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**SURFACE WATER SUPPLY OF THE
UNITED STATES**

1918

PART XII. NORTH PACIFIC SLOPE DRAINAGE BASINS

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

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The first part of the document discusses the importance of maintaining accurate records of all transactions. It emphasizes that every entry should be clearly documented, including the date, amount, and purpose of the transaction. This ensures transparency and allows for easy reconciliation of accounts.

In the second section, the author outlines the various methods used to collect and analyze data. This includes direct observation, interviews, and the use of specialized software tools. The goal is to gather comprehensive information that can be used to identify trends and make informed decisions.

The third section focuses on the challenges faced during the data collection process. These include issues such as incomplete data, inconsistent reporting, and the need for standardized procedures. The author provides practical solutions to these problems, such as implementing regular training sessions and using checklists to ensure data quality.

Finally, the document concludes with a summary of the key findings and recommendations. It stresses the importance of ongoing monitoring and evaluation to ensure that the data collection process remains effective and efficient. The author encourages a proactive approach to data management, where potential issues are identified and addressed before they become significant problems.

SURFACE WATER SUPPLY OF LOWER COLUMBIA RIVER AND PACIFIC SLOPE DRAINAGE BASINS IN OREGON, 1918.

AUTHORIZATION AND SCOPE OF WORK.

This volume is one of a series of 14 reports presenting records of measurements of flow made on streams in the United States during the year ending September 30, 1918.

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

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

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

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

Annual appropriations for the fiscal years ending June 30, 1895-1919.

| | |
|------------------------------|----------|
| 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 1917, inclusive..... | 150,000 |
| 1918..... | 175,000 |

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 5.

Measurements of stream flow have been made at about 4,510 points in the United States and also at many points in Alaska and the Hawaiian Islands. In July, 1918, 1,180 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-foot, gallons per minute, miners’ inches, and discharge in second-feet per square mile, and (2) those that represent the actual quantity of water, as run-off in inches, acre-feet, and millions of cubic feet. The principal terms used in this series of reports are second-foot, second-foot per square mile, run-off in inches, acre-feet, and millions of cubic feet. They may be defined as follows:

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

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

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

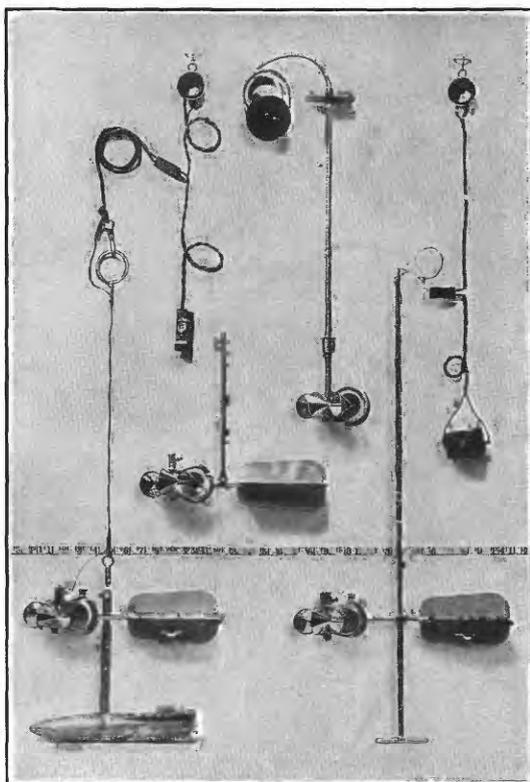
An “acre-foot,” equivalent to 43,560 cubic feet, is the quantity required to cover an acre to the depth of 1 foot. The term is commonly used in connection with storage for irrigation.

The following terms not in common use are here defined:

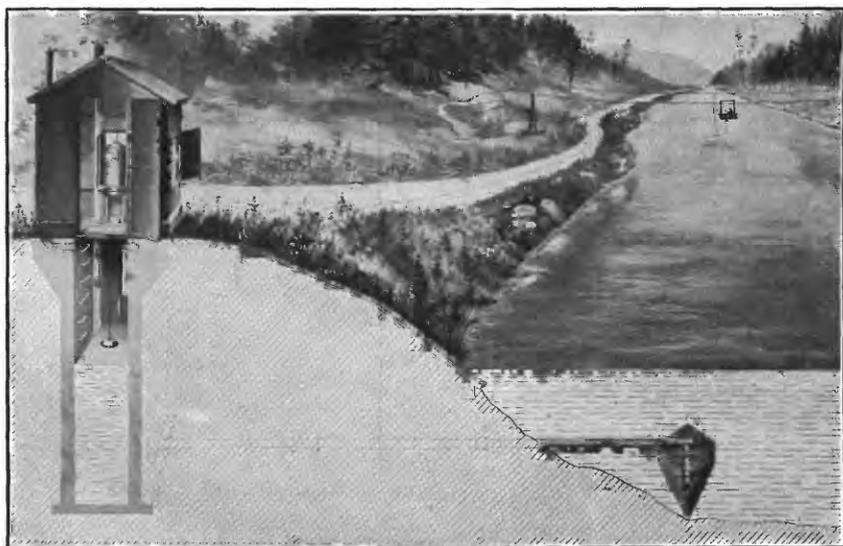
“Stage-discharge relation,” an abbreviation for the term “relation of gage height to discharge.”

“Control,” a term used to designate the section or sections of the stream channel below the gage which 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.

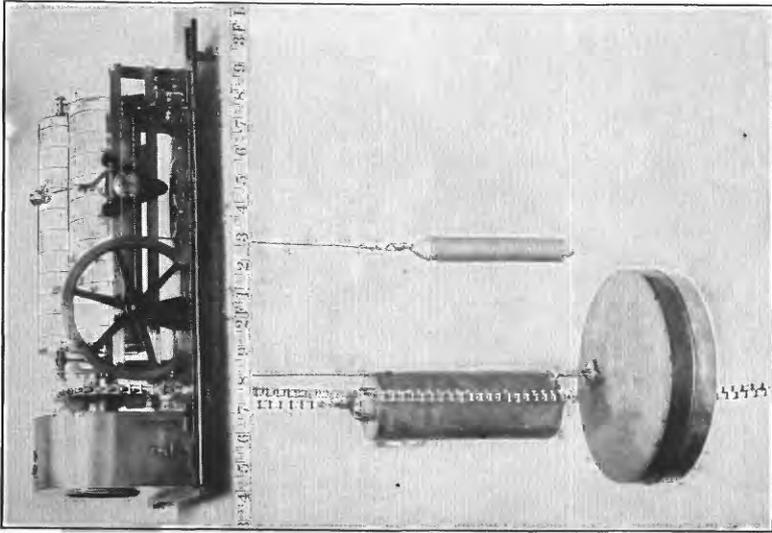
The “point of zero flow” for a gaging station is that point on the gage—the gage height—to which the surface of the river would fall if there were no flow.



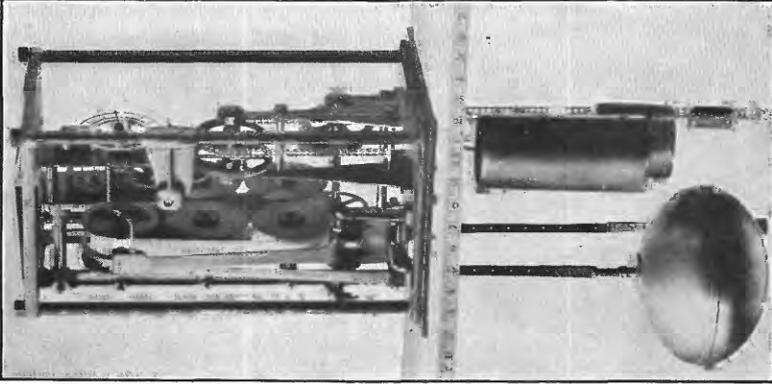
A. PRICE CURRENT METERS.



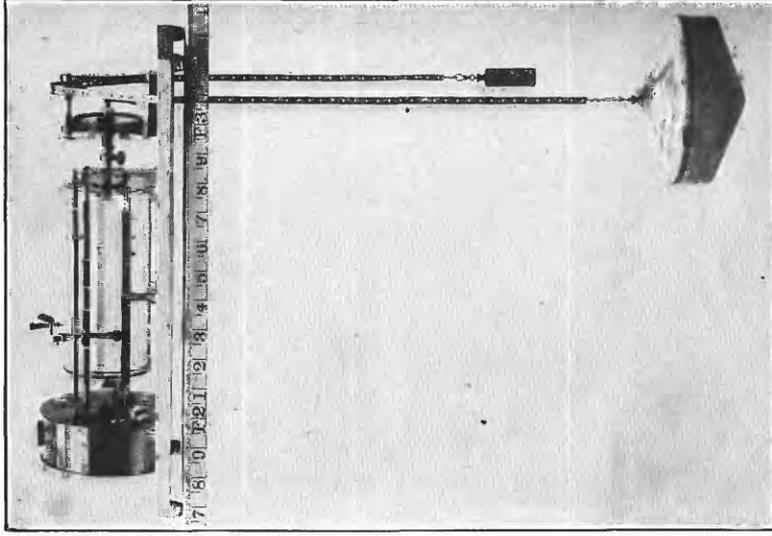
B. TYPICAL GAGING STATION.



A. STEVENS CONTINUOUS.



B. GURLEY PRINTING.
WATER-STAGE RECORDERS.



C. FRIEZ.

EXPLANATION OF DATA.

The data presented in this report cover the year beginning October 1, 1917, and ending September 30, 1918. 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. (See Pls. I, II.) The general methods are outlined in standard textbooks on the measurement of river discharge.

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

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

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

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

The table of daily discharge gives, in general, the discharge in second-feet corresponding to the mean of the gage heights read each day. At stations on streams subject to sudden or rapid diurnal fluctuation the discharge obtained from the rating table and the mean daily gage height may not be the true mean discharge for the day. If such stations are equipped with water-stage recorders the

mean daily discharge may be obtained by averaging discharge at regular intervals during the day or by use of the discharge integrator, an instrument operating on the principle of the planimeter and containing as an essential element the rating curve of the station.

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

ACCURACY OF FIELD DATA AND COMPUTED RESULTS.

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

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

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

The monthly means for any station may represent with high accuracy the quantity of water flowing past the gage, but the figures showing discharge per square mile and depth 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 in inches" are therefore not computed if such errors appear probable. The computations are also omitted for stations on streams draining areas in which the annual rainfall is less than 20 inches. All figures representing "second-feet per square mile" and "run-off in inches" previously published by the Survey

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

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

COOPERATION.

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

Cooperation with the States is effected under contracts which are made between the Director of the United States Geological Survey and the State engineers or other officials and are authorized by legislative acts appropriating moneys.

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

Acknowledgments are also due to the United States 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 paid for by them; to the Corps of Engineers, United States Army; and to the United States Weather Bureau for hydrographic and climatic data.

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

DIVISION OF WORK.

The data for stations in Oregon and Washington, except those in the Cowlitz River basin in Washington, were collected and prepared for publication under the direction of F. F. Henshaw, district engineer, assisted by C. L. Batchelder and R. C. Briggs.

Data for stations in the Cowlitz River basin in Washington were collected and prepared for publication under the direction of G. L. Parker, district engineer, assisted by Lasley Lee, T. G. Bedford, L. D. Carson, W. E. Dickinson, and E. C. Howard.

The records were reviewed and the manuscript assembled by B. L. Bigwood and Robert Follansbee.

GAGING-STATION RECORDS.

COLUMBIA RIVER AT THE DALLES, OREG.

LOCATION.—In sec. 34, T. 2 N., R. 13 E., 2,000 feet below ferry at The Dalles, Wasco County, 18 miles below Deschutes River, and above Hood and Klickitat rivers.

DRAINAGE AREA.—237,000 square miles.

RECORDS AVAILABLE.—June 1, 1878, to September 30, 1918. 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 of 8.9 feet lower than the Brooks gage. Gage at Cascade Locks, about 20 miles below The Dalles, which was used in computing 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, float 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, 33.7 feet, June 25 (discharge, 578,000 second-feet); minimum stage recorded, 1.0 foot November 27 (discharge, 70,600 second-feet).

1858-1918: 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).

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

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

REGULATION.—None.

ACCURACY.—Stage-discharge relation practically permanent; not affected by ice during winter; open water rating applicable throughout year. Rating curve well defined between 80,000 and 900,000 second-feet. Gage read to tenths once daily. Daily discharge ascertained by applying daily gage height to rating table. Records excellent.

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

No discharge measurements made during year.

COLUMBIA RIVER AT THE DALLES, OREG.

Daily discharges, in second-feet, of Columbia River at The Dalles, Oreg., for the year ending Sept. 30, 1918.

