
| 2 | 262 | 316 | 288 | 209 | 242 | 274 | 542 | 400 | 436 | 277 |
| 3 | 262 | 307 | 283 | 210 | 254 | 274 | 622 | 387 | 428 | 274 |
| 4 | 264 | 303 | 279 | 216 | 264 | 281 | 645 | 371 | 420 | 268 |
| 5 | 266 | 303 | 277 | 221 | 272 | 279 | 618 | 374 | 411 | 264 |
| 6 | 268 | 301 | 272 | 223 | 277 | 274 | 618 | 369 | 400 | 264 |
| 7 | 270 | 299 | 268 | 226 | 279 | 272 | 614 | 366 | 392 | 254 |
| 8 | 272 | 296 | 262 | 234 | 283 | 270 | 618 | 361 | 38[illegible] | 250 |
| 9 | 270 | 296 | 256 | 234 | 283 | 270 | 606 | 361 | 379 | 248 |
| 10 | 270 | 296 | 250 | 236 | 283 | 268 | 595 | 371 | 374 | 246 |
| 11 | 270 | 292 | 246 | 236 | 279 | 266 | 588 | 369 | 368 | 242 |
| 12 | 270 | 292 | 242 | 238 | 277 | 266 | 591 | 371 | 364 | 240 |
| 13 | 270 | 310 | 236 | 238 | 274 | 268 | 606 | 371 | 356 | 232 |
| 14 | 270 | 301 | 232 | 240 | 270 | 272 | 584 | 374 | 351 | 230 |
| 15 | 268 | 299 | 228 | 242 | 268 | 279 | 559 | 374 | 347 | 230 |
| 16 | 266 | 303 | 223 | 242 | 266 | 288 | 545 | 379 | 344 | 230 |
| 17 | 266 | 305 | 223 | 242 | 264 | 294 | 535 | 384 | 338 | 228 |
| 18 | 270 | 310 | 219 | 242 | 262 | 305 | 542 | 392 | 335 | 225 |
| 19 | 294 | 310 | 216 | 242 | 260 | 314 | 538 | 400 | 332 | 223 |
| 20 | 288 | 312 | 212 | 242 | 260 | 326 | 538 | 406 | 328 | 223 |
| 21 | 296 | 312 | 210 | 240 | 262 | 335 | 522 | 420 | 323 | 223 |
| 22 | 310 | 312 | 209 | 238 | 264 | 344 | 503 | 428 | 319 | 221 |
| 23 | 319 | 312 | 209 | 236 | 264 | 353 | 484 | 431 | 314 | 219 |
| 24 | 323 | 312 | 209 | 234 | 268 | 369 | 478 | 436 | 310 | 216 |
| 25 | 328 | 310 | 209 | 232 | 268 | 377 | 466 | 436 | 305 | 216 |
| 26 | 328 | 307 | 209 | 230 | 268 | 387 | 454 | 442 | 303 | 212 |
| 27 | 328 | 305 | 209 | 228 | 272 | 392 | 442 | 448 | 298 | 209 |
| 28 | 328 | 301 | 209 | 228 | 272 | 404 | 431 | 469 | 292 | 207 |
| 29 | 326 | 296 | 209 | 225 | ..... | 428 | 422 | 472 | 288 | 204 |
| 30 | 323 | 292 | 209 | 225 | ..... | 448 | 414 | 463 | 282 | 202 |
| 31 | 319 | ..... | 209 | 225 | ..... | 460 | ..... | 448 | ..... | 201 |

NOTE.—Discharge determined from a well-defined rating curve.

*Monthly discharge of McKenzie River at Clear Lake, Oreg., for the year ending Sept. 30, 1915.*

| Month. | Discharge in second-feet. | | | Run-off (total in acre-feet). | Accuracy. |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | | |
| October | 328 | 256 | 2[illegible]8 | 17,700 | A. |
| November | 319 | 292 | 304 | 18,100 | A. |
| December | 292 | 209 | 2[illegible]6 | 14,500 | A. |
| January | 242 | 209 | 2[illegible]1 | 14,200 | A. |
| February | 283 | 242 | 2[illegible]8 | 14,900 | A. |
| March | 460 | 266 | 3[illegible]0 | 19,700 | A. |
| April | 645 | 414 | 5[illegible]1 | 32,200 | A. |
| May | 472 | 361 | 4[illegible]3 | 24,800 | A. |
| June | 448 | 288 | 3[illegible]3 | 21,000 | A. |
| July | 281 | 201 | 2[illegible]4 | 14,400 | A. |
| The period | | | | 192,000 | |

### McKENZIE RIVER NEAR McKENZIE BRIDGE, OREG.

LOCATION.—In sec. 17, T. 16 S., R. 6 E., at the Paradise ranger station 2 miles above highway bridge at McKenzie Bridge, Lane County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—August 8, 1910, to September 30, 1915.

GAGE.—Vertical staff at Paradise ranger station; read by S. L. Taylor. Gage read in 1914 is staff at Hayes ranch one-half mile above McKenzie Bridge, and a third gage, which was formerly read, is attached to the abutment of the highway bridge at McKenzie Bridge.

DISCHARGE MEASUREMENTS.—Made from cable three-eighths mile above the ranger station.

CHANNEL AND CONTROL.—Rocky; practically permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 3.00 feet October 19 (discharge, 2,540 second-feet); this is the date on which maxima for the year occurred on adjoining streams. Minimum stage recorded, 1.48 feet September 19, 21, 24, 25 (discharge, 966 second-feet; stage continued to fall until end of month).

1910–1915: Maximum stage recorded, 5.0 feet on gage at highway bridge January 13, 1912 (discharge, 7,400 second-feet); minimum stage recorded is that of 1915.

WINTER FLOW.—Stage-discharge relation unaffected by ice.

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Results considered good.

COOPERATION.—Gage records at ranger station furnished by United States Forest Service, C. R. Seitz, supervisor.

*Discharge measurements of McKenzie River near McKenzie Bridge, Oreg., during the year ending Sept. 30, 1915.*

| Date. | Made by— | Gage height. | Discharge. |
|---|---|---|---|
| | | *Feet.* | *Sec.-ft.* |
| Nov. 16 | R. D. Cooper | 2.01 | 1,420 |
| Sept. 24 | Henshaw and Batchelder | 1.48 | 963 |

*Daily discharge, in second-feet, of McKenzie River near McKenzie Bridge, Oreg.; for the year ending Sept. 30, 1915.*

| Day. | Oct. | Nov. | Dec. | Apr. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | 1,750 | 1,420 | 1,580 | 1,240 | 1,110 | 1,010 |
| 2 | | | | 1,860 | 1,400 | 1,570 | 1,230 | 1,100 | 1,000 |
| 3 | | | | 2,000 | 1,400 | 1,560 | 1,230 | 1,090 | 1,000 |
| 4 | | | 1,230 | 1,940 | 1,390 | 1,550 | 1,230 | 1,090 | 997 |
| 5 | | | | 1,880 | 1,380 | 1,520 | 1,220 | 1,090 | 994 |
| 6 | 1,190 | | | 1,790 | 1,380 | 1,490 | 1,220 | 1,080 | 991 |
| 7 | | | | 1,820 | 1,370 | 1,470 | 1,220 | 1,080 | 988 |
| 8 | | | | 1,770 | 1,360 | 1,470 | 1,210 | 1,080 | 986 |
| 9 | | | | 1,770 | 1,380 | 1,460 | 1,210 | 1,070 | 983 |
| 10 | | | | 1,750 | 1,420 | 1,450 | 1,200 | 1,070 | 980 |
| 11 | | | 1,170 | 1,750 | 1,460 | 1,440 | 1,190 | 1,070 | 980 |
| 12 | | | | 1,770 | 1,490 | 1,430 | 1,190 | 1,070 | 980 |
| 13 | | 1,620 | 1,170 | 1,790 | 1,530 | 1,420 | 1,190 | 1,070 | 980 |
| 14 | | | | 1,740 | 1,570 | 1,410 | 1,180 | 1,070 | 978 |
| 15 | | | | 1,690 | 1,550 | 1,400 | 1,180 | 1,070 | 976 |
| 16 | | 1,390 | | 1,690 | 1,520 | 1,390 | 1,170 | 1,070 | 973 |
| 17 | | | | 1,690 | 1,520 | 1,380 | 1,160 | 1,060 | 970 |
| 18 | | | | 1,690 | 1,550 | 1,380 | 1,160 | 1,050 | 968 |
| 19 | 2,540 | | | 1,670 | 1,580 | 1,360 | 1,150 | 1,050 | 966 |
| 20 | 1,790 | 1,360 | | 1,670 | 1,610 | 1,330 | 1,150 | 1,040 | 966 |
| 21 | | | | 1,620 | 1,640 | 1,310 | 1,150 | 1,040 | 966 |
| 22 | | | | 1,600 | 1,670 | 1,310 | 1,150 | 1,040 | 966 |
| 23 | | | | 1,580 | 1,710 | 1,290 | 1,150 | 1,040 | 966 |
| 24 | | | | 1,560 | 1,740 | 1,290 | 1,140 | 1,040 | 966 |
| 25 | | | | 1,530 | 1,770 | 1,280 | 1,140 | 1,040 | 965 |
| 26 | | | | 1,510 | 1,800 | 1,270 | 1,140 | 1,030 | 964 |
| 27 | | | | 1,490 | 1,830 | 1,260 | 1,140 | 1,030 | 963 |
| 28 | | 1,290 | | 1,470 | 1,860 | 1,250 | 1,130 | 1,020 | 962 |
| 29 | | | | 1,460 | 1,720 | 1,250 | 1,130 | 1,020 | 961 |
| 30 | | | | 1,450 | 1,590 | 1,250 | 1,130 | 1,010 | 960 |
| 31 | | | | | 1,590 | | 1,120 | 1,010 | |

NOTE.—Discharge determined from a well-defined rating curve. Discharge October to December, inclusive, given only for days on which gage was read. Discharge interpolated Apr. 22–27, May 10–13, 18–27, June 1–3, 8–17, 19–20, 24–28. Gage read 7 times in July, 11 times in August, and 7 times in September.

*Monthly discharge of McKenzie River near McKenzie Bridge, Oreg., for the year ending Sept. 30, 1915.*

| Month. | Discharge in second-feet. | | | Run-off (total in acre-feet). | Accuracy. |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | | |
| April | 2,000 | 1,450 | 1,690 | 101,000 | A. |
| May | 1,860 | 1,360 | 1,550 | 95,300 | B. |
| June | 1,580 | 1,250 | 1,390 | 82,700 | A. |
| July | 1,240 | 1,120 | 1,180 | 72,600 | A. |
| August | 1,110 | 1,010 | 1,060 | 65,200 | A. |
| September | 1,010 | 960 | 977 | 58,100 | A. |
| The period | | | | 475,000 | |

NOTE.—See note to table of daily discharge.

### McKENZIE RIVER NEAR SPRINGFIELD, OREG.

LOCATION.—In sec. 32, T. 17 S., R. 1 W., at Hendrick's bridge, 3 miles below Walterville, 3 miles above Camp Creek, and 11 miles above Springfield, Lane County.

DRAINAGE AREA.—960 square miles.

RECORDS AVAILABLE.—September 12, 1905, to March 31, 1915, when station was discontinued.

GAGE.—Vertical staff on left bank; read daily. Gage reader, Mrs. N. M. Hendricks.

DISCHARGE MEASUREMENTS.—Made from cable 200 feet below gage.

CHANNEL AND CONTROL.—Coarse gravel and small boulders; shifting.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 5.9 feet at noon Ocober 19 (discharge, 11,700 second-feet plus about 300 second-feet in canal, total 12,000 second-feet); minimum stage recorded, 0.40 foot September 25 (discharge, 1,180 second-feet plus 371 second-feet in canal, total 1,550 second-feet).

1905–1915: Maximum stage recorded, 13.0 feet at 5 p. m. November 22, 1909 (discharge, 43,500 second-feet); minimum stage recorded for total flow of river, 1.05 feet November 5, 1910 (discharge, 1,540 second-feet).

WINTER FLOW.—Stage-discharge relation unaffected by ice.

DIVERSIONS.—The power canal of the Eugene municipal plant has diverted water around the station since about February 14, 1911. Record has been kept of this diversion and the amounts added to the discharge of the river station.

REGULATION.—None.

ACCURACY.—Results considered good.

The following discharge measurement was made by C. G. Paulsen:

December 25, 1914: Gage height, 1.12 feet; discharge, 1,870 second-feet.

*Daily discharge, in second-feet, of McKenzie River near Springfield, Oreg., for the year ending Sept. 30, 1915.*

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. |
|---|---|---|---|---|---|---|
| 1 | 1,700 | 2,680 | 2,550 | 3,080 | 9,460 | 3,950 |
| 2 | 2,680 | 2,680 | 2,680 | 3,500 | 6,630 | 3,950 |
| 3 | 3,650 | 2,550 | 3,080 | 3,360 | 7,360 | 3,800 |
| 4 | 2,680 | 2,550 | 2,680 | 3,220 | 6,630 | 3,800 |
| 5 | 2,550 | 2,430 | 2,550 | 3,080 | 5,940 | 3,650 |
| 6 | 2,000 | 2,940 | 2,550 | 2,940 | 5,480 | 3,650 |
| 7 | 2,000 | 2,680 | 2,430 | 3,080 | 5,260 | 3,500 |
| 8 | 2,100 | 2,430 | 2,430 | 6,400 | 4,440 | 3,220 |
| 9 | 2,100 | 2,210 | 2,550 | 5,260 | 4,440 | 3,360 |
| 10 | 2,320 | 2,210 | 2,430 | 4,270 | 4,110 | 3,360 |
| 11 | 1,700 | 2,210 | 2,430 | 3,950 | 3,950 | 3,220 |
| 12 | 1,700 | 2,810 | 2,430 | 5,480 | 3,650 | 2,940 |
| 13 | 1,700 | 4,620 | 2,210 | 5,260 | 3,500 | 3,360 |
| 14 | 2,000 | 4,270 | 2,100 | 10,700 | 3,220 | 3,500 |
| 15 | 2,000 | 4,270 | 2,100 | 9,180 | 3,080 | 3,950 |
| 16 | 2,100 | 3,220 | 2,100 | 5,480 | 3,500 | 4,620 |
| 17 | 2,320 | 3,080 | 2,000 | 4,620 | 3,650 | 4,620 |
| 18 | 2,810 | 2,810 | 2,100 | 4,270 | 4,110 | 4,440 |
| 19 | 11,700 | 2,550 | 2,000 | 4,440 | 3,950 | 4,440 |
| 20 | 6,400 | 2,550 | 2,000 | 4,440 | 3,650 | 4,110 |
| 21 | 4,620 | 2,550 | 1,900 | 4,110 | 3,500 | 3,950 |
| 22 | 4,270 | 2,550 | 1,900 | 3,800 | 4,110 | 4,270 |
| 23 | 3,360 | 2,430 | 1,800 | 3,500 | 4,110 | 4,440 |
| 24 | 3,360 | 2,320 | 1,800 | 3,220 | 3,950 | 3,950 |
| 25 | 2,810 | 2,320 | 1,900 | 3,080 | 3,950 | 4,110 |
| 26 | 2,320 | 2,320 | 2,000 | 2,940 | 3,800 | 3,800 |
| 27 | 2,320 | 2,210 | 2,550 | 2,940 | 3,950 | 4,440 |
| 28 | 2,320 | 2,320 | 2,550 | 3,220 | 3,800 | 4,270 |
| 29 | 2,430 | 2,320 | 2,550 | 3,080 | ..... | 3,800 |
| 30 | 2,550 | 2,550 | 2,550 | 2,940 | ..... | 4,270 |
| 31 | 2,680 | ..... | 2,810 | 3,500 | ..... | 4,440 |

NOTE.—Discharge determined from a fairly well defined rating curve.

*Monthly discharge of McKenzie River and Eugene power canal near Springfield, Oreg., for period ending Mar. 31, 1915.*

[Drainage area, 960 square miles.]

| Month. | Discharge in second-feet. | | | | | | Run-off. | | Accuracy. |
|---|---|---|---|---|---|---|---|---|---|
| | River. | | | Canal (mean).[a] | Total (mean). | Per square mile. | Depth in inches. | Total in acre-feet. | |
| | Maximum. | Minimum. | Mean. | | | | | | |
| October | 11,700 | 1,700 | 2,940 | 329 | 3,270 | 3.41 | 3.93 | 201,000 | B. |
| November | 4,620 | 2,210 | 2,720 | 341 | 3,060 | 3.19 | 3.56 | 182,000 | B. |
| December | 3,080 | 1,800 | 2,310 | 347 | 2,660 | 2.77 | 3.19 | 164,000 | B. |
| January | 10,700 | 2,940 | 4,270 | 348 | 4,620 | 4.81 | 5.54 | 284,000 | B. |
| February | 9,460 | 3,080 | 4,540 | 335 | 4,880 | 5.08 | 5.29 | 271,000 | B. |
| March | 4,620 | 2,940 | 3,910 | 317 | 4,230 | 4.41 | 5.08 | 260,000 | B. |
| The period | | | | | | | | 1,360,000 | |

[a] Mean monthly discharge of power canal is average of determinations of discharge of canal for days on which gage was read.

### EUGENE POWER CANAL NEAR WALTERVILLE, OREG.

LOCATION.—In sec. 28, T. 17 S., R. 1 W., about 3 miles below the intake, 1¼ miles below Walterville, Lane County.

RECORDS AVAILABLE.—September 7, 1911, to March 31, 1915, when station was discontinued.

GAGE.—Vertical staff on left pier of wagon bridge; read about three times a week. Gage reader, C. C. Campbell. Gage used in 1911 and 1912 was at intake.

DISCHARGE MEASUREMENTS.—Made from bridge at gage.

CHANNEL AND CONTROL.—Gravel; practically permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 4.0 feet January 8 (discharge, 411 second-feet); minimum stage recorded, 3.1 feet March 10 (discharge, 303 second-feet).

1911–1915: Maximum stage recorded, 4.0 feet January 22, 1914, and January 8, 1915 (discharge, 411 second-feet). Canal probably dry at times.

ACCURACY.—Results good for days on which gage was read.

The following discharge measurement was made by C. G. Paulsen:

December 25, 1914: Gage height, 3.36 feet; discharge, 337 second-feet.

The Eugene power canal diverts water from McKenzie River in sec. 26, T. 17 S., R. 1 W., and extends about 4 miles to the power plant in section 29; the water is returned to the river by the tailrace in section 30.

*Daily discharge, in second-feet, of Eugene power canal near Walterville, Oreg., for the year ending Sept. 30, 1915.*

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | ..... | 339 | ..... | ..... | 339 | ..... | 16 | ..... | ..... | ..... | 351 | 327 | ..... |
| 2 | ..... | ..... | ..... | ..... | ..... | ..... | 17 | 339 | ..... | ..... | ..... | ..... | 327 |
| 3 | 339 | ..... | 339 | ..... | ..... | ..... | 18 | ..... | 351 | 339 | ..... | ..... | ..... |
| 4 | ..... | ..... | ..... | ..... | ..... | ..... | 19 | ..... | ..... | ..... | 327 | ..... | ..... |
| 5 | ..... | ..... | ..... | ..... | 339 | 315 | 20 | ..... | ..... | ..... | ..... | 339 | ..... |
| 6 | ..... | ..... | ..... | 351 | ..... | ..... | 21 | ..... | ..... | ..... | ..... | ..... | ..... |
| 7 | 327 | 339 | ..... | ..... | ..... | ..... | 22 | ..... | ..... | ..... | ..... | ..... | 327 |
| 8 | ..... | ..... | 363 | 411 | ..... | ..... | 23 | ..... | ..... | ..... | 339 | ..... | ..... |
| 9 | ..... | ..... | ..... | ..... | ..... | ..... | 24 | 315 | 339 | 351 | ..... | ..... | ..... |
| 10 | 315 | ..... | ..... | ..... | ..... | 303 | 25 | ..... | ..... | ..... | ..... | ..... | ..... |
| 11 | ..... | ..... | ..... | ..... | 327 | ..... | 26 | ..... | ..... | ..... | ..... | ..... | ..... |
| 12 | ..... | ..... | 351 | ..... | ..... | ..... | 27 | ..... | ..... | ..... | 315 | ..... | 315 |
| 13 | ..... | 339 | ..... | ..... | 339 | ..... | 28 | ..... | 339 | 339 | ..... | ..... | ..... |
| 14 | ..... | ..... | ..... | 363 | ..... | ..... | 29 | ..... | ..... | ..... | ..... | ..... | ..... |
| 15 | ..... | ..... | ..... | ..... | ..... | ..... | 30 | ..... | ..... | ..... | 327 | ..... | ..... |
| | | | | | | | 31 | 339 | ..... | ..... | ..... | ..... | ..... |

NOTE.—Discharge determined from a fairly well defined rating curve; given only for days on which gage was read.

### SANTIAM RIVER AT JEFFERSON, OREG.

LOCATION.—In the NE. ¼ sec. 11, T. 10 S., R. 3 W., at the Southern Pacific Railroad bridge in Jefferson, Marion County, about 2½ miles below the junction of the North and South Santiam rivers, and about 9 miles above the mouth.

DRAINAGE AREA.—1,890 square miles.

RECORDS AVAILABLE.—July 19, 1905, to July 1, 1906; May 15, 1908, to September 30, 1915.

GAGE.—Vertical staff on right bank.

DISCHARGE MEASUREMENTS.—Made from Southern Pacific Railroad bridge or from the highway bridge just below it.

CHANNEL AND CONTROL.—Rock and coarse gravel; practically permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 7.5 feet at 8 a. m. January 15 (discharge, 29,100 second-feet); minimum stage recorded, 0.6 foot September 5 to 11 (discharge, 510 second-feet).

1905–6 and 1908–1915: Maximum stage recorded, 18.2 feet during night of November 22, 1909 (discharge, 108,000 second-feet); minimum stage recorded, 0.4 foot September 16 to 20, 1909, and September 11 to 17, 1910 (discharge, 350 second-feet).

WINTER FLOW.—Stage-discharge relation unaffected by ice.

DIVERSIONS.—The Albany power canal diverts water from South Santiam River near Lebanon, the Salem power canal from North Santiam River near Stayton, and water is diverted from the North Santiam for irrigation near West Stayton.

REGULATION.—None.

ACCURACY.—Results considered good.

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

The following discharge measurement was made by P. V. Hodges:
September 8, 1915: Gage height, 0.64 foot; discharge, 525 second-feet.

*Daily discharge, in second-feet, of Santiam River at Jefferson, Oreg., for the year ending Sept. 30, 1915.*

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1,350 | 4,330 | 6,500 | 7,300 | 7,700 | 8,100 | 7,300 | 3,790 | 8,950 | 1,900 | 1,040 | 630 |
| 2 | 1,520 | 7,300 | 5,800 | 11,800 | 20,100 | 7,300 | 8,950 | 3,530 | 8,100 | 1,900 | 1,040 | 630 |
| 3 | 9,850 | 8,100 | 6,150 | 9,400 | 16,300 | 6,900 | 10,800 | 3,530 | 7,700 | 1,900 | 1,040 | 630 |
| 4 | 6,150 | 7,700 | 6,500 | 8,500 | 16,800 | 6,900 | 12,800 | 3,530 | 6,500 | 1,700 | 1,040 | 630 |
| 5 | 4,330 | 7,300 | 5,800 | 7,700 | 14,300 | 8,500 | 9,850 | 3,270 | 5,800 | 1,700 | 1,040 | 510 |
| 6 | 3,790 | 9,850 | 5,200 | 7,300 | 13,800 | 7,700 | 8,100 | 3,020 | 5,200 | 1,700 | 1,040 | 510 |
| 7 | 3,020 | 8,100 | 4,900 | 7,300 | 11,800 | 7,300 | 8,100 | 3,020 | 4,330 | 2,110 | 1,040 | 510 |
| 8 | 2,780 | 6,900 | 5,200 | 10,300 | 10,300 | 6,150 | 7,700 | 3,020 | 4,330 | 2,550 | 900 | 510 |
| 9 | 2,780 | 5,800 | 5,200 | 17,300 | 9,850 | 5,500 | 6,900 | 3,020 | 4,060 | 2,780 | 900 | 510 |
| 10 | 2,780 | 5,200 | 4,330 | 13,300 | 9,400 | 4,900 | 6,500 | 3,530 | 4,060 | 2,330 | 900 | 510 |
| 11 | 3,790 | 4,330 | 3,790 | 12,300 | 8,100 | 4,330 | 5,800 | 5,800 | 4,330 | 2,110 | 900 | 510 |
| 12 | 3,790 | 5,800 | 3,530 | 10,800 | 7,300 | 4,330 | 5,800 | 7,300 | 4,330 | 1,900 | 900 | 630 |
| 13 | 3,530 | 9,850 | 3,270 | 10,800 | 6,900 | 4,610 | 6,500 | 7,300 | 4,330 | 1,900 | 900 | 630 |
| 14 | 3,530 | 19,500 | 3,020 | 26,100 | 5,800 | 5,800 | 7,700 | 9,850 | 4,060 | 1,900 | 760 | 760 |
| 15 | 3,020 | 14,800 | 2,780 | 29,100 | 5,500 | 8,500 | 6,150 | 11,800 | 3,790 | 1,700 | 760 | 760 |
| 16 | 2,780 | 11,800 | 2,330 | 19,500 | 4,900 | 9,850 | 5,800 | 8,500 | 3,530 | 1,700 | 760 | 760 |
| 17 | 2,780 | 9,400 | 1,900 | 14,800 | 4,330 | 8,950 | 5,800 | 8,500 | 3,270 | 1,900 | 760 | 760 |
| 18 | 4,060 | 8,100 | 1,900 | 12,300 | 6,900 | 9,400 | 5,500 | 8,950 | 3,020 | 2,110 | 760 | 630 |
| 19 | 11,800 | 6,900 | 1,700 | 11,800 | 7,300 | 8,100 | 5,500 | 14,800 | 3,020 | 1,900 | 760 | 630 |
| 20 | 22,500 | 6,150 | 1,520 | 11,300 | 6,900 | 7,300 | 5,200 | 14,300 | 3,020 | 1,900 | 760 | 630 |
| 21 | 14,800 | 5,800 | 1,350 | 10,300 | 6,900 | 7,700 | 4,330 | 11,800 | 2,780 | 1,700 | 760 | 630 |
| 22 | 10,300 | 5,500 | 1,350 | 9,400 | 7,300 | 7,300 | 4,330 | 11,800 | 2,780 | 1,700 | 630 | 630 |
| 23 | 7,700 | 5,200 | 1,350 | 8,100 | 7,300 | 7,300 | 3,790 | 11,800 | 2,550 | 1,520 | 630 | 630 |
| 24 | 6,500 | 4,610 | 1,350 | 7,300 | 8,100 | 7,300 | 3,790 | 11,800 | 2,550 | 1,520 | 630 | 760 |
| 25 | 5,500 | 4,330 | 1,350 | 6,500 | 9,850 | 6,900 | 4,060 | 11,800 | 2,550 | 1,350 | 630 | 760 |
| 26 | 4,330 | 4,330 | 4,330 | 5,800 | 9,400 | 6,150 | 4,060 | 12,300 | 2,550 | 1,350 | 630 | 760 |
| 27 | 4,060 | 4,060 | 7,300 | 5,200 | 8,100 | 5,500 | 4,060 | 14,800 | 2,330 | 1,350 | 630 | 760 |
| 28 | 3,530 | 3,790 | 6,900 | 4,610 | 8,950 | 5,200 | 4,330 | 17,300 | 2,330 | 1,350 | 630 | 760 |
| 29 | 3,270 | 5,800 | 7,300 | 4,330 | ..... | 4,330 | 4,330 | 16,800 | 2,330 | 1,350 | 630 | 760 |
| 30 | 3,020 | 7,300 | 6,900 | 4,330 | ..... | 6,900 | 4,330 | 12,300 | 2,110 | 1,190 | 630 | 760 |
| 31 | 3,530 | ..... | 6,900 | 4,060 | ..... | 8,500 | ..... | 9,850 | ..... | 1,040 | 630 | ..... |

NOTE.—Discharge determined from a fairly well defined rating curve.

*Monthly discharge of Santiam River at Jefferson, Oreg., for the year ending Sept. 30, 1915.*

| Month. | Discharge in second-feet. | | | Run-off (total in acre-feet). | Accuracy. |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | | |
| October | 22,500 | 1,350 | 5,370 | 330,000 | B. |
| November | 19,500 | 3,790 | 7,260 | 432,000 | B. |
| December | 7,300 | 1,350 | 4,120 | 253,000 | B. |
| January | 29,100 | 4,060 | 10,600 | 652,000 | B. |
| February | 20,100 | 4,330 | 9,290 | 516,000 | B. |
| March | 9,850 | 4,330 | 6,890 | 424,000 | B. |
| April | 12,800 | 3,790 | 6,270 | 373,000 | B. |
| May | 17,300 | 3,020 | 8,800 | 541,000 | B. |
| June | 8,950 | 2,110 | 4,020 | 239,000 | B. |
| July | 2,780 | 1,040 | 1,770 | 109,000 | B. |
| August | 1,040 | 630 | 808 | 49,700 | B. |
| September | 760 | 510 | 650 | 38,700 | B. |
| The year | 29,100 | 510 | 5,470 | 3,960,400 | |

### CLACKAMAS RIVER NEAR CAZADERO, OREG.

LOCATION.—In the NE. ¼ sec. 11, T. 4 S., R. 4 E., a short distance above the backwater from the Cazadero dam of the Portland Railway, Light & Power Co., and 3 miles southeast of Cazadero, Clackamas County.

DRAINAGE AREA.—685 square miles.

RECORDS AVAILABLE.—January 1, 1909, to September 30, 1915.

GAGE.—Friez water-stage recorder referred to a vertical staff on right bank. Gage reader, J. A. Brooks.

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

CHANNEL AND CONTROL.—Rocks and gravel; shifting in extreme floods.

EXTREMES OF DISCHARGE.—Maximum stage during year from water-stage recorder, 30.45 feet at 6 p. m. January 14 (discharge, 6,590 second-feet); minimum stage recorded, 25.70 feet September 21 to 23 (discharge, 705 second-feet).

1909–1915: Maximum stage recorded, 43.70 feet at 1 p. m. November 22, 1909 (discharge, 46,800 second-feet); minimum is that of 1915.

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Results considered excellent.

*Discharge measurements of Clackamas River near Cazadero, Oreg., during the year ending Sept. 30, 1915.*

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---|---|---|---|---|---|---|---|
| | | *Feet.* | *Sec.-ft.* | | | *Feet.* | *Sec.-ft.* |
| Oct. 26 | Ewing and Brooks | 26.70 | 1,560 | May 18 | Batchelder and Brooks | 27.80 | 2,960 |
| 28 | J. A. Brooks | 26.50 | 1,340 | July 1 | Ewing and Brooks | 26.25 | 1,180 |
| Mar. 16 | Ewing and Brooks | 28.40 | 3,600 | Aug. 16 | McMillen and Scupham | 25.83 | 782 |
| 24 | do | 28.30 | 3,460 | 28 | do | 25.75 | 748 |
| 27 | Brooks and Shock | 27.55 | 2,450 | Sept 1 | do | 25.74 | 746 |
| 29 | do | 28.00 | 3,140 | 25 | Brooks and Shock | 25.70 | 706 |
| Apr. 26 | Brooks and Scupham | 27.10 | 1,990 | | | | |

*Daily discharge, in second-feet, of Clackamas River near Cazadero, Oreg., for the year ending Sept. 30, 1915.*

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1,060 | 2,080 | 1,570 | 2,180 | 3,520 | 2,340 | 3,760 | 1,820 | 2,740 | 1,140 | 894 | 727 |
| 2 | 1,560 | 2,770 | 1,550 | 2,460 | 3,650 | 2,200 | 4,530 | 1,740 | 2,740 | 1,100 | 878 | 732 |
| 3 | 2,040 | 2,780 | 1,610 | 2,200 | 3,260 | 2,100 | 5,110 | 1,730 | 2,550 | 1,090 | 878 | 722 |
| 4 | 1,710 | 2,550 | 1,540 | 2,090 | 2,930 | 2,530 | 4,710 | 1,720 | 2,310 | 1,070 | 862 | 722 |
| 5 | 1,530 | 2,410 | 1,490 | 2,000 | 2,850 | 2,640 | 4,000 | 1,660 | 2,070 | 1,050 | 854 | 722 |
| 6 | 1,410 | 2,630 | 1,410 | 1,890 | 2,980 | 2,420 | 3,520 | 1,640 | 1,900 | 1,090 | 838 | 716 |
| 7 | 1,300 | 2,330 | 1,370 | 1,850 | 2,730 | 2,250 | 3,550 | 1,620 | 1,760 | 1,180 | 830 | 716 |
| 8 | 1,250 | 2,080 | 1,330 | 2,900 | 2,520 | 2,160 | 3,400 | 1,610 | 1,610 | 1,160 | 830 | 716 |
| 9 | 1,230 | 1,920 | 1,310 | 3,140 | 2,420 | 2,040 | 3,070 | 1,750 | 1,600 | 1,180 | 830 | 716 |
| 10 | 1,280 | 1,780 | 1,270 | 2,640 | 2,300 | 2,000 | 2,930 | 2,310 | 1,590 | 1,100 | 823 | 716 |
| 12 | 1,350 | 1,910 | 1,260 | 2,380 | 2,150 | 1,940 | 2,890 | 2,550 | 2,130 | 1,070 | 816 | 727 |
| 13 | 1,390 | 2,330 | 1,210 | 2,230 | 2,030 | 1,870 | 2,970 | 2,880 | 2,310 | 1,040 | 809 | 760 |
| 13 | 1,310 | 5,230 | 1,130 | 2,570 | 1,930 | 1,950 | 3,100 | 2,940 | 2,070 | 991 | 802 | 795 |
| 14 | 1,230 | 4,860 | 1,110 | 5,440 | 1,820 | 2,640 | 2,870 | 2,880 | 1,850 | 1,080 | 781 | 802 |
| 15 | 1,190 | 3,500 | 1,150 | 4,480 | 1,790 | 3,500 | 2,640 | 2,740 | 1,720 | 1,090 | 781 | 760 |
| 16 | 1,150 | 2,890 | 1,080 | 3,050 | 1,730 | 3,540 | 2,570 | 2,490 | 1,630 | 1,070 | 767 | 749 |
| 17 | 1,180 | 2,560 | 1,000 | 2,500 | 1,790 | 3,320 | 2,600 | 2,740 | 1,560 | 1,210 | 760 | 732 |
| 18 | 1,410 | 2,350 | 1,020 | 2,270 | 2,210 | 3,460 | 2,620 | 2,810 | 1,510 | 1,130 | 760 | 727 |
| 19 | 4,990 | 2,170 | 1,020 | 2,220 | 2,200 | 3,110 | 2,580 | 2,940 | 1,490 | 1,070 | 754 | 722 |
| 20 | 4,730 | 2,080 | 1,020 | 2,150 | 2,110 | 2,870 | 2,520 | 2,810 | 1,480 | 1,030 | 760 | 716 |
| 21 | 3,330 | 2,000 | 1,030 | 2,050 | 2,070 | 2,850 | 2,350 | 2,680 | 1,410 | 991 | 760 | 705 |
| 22 | 2,600 | 1,890 | 1,040 | 1,920 | 2,120 | 2,880 | 2,220 | 2,550 | 1,330 | 964 | 754 | 705 |
| 23 | 2,160 | 1,910 | 1,030 | 1,810 | 2,190 | 3,350 | 2,170 | 2,490 | 1,330 | 937 | 749 | 705 |
| 24 | 1,890 | 1,820 | 1,030 | 1,700 | 2,510 | 3,450 | 2,140 | 2,490 | 1,280 | 937 | 738 | 710 |
| 25 | 1,730 | 1,730 | 1,020 | 1,610 | 2,730 | 3,080 | 2,130 | 2,490 | 1,280 | 919 | 738 | 705 |
| 26 | 1,600 | 1,680 | 1,320 | 1,580 | 2,520 | 2,720 | 2,030 | 2,620 | 1,360 | 910 | 738 | 705 |
| 27 | 1,500 | 1,640 | 1,330 | 1,510 | 2,410 | 2,510 | 1,940 | 2,620 | 1,310 | 902 | 732 | 727 |
| 28 | 1,380 | 1,700 | 1,570 | 1,460 | 2,430 | 2,500 | 1,920 | 3,070 | 1,230 | 902 | 732 | 727 |
| 29 | 1,340 | 1,720 | 1,500 | 1,430 | ..... | 3,000 | 1,890 | 2,940 | 1,190 | 902 | 732 | 716 |
| 30 | 1,310 | 1,620 | 1,620 | 1,450 | ..... | 3,320 | 1,840 | 2,620 | 1,170 | 902 | 727 | 705 |
| 31 | 1,510 | ..... | 1,730 | 1,510 | ..... | 3,490 | ..... | 2,310 | ..... | 894 | 727 | ..... |

NOTE.—Discharge determined from a well-defined rating curve.

*Monthly discharge of Clackamas River near Cazadero, Oreg., for the year ending Sept. 30, 1915.*

[Drainage area, 685 square miles.]

| Month. | Discharge in second-feet. | | | | Run-off. | | Accuracy. |
|---|---|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | Per square mile. | Depth in inches on drainage area. | Total in acre-feet. | |
| October | 4,990 | 1,060 | 1,760 | 2.57 | 2.96 | 108,000 | A. |
| November | 5,230 | 1,620 | 2,360 | 3.45 | 3.85 | 140,000 | A. |
| December | 1,730 | 1,000 | 1,280 | 1.87 | 2.16 | 78,700 | A. |
| January | 5,440 | 1,430 | 2,280 | 3.33 | 3.84 | 140,000 | A. |
| February | 3,650 | 1,730 | 2,420 | 3.53 | 3.68 | 134,000 | A. |
| March | 3,540 | 1,870 | 2,710 | 3.96 | 4.56 | 167,000 | A. |
| April | 5,110 | 1,840 | 2,890 | 4.22 | 4.71 | 172,000 | A. |
| May | 3,070 | 1,610 | 2,400 | 3.50 | 4.04 | 148,000 | A. |
| June | 2,740 | 1,170 | 1,720 | 2.51 | 2.80 | 102,000 | A. |
| July | 1,210 | 894 | 1,040 | 1.52 | 1.75 | 64,000 | A. |
| August | 894 | 727 | 788 | 1.15 | 1.33 | 48,500 | A. |
| September | 802 | 705 | 727 | 1.06 | 1.18 | 43,300 | A. |
| The year | 5,440 | 705 | 1,860 | 2.72 | 36.86 | 1,350,000 | |

### OAK GROVE FORK OF CLACKAMAS RIVER AT TIMOTHY MEADOWS NEAR CAZADERO, OREG.

LOCATION.—In T. 5 S., R. 8 E., about sec. 26 (unsurveyed), at Timothy Meadows, about 11¼ miles above station at intake, about 17 miles above mouth of Oak Grove Fork, and 43 miles above Cazadero, Clackamas County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—February 25, 1913, to September 30, 1915.

GAGE.—Stevens continuous water-stage recorder on right bank.

DISCHARGE MEASUREMENTS.—Made from footbridge 20 feet above gage.

CHANNEL AND CONTROL.—Channel, gravel; control practically permanent, but may be affected by drift logs.

EXTREMES OF DISCHARGE.—Maximum stage during year from water-stage recorder, 1.24 feet at 9 p. m. April 3 (discharge, 245 second-feet). Minimum stage from water-stage recorder, 0.56 foot September 10 and 11 (discharge, 118 second-feet).

1913–1915: Maximum stage recorded, 2.15 feet May 27, 1913 (discharge, 496 second-feet). Minimum stage is that of 1915.

ACCURACY.—Results considered excellent.

COOPERATION.—Field data furnished by Portland Railway, Light & Power Co.

The following discharge measurement was made by N. W. McMillen:

August 23, 1914: Gage height, 0.68 foot; discharge, 138 second-feet.

*Daily discharge, in second-feet, of Oak Grove Fork of Clackamas River at Timothy Meadows near Cazadero, Oreg., for the year ending Sept. 30, 1915.*

| Day. | Oct. | Nov. | Feb. | Mar. | Apr. | May. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 132 | 141 | ..... | 127 | 210 | 194 | 129 | 131 | ..... |
| 2 | 138 | 141 | ..... | 127 | 218 | 192 | 129 | 129 | ..... |
| 3 | 136 | 138 | ..... | 127 | 237 | 186 | 129 | 129 | 121 |
| 4 | 134 | 136 | ..... | 131 | 235 | 179 | 129 | 127 | 122 |
| 5 | 134 | 136 | ..... | 129 | 226 | 173 | 129 | 129 | 122 |
| 6 | 132 | 139 | ..... | 129 | 220 | 170 | 131 | 129 | 122 |
| 7 | 132 | 136 | ..... | 127 | 230 | 166 | 131 | 127 | 121 |
| 8 | 131 | 136 | ..... | 127 | 224 | 164 | 134 | 126 | 121 |
| 9 | 131 | 136 | ..... | 127 | 216 | 170 | 134 | 126 | 120 |
| 10 | 132 | 134 | ..... | 127 | 214 | 179 | 132 | 124 | 120 |
| 11 | 132 | 134 | ..... | 127 | 216 | 192 | 132 | 124 | 118 |
| 12 | 132 | 134 | ..... | 132 | 220 | 202 | 132 | ..... | ..... |
| 13 | 132 | 155 | ..... | 143 | 224 | 206 | 132 | ..... | ..... |
| 14 | 131 | 148 | ..... | 154 | 220 | 200 | 134 | ..... | ..... |
| 15 | 132 | 145 | ..... | 164 | 212 | 188 | 132 | ..... | ..... |
| 16 | 132 | 141 | ..... | 170 | 214 | ..... | 132 | ..... | ..... |
| 17 | 132 | 139 | ..... | 168 | 214 | ..... | 134 | ..... | ..... |
| 18 | 134 | 138 | ..... | 168 | 218 | ..... | 134 | ..... | ..... |
| 19 | 148 | 138 | ..... | 168 | 218 | ..... | 134 | ..... | ..... |
| 20 | 143 | 136 | ..... | 169 | 220 | ..... | 134 | ..... | ..... |
| 21 | 138 | 136 | ..... | 173 | 218 | ..... | 132 | ..... | ..... |
| 22 | 136 | ..... | ..... | 173 | 212 | ..... | 131 | ..... | ..... |
| 23 | 134 | ..... | 124 | 177 | 214 | ..... | 129 | 138 | ..... |
| 24 | 134 | ..... | 127 | 177 | 214 | ..... | 127 | ..... | ..... |
| 25 | 134 | ..... | 127 | 172 | 220 | ..... | 127 | ..... | ..... |
| 26 | 134 | ..... | 127 | 166 | 212 | ..... | 129 | ..... | ..... |
| 27 | 136 | ..... | 127 | 163 | 210 | ..... | 129 | ..... | ..... |
| 28 | 132 | ..... | 127 | 172 | 202 | ..... | 129 | ..... | ..... |
| 29 | 134 | ..... | ..... | 192 | 202 | ..... | 131 | ..... | ..... |
| 30 | 136 | ..... | ..... | 200 | 198 | ..... | 131 | ..... | ..... |
| 31 | 136 | ..... | ..... | 198 | ..... | ..... | 131 | ..... | ..... |

NOTE.—Daily discharge ascertained from well-defined rating curve. Mean discharge estimated as follows: Nov. 22–30, 136 second-feet; May 16–31, 174 second-feet; Aug. 12–22, 131 second-feet; Aug. 24–31, 130 second-feet; Sept. 1 and 2, 122 second-feet; Sept. 12–30, 117 second-feet.