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|-------|---------|--------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 1... | 107,000 | 85,600 | 78,400 | 313,900 | 146,000 | 104,000 | 195,000 | 246,000 | 311,000 | 513,000 | 287,000 | 140,000 |
| 2... | 106,000 | 83,800 | 79,400 | 303,000 | 138,000 | 104,000 | 195,000 | 258,000 | 311,000 | 507,000 | 290,000 | 138,000 |
| 3... | 106,000 | 82,900 | 78,600 | 283,000 | 129,000 | 103,000 | 195,000 | 270,000 | 327,000 | 497,000 | 232,000 | 137,000 |
| 4... | 106,000 | 82,900 | 82,000 | 279,000 | 122,000 | 101,000 | 191,000 | 284,000 | 327,000 | 467,000 | 216,000 | 136,000 |
| 5... | 104,000 | 82,900 | 86,800 | 263,000 | 134,000 | 102,000 | 188,000 | 298,000 | 322,000 | 461,000 | 212,000 | 135,000 |
| 6... | 101,000 | 82,900 | 89,200 | 252,000 | 136,000 | 103,000 | 178,000 | 322,000 | 322,000 | 432,000 | 209,000 | 135,000 |
| 7... | 99,000 | 82,000 | 87,400 | 252,000 | 147,800 | 105,000 | 173,000 | 303,000 | 335,000 | 411,000 | 208,000 | 134,000 |
| 8... | 98,000 | 82,000 | 85,600 | 246,000 | 155,000 | 105,000 | 168,000 | 322,000 | 368,000 | 388,000 | 208,000 | 132,000 |
| 9... | 98,000 | 82,000 | 83,800 | 246,000 | 159,000 | 103,000 | 165,000 | 363,000 | 381,000 | 370,000 | 205,000 | 130,000 |
| 10... | 98,000 | 81,100 | 82,000 | 240,000 | 158,000 | 101,000 | 166,000 | 363,000 | 408,000 | 348,000 | 202,000 | 128,000 |
| 11... | 101,000 | 80,200 | 81,100 | 236,000 | 156,000 | 99,000 | 172,000 | 359,000 | 430,000 | 340,000 | 198,000 | 121,000 |
| 12... | 105,000 | 79,400 | 80,200 | 228,000 | 148,000 | 100,000 | 204,800 | 356,000 | 457,000 | 328,000 | 190,000 | 121,000 |
| 13... | 105,000 | 79,400 | 84,700 | 218,000 | 142,000 | 101,000 | 215,000 | 352,000 | 481,000 | 320,000 | 185,000 | 120,000 |
| 14... | 107,000 | 78,600 | 88,200 | 219,000 | 142,000 | 102,000 | 222,000 | 349,000 | 601,000 | 311,000 | 184,000 | 117,000 |
| 15... | 108,000 | 77,000 | 86,800 | 216,000 | 140,000 | 103,000 | 226,000 | 348,000 | 586,000 | 302,000 | 181,000 | 116,000 |
| 16... | 108,000 | 76,400 | 95,000 | 209,000 | 137,000 | 105,000 | 229,000 | 372,000 | 560,000 | 311,000 | 181,000 | 115,000 |
| 17... | 108,000 | 73,000 | 107,000 | 204,000 | 135,000 | 106,000 | 223,000 | 388,000 | 568,000 | 310,000 | 178,000 | 114,000 |
| 18... | 107,000 | 71,400 | 122,000 | 206,000 | 131,000 | 106,000 | 219,000 | 398,000 | 596,000 | 308,000 | 168,000 | 114,000 |
| 19... | 105,000 | 72,200 | 138,000 | 199,000 | 125,000 | 110,000 | 209,000 | 401,000 | 664,000 | 302,000 | 168,000 | 114,000 |
| 20... | 103,000 | 73,000 | 188,000 | 195,000 | 122,000 | 116,000 | 205,000 | 480,000 | 664,000 | 302,000 | 164,000 | 114,000 |
| 21... | 101,000 | 73,800 | 177,000 | 187,000 | 118,000 | 128,000 | 204,000 | 388,000 | 570,000 | 287,000 | 163,000 | 114,000 |
| 22... | 100,000 | 72,200 | 211,000 | 180,000 | 114,000 | 137,000 | 204,000 | 376,000 | 674,000 | 286,000 | 161,000 | 113,000 |
| 23... | 99,000 | 71,400 | 178,000 | 172,000 | 112,000 | 144,000 | 208,000 | 368,000 | 672,000 | 284,000 | 161,000 | 113,000 |
| 24... | 100,000 | 71,400 | 187,000 | 166,000 | 110,000 | 154,000 | 218,000 | 359,000 | 672,000 | 283,000 | 160,000 | 113,000 |
| 25... | 99,000 | 71,400 | 168,000 | 168,000 | 108,000 | 146,000 | 234,000 | 349,000 | 678,000 | 283,000 | 159,000 | 112,000 |
| 26... | 98,000 | 71,400 | 165,000 | 161,000 | 110,000 | 168,000 | 243,000 | 342,000 | 674,000 | 278,000 | 157,000 | 108,000 |
| 27... | 97,000 | 70,600 | 164,000 | 172,000 | 108,000 | 176,000 | 248,000 | 339,000 | 672,000 | 272,000 | 155,000 | 108,000 |
| 28... | 94,000 | 72,200 | 174,000 | 185,000 | 105,000 | 187,000 | 246,000 | 322,000 | 664,000 | 267,000 | 152,000 | 108,000 |
| 29... | 91,000 | 74,600 | 211,000 | 174,000 | ..... | 195,000 | 245,000 | 320,000 | 649,000 | 265,000 | 150,000 | 110,000 |
| 30... | 88,200 | 79,400 | 258,000 | 183,000 | ..... | 197,000 | 245,000 | 325,000 | 690,000 | 268,000 | 148,000 | 110,000 |
| 31... | 87,400 | ..... | 302,000 | 158,000 | ..... | 197,000 | ..... | 318,000 | ..... | 246,000 | 141,000 | ..... |

Monthly discharge of Columbia River at The Dalles, Oreg., for the year ending Sept. 30, 1918.

[Drainage area, 237,000 square miles.]

| Month. | Discharge in second-feet. | | | | Run-off. | |
|----------------|---------------------------|----------|---------|------------------|----------|-------------|
| | Maximum. | Minimum. | Mean. | Per square mile. | Inches. | Acres-feet. |
| October..... | 108,000 | 87,400 | 101,000 | 0.426 | 0.40 | 6,210,000 |
| November..... | 85,600 | 70,600 | 77,200 | .326 | .38 | 4,590,000 |
| December..... | 302,000 | 78,600 | 129,000 | .544 | .63 | 7,380,000 |
| January..... | 313,000 | 155,000 | 216,000 | .911 | 1.05 | 13,300,000 |
| February..... | 159,000 | 105,000 | 132,000 | .557 | .58 | 7,330,000 |
| March..... | 197,000 | 99,000 | 127,000 | .538 | .62 | 7,810,000 |
| April..... | 248,000 | 165,000 | 208,000 | .878 | .98 | 12,400,000 |
| May..... | 401,000 | 246,000 | 344,000 | 1.45 | 1.67 | 21,200,000 |
| June..... | 578,000 | 311,000 | 476,000 | 2.01 | 2.24 | 28,300,000 |
| July..... | 518,000 | 246,000 | 330,000 | 1.43 | 1.65 | 20,800,000 |
| August..... | 237,000 | 141,000 | 182,000 | .768 | .88 | 11,200,000 |
| September..... | 140,000 | 108,000 | 121,000 | .511 | .57 | 7,300,000 |
| The year..... | 578,000 | 70,600 | 205,000 | .865 | 11.72 | 148,000,000 |

TRIBUTARIES OF COLUMBIA RIVER BELOW MOUTH OF SNAKE RIVER.

WALLA WALLA RIVER BASIN.

WALLA WALLA RIVER NEAR MILTON, OREG.

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

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—March 17 to September 30, 1918.

GAGE.—Friez water-stage recorder referred to vertical staff; inspected by W. W. Roeder. Temporary staff used to May 25.

DISCHARGE MEASUREMENTS.—Made from cable 9 feet below gage.

CHANNEL AND CONTROL.—Left bank overflowed at high stages; right bank high and rocky. Control, 100 feet below gage, is composed of gravel and small boulders; may shift slightly.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period, 1.74 feet at 4 a. m. March 26 (discharge, estimated from extension of rating curve, 606 second-feet); minimum stage recorded, 0.17 foot at 3 p. m. July 18 (discharge, 95 second-feet.)

REGULATION.—Release of ponded water at the Pacific Power and Light Co.'s plant about 5 miles above station affects the flow somewhat, especially at low water.

ACCURACY.—Stage-discharge relation practically permanent. Rating curve fairly well defined from 100 to 500 second-feet. Operation of water-stage recorder satisfactory from April to September. Daily discharge ascertained by applying to rating table the mean daily gage height obtained by inspecting recorder graph. Records good.

COOPERATION.—Station installed and records obtained under direction of A. E. Perry, water master for Umatilla County.

Discharge measurements of Walla Walla River near Milton, Oreg., during the year ending ending Sept. 30, 1918.

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---------|----------------------|----------------------|------------------------|---------|------------------|----------------------|------------------------|
| Apr. 25 | Perry and Batchelder | <i>Feet.</i> 1.32 | <i>Sec.-ft.</i> 448 | July 11 | Perry and Roeder | <i>Feet.</i> 0.23 | <i>Sec.-ft.</i> 128 |
| June 20 | Perry and Roeder | .38 | 151 | Aug. 31 | do | .25 | 112 |

^c Water masters.

Daily discharge, in second-feet, of Walla Walla River near Milton, Oreg., for the year ending Sept. 30, 1918.

| Day. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|------|------|------|------|-------|-------|------|-------|
| 1. | | 515 | 410 | 245 | 128 | 120 | 112 |
| 2. | | 445 | 410 | 230 | 130 | 125 | 115 |
| 3. | | 410 | 428 | 230 | 130 | 125 | 112 |
| 4. | | 392 | 480 | 215 | 145 | 122 | 110 |
| 5. | | 375 | 490 | 215 | 145 | 122 | 108 |
| 6. | | 358 | 428 | 212 | 140 | 122 | 112 |
| 7. | | 358 | 410 | 215 | 125 | 130 | 130 |
| 8. | | 375 | 392 | 230 | 125 | 130 | 130 |
| 9. | | 445 | 375 | 215 | 118 | 125 | 130 |
| 10. | | 480 | 340 | 215 | 125 | 120 | 125 |
| 11. | | 490 | 322 | 203 | 122 | 120 | 145 |
| 12. | | 490 | 322 | 200 | 122 | 122 | 135 |
| 13. | | 445 | 322 | 200 | 118 | 125 | 132 |
| 14. | | 410 | 322 | 191 | 120 | 122 | 142 |
| 15. | | 410 | 322 | 185 | 125 | 130 | 138 |
| 16. | | 375 | 392 | 179 | 125 | 130 | 135 |
| 17. | 410 | 358 | 358 | 179 | 105 | 130 | 130 |
| 18. | 392 | 340 | 340 | 176 | 105 | 128 | 128 |
| 19. | 410 | 322 | 322 | 161 | | 128 | 125 |
| 20. | 410 | 322 | 305 | 155 | | 122 | 125 |
| 21. | 392 | 392 | 290 | 155 | | 118 | 132 |
| 22. | 428 | 428 | 305 | 152 | 130 | 112 | 138 |
| 23. | 445 | 445 | 290 | 155 | | 115 | 125 |
| 24. | 480 | 445 | 296 | 150 | | 105 | 132 |
| 25. | 550 | 445 | 280 | 148 | | 105 | 130 |
| 26. | 590 | 410 | 275 | 142 | 152 | 112 | 128 |
| 27. | 550 | 410 | 260 | 140 | 152 | 120 | 128 |
| 28. | 480 | 392 | 260 | 135 | 145 | 118 | 130 |
| 29. | 480 | 392 | 245 | 130 | 138 | 112 | 135 |
| 30. | 515 | 392 | 245 | 130 | 135 | 115 | 130 |
| 31. | 550 | | 245 | | 128 | 112 | |

NOTE.—Discharge estimated July 19-25.

UMATILLA RIVER BASIN.

9

Monthly discharge of Walla Walla River near Milton, Oreg., for the year ending Sept. 30, 1918.

| Month. | Discharge in second-feet. | | | Run-off in acre-feet. | Month. | Discharge in second-feet. | | | Run-off in acre-feet. |
|------------------|---------------------------|----------|-------|-----------------------|-----------------|---------------------------|----------|-------|-----------------------|
| | Maximum. | Minimum. | Mean. | | | Maximum. | Minimum. | Mean. | |
| March 17-30..... | 590 | 392 | 472 | 14,000 | August..... | 130 | 105 | 121 | 7,420 |
| April..... | 515 | 322 | 408 | 24,300 | September..... | 145 | 108 | 123 | 7,620 |
| May..... | 480 | 245 | 338 | 20,800 | The period..... | | | | 93,000 |
| June..... | 245 | 130 | 183 | 10,900 | | | | | |
| July..... | | | 129 | 7,930 | | | | | |

UMATILLA RIVER BASIN.

UMATILLA RIVER ABOVE FURNISH RESERVOIR, NEAR YOAKUM, OREG.

LOCATION.—In NW. $\frac{1}{4}$ sec. 17, T. 2 N., R. 31 E., at Oregon-Washington Railroad & Navigation Co.'s bridge a quarter of a mile above Campbell flag station, 5 miles by river above Yoakum and old gaging station, and 10 miles west of Pendleton, Umatilla County; just above backwater from Furnish reservoir.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—June 18 to August 28, 1915; July 5, 1916, to September 30, 1918.

GAGE.—Stevens eight-day water-stage recorder on right side of main channel at downstream end of bridge pier, installed July, 1916; read by J. M. Bilton and A. E. Perry. Temporary gage near same location used in 1915.

DISCHARGE MEASUREMENTS.—Made from cable 20 feet above gage, by wading, or from a log across river 200 feet above cable.

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

EXTREMES OF DISCHARGE.—Maximum stage during year, estimated from recorder graph, 9.0 feet, at 11 a. m. December 29 (discharge, 7,550 second-feet); minimum stage recorded, 0.32 foot at 9.30 a. m. August 29 (discharge, 30 second-feet).

1916-1918: Maximum stage recorded, 9.03 feet May 13, 1917 (discharge, 7,940 second-feet); minimum stage recorded, 0.40 foot July 27, 1917 (discharge, 27 second-feet).

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

DIVERSIONS.—720 acres irrigated from Umatilla River above station and some from tributaries.

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

ACCURACY.—Stage-discharge relation changed during winter. Rating curves used as follows: October 1 to December 14, well defined below 500 second-feet; December 15 to September 30, well defined below 3,500 second-feet. Operation of water-stage recorder satisfactory except October 18 to November 8 and May 18 to June 10. Daily discharge ascertained by applying to rating table mean daily gage height obtained by inspecting recorder graph, except for periods when water-stage recorder was not operating, for which it was ascertained by estimation and interpolation. Records excellent.

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

Discharge measurements of Umatilla River above Furnish reservoir, near Yoakum, Oreg., during the year ending Sept. 30, 1918.

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---------|--------------------------------|--------------|-----------------|---------|------------------------|--------------|-----------------|
| | | <i>Feet.</i> | <i>Sec.-ft.</i> | | | <i>Feet.</i> | <i>Sec.-ft.</i> |
| Mar. 24 | C. L. Batchelder..... | 5.58 | 2,820 | June 17 | Perry and Pearson..... | 1.13 | 114 |
| Apr. 20 | A. E. Perry ^a | 3.21 | 836 | 30 | A. E. Perry..... | .90 | 75 |
| May 17 |do..... | 2.37 | 468 | July 12 |do..... | .48 | 42.5 |
| 27 |do..... | 1.91 | 280 | 27 |do..... | .60 | 47.0 |
| June 3 |do..... | 1.54 | 207 | Aug. 9 |do..... | .46 | 37.0 |

^a Water master for Umatilla County.

Daily discharge, in second-feet, of Umatilla River above Furnish reservoir, near Yoakum, Oreg., for the year ending Sept. 30, 1918.