*Monthly discharge of Oak Grove Fork of Clackamas River at Timothy Meadows near Cazadero, Oreg., for the year ending Sept. 30, 1915.*

| Month. | Discharge in second-feet. | | | Run-off (total in acre-feet). | Accuracy. |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | | |
| October | 148 | 131 | 13[illegible] | 8,240 | A. |
| November | 155 | ..... | 13[illegible] | 8,210 | A. |
| December | ..... | ..... | a12[illegible] | 7,870 | C. |
| January | ..... | ..... | a11[illegible] | 7,320 | C. |
| February | ..... | ..... | a122 | 6,780 | B. |
| March | 200 | 127 | 155 | 9,530 | A. |
| April | 237 | 198 | 217 | 12,900 | A. |
| May | 206 | ..... | 179 | 11,000 | B. |
| June | ..... | ..... | a160 | 10,100 | C. |
| July | 134 | 127 | 13[illegible] | 8,060 | A. |
| August | ..... | ..... | 130 | 7,990 | B. |
| September | ..... | ..... | 11[illegible] | 7,020 | B. |
| The year | 237 | ..... | 145 | 105,000 | |

a Estimated from station at intake.

**OAK GROVE FORK OF CLACKAMAS RIVER AT INTAKE NEAR CAZADERO, OREG.**

LOCATION.—In the SW. ¼ sec. 4, T. 6 S., R. 7 E., 2,000 feet above proposed intake of Oak Grove power development of Portland Railway, Light & Power Co., and about 35 miles above Cazadero, Clackamas County.

DRAINAGE AREA.—131 square miles (measured by Portland Railway, Light & Power Co.

RECORDS AVAILABLE.—May 21, 1909, to September 30, 1915.

GAGE.—Friez water-stage recorder installed on left bank since October, 1913; Watson recording gage used March, 1912, to September, 1913; vertical staff prior to March, 1912.

DISCHARGE MEASUREMENTS.—Made from cable; velocities high; channel straight.

CHANNEL AND CONTROL.—Gravel; fairly permanent.

EXTREMES OF DISCHARGE.—Maximum stage during year from water-stage recorder, 1.60 feet at 9 p. m., April 3 (discharge, 860 second-feet). Minimum stage from water-stage recorder, 0.62 foot September 20 to 30 (discharge, 347 second-feet).

1909–1915: Maximum stage recorded, 3.40 feet November 24, 1909 (discharge, 2,670 second-feet). Minimum discharge, 320 second-feet (gage height, 0.60 foot) October 17 to November 3, 1911.

ICE.—Never any ice, as stream is largely spring-fed.

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Results considered good.

COOPERATION.—Field data furinshed by Portland Railway, Light & Power Co. The following discharge measurement was made by N. W. McMillen:

August 24, 1915: Gage height, 0.65 foot; discharge, 363 second-feet.

*Daily discharge, in second-feet, of Oak Grove Fork of Clackamas River at intake near Cazadero, Oreg., for the year ending Sept. 30, 1915.*

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 368 | 397 | 389 | 360 | 413 | 405 | 692 | 565 | 491 | 395 | 38[illegible] | 354 |
| 2 | 393 | 378 | 385 | 354 | 405 | 397 | 734 | 555 | 500 | 395 | 38[illegible] | 354 |
| 3 | 378 | 382 | 382 | 350 | 397 | 393 | 839 | 545 | 496 | 395 | 38[illegible] | 354 |
| 4 | 371 | 371 | 378 | 350 | 389 | 425 | 811 | 530 | 482 | 391 | 38[illegible] | 354 |
| 5 | 371 | 385 | 374 | 350 | 389 | 413 | 769 | 530 | 482 | 391 | 38[illegible] | 350 |
| 6 | 365 | 382 | 378 | 350 | 385 | 409 | 734 | 530 | 478 | 395 | 38[illegible] | 350 |
| 7 | 360 | 374 | 378 | 354 | 385 | 405 | 769 | 530 | 473 | 395 | 38[illegible] | 350 |
| 8 | 355 | 371 | 374 | 378 | 385 | 405 | 741 | 525 | 468 | 399 | 383 | 350 |
| 9 | 350 | 371 | 374 | 368 | 385 | 405 | 714 | 525 | 455 | 395 | 382 | 350 |
| 10 | 357 | 371 | 374 | 360 | 382 | 401 | 702 | 525 | 455 | 391 | 383 | 350 |
| 11 | 360 | 378 | 374 | 364 | 378 | 405 | 702 | 525 | 460 | 391 | 378 | 350 |
| 12 | 364 | 401 | 371 | 364 | 368 | 409 | 720 | 525 | 464 | 387 | 378 | 350 |
| 13 | 350 | 500 | 364 | 382 | 368 | 438 | 708 | 525 | 460 | 391 | 361 | 350 |
| 14 | 350 | 448 | 360 | 405 | 368 | 480 | 666 | 520 | 451 | 391 | 358 | 350 |
| 15 | 350 | 438 | 357 | 385 | 368 | 535 | 660 | 520 | 443 | 383 | 358 | 350 |
| 16 | 359 | 413 | 354 | 368 | 368 | 545 | 648 | 540 | 435 | 387 | 358 | 350 |
| 17 | 368 | 405 | 350 | 360 | 368 | 545 | 648 | 530 | 431 | 387 | 358 | 350 |
| 18 | 368 | 393 | 350 | 360 | 368 | 550 | 648 | 520 | 431 | 387 | 358 | 350 |
| 19 | 368 | 385 | 350 | 360 | 368 | 530 | 648 | 510 | 431 | 387 | 358 | 350 |
| 20 | 368 | 385 | 350 | 360 | 368 | 530 | 648 | 515 | 427 | 387 | 358 | 347 |
| 21 | 368 | 385 | 350 | 360 | 368 | 545 | 630 | 525 | 423 | 387 | 358 | 347 |
| 22 | 368 | 385 | 350 | 357 | 368 | 550 | 612 | 525 | 419 | 387 | 358 | 347 |
| 23 | 368 | 389 | 350 | 357 | 371 | 570 | 618 | 520 | 419 | 387 | 358 | 347 |
| 24 | 368 | 389 | 350 | 357 | 389 | 590 | 618 | 505 | 411 | 387 | 358 | 347 |
| 25 | 368 | 385 | 354 | 354 | 397 | 580 | 606 | 515 | 407 | 383 | 358 | 347 |
| 26 | 364 | 385 | 364 | 350 | 385 | 555 | 585 | 515 | 415 | 383 | 358 | 347 |
| 27 | 364 | 393 | 357 | 350 | 393 | 545 | 575 | 510 | 407 | 383 | 358 | 347 |
| 28 | 364 | 397 | 368 | 350 | 401 | 570 | 575 | 510 | 399 | 383 | 358 | 347 |
| 29 | 360 | 397 | 368 | 350 | ..... | 620 | 580 | 491 | 399 | 383 | 358 | 347 |
| 30 | 368 | 393 | 368 | 350 | ..... | 632 | 570 | 482 | 395 | 383 | 354 | 347 |
| 31 | 371 | ..... | 368 | 364 | ..... | 632 | ..... | 478 | ..... | 383 | 354 | ..... |

NOTE.—Daily discharge ascertained from two fairly well defined rating curves applicable Oct. 1 to Apr. 2 and Apr. 3 to Sept. 30, respectively. Daily discharge interpolated Oct. 6–8, May 5–11, 17, 18, July 5, 6, and Aug. 19–24.

*Monthly discharge of Oak Grove Fork of Clackamas River at intake near Cazadero, Oreg., for the year ending Sept. 30, 1915.*

| Month. | Discharge in second feet. | | | Run-off (total in acre-feet). | Accuracy. |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | | |
| October | 393 | 350 | 365 | 22,400 | A. |
| November | 500 | 371 | 394 | 23,400 | A. |
| December | 389 | 350 | 365 | 22,400 | A. |
| January | 405 | 350 | 361 | 22,200 | A. |
| February | 413 | 368 | 381 | 21,200 | A. |
| March | 632 | 393 | 497 | 30,600 | A. |
| April | 839 | 570 | 672 | 40,000 | B. |
| May | 565 | 478 | 521 | 32,000 | B. |
| June | 500 | 395 | 444 | 26,400 | A. |
| July | 399 | 383 | 389 | 23,900 | A. |
| August | 383 | 354 | 367 | 22,600 | A. |
| September | 354 | 347 | 349 | 20,800 | A. |
| The year | 839 | 347 | 425 | 308,000 | |

## LEWIS RIVER BASIN.

### LEWIS RIVER NEAR AMBOY, WASH.

LOCATION.—In sec. 36, T. 6 N., R. 3 E., at Cresap's ferry crossing, on the county road from Amboy to Cougar, 1½ miles below Canyon Creek, 2 miles above Speilei Creek, and about 5 miles northeast of Amboy, Clarke 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, 1915.

GAGE.—Inclined staff on left bank, replacing vertical staff at same location and datum; read once daily. Gage reader, Philip Hanley.

DISCHARGE MEASUREMENTS.—Made from the ferry or from a boat about 30 feet above the gage.

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

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 6.7 feet at 8 a. m. April 2 (discharge, 15,800 second-feet); minimum stage recorded, 0.08 foot September 30 (discharge, 686 second-feet).

1911–1915: Maximum stage recorded, 11.4 feet at 4 p. m. January 5, 1914 (discharge, 35,000 second-feet); minimum stage recorded is that of 1915.

WINTER FLOW.—Stage-discharge relation never affected by ice.

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Results considered excellent except for extremely high and low stages.

The following discharge measurement was made by C. L. Batchelder:
August 10, 1915: Gage hei ht, 0.48 foot; discharge, 981 second-feet.

*Daily discharge, in second-feet, of Lewis River near Amboy, Wash., for the year ending Sept. 30, 1915.*

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1,560 | 3,450 | 3,630 | 5,360 | 4,200 | 3,630 | 9,530 | 2,470 | 3,810 | 1,400 | 1,070 | 840 |
| 2 | 2,940 | 6,100 | 3,450 | 4,880 | 3,810 | 3,450 | 15,200 | 2,320 | 3,450 | 1,300 | 1,070 | 840 |
| 3 | 2,780 | 12,700 | 3,280 | 4,650 | 3,810 | 3,280 | 13,800 | 2,180 | 3,110 | 1,300 | 1,070 | 840 |
| 4 | 2,470 | 10,200 | 3,110 | 4,000 | 3,630 | 3,450 | 11,400 | 2,320 | 2,940 | 1,300 | 990 | 840 |
| 5 | 2,180 | 8,300 | 2,940 | 3,630 | 6,360 | 3,280 | 8,600 | 2,180 | 2,790 | 1,300 | 990 | 840 |
| 6 | 2,040 | 7,430 | 2,940 | 3,280 | 5,850 | 3,110 | 7,160 | 2,320 | 2,630 | 1,300 | 990 | 805 |
| 7 | 1,910 | 6,100 | 2,780 | 3,450 | 5,360 | 2,940 | 6,890 | 2,320 | 2,470 | 1,400 | 950 | 770 |
| 8 | 1,790 | 5,360 | 2,780 | 4,420 | 4,420 | 2,940 | 6,100 | 2,320 | 2,320 | 1,450 | 950 | 770 |
| 9 | 1,790 | 5,120 | 2,620 | 4,200 | 4,000 | 2,940 | 5,600 | 2,620 | 2,180 | 1,450 | 950 | 770 |
| 10 | 2,470 | 4,420 | 2,470 | 4,000 | 3,630 | 2,780 | 4,880 | 3,110 | 2,040 | 1,350 | 950 | 770 |
| 11 | 2,470 | 5,360 | 2,320 | 4,880 | 3,450 | 2,780 | 4,650 | 3,110 | 2,040 | 1,250 | 950 | 770 |
| 12 | 2,180 | 6,100 | 2,180 | 5,360 | 3,280 | 2,780 | 4,650 | 2,940 | 1,900 | 1,250 | 910 | 840 |
| 13 | 1,790 | 12,700 | 2,180 | 5,600 | 3,280 | 3,110 | 4,880 | 2,780 | 1,900 | 1,200 | 910 | 840 |
| 14 | 1,790 | 10,800 | 2,040 | 6,890 | 2,940 | 5,360 | 4,420 | 2,620 | 1,790 | 1,200 | 910 | 805 |
| 15 | 2,320 | 7,710 | 2,040 | 5,850 | 2,940 | 7,430 | 4,200 | 2,470 | 1,790 | 1,350 | 910 | 770 |
| 16 | 2,470 | 7,160 | 1,910 | 4,880 | 2,620 | 7,160 | 4,200 | 2,320 | 1,730 | 1,450 | 910 | 770 |
| 17 | 2,940 | 6,360 | 1,910 | 4,200 | 3,630 | 6,360 | 4,200 | 2,320 | 1,670 | 1,560 | 910 | 770 |
| 18 | 4,650 | 5,360 | 1,790 | 4,000 | 3,450 | 6,360 | 4,200 | 2,320 | 1,670 | 1,450 | 910 | 770 |
| 19 | 12,700 | 4,650 | 1,790 | 3,810 | 3,110 | 5,850 | 4,000 | 2,620 | 1,560 | 1,400 | 910 | 735 |
| 20 | 8,910 | 4,200 | 1,670 | 3,450 | 3,110 | 5,120 | 4,200 | 2,470 | 1,560 | 1,350 | 910 | 735 |
| 21 | 7,160 | 4,200 | 1,670 | 3,110 | 3,110 | 5,120 | 3,810 | 2,620 | 1,560 | 1,250 | 910 | 735 |
| 22 | 6,100 | 4,000 | 1,670 | 3,110 | 3,450 | 5,360 | 3,630 | 2,780 | 1,560 | 1,200 | 910 | 735 |
| 23 | 4,880 | 4,000 | 1,670 | 2,940 | 3,450 | 5,600 | 3,280 | 2,780 | 1,450 | 1,160 | 875 | 735 |
| 24 | 4,200 | 3,810 | 1,670 | 2,780 | 3,630 | 5,360 | 3,110 | 2,940 | 1,450 | 1,160 | 840 | 700 |
| 25 | 3,810 | 3,630 | 1,670 | 2,620 | 4,650 | 4,880 | 2,940 | 3,280 | 1,450 | 1,160 | 840 | 700 |
| 26 | 3,450 | 3,630 | 3,110 | 2,470 | 4,200 | 4,650 | 2,780 | 4,200 | 1,560 | 1,120 | 840 | 700 |
| 27 | 3,110 | 3,450 | 4,000 | 2,320 | 4,000 | 4,000 | 2,780 | 4,880 | 1,560 | 1,120 | 840 | 735 |
| 28 | 2,940 | 3,630 | 3,450 | 2,320 | 3,810 | 3,810 | 2,780 | 6,890 | 1,450 | 1,120 | 840 | 735 |
| 29 | 2,780 | 3,810 | 3,280 | 2,040 | ..... | 4,200 | 2,780 | 5,360 | 1,450 | 1,120 | 840 | 700 |
| 30 | 2,620 | 3,810 | 3,280 | 2,470 | ..... | 4,420 | 2,620 | 4,650 | 1,450 | 1,120 | 805 | 686 |
| 31 | 3,110 | ..... | 4,200 | 2,470 | ..... | 4,650 | ..... | 4,000 | ..... | 1,120 | 805 | ..... |

NOTE.—Discharge determined from a rating curve well defined between 900 and 14,000 second-feet.

*Monthly discharge of Lewis River near Amboy, Wash., for the year ending Sept. 30, 1915.*

[Drainage area, 665 square miles]

| Month. | Discharge in second-feet. | | | | Run-off. | | Accuracy. |
|---|---|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | Per square mile. | Depth in inches on drainage area. | Total in acre-feet. | |
| October | 12,700 | 1,560 | 3,490 | 5.25 | 6.05 | 215,000 | A. |
| November | 12,700 | 3,450 | 5,920 | 8.90 | 9.93 | 352,000 | A. |
| December | 4,200 | 1,670 | 2,560 | 3.85 | 4.44 | 157,000 | A. |
| January | 6,890 | 2,040 | 3,850 | 5.79 | 6.68 | 237,000 | A. |
| February | 6,360 | 2,620 | 3,830 | 5.76 | 6.00 | 213,000 | A. |
| March | 7,430 | 2,780 | 4,390 | 6.60 | 7.61 | 270,000 | A. |
| April | 15,200 | 2,620 | 5,440 | 8.18 | 9.13 | 324,000 | A. |
| May | 6,890 | 2,180 | 3,050 | 4.59 | 5.29 | 188,000 | A. |
| June | 3,810 | 1,450 | 2,010 | 3.02 | 3.37 | 120,000 | A. |
| July | 1,560 | 1,120 | 1,280 | 1.93 | 2.22 | 78,700 | A. |
| August | 1,070 | 805 | 918 | 1.38 | 1.59 | 56,400 | A. |
| September | 840 | 686 | 769 | 1,16 | 1,29 | 45,800 | B. |
| The year | 15,200 | 686 | 3,120 | 4.69 | 63.60 | 2,260,000 | |

## COWLITZ RIVER BASIN.

### OHANAPECOSH RIVER NEAR LEWIS, WASH.

LOCATION.—In sec. 29, T. 14 N., R. 10 E. Willamette meridian, above Clear Fork, and 7 miles northeast of Lewis, in Lewis County.

DRAINAGE AREA.—116 square miles (measured on Pl. I, Water-Supply Paper 313).

RECORDS AVAILABLE.—August 19, 1907, to January 12, 1913; April 14, 1913, to September 30, 1915.

GAGE.—January 13, 1914, to May 1, 1915, vertical staff on left bank, about 900 feet above mouth of Clear Fork; since May 4, 1915, inclined staff 8 feet downstream from gage previously used; read to hundredths twice a week by J. L. Jennings. Prior to January 5, 1914, vertical staff 8 feet upstream from present gage and at a datum approximately 0.06 foot lower.

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

CHANNEL AND CONTROL.—Bed composed of gravel and small boulders which shift at high stages. One channel at all stages; banks not subject to overflow. Stage of zero flow, determined August 28, 1915, gage height $-1.00\pm.3$ foot.

EXTREMES OF DISCHARGE.—Maximum stage recorded during the year, 4.2 feet at noon November 3 (discharge, 2,700 second-feet); minimum stage recorded 0.20 foot at 10 a. m. September 28 (discharge, 56 second-feet).

1907–1915: Maximum stage recorded, above top of gage (8.0 feet) November 23, 1909 (discharge estimated at 7,500 second-feet); minimum stage recorded, 0.20 foot September 28, 1915.

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

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Records good for days when gage was read.

COOPERATION.—Gage-height record furnished by Portland Railway, Light & Power Co.

*Discharge measurements of Ohanapecosh River near Lewis, Wash., during the year ending Sept. 30, 1915.*

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---|---|---|---|---|---|---|---|
| | | *Feet.* | *Sec.-ft.* | | | *Feet.* | *Sec.-ft.* |
| Oct. 3 | I. L. Collier | 0.78 | 166 | June 3 | C. G. Paulsen | 1.64 | 521 |
| Apr. 16 | C. G. Paulsen | 2.00 | 680 | Aug. 28 | ....do | .49 | 113 |
| 18 | Parker and Paulsen | 2.44 | 893 | | | | |

*Daily discharge, in second-feet, of Ohanapecosh River near Lewis, Wash., for the year ending Sept. 30, 1915.*

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | 375 | | | | | 460 | | | | |
| 2 | | | | 164 | 143 | 170 | | | | 322 | | |
| 3 | 162 | 2,700 | | | | | 2,140 | | 522 | | 204 | |
| 4 | | | | | | | | 460 | | | | 92 |
| 5 | | | 278 | 195 | | | | | | | | |
| 6 | | | | | 225 | 181 | 990 | | | 270 | | |
| 7 | 167 | 930 | | | | | | | | | | 73 |
| 8 | | | 225 | | | | | 680 | 500 | | | |
| 9 | | | | 195 | 195 | 173 | | | | | | |
| 10 | 225 | 600 | | | | | 568 | | | 204 | 137 | |
| 11 | | | | | | | | 635 | | | | 71 |
| 12 | | | 167 | 195 | | | | | 420 | | | |
| 13 | 550 | | | | 210 | 167 | 770 | | | 204 | | |
| 14 | | 1,450 | | | | | | | | | 129 | 63 |
| 15 | | | 167 | | | | | 440 | 380 | | | |
| 16 | | | | 183 | 167 | 575 | 680 | | | 235 | | |
| 17 | 438 | 600 | | | | | | | | | 146 | |
| 18 | | | | | | | 930 | 635 | | | | 77 |
| 19 | | | 162 | 173 | | | | | 360 | | | |
| 20 | 870 | | | | 167 | 460 | | | | 204 | | |
| 21 | | 930 | | | | | | | | | 164 | 77 |
| 22 | | | 140 | | | | | 480 | 340 | | | |
| 23 | | | | 167 | 162 | 755 | | | | 204 | | |
| 24 | 395 | 650 | | | | | 500 | | | | 158 | |
| 25 | | | | | | | | 500 | | | | 70 |
| 26 | | | 125 | 140 | | | 522 | | 270 | | | |
| 27 | 355 | | | | 173 | 415 | | | | 179 | | |
| 28 | | 505 | | | | | | | | | 113 | 56 |
| 29 | | | 115 | | | | | 990 | 270 | | | |
| 30 | | | | 140 | | 460 | | | | | | |
| 31 | 505 | | | | | | | 635 | | 204 | 115 | |

NOTE.—Discharge determined as follows: Oct. 1 to Apr. 1, from a rating curve well defined above and fairly well defined below 100 second-feet; Apr. 2 to Sept. 30, from a rating curve well defined above and fairly well defined below 70 second-feet.

### COWLITZ RIVER AT LEWIS, WASH.

LOCATION.—In sec. 15, T. 13, N., R. 9 E. Willamette meridian, at suspension bridge, about 1 mile northeast of Lewis and 1½ miles below Lake Creek, in Lewis County.

DRAINAGE AREA.—275 miles (measured on Pl. I, Water-Supply Paper 313).

RECORDS AVAILABLE.—July 1, 1911, to September 30, 1915.

GAGE.—October 1, 1914, to May 3, 1915, vertical staff on left bank 110 feet below suspension bridge; May 4 to September 30, 1915, vertical staff bolted to solid rock on left bank 40 feet above suspension bridge. Gage read to hundredths once daily from June to September by J. L Jennings and William Sethe. The gage used prior to May 4, 1915, was one of several that had been maintained at the same site and at approximately the same datum, since August 15, 1907, when the original gage was installed by the Valley Development Co. The gage in use July 1, 1911, was washed out November 20, 1911, reinstalled November 27, 1911, again washed out November 3, 1914, and replaced November 9, 1914. Datum of gage installed May 4, 1915, entirely different from that of gages previously used.

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

CHANNEL AND CONTROL.—Bed of stream composed of gravel and sand; likely to shift. Right bank subject to overflow at extremely high stages. Control is a gravel and boulder riffle 300 feet below the gage. Stage of zero flow determined from new gage August 29, 1915, −1.8 feet ±0.3 foot.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 7.1 feet at 9.30 a. m. November 3 (discharge, 13,400 second-feet); minimum stage recorded, 0.43 foot at 8 a. m. September 28 (discharge, 375 second-feet).

1911–1915: Maximum stage recorded, 7.35 feet November 19, 1911 (discharge not computed; gage washed out on following day); minimum stage recorded, 0.95 foot October 30 to November 3, 1911 (discharge, 285 second-feet).

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

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Results good. Considerable diurnal fluctuation March to June.

COOPERATION.—Gage-height record furnished by United States Forest Service and Portland Railway, Light & Power Co.

*Discharge measurements of Cowlitz River at Lewis, Wash., during the year ending Sept. 30, 1915.*

| Date. | Made by— | Gage height. | | Discharge. | Date. | Made by— | Gage height. | | Discharge. |
|---|---|---|---|---|---|---|---|---|---|
| | | Old gage. | New gage. | | | | Old gage. | New gage. | |
| | | *Feet.* | *Feet.* | *Sec.-ft.* | | | *Feet.* | *Feet.* | *Sec.-ft.* |
| Oct 2 | I. L. Collier..... | 1.30 | ..... | [a]615 | June 4 | C. G. Paulsen..... | 1.80 | 1.90 | [b]1,260 |
| Apr. 17 | Paulsen and Parker | 2.30 | 2.46 | [a]1,940 | Aug. 26 | .....do..... | ..... | 1.44 | 885 |
| 18 | Parker and Paulsen | 2.46 | 2.64 | [a]2,170 | 29 | .....do..... | ..... | 1.14 | 666 |
| June 1 | C. G. Paulsen..... | 2.02 | 2.14 | [b]1,530 | | | | | |

[a] Measured from bridge 150 feet above gage. [b] Measured from cable 100 feet below gage.

*Daily discharge, in second-feet, of Cowlitz River at Lewis, Wash., for the year ending Sept. 30, 1915.*

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 612 | 1,140 | 1,140 | 628 | 590 | 555 | 1,780 | 1,140 | 1,540 | 1,000 | 780 | 600 |
| 2 | 624 | 4,970 | 1,080 | 666 | 555 | 555 | 7,190 | 1,110 | 1,400 | 1,080 | 828 | 600 |
| 3 | 617 | 13,400 | 930 | 666 | 555 | 520 | 5,150 | 1,080 | 1,270 | 1,080 | 876 | 483 |
| 4 | 610 | 11,500 | 836 | 666 | 520 | 555 | 3,840 | 1,080 | 1,270 | 1,080 | 627 | 483 |
| 5 | 602 | 9,620 | 707 | 628 | 590 | 590 | 2,530 | 1,000 | 1,300 | 1,000 | 686 | 483 |
| 6 | 595 | 7,730 | 590 | 628 | 707 | 590 | 2,370 | 1,170 | 1,320 | 920 | 744 | 483 |
| 7 | 588 | 5,850 | 555 | 590 | 707 | 572 | 2,220 | 1,370 | 1,340 | 960 | 876 | 424 |
| 8 | 588 | 3,960 | 707 | 628 | 666 | 555 | 1,920 | 1,370 | 1,370 | 1,080 | 876 | 443 |
| 9 | 684 | 2,070 | 590 | 666 | 707 | 555 | 1,710 | 1,520 | 1,340 | 928 | 780 | 462 |
| 10 | 780 | 1,920 | 590 | 666 | 628 | 555 | 1,640 | 1,660 | 1,320 | 776 | 654 | 434 |
| 11 | 1,000 | 2,860 | 555 | 666 | 590 | 555 | 1,680 | 1,480 | 1,300 | 712 | 640 | 407 |
| 12 | 1,220 | 2,690 | 555 | 666 | 590 | 555 | 1,710 | 1,220 | 1,270 | 683 | 627 | 443 |
| 13 | 1,440 | 7,190 | 520 | 666 | 555 | 520 | 1,920 | 1,040 | 1,140 | 712 | 600 | 390 |
| 14 | 1,250 | 3,790 | 520 | 707 | 522 | 1,220 | 1,580 | 1,040 | 1,000 | 654 | 654 | 390 |
| 15 | 1,060 | 3,030 | 590 | 666 | 488 | 1,920 | 1,510 | 920 | 1,040 | 695 | 683 | 390 |
| 16 | 1,110 | 2,220 | 520 | 628 | 520 | 1,640 | 1,710 | 1,000 | 1,000 | 735 | 712 | 421 |
| 17 | 1,160 | 1,920 | 488 | 628 | 555 | 1,380 | 1,920 | 1,080 | 962 | 776 | 627 | 452 |
| 18 | 1,360 | 1,640 | 520 | 590 | 590 | 1,380 | 2,220 | 1,480 | 922 | 683 | 654 | 483 |
| 19 | 1,560 | 1,510 | 488 | 590 | 555 | 1,260 | 2,220 | 1,220 | 883 | 730 | 744 | 476 |
| 20 | 1,760 | 2,530 | 472 | 590 | 520 | 1,200 | 2,220 | 1,170 | 895 | 776 | 811 | 469 |
| 21 | 1,490 | 2,370 | 455 | 555 | 520 | 1,230 | 1,710 | 1,040 | 908 | 760 | 744 | 462 |
| 22 | 1,220 | 2,070 | 455 | 555 | 520 | 1,260 | 1,380 | 1,040 | 920 | 744 | 744 | 457 |
| 23 | 1,090 | 1,920 | 455 | 555 | 520 | 1,780 | 1,260 | 1,040 | 1,120 | 744 | 744 | 452 |
| 24 | 958 | 1,710 | 425 | 538 | 520 | 1,710 | 1,140 | 1,040 | 966 | 724 | 776 | 448 |
| 25 | 912 | 1,710 | 455 | 520 | 590 | 1,440 | 1,200 | 1,170 | 811 | 703 | 654 | 443 |
| 26 | 912 | 1,640 | 488 | 520 | 555 | 1,200 | 1,260 | 1,170 | 776 | 683 | 776 | 424 |
| 27 | 866 | 1,640 | 472 | 488 | 555 | 1,080 | 1,260 | 1,270 | 776 | 712 | 776 | 375 |
| 28 | 780 | 1,580 | 455 | 488 | 555 | 1,170 | 1,380 | 1,370 | 811 | 712 | 600 | 375 |
| 29 | 780 | 1,260 | 455 | 488 | ..... | 1,260 | 1,580 | 1,420 | 846 | 712 | 683 | 424 |
| 30 | 1,010 | 1,260 | 488 | 455 | ..... | 1,320 | 1,260 | 1,510 | 920 | 744 | 883 | 462 |
| 31 | 1,220 | ..... | 555 | 522 | ..... | 1,380 | ..... | 1,600 | ..... | 776 | 600 | ..... |

NOTE.—Discharge ascertained as follows: Oct. 1 to Nov. 3, from a rating curve well defined between 550 and 1,400 second-feet; Nov. 4 to May 3, from a rating curve very well defined between 900 and 2,400 second-feet; May 4 to Sept. 30, from a well-defined rating curve. Discharge interpolated for lack of gage readings, Oct. 1, 3–6, 9, 11–12, 14, 16, 18, 19, 21, 23, Nov. 4–8, Dec. 20, 27, Jan. 10, 24, 31, Feb. 14, 21, 28, Mar. 7, 14, 21, 28, Apr. 4, 11, 25, May 2, 9, 16, 23, 30, June 2, 5–7, 9–11, 13, 16–18, 20–21, 24, July 1, 9, 15–16, 19, 21, 24–25, 28, 30, Aug. 1–2, 5, 9, 11, 15, 22, Sept. 1, 4, 8, 10, 16–17, 19–20, 22–24.

*Monthly discharge of Cowlitz River at Lewis, Wash., for the year ending Sept. 30, 1915.*

[Drainage area, 275 square miles.]

| Month. | Discharge in second-feet. | | | | Run-off. | | Accuracy. |
|---|---|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | Per square mile. | Depth in inches on drainage area. | Total in acre-feet. | |
| October | 1,760 | 588 | 983 | 3.57 | 4.12 | 60,400 | B. |
| November | 13,400 | 1,260 | 3,630 | 13.2 | 14.73 | 216,000 | B. |
| December | 1,140 | 425 | 584 | 2.12 | 2.44 | 35,900 | B. |
| January | 707 | 455 | 597 | 2.17 | 2.50 | 36,700 | B. |
| February | 707 | 488 | 573 | 2.08 | 2.17 | 31,800 | B. |
| March | 1,920 | 520 | 1,030 | 3.75 | 4.32 | 63,300 | A. |
| April | 7,190 | 1,140 | 2,080 | 7.56 | 8.44 | 124,000 | A. |
| May | 1,660 | 920 | 1,220 | 4.44 | 5.12 | 75,000 | A. |
| June | 1,540 | 776 | 1,090 | 3.96 | 4.42 | 64,900 | B. |
| July | 1,080 | 654 | 809 | 2.94 | 3.39 | 49,700 | B. |
| August | 883 | 600 | 721 | 2.62 | 3.02 | 44,300 | B. |
| September | 600 | 375 | 451 | 1.64 | 1.83 | 26,800 | B. |
| The year | 13,400 | 375 | 1,150 | 4.18 | 56.50 | 829,000 | |

### COWLITZ RIVER AT MOSSY ROCK, WASH.

LOCATION.—In sec. 1, T. 12 N., R. 2 E., at county highway bridge 1 mile north of Mossy Rock, in Lewis County, and 2½ miles above mouth of Tilton River.

DRAINAGE AREA.—1,170 square miles (measured on Pl. I, Water-Supply Paper 313).

RECORDS AVAILABLE.—January 1, 1912, to September 30, 1915 (fragmentary).

GAGE.—Vertical staff in 3 sections on left bank, 100 feet above bridge; read once a day to tenths by G. W. Jerrells. Prior to September 18, 1913, a chain gage on the bridge, at a different datum.

DISCHARGE MEASUREMENTS.—Made from highway bridge.

CHANNEL AND CONTROL.—Channel above and below gage is a deep canyon with almost vertical walls. Control is a broad riffle 450 feet below gage; composed of sand, gravel, and boulders; shifting at high stages. Stage of zero flow, about gage height, −0.9 foot.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 12.0 feet at 8 a. m. April 3 (discharge, 17,900 second-feet); minimum stage recorded, 1.45 feet September 30 (discharge, 862 second-feet).

1912–1915: Maximum stage recorded, 18.0 feet January 7 to 8, 1914 (discharge, 30,300 second-feet); minimum stage recorded September 30, 1915.

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

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation was changed during high water of April 3, 1915. Gage-height record prior to April, 1915, not very reliable. Practically no diurnal fluctuations. Results October to March, fair; April to September, excellent.

*Discharge measurements of Cowlitz River at Mossy Rock, Wash., during the year ending Sept. 30, 1915.*

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---|---|---|---|---|---|---|---|
| | | *Feet.* | *Sec.-ft.* | | | *Feet.* | *Sec.-ft.* |
| May 21 | C. G. Paulsen | 3.78 | 3,440 | Sept. 1 | C. G. Paulsen | 2.02 | 1,350 |
| 21 | ....do | 3.78 | 3,460 | 30 | A. H. Tuttle | 1.46 | 862 |
| June 1 | G. L. Parker | 4.45 | 4,660 | 30 | ....do | 1.46 | 841 |
| July 8 | C. G. Paulsen | 2.78 | 2,190 | | | | |

*Daily discharge, in second-feet, of Cowlitz River at Mossy Rock, Wash., for the year ending Sept. 30, 1915.*

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1,140 | 5,000 | 3,310 | 1,320 | 1,520 | 1,970 | 3,790 | 3,140 | 4,430 | 2,330 | 1,730 | 1,300 |
| 2 | 1,220 | 8,660 | 3,010 | 1,220 | 1,630 | 1,970 | 10,500 | 3,140 | 4,260 | 2,460 | 1,730 | 1,300 |
| 3 | 1,320 | 14,800 | 2,730 | 1,220 | 1,740 | 1,970 | 17,900 | 3,000 | 3,920 | 2,460 | 1,730 | 1,220 |
| 4 | 1,320 | 15,300 | 2,460 | 1,220 | 1,860 | 1,970 | 13,400 | 3,290 | 3,760 | 2,460 | 1,730 | 1,130 |
| 5 | 1,320 | 11,600 | 2,330 | 1,320 | 1,970. | 1,860 | 8,560 | 3,600 | 3,600 | 2,460 | 1,730 | 1,130 |
| 6 | 1,320 | 8,660 | 2,210 | 1,320 | 1,970 | 1,740 | 7,110 | 3,760 | 3,600 | 2,330 | 1,730 | 1,130 |
| 7 | 1,320 | 6,820 | 2,090 | 1,520 | 2,090 | 1,740 | 7,470 | 3,920 | 3,760 | 2,330 | 1,730 | 1,050 |
| 8 | 1,320 | 6,080 | 1,970 | 1,860 | 2,090 | 1,740 | 7,110 | 3,920 | 3,760 | 2,210 | 1,730 | 1,050 |
| 9 | 1,320 | 12,400 | 1,860 | 1,860 | 2,210 | 1,740 | 6,390 | 3,920 | 3,290 | 2,210 | 1,610 | 1,050 |
| 10 | 1,320 | 15,300 | 1,740 | 1,860 | 2,210 | 1,740 | 6,030 | 3,920 | 3,600 | 2,090 | 1,610 | 975 |
| 11 | 1,970 | 16,100 | 1,740 | 1,970 | 2,090 | 1,860 | 5,670 | 3,902 | 2,860 | 1,970 | 1,610 | 975 |
| 12 | 3,310 | 14,200 | 1,740 | 2,090 | 1,970 | 1,970 | 5,670 | 3,920 | 2,720 | 1,970 | 1,610 | 975 |
| 13 | 3,470 | 11,300 | 1,740 | 2,210 | 1,970 | 1,970 | 5,670 | 3,920 | 2,590 | 1,970 | 1,500 | 1,050 |
| 14 | 3,310 | 10,500 | 1,740 | 2,460 | 1,970 | 2,210 | 5,670 | 3,920 | 2,590 | 1,850 | 1,500 | 975 |
| 15 | 3,010 | 9,780 | 1,740 | 2,460 | 1,970 | 2,730 | 5,670 | 3,920 | 2,590 | 1,850 | 1,500 | 975 |
| 16 | 3,310 | 10,100 | 1,740 | 2,210 | 1,970 | 3,160 | 5,670 | 3,920 | 2,720 | 1,730 | 1,500 | 900 |
| 17 | 3,310 | 9,400 | 1,740 | 2,090 | 1,970 | 3,790 | 5,670 | 3,920 | 2,590 | 1,850 | 1,500 | 900 |
| 18 | 5,000 | 6,820 | 1,630 | 1,970 | 1,860 | 3,310 | 5,490 | 3,600 | 2,460 | 1,850 | 1,500 | 900 |
| 19 | 8,660 | 7,000 | 1,520 | 1,970 | 1,740 | 3,010 | 5,130 | 3,440 | 2,330 | 1,850 | 1,500 | 975 |
| 20 | 7,920 | 6,440 | 1,520 | 1,970 | 1,740 | 2,460 | 4,780 | 3,600 | 2,590 | 1,850 | 1,400 | 975 |
| 21 | 5,000 | 6,440 | 1,520 | 1,970 | 1,740 | 2,210 | 4,260 | 3,600 | 2,460 | 1,850 | 1,400 | 975 |
| 22 | 4,300 | 5,720 | 1,420 | 1,970 | 1,740 | 2,330 | 4,090 | 3,440 | 2,210 | 1,850 | 1,400 | 975 |
| 23 | 3,310 | 5,360 | 1,420 | 1,860 | 1,740 | 2,460 | 3,920 | 3,290 | 2,210 | 1,850 | 1,400 | 975 |
| 24 | 2,730 | 5,000 | 1,320 | 1,860 | 1,860 | 2,730 | 3,920 | 3,000 | 2,330 | 1,850 | 1,400 | 975 |
| 25 | 2,730 | 4,640 | 1,320 | 1,740 | 1,970 | 3,010 | 3,920 | 3,000 | 2,460 | 1,850 | 1,400 | 900 |
| 26 | 2,730 | 4,300 | 1,320 | 1,740 | 1,970 | 3,310 | 3,760 | 3,290 | 2,330 | 1,730 | 1,400 | 900 |
| 27 | 2,730 | 4,130 | 1,320 | 1,630 | 1,970 | 3,310 | 3,600 | 3,290 | 2,210 | 1,850 | 1,400 | 975 |
| 28 | 2,870 | 3,960 | 1,320 | 1,630 | 1,970 | 3,310 | 3,440 | 5,670 | 2,210 | 1,610 | 1,400 | 975 |
| 29 | 2,870 | 3,790 | 1,320 | 1,520 | ..... | 3,310 | 3,290 | 6,750 | 2,210 | 1,610 | 1,400 | 975 |
| 30 | 2,870 | 3,630 | 1,320 | 1,520 | ..... | 3,470 | 3,290 | 5,670 | 2,210 | 1,730 | 1,400 | 862 |
| 31 | 2,870 | ..... | 1,320 | 1,520 | ..... | 3,470 | ..... | 4,780 | ..... | 1,730 | 1,400 | ..... |

NOTE.—Discharge determined as follows: Oct. 1 to Apr. 2, from rating curve fairly well defined up to 7,000 second-feet; Apr. 3 to Sept. 30, from well-defined curve.

*Monthly discharge of Cowlitz River at Mossy Rock, Wash., for the year ending Sept. 30, 1915.*

[Drainage area, 1,170 square miles.]

| Month. | Discharge in second-feet. | | | | Run-off. | | Accuracy. |
|---|---|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | Per square mile. | Depth in inches on drainage area. | Total in acre-feet. | |
| October | 8,660 | 1,140 | 2,970 | 2.51 | 2.89 | 181,000 | B. |
| November | 16,100 | 3,630 | 8,440 | 7.21 | 8.04 | 502,000 | C. |
| December | 3,310 | 1,320 | 1,790 | 1.53 | 1.76 | 110,000 | C. |
| January | 2,460 | 1,220 | 1,780 | 1.52 | 1.75 | 109,000 | C. |
| February | 2,210 | 1,520 | 1,910 | 1.63 | 1.70 | 106,000 | C. |
| March | 3,790 | 1,740 | 2,510 | 2.15 | 2.48 | 154,000 | C. |
| April | 17,900 | 3,290 | 6,030 | 5.15 | 5.75 | 359,000 | B. |
| May | 6,750 | 3,000 | 3,850 | 3.29 | 3.79 | 237,000 | A. |
| June | 4,430 | 2,210 | 2,900 | 2.48 | 2.77 | 173,000 | A. |
| July | 2,460 | 1,610 | 1,990 | 1.70 | 1.96 | 122,000 | A. |
| August | 1,730 | 1,400 | 1,530 | 1.31 | 1.51 | 94,100 | A. |
| September | 1,300 | 862 | 1,010 | .864 | .96 | 60,100 | A. |
| The year | 17,900 | 862 | 3,050 | 2.61 | 35.36 | 2,210,000 | |

### CLEAR FORK NEAR LEWIS, WASH.

LOCATION.—In sec. 29, T. 14 N., R. 10 E., above Yakima trail bridge, 1,000 feet above mouth, and about 7 miles northeast of Lewis, in Lewis County.

DRAINAGE AREA.—48 square miles (measured on Pl. I, Water-Supply Paper 313).

RECORDS AVAILABLE.—August 20, 1907, to September 20, 1915.

GAGE.—Vertical staff on right bank, 350 feet above Yakima trail bridge. Gage washed out several times prior to 1912, but replaced at same site and approximately same datum. Relation of present datum to that maintained prior to 1912 somewhat uncertain. Gage read to hundredths twice a week by J. L. Jennings.

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

CHANNEL AND CONTROL.—Bed composed of gravel and boulders, shifting during floods. One channel at all stages. Stage of zero flow determined September 9, 1913, as at gage height −1.0 foot, ±0.1 foot.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 4.3 feet at 11.50 a. m., November 3 (discharge, 1,320 second-feet); minimum stage recorded, 1.16 feet at 11.15 a. m., September 28 (discharge, 43 second-feet).

1907–1915: Maximum stage recorded, 7.3 feet November 23, 1909 (discharge, 2,530 second-feet); minimum stage recorded September 28, 1915.

WINTER FLOW.—Stage-discharge relation probably not affected by ice; open-channel rating assumed applicable.

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Results excellent. Considerable diurnal fluctuation March to June.

COOPERATION.—Gage height record furnished by Portland Railway, Light & Power Co.

*Discharge measurements of Clear Fork near Lewis, Wash., during the year ending Sept. 30, 1915.*

| Date. | Made by— | Gage height. | | Discharge. | Date. | Made by— | Gage height. | | Discharge. |
|---|---|---|---|---|---|---|---|---|---|
| | | Old gage. | New gage. | | | | Old gage. | New gage. | |
| | | *Feet.* | *Feet.* | *Sec.-ft.* | | | *Feet.* | *Feet.* | *Sec.-ft.* |
| Oct. 3 | I. L. Collier | 0.95 | ..... | a 109 | June 3 | C. G. Paulsen | 1.53 | 2.21 | 196 |
| Apr. 16 | G. L. Parker | 1.86 | 2.51 | a 256 | Aug. 28 | .....do | ..... | 1.26 | 51 |
| " 18 | Paulsen and Parker | 2.11 | 2.76 | 321 | | | | | |

a Measured by wading 500 feet below gage.

*Daily discharge, in second-feet, of Clear Fork near Lewis, Wash., for the years ending Sept. 30, 1914–15.*

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1913–14. | | | | | | | | | | | | |
| 1 | 100 | ..... | ..... | 100 | 131 | ..... | ..... | ..... | ..... | 312 | ..... | ..... |
| 2 | ..... | 174 | 230 | ..... | ..... | 285 | ..... | ..... | ..... | ..... | ..... | 78 |
| 3 | 100 | ..... | ..... | 100 | 124 | ..... | 162 | ..... | 536 | ..... | ..... | ..... |
| 4 | ..... | 164 | 206 | ..... | ..... | 206 | ..... | 422 | ..... | ..... | ..... | ..... |
| 5 | 88 | ..... | ..... | 1,680 | ..... | ..... | ..... | ..... | ..... | ..... | 110 | ..... |
| 6 | ..... | 254 | 184 | ..... | 117 | 179 | 298 | ..... | ..... | ..... | ..... | ..... |
| 7 | 146 | ..... | ..... | 1,150 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 8 | ..... | 242 | 164 | ..... | 104 | 188 | ..... | ..... | ..... | 216 | ..... | 78 |
| 9 | 130 | ..... | ..... | 536 | ..... | ..... | 298 | 422 | ..... | ..... | ..... | 79 |
| 10 | ..... | 280 | 146 | ..... | 104 | 179 | ..... | ..... | 226 | ..... | ..... | ..... |
| 11 | 294 | ..... | ..... | 326 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 12 | ..... | 230 | 146 | ..... | 110 | 188 | ..... | ..... | ..... | ..... | 104 | ..... |
| 13 | 368 | ..... | ..... | 248 | ..... | ..... | 458 | 576 | ..... | ..... | ..... | ..... |
| 14 | ..... | 184 | 155 | ..... | 110 | 312 | ..... | ..... | 356 | ..... | ..... | ..... |
| 15 | 308 | ..... | ..... | 206 | ..... | ..... | ..... | ..... | ..... | 197 | ..... | ..... |
| 16 | ..... | 184 | 146 | ..... | 104 | 388 | 536 | ..... | ..... | ..... | ..... | 117 |
| 17 | 254 | ..... | ..... | 188 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 18 | ..... | 280 | 138 | ..... | 104 | 356 | ..... | ..... | ..... | ..... | ..... | ..... |
| 19 | 230 | ..... | ..... | 162 | ..... | ..... | ..... | ..... | ..... | ..... | 98 | ..... |
| 20 | ..... | 242 | 130 | ..... | 104 | 356 | 536 | 458 | ..... | ..... | ..... | ..... |
| 21 | 294 | ..... | ..... | 162 | ..... | ..... | ..... | ..... | ..... | 138 | ..... | ..... |
| 22 | ..... | 230 | 122 | ..... | 131 | 326 | ..... | ..... | ..... | ..... | ..... | 124 |
| 23 | 230 | ..... | ..... | 237 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 24 | ..... | 368 | 114 | ..... | 138 | 260 | 326 | ..... | 260 | ..... | ..... | ..... |
| 25 | 267 | ..... | ..... | 188 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| 26 | ..... | 323 | 114 | ..... | 131 | 197 | ..... | ..... | ..... | ..... | 84 | ..... |
| 27 | 230 | ..... | ..... | 162 | ..... | ..... | 260 | 356 | ..... | ..... | ..... | ..... |
| 28 | ..... | 308 | 107 | ..... | 206 | 179 | ..... | ..... | ..... | ..... | ..... | ..... |
| 29 | 174 | ..... | ..... | 146 | ..... | ..... | ..... | ..... | ..... | 117 | ..... | 98 |
| 30 | ..... | 280 | 100 | ..... | ..... | 170 | 237 | ..... | ..... | ..... | ..... | ..... |
| 31 | 164 | ..... | ..... | 146 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |

*Discharge measurements of Clear Fork near Lewis, Wash., during the year ending Sept. 30, 1915*—Continued.

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1914-15. | | | | | | | | | | | | |
| 1 | | | 188 | | | | | 162 | | | | |
| 2 | | | | 110 | 92 | 92 | | | | 230 | | |
| 3 | 104 | 1,320 | | | | | 750 | | 188 | | 74 | |
| 4 | | | | | | | | 179 | | | | 50 |
| 5 | | | 162 | 110 | | | | | | | | |
| 6 | | | | | 104 | 92 | 405 | | | 115 | | |
| 7 | 98 | 388 | | | | | | | | | | 46 |
| 8 | | | 138 | | | | | 248 | 208 | | | |
| 9 | | | | 104 | 104 | 92 | | | | | | |
| 10 | 104 | 285 | | | | | 260 | | | 87 | 63 | |
| 11 | | | | | | | | 216 | | | | 45 |
| 12 | | | 110 | 104 | | | | | 178 | | | |
| 13 | 197 | | | | 98 | 86 | 326 | | | 87 | | |
| 14 | | 660 | | | | | | | | | 63 | 51 |
| 15 | | | 117 | | | | | 154 | 168 | | | |
| 16 | | | | 131 | 92 | 170 | 260 | | | | | |
| 17 | 138 | 341 | | | | | | | | 87 | 63 | |
| 18 | | | | | | | 326 | 216 | | | | 50 |
| 19 | | | 110 | 104 | | | | | 100 | | | |
| 20 | 272 | | | | 86 | 188 | | | | 87 | | |
| 21 | | 298 | | | | | | | | | 56 | 46 |
| 22 | | | 98 | | | | | 170 | 132 | | | |
| 23 | | | | 92 | 86 | 272 | | | | 82 | | |
| 24 | 170 | 260 | | | | | 179 | | | | 54 | |
| 25 | | | | | | | | 178 | | | | 46 |
| 26 | | | 104 | 82 | | | 197 | | 115 | | | |
| 27 | 138 | | | | 92 | 170 | | | | 75 | | |
| 28 | | 226 | | | | | | | | | 51 | 43 |
| 29 | | | 98 | | | | | 304 | 124 | | | |
| 30 | | | | 86 | | 206 | | | | | | |
| 31 | 154 | | | | | | | 230 | | 80 | 52 | |

NOTE.—Discharge ascertained from well-defined rating curves applicable Oct. 1, 1913, to Jan. 4, 1914; Jan. 5, 1914, to May 24, 1915; and May 25 to Sept. 30, 1915; determinations given only for days on which gage was read. Data for the year ending Sept. 30, 1914, revised since publication in Water-Supply Paper 394.

### COAL CREEK AT MOUTH, NEAR LEWIS, WASH.

LOCATION.—In sec. 6, T. 13 N., R. 10 E., at Yakima trail bridge, half a mile above the mouth and about 4 miles northeast of Lewis, in Lewis County.

DRAINAGE AREA.—Approximately 10 square miles (measured on Pl. I, Water-Supply Paper 313).

RECORDS AVAILIABLE.—November 6, 1910, to January 20, 1913, and April 13, 1913, to September 30, 1915, when station was discontinued.

GAGE.—Vertical staff, 0 to 8.0 feet, nailed to large stump on left bank, 10 feet above the Yakima trail bridge, read to hundredths two and three times a week by J. L. Jennings.

DISCHARGE MEASUREMENTS.—Made by wading near gage and from Yakima trail bridge.

CHANNEL AND CONTROL.—One channel at all stages; bed composed of large boulders mixed with gravel and sand; not subject to shifting. Stage of zero flow gage height −0.1 foot +0.2, as determined October 3, 1914, and August 28, 1915.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 3.0 feet November 3 (discharge, 404 second-feet); minimum stage recorded, 0.55 foot September 11, 25, 28 (discharge, 3.8 second-feet).

1910–1915: Maximum stage recorded, 3.6 feet November 19, 1911 (discharge, 580 second-feet); minimum stage recorded, 0.5 foot September 8, 1911 (discharge, 3.0 second-feet).

WINTER FLOW.—Stage-discharge relation probably not affected by ice; open-channel, rating curve assumed applicable.

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Record of daily discharge excellent; but accuracy of monthly means impaired by incompleteness of gage-height record.

COOPERATION.—Gage-height record furnished by Valley Development Co.

*Discharge measurements of Coal Creek at mouth, near Lewis, Wash., during the year ending Sept. 30, 1915.*

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---|---|---|---|---|---|---|---|
| | | *Feet.* | *Sec.-ft.* | | | *Feet.* | *Sec.-ft.* |
| Oct. 3 | I. L. Collier | 0.82 | 12.4 | June 4 | C. G. Paulsen | 1.22 | 26.7 |
| Apr. 17 | C. G. Paulsen | 1.53 | 49.6 | Aug. 28 | do | .59 | 4.0 |

*Daily discharge, in second-feet, of Coal Creek at mouth, near Lewis, Wash., for the years ending Sept. 30, 1911–1915.*

| Day. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1910–11. | | | | | | | | | | | |
| 1 | ..... | 40 | 26 | 19 | 8.5 | 70 | 50 | 214 | 50 | 10 | 3.8 |
| 2 | ..... | 97 | 24 | 17 | 8.5 | 70 | 70 | 189 | 50 | 10 | 4.5 |
| 3 | ..... | 97 | 24 | 17 | 8.5 | 56 | 78 | 189 | 56 | 10 | 4.5 |
| 4 | ..... | 97 | 26 | 17 | 12 | 45 | 88 | 97 | 70 | 10 | 4.5 |
| 5 | ..... | 78 | 26 | 15 | 12 | 40 | 97 | 70 | 56 | 10 | 7.0 |
| 6 | 24 | 62 | 36 | 15 | 12 | 32 | 78 | 70 | 56 | 8.5 | 5.8 |
| 7 | 141 | 78 | 50 | 13 | 13 | 29 | 62 | 78 | 50 | 8.5 | 5.8 |
| 8 | 141 | 62 | 45 | 13 | 13 | 29 | 62 | 78 | 40 | 8.5 | 3.0 |
| 9 | 78 | 50 | 40 | 13 | 13 | 29 | 56 | 78 | 32 | 7.0 | ..... |
| 10 | ..... | 40 | 32 | 13 | 13 | 29 | 45 | 97 | 32 | 7.0 | 15 |
| 11 | 266 | 40 | 32 | 13 | 13 | 26 | 40 | 202 | 29 | 7.0 | ..... |
| 12 | 165 | 36 | 29 | 12 | 12 | 24 | 45 | 214 | 29 | 7.0 | 8.5 |
| 13 | 97 | 29 | 24 | 12 | 12 | 21 | 45 | 189 | 29 | 7.0 | ..... |
| 14 | 78 | 29 | 19 | 12 | 12 | 21 | 40 | 165 | 29 | 7.0 | 10 |
| 15 | 50 | 26 | 19 | 12 | 17 | 21 | 45 | 130 | 29 | 7.0 | ..... |
| 16 | 40 | 29 | 19 | 10 | 24 | 24 | 78 | 118 | 26 | 7.0 | 40 |
| 17 | 32 | 26 | 21 | 10 | 10 | 21 | 78 | 97 | 24 | 7.0 | ..... |
| 18 | 32 | 26 | 21 | 10 | 40 | 26 | 97 | 78 | 21 | 5.8 | 36 |
| 19 | 29 | 29 | 24 | 10 | 40 | 26 | 88 | 70 | 19 | 5.8 | ..... |
| 20 | 97 | 26 | 21 | 10 | 56 | 26 | 70 | 56 | 19 | 7.0 | 24 |
| 21 | ..... | 26 | 19 | 10 | 70 | 32 | 78 | 62 | 17 | 7.0 | ..... |
| 22 | 240 | 24 | 17 | 10 | 78 | 40 | 97 | 70 | 17 | 5.8 | 19 |
| 23 | 189 | 40 | 17 | 10 | 108 | 40 | 78 | 56 | 15 | 5.8 | ..... |
| 24 | 141 | 56 | 17 | 10 | 88 | 70 | 70 | 40 | 15 | 4.5 | 13 |
| 25 | 97 | 50 | 15 | 10 | 62 | 118 | 56 | 36 | 13 | 4.5 | ..... |
| 26 | 62 | 40 | 15 | 10 | 56 | 88 | 50 | 45 | 13 | 4.5 | 13 |
| 27 | 50 | 40 | 13 | 8.5 | 70 | 62 | 50 | 70 | 13 | 4.5 | ..... |
| 28 | 40 | 32 | 13 | 8.5 | 32 | 50 | 56 | 62 | 12 | 4.5 | 12 |
| 29 | 40 | 29 | 13 | ..... | 32 | ..... | 70 | 50 | 12 | 3.8 | ..... |
| 30 | 40 | 32 | 17 | ..... | 36 | ..... | 118 | 50 | 12 | 4.5 | 10 |
| 31 | ..... | 29 | 19 | ..... | 50 | ..... | 189 | ..... | 10 | 4.5 | ..... |

*Daily discharge, in second-feet, of Coal Creek at mouth, near Lewis, Wash., for the years ending Sept. 30, 1911–1915*—Continued.

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1911–12. | | | | | | | | | | | | |
| 1 | | 7.0 | 50 | | 97 | | 29 | 32 | | | 19 | |
| 2 | 12 | | | 16 | | 17 | | | 165 | 48 | | 40 |
| 3 | | 7.0 | 40 | | 50 | | 40 | 31 | | | 19 | |
| 4 | 12 | | | 13 | | 17 | | | 130 | 40 | | 31 |
| 5 | | 13 | 37 | | 58 | | 32 | 32 | | | 9.4 | |
| 6 | 10 | | | 13 | | 17 | | | 189 | 45 | | 21 |
| 7 | | 78 | 37 | | 65 | | 32 | 49 | | | 19 | |
| 8 | 8.5 | | | 13 | | 17 | | | 202 | 32 | | 32 |
| 9 | | 50 | 78 | | 78 | | 40 | 189 | | | 19 | |
| 10 | 10 | | | 16 | | 16 | | | 141 | 32 | | 21 |
| 11 | | 24 | 62 | | 118 | | 52 | 141 | | | 19 | |
| 12 | 10 | | | 38 | | 15 | | | 266 | 32 | | 21 |
| 13 | | 26 | 50 | | 93 | | 45 | 189 | | | 19 | |
| 14 | 13 | | | 320 | | 15 | | | 141 | 32 | | 20 |
| 15 | | 21 | 40 | | 75 | | 32 | 240 | | | 19 | |
| 16 | 12 | | | 189 | | 14 | | | 76 | 26 | | 17 |
| 17 | | 165 | 32 | | 141 | | 32 | 141 | | | 19 | |
| 18 | 12 | | | 116 | | 13 | | | 78 | 32 | | 15 |
| 19 | | 580 | 31 | | 118 | | 31 | 163 | | | 17 | |
| 20 | 10 | | | 82 | | 12 | | | 153 | 21 | | 13 |
| 21 | | 214 | 21 | | 62 | | 26 | 214 | | | 19 | |
| 22 | 10 | | | 78 | | 13 | | | 97 | 17 | | 12 |
| 23 | | 97 | 32 | | 40 | | 26 | 88 | | | 17 | |
| 24 | 8.5 | | | 82 | | 13 | | | 118 | 13 | | 12 |
| 25 | | 78 | 26 | | 32 | | 25 | | | | 9.4 | |
| 26 | 8.5 | | | 141 | | 19 | | | 165 | 17 | | 12 |
| 27 | | 108 | 21 | | 26 | | 25 | 148 | | | 8.5 | |
| 28 | 7.0 | | | 108 | | 45 | | | 70 | 15 | | 10 |
| 29 | | 62 | 19 | | 17 | | 32 | 141 | | | 7.0 | |
| 30 | 7.0 | | | 189 | | 25 | | | 32 | 13 | | 10 |
| 31 | | | 16 | | | | | 141 | | | 21 | |

| Day. | Oct. | Nov. | Dec. | Jan. | Apr. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|
| 1912–13. | | | | | | | | | | |
| 1 | | 13 | 17 | | | | 404 | 165 | | 9.7 |
| 2 | 10 | | | | | 50 | | | 24 | |
| 3 | | 13 | 45 | | | | 306 | 143 | | 13 |
| 4 | 10 | | | 240 | | 40 | | | 17 | |
| 5 | | 21 | 29 | | | | 279 | 120 | | 21 |
| 6 | 8.5 | | | 50 | | 50 | | | 19 | |
| 7 | | 32 | 24 | | | | 266 | 120 | | 12 |
| 8 | 10 | | | 50 | | 214 | | | 19 | |
| 9 | | 141 | 21 | | | | 214 | 89 | | 17 |
| 10 | 10 | | | 45 | | 240 | | | 16 | 14 |
| 11 | | 78 | 32 | | | | 64 | 80 | | 13 |
| 12 | 9.7 | | | 32 | 120 | 165 | | | 16 | |
| 13 | | 214 | 32 | | | | 80 | 80 | | 13 |
| 14 | 9.4 | | | 22 | 214 | 143 | | | 12 | |
| 15 | | 97 | 26 | | | | 62 | 99 | | 8.5 |
| 16 | 9.7 | | | 17 | 80 | 99 | | | 15 | |
| 17 | | 50 | 26 | | | | 120 | 72 | | 7.0 |
| 18 | 13 | | | 15 | 143 | 80 | | | 13 | |
| 19 | | 50 | 32 | | | | 214 | 32 | | 7.0 |
| 20 | 15 | | | 10 | 214 | 50 | | | 13 | |
| 21 | | 45 | 26 | | | | 165 | 64 | | 8.5 |
| 22 | 17 | | | | 143 | 214 | | | 13 | |
| 23 | | 21 | 25 | | | | 279 | 56 | | 5.8 |
| 24 | 13 | | | | 132 | 240 | | | 15 | |
| 25 | | 13 | 22 | | | | 214 | 50 | | 9.7 |
| 26 | 21 | | | | 110 | 279 | | | 10 | |
| 27 | | 7.6 | 24 | | | | 143 | 32 | | 9.4 |
| 28 | 17 | | | | 80 | 334 | | | 10 | |
| 29 | | 5.8 | 26 | | | | 120 | 26 | | 13 |
| 30 | 16 | | | | 56 | 279 | | | 10 | |
| 31 | | | | | | | | 80 | | |

*Daily discharge, in second-feet, of Coal Creek at mouth, near Lewis, Wash., for the years ending Sept. 30, 1911–1915*—Continued.

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1913–14. | | | | | | | | | | | | |
| 1 | 10 | | | 16 | | | | | | | | |
| 2 | | 26 | 50 | | 22 | 88 | | | | 28 | | 4.5 |
| 3 | 9.7 | | | 16 | | | 36 | | 97 | | | 3.8 |
| 4 | | 22 | 36 | | 21 | 51 | | 108 | | | | |
| 5 | 7.0 | | | 460 | | | | | | | 9.4 | |
| 6 | | 40 | 36 | | 19 | 38 | 97 | | | | | |
| 7 | 25 | | | 334 | | | | | | | | |
| 8 | | 32 | 32 | | 16 | 62 | | | | 21 | | 5.8 |
| 9 | 17 | | | 141 | | | 93 | 127 | | | | 7.3 |
| 10 | | 56 | 29 | | 16 | 60 | | | 36 | | | |
| 11 | 60 | | | 78 | | | | | | | | |
| 12 | | 50 | 29 | | 19 | 58 | | | | | 7.0 | |
| 13 | 118 | | | 50 | | | 132 | 130 | | | | |
| 14 | | 32 | 30 | | 19 | 82 | | | 65 | | | |
| 15 | 62 | | | 36 | | | | | | 17 | | |
| 16 | | 32 | 27 | | 19 | 118 | 160 | | | | | 13 |
| 17 | 40 | | | 31 | | | | | | | | |
| 18 | | 50 | 24 | | 20 | 118 | | | | | | |
| 19 | 36 | | | 24 | | | | | | | 6.5 | |
| 20 | | 50 | 21 | | 21 | 118 | 141 | 97 | | | | |
| 21 | 56 | | | 24 | | | | | | 13 | | |
| 22 | | 45 | 20 | | 31 | 95 | | | | | | 15 |
| 23 | 40 | | | 52 | | | | | | | | |
| 24 | | 97 | 18 | | 36 | 62 | 75 | | 70 | | | |
| 25 | 40 | | | 34 | | | | | | | | |
| 26 | | 62 | 17 | | 30 | | | | | | 5.8 | |
| 27 | 32 | | | 29 | | 37 | 50 | 62 | | | | |
| 28 | | 50 | 17 | | 60 | | | | | | | |
| 29 | 26 | | | 25 | | 31 | | | | 8.8 | | 8.5 |
| 30 | | 56 | 15 | | | | 50 | | | | | |
| 31 | 25 | | | 24 | | 26 | | | | | | |
| 1914–15. | | | | | | | | | | | | |
| 1 | | | 29 | | | | | 25 | | | | |
| 2 | | | | 19 | 14 | 15 | | | | 12 | | |
| 3 | 11 | 404 | | | | | 240 | | 30 | | 9.4 | |
| 4 | | | | | | | | 26 | | | | 4.5 |
| 5 | | | 41 | 17 | | | | | 27 | | | |
| 6 | | | | | 17 | 17 | 105 | | | 12 | | |
| 7 | 11 | 108 | | | | | | | | | | 4.4 |
| 8 | | | 19 | | | | | 36 | 24 | | | |
| 9 | | | | 50 | 17 | 16 | | | | | | |
| 10 | 18 | 62 | | | | | 50 | | | 9.4 | 7.0 | |
| 11 | | | | | | | | 30 | | | | 3.8 |
| 12 | | | 15 | 18 | | | | | 20 | | | |
| 13 | 41 | | | | 16 | 15 | 62 | | | | | |
| 14 | | 240 | | | | | | | | 12 | 7.0 | 5.5 |
| 15 | | | 17 | | | | | 24 | 19 | | | |
| 16 | | | | 16 | 13 | 15 | 45 | | | | | |
| 17 | 20 | 70 | | | | | | | | 15 | 9.4 | |
| 18 | | | | | | | 62 | 26 | | | | 4.5 |
| 19 | | | 13 | 18 | | | | | 12 | | | |
| 20 | 50 | | | | 13 | 19 | | | | 12 | | |
| 21 | | 62 | | | | | | | | | 5.8 | 4.2 |
| 22 | | | 10 | | | | | 28 | 15 | | | |
| 23 | | | | 18 | 13 | 68 | | | | 10 | | |
| 24 | 24 | 51 | | | | | 27 | | | | 5.5 | |
| 25 | | | | | | | | 26 | | | | 3.8 |
| 26 | | | 14 | 17 | | | 26 | | 10 | | | |
| 27 | 19 | | | | 14 | 40 | | | | 9.4 | | |
| 28 | | 48 | | | | | | | | | 4.4 | 3.8 |
| 29 | | | 12 | | | | | 56 | 13 | | | |
| 30 | | | | 13 | | 40 | | | | | | |
| 31 | 24 | | | | | | | 42 | | 10 | 4.5 | |

NOTE.—Discharge ascertained from well-defined rating curve applicable for entire period; given only for days on which gage was read. All discharge records previously published revised.

*Monthly discharge of Coal Creek at mouth, near Lewis, Wash., for the years ending Sept. 30, 1911–1915.*

| Month. | Mean discharge in second-feet. | Run-off (total in acre-feet). | Accuracy. |
|---|---|---|---|
| 1910–11. | | | |
| November 6–30 | 100 | 4,960 | A. |
| December | 45.0 | 2,770 | A. |
| January | 23.6 | 1,450 | A. |
| February | 12.1 | 672 | A. |
| March | 33.3 | 2,050 | A. |
| April | 42.2 | 2,510 | A. |
| May | 71.7 | 4,410 | A. |
| June | 100 | 5,950 | A. |
| July | 28.9 | 1,780 | A. |
| August | 6.81 | 419 | B. |
| September | 14.6 | 869 | B. |
| The period | ..... | 27,800 | |
| 1911–12. | | | |
| October | 9.98 | 614 | B. |
| November | 103 | 6,130 | B. |
| December | 37.2 | 2,290 | B. |
| January | 93.0 | 5,720 | B. |
| February | 71.9 | 4,140 | B. |
| March | 18.0 | 1,110 | B. |
| April | 33.3 | 1,980 | B. |
| May | 130 | 7,990 | B. |
| June | 137 | 8,150 | B. |
| July | 27.4 | 1,680 | B. |
| August | 12.3 | 756 | B. |
| September | 19.2 | 1,140 | B. |
| The year | 57.4 | 41,700 | |
| 1912–13. | | | |
| October | 12.5 | 769 | B. |
| November | 53.5 | 3,180 | B. |
| December | 30.0 | 1,840 | B. |
| January 1–20 | 65.0 | 2,580 | B. |
| April 12–30 | 131 | 4,940 | B. |
| May | 167 | 10,300 | B. |
| 1913. | | | |
| June | 191 | 11,400 | B. |
| July | 80.5 | 4,950 | B. |
| August | 15.8 | 972 | B. |
| September | 11.1 | 660 | B. |
| 1913–14. | | | |
| October | 38.4 | 2,360 | B. |
| November | 46.2 | 2,750 | B. |
| December | 27.0 | 1,660 | B. |
| January | 88.1 | 5,420 | B. |
| February | 24.4 | 1,360 | B. |
| March | 69.5 | 4,270 | B. |
| April | 94.9 | 5,650 | C. |
| May | 99.3 | 6,110 | C. |
| June | 63.8 | 3,800 | C. |
| July | 16.9 | 1,040 | C. |
| August | 7.06 | 434 | C. |
| September | 9.76 | 581 | C. |
| The year | 48.9 | 35,400 | |
| 1914–15. | | | |
| October | 24.8 | 1,530 | C. |
| November | 124 | 7,380 | C. |
| December | 18.1 | 1,110 | C. |
| January | 20.3 | 1,250 | C. |
| February | 14.6 | 811 | C. |
| March | 28.7 | 1,760 | C. |
| April | 71.6 | 4,260 | C. |
| May | 31.2 | 1,920 | B. |
| June | 19.1 | 1,140 | C. |
| July | 11.3 | 695 | C. |
| August | 7.00 | 430 | C. |
| September | 4.31 | 256 | C. |
| The year | 31.1 | 22,500 | |

NOTE.—Monthly mean discharge obtained by interpolating discharge for all days when gage was not read. Accuracy of monthly means depends largely upon frequency of gage readings.

### LAKE CREEK AT OUTLET OF PACKWOOD LAKE, NEAR LEWIS, WASH.

LOCATION.—In sec. 21, T. 13 N., R. 10 E., at outlet of Packwood Lake, 5 miles east of Lewis, in Lewis County.

DRAINAGE AREA.—About 18 square miles (measured on Pl. I, Water-Supply Paper 313).

RECORDS AVAILABLE.—September 2, 1911, to September 30, 1915.

GAGE.—Vertical staff spiked to cedar tree on right bank, 32 feet upstream from weir and 500 feet below outlet. Zero of gage set at same elevation as weir crest; read twice a day, to hundredths, by J. L. Jennings.

DISCHARGE MEASUREMENTS.—Made by wading 5 feet above weir crest.

CHANNEL AND CONTROL.—A rectangular weir 19.94 feet long with a crest 1 inch wide forms control. Overflow occurs at gage height 4.4 feet.

EXTREMES OF DISCHARGE.—Maximum stage recorded during the year, 2.20 feet November 14 (discharge, 247 second-feet); minimum stage recorded, 0.48 foot February 26 to March 3 (discharge, 33 second-feet).

1911–1915: Maximum stage recorded, 3.26 feet at 6 p. m. June 3, 1913, and 6 a. m. June 4, 1913 (discharge, 465 second-feet); minimum stage recorded February 26 to March 3, 1915.

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

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Results excellent except for short periods when there may have been a small amount of leakage under weir. Practically no diurnal fluctuation.

COOPERATION.—Gage-height record furnished by Portland Railway, Light & Power Co.

*Discharge measurements of Lake Creek at outlet of Packwood Lake, near Lewis, Wash., during the year ending Sept. 30, 1915.*

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---|---|---|---|---|---|---|---|
| | | *Feet.* | *Sec.-ft.* | | | *Feet.* | *Sec.-ft.* |
| Oct. 5 | I. L. Collier | 0.72 | 53 | Aug. 27 | Paulsen and Jennings | 0.88 | 64 |
| Apr. 15 | Parker and Paulsen | 1.07 | 84 | 30 | C. G. Paulsen | .90 | 66 |
| June 2 | C. G. Paulsen | 1.30 | 114 | | | | |

*Daily discharge, in second-feet, of Lake Creek at outlet of Packwood Lake near Lewis, Wash., for the year ending Sept. 30, 1915.*

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 56 | 78 | 78 | 47 | 37 | 33 | 48 | 68 | 117 | 99 | 78 | 64 |
| 2 | 57 | 105 | 78 | 45 | 37 | 33 | 64 | 68 | 111 | 105 | 78 | 64 |
| 3 | 57 | 186 | 73 | 47 | 36 | 33 | 88 | 68 | 105 | 111 | 78 | 64 |
| 4 | 54 | 211 | 68 | 46 | 36 | 34 | 105 | 68 | 99 | 111 | 78 | 64 |
| 5 | 53 | 211 | 68 | 45 | 36 | 34 | 105 | 68 | 105 | 111 | 73 | 59 |
| 6 | 52 | 186 | 68 | 45 | 36 | 34 | 105 | 68 | 111 | 111 | 73 | 59 |
| 7 | 51 | 163 | 64 | 45 | 36 | 34 | 105 | 73 | 117 | 111 | 73 | 56 |
| 8 | 50 | 149 | 64 | 45 | 36 | 34 | 99 | 78 | 117 | 111 | 68 | 57 |
| 9 | 50 | 130 | 59 | 44 | 34 | 33 | 99 | 83 | 111 | 111 | 68 | 59 |
| 10 | 53 | 117 | 59 | 45 | 34 | 33 | 88 | 94 | 99 | 99 | 68 | 56 |
| 11 | 57 | 130 | 57 | 45 | 34 | 33 | 88 | 94 | 94 | 88 | 68 | 54 |
| 12 | 64 | 149 | 55 | 45 | 34 | 33 | 88 | 88 | 88 | 88 | 68 | 55 |
| 13 | 68 | 220 | 54 | 45 | 35 | 33 | 88 | 88 | 83 | 83 | 64 | 54 |
| 14 | 68 | 247 | 54 | 45 | 34 | 34 | 88 | 83 | 83 | 78 | 68 | 50 |
| 15 | 68 | 202 | 53 | 45 | 33 | 37 | 88 | 78 | 88 | 83 | 64 | 50 |
| 16 | 68 | 170 | 52 | 44 | 33 | 40 | 83 | 78 | 88 | 83 | 68 | 50 |
| 17 | 68 | 149 | 50 | 42 | 34 | 40 | 83 | 78 | 88 | 88 | 68 | 50 |
| 18 | 68 | 130 | 50 | 42 | 34 | 42 | 87 | 78 | 88 | 83 | 64 | 49 |
| 19 | 78 | 123 | 50 | 42 | 34 | 42 | 94 | 88 | 88 | 83 | 68 | 48 |
| 20 | 78 | 111 | 48 | 41 | 34 | 42 | 94 | 88 | 88 | 83 | 68 | 48 |
| 21 | 83 | 111 | 47 | 40 | 33 | 42 | 94 | 88 | 88 | 88 | 68 | 47 |
| 22 | 78 | 105 | 46 | 39 | 33 | 42 | 88 | 88 | 88 | 88 | 68 | 47 |
| 23 | 73 | 99 | 46 | 39 | 33 | 43 | 83 | 83 | 88 | 88 | 68 | 45 |
| 24 | 68 | 99 | 46 | 38 | 33 | 43 | 83 | 83 | 94 | 83 | 68 | 44 |
| 25 | 68 | 99 | 46 | 38 | 33 | 42 | 78 | 83 | 94 | 83 | 68 | 44 |
| 26 | 64 | 94 | 46 | 37 | 33 | 42 | 78 | 83 | 88 | 83 | 68 | 43 |
| 27 | 64 | 88 | 47 | 37 | 33 | 42 | 73 | 88 | 88 | 78 | 68 | 42 |
| 28 | 64 | 88 | 47 | 37 | 33 | 42 | 73 | 95 | 88 | 78 | 68 | 42 |
| 29 | 64 | 83 | 47 | 36 | ..... | 42 | 73 | 102 | 88 | 73 | 68 | 40 |
| 30 | 64 | 83 | 47 | 36 | ..... | 44 | 73 | 110 | 94 | 78 | 68 | 39 |
| 31 | 73 | ..... | 46 | 37 | ..... | 44 | ..... | 117 | ..... | 78 | 68 | ..... |

NOTE.—Discharge determined from a rating curve well defined between 50 and 250 feet.

*Monthly discharge of Lake Creek at outlet of Packwood Lake, near Lewis, Wash., for the year ending Sept. 30, 1915.*

| Month. | Discharge in second-feet. | | | Run-off (total in acre-feet). | Accuracy. |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | | |
| October | 83 | 50 | 63.9 | 3,930 | A. |
| November | 247 | 78 | 137 | 8,150 | A. |
| December | 78 | 46 | 55.3 | 3,400 | A. |
| January | 47 | 36 | 42.1 | 2,590 | A. |
| February | 37 | 33 | 34.3 | 1,900 | A. |
| March | 44 | 33 | 38.0 | 2,340 | A. |
| April | 105 | 48 | 86.1 | 5,120 | A. |
| May | 117 | 68 | 83.8 | 5,150 | A. |
| June | 117 | 83 | 95.5 | 5,680 | A. |
| July | 111 | 73 | 90.9 | 5,590 | B. |
| August | 78 | 64 | 69.4 | 4,270 | A. |
| September | 64 | 39 | 51.4 | 3,060 | B. |
| The year | 247 | 33 | 70.7 | 51,200 | |

### LAKE CREEK AT MOUTH, NEAR LEWIS, WASH.

LOCATION.—In sec. 11, T. 13 N., R. 9 E. Willamette meridian, a quarter of a mile above mouth, below Yakima trail bridge, and two miles northeast of Lewis, in Lewis County.

DRAINAGE AREA.—About 26 square miles (measured on Pl. I, Water-Supply Paper 313).

RECORDS AVAILABLE.—August 21, 1907, to January 22, 1913, and March 11, 1913, to September 30, 1915, when the station was discontinued.

GAGE.—Vertical staff gage, 0 to 8.0 feet, on right bank, a quarter of a mile below Yakima trail bridge. Gage read to hundredths twice a week October 1 to November 14, December 26 to January 23, April 24 to September 30, and once daily November 17 to December 22 and January 25 to April 18, by J. L. Jennings.

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

CHANNEL AND CONTROL.—Large boulders; probably permanent. One channel at all stages. Stage of zero flow determined October 4, 1914, gage height —1.0 foot ±0.2.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 1.7 feet at 8.30 a. m. November 14 (discharge, 358 second-feet); minimum stage recorded, 0.25 foot February 28 (discharge, 40 second-feet).

1907–1915: Maximum stage recorded, 4.00 feet March 15 and 16, 1908 (discharge, 1,440 second-feet); minimum stage recorded, 0.20 foot from September 8 to 19 1910, and October 30 to November 3, 1911 (discharge, 36 second-feet).

WINTER FLOW.—Stage-discharge relation probably not affected by ice; open-channel rating curve assumed applicable.

DIVERSIONS.—None.

REGULATIONS.—None.

ACCURACY.—Results good.

*Discharge measurements of Lake Creek at mouth, near Lewis, Wash., during the year ending Sept. 30, 1015.*

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---|---|---|---|---|---|---|---|
| | | *Feet.* | *Sec.-ft.* | | | *Feet.* | *Sec.-ft.* |
| Oct. 4 | I. L. Collier | 0.50 | 62 | June 4 | C. G. Paulsen | 0.86 | 111 |
| Apr. 17 | Parker and Paulsen | .82 | 106 | Aug. 28 | ....do | .58 | 68 |

*Daily discharge, in second-feet, of Lake Creek at mouth, near Lewis Wash., for the year ending Sept. 30, 1915.*

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 62 | 150 | 94 | 58 | 51 | 40 | 71 | 82 | 170 | 115 | 84 | 70 |
| 2 | 62 | 225 | 90 | 60 | 48 | 43 | 80 | 81 | 145 | 122 | 83 | 69 |
| 3 | 62 | 290 | 87 | 60 | 54 | 42 | 138 | 80 | 125 | 127 | 82 | 68 |
| 4 | 60 | 330 | 77 | 60 | 54 | 45 | 198 | 80 | 108 | 127 | 80 | 67 |
| 5 | 59 | 330 | 78 | 60 | 54 | 47 | 198 | 80 | 114 | 127 | 80 | 65 |
| 6 | 58 | 275 | 75 | 62 | 55 | 51 | 198 | 80 | 130 | 127 | 80 | 63 |
| 7 | 58 | 227 | 72 | 65 | 54 | 49 | 198 | 83 | 140 | 127 | 80 | 62 |
| 8 | 60 | 197 | 66 | 67 | 51 | 47 | 198 | 85 | 140 | 127 | 80 | 63 |
| 9 | 63 | 170 | 67 | 68 | 51 | 47 | 184 | 93 | 131 | 127 | 80 | 65 |
| 10 | 66 | 145 | 65 | 65 | 52 | 49 | 184 | 104 | 122 | 110 | 80 | 68 |
| 11 | 72 | 195 | 65 | 63 | 51 | 48 | 170 | 106 | 112 | 100 | 77 | 70 |
| 12 | 77 | 250 | 66 | 60 | 49 | 47 | 150 | 103 | 102 | 100 | 72 | 67 |
| 13 | 85 | 305 | 64 | 60 | 49 | 47 | 150 | 98 | 90 | 94 | 72 | 63 |
| 14 | 85 | 358 | 62 | 59 | 48 | 60 | 150 | 94 | 90 | 85 | 72 | 59 |
| 15 | 85 | 315 | 60 | 58 | 49 | 57 | 150 | 90 | 100 | 86 | 71 | 56 |
| 16 | 85 | 270 | 56 | 58 | 47 | 60 | 131 | 89 | 100 | 87 | 71 | 54 |
| 17 | 85 | 227 | 56 | 57 | 47 | 60 | 106 | 88 | 100 | 88 | 70 | 53 |
| 18 | 85 | 198 | 54 | 56 | 47 | 62 | 110 | 88 | 99 | 88 | 70 | 52 |
| 19 | 112 | 184 | 60 | 56 | 48 | 60 | 140 | 112 | 99 | 88 | 71 | 51 |
| 20 | 112 | 170 | 54 | 55 | 47 | 60 | 140 | 112 | 97 | 88 | 72 | 50 |
| 21 | 135 | 158 | 47 | 54 | 47 | 61 | 140 | 112 | 97 | 90 | 72 | 49 |
| 22 | 120 | 148 | 51 | 52 | 47 | 62 | 128 | 112 | 94 | 90 | 71 | 51 |
| 23 | 105 | 138 | 52 | 51 | 47 | 65 | 122 | 94 | 97 | 90 | 71 | 52 |
| 24 | 94 | 134 | 54 | 53 | 44 | 62 | 122 | 91 | 103 | 88 | 70 | 53 |
| 25 | 92 | 127 | 55 | 56 | 43 | 61 | 117 | 88 | 103 | 87 | 70 | 54 |
| 26 | 84 | 118 | 56 | 53 | 42 | 60 | 109 | 94 | 99 | 86 | 70 | 52 |
| 27 | 72 | 115 | 54 | 56 | 43 | 58 | 104 | 102 | 99 | 85 | 71 | 51 |
| 28 | 72 | 112 | 52 | 56 | 40 | 58 | 98 | 112 | 99 | 82 | 71 | 51 |
| 29 | 72 | 102 | 51 | 54 | ..... | 57 | 93 | 127 | 99 | 80 | 71 | 50 |
| 30 | 72 | 95 | 53 | 51 | ..... | 62 | 87 | 145 | 106 | 83 | 72 | 49 |
| 31 | 85 | ..... | 56 | 51 | ..... | 65 | ..... | 170 | ..... | 85 | 72 | ..... |

NOTE.—Discharge ascertained from a rating curve well defined between 40 and 600 second-feet. Gage read about twice a week Oct. 1 to Nov. 16, Dec. 23 to Jan. 24, and Apr. 19 to Sept. 30. Gage read daily Nov. 17 to Dec. 22 and Jan. 25 to Apr. 18, except the following days: Nov. 22, 27, 29; Dec. 6, 13, 14, 20; Mar. 7, 21, 28; Apr. 11, 14, and 15. Discharge for periods when gage was not read obtained by hydrographic comparison with record of Lake Creek at outlet of Packwood Lake, near Lewis.