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---------|------|------|-------|-------|-------|-------|-------|------|-------|-------|------|-------|
| 1..... | 43 | | 109 | 2,630 | 1,760 | 780 | 2,890 | 780 | 236 | 72 | 27 | 33 |
| 2..... | 42 | | 115 | 2,300 | 1,550 | 830 | 2,100 | 755 | 222 | 67 | 26 | 34 |
| 3..... | 41 | | 92 | 1,910 | 1,330 | 970 | 1,650 | 730 | 206 | 63 | 26 | 33 |
| 4..... | 40 | | 87 | 1,910 | 1,330 | 1,260 | 1,410 | 730 | 201 | 58 | 35 | 33 |
| 5..... | 41 | 55 | 82 | 2,100 | 1,650 | 1,190 | 1,160 | 730 | 194 | 54 | 26 | 33 |
| 6..... | 41 | | 82 | 2,100 | 2,000 | 1,060 | 1,060 | 680 | 186 | 49 | 24 | 34 |
| 7..... | 42 | | 93 | 2,520 | 2,630 | 970 | 1,000 | 630 | 179 | 48 | 23 | 36 |
| 8..... | 40 | | 107 | 3,970 | 2,200 | 910 | 1,000 | 590 | 172 | 45 | 24 | 36 |
| 9..... | 39 | | 101 | 3,340 | 1,820 | 880 | 1,260 | 550 | 164 | 42 | 26 | 37 |
| 10..... | 38 | 58 | 103 | 2,520 | 1,570 | 880 | 1,260 | 510 | 157 | 42 | 29 | 40 |
| 11..... | 38 | 60 | 101 | 2,000 | 1,490 | 855 | 2,000 | 475 | 150 | 40 | 26 | 39 |
| 12..... | 38 | 58 | 105 | 4,100 | 1,410 | 886 | 1,940 | 475 | 146 | 40 | 26 | 36 |
| 13..... | 40 | 59 | 123 | 4,100 | 1,330 | 1,030 | 1,730 | 458 | 140 | 39 | 34 | 37 |
| 14..... | 41 | 58 | 1,039 | 3,100 | 1,300 | 1,060 | 1,490 | 458 | 126 | 26 | 23 | 40 |
| 15..... | 40 | 60 | 910 | 2,630 | 1,130 | 1,030 | 1,260 | 422 | 130 | 38 | 33 | 43 |
| 16..... | 40 | 59 | 630 | 2,630 | 1,090 | 1,060 | 1,090 | 405 | 122 | 28 | 25 | 42 |
| 17..... | 40 | 55 | 510 | 2,520 | 1,030 | 1,260 | 1,000 | 458 | 116 | 20 | 27 | 42 |
| 18..... | 41 | 59 | 1,090 | 3,220 | 1,000 | 1,010 | 880 | 440 | 108 | 40 | 26 | 39 |
| 19..... | 42 | 57 | 1,490 | 2,860 | 910 | 2,200 | 830 | 423 | 104 | 40 | 24 | 26 |
| 20..... | 44 | 58 | 2,000 | 2,860 | 836 | 2,000 | 830 | 405 | 98 | 36 | 50 | 34 |
| 21..... | 45 | 60 | 1,570 | 2,300 | 730 | 1,820 | 880 | 388 | 94 | 40 | 29 | 35 |
| 22..... | 46 | 58 | 1,120 | 1,910 | 730 | 1,820 | 1,000 | 370 | 89 | 37 | 45 | 37 |
| 23..... | | 59 | 1,570 | 1,730 | 705 | 2,200 | 1,090 | 357 | 82 | 37 | 44 | 39 |
| 24..... | | 60 | 2,300 | 1,650 | 705 | 2,520 | 1,090 | 344 | 77 | 62 | 49 | 40 |
| 25..... | | 63 | 1,570 | 4,100 | 680 | 3,220 | 1,060 | 331 | 95 | 66 | 39 | 41 |
| 26..... | | 57 | 1,260 | 5,050 | 730 | 3,580 | 970 | 318 | 100 | 55 | 28 | 40 |
| 27..... | 48 | 58 | 2,860 | 3,840 | 805 | 3,340 | 855 | 305 | 92 | 50 | 36 | 40 |
| 28..... | | 56 | 5,050 | 2,980 | 755 | 2,630 | 805 | 291 | 87 | 47 | 25 | 40 |
| 29..... | | 60 | 6,950 | 2,520 | | 2,300 | 805 | 277 | 81 | 44 | 26 | 40 |
| 30..... | | 75 | 4,490 | 2,200 | | 2,300 | 805 | 284 | 76 | 39 | 26 | 40 |
| 31..... | | | 3,100 | 1,980 | | 2,690 | | 250 | | 37 | 26 | |

^a Interpolated.

NOTE.—Discharge estimated October 23 to November 8.

Monthly discharge of Umatilla River above Furnish reservoir, near Yoakum, Oreg., for the year ending Sept. 30, 1918.

| Month. | Discharge in second-feet. | | | Run-off in acre-feet. | Month. | Discharge in second-feet. | | | Run-off in acre-feet. |
|---------------|---------------------------|-----------|-------|-----------------------|----------------|---------------------------|-----------|-------------------|-----------------------|
| | Maxi-mum. | Mini-mum. | Mean. | | | Maxi-mum. | Mini-mum. | Mean. | |
| October..... | | 38 | 43.0 | 2,640 | May..... | 780 | 260 | 471 | 29,000 |
| November..... | 75 | | 58.0 | 3,450 | June..... | 236 | 76 | 125 | 8,030 |
| December..... | 6,950 | 82 | 1,320 | 81,200 | July..... | 72 | 36 | 46.5 | 2,890 |
| January..... | 5,050 | 1,650 | 2,780 | 170,000 | August..... | 59 | 35 | 38.0 ^a | 2,340 |
| February..... | 2,630 | 680 | 1,280 | 70,000 | September..... | 43 | 33 | 37.7 | 2,240 |
| March..... | 3,580 | 780 | 1,690 | 102,000 | | | | | |
| April..... | 2,800 | 805 | 1,260 | 75,000 | The year..... | 6,950 | 33 | 757 | 340,000 |

UMATILLA RIVER NEAR UMATILLA, OREG.

LOCATION.—In NW $\frac{1}{4}$ sec. 21, T. 5 N., R. 28 E., near main line of Oregon-Washington Railroad & Navigation Co., $1\frac{1}{2}$ miles below diversion dam of main canal of West Division Umatilla project, and $1\frac{1}{2}$ miles above Umatilla, Umatilla County, and mouth of river.

DRAINAGE AREA.—2,130 square miles.

RECORDS AVAILABLE.—October 21, 1903, to September 30, 1918.

GAGE.—Inclined staff in two sections; lower section 1.2 to 3.5 feet, upper 3.5 to 10.8 feet. Record from a gage above diversion dam of West Division project used January 15 to March 31, 1918. Read by T. J. George.

DISCHARGE MEASUREMENTS.—Made from cable or by wading.

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

EXTREMES OF DISCHARGE.—Maximum stage during year occurred December 29; exact gage height not known, but an approximate height of 2.4 feet (West Division project gage) was determined from flood mark at dam above station (discharge, about 7,000 second-feet); minimum stage recorded, 2.20 feet September 3 and 4 (discharge, 23 second-feet).

1903-1918: 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, 1909 (channel dry).

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

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

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

ACCURACY.—Stage-discharge relation practically permanent for stages above 3.5 feet (discharge, 770 second-feet); below this a change in relation occurred in 1917. A rating curve has been developed for each of the gages at this station. See under "Gage." The curve for the gage below diversion dam is well defined and for the gage above diversion dam is fairly well defined. Gage read to hundredths once daily. Daily discharge ascertained by applying daily gage height to rating table, except for November, December, and January, for which it was ascertained by comparison with flow at the station above Furnish reservoir. Records good.

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

Discharge measurements of Umatilla River near Umatilla, Oreg., during the year ending Sept. 30, 1918.

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---------|------------------|--------------|-----------------|---------|-------------|--------------|-----------------|
| | | <i>Feet.</i> | <i>Sec.-ft.</i> | | | <i>Feet.</i> | <i>Sec.-ft.</i> |
| Nov. 26 | F. F. Henshaw | 2.65 | 119 | July 15 | A. E. Perry | 2.22 | 40.4 |
| Mar. 28 | C. L. Batchelder | 4.25 | 1,800 | Aug. 19 | do. | 2.38 | 47.5 |

^a Gage at West Division project dam read 0.94 foot.

Daily discharge, in second-feet, of Umatilla River near Umatilla, Oreg., for the year ending Sept. 30, 1918.

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---------|------|-------|---------|-------|-------|-------|-------|------|-------|-------|------|-------|
| 1..... | 75 | 95 | | | 1,120 | 740 | 2,620 | 580 | 68 | 68 | 53 | 37 |
| 2..... | 75 | 92 | | | 1,070 | 740 | 2,450 | 580 | 68 | 71 | 53 | 37 |
| 3..... | 73 | 95 | 125 | | 1,020 | 740 | 1,970 | 490 | 68 | 75 | 57 | 22 |
| 4..... | 73 | 92 | | 2,100 | 975 | 908 | 1,520 | 410 | 75 | 81 | 53 | 28 |
| 5..... | 73 | 96 | | | 975 | 975 | 1,180 | 330 | 75 | 89 | 57 | 24 |
| 6..... | 75 | 95 | 110 | | 1,380 | 820 | 995 | 295 | 75 | 64 | 58 | 26 |
| 7..... | 75 | 97 | | 1,520 | 2,080 | 780 | 380 | 260 | 75 | 64 | 53 | 24 |
| 8..... | 75 | 75 | | | 2,080 | 780 | 825 | 218 | 81 | 62 | 61 | 36 |
| 9..... | 75 | 75 | | | 1,550 | 740 | 825 | 165 | 73 | 62 | 51 | 37 |
| 10..... | 75 | | 120 | | 1,220 | 740 | 1,380 | 113 | 71 | 57 | 51 | 34 |
| 11..... | 89 | | 111 | 8,000 | 1,120 | 740 | 1,740 | 89 | 66 | 53 | 51 | 31 |
| 12..... | 97 | | | | 1,030 | 700 | 1,590 | 64 | 64 | 53 | 60 | 30 |
| 13..... | 103 | | | | 1,030 | 780 | 1,590 | 62 | 62 | 47 | 50 | 30 |
| 14..... | 103 | 125 | | | 975 | 820 | 1,380 | 75 | 66 | 43 | 50 | 31 |
| 15..... | 103 | | | 2,850 | 906 | 820 | 1,240 | 64 | 64 | 43 | 50 | 40 |
| 16..... | 103 | | 500 | 2,560 | 820 | 820 | 995 | 64 | 64 | 45 | 50 | 47 |
| 17..... | 95 | | | 2,400 | 820 | 820 | 938 | 47 | 57 | 53 | 50 | 47 |
| 18..... | 92 | 129 | 450 | 3,060 | 820 | 1,270 | 720 | 71 | 82 | 53 | 50 | 47 |
| 19..... | 92 | | | 3,060 | 780 | 2,080 | 535 | 102 | 64 | 66 | 60 | 47 |
| 20..... | 92 | | | 2,240 | 700 | 1,930 | 370 | 92 | 60 | 45 | 50 | 50 |
| 21..... | 92 | | | 1,810 | 735 | 1,690 | 490 | 81 | 57 | 40 | 62 | 50 |
| 22..... | 92 | 133 | 1,300 | 1,430 | 626 | 1,550 | 480 | 71 | 57 | 47 | 68 | 50 |
| 23..... | 95 | | | 1,220 | 592 | 1,740 | 580 | 75 | 55 | 50 | 48 | 47 |
| 24..... | 95 | 128 | | 1,170 | 625 | 2,240 | 720 | 86 | 55 | 53 | 48 | 47 |
| 25..... | 89 | | | 2,080 | 660 | 2,560 | 720 | 86 | 58 | 58 | 47 | 47 |
| 26..... | 75 | 122 | | 5,050 | 698 | 3,100 | 625 | 86 | 53 | 53 | 45 | 43 |
| 27..... | 75 | a 122 | 1,380 | 3,060 | 592 | 3,060 | 490 | 103 | 59 | 40 | 48 | 40 |
| 28..... | 92 | a 122 | 4,000 | 2,400 | 558 | 2,560 | 450 | 89 | 53 | 40 | 43 | 40 |
| 29..... | 103 | 122 | a 5,500 | 1,890 | | 2,080 | 880 | 84 | 62 | 40 | 37 | 40 |
| 30..... | 103 | a 125 | a 5,000 | 1,690 | | 2,080 | 625 | 75 | 64 | 43 | 37 | 40 |
| 31..... | 103 | | a 3,310 | 1,320 | | 2,400 | | 68 | | 43 | 37 | |

a Estimated.

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

Monthly discharge of Umatilla River near Umatilla, Oreg., for the year ending Sept. 30, 1918.

| Month. | Discharge in second-feet. | | | Run-off in acre-feet. | | |
|----------------|---------------------------|----------|-------|-----------------------|---------|---------|
| | Maximum. | Minimum. | Mean. | River. | Canals. | Total. |
| October..... | 108 | 73 | 88.0 | 5,410 | 2,620 | 8,030 |
| November..... | | 92 | 116 | 6,900 | 900 | 7,800 |
| December..... | a 6,500 | | 1,110 | 68,200 | | 68,200 |
| January..... | 6,050 | 1,170 | 2,400 | 148,000 | | 148,000 |
| February..... | 2,080 | 558 | 984 | 54,600 | | 54,600 |
| March..... | 3,100 | 700 | 1,410 | 86,700 | | 86,700 |
| April..... | 2,620 | 370 | 1,050 | 62,500 | 2,490 | 64,990 |
| May..... | 580 | 47 | 164 | 10,100 | 2,700 | 12,800 |
| June..... | 81 | 53 | 64.0 | 3,810 | 3,310 | 7,120 |
| July..... | 89 | 40 | 54.7 | 3,360 | 3,720 | 7,080 |
| August..... | 68 | 37 | 49.9 | 3,070 | 3,850 | 6,920 |
| September..... | 50 | 23 | 38.6 | 2,300 | 3,780 | 6,050 |
| The year..... | a 6,500 | 23 | 628 | 455,000 | 23,300 | 478,000 |

a Estimated.

NOTE.—Run-off given for canals is sum of run-off of main canal of West Division and Oregon Land & Water Co.'s canal, which divert around the station. Run-off records of canals furnished by the United States Reclamation Service.

JOHN DAY RIVER BASIN.

JOHN DAY RIVER AT McDONALD, OREG.

LOCATION.—In NW. $\frac{1}{4}$ sec. 11, T. 1 N., R. 19 E., at ferry at McDonald post office, Sherman County, half a mile below mouth of Rock Creek, 16 miles above junction with Columbia River, and 18 miles southwest of Arlington.

DRAINAGE AREA.—7,800 square miles.

RECORDS AVAILABLE.—December 16, 1904, to September 30, 1918.

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

DISCHARGE MEASUREMENTS.—Made from cable or by wading.

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

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 6.8 feet at 6 a. m. February 8 (discharge, 11,200 second-feet); minimum stage recorded, 1.28 feet September 9 and 10 (discharge, 113 second-feet).

1905-1918: Maximum stage recorded, 10.38 feet February 6, 1907 (discharge, 22,800 second-feet). A flood about 25 years ago is said to have reached a height of 12.8 feet (discharge, estimated from extension of rating curve, 33,000 second-feet). Minimum stage recorded, 1.02 feet September 8 to 11, 1915 (discharge, 68 second-feet).

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

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

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent during year. Rating curve well defined between 250 and 10,000 second-feet and fairly well defined outside these limits. Gage read to quarter-tenths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table. Records excellent.

Discharge measurements of John Day River at McDonald, Oreg., during the year ending Sept. 30, 1918.

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---------|-----------------------|--------------|-----------------|---------|-----------------------|--------------|-----------------|
| | | <i>Feet.</i> | <i>Sec.-ft.</i> | | | <i>Feet.</i> | <i>Sec.-ft.</i> |
| Oct. 19 | C. L. Batchelder..... | 1.63 | 282 | May 26 | C. L. Batchelder..... | 2.02 | 1,620 |
| Jan. 15 |do..... | 4.59 | 4,560 | Sept. 3 | R. C. Briggs..... | 1.33 | 139 |
| Feb. 4 | R. C. Briggs..... | 3.71 | 2,640 | | | | |

Daily discharge, in second-feet, of John Day River at McDonald, Oreg., for the year ending Sept. 30, 1918.

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1..... | 386 | 318 | 1,100 | 3,640 | 2,630 | 1,990 | 7,360 | 4,100 | 1,320 | 598 | 240 | 168 |
| 2..... | 365 | 330 | 1,100 | 2,810 | 1,990 | 1,840 | 7,360 | 4,100 | 1,260 | 539 | 222 | 144 |
| 3..... | 344 | 330 | 1,100 | 2,460 | 2,300 | 2,140 | 6,760 | 4,100 | 1,260 | 460 | 200 | 128 |
| 4..... | 330 | 344 | 1,260 | 2,300 | 2,630 | 2,300 | 5,900 | 4,100 | 1,320 | 400 | 185 | 128 |
| 5..... | 330 | 366 | 955 | 2,300 | 2,630 | 2,460 | 5,100 | 4,580 | 1,320 | 400 | 170 | 124 |
| 6..... | 300 | 386 | 820 | 2,810 | 3,200 | 2,460 | 4,580 | 4,840 | 1,380 | 400 | 160 | 120 |
| 7..... | 300 | 386 | 730 | 2,630 | 6,180 | 2,140 | 4,100 | 4,580 | 1,440 | 385 | 180 | 120 |
| 8..... | 300 | 365 | 685 | 2,460 | 9,880 | 1,990 | 3,860 | 4,100 | 1,570 | 365 | 152 | 120 |
| 9..... | 300 | 344 | 640 | 3,420 | 6,180 | 1,990 | 3,640 | 3,860 | 1,700 | 330 | 144 | 112 |
| 10..... | 300 | 400 | 640 | 2,140 | 4,580 | 2,140 | 3,640 | 3,640 | 1,840 | 330 | 140 | 112 |
| 11..... | 300 | 408 | 640 | 1,990 | 4,340 | 2,140 | 6,180 | 3,200 | 1,770 | 306 | 140 | 120 |
| 12..... | 300 | 420 | 598 | 1,990 | 4,100 | 2,140 | 6,180 | 2,810 | 1,770 | 270 | 140 | 120 |
| 13..... | 300 | 408 | 598 | 2,630 | 4,100 | 2,140 | 6,180 | 2,630 | 1,840 | 300 | 152 | 120 |
| 14..... | 234 | 400 | 555 | 6,460 | 3,860 | 2,300 | 5,620 | 2,460 | 1,700 | 270 | 152 | 222 |
| 15..... | 282 | 365 | 555 | 4,840 | 3,640 | 2,300 | 5,360 | 2,630 | 1,840 | 258 | 156 | 200 |
| 16..... | 282 | 386 | 598 | 4,100 | 3,200 | 2,140 | 5,100 | 2,810 | 1,640 | 222 | 160 | 140 |
| 17..... | 270 | 409 | 1,000 | 4,100 | 2,630 | 2,300 | 4,840 | 2,630 | 1,440 | 210 | 152 | 216 |
| 18..... | 270 | 400 | 1,000 | 4,580 | 3,000 | 2,810 | 4,340 | 2,460 | 1,320 | 210 | 124 | 185 |
| 19..... | 270 | 400 | 910 | 6,460 | 2,810 | 3,860 | 4,100 | 2,300 | 1,210 | 210 | 140 | 165 |
| 20..... | 270 | 400 | 820 | 6,180 | 2,630 | 5,360 | 3,640 | 2,140 | 1,000 | 300 | 160 | 210 |
| 21..... | 270 | 400 | 955 | 4,580 | 2,140 | 5,100 | 3,640 | 2,140 | 955 | 210 | 160 | 234 |
| 22..... | 270 | 400 | 1,260 | 3,640 | 1,920 | 5,100 | 3,640 | 1,990 | 910 | 205 | 160 | 210 |
| 23..... | 300 | 400 | 1,380 | 3,200 | 1,770 | 6,180 | 4,100 | 1,840 | 910 | 185 | 160 | 210 |
| 24..... | 300 | 400 | 1,320 | 3,000 | 1,840 | 6,460 | 4,580 | 1,840 | 910 | 170 | 270 | 618 |
| 25..... | 300 | 386 | 1,840 | 3,000 | 2,300 | 7,360 | 4,840 | 1,700 | 1,380 | 160 | 240 | 210 |
| 26..... | 300 | 386 | 2,300 | 3,640 | 2,140 | 8,600 | 4,840 | 1,570 | 1,100 | 185 | 240 | 185 |
| 27..... | 300 | 386 | 2,460 | 6,180 | 1,990 | 9,240 | 4,840 | 1,570 | 1,000 | 200 | 222 | 190 |
| 28..... | 300 | 430 | 3,640 | 5,100 | 2,140 | 7,960 | 4,340 | 1,500 | 910 | 258 | 205 | 205 |
| 29..... | 300 | 438 | 3,860 | 4,100 | ..... | 7,360 | 3,860 | 1,440 | 775 | 246 | 185 | 210 |
| 30..... | 300 | 515 | 5,100 | 3,640 | ..... | 7,060 | 3,860 | 1,380 | 640 | 240 | 165 | 210 |
| 31..... | 318 | ..... | 4,100 | 3,420 | ..... | 6,760 | ..... | 1,320 | ..... | 240 | ..... | ..... |

Monthly discharge of John Day River at McDonald, Oreg., for the year ending Sept. 30, 1918.

| Month. | Discharge in second-feet. | | | Run-off in acre-feet. | Month. | Discharge in second-feet. | | | Run-off in acre-feet. |
|---------------|---------------------------|----------|-------|-----------------------|----------------|---------------------------|----------|-------|-----------------------|
| | Maximum. | Minimum. | Mean. | | | Maximum. | Minimum. | Mean. | |
| October..... | 386 | 270 | 302 | 18,600 | May..... | 4,840 | 1,320 | 2,790 | 172,000 |
| November..... | 515 | 318 | 390 | 23,200 | June..... | 1,840 | 640 | 1,310 | 78,000 |
| December..... | 5,100 | 555 | 1,440 | 88,500 | July..... | 598 | 160 | 239 | 17,600 |
| January..... | 6,460 | 1,990 | 3,670 | 226,000 | August..... | 270 | 124 | 175 | 10,800 |
| February..... | 9,880 | 1,770 | 3,310 | 184,000 | September..... | 318 | 113 | 171 | 10,200 |
| March..... | 9,240 | 1,840 | 4,070 | 250,000 | The year. | 9,880 | 113 | 1,890 | 1,370,000 |
| April..... | 7,360 | 3,640 | 4,880 | 280,000 | | | | | |

DESCHUTES RIVER BASIN.

DESCHUTES RIVER BELOW BEND, OREG.

LOCATION.—In SE. $\frac{1}{4}$ 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, 1918.

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

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

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

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 2.63 feet at 9 a. m., January 15 (discharge, 2,080 second-feet); minimum stage recorded, 0.53 foot at 8 a. m. July 19 (discharge, 122 second-feet).

1915-1918: Maximum and minimum stages same as for 1918.

1905-1918: Maximum stage recorded, 3.45 feet at pumping plant at Bend at 7.45 a. m. November 27, 1909 (discharge, 4,820 second-feet; no diversions).

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

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

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

ACCURACY.—Stage-discharge relation practically permanent during year. Rating curve well defined. Operation of water-stage recorder fairly satisfactory. Daily discharge ascertained by use of discharge integrator except October 6-21 and November 18 to February 24, for which it was ascertained by applying to rating table mean daily gage height obtained by inspecting recorder graph, except for periods indicated in footnote to table of daily discharge; also for a few scattered days through the year one daily gage reading has been used. Records good.

Discharge measurements of Deschutes River below Bend, Oreg., during the year ending Sept. 30, 1918.

| Date. | Made by— | Gage height. | Dis-charge. | Date. | Made by— | Gage height. | Dis-charge. |
|---------|-----------------------|--------------|-------------|---------|------------------|--------------|-------------|
| | | Feet. | Sec.-ft. | | | Feet. | Sec.-ft. |
| Oct. 15 | Briggs and Batchelder | 1.84 | 1,060 | May 30 | C. L. Batchelder | 1.75 | 1,040 |
| Nov. 16 | R. C. Briggs | 2.10 | 1,330 | June 25 | R. C. Briggs | 1.28 | 662 |
| Feb. 7 | do. | 2.48 | 1,830 | July 21 | do. | 1.25 | 594 |
| Apr. 15 | F. F. Henshaw | 1.89 | 1,160 | 26 | do. | 1.03 | 392 |

Daily discharge, in second-feet, of Deschutes River below Bend, Oreg., for the year ending Sept. 30, 1918.

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---------|-------|--------|-------|--------|--------|--------|--------|-------|-------|-------|-------|-------|
| 1..... | 910 | | | 1,710 | b1,520 | 1,210 | 1,560 | 1,050 | 700 | 460 | 436 | 455 |
| 2..... | 885 | | | 1,710 | b1,550 | 1,390 | 1,670 | 990 | 700 | 470 | 414 | 491 |
| 3..... | 875 | | | 1,640 | b1,370 | 1,510 | 1,650 | 910 | 690 | 440 | 382 | 450 |
| 4..... | 875 | | | 1,640 | 1,290 | 1,430 | b1,410 | 900 | 700 | 400 | 382 | 450 |
| 5..... | 810 | | | 1,640 | 1,510 | 1,470 | b1,270 | 870 | 690 | 450 | 392 | 446 |
| 6..... | 834 | 900 | | 1,640 | 1,350 | a1,460 | b1,230 | 830 | 650 | 400 | 372 | 455 |
| 7..... | 790 | | | 1,710 | 1,780 | a1,440 | 1,190 | 810 | 660 | 400 | 382 | 495 |
| 8..... | 795 | | | 1,710 | 1,780 | a1,430 | 1,140 | 810 | 660 | 455 | 370 | 450 |
| 9..... | 790 | | | 1,640 | 1,780 | a1,415 | 1,150 | 840 | 620 | 465 | 332 | 320 |
| 10..... | 789 | | | 1,670 | a1,740 | 1,400 | 1,170 | 860 | 660 | 470 | 370 | 332 |
| 11..... | 772 | | | 1,450 | 1,710 | 1,350 | 1,160 | 860 | 600 | 450 | 395 | 548 |
| 12..... | 768 | 1,000 | 1,270 | b1,285 | 1,780 | 1,330 | 1,120 | 835 | 565 | 450 | 378 | 595 |
| 13..... | 763 | 1,150 | | b1,280 | 1,790 | 1,330 | 1,110 | 840 | 610 | 465 | 372 | 595 |
| 14..... | 780 | 1,300 | | b1,410 | 1,510 | 1,310 | 1,160 | 875 | 625 | 410 | 372 | 634 |
| 15..... | 888 | 1,310 | | b1,500 | 1,570 | 1,340 | 1,140 | 925 | 770 | 420 | 372 | 662 |
| 16..... | 1,070 | 1,360 | | b1,700 | 1,570 | 1,360 | 1,120 | 895 | 610 | 390 | 385 | 710 |
| 17..... | 1,070 | 1,290 | | 1,850 | 1,450 | 1,240 | 1,160 | 890 | 630 | 395 | 385 | 700 |
| 18..... | 1,070 | 1,280 | | 1,850 | 1,450 | 1,220 | 1,180 | 845 | b 500 | 395 | 390 | 685 |
| 19..... | 1,080 | 1,290 | | 1,850 | 1,450 | 1,360 | 1,180 | 897 | b 370 | 370 | 410 | 685 |
| 20..... | 1,070 | 1,340 | | 1,790 | 1,450 | 1,330 | 1,180 | 850 | b 580 | 340 | 475 | 668 |
| 21..... | 1,050 | 1,340 | | 1,710 | 1,510 | 1,440 | 1,070 | 875 | b 630 | 490 | 480 | 650 |
| 22..... | 1,000 | 1,290 | | 1,710 | 1,510 | 1,370 | 940 | 900 | b 610 | 425 | 520 | 665 |
| 23..... | 1,940 | a1,290 | 1,200 | 1,710 | 1,510 | 1,360 | 900 | 870 | b 590 | 455 | 520 | 660 |
| 24..... | 1,030 | a1,290 | 1,240 | 1,710 | 1,510 | 1,340 | 890 | 840 | 620 | 521 | 515 | 650 |
| 25..... | 1,050 | 1,280 | 1,040 | 1,710 | 1,510 | 1,400 | 900 | 870 | 630 | 486 | b 515 | 642 |
| 26..... | 1,040 | 1,280 | 1,710 | 1,710 | 1,350 | 1,440 | 900 | 1,080 | 565 | 455 | b 517 | 640 |
| 27..... | 1,040 | 1,280 | 1,780 | 1,640 | 1,260 | 1,600 | 890 | 1,040 | 550 | 435 | b 516 | 636 |
| 28..... | 1,050 | | 1,780 | 1,640 | 1,230 | 1,630 | 942 | 1,050 | 535 | 447 | b 490 | 636 |
| 29..... | | 1,290 | 1,780 | 1,570 | ..... | 1,540 | 960 | 1,070 | 510 | 442 | b 500 | 632 |
| 30..... | 1,060 | | 1,710 | b1,550 | ..... | 1,570 | 1,100 | 920 | 500 | 442 | b 480 | 643 |
| 31..... | | | 1,710 | b1,550 | ..... | 1,640 | ..... | 720 | ..... | 417 | b 470 | ..... |

a Interpolated.

b Estimated.