*Monthly discharge of Lake Creek at mouth, near Lewis Wash., for the year ending Sept. 30, 1915.*

| Month. | Discharge in second-feet. | | | Run-off (total in acre-feet). | Accuracy. |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | | |
| October | 135 | 58 | 80.5 | 4,950 | B. |
| November | 358 | 95 | 202 | 12,000 | B. |
| December | 94 | 47 | 62.9 | 3,870 | B. |
| January | 68 | 51 | 57.9 | 3,560 | B. |
| February | 55 | 40 | 48.5 | 2,690 | B. |
| March | 65 | 40 | 54.6 | 3,360 | B. |
| April | 198 | 71 | 139 | 8,270 | B. |
| May | 170 | 80 | 99.2 | 6,100 | B. |
| June | 170 | 90 | 110 | 6,550 | B. |
| July | 127 | 80 | 99.5 | 6,120 | B. |
| August | 84 | 70 | 74.5 | 4,580 | B. |
| September | 70 | 49 | 58.2 | 3,460 | B. |
| The year | 358 | 40 | 90.5 | 65,500 | |

## ROGUE RIVER BASIN.

### ROGUE RIVER BELOW PROSPECT, OREG.

LOCATION.—In sec. 6, T. 33 S., R. 3 E., at Prospect power plant of California-Oregon Power Co., 2 miles below Prospect, and about 47 miles northeast of Medford; a mile below the mouth of Mill Creek and 2 miles above Middle Fork.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—August 3, 1913, to September 30, 1915.

GAGE.—Vertical staff on right bank about 100 feet above power house. Read twice daily to hundredths by Charles A. Lower.

DISCHARGE MEASUREMENTS.—Made from cable about 500 feet above gage.

CHANNEL AND CONTROL.—Control of large boulders; practically permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 4.9 feet March 20 (discharge, 2,870 second-feet; total, including estimated discharge of flume, 3,040 second-feet); minimum stage recorded, 2.3 feet September 30 (discharge, 400 second-feet; total, including flume, 457 second-feet).

1913–1915: Maximum stage recorded, 5.0 feet at noon April 15, 1914 (discharge, 3,000 second-feet; total, including estimated discharge of flume, 3,120 second-feet); minimum stage recorded was that of 1915.

WINTER FLOW.—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. 151.)

REGULATION.—None.

ACCURACY.—Results good.

The following discharge measurement was made by P. V. Hodges:

September 21, 1915: Gage height, 2.35 feet; discharge, 419 second-feet.

*Daily discharge, in second-feet, of Rogue River below Prospect, Oreg., for the years ending Sept. 30, 1913–1915.*

| Day. | Aug. | Sept. | Day. | Aug. | Sept. | Day. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|
| 1912–13. | | | 1912–13. | | | 1912–13. | | |
| 1 | ..... | 595 | 11 | 665 | 560 | 21 | 630 | 532 |
| 2 | ..... | 560 | 12 | 630 | 560 | 22 | 630 | 532 |
| 3 | 740 | 780 | 13 | 630 | 560 | 23 | 595 | 505 |
| 4 | 700 | 665 | 14 | 630 | 560 | 24 | 595 | 532 |
| 5 | 700 | 630 | 15 | 630 | 560 | 25 | 595 | 532 |
| 6 | 665 | 595 | 16 | 630 | 560 | 26 | 595 | 532 |
| 7 | 665 | 560 | 17 | 630 | 560 | 27 | 595 | 532 |
| 8 | 665 | 560 | 18 | 630 | 560 | 28 | 595 | 560 |
| 9 | 665 | 560 | 19 | 630 | 560 | 29 | 595 | 595 |
| 10 | 665 | 560 | 20 | 630 | 560 | 30 | 595 | 560 |
| | | | | | | 31 | 595 | ..... |

*Daily discharge, in second-feet, of Rogue River below Prospect, Oreg., for the years ending Sept. 30, 1913–1915*—Continued.

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1913–14. | | | | | | | | | | | | |
| 1 | 532 | 532 | 700 | 1,740 | 860 | 2,250 | 1,100 | 1,520 | 1,300 | 780 | 560 | 505 |
| 2 | 560 | 560 | 740 | 2,020 | 860 | 2,020 | 1,100 | 1,580 | 1,250 | 740 | 560 | 505 |
| 3 | 560 | 532 | 700 | 1,690 | 820 | 1,690 | 1,150 | 1,690 | 1,150 | 820 | 532 | 505 |
| 4 | 560 | 532 | 665 | 1,580 | 820 | 1,690 | 1,470 | 1,690 | 1,150 | 700 | 532 | 505 |
| 5 | 532 | 820 | 665 | 1,580 | 780 | 2,020 | 1,740 | 1,580 | 1,150 | 700 | 532 | 505 |
| 6 | 560 | 2,020 | 665 | 1,580 | 740 | 2,020 | 1,640 | 1,580 | 1,150 | 630 | 532 | 505 |
| 7 | 1,250 | 1,580 | 665 | 1,800 | 700 | 2,020 | 1,580 | 1,580 | 1,250 | 665 | 532 | 505 |
| 8 | 950 | 1,150 | 665 | 1,800 | 700 | 2,020 | 1,580 | 1,640 | 1,300 | 665 | 532 | 630 |
| 9 | 665 | 950 | 665 | 1,580 | 700 | 2,020 | 1,740 | 1,580 | 1,250 | 700 | 505 | 560 |
| 10 | 595 | 905 | 665 | 1,420 | 780 | 2,020 | 2,020 | 1,580 | 1,150 | 630 | 505 | 532 |
| 11 | 560 | 1,100 | 630 | 1,250 | 820 | 2,020 | 1,910 | 1,580 | 1,150 | 630 | 505 | 505 |
| 12 | 560 | 860 | 630 | 1,150 | 820 | 2,130 | 1,800 | 1,580 | 1,250 | 630 | 505 | 505 |
| 13 | 630 | 1,050 | 630 | 1,150 | 860 | 2,130 | 2,020 | 1,740 | 1,150 | 630 | 505 | 505 |
| 14 | 630 | 1,100 | 630 | 1,150 | 820 | 2,020 | 2,250 | 1,800 | 1,150 | 630 | 505 | 505 |
| 15 | 560 | 860 | 630 | 1,050 | 820 | 1,910 | 2,740 | 1,800 | 1,150 | 595 | 505 | 665 |
| 16 | 630 | 630 | 630 | 1,050 | 820 | 1,910 | 2,490 | 1,690 | 1,050 | 595 | 505 | 860 |
| 17 | 595 | 630 | 665 | 1,000 | 860 | 2,020 | 2,130 | 1,690 | 1,000 | 595 | 505 | 1,050 |
| 18 | 560 | 665 | 630 | 950 | 950 | 2,020 | 2,020 | 1,580 | 950 | 595 | 505 | 780 |
| 19 | 595 | 665 | 630 | 860 | 1,050 | 2,020 | 2,020 | 1,520 | 950 | 595 | 505 | 700 |
| 20 | 560 | 665 | 630 | 860 | 1,050 | 2,020 | 2,020 | 1,520 | 860 | 595 | 505 | 780 |
| 21 | 560 | 630 | 630 | 950 | 1,150 | 2,020 | 2,020 | 1,690 | 860 | 595 | 505 | 630 |
| 22 | 560 | 595 | 630 | 1,360 | 1,150 | 2,020 | 1,800 | 1,580 | 860 | 595 | 505 | 560 |
| 23 | 560 | 700 | 630 | 1,250 | 1,100 | 2,020 | 1,800 | 1,580 | 820 | 560 | 505 | 532 |
| 24 | 560 | 740 | 630 | 1,360 | 1,100 | 1,910 | 1,740 | 1,580 | 1,150 | 560 | 505 | 532 |
| 25 | 532 | 740 | 630 | 1,360 | 1,580 | 1,690 | 1,640 | 1,800 | 950 | 560 | 505 | 505 |
| 26 | 560 | 1,100 | 630 | 1,470 | 1,470 | 1,580 | 1,580 | 1,470 | 950 | 560 | 505 | 560 |
| 27 | 560 | 1,150 | 630 | 1,250 | 1,470 | 1,470 | 1,520 | 1,420 | 860 | 560 | 505 | 532 |
| 28 | 532 | 820 | 630 | 1,150 | 2,250 | 1,360 | 1,420 | 1,360 | 780 | 560 | 505 | 505 |
| 29 | 532 | 950 | 560 | 1,050 | ..... | 1,250 | 1,360 | 1,250 | 780 | 560 | 505 | 505 |
| 30 | 532 | 860 | 595 | 1,050 | ..... | 1,200 | 1,360 | 1,250 | 780 | 560 | 505 | 505 |
| 31 | 532 | ..... | 1,580 | 950 | ..... | 1,150 | ..... | 1,250 | ..... | 560 | 505 | ..... |
| 1914–15. | | | | | | | | | | | | |
| 1 | 505 | 700 | 505 | 505 | 1,470 | 740 | 1,580 | 1,150 | 1,300 | 560 | 465 | 430 |
| 2 | 630 | 740 | 505 | 505 | 1,360 | 740 | 1,800 | 1,050 | 1,300 | 560 | 465 | 430 |
| 3 | 740 | 700 | 505 | 505 | 1,250 | 740 | 2,020 | 1,050 | 1,150 | 560 | 465 | 430 |
| 4 | 630 | 630 | 505 | 595 | 950 | 740 | 1,800 | 1,000 | 1,150 | 560 | 465 | 430 |
| 5 | 560 | 595 | 505 | 560 | 860 | 740 | 1,640 | 950 | 1,100 | 560 | 465 | 430 |
| 6 | 532 | 630 | 505 | 560 | 780 | 700 | 1,580 | 1,000 | 1,050 | 560 | 465 | 430 |
| 7 | 532 | 595 | 505 | 560 | 780 | 665 | 1,580 | 950 | 1,050 | 665 | 465 | 430 |
| 8 | 595 | 560 | 505 | 665 | 740 | 665 | 1,520 | 1,050 | 950 | 560 | 465 | 430 |
| 9 | 560 | 560 | 505 | 630 | 740 | 665 | 1,360 | 1,100 | 860 | 630 | 465 | 430 |
| 10 | 700 | 560 | 505 | 595 | 700 | 665 | 1,470 | 1,200 | 860 | 560 | 465 | 430 |
| 11 | 665 | 560 | 505 | 560 | 665 | 665 | 1,580 | 1,150 | 905 | 532 | 465 | 430 |
| 12 | 630 | 560 | 505 | 560 | 630 | 700 | 1,740 | 1,150 | 860 | 532 | 465 | 430 |
| 13 | 595 | 700 | 485 | 560 | 630 | 1,050 | 1,800 | 1,250 | 780 | 532 | 465 | 430 |
| 14 | 595 | 630 | 465 | 630 | 595 | 1,420 | 1,580 | 1,200 | 780 | 532 | 448 | 430 |
| 15 | 532 | 560 | 465 | 560 | 595 | 1,250 | 1,470 | 1,100 | 780 | 505 | 448 | 430 |
| 16 | 532 | 560 | 505 | 532 | 630 | 1,250 | 1,580 | 1,050 | 780 | 505 | 448 | 415 |
| 17 | 665 | 560 | 465 | 505 | 665 | 1,300 | 1,640 | 1,150 | 740 | 505 | 448 | 430 |
| 18 | 700 | 560 | 465 | 532 | 700 | 1,420 | 1,690 | 1,580 | 700 | 505 | 448 | 430 |
| 19 | 2,250 | 560 | 485 | 532 | 740 | 1,250 | 1,800 | 1,640 | 700 | 505 | 430 | 430 |
| 20 | 1,360 | 560 | 505 | 560 | 780 | 1,420 | 1,800 | 1,420 | 660 | 485 | 430 | 415 |
| 21 | 1,150 | 560 | 465 | 532 | 740 | 1,420 | 1,690 | 1,470 | 630 | 485 | 430 | 415 |
| 22 | 905 | 532 | 505 | 505 | 740 | 1,640 | 1,520 | 1,360 | 630 | 485 | 430 | 430 |
| 23 | 780 | 532 | 505 | 505 | 700 | 1,800 | 1,420 | 1,360 | 630 | 485 | 430 | 430 |
| 24 | 780 | 505 | 505 | 505 | 700 | 1,800 | 1,300 | 1,800 | 630 | 485 | 430 | 430 |
| 25 | 700 | 532 | 505 | 560 | 740 | 1,640 | 1,250 | 1,690 | 630 | 485 | 465 | 415 |
| 26 | 700 | 505 | 560 | 505 | 700 | 1,420 | 1,300 | 1,690 | 630 | 485 | 430 | 415 |
| 27 | 630 | 505 | 505 | 505 | 740 | 1,360 | 1,360 | 1,640 | 595 | 465 | 430 | 415 |
| 28 | 630 | 532 | 505 | 532 | 820 | 1,420 | 1,360 | 1,740 | 595 | 485 | 430 | 415 |
| 29 | 595 | 532 | 505 | 560 | ..... | 1,470 | 1,420 | 1,580 | 560 | 465 | 430 | 415 |
| 30 | 595 | 505 | 505 | 595 | ..... | 1,420 | 1,250 | 1,470 | 560 | 485 | 430 | 400 |
| 31 | 595 | ..... | 505 | 630 | ..... | 1,580 | ..... | 1,360 | ..... | 485 | 430 | ..... |

NOTE.—Discharge determined from rating curve well defined between 400 and 3,000 second-feet, by measurements made in 1916 and 1917.

*Monthly discharge of Rogue River below Prospect, Oreg., for the years ending Sept. 30, 1913–1915.*

| Month. | Discharge in second-feet. | | | | | Run-off (total in acre-feet). | Accuracy. |
|---|---|---|---|---|---|---|---|
| | River. | | | Canal mean. | Mean total. | | |
| | Maximum. | Minimum. | Mean. | | | | |
| 1913. | | | | | | | |
| August 3–31 | 740 | 595 | 635 | 120 | 755 | 43,400 | B. |
| September | 780 | 505 | 569 | 120 | 689 | 41,000 | B. |
| 1913–14. | | | | | | | |
| October | 1,250 | 532 | 602 | 120 | 722 | 44,400 | B. |
| November | 2,020 | 532 | 870 | 120 | 990 | 58,900 | B. |
| December | 1,580 | 560 | 674 | 120 | 794 | 48,800 | B. |
| January | 2,020 | 860 | 1,310 | 120 | 1,430 | 87,900 | B. |
| February | 2,250 | 700 | 996 | 120 | 1,120 | 62,200 | B. |
| March | 2,250 | 1,150 | 1,860 | 120 | 1,980 | 122,000 | B. |
| April | 2,740 | 1,100 | 1,760 | 120 | 1,880 | 112,000 | B. |
| May | 1,800 | 1,250 | 1,570 | 120 | 1,690 | 104,000 | B. |
| June | 1,300 | 780 | 1,050 | 130 | 1,180 | 70,200 | B. |
| July | 820 | 560 | 624 | 130 | 754 | 46,400 | B. |
| August | 560 | 505 | 514 | 130 | 644 | 39,600 | B. |
| September | 1,050 | 505 | 583 | 130 | 713 | 42,400 | B. |
| The year | 2,740 | 505 | 1,030 | 123 | 1,150 | 839,000 | |
| 1914–15. | | | | | | | |
| October | 2,250 | 505 | 728 | 130 | 858 | 52,800 | B. |
| November | 740 | 505 | 577 | 130 | 707 | 42,100 | B. |
| December | 560 | 465 | 499 | 140 | 639 | 39,300 | B. |
| January | 665 | 505 | 553 | 140 | 693 | 42,600 | B. |
| February | 1,470 | 595 | 791 | 150 | 941 | 52,300 | B. |
| March | 1,800 | 665 | 1,150 | 170 | 1,320 | 81,200 | B. |
| April | 2,020 | 1,250 | 1,560 | 170 | 1,730 | 103,000 | B. |
| May | 1,800 | 950 | 1,300 | 170 | 1,470 | 90,400 | B. |
| June | 1,300 | 560 | 818 | 165 | 983 | 58,500 | B. |
| July | 665 | 465 | 523 | 163 | 686 | 42,200 | B. |
| August | 465 | 430 | 449 | 162 | 611 | 37,600 | B. |
| September | 430 | 400 | 425 | 153 | 578 | 34,400 | B. |
| The year | 2,250 | 400 | 781 | 154 | 935 | 676,000 | |

### ROGUE RIVER NEAR TOLO, OREG.

LOCATION.—In sec. 18, T. 36 S., R. 2 W., at Raygold, just below dam and power house of the California-Oregon Power Co., 1¼ miles below Tolo, 7 miles above Gold Hill, half a mile below mouth of Bear Creek.

DRAINAGE AREA.—2,020 square miles.

RECORDS AVAILABLE.—August 30, 1905, to September 30, 1915.

GAGE.—Friez water-stage recorder referred to vertical staff bolted to concrete pier of bridge near right bank. Gage reader, F. H. Farrar.

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

CHANNEL AND CONTROL.—Rock and boulders; practically permanent. One channel at all stages.

EXTREMES OF DISCHARGE.—Maximum stage during year from water-stage recorder, 7.4 feet at 9 p. m., February 1 (discharge, 15,400 second-feet); minimum stage from water-stage recorder, 0.00 foot during the night of August 10 to September 9 (discharge, 560 second-feet).

1905–1915: Maximum stage recorded, 20.00 feet at 7.30 a. m., November 23, 1909 (discharge estimated by extension of rating curve as 60,000 second-feet); minimum is that of 1915.

WINTER FLOW.—Stage-discharge relation unaffected 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.—Results considered excellent since recorder was installed; fair previous to that time.

*Discharge measurements of Rogue River near Tolo, Oreg., during the year ending Sept. 30, 1915.*

| Date. | Made by— | Gage height. | Discharge. |
|---|---|---|---|
| | | *Feet.* | *Sec.-ft.* |
| Mar. 13 | J. E. Stewart | 2.04 | 2,300 |
| Sept. 16 | P. V. Hodges | .94 | 1,220 |
| 16 | ....do | .58 | 906 |

*Daily discharge, in second-feet, of Rogue River near Tolo, Oreg., for the year ending Sept. 30, 1915.*

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1,260 | 1,300 | 1,350 | 1,220 | 6,020 | 2,720 | 3,130 | 2,400 | 2,890 | 1,410 | 1,200 | 1,090 |
| 2 | 1,170 | 1,350 | 1,350 | 1,350 | 9,700 | 2,440 | 3,270 | 2,240 | 2,760 | 1,420 | 1,030 | 1,150 |
| 3 | 1,260 | 1,400 | 1,540 | 1,350 | 5,800 | 2,300 | 3,340 | 2,080 | 2,630 | 1,390 | 1,060 | 1,120 |
| 4 | 1,350 | 1,440 | 1,490 | 1,540 | 4,030 | 2,300 | 3,410 | 1,950 | 2,500 | 1,460 | 1,060 | 1,130 |
| 5 | 1,350 | 1,400 | 1,440 | 1,540 | 3,020 | 2,580 | 3,480 | 1,870 | 2,380 | 1,430 | 1,070 | 1,020 |
| 6 | 1,350 | 1,740 | 1,400 | 1,640 | 2,720 | 2,300 | 3,190 | 1,860 | 2,250 | 1,470 | 1,070 | 960 |
| 7 | 1,440 | 1,690 | 1,350 | 1,590 | 2,440 | 2,180 | 3,190 | 1,850 | 2,120 | 1,690 | 1,040 | 980 |
| 8 | 1,260 | 1,690 | 1,400 | 3,180 | 2,580 | 2,060 | 3,180 | 2,010 | 2,030 | 1,560 | 1,040 | 1,020 |
| 9 | 1,350 | 1,690 | 1,400 | 2,720 | 2,440 | 2,000 | 2,910 | 2,160 | 2,000 | 1,630 | 1,080 | 1,010 |
| 10 | 1,350 | 1,590 | 1,400 | 2,060 | 2,300 | 2,060 | 3,000 | 2,320 | 1,960 | 1,520 | 1,070 | 1,010 |
| 11 | 1,350 | 1,570 | 1,350 | 1,840 | 2,180 | 2,030 | 3,020 | 2,300 | 2,040 | 1,590 | 1,070 | 1,020 |
| 12 | 1,350 | 1,560 | 1,300 | 1,790 | 2,060 | 2,000 | 3,040 | 2,200 | 2,060 | 1,540 | 1,070 | 1,040 |
| 13 | 1,350 | 1,540 | 1,260 | 2,060 | 1,950 | 2,180 | 3,480 | 2,320 | 1,910 | 1,540 | 1,080 | 1,060 |
| 14 | 1,350 | 1,590 | 1,350 | 4,210 | 1,840 | 3,180 | 3,210 | 2,410 | 1,830 | 1,530 | 1,080 | 1,050 |
| 15 | 1,740 | 1,490 | 1,100 | 3,020 | 1,790 | 3,020 | 2,930 | 2,450 | 1,760 | 1,530 | 1,070 | 1,020 |
| 16 | 1,790 | 1,350 | 1,110 | 2,180 | 1,790 | 3,020 | 2,900 | 2,360 | 1,730 | 1,510 | 1,060 | 1,070 |
| 17 | 2,120 | 1,400 | 1,130 | 1,950 | 1,790 | 3,020 | 3,020 | 2,270 | 1,680 | 1,490 | 1,050 | 1,060 |
| 18 | 2,820 | 1,400 | 1,130 | 1,790 | 2,060 | 3,180 | 3,150 | 2,810 | 1,670 | 1,470 | 1,010 | 1,080 |
| 19 | 3,510 | 1,380 | 1,130 | 1,740 | 2,300 | 2,870 | 3,260 | 3,740 | 1,620 | 1,450 | 1,030 | 1,050 |
| 20 | 3,340 | 1,350 | 1,110 | 1,740 | 2,370 | 2,870 | 3,330 | 3,350 | 1,590 | 1,430 | 1,020 | 1,040 |
| 21 | 2,440 | 1,400 | 1,140 | 1,690 | 2,440 | 3,340 | 3,210 | 3,190 | 1,570 | 1,420 | 1,040 | 1,040 |
| 22 | 2,120 | 1,440 | 1,170 | 1,640 | 2,240 | 3,510 | 2,990 | 3,070 | 1,550 | 1,400 | 1,060 | 1,030 |
| 23 | 1,790 | 1,490 | 1,170 | 1,640 | 2,300 | 3,680 | 2,780 | 2,950 | 1,550 | 1,380 | 1,000 | 1,020 |
| 24 | 1,790 | 1,540 | 1,170 | 1,540 | 2,300 | 3,840 | 2,700 | 3,510 | 1,470 | 1,360 | 1,000 | 1,040 |
| 25 | 1,640 | 1,260 | 1,170 | 1,590 | 2,720 | 3,630 | 2,630 | 3,500 | 1,530 | 1,340 | 980 | 1,010 |
| 26 | 1,540 | 1,220 | 1,170 | 1,560 | 2,580 | 3,410 | 2,560 | 3,550 | 1,580 | 1,320 | 1,000 | 990 |
| 27 | 1,490 | 1,220 | 1,170 | 1,540 | 2,440 | 3,300 | 2,560 | 3,600 | 1,500 | 1,290 | 1,030 | 1,000 |
| 28 | 1,490 | 1,300 | 1,220 | 1,490 | 2,870 | 3,200 | 2,560 | 3,700 | 1,500 | 1,320 | 1,050 | 1,040 |
| 29 | 1,490 | 1,490 | 1,170 | 1,740 | ..... | 3,090 | 2,660 | 3,570 | 1,470 | 1,300 | 1,080 | 1,000 |
| 30 | 1,400 | 1,400 | 1,130 | 1,740 | ..... | 2,940 | 2,570 | 3,250 | 1,420 | 1,360 | 1,100 | 1,000 |
| 31 | 1,400 | ..... | 1,130 | 1,790 | ..... | 3,220 | ..... | 3,050 | ..... | 1,370 | 1,100 | ..... |

NOTE.—Discharge determined from a rating curve well defined between 900 and 5,000 second-feet. Gage records from Gurley Simplex recorder Oct. 15 to Mar. 22; from Fries recorder (with use of integrator) Mar. 23 to Sept. 30. One reading daily on staff gage Oct. 1–14. Discharge interpolated Nov. 11–12, Dec. 23–25, June 2–6, July 16–25, and Sept. 20–21.

*Monthly discharge of Rogue River near Tolo, Oreg., for the year ending Sept. 30, 1915.*

| Month. | Discharge in second-feet. | | | Run-off (total in acre-feet). | Accuracy. |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | | |
| October | 3,510 | 1,170 | 1,690 | 104,000 | B. |
| November | 1,740 | 1,220 | 1,460 | 86,900 | A. |
| December | 1,540 | 1,100 | 1,270 | 76,900 | A. |
| January | 4,210 | 1,520 | 1,880 | 116,000 | A. |
| February | 9,700 | 1,790 | 2,900 | 161,000 | A. |
| March | 3,840 | 2,000 | 2,820 | 173,000 | A. |
| April | 3,480 | 2,560 | 3,000 | 180,000 | A. |
| May | 3,740 | 1,850 | 2,710 | 167,000 | A. |
| June | 2,890 | 1,420 | 1,890 | 112,000 | A. |
| July | 1,690 | 1,290 | 1,450 | 89,200 | B. |
| August | 1,200 | 980 | 1,050 | 64,600 | A. |
| September | 1,150 | 960 | 1,000 | 61,900 | B. |
| The year | 9,700 | 960 | 1,900 | 1,390,000 | |

### CALIFORNIA-OREGON POWER CO.'S FLUME NEAR PROSPECT, ORE.

LOCATION.—In sec. 6, T. 33 S., R. 3 E., at lower end of power flume, just above the forebay, and about 2 miles below Prospect.

RECORDS AVAILABLE.—August 1, 1913, to September 30, 1915.

GAGE.—Vertical staff in stilling box on right side of flume, about 500 feet above forebay, used after August 17, 1915. Gage 1 mile above forebay used August 1, 1913, to August 16, 1915.

DISCHARGE MEASUREMENTS.—Made from collar of flume.

CHANNEL AND CONTROL.—Wooden flume at the end of which there is a free fall into the forebay.

WINTER FLOW.—Stage-discharge relation never affected by ice.

ACCURACY.—Results good.

The California-Oregon Power Co.'s flume diverts water from Rogue River in the SE. ¼ sec. 30, T. 32 S., R. 3 E., and delivers it to the power plant in the NW. ¼ sec. 6, T. 33 S., R. 3 E., where a head of about 500 feet is obtained.

*Discharge measurements of California-Oregon Power Co.'s flume near Prospect, Oreg., during the years ending Sept. 30, 1913–1915.*

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---|---|---|---|---|---|---|---|
| 1912–13. | | *Feet.* | *Sec.-ft.* | 1914–15. | | *Feet.* | *Sec.-ft.* |
| July 30 | James E. Stewart | [a] 3.53 | 121 | Aug. 17 | F. F. Henshaw | 2.35 | 161 |
| | | | | 17 | do | 2.35 | 164 |
| 1913–14. | | | | Sept. 22 | P. V. Hodges | 2.19 | 143 |
| Sept. 13 | do | [a] 3.68 | 130 | | | | |

[a] Referred to old gage about midway of flume.

*Daily discharge, in second-feet, of California-Oregon Power Co.'s flume near Prospect, Oreg., for the year ending Sept. 30, 1915.*

| Day. | Aug. | Sept. | Day. | Aug. | Sept. | Day. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|
| 1 | | 157 | 11 | | 157 | 21 | 157 | 150 |
| 2 | | 157 | 12 | | 150 | 22 | 157 | 144 |
| 3 | | 157 | 13 | | 144 | 23 | 157 | 157 |
| 4 | | 157 | 14 | | 150 | 24 | 157 | 157 |
| 5 | | 150 | 15 | | 157 | 25 | 164 | 157 |
| 6 | | 150 | 16 | | 157 | 26 | 164 | 150 |
| 7 | | 144 | 17 | | 157 | 27 | 157 | 150 |
| 8 | | 157 | 18 | 164 | 157 | 28 | 157 | 144 |
| 9 | | 157 | 19 | 164 | 144 | 29 | 164 | 144 |
| 10 | | 167 | 20 | 170 | 144 | 30 | 164 | 157 |
| | | | | | | 31 | 157 | |

NOTE.—Discharge determined from rating curve well defined between 120 and 299 second-feet. Discharge not computed from readings on old gage, as stage-discharge relation was affected by baffle board placed in flume below, and gage readings themselves are somewhat uncertain. Monthly mean discharges for August, 1913, to July, 1915, estimated in order to complete the total run-off for the river station. (See Rogue River below Prospect, Oreg.)

*Monthly discharge of California-Oregon Power Co.'s flume near Prospect, Oreg., for the year ending Sept. 30, 1915.*

| Month. | Discharge in second-feet. | | | Run-off (total in acre-feet). | Accuracy. |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | | |
| August 18–31 | 170 | 167 | 162 | 4,470 | A. |
| September | 157 | 144 | 153 | 9,100 | A. |

### SOUTH FORK OF BIG BUTTE CREEK NEAR BUTTE FALLS, OREG.

LOCATION.—In the SE. ¼ sec. 11, T. 35 S., R. 2 E., at the covered highway bridge about a mile above Butte Falls, Jackson County, and about 2 miles above junction of North and South forks.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—September 20, 1910, to October 5, 1911, and August 5 to October 10, 1915.

GAGE.—Vertical staff on pier near left bank; read about three times a week. Gage reader, O. B. Morris.

DISCHARGE MEASUREMENTS.—Measurements in 1915 made by wading.

CHANNEL AND CONTROL.—Rocks and gravel; may shift.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period August 19 to October 10, 1915, 1.43 feet August 28, September 11 to 20, and September 25 (discharge, 95 second-feet); minimum stage recorded, 1.41 second-feet August 5, 19 to 22, 26, and September 23 (discharge, 85 second-feet).

1910–11 and 1915: Maximum stage recorded, 2.5 feet January 20, 1911 (discharge, 800 second-feet); minimum is that of 1915.

WINTER FLOW.—Stage-discharge relation unaffected by ice.

DIVERSIONS.—A small area of land is irrigated above the station.

REGULATION.—None.

ACCURACY.—Results considered good.

*Discharge measurements of South Fork of Big Butte Creek at Butte Falls, Oreg., during the year ending Sept. 30, 1915.*

| Date. | Made by— | Gage height. | Discharge. |
|---|---|---|---|
| | | *Feet.* | *Sec.-ft.* |
| Aug. 5 | R. P. Cowgill | 1.41 | 81.4 |
| 19 | do | 1.41 | 102 |
| Sept. 22 | P. V. Hodges | 1.42 | 92.6 |

*Daily discharge, in second-feet, of South Fork of Big Butte Creek near Butte Falls, Oreg., for the period Aug. 5 to Oct. 10, 1915.*

| Day. | Aug. | Sept. | Oct. | Day. | Aug. | Sept. | Oct. | Day. | Aug. | Sept. | Oct. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | 90 | | 11 | | 95 | | 21 | | | |
| 2 | | | 90 | 12 | | | | 22 | 85 | 90 | |
| 3 | | 90 | | 13 | | 95 | | 23 | | 85 | |
| 4 | | | 90 | 14 | | | | 24 | 90 | | |
| 5 | 85 | 90 | | 15 | | 95 | | 25 | | 95 | |
| 6 | | | | 16 | | | | 26 | 85 | | |
| 7 | | | 90 | 17 | | 95 | | 27 | | 90 | |
| 8 | | | | 18 | | | | 28 | 95 | | |
| 9 | | 90 | | 19 | 85 | | | 29 | | 90 | |
| 10 | | | 90 | 20 | 85 | 95 | | 30 | 90 | | |
| | | | | | | | | 31 | | | |

NOTE.—Discharge determined from a fairly well-defined rating curve; given only for days on which gage was read.

### LITTLE BUTTE CREEK NEAR EAGLE POINT, OREG.

LOCATION.—In the SE. ¼ sec. 35, T. 35 S., R. 1 W., at H. B. Tronson's fruit ranch, 1½ miles above Eagle Point, Jackson County.

DRAINAGE AREA.—336 square miles.

RECORDS AVAILABLE.—July 13, 1907, to September 30, 1915.

GAGE.—Vertical staff spiked to alder trees on left bank; read daily. Gage reader, H. B. Tronson.

DISCHARGE MEASUREMENTS.—Made from cable suspension bridge 40 feet above gage or by wading at extremely low water.

CHANNEL AND CONTROL.—Sand at measuring section; solid rock control.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 4.2 feet during night of February 1 (discharge, 1,420 second-feet); minimum stage recorded, —0.15 foot August 1, 2, and 13 to 20 (discharge, 7 second-feet).

1907–1915: Maximum stage recorded, 10.6 feet February 17, 1912 (discharge, 6,240 second-feet); minimum is that of 1915.

WINTER FLOW.—Stage-discharge relation unaffected by ice.

DIVERSIONS.—Practically entire low-water flow diverted above this station. The principal diversions are the main canal of the Rogue River Valley Canal Co., the municipal water supply for Medford (about 7.5 second-feet), Eagle Point ditch, and water to irrigate several hundred acres along the creek. The record at this station shows the unappropriated flow and return water.

REGULATION.—A small amount of storage is developed at Fish Lake, but was not being used in 1915.

ACCURACY.—Results considered good except for extremely low water.

*Discharge measurements of Little Butte Creek near Eagle Point, Oreg., during the year ending Sept. 30, 1915.*

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---|---|---|---|---|---|---|---|
| | | *Feet.* | *Sec.-ft.* | | | *Feet.* | *Sec.-ft.* |
| Mar. 12 | J. E. Stewart | 1.41 | 139 | Aug. 3 | R. P. Cowgill | —0.10 | 6.2 |
| July 17 | R. P. Cowgill | .32 | 18.4 | Sept. 19 | P. V. Hodges | .15 | 15.3 |

*Daily discharge, in second-feet, of Little Butte Creek near Eagle Point, Oreg., for the year ending Sept. 30, 1915.*

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 49 | 83 | 73 | 73 | 950 | 176 | 220 | 113 | 220 | 31 | 8 | 8 |
| 2 | 73 | 83 | 73 | 73 | 656 | 162 | 220 | 113 | 220 | 31 | 7 | 8 |
| 3 | 73 | 83 | 73 | 73 | 388 | 149 | 220 | 113 | 205 | 31 | 7 | 10 |
| 4 | 73 | 83 | 73 | 73 | 236 | 205 | 251 | 113 | 162 | 31 | 8 | 11 |
| 5 | 64 | 83 | 73 | 73 | 149 | 190 | 236 | 113 | 124 | 31 | 8 | 12 |
| 6 | 64 | 83 | 73 | 73 | 136 | 162 | 220 | 113 | 93 | 33 | 8 | 13 |
| 7 | 54 | 83 | 73 | 73 | 136 | 136 | 220 | 113 | 83 | 54 | 8 | 14 |
| 8 | 54 | 83 | 73 | 136 | 124 | 136 | 236 | 103 | 83 | 49 | 8 | 14 |
| 9 | 49 | 83 | 73 | 113 | 149 | 124 | 236 | 103 | 83 | 41 | 8 | 15 |
| 10 | 93 | 83 | 73 | 93 | 136 | 124 | 220 | 103 | 83 | 38 | 8 | 16 |
| 11 | 73 | 83 | 73 | 83 | 136 | 124 | 220 | 103 | 93 | 36 | 8 | 16 |
| 12 | 73 | 83 | 73 | 93 | 136 | 124 | 190 | 103 | 93 | 33 | 8 | 16 |
| 13 | 73 | 83 | 73 | 113 | 136 | 176 | 190 | 113 | 93 | 33 | 7 | 18 |
| 14 | 64 | 83 | 73 | 251 | 136 | 190 | 190 | 124 | 83 | 31 | 7 | 18 |
| 15 | 54 | 83 | 73 | 176 | 113 | 162 | 176 | 113 | 73 | 29 | 7 | 18 |
| 16 | 54 | 83 | 73 | 149 | 103 | 162 | 176 | 113 | 54 | 24 | 7 | 18 |
| 17 | 54 | 83 | 73 | 124 | 93 | 162 | 162 | 113 | 49 | 21 | 7 | 17 |
| 18 | 54 | 83 | 73 | 93 | 93 | 176 | 162 | 251 | 44 | 20 | 7 | 14 |
| 19 | 370 | 73 | 73 | 73 | 113 | 190 | 162 | 370 | 44 | 19 | 7 | 14 |
| 20 | 316 | 73 | 73 | 73 | 176 | 220 | 162 | 316 | 44 | 19 | 7 | 14 |
| 21 | 277 | 64 | 73 | 83 | 162 | 220 | 162 | 316 | 41 | 19 | 8 | 14 |
| 22 | 176 | 64 | 73 | 83 | 136 | 251 | 162 | 283 | 41 | 19 | 8 | 14 |
| 23 | 103 | 64 | 73 | 73 | 136 | 251 | 162 | 283 | 41 | 18 | 8 | 14 |
| 24 | 93 | 64 | 73 | 73 | 113 | 251 | 162 | 300 | 41 | 18 | 8 | 14 |
| 25 | 93 | 64 | 73 | 73 | 124 | 236 | 162 | 283 | 38 | 18 | 8 | 14 |
| 26 | 93 | 64 | 73 | 73 | 124 | 205 | 149 | 283 | 38 | 18 | 8 | 14 |
| 27 | 83 | 64 | 73 | 73 | 162 | 205 | 136 | 283 | 36 | 18 | 8 | 14 |
| 28 | 83 | 64 | 73 | 73 | 236 | 220 | 136 | 267 | 33 | 17 | 8 | 17 |
| 29 | 83 | 83 | 73 | 73 | ..... | 251 | 124 | 267 | 33 | 14 | 8 | 18 |
| 30 | 83 | 73 | 73 | 73 | ..... | 220 | 124 | 251 | 31 | 12 | 8 | 18 |
| 31 | 83 | ..... | 73 | 73 | ..... | 236 | ..... | 251 | ..... | 10 | 8 | ..... |

NOTE.—Discharge determined from a rating curve well defined between 30 and 600 second-feet and fairly well defined below 30 second-feet.

*Monthly discharge of Little Butte Creek near Eagle Point, Oreg., for the year ending Sept. 30, 1915.*

| Month. | Discharge in second-feet. | | | Run-off (total in acre-feet). | Accuracy. |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | | |
| October | 370 | 49 | 99.4 | 6,110 | B. |
| November | 83 | 64 | 76.9 | 4,580 | B. |
| December | 73 | 73 | 73.0 | 4,490 | B. |
| January | 251 | 73 | 93.7 | 5,760 | B. |
| February | 950 | 93 | 196 | 10,900 | B. |
| March | 251 | 124 | 187 | 11,500 | B. |
| April | 251 | 124 | 185 | 11,000 | B. |
| May | 370 | 103 | 190 | 11,700 | B. |
| June | 220 | 31 | 80.0 | 4,760 | B. |
| July | 54 | 10 | 26.3 | 1,620 | B. |
| August | 8 | 7 | 7.68 | 472 | C. |
| September | 18 | 8 | 14.5 | 863 | B. |
| The year | 950 | 7 | 102 | 73,800 | |

### ROGUE RIVER VALLEY CANAL AT INTAKE, NEAR LAKE CREEK, OREG.[1]

LOCATION.—In the SE. ¼ sec. 20, T. 36 S., R. 2 E., 100 feet below intake, and about a mile east of Lake Creek, Jackson County.

RECORDS AVAILABLE.—April 1 to September 30, 1914; April 1 to October 15, 1915.

GAGE.—Vertical staff on left bank just below fish screen; read about three times a week. Gage reader, Will Mann.

DISCHARGE MEASUREMENTS.—Made by wading.

CHANNEL AND CONTROL.—Earth section; apparently changes slightly.

EXTREMES OF DISCHARGE.—Maximum stage recorded during irrigating seasons 1914 and 1915, 2.00 feet July 20, 1915 (discharge, 34 second-feet); canal dry during winter.

ACCURACY.—Results considered fair.

Rogue River Valley canal diverts water from the right bank of North Fork of Little Butte Creek in sec 20, T. 36 S., R. 2 E., to irrigate lands in the drainage basin of Bear Creek.

*Discharge measurements of Rogue River Valley canal at intake, near Lake Creek, Oreg., during the year ending Sept. 30, 1915.*

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---|---|---|---|---|---|---|---|
| | | *Feet.* | *Sec.-ft.* | | | *Feet.* | *Sec.-ft.* |
| Apr. 30 | R. P. Cowgill | 1.45 | 16.3 | Aug. 1 | R. P. Cowgill | 1.82 | 25.7 |
| May 13 | do | 1.67 | 23.0 | Sept. 18 | P. V. Hodges | 1.80 | 16.0 |

[1] Known as Rogue River Valley canal near Brownsboro, Oreg., in report for 1914.

*Daily discharge, in second-feet, of Rogue River Valley canal at intake near Lake Creek, Oreg., for the period Apr. 1 to Oct. 15, 1915.*

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

NOTE.—Discharge determined from a fairly well defined rating curve Apr. 1 to July 24 and Aug. 6–13 and by indirect method for shifting control for rest of period. Gage read about every other day; discharge interpolated for days on which gage was not read.

*Monthly discharge of Rogue River Valley canal at intake, near Lake Creek, Oreg., for the period Apr. 1 to Oct. 15, 1915.*

| Month. | Discharge in second-feet. | | | Run-off (total in acre-feet). | Accuracy. |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | | |
| April | 16 | 14 | 14.8 | 881 | B. |
| May | 28 | 16 | 21.5 | 1,320 | B. |
| June | 28 | 22 | 25.4 | 1,510 | B. |
| July | 34 | 22 | 28.6 | 1,760 | C. |
| August | 27 | 23 | 24.8 | 1,520 | C. |
| September | 24 | 14 | 18.8 | 1,120 | C. |
| October 1–15 | 14 | 12 | 13.4 | 399 | C. |
| The period | ..... | ..... | ..... | 8 510 | |

### ROGUE RIVER VALLEY CANAL NEAR BROWNSBORO, OREG.

LOCATION.—In SW. ¼ sec. 8, T. 36 S., R. 1 E., about 200 feet above the head of Bradshaw drop, and 2 miles southeast of Brownsboro, Jackson County.

RECORDS AVAILABLE.—June 1 to September 30, 1913; April 27 to October 15, 1915.

GAGE.—Vertical staff driven in bottom of canal. Gage reader, Will Mann.

DISCHARGE MEASUREMENTS.—Made by wading near gage.

CHANNEL AND CONTROL.—Solid rock control at head of drop; aquatic plants may grow between head of drop and gage and affect stage-discharge relation.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of record in 1915, 1.60 feet July 17 (discharge, 24 second-feet); canal dry during winter.

ACCURACY.—Results considered fair.

About 300 acres of land are irrigated between the intake of the canal and this station.