Note.—Braced figures show estimated mean discharge for period indicated; obtained by comparison with a partial record from Bend Light & Power Co.'s gage and output of plant.

Daily discharge, in second feet, of Deschutes River, including canals, near Bend, Oreg., for the year ending Sept. 30, 1918.

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1..... | 1,550 | | | 1,740 | 1,580 | 1,480 | 1,580 | 1,570 | 1,490 | 1,380 | 1,280 | 1,300 |
| 2..... | 1,580 | | | 1,740 | 1,580 | 1,490 | 1,580 | 1,520 | 1,510 | 1,400 | 1,240 | 1,310 |
| 3..... | 1,620 | | | 1,670 | 1,580 | 1,520 | 1,670 | 1,540 | 1,500 | 1,360 | 1,220 | 1,300 |
| 4..... | 1,560 | | | 1,670 | 1,580 | 1,500 | 1,620 | 1,540 | 1,500 | 1,340 | 1,230 | 1,300 |
| 5..... | 1,520 | | | 1,680 | 1,710 | 1,490 | 1,580 | 1,630 | 1,520 | 1,380 | 1,240 | 1,300 |
| 6..... | 1,580 | 1,350 | | 1,710 | 1,850 | 1,480 | 1,520 | 1,500 | 1,480 | 1,340 | 1,220 | 1,260 |
| 7..... | 1,430 | | | 1,750 | 1,780 | 1,460 | 1,500 | 1,510 | 1,510 | 1,340 | 1,230 | 1,270 |
| 8..... | 1,500 | | | 1,740 | 1,780 | 1,450 | 1,440 | 1,620 | 1,520 | 1,390 | 1,220 | 1,320 |
| 9..... | 1,500 | | | 1,670 | 1,800 | 1,480 | 1,440 | 1,540 | 1,500 | 1,360 | 1,230 | 1,240 |
| 10..... | 1,450 | | | 1,600 | 1,760 | 1,420 | 1,460 | 1,590 | 1,550 | 1,380 | 1,220 | 1,320 |
| 11..... | 1,430 | | | 1,530 | 1,730 | 1,370 | 1,490 | 1,670 | 1,490 | 1,360 | 1,250 | 1,320 |
| 12..... | 1,420 | 1,300 | 1,360 | 1,600 | 1,800 | 1,350 | 1,500 | 1,580 | 1,500 | 1,350 | 1,240 | 1,320 |
| 13..... | 1,480 | 1,350 | | 1,600 | 1,800 | 1,370 | 1,500 | 1,560 | 1,510 | 1,360 | 1,220 | 1,310 |
| 14..... | 1,410 | 1,370 | | 1,600 | 1,530 | 1,330 | 1,550 | 1,670 | 1,540 | 1,340 | 1,230 | 1,310 |
| 15..... | 1,400 | 1,380 | | 1,600 | 1,590 | 1,360 | 1,530 | 1,630 | 1,500 | 1,350 | 1,230 | 1,360 |
| 16..... | 1,480 | 1,370 | | 1,700 | 1,590 | 1,400 | 1,520 | 1,620 | 1,500 | 1,220 | 1,240 | 1,260 |
| 17..... | 1,480 | 1,350 | | 1,850 | 1,470 | 1,380 | 1,580 | 1,630 | 1,470 | 1,330 | 1,230 | 1,340 |
| 18..... | 1,480 | 1,320 | | 1,890 | 1,470 | 1,360 | 1,630 | 1,600 | 1,480 | 1,320 | 1,240 | 1,320 |
| 19..... | 1,480 | 1,400 | | 1,890 | 1,400 | 1,350 | 1,630 | 1,650 | 1,490 | 1,300 | 1,250 | 1,320 |
| 20..... | 1,460 | 1,370 | | 1,820 | 1,460 | 1,390 | 1,640 | 1,520 | 1,500 | 1,280 | 1,260 | 1,300 |
| 21..... | 1,450 | 1,370 | | 1,740 | 1,520 | 1,460 | 1,580 | 1,540 | 1,560 | 1,360 | 1,240 | 1,330 |
| 22..... | 1,390 | 1,320 | | 1,740 | 1,520 | 1,410 | 1,480 | 1,590 | 1,540 | 1,350 | 1,270 | 1,310 |
| 23..... | 1,430 | 1,320 | 1,540 | 1,740 | 1,520 | 1,500 | 1,470 | 1,670 | 1,490 | 1,370 | 1,250 | 1,330 |
| 24..... | 1,410 | 1,320 | 1,490 | 1,710 | 1,530 | 1,520 | 1,480 | 1,520 | 1,500 | 1,420 | 1,250 | 1,320 |
| 25..... | 1,410 | 1,320 | 1,660 | 1,710 | 1,430 | 1,530 | 1,500 | 1,520 | 1,540 | 1,410 | 1,240 | 1,310 |
| 26..... | 1,400 | 1,320 | 1,720 | 1,710 | 1,560 | 1,530 | 1,500 | 1,510 | 1,490 | 1,390 | 1,240 | 1,310 |
| 27..... | 1,390 | 1,320 | 1,780 | 1,640 | 1,500 | 1,620 | 1,500 | 1,460 | 1,460 | 1,370 | 1,230 | 1,300 |
| 28..... | 1,390 | 1,370 | 1,810 | 1,640 | 1,510 | 1,650 | 1,550 | 1,470 | 1,460 | 1,350 | 1,220 | 1,300 |
| 29..... | 1,380 | 1,370 | 1,810 | 1,670 | ..... | 1,560 | 1,570 | 1,520 | 1,440 | 1,380 | 1,230 | 1,300 |
| 30..... | 1,360 | 1,360 | 1,740 | 1,580 | ..... | 1,590 | 1,480 | 1,550 | 1,430 | 1,370 | 1,200 | 1,310 |
| 31..... | 1,360 | | 1,740 | 1,580 | ..... | 1,660 | ..... | 1,500 | ..... | 1,350 | 1,200 | ..... |

Monthly discharge of Deschutes River below Bend, Oreg., for the year ending Sept. 30, 1918.

| Month. | Discharge in second-feet. | | | Run-off in acre-feet. |
|----------------|---------------------------|----------|-------|-----------------------|
| | Maximum. | Minimum. | Mean. | |
| October..... | 1,680 | 798 | 940 | 87,800 |
| November..... | 1,344 | 1,210 | 1,170 | 89,600 |
| December..... | 1,780 | 1,370 | 1,570 | 84,200 |
| January..... | 1,850 | 1,280 | 1,640 | 101,000 |
| February..... | 1,860 | 1,290 | 1,540 | 85,500 |
| March..... | 1,640 | 1,210 | 1,410 | 86,700 |
| April..... | 1,650 | 890 | 1,140 | 67,800 |
| May..... | 1,080 | 720 | 902 | 55,500 |
| June..... | 825 | 500 | 627 | 37,300 |
| July..... | 531 | 340 | 435 | 28,700 |
| August..... | 520 | 370 | 430 | 26,400 |
| September..... | 710 | 385 | 583 | 34,700 |
| The year..... | 1,850 | 840 | 1,010 | 733,000 |

Monthly discharge of Deschutes River, including canals, near Bend, Oreg., for the year ending Sept. 30, 1918.

| Month. | Discharge in second-feet. | | | Run-off in acre-feet. |
|----------------|---------------------------|----------|-------|-----------------------|
| | Maximum. | Minimum. | Mean. | |
| October..... | 1,560 | 1,360 | 1,450 | 89,200 |
| November..... | 1,400 | 1,300 | 1,350 | 80,300 |
| December..... | 1,310 | 1,460 | 1,460 | 89,800 |
| January..... | 1,890 | 1,530 | 1,690 | 104,000 |
| February..... | 1,850 | 1,430 | 1,610 | 89,400 |
| March..... | 1,660 | 1,330 | 1,470 | 90,400 |
| April..... | 1,670 | 1,440 | 1,540 | 91,600 |
| May..... | 1,650 | 1,460 | 1,550 | 95,300 |
| June..... | 1,560 | 1,430 | 1,500 | 89,200 |
| July..... | 1,420 | 1,280 | 1,360 | 82,600 |
| August..... | 1,350 | 1,300 | 1,340 | 82,400 |
| September..... | 1,360 | 1,260 | 1,310 | 78,000 |
| The year..... | 1,890 | 1,260 | 1,470 | 1,060,000 |

DESCHUTES RIVER AT MECCA, OREG.

LOCATION.—In SW $\frac{1}{4}$ sec. 20, T. 9 S., R. 13 E., at bridge at Mecca station on Oregon Trunk Railway, Jefferson County, $1\frac{1}{2}$ miles below mouth of Shilike Creek and 12 miles above mouth of Warm Spring River.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—June 7, 1911, to September 30, 1918.

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

DISCHARGE MEASUREMENTS.—Made from highway bridge.

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

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 4.8 feet December 29 (discharge, 9,300 second-feet); minimum stage recorded, 2.2 feet August 6 to 10 (discharge, 3,740 second-feet).

1911-1918: Maximum stage recorded, 5.75 feet March 21, 1916 (discharge, 11,700 second-feet); minimum stage recorded, 1.95 feet in August and September, 1915 (discharge, 3,410 second-feet).

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

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

REGULATION.—None.

ACCURACY.—Stage-discharge relation practically permanent during year. Rating curve well defined between 3,900 and 9,000 second-feet. Gage read to quarter-tenths daily. Daily discharge ascertained by applying daily gage height to rating table. Records excellent.

Discharge measurements of Deschutes River at Mecca, Oreg., during the year ending Sept. 30, 1918.

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---------|-----------------------|--------------|-----------------|----------|-----------------------|--------------|-----------------|
| | | <i>Feet.</i> | <i>Sec.-ft.</i> | | | <i>Feet.</i> | <i>Sec.-ft.</i> |
| Oct. 2 | C. L. Batchelder..... | 2.53 | 4,280 | June 27 | R. C. Briggs..... | 2.80 | 4,210 |
| Feb. 13 | R. C. Briggs..... | 3.40 | 5,870 | July 22 | do..... | 2.40 | 4,050 |
| Apr. 13 | F. F. Henshaw..... | 2.96 | 5,140 | Sept. 27 | C. L. Batchelder..... | 2.38 | 4,090 |
| May 23 | C. L. Batchelder..... | 2.70 | 4,640 | | | | |

Daily discharge, in second-feet, of Deschutes River at Mecca, Oreg., for the year ending Sept. 30, 1918.

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1..... | 4,400 | 4,580 | 5,330 | 6,340 | 5,720 | 5,140 | 6,340 | 4,780 | 4,400 | 3,890 | 3,890 | 3,890 |
| 2..... | 4,400 | 4,580 | 5,140 | 6,340 | 5,720 | 5,330 | 7,080 | 4,780 | 4,400 | 3,890 | 3,890 | 3,890 |
| 3..... | 4,220 | 4,580 | 4,950 | 6,340 | 5,720 | 5,520 | 6,600 | 4,780 | 4,400 | 3,890 | 3,890 | 3,890 |
| 4..... | 4,220 | 4,400 | 4,760 | 6,340 | 5,920 | 5,520 | 6,360 | 4,780 | 4,400 | 3,820 | 3,890 | 3,890 |
| 5..... | 4,220 | 4,580 | 4,760 | 6,600 | 6,140 | 5,520 | 5,920 | 4,780 | 4,400 | 3,820 | 3,820 | 3,820 |
| 6..... | 4,140 | 4,580 | 4,760 | 6,600 | 6,600 | 5,520 | 5,720 | 4,780 | 4,400 | 3,890 | 3,740 | 3,890 |
| 7..... | 4,140 | 4,580 | 4,760 | 6,360 | 6,340 | 5,520 | 5,520 | 4,780 | 4,580 | 3,890 | 3,740 | 3,890 |
| 8..... | 4,140 | 4,400 | 4,760 | 6,360 | 7,320 | 5,520 | 5,520 | 4,580 | 4,580 | 3,890 | 3,740 | 3,890 |
| 9..... | 4,140 | 4,400 | 4,760 | 6,360 | 7,980 | 5,520 | 5,520 | 4,400 | 4,780 | 3,970 | 3,740 | 3,890 |
| 10..... | 4,140 | 4,400 | 4,760 | 6,360 | 6,360 | 5,520 | 5,520 | 4,400 | 4,780 | 4,050 | 3,740 | 3,970 |
| 11..... | 4,140 | 4,400 | 4,760 | 6,360 | 6,360 | 5,520 | 5,720 | 4,400 | 4,780 | 4,050 | 3,820 | 3,970 |
| 12..... | 4,140 | 4,400 | 4,760 | 6,340 | 6,360 | 5,520 | 5,520 | 4,400 | 4,580 | 4,050 | 3,890 | 3,970 |
| 13..... | 4,140 | 4,760 | 5,140 | 6,340 | 6,360 | 5,520 | 5,520 | 4,400 | 4,580 | 4,050 | 3,890 | 3,970 |
| 14..... | 4,140 | 4,780 | 5,140 | 6,600 | 6,360 | 5,520 | 5,520 | 4,580 | 4,400 | 4,050 | 3,820 | 4,580 |
| 15..... | 4,220 | 4,780 | 5,140 | 6,240 | 5,920 | 5,520 | 5,360 | 4,780 | 4,400 | 3,970 | 3,820 | 4,400 |
| 16..... | 4,800 | 4,760 | 5,140 | 6,340 | 5,920 | 5,520 | 5,330 | 4,780 | 4,400 | 3,970 | 3,820 | 4,400 |
| 17..... | 4,400 | 4,760 | 5,330 | 6,340 | 5,920 | 5,520 | 5,140 | 4,780 | 4,400 | 3,970 | 3,820 | 4,400 |
| 18..... | 4,400 | 4,760 | 6,340 | 6,340 | 5,920 | 5,520 | 6,140 | 4,780 | 4,400 | 3,970 | 3,820 | 4,220 |
| 19..... | 4,400 | 4,580 | 7,800 | 6,340 | 5,920 | 5,720 | 5,140 | 4,580 | 4,400 | 3,970 | 3,820 | 4,140 |
| 20..... | 4,400 | 4,580 | 7,320 | 6,360 | 5,720 | 5,920 | 4,950 | 4,580 | 4,400 | 3,890 | 3,820 | 4,140 |
| 21..... | 4,400 | 4,580 | 6,340 | 6,360 | 5,720 | 6,140 | 4,950 | 4,400 | 4,400 | 3,970 | 3,890 | 4,050 |
| 22..... | 4,400 | 4,580 | 6,360 | 6,360 | 5,720 | 6,360 | 4,760 | 4,400 | 4,400 | 4,050 | 3,890 | 4,050 |
| 23..... | 4,400 | 4,580 | 6,360 | 6,140 | 5,720 | 6,600 | 4,760 | 4,400 | 4,400 | 4,050 | 3,890 | 4,050 |
| 24..... | 4,400 | 4,580 | 6,140 | 6,140 | 5,720 | 6,840 | 4,760 | 4,400 | 4,400 | 3,970 | 3,820 | 3,970 |
| 25..... | 4,400 | 4,780 | 6,360 | 6,140 | 5,720 | 7,080 | 4,760 | 4,400 | 4,400 | 3,970 | 3,970 | 3,970 |
| 26..... | 4,400 | 4,780 | 6,340 | 6,140 | 5,520 | 7,320 | 4,760 | 4,400 | 4,400 | 3,970 | 4,050 | 3,970 |
| 27..... | 4,400 | 4,760 | 7,800 | 6,140 | 5,520 | 7,800 | 4,760 | 4,400 | 4,220 | 3,970 | 3,970 | 3,970 |
| 28..... | 4,400 | 4,760 | 9,040 | 6,140 | 5,330 | 7,320 | 4,760 | 4,580 | 4,140 | 3,890 | 3,970 | 3,970 |
| 29..... | 4,400 | 4,780 | 9,300 | 6,140 | ..... | 6,840 | 4,760 | 4,400 | 4,050 | 3,890 | 3,970 | 4,050 |
| 30..... | 4,580 | 6,360 | 7,800 | 5,920 | ..... | 6,840 | 4,780 | 4,400 | 3,970 | 3,890 | 3,890 | 4,050 |
| 31..... | 4,580 | ..... | 7,320 | 5,920 | ..... | 7,080 | ..... | 4,400 | ..... | 3,890 | 3,890 | ..... |