*Discharge measurements of Rogue River Valley canal near Brownsboro, Oreg., during the year ending Sept. 30, 1915.*

| Date. | Made by— | Gage height. | Discharge. |
|---|---|---|---|
| | | *Feet.* | *Sec.-ft.* |
| Apr. 27 | R. P. Cowgill | 1.24 | 12.9 |
| May 13 | ....do | 1.45 | 18.9 |
| Sept. 19 | P. V. Hodges | 1.35 | 12.8 |

*Daily discharge, in second-feet, of Rogue River Valley canal near Brownsboro, Oreg., for 1915.*

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

NOTE.—Discharge determined from a fairly well-defined rating curve Apr. 27 to Aug. 20, and by indirect method for shifting control thereafter. Gage read about every other day; discharge interpolated for intervening days. Mean discharge July 24 to Aug. 13 estimated at 20 second-feet.

*Monthly discharge of Rogue River Valley canal near Brownsboro, Oreg., for the period Apr. 27 to Oct. 15, 1915.*

| Month. | Discharge, in second-feet. | | | Run-off (total in acre-feet). | Accuracy. |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | | |
| May | 21 | 14 | 17.4 | 1,070 | B. |
| June | 22 | 12 | 19.9 | 1,180 | B. |
| July | 24 | 14 | 20.4 | 1,250 | C. |
| August | 21 | 16 | 18.4 | 1,130 | C. |
| September | 19 | 10 | 14.8 | 881 | C. |
| October 1–15 | 10 | 9 | 9.4 | 280 | C. |
| The period | ..... | ..... | ..... | 5,790 | |

### BEAR CREEK AT MEDFORD, OREG.

LOCATION.—In the NW. ¼ sec. 30, T. 37 S., R. 1 W., just above the Main Street Bridge in Medford, Jackson County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—March 13 to September 30, 1915.

GAGE.—Vertical staff at southeast corner of Page theater building, on left bank. Gage reader, R. P. Cowgill.

DISCHARGE MEASUREMENTS.—Made from bridge or by wading; conditions favorable.

CHANNEL AND CONTROL.—Channel of loose gravel; a concrete sewer passing under creek forms a partial control.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period March 13 to September 30, 2.45 feet March 31 (discharge, 209 second-feet); minimum stage recorded, 1.25 feet August 20 (discharge, 0.2 second-foot or less).

WINTER FLOW.—No record.

DIVERSIONS.—A large area above the station is irrigated from the flood waters of Bear Creek.

REGULATION.—None.

ACCURACY.—Results considered excellent except for period during which stream was practically dry.

*Discharge measurements of Bear Creek at Medford, Oreg., during the year ending Sept. 30, 1915.*

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---|---|---|---|---|---|---|---|
| | | *Feet.* | *Sec.-ft.* | | | *Feet.* | *Sec.-ft.* |
| May 19 | Rhea Luper | 2.10 | 118 | June 12 | R. P. Cowgill | 1.90 | 65.5 |
| Mar. 13 | Stewart and Cowgill | 2.23 | 131 | 23 | do | 1.73 | 37.8 |
| Apr. 4 | R. P. Cowgill | 2.33 | 170 | 29 | do | 1.65 | 25.6 |
| May 3 | do | 2.11 | 110 | July 25 | do | 1.37 | 2.7 |
| 9 | do | 1.98 | 79.1 | Sept. 14 | P. V. Hodges | 1.30 | .2 |

*Daily discharge, in second-feet, of Bear Creek at Medford, Oreg., for the year ending Sept. 30, 1915.*

| Day. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|
| 1 | ..... | 178 | 108 | 103 | 21 | ..... | ..... |
| 2 | ..... | 193 | 103 | 96 | 20 | ..... | ..... |
| 3 | ..... | 193 | 110 | 85 | 19 | ..... | ..... |
| 4 | ..... | 178 | 108 | 81 | 21 | ..... | ..... |
| 5 | ..... | 171 | 99 | 72 | 26 | ..... | ..... |
| 6 | ..... | 171 | 87 | 77 | 27 | ..... | ..... |
| 7 | ..... | 171 | 87 | 81 | 36 | ..... | ..... |
| 8 | ..... | 148 | 74 | 70 | 33 | ..... | ..... |
| 9 | ..... | 142 | 77 | 66 | 38 | ..... | ..... |
| 10 | ..... | 142 | 99 | 66 | 33 | ..... | ..... |
| 11 | ..... | 142 | 92 | 70 | 28 | ..... | ..... |
| 12 | ..... | 142 | 96 | 70 | 26 | ..... | ..... |
| 13 | 142 | 142 | 103 | 66 | 22 | ..... | ..... |
| 14 | 162 | 133 | 108 | 55 | 23 | ..... | 0.2 |
| 15 | 162 | 133 | 113 | 52 | 21 | ..... | ..... |
| 16 | 178 | 133 | 106 | 50 | 20 | ..... | ..... |
| 17 | 178 | 133 | 106 | 45 | 12 | ..... | ..... |
| 18 | 156 | 133 | 120 | 46 | 13 | ..... | ..... |
| 19 | 148 | 133 | 156 | 39 | 11 | ..... | ..... |
| 20 | 148 | 133 | 148 | 39 | 8.5 | 0 2 | ..... |
| 21 | 178 | 133 | 130 | 39 | 7.8 | ..... | ..... |
| 22 | 178 | 120 | 126 | 36 | 3.5 | ..... | ..... |
| 23 | 178 | 108 | 110 | 36 | 3.4 | ..... | ..... |
| 24 | 178 | 108 | 133 | 36 | 3.2 | ..... | ..... |
| 25 | 162 | 142 | 116 | 34 | 3.1 | ..... | ..... |
| 26 | 148 | 128 | 118 | 36 | 2.1 | ..... | ..... |
| 27 | 148 | 108 | 110 | 31 | 1.2 | ..... | ..... |
| 28 | 162 | 108 | 139 | 29 | 0.2 | ..... | ..... |
| 29 | 193 | 108 | 123 | 26 | .2 | ..... | ..... |
| 30 | 193 | 108 | 113 | 22 | .2 | ..... | ..... |
| 31 | 209 | ..... | 116 | ..... | .2 | ..... | ..... |

NOTE.—Discharge determined from a well-defined rating curve. Discharge interpolated June 23, 24, 26, 27.

*Monthly discharge of Bear Creek at Medford, Oreg., for the year ending Sept. 30, 1915.*

| Month. | Discharge in second-feet. | | | Run-off (total in acre-feet). | Accuracy. |
|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | | |
| March 13–31 | 209 | 142 | 168 | 6,350 | A. |
| April | 193 | 108 | 140 | 8,330 | A. |
| May | 156 | 74 | 111 | 6,820 | A. |
| June | 103 | 22 | 55.1 | 3,280 | A. |
| July | 38 | .2 | 15.6 | 959 | B. |
| August | | | *a*.2 | 12 | C. |
| September | | | *a*.2 | 12 | C. |
| The period | | | | 25,800 | |

*a* Estimated.

## UMPQUA RIVER BASIN.

### UMPQUA RIVER NEAR ELKTON, OREG.

LOCATION.—In sec. 8, T. 23 S., R. 7 W., at the falls in the river, 4 miles south (by road) from Elkton, and 8 miles (by river) above Elk Creek.

DRAINAGE AREA.—3,680 square miles.

RECORDS AVAILABLE.—October 18, 1905, to December 31, 1906, and May 12, 1907, to September 30, 1915.

GAGE.—Staff in five sections. Low-water section inclined, the others vertical. Datum lowered 0.52 foot September 2, 1910. Gage read twice daily by D. C. Higginbotham.

DISCHARGE MEASUREMENTS.—Made from ferry 100 feet below gage.

CHANNEL AND CONTROL.—Gravel; somewhat shifting.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 12.0 feet at 7 a. m, February 3 (discharge, 33,100 second-feet); minimum stage recorded, 0.10 foot September 17 to 30 (discharge, 950 second-feet).

1905–1915: Maximum stage recorded, 38.5 feet (present datum) at 7 a. m. November 23, 1909; minimum stage occurred in 1915.

WINTER FLOW.—Stage-discharge relation unaffected by ice.

DIVERSIONS.—Practically none.

REGULATION.—Practically none.

ACCURACY.—Stage-discharge relation changed slightly between 1911 and 1914; records as published for 1913, in Water-Supply Paper 362, are probably slightly low. Records for 1914 and 1915 considered good except those for low water of 1914, which may be slightly too low.

The following discharge measurement was made by M. S. Kelley:

August 12, 1915: Gage height, 0.24 foot; discharge, 1,040 second-feet.

*Daily discharge, in second-feet, of Umpqua River near Elkton, Oreg., for the years ending Sept. 30, 1914–15.*

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1913–14. | | | | | | | | | | | | |
| 1 | 1,450 | 1,240 | 14,700 | 33,100 | 17,100 | 26,200 | 6 800 | 4,560 | 3,290 | 2,150 | 1,240 | 1,040 |
| 2 | 1,340 | 1,450 | 13,200 | 22,000 | 16,400 | 22,000 | 6,400 | 4,230 | 2,990 | 2,020 | 1,240 | 1,040 |
| 3 | 1,240 | 1,450 | 10,800 | 30,700 | 15,700 | 18,500 | 6,010 | 3,910 | 2,690 | 2,410 | 1,240 | 1,040 |
| 4 | 1,240 | 1,900 | 9,600 | 24,100 | 15,000 | 17,100 | 6,010 | 4,390 | 2,690 | 2,150 | 1,240 | 1,040 |
| 5 | 1,240 | 2,840 | 8,600 | 22,000 | 14,400 | 20,200 | 6,800 | 4,560 | 2,990 | 1,900 | 1,140 | 1,040 |
| 6 | 1,240 | 4,900 | 7,890 | 20,600 | 13,500 | 21,300 | 6,600 | 4,230 | 3,290 | 1,900 | 1,140 | 1,040 |
| 7 | 1,340 | 15,700 | 7,220 | 18,500 | 12,300 | 17,800 | 6,010 | 4,730 | 4,230 | 1,670 | 1,140 | 1,040 |
| 8 | 4,560 | 12,000 | 6,800 | 17,100 | 11,100 | 15,700 | 5,630 | 5,080 | 6,600 | 1,670 | 1,140 | 1,040 |
| 9 | 5,630 | 7,660 | 6,400 | 15,000 | 9,900 | 14,400 | 6,010 | 4,560 | 6,800 | 1,670 | 1,140 | 1,340 |
| 10 | 4,900 | 6,800 | 6,010 | 12,600 | 7,660 | 13,200 | 7,440 | 4,230 | 5,440 | 1,780 | 1,140 | 1,450 |
| 11 | 4,230 | 6,010 | 5,630 | 11,400 | 7,440 | 12,000 | 10,500 | 3,910 | 4,900 | 1,670 | 1,140 | 1,240 |
| 12 | 3,590 | 5,080 | 4,900 | 10,800 | 10,200 | 11,400 | 9,100 | 3,910 | 4,560 | 1,450 | 1,140 | 1,240 |
| 13 | 2,990 | 4,390 | 4,070 | 11,100 | 9,600 | 10,800 | 8,600 | 4,230 | 4,230 | 1,450 | 1,140 | 1,140 |
| 14 | 2 410 | 3,590 | 3,440 | 12,300 | 9,100 | 9,100 | 8,120 | 4,730 | 3,910 | 1,670 | 1,140 | 1,140 |
| 15 | 2,150 | 2,990 | 2,990 | 13,500 | 8,600 | 8,120 | 8,360 | 4,560 | 3,590 | 1,670 | 1,140 | 1,140 |
| 16 | 1,900 | 2,690 | 2,990 | 14,700 | 8,360 | 7,660 | 17,400 | 4,230 | 3,290 | 1,450 | 1,140 | 1,340 |
| 17 | 2,550 | 2,550 | 2,840 | 16,000 | 7,660 | 7,220 | 15,700 | 3,910 | 2,990 | 1,450 | 1,140 | 1,780 |
| 18 | 2,990 | 2,990 | 2,990 | 17,800 | 6,800 | 6,800 | 12,000 | 3,910 | 2,690 | 1,340 | 1,140 | 2,840 |
| 19 | 2,990 | 3,440 | 2,990 | 20,200 | 6,400 | 6,400 | 10,200 | 3,590 | 2,690 | 1,240 | 1,140 | 2,280 |
| 20 | 2,690 | 3,910 | 2,840 | 24,100 | 6,010 | 6,200 | 9,100 | 3,910 | 2,410 | 1,240 | 1,140 | 1,900 |
| 21 | 2,410 | 4,230 | 2,990 | 29,100 | 5,630 | 6,010 | 8,120 | 5,230 | 2,150 | 1,450 | 1,040 | 1,670 |
| 22 | 2,020 | 5,630 | 3,290 | 45,100 | 5,260 | 5,630 | 7,220 | 6,010 | 2,280 | 1,240 | 1,040 | 1,900 |
| 23 | 1,670 | 5,260 | 3,750 | 45,900 | 5,630 | 6,010 | 8,600 | 4,900 | 2,840 | 1,240 | 1,040 | 2,020 |
| 24 | 1,450 | 4,900 | 4,390 | 38,700 | 6,400 | 5,630 | 8,120 | 4,560 | 3,290 | 1,450 | 1,040 | 1,670 |
| 25 | 1,240 | 4,900 | 5,080 | 48,300 | 8,600 | 5,260 | 7,660 | 4,900 | 3,290 | 1,450 | 1,040 | 1,670 |
| 26 | 1,140 | 6,010 | 9,100 | 57,100 | 10,800 | 4,900 | 7,220 | 6,200 | 2,990 | 1,340 | 1,040 | 1,560 |
| 27 | 1,140 | 7,220 | 8,600 | 53,500 | 15,700 | 5,080 | 6,200 | 6,010 | 2,690 | 1,340 | 1,040 | 1,450 |
| 28 | 1,140 | 9,350 | 7,220 | 37,100 | 20,200 | 4,900 | 5,630 | 5,260 | 2,410 | 1,240 | 1,040 | 1,450 |
| 29 | 1,140 | 10,800 | 6,200 | 24,800 | ------- | 5,260 | 5,260 | 4,560 | 2,150 | 1,240 | 1,040 | 1,340 |
| 30 | 1,140 | 13,800 | 5,630 | 18,500 | ------- | 5,820 | 4,900 | 3,910 | 2,150 | 1,240 | 1,040 | 1,240 |
| 31 | 1,140 | ------- | 5,260 | 17,800 | ------- | 6,400 | ------- | 3,590 | ------- | 1,240 | 1,040 | ------- |
| 1914–15. | | | | | | | | | | | | |
| 1 | 1,240 | 3,290 | 6,400 | 3,750 | 4,560 | 8,600 | 6,010 | 3,440 | 7,220 | 1,670 | 1,140 | 1,040 |
| 2 | 1,450 | 3,290 | 5,080 | 4,900 | 12,000 | 8,120 | 5,820 | 3,910 | 6,800 | 1,670 | 1,140 | 1,040 |
| 3 | 1,780 | 2,990 | 5,630 | 6,010 | 29,100 | 7,220 | 6,400 | 3,910 | 6,400 | 1,670 | 1,140 | 1,040 |
| 4 | 3,910 | 2,840 | 7,010 | 6,800 | 17,100 | 7,660 | 7,010 | 3,590 | 6,010 | 1,670 | 1,140 | 1,040 |
| 5 | 3,140 | 2,690 | 6,400 | 6,200 | 14,700 | 8,600 | 8,120 | 3,290 | 5,630 | 1,900 | 1,140 | 1,040 |
| 6 | 2,410 | 2,410 | 6,010 | 5,440 | 13,800 | 8,600 | 7,220 | 3,290 | 4,900 | 2,150 | 1,140 | 1,040 |
| 7 | 1,900 | 2,410 | 5,630 | 6,800 | 13,200 | 7,660 | 6,200 | 2,990 | 4,230 | 1,900 | 1,140 | 1,040 |
| 8 | 1,670 | 2,690 | 5,630 | 22,400 | 12,600 | 7,220 | 5,630 | 2,690 | 3,590 | 1,670 | 1,140 | 1,040 |
| 9 | 1,670 | 2,690 | 7,660 | 19,200 | 12,000 | 6,800 | 5,260 | 2,690 | 3,290 | 1,450 | 1,140 | 1,040 |
| 10 | 2,150 | 2,410 | 9,600 | 14,400 | 11,400 | 6,400 | 4,900 | 2,990 | 3,910 | 1,340 | 1,140 | 1,040 |
| 11 | 2,990 | 2,150 | 8,850 | 11,700 | 10,800 | 6,010 | 4,900 | 2,990 | 4,230 | 1,450 | 1,140 | 1,040 |
| 12 | 3,590 | 1,900 | 7,660 | 10,800 | 10,200 | 5,630 | 5,630 | 2,990 | 3,910 | 1,340 | 1,140 | 1,040 |
| 13 | 4,560 | 2,150 | 6,800 | 10,200 | 9,600 | 5,260 | 6,400 | 3,290 | 3,590 | 1,140 | 1,140 | 1,040 |
| 14 | 3,750 | 2,690 | 5,820 | 22,000 | 9,100 | 4,900 | 6,010 | 5,820 | 3,290 | 1,240 | 1,140 | 1,040 |
| 15 | 2,550 | 3,440 | 5,260 | 23,400 | 8,600 | 6,010 | 5,630 | 6,400 | 2,990 | 1,450 | 1,140 | 1,040 |
| 16 | 1,900 | 3,290 | 4,900 | 18,500 | 8,120 | 8,600 | 5,260 | 6,010 | 2,690 | 1,240 | 1,140 | 1,040 |
| 17 | 1,900 | 2,990 | 4,560 | 16,400 | 7,660 | 9,600 | 4,900 | 6,010 | 2,410 | 1,240 | 1,140 | 950 |
| 18 | 2,020 | 2,840 | 4,230 | 13,800 | 7,220 | 8,850 | 4,560 | 7,220 | 2,410 | 1,140 | 1,140 | 950 |
| 19 | 3,750 | 2,690 | 3,910 | 12,000 | 6,400 | 7,660 | 4,230 | 11,100 | 2,990 | 1,240 | 1,140 | 950 |
| 20 | 22,000 | 2,550 | 3,590 | 10,500 | 6,010 | 6,600 | 3,910 | 14,400 | 2,690 | 1,450 | 1,140 | 950 |
| 21 | 10,500 | 2,410 | 3,290 | 9,600 | 6,010 | 6,010 | 4,390 | 12,000 | 2,550 | 1,450 | 1,140 | 950 |
| 22 | 8,360 | 2,150 | 2,990 | 9,100 | 6,800 | 5,630 | 4,900 | 10,500 | 2,410 | 1,240 | 1,140 | 950 |
| 23 | 7,010 | 2,150 | 2,690 | 8,120 | 7,899 | 6,010 | 4,560 | 9,100 | 2,150 | 1,240 | 1,140 | 950 |
| 24 | 6,010 | 2,410 | 2,410 | 7,660 | 8,850 | 6,400 | 4,230 | 7,660 | 2,150 | 1,240 | 1,140 | 950 |
| 25 | 4,900 | 2,410 | 2,410 | 7,220 | 8,600 | 6,400 | 3,910 | 8,120 | 2,150 | 1,140 | 1,140 | 950 |
| 26 | 4,560 | 2,150 | 3,290 | 6,400 | 8,120 | 6,010 | 3,590 | 10,800 | 2,150 | 1,140 | 1,040 | 950 |
| 27 | 4,230 | 1,900 | 3,910 | 6,010 | 8,120 | 5,630 | 3,290 | 9,100 | 1,900 | 1,240 | 1,040 | 950 |
| 28 | 3,910 | 2,280 | 3,910 | 5,630 | 8,600 | 5,630 | 3,590 | 8,600 | 1,900 | 1,450 | 1,040 | 950 |
| 29 | 3,590 | 2,690 | 3,590 | 5,260 | ------- | 6,400 | 3,590 | 8,360 | 1,900 | 1,240 | 1,040 | 950 |
| 30 | 3,290 | 5,080 | 3,290 | 4,560 | ------- | 6,800 | 3,290 | 8,120 | 1,670 | 1,140 | 1,040 | 950 |
| 31 | 2,990 | ------- | 2,990 | 4,560 | ------- | 6,400 | ------- | 7,660 | ------- | 1,140 | 1,040 | ------- |

NOTE.—Daily discharge ascertained from rating curve well defined below 40,000 second-feet, except for low water of 1914, for which it is poorly defined.

*Monthly discharge of Umpqua River near Elkton, Oreg., for the years ending Sept. 30, 1914–15.*

[Drainage area, 3,680 square miles.]

| Month. | Discharge in second-feet. | | | | Run-off. | | Accuracy. |
|---|---|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | Per square mile. | Depth in inches on drainage area. | Total in acre-feet. | |
| 1913–14. | | | | | | | |
| October | 5,630 | 1,140 | 2,200 | 0.598 | 0.69 | 135,000 | B. |
| November | 15,700 | 1,240 | 5,520 | 1.50 | 1.67 | 328,000 | B. |
| December | 14,700 | 2,840 | 6,080 | 1.65 | 1.90 | 374,000 | B. |
| January | 57,100 | 10,800 | 25,300 | 6.88 | 7.93 | 1,560,000 | B. |
| February | 20,200 | 5,260 | 10,400 | 2.83 | 2.95 | 578,000 | B. |
| March | 26,200 | 4,900 | 10,700 | 2.91 | 3.36 | 658,000 | B. |
| April | 17,400 | 4,900 | 8,060 | 2.19 | 2.44 | 480,000 | B. |
| May | 6,200 | 3,590 | 4,530 | 1.23 | 1.42 | 279,000 | B. |
| June | 6,800 | 2,150 | 3,420 | .929 | 1.04 | 204,000 | B. |
| July | 2,410 | 1,240 | 1,560 | .424 | .49 | 95,900 | B. |
| August | 1,240 | 1,040 | 1,120 | .304 | .35 | 68,900 | B. |
| September | 2,840 | 1,040 | 1,440 | .391 | .44 | 85,700 | B. |
| The year | 57,100 | 1,040 | 6,690 | 1.82 | 24.68 | 4,850,000 | |
| 1914–15. | | | | | | | |
| October | 22,000 | 1,240 | 4,180 | 1.14 | 1.31 | 257,000 | B. |
| November | 5,080 | 1,900 | 2,670 | .726 | .81 | 159,000 | B. |
| December | 9,600 | 2,410 | 5,010 | 1.36 | 1.57 | 308,000 | B. |
| January | 23,400 | 3,750 | 10,300 | 2.80 | 3.23 | 633,000 | A. |
| February | 29,100 | 4,560 | 10,300 | 2.80 | 2.92 | 572,000 | A. |
| March | 9,600 | 4,900 | 6,880 | 1.87 | 2.16 | 423,000 | A. |
| April | 8,120 | 3,290 | 5,110 | 1.39 | 1.55 | 304,000 | A. |
| May | 14,400 | 2,690 | 6,420 | 1.74 | 2.01 | 395,000 | A. |
| June | 7,220 | 1,670 | 3,470 | .943 | 1.05 | 206,000 | A. |
| July | 2,150 | 1,140 | 1,410 | .383 | .44 | 86,700 | A. |
| August | 1,140 | 1,040 | 1,120 | .304 | .35 | 68,900 | B. |
| September | 1,040 | 950 | 998 | .271 | .30 | 59,400 | B. |
| The year | 29,100 | 950 | 4,790 | 1.30 | 17.70 | 3,470,000 | |

### NORTH UMPQUA RIVER AT TOKETEE FALLS, OREG.

LOCATION.—In T. 26 S., R. 5 E. (unsurveyed), half a mile above Toketee Falls, one-eighth mile below mouth of Clearwater River, 15 miles northwest of Diamond Lake, about 52 miles east of Hoaglin post office by trail, and 76 miles east of Roseburg, Douglas County.

DRAINAGE AREA.—337 square miles (measured on topographic map).

RECORDS AVAILABLE.—February 26, 1908, to July 20, 1909; December 19, 1914, to September 30, 1915.

GAGE.—Stevens water-stage recorder on left bank, about one-eighth mile above bridge on Mountain Meadows trail. Vertical staff at same site and datum used 1908 and 1909.

DISCHARGE MEASUREMENTS.—Made from cable about 75 feet below gage; good measuring conditions.

CHANNEL AND CONTROL.—Boulders and rock; probably permanent.

EXTREMES OF STAGE.—Maximum stage recorded, 4.33 feet, January 21, 1909; minimum stage recorded, 1.40 feet, September 19 to 25, 29, and 30, 1915.

WINTER FLOW.—Stage-discharge relation unaffected by ice, as most of the low-water discharge is from springs.

DIVERSIONS.—None.

REGULATION.—None.

COOPERATION.—Gage heights for 1908 and 1909 furnished by the Southern Pacific Co.

Determinations of daily and monthly discharge withheld for additional data.

*Discharge measurements of North Umpqua River at Toketee Falls, Oreg., during the year ending Sept. 30, 1915.*

| Date. | Made by— | Gage height. | Discharge. |
|---|---|---|---|
| | | *Feet.* | *Sec.-ft.* |
| Dec. 20 | C. G. Paulsen | 1.61 | 633 |
| Aug. 13 | Henshaw and Kuhns | 1.49 | 622 |
| Sept. 19 | H. C. Kuhns[a] | 1.42 | 596 |

[a] Assistant forest ranger.

*Daily gage height, in feet, of North Umpqua River at Toketee Falls, Oreg., for the years ending Sept. 30, 1908, 1909, and 1915.*

| Day. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|
| 1908. | | | | | | | | |
| 1 | | 2.80 | 2.10 | 2.65 | 2.75 | 2.65 | 2.25 | 2.10 |
| 2 | | 2.90 | 2.10 | 2.75 | 2.75 | 2.75 | 2.25 | 2.10 |
| 3 | | 2.00 | 2.15 | 2.85 | 2.75 | 2.65 | 2.15 | 2.00 |
| 4 | | 1.90 | 2.25 | 2.85 | 2.65 | 2.65 | 2.15 | 2.10 |
| 5 | | 1.90 | 2.25 | 2.75 | 2.65 | 2.65 | 2.15 | 2.06 |
| 6 | | 1.85 | 2.25 | 2.85 | 2.65 | 2.65 | 2.15 | 1.90 |
| 7 | | 1.85 | 2.25 | 3.00 | 2.75 | 2.60 | 2.15 | 1.90 |
| 8 | | | 2.15 | 3.00 | 2.85 | 2.60 | 2.15 | 1.90 |
| 9 | | 1.85 | 2.25 | 3.10 | 3.00 | 2.50 | 2.15 | 1.90 |
| 10 | | 1.85 | 2.40 | 3.00 | 3.15 | 2.50 | 2.15 | 1.90 |
| 11 | | 1.90 | 2.40 | 3.15 | 3.15 | 2.50 | 2.15 | 1.90 |
| 12 | | 1.90 | 2.50 | 3.10 | 3.15 | 2.58 | 2.15 | 1.90 |
| 13 | | 2.00 | 2.50 | 3.15 | 3.15 | 2.50 | 2.15 | 1.90 |
| 14 | | 2.10 | 2.50 | 3.15 | 3.25 | 2.50 | 2.15 | 1.90 |
| 15 | | 2.60 | 2.60 | 3.10 | 3.10 | 2.50 | 2.15 | 1.85 |
| 16 | | 3.10 | 2.65 | 3.00 | 3.00 | 2.40 | 2.15 | 1.85 |
| 17 | | 3.25 | 2.75 | 3.10 | 3.00 | 2.40 | 2.15 | 1.85 |
| 18 | | 3.25 | 2.75 | 3.10 | 2.90 | 2.35 | 2.15 | 1.85 |
| 19 | | 2.75 | 2.75 | 3.00 | 2.85 | 2.25 | 2.00 | 1.85 |
| 20 | | 2.50 | 3.00 | 3.10 | 2.90 | 2.25 | 2.10 | 1.85 |
| 21 | | 2.40 | 3.25 | 3.00 | 2.85 | 2.25 | 2.00 | 1.85 |
| 22 | | 2.40 | 3.25 | 2.85 | 2.85 | 2.25 | 2.00 | 1.85 |
| 23 | | 2.40 | 3.40 | 2.85 | 2.75 | 2.35 | 2.00 | 1.85 |
| 24 | | 2.35 | 3.25 | 2.85 | 2.75 | 2.40 | 2.00 | 1.85 |
| 25 | | 2.35 | 3.10 | 2.75 | 2.75 | 2.40 | 2.00 | 1.85 |
| 26 | 2.00 | 2.25 | 3.00 | 2.85 | 2.75 | 2.35 | 2.00 | 1.85 |
| 27 | 2.10 | 2.25 | 2.85 | 2.85 | 2.65 | 2.35 | 2.00 | 1.85 |
| 28 | 2.10 | 2.25 | 2.65 | 2.75 | 2.65 | 2.35 | 2.00 | 1.85 |
| 29 | 2.00 | 2.25 | 2.65 | 2.75 | 2.65 | 2.25 | 2.00 | 1.85 |
| 30 | | | 2.65 | 2.75 | 2.65 | 2.25 | 2.00 | 1.85 |
| 31 | | | | 2.85 | | 2.25 | 2.00 | |

*Daily gage height, in feet, of North Umpqua River at Toketee Falls, Oreg., for the years ending Sept. 30, 1908, 1909, and 1915*—Continued.

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. |
|---|---|---|---|---|---|---|---|---|---|---|
| 1908-9. | | | | | | | | | | |
| 1 | 1.85 | 2.15 | 2.00 | 2.10 | 2.50 | 2.25 | 2.15 | 2 25 | 2.90 | 2.15 |
| 2 | 1.85 | 2.15 | 2.00 | 2.10 | 2.25 | 2.15 | 2.15 | 2 35 | 3.00 | 2.10 |
| 3 | 1.85 | 2.10 | 2.00 | 2.10 | 2.25 | 2.15 | 2.15 | 2.50 | 3.00 | 2.00 |
| 4 | 1.85 | 2.10 | 2.00 | 2.50 | 2.15 | 2.15 | 2.15 | 2.65 | 2.90 | 2.00 |
| 5 | 1.85 | 2.10 | 1.90 | 3.15 | 2.15 | 2.25 | 2.25 | 2.75 | 2.85 | 2.00 |
| 6 | 1.75 | 2.00 | 1.90 | 3.10 | 2.15 | 2.25 | 2.25 | 2.75 | 2.75 | 2.25 |
| 7 | 1.75 | 2.00 | 1.90 | 3.25 | 2.10 | 2.25 | 2.25 | 2 65 | 2.75 | 2.25 |
| 8 | 1.75 | 2.00 | 1.90 | 3.10 | 2.10 | 2.15 | 2.02 | 2.60 | 2.65 | 2.15 |
| 9 | 1.75 | 1.90 | 1.90 | 3.10 | 2.10 | 2.25 | 2.02 | 2.60 | 2.65 | 2.10 |
| 10 | 1.75 | 1.90 | 1.85 | 2.85 | 2.00 | 2.25 | 2.02 | 2.65 | 2.65 | 2.00 |
| 11 | 1.75 | 1.90 | 1.85 | 2.50 | 2.00 | 2.25 | 2.02 | 2.65 | 2.50 | 2.00 |
| 12 | 1.85 | 1.90 | 1.85 | 2.15 | 2.10 | 2.25 | 2.02 | 2.60 | 2.50 | 2.00 |
| 13 | 1.85 | 1.85 | 1.85 | 2.10 | 2.10 | 2.25 | 2.02 | 2.60 | 2.50 | 2.00 |
| 14 | 2.00 | 1.85 | 1.85 | 2.15 | 2.10 | 2.25 | 2.10 | 2.50 | 2.40 | 2.00 |
| 15 | 2.25 | 1.85 | 1.85 | 2.50 | 2.15 | 2.25 | 2.10 | 2.40 | 2.40 | 1.90 |
| 16 | 2.50 | 1.85 | 1.85 | 3.65 | 2.15 | 2.35 | 2.10 | 2.40 | 2.40 | 1.90 |
| 17 | 2.25 | 1.85 | 1.85 | 3.50 | 2.35 | 2.25 | 2.10 | 2.40 | 2.40 | 1.90 |
| 18 | 2.10 | 1.90 | 1.85 | 3.75 | 2.65 | 2.35 | 2.10 | 2.35 | 2.50 | 1.90 |
| 19 | 2.25 | 2.00 | 1.85 | 4.00 | 2.50 | 2.25 | 2.10 | 2.35 | 2.50 | 1.90 |
| 20 | 2.25 | 2.35 | 1.75 | 4.25 | 2.40 | 2.25 | 2.10 | 2.35 | 2.50 | 1.90 |
| 21 | 2.15 | 2.35 | 1.75 | 4.35 | 2.50 | 2.15 | 2.10 | 2.35 | 2.35 | ..... |
| 22 | 2.10 | 2.40 | 1.85 | 4.10 | 2.50 | 2.15 | 2.10 | 2.35 | 2.25 | ..... |
| 23 | 2.10 | 2.35 | 1.85 | 3.35 | 2.40 | 2.15 | 2.10 | 2.25 | 2.25 | ..... |
| 24 | 2.10 | 2.25 | 1.85 | 3.10 | 2.35 | 2.15 | 2.10 | 2.25 | 2.25 | ..... |
| 25 | 2.10 | 2.25 | 1.85 | 3.00 | 2.35 | 2.10 | 2.10 | 2.25 | 2.25 | ..... |
| 26 | 2.10 | 2.15 | 1.90 | 3.00 | 2.25 | 2.10 | 2.10 | 2.25 | 2.25 | ..... |
| 27 | 2.10 | 2.15 | 1.90 | 2.90 | 2.25 | 2.10 | 2.10 | 2.25 | 2.15 | ..... |
| 28 | 2.10 | 2.10 | 1.90 | 2.90 | 2.25 | 2.15 | 2.15 | 2.65 | 2.15 | ..... |
| 29 | 2.10 | 2.10 | 2.00 | 2.90 | ..... | 2.15 | 2.15 | 2.65 | 2.15 | ..... |
| 30 | ..... | 2.00 | 2.00 | 2.85 | ..... | 2.10 | 2.15 | 2.65 | 2.15 | ..... |
| 31 | ..... | ..... | 2.10 | 2.67 | ..... | 2.15 | ..... | 2.65 | ..... | ..... |

| Day. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|
| 1914-15. | | | | | | | | |
| 1 | ..... | 1.64 | 1.87 | 1.80 | 2.07 | 1.96 | ..... | 1.42 |
| 2 | ..... | 1.64 | 1.85 | 1.80 | 2.14 | 1.94 | ..... | 1.42 |
| 3 | ..... | 1.66 | 1.85 | 1.80 | 2.23 | 1.93 | ..... | 1.42 |
| 4 | ..... | 1.65 | 1.83 | 1.82 | 2.19 | 1.90 | ..... | 1.41 |
| 5 | ..... | 1.66 | 1.81 | 1.81 | 2.14 | 1.88 | ..... | 1.42 |
| 6 | ..... | 1.66 | 1.79 | 1.81 | 2.11 | 1.87 | ..... | 1.42 |
| 7 | ..... | 1.72 | 1.78 | 1.81 | 2.13 | 1.87 | ..... | 1.43 |
| 8 | ..... | 1.75 | 1.75 | 1.79 | 2.08 | 1.87 | ..... | 1.42 |
| 9 | ..... | 1.72 | 1.75 | 1.77 | 2.05 | 1.90 | ..... | 1.42 |
| 10 | ..... | 1.71 | 1.74 | 1.77 | 2.05 | 1.94 | ..... | 1.42 |
| 11 | ..... | 1.70 | 1.75 | 1.77 | 2.08 | 1.93 | ..... | 1.43 |
| 12 | ..... | 1.70 | 1.80 | 1.78 | 2.15 | 1.96 | ..... | 1.43 |
| 13 | ..... | 1.78 | 1.81 | 1.84 | 2.19 | 2.01 | 1.49 | 1.44 |
| 14 | ..... | 1.80 | 1.81 | 1.95 | 2.13 | 2.03 | 1.49 | 1.43 |
| 15 | ..... | 1.76 | 1.79 | 1.96 | 2.10 | 1.99 | 1.48 | 1.43 |
| 16 | ..... | 1.73 | 1.80 | 1.96 | 2.11 | 1.96 | 1.47 | 1.43 |
| 17 | ..... | 1.74 | 1.80 | 1.99 | 2.14 | 1.98 | 1.47 | 1.43 |
| 18 | ..... | 1.73 | 1.80 | 2.01 | 2.17 | 2.16 | 1.47 | 1.43 |
| 19 | 1.61 | 1.70 | 1.80 | 1.99 | 2.21 | 2.19 | 1.47 | 1.40 |
| 20 | 1.61 | 1.70 | 1.79 | 1.99 | 2.21 | 2.14 | 1.46 | 1.40 |
| 21 | 1.58 | 1.70 | 1.79 | 2.04 | 2.19 | 2.15 | 1.46 | 1.40 |
| 22 | 1.60 | 1.70 | 1.80 | 2.09 | 2.14 | 2.13 | 1.45 | 1.40 |
| 23 | 1.60 | 1.70 | 1.80 | 2.15 | 2.08 | 2.12 | 1.45 | 1.40 |
| 24 | 1.60 | 1.69 | ..... | 2.16 | 2.04 | 2.28 | 1.47 | 1.40 |
| 25 | 1.62 | 1.70 | ..... | 2.10 | 2.01 | 2.22 | 1.46 | 1.40 |
| 26 | 1.64 | 1.93 | ..... | 2.04 | 1.99 | 2.25 | 1.44 | 1.41 |
| 27 | 1.62 | 1.98 | ..... | 2.00 | 2.00 | 2.24 | 1.43 | 1.42 |
| 28 | 1.62 | 1.99 | ..... | 2.01 | 2.01 | 2.30 | 1.43 | 1.42 |
| 29 | 1.62 | 1.93 | ..... | 2.01 | 2.03 | 2.24 | 1.43 | 1.40 |
| 30 | 1.62 | 1.89 | ..... | 2.01 | 2.00 | 2.19 | 1.42 | 1.40 |
| 31 | 1.63 | 1.87 | ..... | 2.01 | ..... | 2.16 | 1.41 | ..... |

### NORTH UMPQUA RIVER NEAR HOAGLIN, OREG.

LOCATION.—In sec. 18, T. 26 S. R. 1 W., one-fourth mile above the forest boundary, about 9 miles below Steamboat Creek, and 10 miles above Hoaglin post office, Douglas County.

DRAINAGE AREA.—849 square miles (measured on topographic map and Forest Service map.)

RECORDS AVAILABLE.—February 20, 1911, to August 11, 1915 (fragmentary).

GAGE.—Vertical staff on right bank; read at irregular intervals.

DISCHARGE MEASUREMENTS.—Made from cable above gage.

CHANNEL AND CONTROL.—Rocky and deep; practically permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 5.8 feet February 3 (discharge, estimated from extension of rating curve, 6,650 second-feet); minimum stage recorded, 1.87 feet August 11 (discharge, 792 second-feet).

WINTER FLOW.—Stage-discharge relation unaffected by ice.

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Results considered excellent for days on which gage was read.

COOPERATION.—Gage heights furnished by United States Forest Service, S. C. Bartrum, supervisor.

*Discharge measurements of North Umpqua River near Hoaglin, Oreg., during the year ending Sept. 30, 1915.*

| Date. | Made by— | Gage height. | Discharge. |
|---|---|---|---|
| | | *Feet.* | *Sec.-ft.* |
| Dec. 22 | C. G. Paulsen | 2.12 | 964 |
| Aug. 11 | J. C. Kuhns | 1.87 | 798 |
| Oct. 19 | ....do | 1.73 | 727 |

*Daily discharge, in second-feet, of North Umpqua River near Hoaglin, Oreg., for the year ending Sept. 30, 1915.*

| Day. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | July. | Aug. |
|---|---|---|---|---|---|---|---|---|
| 1 | | | | | | | | |
| 2 | | | 5,970 | 2,460 | | | | |
| 3 | | | 6,650 | | 3,040 | | | |
| 4 | | | | | | | | |
| 5 | | | 3,660 | | | | | |
| 6 | | 2,120 | | | | | | |
| 7 | | | | | | | 1,110 | |
| 8 | | | | 1,940 | 2,120 | | | |
| 9 | | | 2,740 | | | | | |
| 10 | | | | | | | | |
| 11 | | | | | | | | 792 |
| 12 | | 1,940 | 1,940 | 1,720 | | | | |
| 13 | | | | | | | | |
| 14 | | | | | | | | |
| 15 | | 3,930 | | 2,820 | | | | |
| 16 | | | | | | | | |
| 17 | | | | | | | | |
| 18 | | | | | | | | |
| 19 | | 2,320 | 2,390 | 2,390 | | | | |
| 20 | | | | | | | | |
| 21 | | | | | | | | |
| 22 | 950 | 1,940 | | | | | | |
| 23 | | | 2,250 | | | | | |
| 24 | | | | | | | | |
| 25 | | | | 2,390 | | 4,400 | | |
| 26 | | 1,470 | | | | | | |
| 27 | | | 2,460 | | | | | |
| 28 | 1,470 | | | | | | | |
| 29 | | 1,940 | | | | | | |
| 30 | | | | | | | | |
| 31 | 1,550 | | | | | | | |

NOTE.—Discharge determined from a rating curve well defined to 3,000 second-feet; given only for days on which gage was read.

### NORTH UMPQUA RIVER NEAR OAKCREEK, OREG.

LOCATION.—In the NW. ¼ sec. 25, T. 26 S., R. 5 W., just below Sunshine ferry, 3 miles west of Oakcreek, about 5 miles east of the former station at Winchester, and about 9 miles northeast of Roseburg, Douglas County.

DRAINAGE AREA.—1,260 square miles (measured on topographic maps and Forest Service map; revised since publication of Water-Supply Paper 394).

RECORDS AVAILABLE.—September 6, 1905, to October 10, 1908; July 24, 1913, to September 30, 1915, when station was discontinued.

GAGE.—Staff, lower part inclined, upper part vertical, on left bank; read daily. Gage reader, F. C. Lauer.

DISCHARGE MEASUREMENTS.—Can best be made from Hughes ferry near Glide, about 8 miles above.

CHANNEL AND CONTROL.—Gravel and rock; somewhat shifting.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 10.1 feet at 8 a. m. October 19 (discharge, 19,600 second-feet); minimum stage recorded, 1.2 feet at 6 p. m. September 23 (discharge, 700 second-feet).

The records of maximum discharge for this station and also that at Winchester have been recomputed as follows, by means of flood measurements made in 1916:

*Maximum recorded stages and corresponding discharge of North Umpqua River, 1906–1915.*

| Year ending Sept. 30— | Station. | Date. | Gage height. | Discharge. |
|---|---|---|---|---|
| | | | *Feet.* | *Sec.-feet.* |
| 1906 | Oakcreek | Jan. 16 | 12.5 | 29,900 |
| 1907 | do | Feb. 4 | 21.2 | 67,900 |
| 1908 | do | Dec. 22 | 17.7 | 52,300 |
| 1909 | Winchester | Jan. 2 | 13.3 | 32,400 |
| 1910 | do | Nov. 23, 2a. m. | 28.1 | 92,000 |
| 1911 | do | Nov. 28 | 15.5 | 41,000 |
| 1912 | do | Jan. 12 | 16.5 | 44,800 |
| 1913 | do | Mar. 30 | 12.5 | 29,300 |
| 1914 | Oakcreek | Dec. 3 | 9.55 | 17,700 |
| 1915 | do | Oct. 19 | 10.1 | 19,600 |

Minimum stage, 1905–1915, September 23, 1915.