Monthly discharge of Deschutes River at Mecca, Oreg., for the year ending Sept. 30, 1918.

| Month. | Discharge in second-feet. | | | Run-off in acre-feet. |
|----------------|---------------------------|----------|-------|-----------------------|
| | Maximum. | Minimum. | Mean. | |
| October..... | 4,580 | 4,140 | 4,310 | 265,000 |
| November..... | 6,360 | 4,400 | 4,670 | 273,400 |
| December..... | 9,300 | 4,760 | 6,010 | 370,000 |
| January..... | 6,240 | 5,920 | 6,480 | 398,000 |
| February..... | 7,320 | 5,330 | 6,040 | 335,000 |
| March..... | 7,800 | 5,160 | 6,090 | 370,000 |
| April..... | 7,080 | 4,760 | 5,390 | 321,000 |
| May..... | 4,760 | 4,400 | 4,560 | 280,000 |
| June..... | 4,780 | 3,970 | 4,420 | 263,000 |
| July..... | 4,050 | 3,320 | 3,950 | 243,000 |
| August..... | 4,050 | 3,740 | 3,860 | 237,000 |
| September..... | 4,580 | 3,880 | 4,040 | 240,000 |
| The year..... | 8,300 | 5,740 | 4,970 | 3,600,000 |

DESCHUTES RIVER AT MOODY, NEAR BIGGS, OREG.

LOCATION.—In SE. $\frac{1}{4}$ sec. 26, T. 2 N., R. 15 E., opposite Moody railroad station, $1\frac{1}{2}$ miles above bridge of Oregon-Washington Railroad & Navigation Co., $1\frac{1}{2}$ miles above mouth of river, and 5 miles southwest of Biggs, Sherman County.

DRAINAGE AREA.—About 9,180 square miles.

RECORDS AVAILABLE.—July 7, 1906, to September 30, 1918; October 19, 1897, to December 31, 1899, for a station near Moro, 10 miles above mouth of river in NE. $\frac{1}{4}$ sec. 5, T. 1 S., R. 16 E. Records for 1908 and 1910 somewhat fragmentary.

GAGE.—Staff in two sections, the lower inclined, the upper vertical; read by Crist Kitto. 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, 5.3 feet December 29 (discharge, 17,500 second-feet); minimum stage recorded, 2.15 feet on several days during August and September (discharge, 4,080 second-feet).

1906-1918: 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, 1915 (discharge, 3,600 second-feet).

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

DIVERSIONS.—Summer discharge at this station has been progressively reduced since 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.—Stage-discharge relation practically permanent during year. Rating curve well defined between 3,600 and 15,000 second-feet. Gage read to tenths once daily. Daily discharge ascertained by applying daily gage height to rating table, except for period indicated in footnote to table of daily discharge. Records excellent.

Discharge measurements of Deschutes River at Moody, near Biggs, Oreg., during the year ending Sept. 30, 1918.

| Date. | Made by— | Gage height. | Discharge. |
|---------|------------------|--------------|----------------|
| May 26 | C. L. Batchelder | Feet. 2.58 | Sec.-ft. 5,470 |
| Sept. 3 | R. C. Briggs | 2.15 | 4,090 |

Daily discharge, in second-feet, of Deschutes River at Moody, near Biggs, Oreg., for the year ending Sept. 30, 1918.

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---------|-------|-------|--------|-------|--------|-------|-------|-------|-------|-------|-------|-------|
| 1..... | 4,470 | 4,750 | 6,260 | 9,600 | 7,300 | 6,260 | 8,000 | 5,940 | 4,890 | 4,340 | 4,200 | 4,080 |
| 2..... | 4,470 | 4,750 | 5,940 | 9,200 | 6,950 | 6,260 | 8,069 | 5,940 | 4,890 | 4,340 | 4,200 | 4,080 |
| 3..... | 4,470 | 4,750 | 5,320 | 8,400 | 6,950 | 6,600 | 8,000 | 5,940 | 4,890 | 4,340 | 4,200 | 4,080 |
| 4..... | 4,470 | 4,750 | 5,320 | 9,200 | 6,950 | 6,600 | 7,300 | 5,940 | 4,750 | 4,340 | 4,200 | 4,080 |
| 5..... | 4,470 | 4,750 | 5,030 | 9,200 | 6,960 | 6,260 | 7,300 | 5,940 | 4,890 | 4,200 | 4,200 | 4,080 |
| 6..... | 4,470 | 4,750 | 5,030 | 8,800 | 8,000 | 6,260 | 6,600 | 5,940 | 4,890 | 4,200 | 4,200 | 4,080 |
| 7..... | 4,470 | 4,750 | 5,030 | 8,400 | 10,500 | 6,260 | 6,600 | 5,620 | 5,030 | 4,200 | 4,200 | 4,080 |
| 8..... | 4,470 | 4,750 | 5,030 | 8,400 | 9,600 | 6,260 | 6,600 | 5,620 | 5,030 | 4,200 | 4,200 | 4,080 |
| 9..... | 4,470 | 4,750 | 5,030 | 8,000 | 9,600 | 6,260 | 6,600 | 5,320 | 4,750 | 4,200 | 4,200 | 4,080 |
| 10..... | 4,340 | 4,890 | 5,030 | 8,000 | 8,800 | 6,260 | 6,600 | 5,620 | 4,890 | 4,200 | 4,200 | 4,080 |
| 11..... | 4,340 | 4,890 | 5,030 | 8,400 | 8,400 | 6,260 | 6,600 | 5,320 | 4,890 | 4,200 | 4,080 | 4,080 |
| 12..... | 4,340 | 4,890 | 5,030 | 9,600 | 8,000 | 6,260 | 6,600 | 5,320 | 4,750 | 4,200 | 4,080 | 4,080 |
| 13..... | 4,340 | 4,890 | 5,030 | 8,400 | 8,000 | 6,260 | 6,600 | 5,320 | 4,750 | 4,200 | 4,080 | 4,080 |
| 14..... | 4,340 | 4,890 | 5,030 | 8,800 | 8,000 | 5,940 | 6,600 | 5,940 | 4,750 | 4,200 | 4,080 | 4,080 |
| 15..... | 4,340 | 4,890 | 5,030 | 9,200 | 7,650 | 6,260 | 6,260 | 5,620 | 4,750 | 4,200 | 4,080 | 4,470 |
| 16..... | 4,470 | 4,890 | 6,260 | 8,600 | 7,300 | 6,260 | 5,940 | 5,320 | 4,750 | 4,200 | 4,080 | 4,470 |
| 17..... | 4,470 | 4,890 | 6,600 | 9,600 | 7,300 | 5,940 | 5,940 | 5,320 | 4,750 | 4,340 | 4,200 | 4,340 |
| 18..... | 4,470 | 4,890 | 8,800 | 9,200 | 7,300 | 6,600 | 8,940 | 5,320 | 4,750 | 4,340 | 4,340 | 4,340 |
| 19..... | 4,470 | 4,890 | 15,100 | 8,800 | 7,300 | 6,600 | 5,940 | 5,320 | 4,750 | 4,470 | 4,340 | 4,340 |
| 20..... | 4,610 | 4,890 | 14,000 | 8,400 | 6,950 | 6,600 | 5,940 | 5,320 | 4,750 | 4,470 | 4,200 | 4,340 |
| 21..... | 4,610 | 4,890 | 8,800 | 8,000 | 6,950 | 6,950 | 5,940 | 5,320 | 4,750 | 4,340 | 4,080 | 4,200 |
| 22..... | 4,610 | 4,890 | 8,800 | 8,000 | 6,600 | 7,300 | 5,940 | 5,320 | 4,750 | 4,340 | 4,080 | 4,200 |
| 23..... | 4,610 | 4,890 | 8,800 | 8,000 | 6,600 | 7,300 | 5,940 | 5,320 | 5,750 | 4,340 | 4,200 | 4,200 |
| 24..... | 4,610 | 4,890 | 9,600 | 8,000 | 6,950 | 7,650 | 5,940 | 5,320 | 4,750 | 4,340 | 4,200 | 4,470 |
| 25..... | 4,610 | 4,890 | 8,800 | 7,650 | 6,600 | 7,650 | 5,940 | 5,320 | 4,610 | 4,340 | 4,370 | 4,470 |
| 26..... | 4,750 | 4,890 | 8,800 | 7,300 | 6,600 | 8,000 | 5,940 | 5,320 | 4,610 | 4,340 | 4,340 | 4,200 |
| 27..... | 4,750 | 4,890 | 8,400 | 8,000 | 6,260 | 8,000 | 5,940 | 5,320 | 4,470 | 4,340 | 4,200 | 4,200 |
| 28..... | 4,750 | 4,890 | 13,500 | 8,000 | 6,600 | 8,400 | 5,620 | 5,320 | 4,470 | 4,340 | 4,200 | 4,200 |
| 29..... | 4,750 | 5,320 | 17,500 | 7,650 | ..... | 8,000 | 5,620 | 6,320 | 4,470 | 4,340 | 4,200 | 4,200 |
| 30..... | 4,750 | 8,400 | 13,000 | 7,650 | ..... | 7,650 | 5,940 | 5,320 | 4,470 | 4,200 | 4,080 | 4,200 |
| 31..... | 4,750 | ..... | 13,500 | 7,300 | ..... | 7,650 | ..... | 4,890 | ..... | 4,200 | 4,080 | ..... |

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

Monthly discharge of Deschutes River at Moody, near Biggs, Oreg., for the year ending Sept. 30, 1918.

| Month. | Discharge in second-feet. | | | Run-off in acre-feet. |
|----------------|---------------------------|----------|-------|-----------------------|
| | Maximum. | Minimum. | Mean. | |
| October..... | 4,750 | 4,340 | 4,530 | 279,000 |
| November..... | 8,400 | 4,750 | 4,980 | 296,000 |
| December..... | 17,500 | 5,030 | 8,010 | 493,000 |
| January..... | 9,600 | 7,300 | 8,480 | 521,000 |
| February..... | 10,500 | 6,260 | 7,530 | 418,000 |
| March..... | 8,400 | 5,940 | 6,800 | 418,000 |
| April..... | 8,000 | 5,620 | 6,420 | 382,000 |
| May..... | 5,940 | 4,890 | 5,480 | 337,000 |
| June..... | 5,030 | 4,470 | 4,760 | 283,000 |
| July..... | 4,470 | 4,200 | 4,290 | 264,000 |
| August..... | 4,470 | 4,080 | 4,200 | 258,000 |
| September..... | 4,470 | 4,080 | 4,180 | 249,000 |
| The year..... | 17,500 | 4,080 | 5,800 | 4,200,000 |

EAST FORK NEAR LAPINE, OREG.

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

DRAINAGE AREA.—Not measured.

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

GAGE.—Vertical staff on downstream side of east bent of bridge; read by Mrs. M. C. Bogue. During 1912 a gage at the Rosland ranger station, 1½ miles below the present gage, was used.

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

CHANNEL AND CONTROL.—No well defined control; sandy bottom. Banks of earth; are overflowed at high stages.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period, 2.20 feet during discharge measurement June 23 (discharge, 300 second-feet); minimum stage recorded, 0.50 foot August 27 to September 9 (discharge, 80 second-feet), 1910–1913; 1918: Maximum stage recorded, 4.0 feet June 12, 1912, from high water marks (discharge, 760 second-feet).

ICE.—Stage-discharge relation affected by ice; no record.

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

REGULATION.—None.

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

Discharge measurements of East Fork near Lapine, Oreg., during 1918.