WINTER FLOW.—No ice ever forms at this station.

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Results considered excellent.

*Discharge measurements of North Umpqua River near Oakcreek, Oreg., during the year ending Sept. 30, 1916.*

| Date. | Made by— | Gage height. | Discharge. |
|---|---|---|---|
| | | *Feet.* | *Sec.-ft.* |
| Aug. 10 | Henshaw and Lundgren | 1.48 | 854 |
| Feb. 7 | J. C. Kuhns | 15.40 | 40,800 |

NOTE.—Measurement Feb. 7, 1916, made at Winchester; inflow estimated at 500 second-feet was deducted to obtain discharge at the station.

*Daily discharge, in second-feet, of North Umpqua River near Oakcreek, Oreg., for the year ending Sept. 30, 1915.*

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1,080 | 1,560 | 1,600 | 3,180 | 13,700 | 4,000 | 2,750 | 1,910 | 3,180 | 1,240 | 930 | 750 |
| 2 | 1,760 | 1,700 | 2,020 | 2,750 | 8,540 | 3,650 | 3,030 | 1,910 | 2,890 | 1,160 | 930 | 750 |
| 3 | 3,490 | 1,510 | 3,490 | 2,960 | 9,750 | 3,180 | 3,820 | 1,910 | 2,620 | 1,160 | 930 | 750 |
| 4 | 2,640 | 1,510 | 2,130 | 3,180 | 7,160 | 4,360 | 3,580 | 1,910 | 2,250 | 1,160 | 860 | 750 |
| 5 | 1,800 | 1,800 | 2,020 | 2,890 | 5,900 | 3,820 | 3,330 | 1,800 | 2,250 | 1,160 | 860 | 725 |
| 6 | 1,800 | 1,700 | 1,910 | 3,180 | 5,310 | 3,490 | 3,030 | 1,700 | 2,190 | 1,240 | 860 | 700 |
| 7 | 1,800 | 1,510 | 1,800 | 3,330 | 5,020 | 3,260 | 2,890 | 1,700 | 2,130 | 1,420 | 890 | 700 |
| 8 | 1,700 | 1,460 | 1,800 | 8,060 | 4,740 | 3,030 | 2,750 | 1,600 | 2,020 | 1,420 | 860 | 700 |
| 9 | 1,600 | 1,420 | 1,700 | 5,700 | 4,000 | 2,890 | 2,490 | 1,920 | 1,910 | 1,510 | 860 | 700 |
| 10 | 1,800 | 1,420 | 1,700 | 4,520 | 3,650 | 2,620 | 2,490 | 2,250 | 2,020 | 1,420 | 860 | 700 |
| 11 | 1,700 | 1,420 | 1,600 | 3,330 | 3,030 | 2,490 | 2,620 | 2,250 | 2,130 | 1,290 | 800 | 700 |
| 12 | 1,600 | 1,420 | 1,600 | 3,030 | 2,750 | 2,490 | 2,750 | 2,250 | 2,020 | 1,160 | 860 | 725 |
| 13 | 1,420 | 1,910 | 1,510 | 3,650 | 2,620 | 2,490 | 3,030 | 2,490 | 1,910 | 1,160 | 800 | 750 |
| 14 | 1,420 | 2,620 | 1,420 | 10,500 | 2,440 | 3,240 | 2,890 | 3,330 | 1,800 | 1,080 | 800 | 750 |
| 15 | 1,420 | 2,980 | 1,420 | 6,720 | 2,250 | 4,000 | 2,750 | 3,820 | 1,700 | 1,080 | 800 | 750 |
| 16 | 1,240 | 3,330 | 1,420 | 5,590 | 2,250 | 3,650 | 2,620 | 3,420 | 1,600 | 1,080 | 800 | 750 |
| 17 | 1,420 | 1,800 | 1,240 | 4,650 | 2,250 | 3,650 | 2,620 | 3,030 | 1,600 | 1,080 | 800 | 750 |
| 18 | 10,500 | 1,700 | 1,240 | 3,820 | 3,330 | 3,650 | 2,690 | 2,820 | 1,600 | 1,080 | 800 | 700 |
| 19 | 19,600 | 1,600 | 1,160 | 3,820 | 3,330 | 3,030 | 2,750 | 8,060 | 1,510 | 1,080 | 800 | 700 |
| 20 | 6,300 | 1,510 | 1,160 | 3,820 | 3,650 | 3,030 | 2,620 | 5,700 | 1,460 | 1,080 | 800 | 700 |
| 21 | 4,000 | 1,420 | 1,160 | 3,490 | 3,340 | 3,180 | 2,490 | 5,120 | 1,420 | 1,000 | 800 | 700 |
| 22 | 2,750 | 1,380 | 1,160 | 2,890 | 3,030 | 3,330 | 2,250 | 5,120 | 1,420 | 1,000 | 800 | 700 |
| 23 | 2,370 | 1,330 | 1,160 | 2,750 | 4,000 | 3,650 | 2,020 | 5,810 | 1,420 | 1,000 | 800 | 700 |
| 24 | 2,250 | 1,330 | 1,160 | 2,500 | 4,180 | 3,330 | 1,910 | 6,500 | 1,420 | 930 | 800 | 700 |
| 25 | 1,980 | 1,240 | 1,080 | 2,250 | 4,740 | 3,030 | 1,960 | 6,100 | 1,330 | 965 | 750 | 750 |
| 26 | 1,700 | 1,160 | 1,600 | 2,130 | 5,500 | 2,750 | 2,020 | 6,500 | 1,330 | 1,000 | 750 | 725 |
| 27 | 1,600 | 1,240 | 1,810 | 2,020 | 5,120 | 2,620 | 1,910 | 5,700 | 1,280 | 930 | 750 | 700 |
| 28 | 1,510 | 1,700 | 2,020 | 2,020 | 4,560 | 2,620 | 1,910 | 5,500 | 1,240 | 930 | 750 | 700 |
| 29 | 1,420 | 1,750 | 2,020 | 2,750 | ..... | 2,620 | 2,130 | 4,740 | 1,240 | 930 | 750 | 700 |
| 30 | 1,420 | 1,800 | 2,020 | 2,490 | ..... | 2,620 | 2,020 | 4,120 | 1,240 | 930 | 750 | 700 |
| 31 | 1,420 | ..... | 1,910 | 8,100 | ..... | 2,750 | ..... | 3,490 | ..... | 930 | 750 | ..... |

NOTE.—Discharge determined from a well-defined rating curve; interpolated for Sundays.

*Monthly discharge of North Umpqua River near Oakcreek, Oreg., for the year ending Sept. 30, 1915.*

[Drainage area, 1,260 square miles.]

| Month. | Discharge in second-feet. | | | | Run-off. | | Accuracy. |
|---|---|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | Per square mile. | Depth in inches on drainage area. | Total in acre-feet. | |
| October | 19,600 | 1,080 | 2,850 | 2.26 | 2.61 | 175,000 | A. |
| November | 3,330 | 1,160 | 1,670 | 1.33 | 1.48 | 99,400 | A. |
| December | 3,490 | 1,080 | 1,650 | 1.31 | 1.51 | 101,000 | A. |
| January | 10,500 | 2,020 | 3,940 | 3.13 | 3.61 | 242,000 | A. |
| February | 13,700 | 2,250 | 4,650 | 3.69 | 3.84 | 258,000 | A. |
| March | 4,360 | 2,490 | 3,180 | 2.52 | 2.90 | 196,000 | A. |
| April | 3,820 | 1,910 | 2,600 | 2.06 | 2.30 | 155,000 | A. |
| May | 8,060 | 1,600 | 3,850 | 3.06 | 3.53 | 237,000 | A. |
| June | 3,180 | 1,240 | 1,800 | 1.43 | 1.60 | 107,000 | A. |
| July | 1,510 | 930 | 1,120 | .889 | 1.02 | 68,900 | A. |
| August | 930 | 750 | 815 | .647 | .75 | 50,100 | A. |
| September | 750 | 700 | 719 | .571 | .64 | 42,800 | A. |
| The year | 19,600 | 700 | 2,390 | 1.90 | 25.79 | 1,730,000 | |

### MILL CREEK NEAR ASH, OREG.

LOCATION.—In sec. 2, T. 23 S., R. 10 W., three-fourths mile below outlet of Loon Lake, 5 miles northwest of Ash post office, and about 12 miles south of Scottsburg, Douglas County.

DRAINAGE AREA.—90 square miles (measured on maps prepared by J. G. Kelley).

RECORDS AVAILABLE.—May 18, 1907, to September 30, 1912; April 20 to September 30, 1915.

GAGE.—Stevens water-stage recorder on right bank. Gage reader, Richard Peterson. Vertical staff on lake was read 1907 to 1912, and for comparison in 1915 and 1916.

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

CHANNEL AND CONTROL.—Channel, gravel; control of boulders and bed rock about 85 feet below gage. Rock channel at lake outlet forms control for lake gage.

EXTREMES OF DISCHARGE.—Maximum stage from water-stage recorder during period April 20 to September 30, 1915, 2.16 feet 3 to 9 a. m. May 20 (discharge, 394 sec, ond-feet); minimum stage from water-stage recorder, 0.32 foot at 2 p. m. September 26 (discharge, 4.2 second-feet).

1907–1912: Maximum stage recorded on lake gage, 21.4 feet November 23, 1909 (discharge, 10,000 second-feet); minimum stage recorded, 2.1 feet September 13 to 20 and September 25 to October 2, 1910 (discharge, 1.5 second-feet).

WINTER FLOW.—Stage-discharge relation unaffected by ice.

DIVERSIONS.—None.

REGULATION.—Some fluctuation at low water due to effect of wind on lake.

ACCURACY.—Results considered good except for periods of extremely low water, for which they are only fair.

*Discharge measurements of Mill Creek near Ash, Oreg., during the year ending Sept. 30, 1915.*

[Made by M. S. Kelley.]

| Date. | Gage height. | Discharge. | Date. | Gage height. | Discharge. |
|---|---|---|---|---|---|
| | *Feet.* | *Sec.-ft.* | | *Feet.* | *Sec.-ft.* |
| Apr. 15 | ..... | 164 | Apr. 26 | 1.18 | 99.0 |
| 20 | 1.30 | 125 | Aug. 6 | .58 | 23.9 |

*Daily discharge, in second-feet, of Mill Creek near Ash, Oreg., for the years ending Sept. 30, 1907–1912 and 1915.*

| Day. | May. | June. | July. | Aug. | Sept. | Day. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1907. | | | | | | 1907. | | | | | |
| 1 | ..... | 69 | 34 | 15 | 5.0 | 16 | ..... | 75 | 23 | 11 | 4.5 |
| 2 | ..... | 69 | 34 | 15 | 5.0 | 17 | ..... | 71 | 22 | 11 | 4.5 |
| 3 | ..... | 66 | 33 | 14 | 5.0 | 18 | 81 | 67 | 22 | 10 | 4.5 |
| 4 | ..... | 63 | 32 | 14 | 5.0 | 19 | 81 | 64 | 21 | 9 | 5.0 |
| 5 | ..... | 60 | 31 | 14 | 5.0 | 20 | 81 | 60 | 20 | 8 | 5.0 |
| 6 | ..... | 57 | 30 | 14 | 5.0 | 21 | 81 | 56 | 20 | 7 | 5.0 |
| 7 | ..... | 54 | 30 | 14 | 5.0 | 22 | 81 | 52 | 20 | 6 | 5.0 |
| 8 | ..... | 51 | 29 | 14 | 5.0 | 23 | 81 | 48 | 19 | 6 | 5.0 |
| 9 | ..... | 48 | 28 | 14 | 4.5 | 24 | 81 | 46 | 19 | 6 | 5.0 |
| 10 | ..... | 56 | 27 | 14 | 4.5 | 25 | 81 | 44 | 18 | 6 | 5.5 |
| 11 | ..... | 64 | 26 | 14 | 4.5 | 26 | 81 | 42 | 18 | 6 | 5.5 |
| 12 | ..... | 73 | 26 | 14 | 4.5 | 27 | 81 | 41 | 17 | 6 | 5.5 |
| 13 | ..... | 81 | 25 | 14 | 4.5 | 28 | 81 | 39 | 17 | 6 | 5.5 |
| 14 | ..... | 88 | 24 | 13 | 4.5 | 29 | 81 | 38 | 17 | 6 | 6.0 |
| 15 | ..... | 88 | 23 | 12 | 4.5 | 30 | 75 | 36 | 16 | 6 | 6.0 |
| | | | | | | 31 | 72 | ..... | 16 | 6 | ..... |

*Daily discharge, in second-feet, of Mill Creek near Ash, Oreg., for the years ending Sept. 30, 1907–1912 and 1915*—Continued.

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1907–8. | | | | | | | | | | | | |
| 1 | 7 | 10 | 290 | 1,180 | 194 | 478 | 452 | 126 | 122 | 60 | 19 | 8 |
| 2 | 8 | 11 | 238 | 1,270 | 188 | 800 | 478 | 126 | 118 | 58 | 19 | 8 |
| 3 | 8 | 12 | 208 | 1,100 | 177 | 835 | 426 | 162 | 114 | 55 | 19 | 8 |
| 4 | 9 | 14 | 194 | 905 | 194 | 740 | 378 | 246 | 110 | 51 | 17 | 7 |
| 5 | 9 | 16 | 238 | 770 | 246 | 650 | 310 | 254 | 106 | 48 | 16 | 7 |
| 6 | 10 | 18 | 254 | 680 | 378 | 504 | 272 | 208 | 101 | 48 | 15 | 6 |
| 7 | 10 | 20 | 290 | 560 | 710 | 452 | 254 | 194 | 97 | 46 | 15 | 6 |
| 8 | 11 | 22 | 354 | 504 | 680 | 402 | 254 | 182 | 92 | 44 | 14 | 6 |
| 9 | 12 | 23 | 378 | 620 | 550 | 354 | 222 | 172 | 88 | 42 | 14 | 6 |
| 10 | 12 | 23 | 354 | 680 | 426 | 332 | 201 | 162 | 83 | 42 | 13 | 6 |
| 11 | 13 | 22 | 620 | 680 | 426 | 310 | 182 | 144 | 78 | 40 | 12 | 6 |
| 12 | 14 | 22 | 905 | 560 | 414 | 291 | 172 | 135 | 74 | 38 | 11 | 6 |
| 13 | 12 | 21 | 1,320 | 504 | 402 | 272 | 162 | 140 | 69 | 35 | 11 | 6 |
| 14 | 10 | 21 | 1,910 | 452 | 378 | 254 | 153 | 130 | 67 | 33 | 10 | 6 |
| 15 | 8 | 20 | 1,360 | 402 | 354 | 254 | 153 | 130 | 65 | 30 | 10 | 6 |
| 16 | 7 | 21 | 905 | 354 | 343 | 290 | 148 | 135 | 63 | 30 | 10 | 5.8 |
| 17 | 7 | 22 | 650 | 332 | 378 | 332 | 146 | 144 | 60 | 30 | 9 | 5.7 |
| 18 | 6 | 23 | 590 | 310 | 378 | 354 | 144 | 182 | 60 | 30 | 9 | 5.5 |
| 19 | 6 | 26 | 452 | 310 | 354 | 332 | 144 | 238 | 60 | 30 | 9 | 5.3 |
| 20 | 6 | 53 | 800 | 452 | 332 | 310 | 135 | 264 | 63 | 29 | 9 | 5.1 |
| 21 | 6 | 238 | 1,180 | 680 | 310 | 272 | 126 | 290 | 102 | 27 | 8 | 5.0 |
| 22 | 6 | 254 | 2,660 | 650 | 281 | 246 | 118 | 254 | 102 | 26 | 8 | 4.9 |
| 23 | 5 | 310 | 2,920 | 532 | 246 | 250 | 110 | 238 | 102 | 26 | 8 | 4.7 |
| 24 | 5 | 800 | 2,210 | 452 | 238 | 254 | 148 | 222 | 95 | 24 | 8 | 4.5 |
| 25 | 5 | 1,270 | 3,160 | 378 | 222 | 254 | 222 | 194 | 88 | 24 | 8 | 4.5 |
| 26 | 5 | 980 | 4,420 | 354 | 208 | 284 | 222 | 172 | 81 | 23 | 7 | 4.4 |
| 27 | 5 | 905 | 3,160 | 300 | 194 | 313 | 194 | 162 | 78 | 23 | 7 | 4.4 |
| 28 | 6 | 714 | 2,360 | 254 | 194 | 343 | 182 | 153 | 75 | 22 | 7 | 4.2 |
| 29 | 7 | 523 | 1,460 | 246 | 254 | 332 | 162 | 140 | 69 | 22 | 6 | 4.2 |
| 30 | 8 | 332 | 1,370 | 238 | ..... | 332 | 148 | 135 | 63 | 22 | 8 | 4.2 |
| 31 | 9 | ..... | 1,270 | 208 | ..... | 354 | ..... | 126 | ..... | 20 | 8 | ..... |
| 1908–9. | | | | | | | | | | | | |
| 1 | 4.2 | 67 | 182 | 560 | 504 | 905 | 162 | 69 | 158 | 29 | 14 | 4.8 |
| 2 | 4.2 | 65 | 172 | 504 | 590 | 870 | 172 | 66 | 140 | 27 | 14 | 4.8 |
| 3 | 4.2 | 62 | 153 | 452 | 1,220 | 980 | 182 | 63 | 128 | 27 | 13 | 4.6 |
| 4 | 4.2 | 59 | 144 | 710 | 1,320 | 905 | 172 | 60 | 115 | 26 | 12 | 4.6 |
| 5 | 4.2 | 56 | 126 | 888 | 1,180 | 888 | 177 | 58 | 101 | 25 | 12 | 4.5 |
| 6 | 4.0 | 53 | 122 | 1,510 | 1,140 | 870 | 172 | 58 | 88 | 26 | 11 | 4.5 |
| 7 | 4.0 | 50 | 118 | 1,660 | 1,180 | 740 | 167 | 56 | 76 | 29 | 11 | 4.4 |
| 8 | 4.0 | 47 | 106 | 1,910 | 1,140 | 650 | 158 | 53 | 69 | 31 | 10 | 4.4 |
| 9 | 3.5 | 45 | 102 | 1,440 | 1,060 | 650 | 148 | 53 | 46 | 30 | 10 | 4.2 |
| 10 | 3.5 | 43 | 102 | 1,220 | 1,180 | 620 | 144 | 57 | 60 | 30 | 9 | 4.2 |
| 11 | 3.0 | 40 | 95 | 905 | 1,180 | 426 | 137 | 69 | 58 | 29 | 8 | 4.1 |
| 12 | 3.0 | 38 | 92 | 680 | 1,020 | 452 | 135 | 67 | 53 | 29 | 8 | 4.0 |
| 13 | 3.0 | 36 | 126 | 590 | 940 | 402 | 126 | 65 | 50 | 28 | 8 | 3.9 |
| 14 | 20 | 34 | 194 | 478 | 1,220 | 354 | 118 | 63 | 48 | 26 | 8 | 3.9 |
| 15 | 126 | 32 | 263 | 800 | 1,140 | 321 | 114 | 61 | 47 | 25 | 8 | 3.8 |
| 16 | 194 | 40 | 272 | 2,920 | 1,020 | 290 | 110 | 59 | 47 | 24 | 7 | 3.6 |
| 17 | 194 | 49 | 254 | 2,410 | 1,270 | 263 | 104 | 57 | 48 | 24 | 6 | 3.5 |
| 18 | 177 | 58 | 238 | 2,110 | 1,560 | 254 | 96 | 55 | 47 | 22 | 6 | 3.5 |
| 19 | 160 | 67 | 222 | 1,660 | 1,710 | 230 | 95 | 53 | 44 | 22 | 6 | 3.4 |
| 20 | 141 | 75 | 188 | 2,110 | 1,660 | 222 | 101 | 51 | 43 | 21 | 6 | 3.4 |
| 21 | 122 | 162 | 182 | 2,440 | 1,610 | 238 | 88 | 49 | 40 | 20 | 6 | 3.5 |
| 22 | 105 | 290 | 182 | 2,920 | 1,360 | 254 | 87 | 50 | 39 | 19 | 6 | 3.5 |
| 23 | 88 | 532 | 272 | 2,440 | 1,060 | 238 | 82 | 48 | 38 | 18 | 6 | 3.4 |
| 24 | 79 | 755 | 980 | 1,560 | 905 | 222 | 80 | 46 | 36 | 18 | 6 | 3.4 |
| 25 | 70 | 680 | 725 | 1,140 | 1,320 | 201 | 78 | 44 | 35 | 17 | 6 | 3.6 |
| 26 | 61 | 532 | 1,000 | 905 | 1,710 | 182 | 75 | 43 | 34 | 17 | 6 | 3.8 |
| 27 | 52 | 426 | 1,020 | 680 | 1,320 | 172 | 75 | 43 | 33 | 16 | 5 | 3.9 |
| 28 | 43 | 332 | 976 | 620 | 1,100 | 167 | 75 | 47 | 33 | 16 | 5 | 4.0 |
| 29 | 40 | 272 | 932 | 560 | ..... | 162 | 75 | 75 | 31 | 16 | 5 | 4.1 |
| 30 | 54 | 222 | 888 | 504 | ..... | 158 | 72 | 126 | 30 | 16 | 5 | 4.5 |
| 31 | 69 | ..... | 740 | 504 | ..... | 153 | ..... | 162 | ..... | 15 | 5 | ..... |

*Daily discharge, in second-feet, of Mill Creek near Ash, Oreg., for the years ending Sept. 30, 1907–1912 and 1915*—Continued.

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1909–10. | | | | | | | | | | | | |
| 1 | 5 | 354 | 870 | 465 | 650 | 1,860 | 185 | 110 | 46 | 26 | 5.5 | 2.5 |
| 2 | 6 | 343 | 835 | 439 | 532 | 1,860 | 180 | 106 | 43 | 24 | 5.5 | 2.5 |
| 3 | 8 | 272 | 740 | 343 | 452 | 1,360 | 172 | 102 | 43 | 23 | 5.5 | 2.5 |
| 4 | 8 | 222 | 905 | 290 | 402 | 1,180 | 194 | 102 | 38 | 23 | 5.0 | 2.5 |
| 5 | 9 | 182 | 870 | 254 | 366 | 870 | 201 | 98 | 38 | 23 | 5.0 | 2.5 |
| 6 | 8 | 177 | 518 | 238 | 343 | 740 | 189 | 95 | 38 | 23 | 5.0 | 2.2 |
| 7 | 8 | 182 | 560 | 263 | 321 | 620 | 177 | 95 | 36 | 22 | 5.0 | 2.0 |
| 8 | 8 | 290 | 870 | 478 | 300 | 504 | 165 | 88 | 36 | 20 | 4.8 | 2.0 |
| 9 | 7 | 620 | 1,410 | 590 | 290 | 452 | 153 | 81 | 34 | 20 | 4.8 | 2.0 |
| 10 | 7 | 835 | 1,000 | 491 | 310 | 402 | 153 | 81 | 34 | 20 | 4.5 | 2.0 |
| 11 | 6 | 1,020 | 1,000 | 426 | 343 | 354 | 194 | 81 | 34 | 18 | 4.5 | 1.8 |
| 12 | 6 | 835 | 1,000 | 378 | 390 | 310 | 452 | 81 | 34 | 17 | 4.2 | 1.8 |
| 13 | 6 | 605 | 1,510 | 332 | 402 | 272 | 439 | 78 | 34 | 17 | 4.2 | 1.5 |
| 14 | 6 | 491 | 1,360 | 310 | 680 | 254 | 354 | 75 | 34 | 16 | 4.0 | 1.5 |
| 15 | 6 | 402 | 980 | 310 | 870 | 230 | 300 | 69 | 34 | 14 | 4.0 | 1.5 |
| 16 | 6 | 343 | 740 | 310 | 785 | 208 | 254 | 69 | 34 | 14 | 4.0 | 1.5 |
| 17 | 6 | 310 | 590 | 378 | 710 | 194 | 230 | 63 | 32 | 12 | 4.0 | 1.5 |
| 18 | 6 | 254 | 518 | 478 | 740 | 182 | 208 | 63 | 30 | 12 | 4.0 | 1.5 |
| 19 | 6 | 354 | 402 | 835 | 1,040 | 172 | 194 | 60 | 30 | 11 | 3.8 | 1.5 |
| 20 | 16 | 1,270 | 354 | 905 | 1,020 | 177 | 177 | 58 | 30 | 11 | 3.5 | 1.5 |
| 21 | 40 | 1,420 | 310 | 770 | 870 | 188 | 167 | 58 | 34 | 11 | 3.5 | 1.8 |
| 22 | 74 | 3,040 | 272 | 650 | 785 | 182 | 158 | 56 | 38 | 11 | 3.5 | 1.8 |
| 23 | 75 | 10,000 | 254 | 650 | 835 | 194 | 148 | 53 | 38 | 11 | 3.2 | 1.8 |
| 24 | 66 | 5,160 | 238 | 835 | 980 | 201 | 140 | 53 | 36 | 10 | 3.2 | 1.8 |
| 25 | 58 | 2,920 | 222 | 980 | 1,200 | 208 | 135 | 53 | 34 | 8 | 3.0 | 1.5 |
| 26 | 50 | 2,110 | 208 | 1,060 | 1,250 | 201 | 126 | 50 | 34 | 8 | 3.0 | 1.5 |
| 27 | 44 | 1,270 | 194 | 1,100 | 1,220 | 188 | 118 | 48 | 30 | 8 | 3.0 | 1.5 |
| 28 | 43 | 940 | 162 | 1,100 | 1,540 | 182 | 110 | 48 | 30 | 7 | 3.0 | 1.5 |
| 29 | 48 | 940 | 172 | 1,140 | ..... | 167 | 114 | 48 | 28 | 6 | 3.0 | 1.5 |
| 30 | 92 | 905 | 172 | 980 | ..... | 158 | 110 | 48 | 26 | 6 | 2.8 | 1.5 |
| 31 | 144 | ..... | 272 | 800 | ..... | 144 | ..... | 48 | ..... | 6 | 2.5 | ..... |
| 1910–11. | | | | | | | | | | | | |
| 1 | 1.5 | 8 | 1,610 | 650 | 905 | 224 | 75 | 90 | 131 | 38 | 7.0 | 3.0 |
| 2 | 1.5 | 8 | 980 | 650 | 940 | 206 | 68 | 90 | 121 | 36 | 6.4 | 3.0 |
| 3 | 1.8 | 8 | 870 | 532 | 940 | 190 | 68 | 90 | 112 | 34 | 6.0 | 2.9 |
| 4 | 3.5 | 7 | 1,410 | 452 | 800 | 174 | 68 | 90 | 102 | 32 | 6.0 | 2.9 |
| 5 | 6.0 | 6 | 1,270 | 402 | 710 | 187 | 98 | 90 | 94 | 30 | 6.0 | 3.2 |
| 6 | 11 | 6 | 940 | 354 | 800 | 160 | 98 | 98 | 86 | 28 | 5.8 | 3.7 |
| 7 | 11 | 12 | 710 | 310 | 710 | 174 | 94 | 98 | 82 | 26 | 5.8 | 4.5 |
| 8 | 11 | 58 | 605 | 266 | 710 | 206 | 90 | 98 | 78 | 25 | 5.5 | 5 |
| 9 | 14 | 254 | 650 | 288 | 620 | 224 | 82 | 148 | 78 | 24 | 5.5 | 5 |
| 10 | 14 | 254 | 620 | 560 | 560 | 244 | 116 | 174 | 72 | 22 | 5.2 | 5 |
| 11 | 14 | 590 | 560 | 650 | 504 | 242 | 266 | 174 | 68 | 22 | 5.0 | 5 |
| 12 | 14 | 504 | 478 | 650 | 560 | 224 | 452 | 160 | 65 | 21 | 5.0 | 6 |
| 13 | 20 | 310 | 402 | 560 | 620 | 206 | 452 | 148 | 59 | 20 | 4.8 | 11 |
| 14 | 26 | 206 | 354 | 452 | 740 | 190 | 426 | 136 | 56 | 19 | 4.8 | 17 |
| 15 | 30 | 190 | 310 | 402 | 680 | 174 | 402 | 131 | 54 | 18 | 4.8 | 18 |
| 16 | 26 | 98 | 288 | 354 | 620 | 160 | 378 | 112 | 51 | 17 | 4.5 | 19 |
| 17 | 23 | 86 | 402 | 414 | 560 | 167 | 354 | 112 | 51 | 16 | 4.2 | 20 |
| 18 | 26 | 78 | 452 | 2,010 | 590 | 154 | 321 | 190 | 48 | 16 | 4.2 | 20 |
| 19 | 26 | 78 | 402 | 3,640 | 620 | 142 | 299 | 1,060 | 46 | 15 | 4.0 | 17 |
| 20 | 23 | 90 | 343 | 2,920 | 532 | 126 | 266 | 980 | 44 | 14 | 4.0 | 16 |
| 21 | 23 | 148 | 310 | 2,160 | 478 | 116 | 224 | 680 | 44 | 12 | 3.9 | 13 |
| 22 | 20 | 590 | 266 | 1,220 | 426 | 107 | 206 | 532 | 42 | 12 | 3.9 | 12 |
| 23 | 18 | 905 | 244 | 870 | 378 | 107 | 174 | 426 | 40 | 12 | 3.8 | 10 |
| 24 | 17 | 1,270 | 244 | 680 | 332 | 107 | 160 | 378 | 38 | 11 | 3.8 | 10 |
| 25 | 16 | 800 | 266 | 620 | 310 | 107 | 148 | 310 | 38 | 10 | 3.6 | 9 |
| 26 | 14 | 504 | 266 | 620 | 288 | 107 | 131 | 266 | 36 | 10 | 3.5 | 9 |
| 27 | 12 | 402 | 288 | 590 | 266 | 98 | 121 | 224 | 36 | 10 | 3.5 | 11 |
| 28 | 11 | 1,660 | 288 | 980 | 244 | 90 | 116 | 190 | 38 | 9 | 3.4 | 13 |
| 29 | 11 | 3,160 | 288 | 1,100 | ..... | 82 | 107 | 160 | 38 | 8 | 3.4 | 13 |
| 30 | 10 | 2,410 | 288 | 870 | ..... | 78 | 98 | 148 | 40 | 8 | 3.2 | 12 |
| 31 | 8 | ..... | 402 | 870 | ..... | 75 | ..... | 136 | ..... | 8 | 3.1 | ..... |

*Daily discharge, in second-feet, of Mill Creek near Ash, Oreg., for the years ending Sept. 30, 1907–1912 and 1916.*—Continued.

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1911–12. | | | | | | | | | | | | |
| 1 | 12 | 6 | 107 | 940 | 650 | 343 | 222 | 905 | 177 | 118 | 35 | 11 |
| 2 | 12 | 6 | 98 | 835 | 560 | 310 | 201 | 1,410 | 162 | 110 | 34 | 26 |
| 3 | 11 | 6 | 90 | 680 | 491 | 290 | 182 | 1,100 | 144 | 102 | 33 | 42 |
| 4 | 11 | 6 | 82 | 590 | 426 | 254 | 172 | 800 | 135 | 95 | 32 | 57 |
| 5 | 11 | 6 | 82 | 504 | 478 | 254 | 162 | 504 | 126 | 88 | 31 | 73 |
| 6 | 11 | 6 | 107 | 650 | 504 | 238 | 153 | 478 | 118 | 81 | 30 | 88 |
| 7 | 10 | 10 | 160 | 1,760 | 478 | 254 | 144 | 402 | 110 | 75 | 29 | 95 |
| 8 | 10 | 20 | 174 | 2,160 | 439 | 272 | 144 | 343 | 102 | 72 | 28 | 102 |
| 9 | 10 | 56 | 174 | 1,660 | 426 | 290 | 135 | 290 | 95 | 69 | 27 | 97 |
| 10 | 10 | 224 | 160 | 1,320 | 532 | 272 | 130 | 254 | 88 | 66 | 26 | 93 |
| 11 | 10 | 332 | 142 | 1,060 | 710 | 246 | 126 | 222 | 84 | 63 | 23 | 88 |
| 12 | 9 | 244 | 131 | 1,610 | 770 | 222 | 126 | 208 | 88 | 62 | 20 | 79 |
| 13 | 9 | 266 | 116 | 3,820 | 710 | 208 | 122 | 194 | 95 | 61 | 20 | 70 |
| 14 | 14 | 650 | 112 | 2,860 | 770 | 194 | 114 | 177 | 102 | 60 | 20 | 62 |
| 15 | 24 | 905 | 107 | 2,110 | 800 | 321 | 110 | 162 | 102 | 59 | 20 | 53 |
| 16 | 26 | 1,060 | 116 | 1,360 | 1,860 | 905 | 106 | 153 | 95 | 58 | 20 | 50 |
| 17 | 25 | 1,100 | 174 | 1,020 | 2,710 | 1,360 | 102 | 144 | 95 | 57 | 20 | 47 |
| 18 | 23 | 1,020 | 266 | 770 | 3,160 | 1,100 | 102 | 135 | 88 | 56 | 20 | 44 |
| 19 | 22 | 650 | 288 | 620 | 2,110 | 835 | 118 | 134 | 81 | 55 | 19 | 41 |
| 20 | 19 | 452 | 452 | 590 | 1,410 | 680 | 118 | 133 | 78 | 54 | 18 | 39 |
| 21 | 17 | 378 | 560 | 465 | 980 | 560 | 135 | 132 | 81 | 53 | 17 | 36 |
| 22 | 16 | 288 | 478 | 402 | 650 | 478 | 144 | 131 | 88 | 52 | 17 | 33 |
| 23 | 14 | 224 | 452 | 366 | 770 | 426 | 153 | 129 | 81 | 50 | 17 | 30 |
| 24 | 13 | 206 | 650 | 332 | 800 | 354 | 167 | 128 | 81 | 48 | 17 | 29 |
| 25 | 12 | 160 | 740 | 1,180 | 710 | 310 | 172 | 127 | 81 | 46 | 16 | 27 |
| 26 | 11 | 160 | 650 | 1,610 | 560 | 290 | 182 | 126 | 75 | 44 | 15 | 26 |
| 27 | 10 | 148 | 740 | 1,410 | 504 | 254 | 177 | 126 | 84 | 42 | 14 | 24 |
| 28 | 10 | 136 | 1,360 | 1,100 | 439 | 230 | 172 | 135 | 118 | 40 | 14 | 23 |
| 29 | 9 | 126 | 870 | 870 | 390 | 230 | 177 | 140 | 126 | 38 | 13 | 23 |
| 30 | 8 | 116 | 980 | 740 | ..... | 254 | 402 | 182 | 126 | 37 | 12 | 23 |
| 31 | 7 | ..... | 885 | 680 | ..... | 238 | ..... | 188 | ..... | 36 | 11 | ..... |

| Day. | Apr. | May. | June. | July. | Aug. | Sept. | Day. | Apr. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1915. | | | | | | | 1915. | | | | | | |
| 1 | ..... | 101 | 256 | 54 | 30 | 9 | 16 | ..... | 211 | 102 | 41 | 17 | 6 |
| 2 | ..... | 101 | 232 | 54 | 30 | 9 | 17 | ..... | 199 | 99 | 40 | 17 | 6 |
| 3 | ..... | 99 | 205 | 53 | 28 | 9 | 18 | ..... | 211 | 95 | 40 | 16 | 6 |
| 4 | ..... | 97 | 184 | 52 | 27 | 8 | 19 | ..... | 302 | 92 | 41 | 16 | 6 |
| 5 | ..... | 97 | 159 | 50 | 25 | 8 | 20 | 126 | 336 | 88 | 40 | 15 | 5 |
| 6 | ..... | 93 | 146 | 50 | 24 | 8 | 21 | 124 | 346 | 85 | 38 | 15 | 5 |
| 7 | ..... | 90 | 139 | 48 | 24 | 8 | 22 | 120 | 306 | 82 | 37 | 15 | 5 |
| 8 | ..... | 88 | 135 | 51 | 22 | 7 | 23 | 114 | 277 | 78 | 36 | 15 | 5 |
| 9 | ..... | 92 | 130 | 50 | 22 | 7 | 24 | 110 | 268 | 75 | 35 | 14 | 4 |
| 10 | ..... | 101 | 126 | 50 | 22 | 7 | 25 | 108 | 286 | 72 | 35 | 13 | 4 |
| 11 | ..... | 126 | 122 | 47 | 22 | 7 | 26 | 102 | 302 | 69 | 33 | 11 | 4 |
| 12 | ..... | 137 | 118 | 45 | 21 | 7 | 27 | 102 | 330 | 65 | 33 | 11 | 5 |
| 13 | ..... | 139 | 114 | 43 | 20 | 7 | 28 | 101 | 354 | 62 | 34 | 11 | 5 |
| 14 | ..... | 148 | 110 | 43 | 19 | 7 | 29 | 97 | 342 | 57 | 32 | 10 | 6 |
| 15 | ..... | 190 | 106 | 41 | 19 | 6 | 30 | 97 | 312 | 56 | 32 | 10 | 6 |
| | | | | | | | 31 | ..... | 283 | ..... | 31 | 11 | ..... |

NOTE.—Discharge determined as follows: May 18, 1907, to Nov. 10, 1910, and Jan. 13 to Sept. 30, 1912, from readings on lake gage and a well-defined rating curve, based on measurements in 1907, 1915, and 1916; Nov. 11, 1910, to Jan. 12, 1912, from a well-defined rating curve, which coincides with the other curve above 400 second-feet and below that is based on three measurements made in 1910 and 1911; Apr. 20 to Sept. 30, 1915, from records on Stevens gage and a well-defined rating curve. Gage read at irregular intervals May to November, 1907, August to November, 1908, and July to September, 1912; discharge interpolated for days when gage was not read. Gage read practically every day at other times except Oct. 7–12, 1909, Apr. 6–8, 1910, and May 19–25, 1912 (discharge interpolated), Dec. 10–12, 1910 (discharge estimated).

*Monthly discharge of Mill Creek near Ash, Oreg., for the years ending Sept. 30, 1907–1912 and 1915.*

[Drainage area, 90 square miles.]

| Month. | Discharge in second-feet. | | | | Run-off. | | Accuracy. |
|---|---|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | Per square mile. | Depth in inches on drainage area. | Total in acre-feet. | |
| 1907. | | | | | | | |
| May 18–31 | 81 | 72 | 79.9 | 0.888 | .03 | 2,220 | C. |
| June | 88 | 36 | 58.9 | .654 | .73 | 3,500 | B. |
| July | 34 | 16 | 23.8 | .264 | .30 | 1,460 | B. |
| August | 15 | 6 | 10.5 | .117 | .13 | 646 | B. |
| September | 6.0 | 4.5 | 4.97 | .055 | .06 | 296 | C. |
| The period | | | | | | 8,120 | |
| 1907–8. | | | | | | | |
| October | 14 | 5 | 8.1 | .090 | .10 | 498 | C. |
| November | 1,270 | 10 | 225 | 2.50 | 2.79 | 13,400 | B. |
| December | 4,420 | 194 | 1,240 | 13.80 | 15.91 | 76,200 | B. |
| January | 1,270 | 208 | 546 | 6.07 | 7.00 | 33,600 | B. |
| February | 710 | 177 | 333 | 3.70 | 3.99 | 19,200 | B. |
| March | 835 | 246 | 380 | 4.22 | 4.86 | 23,400 | B. |
| April | 478 | 110 | 214 | 2.38 | 2.66 | 12,700 | B. |
| May | 290 | 126 | 179 | 1.99 | 2.29 | 11,000 | B. |
| June | 122 | 60 | 84.8 | .942 | 1.05 | 5,050 | B. |
| July | 60 | 20 | 34.8 | .387 | .45 | 2,140 | B. |
| August | 19 | 6 | 11.1 | .123 | .14 | 682 | C. |
| September | 8 | 4.2 | 5.68 | .063 | .07 | 338 | C. |
| The year | 4,420 | 4.2 | 273 | 3.03 | 41.31 | 198,000 | |
| 1908–9. | | | | | | | |
| October | 194 | 3.0 | 59.5 | .661 | .76 | 3,660 | C. |
| November | 753 | 32 | 174 | 1.93 | 2.15 | 10,400 | B. |
| December | 1,020 | 92 | 360 | 4.00 | 4.61 | 22,100 | B. |
| January | 2,920 | 452 | 1,280 | 14.2 | 16.37 | 78,700 | B. |
| February | 1,710 | 504 | 1,200 | 13.3 | 13.85 | 66,600 | B. |
| March | 980 | 153 | 434 | 4.82 | 5.56 | 26,700 | B. |
| April | 182 | 72 | 119 | 1.32 | 1.47 | 7,080 | B. |
| May | 162 | 43 | 62.1 | .690 | .80 | 3,820 | B. |
| June | 158 | 30 | 60.5 | .672 | .75 | 3,600 | B. |
| July | 31 | 15 | 23.2 | .258 | .30 | 1,430 | C. |
| August | 14 | 5 | 8.0 | .089 | .10 | 492 | C. |
| September | 4.8 | 3.4 | 3.99 | .044 | .05 | 237 | C. |
| The year | 2,920 | 3.0 | 311 | 3.46 | 46.77 | 225,000 | |
| 1909–10. | | | | | | | |
| October | 144 | 5 | 28.3 | .314 | .36 | 1,740 | C. |
| November | 10,000 | 177 | 1,270 | 14.1 | 15.73 | 75,600 | B. |
| December | 1,510 | 162 | 629 | 6.99 | 8.06 | 38,700 | B. |
| January | 1,140 | 238 | 599 | 6.66 | 7.68 | 36,800 | B. |
| February | 1,540 | 290 | 701 | 7.79 | 8.11 | 38,900 | B. |
| March | 1,860 | 144 | 459 | 5.10 | 5.88 | 28,200 | B. |
| April | 452 | 110 | 193 | 2.14 | 2.39 | 11,500 | B. |
| May | 110 | 48 | 71.5 | .794 | .92 | 4,400 | B. |
| June | 46 | 26 | 34.7 | .386 | .43 | 2,060 | B. |
| July | 26 | 6 | 14.8 | .164 | .19 | 910 | C. |
| August | 5.5 | 2.5 | 4.02 | .045 | .05 | 247 | C. |
| September | 2.5 | 1.5 | 1.82 | .020 | .02 | 108 | C. |
| The year | 10,000 | 1.5 | 330 | 3.67 | 49.82 | 239,000 | |
| 1910–11. | | | | | | | |
| October | 30 | 1.5 | 14.9 | .166 | .19 | 916 | C. |
| November | 3,160 | 6 | 490 | 5.44 | 6.07 | 29,200 | C. |
| December | 1,610 | 244 | 542 | 6.02 | 6.94 | 33,300 | C. |
| January | 3,640 | 266 | 874 | 9.71 | 11.20 | 53,700 | C. |
| February | 940 | 244 | 587 | 6.52 | 6.79 | 32,600 | C. |
| March | 244 | 75 | 156 | 1.73 | 1.99 | 9,590 | C. |
| April | 452 | 68 | 199 | 2.21 | 2.47 | 11,800 | C. |
| May | 1,060 | 90 | 249 | 2.77 | 3.19 | 15,300 | C. |
| June | 131 | 36 | 62.9 | .699 | .78 | 3,740 | C. |
| July | 38 | 8 | 18.8 | .209 | .24 | 1,160 | C. |
| August | 7.0 | 3.1 | 4.63 | .051 | .06 | 285 | C. |
| September | 20 | 2.9 | 9.97 | .111 | .12 | 593 | C. |
| The year | 3,640 | 1.5 | 266 | 2.96 | 40.04 | 192,000 | |

*Monthly discharge of Mill Creek near Ash, Oreg., for the years ending Sept. 30, 1907–1912 and 1915*—Continued.

| Month. | Discharge in second-feet. | | | | Run-off. | | Accuracy. |
|---|---|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | Per square mile. | Depth in inches on drainage area. | Total in acre-feet. | |
| 1911–12. | | | | | | | |
| October | 26 | 7 | 13.4 | 0.149 | 0.17 | 824 | C. |
| November | 1,100 | 6 | 299 | 3.32 | 3.70 | 17,800 | B. |
| December | 1,360 | 82 | 369 | 4.10 | 4.73 | 22,700 | B. |
| January | 3,820 | 332 | 1,160 | 12.9 | 14.87 | 71,300 | B. |
| February | 3,160 | 390 | 890 | 9.89 | 10.67 | 51,200 | B. |
| March | 1,360 | 194 | 402 | 4.47 | 5.15 | 24,700 | B. |
| April | 402 | 102 | 156 | 1.73 | 1.93 | 9,280 | B. |
| May | 1,410 | 126 | 313 | 3.48 | 4.01 | 19,200 | B. |
| June | 177 | 75 | 104 | 1.16 | 1.29 | 6,190 | B. |
| July | 118 | 36 | 62.8 | .698 | .80 | 3,860 | C. |
| August | 35 | 11 | 21.5 | .239 | .28 | 1,320 | C. |
| September | 102 | 11 | 51.0 | .567 | .63 | 3,030 | C. |
| The year | 3,820 | 6 | 319 | 3.54 | 48.23 | 231,000 | |
| 1914–15. | | | | | | | |
| April 20–30 | 126 | 97 | 109 | 1.21 | .50 | 2,380 | A. |
| May | 386 | 88 | 207 | 2.30 | 2.65 | 12,700 | A. |
| June | 256 | 56 | 115 | 1.28 | 1.43 | 6,840 | A. |
| July | 54 | 31 | 42.2 | .469 | .54 | 2,590 | A. |
| August | 30 | 10 | 18.4 | .204 | .24 | 1,130 | A. |
| September | 9 | 4 | 6.4 | .071 | .08 | 381 | B. |
| The period | | | | | | 26,000 | |

## WILSON RIVER BASIN.

### WILSON RIVER NEAR TILLAMOOK, OREG.

LOCATION.—In the NE. ¼ sec. 24, T. 1 S., R. 9 W., at the highway bridge above the mouth of North Fork of Wilson River, about 7 miles from Tillamook, Tillamook County.

DRAINAGE AREA.—170 square miles (measured on maps compiled by G. B. Lacey & Co.).

RECORDS AVAILABLE.—December 18, 1914, to September 30, 1915, when station was discontinued.

GAGE.—Vertical staff in two sections on right bank.

DISCHARGE MEASUREMENTS.—Made from lower side of highway bridge or by wading.

CHANNEL AND CONTROL.—Gravel; probably shifts during high floods.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of record, 9.2 feet Janyary 14 (discharge, 7,500 second-feet); minimum stage recorded, −0.11 foot September 12 to 25 (discharge, 92 second-feet).

WINTER FLOW.—Stage-discharge relation unaffected by ice.

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Results considered good.

*Discharge measurements of Wilson River near Tillamook, Oreg., during the year ending Sept. 30, 1915.*

| Date. | Made by— | Gage height. | Discharge. |
|---|---|---|---|
| | | *Feet.* | *Sec.-ft.* |
| Dec. 18 | P. V. Hodges | 1.52 | 504 |
| May 28 | C. L. Batchelder | 3.00 | 1,400 |
| Aug. 24 | P. V. Hodges | .03 | 106 |

*Daily discharge, in second-feet, of Wilson River near Tillamook, Oreg., for the year ending Sept. 30, 1915.*

| Day. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | 2,270 | 2,090 | 1,260 | 2,810 | 362 | 750 | 200 | 160 | 108 |
| 2 | | 2,180 | 2,360 | 1,190 | 3,170 | 328 | 668 | 200 | 151 | 108 |
| 3 | | 2,270 | 3,440 | 1,190 | 2,450 | 328 | 590 | 190 | 151 | 103 |
| 4 | | 2,090 | 4,530 | 1,120 | 2,360 | 328 | 545 | 180 | 151 | 103 |
| 5 | | 2,090 | 4,530 | 1,120 | 1,840 | 295 | 500 | 180 | 151 | 98 |
| 6 | | 2,180 | 3,930 | 1,050 | 1,540 | 295 | 460 | 212 | 142 | 98 |
| 7 | | 2,270 | 3,530 | 990 | 1,400 | 265 | 420 | 265 | 142 | 98 |
| 8 | | 2,630 | 2,900 | 990 | 1,260 | 265 | 420 | 362 | 134 | 98 |
| 9 | | 2,450 | 2,630 | 930 | 1,190 | 310 | 380 | 265 | 134 | 98 |
| 10 | | 2,360 | 2,090 | 930 | 1,120 | 362 | 380 | 225 | 134 | 98 |
| 11 | | 3,730 | 1,610 | 870 | 990 | 380 | 380 | 200 | 134 | 98 |
| 12 | | 5,830 | 1,470 | 990 | 930 | 400 | 380 | 225 | 134 | 92 |
| 13 | | 6,930 | 1,400 | 1,050 | 930 | 400 | 345 | 280 | 134 | 92 |
| 14 | | 7,500 | 1,260 | 2,090 | 870 | 400 | 310 | 250 | 134 | 92 |
| 15 | | 6,160 | 1,190 | 2,360 | 810 | 400 | 310 | 238 | 127 | 92 |
| 16 | | 5,060 | 1,120 | 2,180 | 722 | 440 | 310 | 238 | 127 | 92 |
| 17 | | 4,030 | 1,050 | 2,000 | 668 | 440 | 280 | 280 | 120 | 92 |
| 18 | 500 | 3,080 | 990 | 2,000 | 615 | 500 | 280 | 265 | 120 | 92 |
| 19 | 511 | 2,540 | 930 | 1,920 | 568 | 722 | 280 | 250 | 120 | 92 |
| 20 | 522 | 2,090 | 870 | 1,840 | 568 | 668 | 250 | 238 | 120 | 92 |
| 21 | 522 | 1,760 | 1,050 | 1,680 | 568 | 615 | 250 | 250 | 120 | 92 |
| 22 | 522 | 1,400 | 1,260 | 1,470 | 522 | 668 | 238 | 225 | 114 | 92 |
| 23 | 522 | 1,190 | 1,470 | 1,190 | 522 | 668 | 225 | 200 | 114 | 92 |
| 24 | 522 | 990 | 1,540 | 930 | 480 | 750 | 238 | 200 | 108 | 92 |
| 25 | 522 | 810 | 1,470 | 750 | 480 | 1,120 | 280 | 190 | 108 | 92 |
| 26 | 2,090 | 750 | 1,400 | 695 | 440 | 1,470 | 280 | 180 | 108 | 103 |
| 27 | 2,180 | 722 | 1,400 | 668 | 400 | 1,540 | 250 | 180 | 108 | 120 |
| 28 | 1,920 | 668 | 1,260 | 668 | 362 | 1,400 | 225 | 180 | 108 | 120 |
| 29 | 1,920 | 668 | ..... | 722 | 362 | 990 | 212 | 180 | 108 | 108 |
| 30 | 2,360 | 668 | ..... | 668 | 362 | 990 | 212 | 180 | 108 | 108 |
| 31 | 2,180 | 1,610 | ..... | 668 | ..... | 870 | ..... | 180 | 108 | ..... |

NOTE.—Discharge determined from a rating curve well defined between 100 and 2,000 second-feet.

*Monthly discharge of Wilson River, near Tillamook, Oreg., for the year ending Sept. 30, 1915.*

[Drainage area, 170 square miles.]

| Month. | Discharge in second-feet. | | | | Run-off. | | Accuracy. |
|---|---|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | Per square mile. | Depth in inches on drainage area. | Total in acre-feet. | |
| December 18–31 | 2,360 | 500 | 1,200 | 7.06 | 3.68 | 33,200 | B |
| January | 7,500 | 668 | 2,610 | 15.4 | 17.75 | 160,000 | B. |
| February | 4,530 | 870 | 1,960 | 11.5 | 11.98 | 109,000 | B. |
| March | 2,360 | 668 | 1,230 | 7.24 | 8.35 | 75,300 | B. |
| April | 3,170 | 362 | 1,040 | 6.12 | 6.83 | 61,900 | B. |
| May | 1,540 | 265 | 612 | 3.60 | 4.15 | 37,600 | A. |
| June | 750 | 212 | 355 | 2.09 | 2.33 | 21,100 | A. |
| July | 362 | 180 | 222 | 1.31 | 1.51 | 13,600 | A. |
| August | 160 | 108 | 127 | .747 | .87 | 7,810 | A. |
| September | 120 | 92 | 98.5 | .579 | .65 | 5,860 | B. |
| The period | | | | | | 526,000 | |

### NORTH FORK OF WILSON RIVER NEAR TILLAMOOK, OREG.

LOCATION.—In the NW. ¼ sec. 24, T. 1 S., R. 9 W., 800 feet above mouth of North Fork, about 8 miles from Tillamook, and about 11 miles from Bay City, Tillamook County.

DRAINAGE AREA.—17 square miles (measured on maps compiled by C. B. Lacey & Co.).

RECORDS AVAILABLE.—August 21, 1913, to September 30, 1915, when station was discontinued.

GAGE.—Vertical staff on left bank.

DISCHARGE MEASUREMENTS.—Made by wading.

CHANNEL AND CONTROL.—Gravel and cobblestones; likely to shift.

EXTREMES OF STAGE.—Maximum stage recorded during year, 4.10 feet January 15 (discharge, 1,760 second-feet); minimum stage recorded, 1.30 feet August 11, 12, 17 to 23, September 3 to 25 and 28 to 30 (discharge, 14 second-feet).

1913–1915: Maximum stage recorded, 5.10 feet September 4, 1913, and January 23, 1914 (discharge, 1,760 second-feet); minimum is that of 1915.

WINTER FLOW. Stage-discharge relation unaffected by ice.

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Results considered good.

*Discharge measurements of North Fork of Wilson River near Tillamook, Oreg., during the year ending Sept. 30, 1915.*

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---|---|---|---|---|---|---|---|
| | | *Feet.* | *Sec.-ft.* | | | *Feet.* | *Sec.-ft.* |
| Dec. 18 | P. V. Hodges | 1.74 | 67.2 | May 29 | C. L. Batchelder | 2.42 | 266 |
| May 28 | C. L. Batchelder | 2.71 | 385 | Aug. 24 | P. V. Hodges | 1.36 | 19.1 |
| 28 | do | 2.62 | 345 | | | | |

*Daily discharge, in second-feet, of North Fork of Wilson River near Tillamook, Oreg., for the year ending Sept. 30, 1915.*

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 72 | 190 | 260 | 335 | 146 | 132 | 190 | 46 | 132 | 33 | 33 | 18 |
| 2 | 94 | 225 | 242 | 295 | 190 | 160 | 740 | 33 | 106 | 33 | 28 | 18 |
| 3 | 160 | 1,100 | 225 | 295 | 208 | 160 | 630 | 33 | 87 | 33 | 28 | 14 |
| 4 | 119 | 800 | 208 | 260 | 402 | 132 | 425 | 33 | 78 | 28 | 24 | 14 |
| 5 | 101 | 630 | 132 | 278 | 740 | 132 | 315 | 33 | 72 | 28 | 22 | 14 |
| 6 | 82 | 500 | 132 | 335 | 630 | 160 | 208 | 33 | 66 | 54 | 22 | 14 |
| 7 | 82 | 425 | 132 | 380 | 500 | 160 | 160 | 33 | 62 | 66 | 22 | 14 |
| 8 | 78 | 315 | 132 | 402 | 425 | 106 | 132 | 33 | 59 | 119 | 16 | 14 |
| 9 | 72 | 278 | 127 | 358 | 380 | 106 | 132 | 36 | 59 | 54 | 16 | 14 |
| 10 | 72 | 225 | 119 | 335 | 358 | 106 | 127 | 46 | 62 | 46 | 16 | 14 |
| 11 | 72 | 190 | 116 | 450 | 335 | 82 | 119 | 46 | 59 | 43 | 14 | 14 |
| 12 | 72 | 242 | 106 | 525 | 278 | 94 | 106 | 46 | 62 | 46 | 14 | 14 |
| 13 | 72 | 380 | 94 | 920 | 208 | 146 | 106 | 46 | 49 | 82 | 16 | 14 |
| 14 | 72 | 525 | 94 | 1,100 | 190 | 380 | 94 | 54 | 46 | 62 | 22 | 14 |
| 15 | 62 | 525 | 94 | 1,160 | 175 | 475 | 82 | 46 | 46 | 49 | 20 | 14 |
| 16 | 78 | 475 | 94 | 860 | 160 | 425 | 82 | 46 | 43 | 59 | 20 | 14 |
| 17 | 119 | 460 | 94 | 800 | 160 | 278 | 82 | 46 | 40 | 62 | 14 | 14 |
| 18 | 740 | 315 | 62 | 686 | 132 | 225 | 62 | 72 | 40 | 59 | 14 | 14 |
| 19 | 980 | 242 | 62 | 630 | 106 | 146 | 62 | 225 | 40 | 49 | 14 | 14 |
| 20 | 1,040 | 175 | 62 | 630 | 106 | 132 | 62 | 175 | 40 | 46 | 14 | 14 |
| 21 | 980 | 146 | 62 | 630 | 146 | 132 | 46 | 106 | 33 | 46 | 14 | 14 |
| 22 | 402 | 132 | 59 | 575 | 225 | 146 | 46 | 132 | 33 | 46 | 14 | 14 |
| 23 | 335 | 119 | 59 | 132 | 260 | 175 | 40 | 127 | 33 | 40 | 14 | 14 |
| 24 | 315 | 119 | 54 | 119 | 225 | 111 | 33 | 154 | 33 | 40 | 19 | 14 |
| 25 | 208 | 82 | 54 | 106 | 190 | 106 | 46 | 260 | 46 | 33 | 18 | 14 |
| 26 | 208 | 82 | 62 | 94 | 160 | 72 | 46 | 380 | 62 | 33 | 18 | 28 |
| 27 | 190 | 72 | 295 | 62 | 160 | 66 | 46 | 485 | 46 | 33 | 18 | 18 |
| 28 | 160 | 111 | 295 | 62 | 132 | 62 | 46 | 358 | 40 | 33 | 18 | 14 |
| 29 | 111 | 132 | 278 | 54 | ..... | 82 | 46 | 260 | 33 | 33 | 18 | 14 |
| 30 | 101 | 160 | 295 | 54 | ..... | 62 | 46 | 225 | 33 | 33 | 18 | 14 |
| 31 | 146 | ..... | 402 | 94 | ..... | 62 | ..... | 160 | ..... | 33 | 18 | 14 |

NOTE—Discharge determined from a rating curve well defined below 600 second-feet.

*Monthly discharge of North Fork of Wilson River near Tillamook, Oreg., for the year ending Sept. 30, 1915.*

[Drainage area, 17 square miles.]

| Month. | Discharge in second-feet. | | | | Run-off. | | Accuracy. |
|---|---|---|---|---|---|---|---|
| | Maximum. | Minimum. | Mean. | Per square mile. | Depth in inches on drainage area. | Total in acre-feet. | |
| October | 1,040 | 62 | 239 | 14.1 | 16.26 | 14,700 | B. |
| November | 1,100 | 72 | 312 | 18.4 | 20.53 | 18,600 | B. |
| December | 402 | 54 | 145 | 8.53 | 9.83 | 8,920 | B. |
| January | 1,160 | 54 | 420 | 24.7 | 28.48 | 25,800 | B. |
| February | 740 | 106 | 262 | 15.4 | 16.04 | 14,600 | B. |
| March | 475 | 62 | 155 | 9.12 | 10.51 | 9,530 | B. |
| April | 740 | 33 | 145 | 8.53 | 9.52 | 8,630 | B. |
| May | 485 | 33 | 123 | 7.24 | 8.35 | 7,560 | B. |
| June | 132 | 33 | 54.7 | 3.22 | 3.59 | 3,250 | A. |
| July | 119 | 28 | 46.9 | 2.76 | 3.18 | 2,880 | A. |
| August | 33 | 14 | 18.6 | 1.09 | 1.26 | 1,140 | A. |
| September | 28 | 14 | 14.9 | .876 | .98 | 887 | A. |
| The year | 1,160 | 14 | 161 | 9.47 | 128.53 | 116,000 | |

## MISCELLANEOUS MEASUREMENTS.

The results of measurements of the flow of streams at points other then those at which gaging stations were maintained are presented in the following tables:

*Miscellaneous discharge measurements in Lower Columbia River basin and Pacific slope basins in Oregon during the year ending Sept. 30, 1915.*

**Walla Walla River basin.**

| Date. | Stream. | Tributary to or diverting from— | Locality. | Gage height. | Discharge. |
|---|---|---|---|---|---|
| | | | | *Feet.* | *Sec.-ft.* |
| Aug. 19 | Walla Walla River | Columbia River | One-fourth mile below junction of North and South forks. | | 89 |
| Feb. 11 | Water supply of Walla Walla, Wash. | Mill Creek | Intake, sec. 12, T. 6 N., R. 37 E., Walla Walla County, Wash. | | 21.6 |

**Umatilla River basin.**

| | | | | | |
|---|---|---|---|---|---|
| Sept. 2 | Umatilla | Columbia River | Above Pendleton, Oreg., one-eighth mile below intake of Byers millrace, in race. | | 31 |
| Apr. 19 | do | do | Above Furnish reservoir, Oreg., sec. 8, T. 2 N., R. 31 E. | | 605 |
| May 1 | do | do | do | | 371 |
| July 20 | do | do | One-fourth mile below Furnish canal spillway, near Echo, Oreg. | | 45.5 |
| 27 | do | do | do | | 26 |
| Aug. 28 | do | do | do | | 19 |
| Nov. 10 | do | do | 1,000 feet above Oregon Land & Water Co.'s dam, near Umatilla, Oreg. | | 94.9 |
| Jan. 8 | do | do | One-half mile above U. S. Geological Survey gaging station near Umatilla, Oreg. | | 79.9 |
| Nov. 10 | Oregon Land & Water Co.'s canal. | Umatilla River | Just below intake near Umatilla, Oreg. | 1.09 | 9.30 |

*Miscellaneous discharge measurements in Lower Columbia River basin and Pacific slope basins in Oregon during the year ending Sept. 30, 1915*—Continued.

**John Day River basin.**

| Date. | Stream. | Tributary to or diverting from— | Locality. | Gage height. | Discharge. |
|---|---|---|---|---|---|
| | | | | *Feet.* | *Sec.-ft.* |
| Oct. 4 | Canyon Creek | John Day River | Damsite, 10 miles above Canyon City, Grant County, Oreg. | 0.23 | 8.20 |
| 4 | do | do | Canyon City, Grant County, Oreg. | .03 | 10.4 |
| July 23 | North Fork of John Day River. | do | Allison's ranch, 13 miles above Dale, Oreg. | 1.08 | 74.8 |
| Oct. 20 | Camas Creek | North Fork of John Day River. | Just below Cable Creek, Oreg. | .65 | 17.6 |
| Mar. 8 | do | do | do | .75 | 21.9 |
| July 20 | do | do | do | .51 | 11.7 |
| 19 | Owings Creek | Camas Creek | Near Ukiah, Oreg. | | 2.25 |
| 15 | Five Mile Creek | do | 10 miles northwest of Ukiah, Oreg., near elevation 4,500 feet. | | a1.00 |
| 15 | Potamus Creek | North Fork of John Day River. | 15 miles east of Ukiah, Oreg., near elevation 4,420 feet. | | 1.52 |
| 14 | Ditch Creek | do | 10 miles east of Parkers Mill, Oreg., elevation about 4,400 feet. | | 1.34 |

**Deschutes River basin.**

| | | | | | |
|---|---|---|---|---|---|
| July 28 | Deschutes River | Columbia River | Graft's ranch, above Davis Creek, sec. 3, T. 22 S., R. 8 E., Oreg. | | 478 |
| 31 | do | do | Cline Falls (former gaging station), sec. 14, T. 15 S., R. 12 E., Oreg. | | 317 |
| Nov. 2 | Davis Creek | Deschutes River | Graff's ranch, at mouth, sec. 10, T. 22 S., R. 8 E., Oreg. | | 208 |
| 2 | Spring Creek | do | Mouth, NW. ¼ sec. 6, T. 20 S., R. 11 E., Oreg. | | 222 |
| Dec. 16 | do | do | do | | 182 |
| Feb. 1 | do | do | do | | 188 |
| 18 | do | do | do | | 176 |
| July 30 | do | do | do | | 155 |
| June 18 | Tumalo Creek | do | Former gaging station near Tumalo, Oreg., in sec. 3, T. 18 S., R. 10 E. | 3.69 | 135 |
| Apr. 17 | Ochoco Creek | Crooked River | Above Mill Creek, Oreg. | | 41.6 |
| 17 | Mill Creek | Ochoco Creek | Bridge near mouth, Oreg. | | 55.6 |
| 16 | Tableland ditch | do | North of Barnes Butte, Oreg. | | 3.05 |
| 17 | Rye grass ditch | do | Near intake at Prineville, Oreg. | | 24.1 |
| June 22 | Metolius River | Deschutes River | Allen's ranch, SW. ¼ sec. 11, T. 12 S., R. 9 E., Oreg. | .50 | 1,100 |
| 22 | Canyon Creek | Metolius River | 2 miles above gage, NW. ¼ NW. ¼ sec. 29, T. 12 S., R. 9 E., Oreg. | | 16.1 |
| 22 | Small stream | Canyon Creek | SE. ¼ SE. ¼ sec. 17, T. 12 S., R. 9 E., Oreg. | | 2.25 |
| 22 | Brush Creek | do | SW. ¼ SE. ¼ sec. 17, T. 12 S., R. 9 E., Oreg. | | 3.07 |
| 22 | Small stream | do | NW. ¼ NE. ¼ sec 20., T. 12 S., R. 9 E., Oreg. | | 4.08 |
| 22 | do | do | SW. ¼ NE. ¼ sec. 20, T. 12 S., R. 9 E., Oreg. | | a3.0 |
| 22 | Roaring Creek | do | One-half mile above mouth, SW. ¼ SW. ¼ sec. 20, T. 12 S., R. 9 E., Oreg. | | 44.5 |
| 4 | Badger Creek | Warm Springs River | He He camp grounds, sec. 19, T. 7 S., R. 11 E., Oreg. | | 18.9 |
| 30 | do | do | do | | 9.4 |
| Sept. 5 | do | do | do | | 7.25 |
| June 29 | Beaver Creek | do | Sec. 15, T. 7 S., R. 11 E., Oreg. | | 42.0 |
| Sept. 4 | do | do | do | | 37.7 |
| Oct. 22 | Tygh Creek | White River | Discontinued gaging station near Tygh Valley, Oreg. | 4.59 | 39.1 |
| Aug. 17 | do | do | do | 4.28 | 13.2 |

a Estimated.

*Miscellaneous discharge measurements in Lower Columbia River basin and Pacific slope basins in Oregon during the year ending Sept. 30, 1915*—Continued.

**Hood River basin.**

| Date. | Stream. | Tributary to or diverting from— | Locality. | Gage height. | Discharge. |
|---|---|---|---|---|---|
| | | | | *Feet.* | *Sec.-ft.* |
| Nov. 19 | Mount Hood ditch... | East Fork of Hood River. | Intake near Mount Hood, Oreg. | ..... | 3.96 |
| July 22 | ....do..... | ....do..... | ....do..... | ..... | 18.9 |
| 24 | ....do..... | ....do..... | ....do..... | ..... | 17.6 |
| Sept. 17 | ....do..... | ....do..... | ..... | ..... | 12.4 |

**Multnomah Creek basin.**

| | | | | | |
|---|---|---|---|---|---|
| July 28 | Multnomah Creek... | Columbia River..... | Below Multnomah Falls, Oreg. | ..... | 11.4 |

**Sandy River basin.**

| | | | | | |
|---|---|---|---|---|---|
| Nov. 8 | Zig Zag River..... | Sandy River..... | Rowe, just above Still Creek, Oreg. | 0.96 | 151 |
| Aug. 15 | ....do..... | ....do..... | ....do..... | .52 | 69.6 |
| Sept. 7 | ....do..... | ....do..... | ....do..... | .40 | 70.4 |
| Nov. 7 | North Side Boulder Creek. | ....do..... | Mouth, near Brightwood, Oreg. | ..... | 18.9 |
| Sept. 7 | Salmon River..... | ....do..... | Welches, Oreg..... | .20 | 85.4 |
| Nov. 10 | ....do..... | ....do..... | Former gaging station near Brightwood Oreg. | .48 | 337 |

**Willamette River basin.**

| | | | | | |
|---|---|---|---|---|---|
| June 24 | Willamette River... | Columbia River..... | Former gaging station at Springfield, Oreg..... | 1.28 | 1,750 |
| Sept. 1 | ....do..... | ....do..... | ....do..... | ..... | 717 |
| 26 | Lost Creek..... | McKenzie River..... | Near McKenzie Bridge, Oreg. sec. 11, T. 16 S., R. 6 E. | .80 | 184 |
| 25 | Horse Creek..... | ....do..... | Near McKenzie Bridge, Oreg. sec. 23, T. 16 S., R. 5 E. | 1.70 | 245 |
| 5 | Power canal..... | South Santiam River.. | Albany, Oreg..... | ..... | 176 |
| 9 | Mill Creek..... | Willamette River..... | Salem, Oreg., below power canal intake. | ..... | 42.2 |
| 9 | Power canal..... | Mill Creek..... | Salem, Oreg..... | ..... | 116 |
| Aug. 5 | Yamhill River..... | Willamette River .... | Former gaging station near La Fayette, Oreg. | 3.80 | 103 |

**Rogue River basin.**

| | | | | | |
|---|---|---|---|---|---|
| 1913. | | | | | |
| July 28 | Rogue River..... | Pacific Ocean..... | Discontinued gaging station, near Prospect, Oreg. | 1.27 | 656 |
| 31 | ....do..... | ....do..... | ....do..... | 1.27 | 588 |
| 1914. | | | | | |
| Sept. 20 | ....do..... | ....do..... | Above California-Oregon Power Co. canal, near Prospect, Oreg. | ..... | 402 |
| Aug. 19 | Mill Creek..... | Rogue River..... | ....do..... | ..... | 39.4 |
| Sept. 22 | ....do..... | ....do..... | ....do..... | ..... | 47.8 |
| Aug. 5 | North Fork of Big Butte Creek. | Big Butte Creek..... | Above junction with South Fork, near Butte Falls. | ..... | 3.7 |
| Sept. 17 | South Fork of Little Butte Creek. | Little Butte Creek.... | Former gaging station near Lake Creek, Oreg. | 9.49 | 14.3 |
| Oct. 21 | North Fork of Little Butte Creek. | ....do..... | Below Fish Lake, 20 miles east of Lake Creek, Oreg. | .31 | 31.3 |
| 22 | ....do..... | ....do..... | ....do..... | .34 | 27.3 |
| 22 | ....do..... | ....do..... | ....do..... | .31 | 34.1 |
| Sept. 18 | North Fork of Little Butte Creek. | ....do..... | Former gaging station near Lake Creek, Oreg. | .61 | 37.5 |
| 18 | First Hanley ditch.. | North Fork of Little Butte Creek. | 200 feet below intake near Lake Creek, Oreg. | ..... | 15.1 |

*Miscellaneous discharge measurements in Lower Columbia River basin and Pacific slope basins in Oregon during the year ending Sept. 30, 1915*—Continued.

**Rogue River basin**—Continued.

| Date. | Stream. | Tributary to or diverting from— | Locality. | Gage height. | Discharge. |
|---|---|---|---|---|---|
| 1913. | | | | *Feet.* | *Sec.-ft.* |
| Sept. 18 | Second Hanley ditch. | North Fork of Little Butte Creek. | 100 feet below intake | | 4.1 |
| 18 | Third Hanley ditch | do | Intake | | a 2.0 |
| Aug. 3 | Eagle Point ditch | Little Butte Creek | Intake, near Brownsboro, Oreg. | | 5.9 |
| Sept. 19 | do | do | do | | 11.5 |
| May 2 | Bear Creek | Rogue River | Former gaging station near Talent, Oreg. | 1.18 | 98.8 |
| July 4 | do | do | do | .70 | 20.3 |
| 17 | do | do | do | .68 | 16.8 |
| 25 | do | do | do | | 4.16 |
| Mar. 14 | Applegate River | do | Former gaging station near Buncom, Oreg. | 3.07 | 708 |
| Sept. 15 | do | do | do | 1.28 | 44.6 |
| 15 | Little Applegate River. | Applegate River | Below Farmer's ditch, near Buncom, Oreg. | | 2.2 |
| 15 | Farmer's ditch | Little Applegate River. | Intake, near Buncom, Oreg. | | 6.2 |
| 15 | Cameron ditch | Applegate River | Former gaging station near Buncom, Oreg. | .80 | 9.14 |

**Umpqua River basin.**

| | | | | | |
|---|---|---|---|---|---|
| Aug. 9 | South Umpqua River. | Umpqua River | Roseburg, Douglas County, Oreg. | | 115 |
| Aug. 15 | North Umpqua River. | do | Trail crossing 1 mile below Bradley Creek, Oreg. b | | 40 |
| Sept. 21 | do | do | do | | 31. |
| Aug. 15 | do | do | 1 mile above Lake Creek, Oreg. b | | 269 |
| Sept. 21 | do | do | do | | 270 |
| Aug. 15 | Silent Creek | Diamond Lake | 1 mile above mouth a | | 21.5 |
| 15 | Lake Creek | North Umpqua River. | Outlet of Diamond Lake a | | 19.7 |
| Sept. 22 | do | do | do | | 21.8 |
| Aug. 14 | do | do | Mouth b | | 28.1 |
| Sept. 20 | do | do | do | | 23.0 |
| Apr. 23 | do | Loon Lake | Bridge, SE. ¼ sec. 24, T. 23 S., R. 10 W. | | 70.1 |
| 24 | do | do | do | | 66.7 |
| Aug. 6 | do | do | Half a mile below bridge, sec. 24, T. 23 S., R. 10 W. | | 12.7 |
| Apr. 23 | Soup Creek | Lake Creek | Mouth, sec. 13, T. 23 S., R. 10 W. | | 5.2 |

a Estimated.
b About 50 miles east of Hoaglin, Douglas County, on unsurveyed land; see Diamond Lake quadrangle.

# INDEX.

# STREAM-GAGING STATIONS

AND

# PUBLICATIONS RELATING TO WATER RESOURCES

## PART XII.—NORTH PACIFIC SLOPE BASINS

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

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

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

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

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

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

Boston, Mass., 2500 Customhouse.
Albany, N. Y., Room 18, Federal Building.
Atlanta, Ga., Post Office Building.
Madison, Wis., care of Railroad Commission of Wisconsin.
Topeka, Kans., 25 Federal Building.
Helena, Mont., Montana National Bank Building.
Denver, Colo., 403 New Post Office Building.
Salt Lake City, Utah, 421 Federal Building.
Boise, Idaho, 615 Idaho Building.
Portland, Oreg., 416 Couch Building.
Tacoma, Wash., 406 Federal Building.
San Francisco, Cal., 328 Customhouse.
Los Angeles, Cal., 619 Federal Building.
Phoenix, Ariz., 417 Fleming Building.
Austin, Tex., Old Post Office Building.
Honolulu, Hawaii, 14 Capitol Building.

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

## STREAM-FLOW REPORTS.

Stream-flow records have been obtained at more than 3,800 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. |
| W 28 | Measurements, ratings, and gage heights, Arkansas River and western United States. | 1898. |

*Stream flow data in reports of the United States Geological Survey*—Continued.

| Report. | Character of data. | Year. |
|---|---|---|
| 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. |

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 1915. 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, Me., 1903 to 1915, are published in Water-Supply Papers 97, 124, 165, 201, 241, 261, 281, 301, 321, 351, 381, and 401, which contain records for the New England streams from 1903 to 1915. 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, 1899–1915.*

| Year. | I | II | III | IV | V | VI | VII | VIII | IX | X | XI | XII | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | North Pacific slope basins. | | |
| | North Atlantic slope basins (St. John River to York River). | South Atlantic slope and eastern Gulf of Mexico basins (James River to the Mississippi). | Ohio River basin. | St. Lawrence River basin. | Hudson Bay and upper Mississippi River basins. | Missouri River basin. | Lower Mississippi River basin. | Western Gulf of Mexico basins. | Colorado River basin. | Great Basin. | Pacific slope basins in California. | Pacific slope basins in Washington and upper Columbia River. | Snake River basin. | Lower Columbia River and Pacific slope basins in Oregon. |
| 1899 [a] | 35 | [b] 35, 36 | 36 | 36 | 36 | [c] 36, 37 | 37 | 37 | [d] 37, 38 | 38, [e] 39 | 38, [f] 39 | 38 | 38 | 38 |
| 1900 [g] | 47, [h] 48 | 48 | 48, [i] 49 | 49 | 49 | 49, [j] 50 | 50 | 50 | 50 | 51 | 51 | 51 | 51 | 51 |
| 1901 | 65, 75 | 65, 75 | 65, 75 | 65, 75 | [k] 65, 66, 75 | 66, 75 | [k] 65, 66, 75 | 66, 75 | 66, 75 | 66, 75 | 66, 75 | 66, 75 | 66, 75 | 66, 75 |
| 1902 | 83 | [b] 82, 83 | 83 | [l] 82, 83 | [k] 83, 85 | 84 | [k] 83, 84 | 84 | 85 | 85 | 85 | 85 | 85 | 85 |
| 1903 | 97 | [b] 97, 98 | 98 | 97 | [h] 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] 139, 173 | 174 | 175, [s] 177 | 176, [r] 177 | 177 | 178 | 178 | [t] 177, 178 |
| 1906 | [n] 201, [o] 203, [p] 206 | [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 |

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

# NORTH PACIFIC SLOPE DRAINAGE BASINS.

## 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, and Lewis 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 a similar list of reports that are of general interest in many sections and cover a wide range of hydrologic subjects, and also brief references to reports published by State and other organizations (see pp. XXXI–XXXII).

## GAGING STATIONS.

NOTE.—Dash after a date indicates that station was being maintained September 30, 1915. 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–
Soleduck River near Quillayute, Wash., 1897–1901.
Kalawa River near Forks, Wash., 1897–1901.

### PUGET SOUND DRAINAGE BASINS.

Elwha River at McDonald, Wash., 1897–1901.
Elwha River near Port Angeles, Wash., 1911–12.
Dungeness River at Sequin, Wash., 1897–98.
Dungeness River at Dungeness, Wash., 1898–1901.
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.
Nisqually River near Ashford, Wash., 1910–1914.
Nisqually River near La Grande, Wash., 1906–1911.
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.

Nooksack River,[1] North Fork (head of 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., 1910–11.
Middle Fork of Nooksack River near Deming, Wash., 1910–11.

COLUMBIA RIVER BASIN.

Columbia River at Wenatchee, Wash., 1910.
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.
Callahan Creek at Troy, Mont., 1911–
Yaak River near Troy, Mont., 1910–
Moyie River at Snyder, Idaho, 1911–
Clark Fork at Missoula, Mont., 1898–1907.
Clark Fork at St. Regis, Mont., 1910–
Clark Fork near Plains, Mont., 1910–
Pend Oreille Lake at Sandpoint, Idaho, 1914–
Clark Fork at Priest River, Idaho, 1903–1905.
Clark Fork at Newport, Wash., 1904–1910.
Clark Fork at Metaline Falls, Wash., 1908–1910; 1912–
Racetrack Creek near Anaconda, Mont., 1911–12; 1914–
Little Blackfoot River and ditch near Elliston, Mont., 1910–
Rock Creek near Quigley, Mont., 1910–1912.
Big Blackfoot River at Bonner, Mont., 1898–1905.
Rattlesnake Creek at Missoula, Mont., 1898–1900.
Bitterroot River, West Fork (head of Bitterroot River), near Darby, Mont., 1910–
Bitterroot River near Grantsdale, Mont., 1902–1907.
Bitterroot River near Missoula, Mont., 1898–1901; 1903–4.
East Fork of Bitterroot River near Darby, Mont., 1910–
Lolo Creek near Lolo, Mont., 1910–
St. Regis River near St. Regis, Mont., 1910–
Flathead River near Columbia Falls, Mont., 1910–
Flathead River at Demersville, near Kalispell, Mont., 1910–1912.
Flathead River at Damon's ranch, near Kalispell, Mont., 1910–1912.
Flathead River at Keller's ranch, near Holt, Mont., 1910–1912.
Flathead Lake (on Flathead River) near Holt, Mont., 1900.
Flathead Lake at Polson, Mont., 1908–
Flathead River near Polson, Mont., 1907–
Middle Fork Flathead River at Belton, Mont., 1910–
Lake McDonald outlet at Lake McDonald, Mont., 1912–1914.
South Fork of Flathead River near Columbia Falls, Mont., 1910–
Swan River near Big Fork, Mont., 1910–11.
Stillwater River near Kalispell, Mont., 1906–7.
Whitefish River near Kalispell, Mont., 1906.
Little Bitterroot River near Marion, Mont., 1910–
Little Bitterroot River near Hubbart, Mont., 1909–

[1] Revised decision of United States Geographic Board rendered Oct. 3, 1917.

Columbia River tributaries—Continued.
Spokane River tributaries—Continued.
Latah (Hangman) Creek at and near Tekoa, Wash., 1904–5.
North Fork of Latah Creek near Spokane, Wash., 1904–5.
Little Spokane River near Spokane, Wash., 1903–1905; 1911–1913.
Sanpoil River at Keller, Wash., 1911–
Nespelem River at Nespelem, Wash., 1911–
Okanogan River at Okanogan, Wash., 1911–
Similkameen River near Oroville, Wash., 1911–
Sinlahekin Creek near Loomis, Wash., 1903–1905.
Johnson Creek near Riverside, Wash., 1903–1907.
Salmon Creek near Conconully, Wash., 1910–
Salmon Creek near Okanogan, Wash., 1903–1912.
Methow River at Winthrop, Wash., 1912.
Methow River at Pateros, Wash., 1903–
Chewack Creek at Winthrop, Wash., 1912–13.
Twisp River at Twisp, Wash., 1911–1913.
Stehekin River (head of Chelan River) at Stehekin, Wash., 1910–
Chelan Lake at Lakeside, Wash., 1897–1899.
Chelan Lake at Chelan, Wash., 1905; 1910–
Chelan River at Chelan, Wash., 1903–
Railroad Creek at Lucerne, Wash., 1910–1913.
Entiat River at Entiat, Wash., 1910–
Wenatchee River near Leavenworth, Wash., 1910–
Wenatchee River at Dryden (Cashmere), Wash., 1904–
Wenatchee River at Wenatchee, Wash., 1897.
White River near Chiwaukum, Wash., 1911–12; 1914.
Nason Creek near Nason, Wash., 1911.
Chiwawa Creek near Leavenworth, Wash., 1911–12; 1913–14.
Chiwaukum Creek near Chiwaukum, Wash., 1911.
Icicle Creek near Leavenworth, Wash., 1911–14.
Peshastin Creek at Blewett, Wash., 1911–12.
Peshastin Creek near Leavenworth, Wash., 1911–12.
Wenatchee Valley canal at Dryden, Wash. (irrigation seasons only), 1912–
Crab Creek at Wilson Creek, Wash., 1904.
Crab Creek at Adrian, Wash., 1910; 1911; 1912.
Crab Creek near Ephrata, Wash., 1909.
Moses Lake at Neppel (Moses Lake), Wash., 1909–1914.
Crab Creek near Warden, Wash., 1909–1912.
Rockyford Creek near Ephrata, Wash., 1909–1911.
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–
Yakima River at Selah Gap, near Yakima,[1] Wash., 1897; 1904; 1911; 1912.
Yakima River at Union Gap, Wash., 1894–1909; 1911–1914.
Yakima River near Wapato, Wash., 1908–
Yakima River at Mabton, Wash., 1904–1906; 1911–12.
Yakima River near Prosser, Wash., 1904–1906; 1913–
Yakima River at Kiona, Wash., 1895–1915.

[1] Yakima; city and precinct, Yakima County, Wash.; not North Yakima. Decision of U. S. Geographic Board rendered Jan. 2, 1918.

Columbia River tributaries—Continued.
Yakima River near Richland, Wash., 1906–1911.
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., 1905–6; 1909–1911.
West Kittitas canal near Thorp, Wash., 1904–1906; 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 near 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–
Naches River below Tieton River, near Naches, Wash., 1905; 1909–1912.
Naches River near Yakima,[1] 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., 1904–1906; 1909–1913.
Tieton River, North Fork, below Clear Creek, near Naches, Wash., 1914–
Tieton River at McAllister Meadows, near Naches, Wash., 1908–1914.
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; 1909–11.
Naches Canal Co.'s (Gleed) canal near Naches, Wash., 1904–1906; 1909–1911.
Yakima Valley (Congdon) canal near Naches, Wash., 1904–1906; 1909–1911.
Naches-Cowiche canal near Naches, Wash., 1904–5; 1909–1911.
Yakima[1] power canal near Yakima,[1] Wash., 1904–1906; 1909–10.
Schanno canal near Yakima, Wash., 1904–5; 1909–1911.
Yakima[1] power waste at Yakima, Wash., 1909–1912.
Yakima[1] mill waste at Yakima, Wash., 1909–1912.
Naches Avenue Union canal at Yakima, Wash., 1904–1906, 1909–1911.
Old Union canal near Yakima, Wash., 1904–1906; 1909–1911.
Moxee Co.'s canal near Yakima, Wash., 1904–1906; 1909–1911.
Fowler canal near Yakima, Wash., 1904–1906; 1909–1911.
Ahtanum Creek, North Fork (head of Ahtanum Creek), near Tampico, Wash., 1907–
Ahtanum Creek at The Narrows, near Tampico, Wash., 1908–1913.