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---------|-------------------|--------------|-----------------|---------|--------------------|--------------|-----------------|
| | | <i>Feet.</i> | <i>Sec.-ft.</i> | | | <i>Feet.</i> | <i>Sec.-ft.</i> |
| June 23 | R. C. Briggs..... | 2.20 | 292 | Oct. 22 | F. F. Henshaw..... | 0.66 | 94 |
| July 27 | do..... | .94 | 115 | | | | |

Daily discharge, in second-feet, of East Fork near Lapine, Oreg., for the period June 23 to Nov. 2, 1918.

| Day. | June. | July. | Aug. | Sept. | Oct. | Nov. | Day. | June. | July. | Aug. | Sept. | Oct. | Nov. |
|---------|-------|-------|------|-------|------|------|---------|-------|-------|------|-------|------|------|
| 1..... | | 185 | 105 | 80 | 88 | 88 | 15..... | | 135 | 88 | | 96 | |
| 2..... | | 172 | 105 | 80 | 88 | 88 | 16..... | | 135 | 88 | | 96 | |
| 3..... | | 172 | 105 | 80 | 88 | | 17..... | | 135 | 96 | | 96 | |
| 4..... | | 159 | 105 | 80 | 88 | | 18..... | | 135 | 96 | | 96 | |
| 5..... | | 159 | 105 | 80 | 88 | | 19..... | | 124 | 96 | | 96 | |
| 6..... | | | | | | | 20..... | | 124 | 96 | | 96 | |
| 7..... | | 159 | 96 | 80 | 105 | | 21..... | | 124 | 96 | | 96 | |
| 8..... | | 172 | 96 | 80 | 96 | | 22..... | | 124 | 88 | | 90 | |
| 9..... | | 159 | 96 | 80 | 96 | | 23..... | | 300 | 124 | 88 | 88 | |
| 10..... | | 147 | 96 | 80 | 96 | | 24..... | | 280 | 124 | 88 | 88 | |
| | | 147 | 96 | 96 | 96 | | 25..... | | 245 | 135 | 88 | 88 | |
| 11..... | | 147 | 96 | 88 | 88 | | 26..... | | 215 | 135 | 88 | 88 | |
| 12..... | | 147 | 96 | 88 | 88 | | 27..... | | 215 | 126 | 80 | 88 | |
| 13..... | | 147 | 96 | 88 | 88 | | 28..... | | 200 | 114 | 80 | 88 | |
| 14..... | | 147 | 96 | 88 | 88 | | 29..... | | 215 | 114 | 80 | 88 | |
| | | | | | | | 30..... | | 200 | 105 | 80 | 88 | |
| | | | | | | | 31..... | | 105 | 80 | | 88 | |

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

Monthly discharge of East Fork near Lapine, Oreg., for the period June 23 to Oct. 31, 1918.

| Month. | Discharge in second-feet. | | | Run-off in acre-feet. |
|-----------------|---------------------------|----------|-------|-----------------------|
| | Maximum. | Minimum. | Mean. | |
| June 23-30..... | 300 | 200 | 224 | 2,710 |
| July..... | 185 | 105 | 140 | 5,610 |
| August..... | 105 | 80 | 93.1 | 5,720 |
| September..... | 96 | 80 | 85.9 | 5,110 |
| October..... | 105 | 88 | 91.5 | 5,630 |
| The period..... | | | | 28,800 |

ARNOLD CANAL NEAR BEND, OREG.

LOCATION.—In SW $\frac{1}{4}$ sec. 23, T. 18 S., R. 11 E., 1 mile below intake of canal and 9 miles south of Bend, Deschutes County.

RECORDS AVAILABLE.—April 10, 1914, to September 30, 1918; information sufficient for an approximate estimate, October, 1912, to March, 1914.

GAGE.—Vertical staff on right side of flume 400 feet below a spillway, installed May 12, 1917; staff on left side just below spillway used May 1, 1915, to December 2, 1916. A gage half a mile above, in NE $\frac{1}{4}$ sec. 27, was used up to April 30, 1915; read by B. Tekampe.

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

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

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 2.16 feet 3 p. m. August 17 (discharge, 111 second-feet); canal dry at various times during year.

1914-1918: Maximum stage recorded, 2.18 feet June 23 and 27, 1917 (discharge, 114 second-feet); canal dry at various times during period.

ACCURACY.—Stage-discharge relation practically permanent during year. Rating curve fairly well defined. Gage read to hundredths about three times weekly. Daily discharge ascertained by applying daily gage height to rating table, except for days when gage was not read, for which it was interpolated. Records good.

Discharge measurements of Arnold canal near Bend, Oreg., during the year ending Sept. 30, 1918.

| Date. | Made by— | Gage height. | Dis-charge. | Date. | Made by— | Gage height. | Dis-charge. |
|---------|-----------------------|--------------|-----------------|---------|-------------------|--------------|-----------------|
| | | <i>Feet.</i> | <i>Sec.-ft.</i> | | | <i>Feet.</i> | <i>Sec.-ft.</i> |
| Oct. 17 | R. C. Briggs..... | 1.55 | 62 | June 24 | R. C. Briggs..... | 1.70 | 73 |
| Nov. 15 |do..... | 1.12 | 35.0 | July 27 |do..... | 2.10 | 103 |
| May 30 | C. L. Batchelder..... | 1.67 | 67 | | | | |

Daily discharge, in second-feet, of Arnold canal near Bend, Oreg., for the year ending Sept. 30, 1918.

| Day | Oct. | Nov. | May. | June. | July. | Aug. | Sept. |
|-----|------|------|------|-------|-------|------|-------|
| 1 | 74 | 56 | | 74 | 102 | 106 | 106 |
| 2 | 82 | 56 | | 74 | 104 | 106 | 106 |
| 3 | 82 | 56 | | 74 | 106 | 106 | 106 |
| 4 | 82 | 52 | | 74 | 186 | 106 | 106 |
| 5 | 82 | 48 | | 82 | 106 | 106 | 102 |
| 6 | 78 | 44 | | 82 | 110 | 106 | 98 |
| 7 | 78 | 40 | | 82 | 110 | 106 | 98 |
| 8 | 78 | 36 | | 94 | 110 | 106 | 98 |
| 9 | 78 | 36 | | 92 | 110 | 106 | 98 |
| 10 | 78 | 36 | | 92 | 110 | 106 | 98 |
| 11 | 76 | 36 | | 90 | 108 | 108 | 98 |
| 12 | 74 | 36 | | 98 | 106 | 110 | 96 |
| 13 | 74 | 36 | | 98 | 110 | 110 | 94 |
| 14 | | 36 | 82 | 102 | 108 | 110 | 94 |
| 15 | 70 | 36 | 86 | 102 | 106 | 110 | 88 |
| 16 | 70 | 36 | 90 | | 106 | 106 | 82 |
| 17 | 70 | 36 | 94 | 27 | 106 | 110 | 82 |
| 18 | 64 | | 98 | 98 | 106 | 110 | 82 |
| 19 | 59 | | 98 | 102 | 106 | 110 | 82 |
| 20 | 53 | | | 102 | 106 | 108 | 82 |
| 21 | 54 | | | 104 | 106 | 106 | 82 |
| 22 | 55 | | | 106 | 106 | 106 | 80 |
| 23 | 56 | | 14 | 94 | 106 | 106 | 78 |
| 24 | 56 | | 82 | 82 | 106 | 110 | 78 |
| 25 | 56 | | 82 | 82 | 108 | 108 | 78 |
| 26 | 56 | | 80 | 82 | 110 | 106 | 78 |
| 27 | 56 | | 78 | 82 | 106 | 106 | 78 |
| 28 | 56 | | 78 | 98 | 108 | 106 | 78 |
| 29 | 56 | | 78 | 106 | 106 | 106 | 78 |
| 30 | 56 | | 76 | 104 | 106 | 106 | 78 |
| 31 | 56 | | 74 | | 106 | 106 | |

NOTE.—Canal dry Oct. 14, Nov. 18 to May 13, May 20-22, and June 16.

Monthly discharge of Arnold canal near Bend, Oreg., for the year ending Sept. 30, 1918.

| Month. | Discharge in second-feet. | | | Run-off in acre-feet. |
|--------------------|---------------------------|----------|-------|-----------------------|
| | Maximum. | Minimum. | Mean. | |
| October (30 days) | 82 | 58 | 67.2 | 4,000 |
| November (17 days) | 56 | 36 | 41.9 | 1,410 |
| May (15 days) | 98 | 14 | 79.3 | 2,360 |
| June (29 days) | 106 | 27 | 88.9 | 5,110 |
| July | 110 | 102 | 107 | 6,580 |
| August | 110 | 106 | 107 | 6,560 |
| September | 108 | 78 | 89.4 | 6,320 |
| The year | | | | 31,400 |

CENTRAL OREGON CANAL NEAR BEND, OREG.

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

RECORDS AVAILABLE.—May 11, 1905, to September 30, 1918.

GAGE.—Vertical enameled staff nailed to inside of flume on right side; read by J. A. Watson.

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 does not change appreciably.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year and during period 1905-1918, 3.8 feet during June, July, and August (discharge, 385 second-feet). Canal dry at various times during year.

ICE.—Canal operated in winter but only during periods of moderately cold weather, for furnishing water for domestic use. The velocity of the water passing the gage is sufficient to maintain open channel at all times.

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

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

Central Oregon canal diverts water from the right bank of Deschutes River in NE. $\frac{1}{4}$ 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, 1918.

| Date. | Made by— | Gage height. | Dis-charge. |
|---------|-----------------------|--------------|-----------------|
| | | <i>Feet.</i> | <i>Sec.-ft.</i> |
| Apr. 15 | F. F. Henshaw..... | 2.18 | 179 |
| May 30 | C. L. Batchelder..... | 3.33 | 322 |
| June 24 | R. C. Briggs..... | 3.60 | 370 |

Daily discharge, in second-feet, of Central Oregon canal near Bend, Oreg., for the year ending Sept. 30, 1918.

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---------|------|------|------|------|------|------|------|------|-------|-------|------|-------|
| 1..... | 246 | | 182 | | | 140 | | 272 | 327 | 385 | 385 | 327 |
| 2..... | 246 | | 182 | | | 58 | | 272 | 327 | 385 | 370 | 327 |
| 3..... | 246 | | 182 | | 95 | | | 299 | 327 | 385 | 385 | 327 |
| 4..... | 285 | | 136 | | 152 | | | 89 | 299 | 327 | 385 | 327 |
| 5..... | 285 | | | | 101 | | | 146 | 299 | 327 | 385 | 341 |
| 6..... | 285 | | | | | | 146 | 299 | 341 | 385 | 385 | 355 |
| 7..... | 285 | 78 | | | | | 146 | 313 | 355 | 385 | 385 | 355 |
| 8..... | 285 | 194 | | | | | 146 | 327 | 355 | 385 | 385 | 355 |
| 9..... | 285 | 207 | | | | | 146 | 327 | 370 | 370 | 385 | 327 |
| 10..... | 285 | 194 | | | | | 146 | 327 | 370 | 355 | 385 | 299 |
| 11..... | 285 | 194 | | 27 | | | 146 | 327 | 370 | 355 | 385 | 299 |
| 12..... | 285 | 194 | | 170 | | | 158 | 327 | 385 | 355 | 385 | 272 |
| 13..... | 285 | 105 | | 170 | | | 170 | 327 | 370 | 355 | 385 | 272 |
| 14..... | 285 | | | 106 | | | 170 | 285 | 170 | 385 | 385 | 259 |
| 15..... | 95 | | | | | | 170 | 285 | 272 | 370 | 385 | 246 |
| 16..... | | | | | | | 182 | 313 | 370 | 370 | 385 | 283 |
| 17..... | | | | | | | 207 | 327 | 385 | 370 | 370 | 220 |
| 18..... | | | | | | | 207 | 327 | 385 | 370 | 385 | 220 |
| 19..... | | | | | | | 207 | 327 | 385 | 385 | 370 | 220 |
| 20..... | | | | | | | 207 | 327 | 385 | 385 | 341 | 220 |
| 21..... | | | | | | | 283 | 327 | 385 | 385 | 327 | 246 |
| 22..... | | | | | | 14 | 246 | 327 | 385 | 385 | 327 | 246 |
| 23..... | | | 105 | | | 97 | 259 | 327 | 355 | 370 | 327 | 246 |
| 24..... | | | 127 | | | 140 | 272 | 245 | 355 | 355 | 327 | 246 |
| 25..... | | | | | | 146 | 272 | | 385 | 370 | 327 | 246 |
| 26..... | | | | | 97 | 55 | 272 | | 385 | 385 | 327 | 246 |
| 27..... | | | | | 123 | | 272 | | 385 | 385 | 327 | 246 |
| 28..... | | | | | 140 | | 272 | | 385 | 385 | 327 | 246 |
| 29..... | | | | | | | 272 | 33 | 385 | 385 | 327 | 246 |
| 30..... | | | 33 | | | | 272 | 194 | 385 | 385 | 327 | 246 |
| 31..... | | | | | | | 327 | | | 370 | 327 | |

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

Monthly discharge of Central Oregon canal near Bend, Oreg., for the year ending Sept. 30, 1918.

| Month. | Discharge in second-feet. | | | Run-off in acre-feet. |
|------------------------|---------------------------|----------|-------|-----------------------|
| | Maximum. | Minimum. | Mean. | |
| October (15 days)..... | 285 | 95 | 264 | 7,850 |
| November (8 days)..... | 207 | 33 | 150 | 2,389 |
| December (7 days)..... | 182 | 105 | 155 | 2,149 |
| January (4 days)..... | 170 | 27 | 118 | 985 |
| February (6 days)..... | 152 | 95 | 118 | 1,400 |
| March (7 days)..... | 146 | 14 | 92.9 | 1,290 |
| April (27 days)..... | 272 | 89 | 201 | 10,890 |
| May (27 days)..... | 327 | 33 | 296 | 15,900 |
| June..... | 385 | 170 | 356 | 21,200 |
| July..... | 385 | 355 | 376 | 23,100 |
| August..... | 385 | 327 | 362 | 22,360 |
| September..... | 355 | 220 | 275 | 16,400 |
| The year..... | 385 | 14 | 284 | 126,000 |

PILOT BUTTE CANAL NEAR BEND, OREG.

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

RECORDS AVAILABLE.—March 6, 1905, to September 30, 1918.

GAGE.—Vertical staff on right bank; read by J. A. Watson.

DISCHARGE MEASUREMENTS.—Made by wading at gage.