[1] Decision of U. S. Geographic Board; formerly called North Yakima.

Columbia River tributaries—Continued.
Yakima River tributaries—Continued.
Ahtanum Creek near Union Gap,[1] Wash., 1904; 1907–1912.
South Fork of Ahtanum Creek at Conrad ranch, near Tampico, Wash., 1915–
South Fork of Ahtanum Creek near Tampico, Wash., 1907–1914.
New Reservation canal near Parker (Union Gap), Wash., 1904–
Old Reservation canal near Parker (Wapato), Wash., 1904–
Sunnyside canal near Wapato, Wash., 1904–
Toppenish Creek near Fort Simcoe, Wash., 1909–
Toppenish Creek near White Swan (Wapato), Wash., 1909–1912.
Toppenish Creek at railway bridge, near Toppenish, Wash., 1894–1896.
Toppenish Creek near Toppenish, Wash., 1908–9.
Toppenish Creek at Alfalfa, Wash., 1909–1912.
Simcoe Creek near Fort Simcoe, Wash., 1909–
Reservation drain at Alfalfa, Wash., 1912–
Satus Creek near Toppenish, Wash., 1908–1913.
Satus Creek below mouth of Dry Creek, near Toppenish, Wash., 1913–
Satus Creek near Alfalfa, Wash., 1905.
Satus Creek near Satus, Wash., 1894–1896.
Kiona canal near Kiona, Wash., 1904–1906; 1908–1911.
Kennewick canal near Richland(Kennewick), Wash., 1904–5; 1910–11.
Lower Yakima canal near Kiona, Wash., 1905; 1910–11.
Snake River at south boundary at Yellowstone National Park, 1913–
Jackson Lake (Snake River) at Moran, Wyo., 1909–10 (fragmentary); 1911–
Snake River [2] near Moran, Wyo., 1903–
Snake River [2] at Grovont, Wyo., 1899.
Snake River [2] near Lyon, Idaho, 1903–1911.
Snake River [2] near Heise, Idaho, 1910–
Snake River at Idaho Falls, Idaho, 1889–1890; 1892–1894.
Snake River near Shelley, Idaho, 1915–
Snake River near Firth, Idaho, 1915.
Snake River near Blackfoot, Idaho, 1910–
Snake River at Neeley, Idaho, 1906–
Snake River at Howells Ferry, near Minidoka, Idaho, 1910–
Snake River at Montgomery Ferry, near Minidoka, Idaho, 1895–1899; 1901–1910
Lake Milner (on Snake River) at Milner, Idaho, 1911–
Snake River at Milner, Idaho, 1909–
Snake River near Twin Falls, Idaho, 1911–
Snake River near Hagerman, Idaho, 1912–
Snake River at King Hill, Idaho, 1909–
Snake River near Murphy, Idaho, 1912; 1913–
Snake River at Weiser, Idaho, 1910–
Snake River at Lewiston, Idaho, 1910.
Snake River near Burbank, Wash., 1907–
Pacific Creek near Moran, Wyo., 1906.
Buffalo River near Elk, Wyo., 1906.
Henrys Fork [3] at Warm River, Idaho, 1910–1915.
Henrys Fork near Ora, Idaho, 1902–1909.
Henrys Fork in canyon above Fall River, Idaho, 1890–91.

[1] Revised decision of U. S. Geographic Board rendered Jan. 2, 1918; formerly called Yakima City.
[2] Decision of United States Geographic Board; formerly called South Fork of Snake River.
[3] Decision of United States Geographic Board; formerly called North Fork of Snake River.

Columbia River tributaries—Continued.
Snake River tributaries—Continued.
Malheur River tributaries—Continued.
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; 1912–13.
Bully Creek at Warm Springs, near Vale, Oreg., 1903–4; 1905–1907; 1911–
Bully Creek at Vale, Oreg., 1904–5.
Hope Mill ditch at Vale, Oreg., 1904–5.
Willow Creek near Malheur, Oreg., 1904–6; 1910–11; 1912–
Willow Creek near Brogan, Oreg., 1910–
Willow Creek at Dell, Oreg., 1904–1906.
Cow Creek near Brogan, Oreg., 1912–1914.
Pole Creek near Brogan, Oreg., 1912–13.
Nevada ditch below Vale, Oreg., 1904–5.
Payette River near Horseshoe Bend, Idaho, 1906–
Payette River at Payette, Idaho, 1895–1897.
North Fork of Payette River at Lardo, Idaho, 1908–
North Fork of Payette River at Van Wyck, Idaho, 1912–
Lake Fork of Payette River near McCall, Idaho, 1909–1914.
Shafer Creek near Horseshoe Bend, Idaho, 1911–12.
Harris Creek near Horseshoe Bend, Idaho, 1911–12.
Weiser River near Weiser, Idaho, 1890–91; 1894–1904; 1910–1915.
Weiser River, West Fork, near Fruitvale, Idaho, 1910–1913.
Lost Creek near Tamarack, Idaho, 1910–1914.
Middle Fork of Weiser River at Middle Fork, Idaho, 1910–1913.
Sage Creek near Midvale, Idaho, 1913.
Sommercamp Creek near Midvale, Idaho, 1913.
Miller Creek near Midvale, Idaho, 1913.
Crane Creek near Midvale, Idaho, 1910–
Mann Creek near Weiser, Idaho, 1911–1913.
Monroe Creek (upper station) near Weiser, Idaho, 1911–12.
Monroe Creek (lower station) near Weiser, Idaho, 1911–1913.
Burnt River, North Fork (head of Burnt River), near Audrey, Oreg., 1915–
Burnt River near Hereford, Oreg., 1915–
Burnt River near Bridgeport, Oreg., 1915–
Middle Fork of Burnt River near Audrey, Oreg., 1915.
South Fork of Burnt River near Unity, Oreg., 1915–
Sawmill Creek near Unity, Oreg., 1915.
Camp Creek near Hereford, Oreg., 1915.
Powder River at Salisbury, Oreg., 1903–1914.
Powder River at Baker, Oreg., 1913; 1914.
Powder River near North Powder, Oreg., 1909–1912; 1913–
Baldock Slough at Baker, Oreg., 1913; 1914.
Old Settlers Slough at Baker, Oreg., 1913; 1914.
Pine Creek near Baker, Oreg., 1913; 1914.
Goodrich Creek near Baker, Oreg., 1913.
Mill Creek near Baker, Oreg., 1913; 1914.
Lee-Polly ditch near Baker, Oreg., 1914.
Marble Creek near Baker, Oreg., 1913; 1914.
Salmon Creek near Baker, Oreg., 1913; 1914.

Columbia River tributaries—Continued.
Snake River tributaries—Continued.
Clearwater River at Lewiston, Idaho, 1910–1913.
Lochsa River near Lowell, Idaho, 1910–1912.
South Fork of Clearwater River near Grangeville, Idaho, 1910–
South Fork of Clearwater River at Kooskia, Idaho, 1910–1912.
Lolo Creek near Greer, Idaho, 1911–12.
Tucannon River near Pomeroy, Wash., 1913–1915.
Tucannon River near Starbuck, Wash., 1914–
Palouse River near Potlatch, Idaho, 1914–
Palouse River at Elberton, Wash., 1904–5.
Palouse River near Winona, Wash., 1915–
Palouse River at Hooper, Wash., 1897–
Rock Creek near Ewan (St. John), Wash., 1903–1905; 1914–
Cow Creek near Keystone, Wash., 1904–5.
Cow Creek near Hooper, Wash., 1904.
Walla Walla River near Milton, Oreg., 1903–1908.
Walla Walla River at Whitman, Wash., 1897–1899.
South Fork of Walla Walla River near Milton, Oreg., 1906; 1907–
South Fork of Walla Walla River near Milton, Oreg. (lower station), 1903–1906.
Mill Creek near Walla Walla, Wash., 1913–
Umatilla River at Gibbon, Oreg., 1896–1911.
Umatilla River at Pendleton, Oreg., 1891–2; 1903–1905.
Umatilla River above Furnish reservoir, near Yoakum, Oreg., 1915–
Umatilla River at Yoakum, Oreg., 1903–
Umatilla River near Umatilla, Oreg., 1903–
North Fork of Umatilla River near Gibbon, Oreg., 1912–
McKay Creek near Pendleton, Oreg., 1903–4.
Farmers' mill ditch at Pendleton, Oreg., 1905.
Slusher & Gould ditch near Nolin, Oreg., 1905–6.
Lisle & Crane ditch near Echo, Oreg., 1905.
Charles Lisle ditch at Echo, Oreg., 1905–6.
Henrietta mill ditch at Echo, Oreg., 1905–6.
Wilson & Co.'s ditch at Echo, Oreg., 1905–6.
Allen ditch at Echo, Oreg., 1905–6.
Western Land & Irrigation Co.'s (Hinkle) ditch at Echo, Oreg., 1905–6.
Pioneer ditch at Echo, Oreg., 1905–6.
Maxwell ditch at Echo, Oreg., 1905–6.
Maxwell Land & Irrigation Co.'s (Hermiston) ditch near Hermiston, Oreg., 1905–6.
Beitle ditch near Hermiston, Oreg., 1905–6.
Oregon Land & Water Co.'s ditch at Umatilla, Oreg., 1905–6.
Brownell ditch at Umatilla, Oreg., 1905–6.
Willow Creek near Arlington, Oreg., 1905–6.
Rock Creek near Goldendale, Wash., 1911–13.
Squaw Creek near Goldendale, Wash., 1911–13.
John Day River near Dayville, Oreg., 1908–1914.
John Day River at Clarno, Oreg., 1914–15
John Day River at McDonald, Oreg., 1904–
South Fork of John Day River at Dayville, Oreg., 1908–1914.
Dayville ditch at Dayville, Oreg., 1910–1914.
Camas Creek above Cable Creek, near Ukiah, Oreg., 1914–
Camas Creek below Cable Creek, near Ukiah, Oreg., 1914.
Cable Creek near Ukiah, Oreg., 1914–
Rock Creek at Rockcreek, Oreg., 1905; 1911.

Columbia River tributaries—Continued.
Deschutes River tributaries—Continued.
Metolius River at Rigg's ranch, near Sisters, Oreg., 1908–1912.
Lake Creek near Sisters, Oreg., 1911–1913; 1915–
First Creek, near Sisters, Oreg., 1915–
Jack Creek near Sisters, Oreg., 1915–
Canyon Creek near Sisters, Oreg., 1915-
Whitewater River near Grandview, Oreg., 1911–1913.
Shitike Creek at Warmspring, Oreg., 1911–
Trout Creek near Antelope, Oreg., 1915.
Trout Creek near Gateway, Oreg., 1915.
Hay Creek near Hay Creek, Oreg., 1915.
Warm Springs River near Warmspring, Oreg., 1911–
Mill Creek near Warmspring, Oreg., 1915.
White River near Tygh Valley, Oreg., 1911–
Tygh Creek at Tygh Valley, Oreg., 1911–1913.
Klickitat River above Pearl Creek, near Glenwood, Wash., 1910.
Klickitat River above Big Muddy Creek, Wash., 1905.
Klickitat River below Big Muddy Creek, Wash., 1905; 1907–8.
Klickitat River at Camp Klickitat, Wash., 1907–1908.
Klickitat River near Glenwood, Wash., 1909–
Klickitat River below Glenwood, Wash., 1914.
Klickitat River at Hanson's cable, near Klickitat, Wash., 1908–9.
Klickitat River at Klickitat (Wright), Wash., 1909–1912.
Klickitat River at Wols Ferry, near Lyle, Wash., 1907–1910.
Klickitat River at Lyle, Wash., 1912.
West Fork of Klickitat River near Glenwood, Wash., 1910.
Big Muddy River above mouth of Cougar Creek, near Wright, Wash., 1905; 1908.
Little Klickitat River near Goldendale, Wash., 1910–1912.
Hood River at Dee, Oreg., 1913–
Hood River at Winans, Oreg., 1905–1907; 1910–1912; 1913.
Hood River at Tucker Bridge, Oreg., 1897–1899; 1913–
Hood River at Powerdale, near Hood River, Oreg., 1913–
East Fork of Hood River above intake, near Mount Hood, Oreg., 1915–
East Fork of Hood River near Mount Hood, Oreg., 1913–14.
East Fork irrigation district canal near Mount Hood, Oreg., 1913–
West Fork of Hood River near Dee, Oreg., 1913–
Pacific Light & Power Co. tailrace near Hood River, Oreg., 1914.
White Salmon River at splash dam near Trout Lake, Wash., 1912–
White Salmon River at Husum, Wash., 1909–
White Salmon River at Condit dam, near Underwood, Wash., 1912–13.
Trout Creek at Guler, Wash., 1909–1911.
Little White Salmon River below Lava Creek, near Cook, Wash., 1903–1906.[1]
Little White Salmon River near Cooks, Wash., 1909.
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–
Sandy River above Bull Run River, near Bull Run, Oreg., 1910–1912.

[1] Records published in U. S. Geol. Survey Water-Supply Paper 272, pp. 428–429.

STREAMS BETWEEN COLUMBIA RIVER AND KLAMATH RIVER.

## REPORTS ON WATER RESOURCES OF THE NORTH PACIFIC SLOPE DRAINAGE BASINS.

### PUBLICATIONS OF UNITED STATES GEOLOGICAL SURVEY.

#### WATER-SUPPLY PAPERS.

Water-supply papers are distributed free by the Geological Survey as long as its stock lasts. An asterisk (*) indicates that this stock has been exhausted. Many of the papers marked in this way may, however, be purchased (at price noted) from the SUPERINTENDENT OF DOCUMENTS, Washington, D. C. Omission of the price indicates that the report is not obtainable from Government sources. Water-supply papers are of octavo size.

*4. A reconnaissance in southeastern Washington, by I. C. Russell, 1897. 96 pp., 7 pls. 15c.

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. 15c.

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. 5c.

*61. Preliminary list of deep borings in the United States, Part II (Nebraska-Wyoming), by N. H. Darton. 1902. 67 pp. 5c.

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.; describes 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. 25c. [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. 5c.

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. 10c.

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. 15c.

Gives estimates (p. 85) of flood discharge and frequency for Boise River at Boise and Weiser River at Weiser, Idaho.

*231. Geology and water resources of the Harney Basin region, Oregon, 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.

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. 15c.

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 geologic 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, Oregon, and its utilization, by F. F. Henshaw, John E. 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, Oregon, prepared under the direction of R. B. Marshall, chief geographer. 1914. 8 pp., 2 pls. (6 sheets). 30c.

349. Profile surveys in Willamette River, Oregon, 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, Washington, 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, Washington, 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 basins, 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 reconnaissances 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, Washington, prepared under the direction of R. B. Marshall, chief geographer. 1915. 8 pp., 5 pls. 15c.

377. Profile surveys in Spokane River basin, Washington, and John Day River basin, Oregon, 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, Oregon, 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, Oregon, 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, Washington, 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.

### BULLETINS.

An asterisk (*) indicates that the Geological Survey's stock of the paper is exhausted. Many of the papers so marked may be purchased from the SUPERINTENDENT OF DOCUMENTS, WASHINGTON, D. C. 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. 25c.

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 and 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. 10c.

*298. Record of deep-well drilling for 1905, by M. L. Fuller and Samuel Sanford. 1906. 299 pp. 25c.

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 are distributed free by the Geological Survey as long as its stock lasts. An asterisk (*) indicates that this stock has been exhausted. Many of the papers so marked, however, may be purchased from the SUPERINTENDENT OF DOCUMENTS, WASHINGTON, D. C.

*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 lands; 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. $1.25. 16 maps in separate case, 75c. 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. $2.85. Contains:

*Mount Rainier Forest Reserve, Washington, by F. G. Plummer, pp. 81–143, Pls. 33–50.

*Olympic Forest Reserve, Washington, from field notes by Arthur Dodwell and T. F. Rixon, pp. 145–208, Pls. 51–70.

*Cascade Range Forest Reserve, Oregon, 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. Leiberg, 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.[1] 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 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 stock of the folio is exhausted.

*45. Boise, Idaho.

Describes geography and geology, cold springs and cold artesian waters, and hot springs and hot artesian waters.

103. Nampa, Idaho-Oregon. 5c.

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.

[1] 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.

104. Silver City, Idaho. 5c.

Describes the relief, drainage, climate, vegetation, and culture of the Silver City quadrangle; discusses the geologic history and the geologic formations, and, under "Economic geology," the surface waters available for irrigation or water-power development, warm springs, and artesian wells; notes possible chances for artesian waters; gives records of wells near Enterprise and Guffey; see also Water-Supply Paper 78.

*139. Snoqualmie, Washington.

Describes the relief and drainage of an area including portions of Kittitas, Yakima, Pierce, and King counties; the statigraphic, structural, and historical geology, and, under "Economic geology," includes a brief paragraph on the utilization of the water supply.

## 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 Reclamation Service; and the reports of the Chief of Engineers, U. S. 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.

## GEOLOGICAL SURVEY HYDROLOGIC REPORTS OF GENERAL INTEREST.

The following list comprises reports not readily classifiable by drainage basins and covering a wide range of hydrologic investigations:

### WATER-SUPPLY PAPERS.

*1. Pumping water for irrigation, by H. M. Wilson. 1896. 56 pp., 9 pls.

Describes pumps and motive powers, windmills, water wheels, and various kinds of engines; also storage reservoirs to retain pumped water until needed for irrigation.

*3. Sewage irrigation, by G. W. Rafter. 1897. 100 pp., 4 pls. (See Water-Supply Paper 22.) 10c.

Discusses methods of sewage disposal by intermittent filtration and by irrigation; describes utilization of sewage in Germany, England, and France, and sewage purification in the United States.

*8. Windmills for irrigation, by E. C. Murphy. 1897. 49 pp., 8 pls. 10c.

Gives results of experimental tests of windmills during the summer of 1896 in the vicinity of Garden, Kans.; describes instruments and methods and draws conclusions.

*14. New tests of certain pumps and water lifts used in irrigation, by O. P. Hood, 1898. 91 pp., 1 pl.

Discusses efficiency of pumps and water lifts of various types.

*20. Experiments with windmills, by T. O. Perry. 1899. 97 pp., 12 pls. 15c.

Includes tables and descriptions of wind wheels, compares wheels of several types, and discusses results.

*22. Sewage irrigation, Part II, by G. W. Rafter. 1899. 100 pp., 7 pls. 15c.

Gives résumé of Water-Supply Paper 3; discusses pollution of certain streams, experiments on purification of factory wastes in Massachusetts, value of commercial fertilizers, and describes American sewage-disposal plants by States; contains bibliography of publications relating to sewage utilization and disposal.

*41. The windmill, its efficiency and economic use, Part I, by E. C. Murphy. 1901. 72 pp., 14 pls. 5c.

*42. The windmill, its efficiency and economic use, Part II, by E. C. Murphy. 1901. 75 pp. (73–147), 2 pls., (15–16). 10c.

Nos. 41 and 42 give details of results of experimental tests with windmills of various types

*43. Conveyance of water in irrigation canals, flumes, and pipes, by Samuel Fortier. 1901. 86 pp., 15 pls. 15c.

*56. Methods of stream measurement. 1901. 51 pp., 12 pls. 15c.

Describes the methods used by the Survey in 1901–2. See also Nos. 64, 94, and 95.

*64. Accuracy of stream measurements, by E. C. Murphy. 1902. 99 pp., 4 pls. (See No. 95.) 10c.

Describes methods of measuring velocity of water and of measuring and computing stream flow and compares results obtained with the different instruments and methods; describes also experiments and results at the Cornell University hydraulic laboratory. A second, enlarged, edition published as Water-Supply Paper 95.

*67. The motions of underground waters, by C. S. Slichter. 1902. 106 pp., 8 pls. 15c.

Discusses origin, depth, and amount of ground waters; permeability of rocks and porosity of soils; causes, rates, and laws of motions of ground water; surface and deep zones of flow, and recovery of waters by open wells and artesian and deep wells; treats of the shape and position of the water table; gives simple methods of measuring yield of flowing well; describes artesian wells at Savannah, Ga.

72. Sewage pollution in the metropolitan area near New York City and its effect on inland water resources, by M. O. Leighton. 1902. 75 pp., 8 pls. 10c.

Defines "normal" and "polluted" waters and discusses the damage resulting from pollution.

*80. The relation of rainfall to run-off, by G. W. Rafter. 1903. 104 pp. 10c.

Treats of measurements of rainfall and laws and measurements of stream flow; gives rainfall, run-off, and evaporation formulas; discusses effects of forests on rainfall and run-off.

87. Irrigation in India (second edition), by H. M. Wilson. 1903. 238 pp., 27 pls. 25c.

First edition was published in Part II of the Twelfth Annual Report.

93. Proceedings of first conference of engineers of the Reclamation Service, with accompanying papers, compiled by F. H. Newell, chief engineer. 1904. 361 pp. 25c. [Requests for this paper should be addressed to the U. S. Reclamation Service.]

Contains, in addition to an account of the organization of the hydrographic [water-resources] branch of the United States Geological Survey and the reports of the conference, the following papers of more or less general interest:

Limits of an irrigation project, by D. W. Ross.
Relation of Federal and State laws to irrigation, by Morris Bien.
Electrical transmission of power for pumping, by H. A. Storrs.
Correct design and stability of high masonry dams, by Geo. Y. Wisner.
Irrigation surveys and the use of the plane table, by J. B. Lippincott.
The use of alkaline waters for irrigation, by Thomas H. Means.

*94. Hydrographic manual of the United States Geological Survey, prepared by E. C. Murphy, J. C. Hoyt, and G. B. Hollister. 1904. 76 pp., 3 pls. 10c.

Gives instruction for field and office work relating to measurements of stream flow by current meters. See also No. 95.

*95. Accuracy of stream measurements (second, enlarged edition), by E. C. Murphy. 1904. 169 pp., 6 pls.

Describes methods of measuring and computing stream flow and compares results derived from different instruments and methods. See also No. 94.

*103. A review of the laws forbidding pollution of inland waters in the United States, by E. B. Goodell. 1904. 120 pp. (See No. 152.)

Explains the legal principles under which antipollution statutes become operative, quotes court decisions to show authority for various deductions, and classifies according to scope the statutes enacted in the different States.

110. Contributions to the hydrology of eastern United States, 1904; M. L. Fuller, geologist in charge. 1905. 211 pp., 5 pls. 10c.

Contains the following reports of general interest. The scope of each paper is indicated by its title.

Description of underflow meter used in measuring the velocity and direction of underground water, by Charles S. Slichter.

The California or "stovepipe" method of well construction, by Charles S. Slichter.

Approximate methods of measuring the yield of flowing wells, by Charles S. Slichter.

Corrections necessary in accurate determinations of flow from vertical well casings, from notes furnished by A. N. Talbot.

Experiments relating to problems of well contamination at Quitman, Ga., by S. W. McCallie.

113. The disposal of strawboard and oil-well wastes, by R. L. Sackett and Isaiah Bowman. 1905. 52 pp., 4 pls. 5c.

The first paper discusses the pollution of streams by sewage and by trade wastes, describes the manufacture of strawboard, and gives results of various experiments in disposing of the waste. The second paper describes briefly the topography, drainage, and geology of the region about Marion, Ind., the contamination of rock wells and of streams by waste oil and brine.

*114. Underground waters of eastern United States; M. L. Fuller, geologist in charge. 1905. 285 pp., 18 pls. 25c.

Contains report on "Occurrence of underground waters," by M. L. Fuller, discussing sources amount, and temperature of waters, permeability and storage capacity of rocks, water-bearing formations, recovery of water by springs, wells, and pumps, essential conditions of artesian flows, and general conditions affecting ground waters in eastern United States.

119. Index to the hydrographic progress reports of the United States Geological Survey, 1888 to 1903, by J. C. Hoyt and B. D. Wood. 1905. 253 pp. 15c.

120. Bibliographic review and index of papers relating to underground waters published by the United States Geological Survey, 1879–1904, by M. L. Fuller. 1905. 128 pp. 10c.

*122. Relation of the law to underground waters, by D. W. Johnson. 1905. 55 pp. 5c

Defines and classifies underground waters, gives common-law rules relating to their use, and cites State legislative acts affecting them.

140. Field measurements of the rate of movement of underground waters, by C. S. Slichter. 1905. 122 pp., 15 pls. 15c.

Discusses the capacity of sand to transmit water, describes measurements of underflow in Rio Hondo, San Gabriel, and Mohave River valleys, Cal., and on Long Island, N. Y., gives results of tests of wells and pumping plants, and describes stovepipe method of well construction.

143. Experiments on steel-concrete pipes on a working scale, by J. H. Quinton. 1905. 61 pp., 4 pls. 5c.

Scope indicated by title.

145. Contributions to the hydrology of eastern United States, 1905; M. L. Fuller, geologist in charge. 1905. 220 pp., 6 pls. 10c.

Contains brief reports of general interest as follows:

Drainage of ponds into drilled wells, by Robert E. Horton.. Discusses efficiency, cost, and capacity of drainage wells, and gives statistics of such wells in southern Michigan.

Construction of so-called fountain and geyser springs, by Myron L. Fuller.

A convenient gage for determining low artesian heads, by Myron L. Fuller.

146. Proceedings of second conference of engineers of the Reclamation Service, with accompanying papers, compiled by F. H. Newell, chief engineer. 1905. 267 pp. 15 c. [Inquiries concerning this report should be addressed to the U. S. Reclamation Service.]

Contains brief account of the organization of the hydrographic [water-resources] branch and the Reclamation Service, reports of conferences and committees, circulars of instruction, and many brief reports on subjects closely related to reclamation, and a bibliography of technical papers by members of the service. Of the papers read at the conference those listed below (scope indicated by title) are of more or less general interest:

Proposed State code of water laws, by Morris Bien.

Power engineering applied to irrigation problems, by O. H. Ensign.

Estimates on tunneling in irrigation projects, by A. L. Fellows.

Collection of stream-gaging data, by N. C. Grover.

Diamond-drill methods, by G. A. Hammond.

Mean-velocity and area curves, by F. W. Hanna.

Importance of general hydrographic data concerning basins of streams gaged by R. E. Horton

Effect of aquatic vegetation on stream flow, by R. E. Horton.

Sahitary regulations governing construction camps, by M. O. Leighton.

Necessity of draining irrigated land, by Thos. H. Means.

Alkali soils, by Thos. H. Means.

Cost of stream-gaging work, by E. C. Murphy.
Equipment of a cable gaging station, by E. C. Murphy.
Silting of reservoirs, by W. M. Reed.
Farm-unit classification, by D. W. Ross.
Cost of power for pumping irrigating water, by H. A. Storrs.
Records of flow at current-meter gaging stations during the frozen season, by F. H. Tillinghast.

147. Destructive floods in the United States in 1904, by E. C. Murphy and others. 1905. 206 pp., 18 pls. 15c.

Contains a brief account of "A method of computing cross-section area of waterways," including formulas for maximum discharge and area of cross section.

*150. Weir experiments, coefficients, and formulas, by R. E. Horton. 1906. 189 pp., 38 pls. (See Water-Supply Paper 200.) 15c.

Scope indicated by title.

151. Field assay of water, by M. O. Leighton. 1905. 77 pp., 4 pls.

Discusses methods, instruments, and reagents used in determining turbidity, color, iron, chlorides, and hardness in connection with the studies of the quality of water in various parts of the United States.

152. A review of the laws forbidding pollution of inland waters in the United States (second edition), by E. B. Goodell. 1905. 149 pp. 10c.

Scope indicated by title.

*155. Fluctuations of the water level in wells, with special reference to Long Island, N. Y., by A. C. Veatch. 1906. 83 pp., 9 pls. 25c.

Includes general discussion of fluctuation changes due to rainfall and evaporation, barometric changes, temperature changes, changes in rivers, changes in lake level, tidal changes, effects of settlement, irrigation, dams, underground-water developments, and to indeterminate causes.

*160. Underground-water papers, 1906; M. L. Fuller, geologist in charge. 1906. 104 pp., 1 pl.

Gives account of work in 1905; lists publications relating to ground waters, and contains the following brief reports of general interest:
Significance of the term "artesian," by Myron L. Fuller.
Representation of wells and springs on maps, by Myron L. Fuller.
Total amount of free water in the earth's crust, by Myron L. Fuller.
Use of fluorescein in the study of underground waters, by R. B. Dole.
Problems of water contamination, by Isaiah Bowman.
Instances of improvement of water in wells, by Myron L. Fuller.

*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. 15c.

*163. Bibliographic review and index of underground-water literature published in the United States in 1905, by M. L. Fuller, F. G. Clapp, and B. L. Johnson. 1906. 130 pp. 15c.

Scope indicated by title.

*179. Prevention of stream pollution by distillery refuse, based on investigations at Lynchburg, Ohio, by Herman Stabler. 1906. 34 pp., 1 pl. 10c.

Describes grain distillation; treatment of slop; sources, character, and effects of effluents on streams; discusses filtration, precipitation, fermentation, and evaporation methods of disposal of wastes without pollution.

*180. Turbine water-wheel tests and power tables, by R. E. Horton. 1906. 134 pp., 2 pls. 20c.

Scope indicated by title.

*185. Investigations on the purification of Boston sewage, by C.-E. A. Winslow and E. B. Phelps. 1906. 163 pp. 25c.

Discusses composition, disposal, purification, and treatment of sewages and tendencies in sewage-disposal practice in England, Germany, and the United States; describes character of crude sewage at Boston, removal of suspended matter, treatment in septic tanks, and purification in intermittent sand filtration and coarse material; gives bibliography.

*186. Stream pollution by acid-iron wastes, a report based on investigations made at Shelby, Ohio, by Herman Stabler. 1906. 36 pp., 1 pl.

Gives history of pollution by acid-iron wastes at Shelby, Ohio, and resulting litigation; discusses effect of acid-iron liquors on sewage purification processes, recovery of copperas from acid-iron wastes, and other processes for removal of pickling liquor.

*187. Determination of stream flow during the frozen season, by H. K. Barrows and R. E. Horton. 1907. 93 pp., 1 pl. 15c.

Scope indicated by title.

*189. The prevention of stream pollution by strawboard waste, by E. B. Phelps. 1906. 29 pp., 2 pls.

Describes manufacture of strawboard, present and proposed methods of disposal of waste liquors, laboratory investigations of precipitation and sedimentation, and field studies of amount and character of water used, raw material and finished product, and mechanical filtration.

*194. Pollution of Illinois and Mississippi rivers by Chicago sewage (a digest of the testimony taken in the case of the State of Missouri *v.* the State of Illinois and the Sanitary District of Chicago), by M. O. Leighton. 1907. 369 pp., 2 pls.

Scope indicated by amplification of title.

*200. Weir experiments, coefficients, and formulas (revision of paper No. 150), by R. E. Horton. 1907. 195 pp., 38 pls. 35c.

Scope indicated by title.

*226. The pollution of streams by sulphite-pulp waste, a study of possible remedies, by E. B. Phelps. 1909. 37 pp., 1 pl. 10c.

Describes manufacture of sulphite pulp, the waste liquors, and the experimental work leading to suggestions as to methods of preventing stream pollution.

*229. The disinfection of sewage and sewage filter effluents, with a chapter on the putrescibility and stability of sewage effluents, by E. B. Phelps. 1909. 91 pp., 1 pl. 15c.

Scope indicated by title.

*234. Papers on the conservation of water resources. 1909. 96 pp., 2 pls 15c.

Contains the following papers, whose scope is indicated by their titles: Distribution of rainfall by Henry Gannett; Floods, by M. O. Leighton; Developed water powers, compiled under the direction of W. M. Steuart, with discussion by M. O. Leighton; Undeveloped water powers, by M. O. Leighton; Irrigation, by F. H. Newell; Underground waters, by W. C. Mendenhall; Denudation, by R. B. Dole and Herman Stabler; Control of catchment areas, by H. N. Parker.

*235. The purification of some textile and other factory wastes, by Herman Stabler and G. H. Pratt. 1909. 76 pp. 10c.

Discusses waste waters from wool scouring, bleaching and dyeing cotton yarn bleaching cotton piece goods, and manufacture of oleomargarine, fertilizer, and glue.

236. The quality of surface waters in the United States, Part I, Analyses of waters east of the one hundredth meridian, by R. B. Dole. 1909. 123 pp. 10c.

Describes collection of samples, methods of examination, preparation of solutions, accuracy of estimates, and expression of analytical results.

238. The public utility of water powers and their governmental regulation, by René Tavernier and M. O. Leighton. 1910. 161 pp. 15c.

Discusses hydraulic power and irrigation, French, Italian, and Swiss legislation relative to the development of water powers, and laws proposed in the French Parliament; reviews work of bureau of hydraulics and agricultural improvements of the French department of agriculture, and gives résumé of Federal and State water-power legislation in the United States

*255. Underground waters for farm use, by M. L. Fuller. 1910. 58 pp., 17 pls. 15c.

Discusses rocks as sources of water supply and the relative safety of supplies from different materials; springs and their protection; open or dug and deep wells, their location, yield, relative cost, protection, and safety; advantages and disadvantages of cisterns and combination wells and cisterns.

*257. Well-drilling methods, by Isaiah Bowman. 1911. 139 pp., 4 pls. 15c.

Discusses amount, distribution, and disposal of rainfall; water-bearing rocks; amount of ground water; artesian conditions; oil and gas bearing formations; gives history of well drilling in Asia, Europe, and the United States; describes in detail the various methods and the machinery used; discusses loss of tools and geologic difficulties, contamination of well waters and methods of prevention, tests of capacity and measurement of depth, and costs of sinking wells.

*258. Underground-water papers, 1910, by M. L. Fuller, F. G. Clapp, G. C. Matson, Samuel Sanford, and H. C. Wolff. 1911. 123 pp., 2 pls. 15c.

Contains the following papers (scope indicated by titles) of general interest:
Drainage by wells, by M. L. Fuller.
Freezing of wells and related phenomena, by M. L. Fuller.
Pollution of underground waters in limestone, by G. C. Matson.
Protection of shallow wells in sandy deposits, by M. L. Fuller.
Magnetic wells, by M. L. Fuller.

*315. The purification of public water supplies, by G. A. Johnson. 1913. 84 pp., 8 pls. 10c.

Discusses ground, lake, and river waters as public supplies, development of waterworks systems in the United States, water consumption, and typhoid fever; describes methods of filtration and sterilization of water and municipal water softening.

334. The Ohio Valley flood of March-April, 1913 (including comparisons with some earlier floods), by A. H. Horton and H. J. Jackson. 1913. 96 pp., 22 pls. 20c.

Although relating specifically to floods in the Ohio Valley, this report discusses also the causes of floods and the prevention of damage by floods.

337. The effects of ice on stream flow, by William Glenn Hoyt. 1913. 77 pp., 7 pls. 15c.

Discusses methods of measuring the winter flow of streams.

*345. Contributions to the hydrology of the United States, 1914; N. C. Grover, chief hydraulic engineer. 1915. 225 pp., 17 pls. 30c. Contains:

(e) A method of determining the daily discharge of rivers of variable slope, by M. R. Hall, W. E. Hall, and C. H. Pierce, pp. 53–65.

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 waters from rivers, lakes, wells, and springs in various parts of the United States, including analyses of the geyser water of Yellowstone National Park, hot springs in Montana, brines from Death Valley, water from the Gulf of Mexico, and mine waters from Tennessee, Michigan, Missouri and Oklahoma, Montana, Colorado and Utah, Nevada and Arizona, and California.

371. Equipment for current-meter gaging stations, by G. J. Lyon. 1915. 64 pp., 37 pls. 20c.

Describes methods of installing automatic and other gages and of constructing gage wells shelters, and structures for making discharge measurements and artificial controls.

*375. Contributions to the hydrology of the United States, 1915; N. C. Grover, chief hydraulic engineer. 1916. 181 pp., 9 pls. 15c. Contains:

(c) The relation of stream gaging to the science of hydraulics, by C. H. Pierce and R. W. Davenport, pp. 77–84.

(e) A method of correcting river discharge for a changing stage, by B. E. Jones, pp. 117–130.

(f) Conditions requiring the use of automatic gages in obtaining records of stream flow, by C. H. Pierce, pp. 131–139.

Three papers presented at the conference of engineers of the water-resources branch in December, 1914.

*400. Contributions to the hydrology of the United States, 1916; N. C. Grover, chief hydraulic engineer. 108 pp., 7 pls. Contains:

(a) The people's interest in water-power resources, by G. O. Smith, pp. 1–8.

(c) The measurement of silt-laden streams, by R. C. Pierce, pp. 39–51.

(d) Accuracy of stream-flow data, by N. C. Grover and J. C. Hoyt, pp. 53–59.

416. The divining rod, a history of water witching, with a bibliography, by Arthur J. Ellis. 1917. 59 pp. 10c.

A brief paper published "merely to furnish a reply to the numerous inquiries that are continually being received from all parts of the country" as to the efficacy of the divining rod for locating underground water.

425. Contributions to the hydrology of the United States, 1917, N. C. Grover, chief hydraulic engineer. 1918. Contains:

*(c) Hydraulic conversion tables and convenient equivalents, pp. 71–94. 1917.

## ANNUAL REPORTS.

*Fifth Annual Report of the United States Geological Survey, 1883–84, J. W. Powell, Director. 1885. xxxvi, 469 pp., 58 pls. $2.25. Contains:

*The requisite and qualifying conditions of artesian wells, by T. C. Chamberlin, pp. 125–173, pl. 21. Scope indicated by title.

Twelfth Annual Report 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:

*Irrigation in India, by H. M. Wilson, pp. 363–561, pls. 107 to 146. See Water-Supply Paper 87.

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:

*American irrigation engineering, by H. M. Wilson, pp. 101–349, pls. 111 to 146. Discusses the economical aspects of irrigation, alkaline drainage, silt, and sedimentation; gives brief history of legislation; describes perennial canals in Idaho, California, Wyoming, and Arizona; discusses water storage at reservoirs of the California and other projects, subsurface sources of supply, pumping, and subirrigation.

Fourteenth Annual Report of the United States Geological Survey, 1892–93, J. W. Powell, Director. 1893. (Pt. II, 1894.) 2 parts. *Pt. II, Accompanying papers, xx, 597 pp., 73 pls. $2.10. Contains:

*The potable waters of eastern United States, by W J McGee, pp. 1–47. Discusses cistern water, stream waters, and ground waters, including mineral springs and artesian wells.

*Natural mineral waters of the United States, by A. C. Peale, pp. 49–88, pls. 3 and 4. Discusses the origin and flow of mineral springs, the source of mineralization, thermal springs, the chemical composition and analysis of spring waters, geographic distribution, and the utilization of mineral waters; gives a list of American mineral-spring resorts: contains also some analyses.

Nineteenth Annual Report of the United States Geological Survey, 1897–98, Charles D. Walcott, Director. 1898. (Parts II, III, and V, 1899.) 6 parts in 7 vols. and separate case for maps with Pt. V. *Pt. II, Papers chiefly of a theoretic nature, v, 958 pp., 172 pls. $2.65. Contains:

*Principles and conditions of the movements of ground water, by F. H. King, pp. 59–294, pls. 6 to 16. Discusses the amount of waters stored in sandstone, in soil, and in other rocks, and the depth to which ground water penetrates; gravitational, thermal, and capillary movements of ground waters, and the configuration of the ground-water surface; gives the results of experimental investigations on the flow of air and water through a rigid, porous medium, and through sand, sandstones, and silts; discusses results obtained by other investigators, and summarizes results of observations; discusses also rate of flow of water through sand and rock, the growth of rivers, rate of filtration through soil, interference of wells, etc.

*Theoretical investigation of the motion of ground waters, by C. S. Slichter, pp. 295–384, pl. 17. Scope indicated by title.

**PROFESSIONAL PAPERS.**

*72. Denudation and erosion in the southern Appalachian region and the Monongahela basin, by L. C. Glenn. 1911. 137 pp., 21 pls. 35c.

Describes the topography, geology, drainage, forests, climate, and population, and transportation facilities of the region, the relation of agriculture, lumbering, mining, and power development to erosion and denudation, and the nature, effects, and remedies of erosion; gives details of conditions in Holston, Nolichucky, French Broad, Little Tennessee, and Hiwassee River basins, along Tennessee River proper, and in the basins of the Coosa-Alabama system, Chattahoochee, Savannah, Saluda, Broad, Catawba, Yadkin, New, and Monongahela rivers.

86. The transportation of débris by running water, by G. K. Gilbert, based on experiments made with the assistance of E. C. Murphy. 1914. 263 pp., 3 pls. 70c.

The results of an investigation which was carried on in a specially equipped laboratory at Berkeley, Cal., and was undertaken for the purpose of learning "the laws which control the movement of bed load and especially to determine how the quantity of load is related to the stream slope and discharge and to the degree of comminution of the débris."

105. Hydraulic-mining débris in the Sierra Nevada, by G. K. Gilbert. 154 pp., 34 pls. 1917. 50c.

Presents the results of an investigation undertaken by the United States Geological Survey in response to a memorial from the California Miners' Association asking that a particular study be made of portions of the Sacramento and San Joaquin valleys affected by detritus from torrential streams. The report deals largely with geologic and physiographic aspects of the subject, traces the physical effects, past and future, of the hydraulic mining of earlier decades, the similar effects which certain other industries induce through stimulation of the erosion of the soil, and the influence of the restriction of the area of inundation by the construction of levees. Suggests cooperation by several interests for the control of the streams now carrying heavy loads of débris.

**BULLETINS.**

*32. Lists and analyses of the mineral springs of the United States (a preliminary study), by A. C. Peale. 1886. 235 pp.

Defines mineral waters, lists the springs by States, and gives tables of analyses so far as available.

*319. Summary of the controlling factors of artesian flows, by Myron L. Fuller. 1908. 44 pp., 7 pls. 10c.

Describes underground reservoirs, the sources of ground waters, the confining agents, the primary and modifying factors of artesian circulation, the essential and modifying factors of artesian flow, and typical artesian systems.

*479. The geochemical interpretation of water analyses, by Chase Palmer. 1911. 31 pp. 5c.

Discusses the expression of chemical analyses, the chemical character of water and the properties of natural waters; gives a classification of waters based on property values and reacting values, and discusses the character of the waters of certain rivers as interpreted directly from the results of analyses; discusses also the relation of water properties to geologic formations, silica in river water, and the character of the water of the Mississippi and the Great Lakes and St. Lawrence River as indicated by chemical analyses.

# INDEX BY AREAS AND SUBJECTS.

[A=Annual Reports; M=Monograph; B=Bulletin; P=Professional Paper; W=Water-Supply Paper; G F=Geologic folio.]



[1] Many of the reports contain brief subject bibliographies. See abstracts.

[2] Many analyses of river, spring, and well waters are scattered through publications, as noted in abstracts.

# INDEX OF STREAMS.