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

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 1.90 feet, 6 p. m. July 31 (discharge, 54 second-feet). Canal dry at various times.

1905-1918: Maximum stage recorded 3.10 feet June 8, 11 to 16, July 19 to 21, 1913 (discharge, 244 second-feet). Canal dry at various times.

ICE.—Canal not operated during freezing weather.

ACCURACY.—Stage-discharge relation fairly permanent. Rating curve not well defined. Gage read to half-tenths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table. Records fair.

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

Discharge measurements of Pilot Butte canal near Bend, Oreg., during the year ending Sept. 30, 1918.

| Date. | Made by— | Gage height. | Discharge. |
|---------|-----------------------|--------------|------------|
| | | Feet. | Sec.-ft. |
| Apr. 25 | F. F. Henshaw..... | 1.60 | 24.4 |
| May 30 | C. L. Batchelder..... | 1.79 | 37.9 |
| June 24 | E. C. Briggs..... | 1.65 | 29.6 |

Daily discharge, in second-feet, of Pilot Butte canal near Bend, Oreg., for the year ending Sept. 30, 1918.

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|------|------|------|------|------|------|------|------|------|-------|-------|------|-------|
| 1 | 24 | | 20 | | | 15 | | 27 | 31 | 31 | 31 | 31 |
| 2 | 24 | | 18 | | | 5 | | 27 | 31 | 31 | 31 | 31 |
| 3 | 24 | | 18 | | 15 | | | 27 | 31 | 31 | 35 | 31 |
| 4 | 24 | | 13 | | 24 | | 14 | 27 | 31 | 31 | 40 | 31 |
| 5 | 24 | | | | 16 | | 24 | 27 | 31 | 31 | 40 | 31 |
| 6 | 24 | | | | | | 24 | 27 | 27 | 31 | 40 | 31 |
| 7 | 24 | 11 | | | | | 24 | 27 | 27 | 31 | 40 | 31 |
| 8 | 24 | 24 | | | | | 24 | 27 | 27 | 31 | 40 | 31 |
| 9 | 24 | 24 | | | | | 24 | 27 | 31 | 31 | 40 | 31 |
| 10 | 24 | 24 | | | | | 24 | 27 | 31 | 31 | 40 | 31 |
| 11 | 24 | 24 | | 4 | | | 24 | 27 | 31 | 27 | 40 | 26 |
| 12 | 24 | 24 | | 20 | | | 26 | 27 | 31 | 20 | 40 | 20 |
| 13 | 24 | 18 | | 20 | | | 27 | 27 | 31 | 27 | 40 | 20 |
| 14 | 24 | | | 12 | | | 27 | 27 | 31 | 24 | 40 | 20 |
| 15 | 8 | | | | | | 27 | 27 | 31 | 40 | 40 | 20 |
| 16 | | | | | | | 29 | 27 | 31 | 40 | 40 | 20 |
| 17 | | | | | | | 31 | 27 | 31 | 40 | 40 | 18 |
| 18 | | | | | | | 31 | 27 | 31 | 35 | 40 | 18 |
| 19 | | | | | | | 31 | 27 | 31 | 27 | 40 | 18 |
| 20 | | | | | | | 31 | 27 | 31 | 20 | 40 | 18 |
| 21 | | | | | | | 31 | 27 | 31 | 18 | 40 | 18 |
| 22 | | | | | | 7 | 31 | 27 | 31 | 18 | 40 | 18 |
| 23 | | | 13 | | | 7 | 27 | 27 | 31 | 21 | 40 | 18 |
| 24 | | | 20 | | | 20 | 27 | 27 | 31 | 18 | 35 | 18 |
| 25 | | | 14 | | | 20 | 27 | 27 | 31 | 16 | 31 | 18 |
| 26 | | | | | | 8 | 27 | 27 | 31 | 18 | 31 | 18 |
| 27 | | | | | 20 | | 27 | 27 | 31 | 18 | 31 | 18 |
| 28 | | | | | 15 | | 27 | 27 | 31 | 18 | 31 | 18 |
| 29 | | | | | | | 27 | 27 | 31 | 18 | 31 | 18 |
| 30 | | 6 | | | | | 27 | 29 | 31 | 18 | 31 | 18 |
| 31 | | | | | | | | 31 | | 33 | 31 | |

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

Monthly discharge of Pilot Butte canal near Bend, Oreg., for the year ending Sept. 30, 1918.

| Month. | Discharge in second-feet. | | | Run-off in acre-feet. |
|-------------------|---------------------------|----------|-------|-----------------------|
| | Maximum. | Minimum. | Mean. | |
| October (15 days) | 24 | 8 | 22.9 | 680 |
| November (8 days) | 24 | 6 | 18.8 | 298 |
| December (7 days) | 20 | 13 | 16.6 | 230 |
| January (4 days) | 20 | 4 | 14.0 | 111 |
| February (6 days) | 24 | 15 | 17.5 | 208 |
| March (7 days) | 20 | 5 | 13.6 | 189 |
| April (27 days) | 31 | 14 | 26.7 | 430 |
| May | 31 | 27 | 27.2 | 1,379 |
| June | 31 | 27 | 30.6 | 1,326 |
| July | 40 | 16 | 26.6 | 1,640 |
| August | 40 | 31 | 37.1 | 2,280 |
| September | 31 | 18 | 22.9 | 1,866 |
| The year | 40 | 4 | 26.5 | 11,900 |

NORTH CANAL NEAR BEND, OREG.

LOCATION.—In NE. $\frac{1}{4}$ sec. 29, T. 17 S., R. 13 E., 500 feet below bridge on road to Tumalo, a quarter of a mile below intake, and 1 mile north of Bend, Deschutes County.

RECORDS AVAILABLE.—June 14, 1913, to September 30, 1918.

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

DISCHARGE MEASUREMENTS.—Made from plank across canal.

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

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 5.7 feet July 30; July 25 to August 11; August 14 to 18 (discharge, 340 second-feet). Canal dry at various times.

1913-1918: Maximum stage recorded same as for 1918; also occurred during parts of July, August, and September, 1917. Canal dry at various times during period.

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

ACCURACY.—Stage-discharge relation changed during June, probably by rocks falling into canal. Two well-defined rating curves used, one applicable before, the other after June 11. Gage read to tenths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table. Records excellent except November to March, for which they are good.

North canal diverts water from the right bank of Deschutes River at a concrete dam about 60 feet high, in NE $\frac{1}{4}$ 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, 1918.

| Date. | Made by-- | Gage height. | Dis-charge. | Date. | Made by-- | Gage height. | Dis-charge. |
|---------|------------------------|--------------|-------------|---------|---------------------|--------------|-------------|
| Oct. 75 | Briggs and Wright..... | Feet. | Sec.-ft. | May 30 | C. L. Datchell..... | Feet. | Sec.-ft. |
| Feb. 8 | R. C. Briggs..... | 4.90 | 370 | June 24 | R. C. Briggs..... | 5.95 | 332 |
| Apr. 16 | F. F. Henshaw..... | 3.29 | 156 | | | | |

Daily discharge, in second-feet, of North canal near Bend, Oreg., for the year ending Sept. 30, 1918.

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---------|------|------|------|------|------|------|------|------|-------|-------|------|-------|
| 1..... | 229 | 197 | 147 | | 33 | 199 | 9 | 175 | 294 | 331 | 346 | 304 |
| 2..... | 229 | 189 | 161 | | | 26 | | 253 | 303 | 331 | 340 | 313 |
| 3..... | 229 | 189 | 166 | | 74 | | | 253 | 303 | 331 | 340 | 312 |
| 4..... | 229 | 189 | 94 | | 119 | | 94 | 269 | 303 | 331 | 340 | 322 |
| 5..... | 253 | 189 | | 10 | 84 | | 119 | 277 | 331 | 331 | 340 | 322 |
| 6..... | 253 | 189 | | 41 | | | 119 | 294 | 321 | 331 | 340 | 322 |
| 7..... | 269 | 189 | | 12 | | | 119 | 312 | 321 | 331 | 340 | 322 |
| 8..... | 253 | 189 | | | | | 106 | 303 | 330 | 331 | 340 | 322 |
| 9..... | 269 | 176 | | | | | 206 | 285 | 330 | 331 | 340 | 313 |
| 10..... | 277 | 154 | | | | | 100 | 285 | 330 | 331 | 340 | 304 |
| 11..... | 277 | 154 | | 17 | | | 126 | 302 | 330 | 331 | 340 | 296 |
| 12..... | 277 | | | 138 | | 5 | 154 | 312 | 331 | 331 | 340 | 296 |
| 13..... | 277 | | | 126 | | 32 | 154 | 312 | 331 | 331 | 340 | 296 |
| 14..... | 277 | | | 70 | | | 154 | 253 | 331 | 331 | 340 | 290 |
| 15..... | 285 | | | | | | 154 | 253 | 331 | 331 | 340 | 290 |
| 16..... | 277 | | | | | 20 | 154 | 253 | 331 | 331 | 340 | 290 |
| 17..... | 277 | | | | | 126 | 154 | 253 | 331 | 331 | 340 | 290 |
| 18..... | 277 | | | | | 119 | 175 | 253 | 331 | 331 | 340 | 290 |
| 19..... | 277 | 77 | | | | 30 | 175 | 253 | 331 | 331 | 340 | 290 |
| 20..... | 277 | | | | | | 175 | 253 | 331 | 331 | 340 | 290 |
| 21..... | 277 | | | | | | 206 | 253 | 331 | 277 | 304 | 277 |
| 22..... | 277 | | 66 | | | | 221 | 277 | 331 | 331 | 340 | 277 |
| 23..... | 277 | | 133 | | 3 | | 253 | 277 | 331 | 331 | 340 | 277 |
| 24..... | 269 | | 94 | | | | 253 | 277 | 331 | 331 | 340 | 277 |
| 25..... | 269 | | | | 26 | | 253 | 277 | 331 | 331 | 340 | 277 |
| 26..... | 253 | | | | 82 | | 261 | 269 | 331 | 340 | 277 | 277 |
| 27..... | 245 | | | | 94 | | 269 | 261 | 331 | 340 | 277 | 277 |
| 28..... | 237 | 50 | | | 112 | | 269 | 261 | 331 | 340 | 277 | 277 |
| 29..... | 221 | 50 | | | | | 269 | 261 | 331 | 340 | 277 | 277 |
| 30..... | 197 | | | | | | 33 | 235 | 331 | 340 | 286 | 277 |
| 31..... | 197 | | | 1 | | | | 294 | | 340 | 295 | |

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

Monthly discharge of North canal near Bend, Oreg., for the year ending Sept. 30, 1918.

| Month. | Discharge in second-feet. | | | Run-off in acre-feet. |
|-------------------------|---------------------------|----------|-------|-----------------------|
| | Maximum. | Minimum. | Mean. | |
| October..... | 285 | 197 | 257 | 15,800 |
| November (14 days)..... | 197 | 50 | 156 | 4,330 |
| December (7 days)..... | 168 | 84 | 125 | 1,740 |
| January (8 days)..... | 133 | 1 | 51.2 | 812 |
| February (10 days)..... | 119 | 8 | 65.8 | 1,270 |
| March (8 days)..... | 126 | 5 | 68.1 | 922 |
| April (28 days)..... | 269 | 9 | 165 | 9,160 |
| May..... | 312 | 176 | 271 | 16,700 |
| June..... | 331 | 294 | 326 | 19,460 |
| July..... | 340 | 277 | 332 | 20,400 |
| August..... | 340 | 277 | 318 | 19,000 |
| September..... | 322 | 260 | 288 | 17,100 |
| The year..... | 340 | 1 | 248 | 127,000 |

SWALLEY CANAL NEAR BEND, OREG.

LOCATION.—In NE. $\frac{1}{4}$ sec. 29, T. 17 S., R. 12 E., 100 yards above road crossing, a quarter of a mile below intake of canal at North canal dam, and $1\frac{1}{2}$ miles north of Bend, Deschutes County.

RECORDS AVAILABLE.—June 1, 1913, to September 30, 1918.

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

DISCHARGE MEASUREMENTS.—Made from plank across flume.

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

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 2.30 feet at 7 a. m. August 12 (discharge, 102 second-feet). Canal dry at various times.

1913-1918: Maximum stage recorded same as for 1918; also occurred at 5 p. m.

July 10, 1917. Canal dry at various times during period.

ICE.—Stage-discharge relation not affected by ice; canal not operated during extremely cold weather.

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

Swalley canal diverts water from the right bank of Deschutes River at North Canal dam in the NE. $\frac{1}{4}$ sec. 29, and irrigates the lands 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, 1918.

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---------|------------------------|--------------|-----------------|---------|-----------------------|--------------|-----------------|
| | | <i>Feet.</i> | <i>Sec.-ft.</i> | | | <i>Feet.</i> | <i>Sec.-ft.</i> |
| Oct. 15 | Briggs and Wright..... | 1.75 | 62 | May 29 | C. L. Batchelder..... | 1.55 | 48.9 |
| Nov. 16 |do..... | 1.22 | 33.3 | June 24 | R. C. Briggs..... | 2.05 | 80 |
| Apr. 16 | F. F. Henshaw..... | 1.24 | 29.4 | | | | |

Daily discharge, in second-feet, of Swalley canal near Bend, Oreg., for the year ending Sept. 30, 1918.

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|-----|------|------|------|------|------|------|------|------|-------|-------|------|-------|
| 1 | 65 | 48 | 33 | 26 | 28 | 10 | 10 | 43 | 68 | 75 | 82 | 72 |
| 2 | 65 | 48 | 33 | 28 | 28 | 10 | 12 | 40 | 79 | 77 | 82 | 72 |
| 3 | 65 | 48 | 34 | 28 | 23 | 10 | 26 | 48 | 72 | 82 | 79 | 68 |
| 4 | 66 | 48 | 33 | 28 | | 18 | 23 | 49 | 68 | 82 | 79 | 68 |
| 5 | 62 | 46 | 33 | 28 | | 18 | 23 | 58 | 68 | 79 | 83 | 68 |
| 6 | 45 | 45 | 33 | 28 | | 18 | 14 | 53 | 62 | 82 | 79 | 65 |
| 7 | 59 | 45 | 30 | 28 | | 20 | 18 | 45 | 65 | 86 | 79 | 68 |
| 8 | 59 | 45 | 28 | 28 | | 18 | 20 | 53 | 59 | 82 | 79 | 68 |
| 9 | 59 | 45 | | 28 | 23 | 18 | 23 | 59 | 82 | 86 | 79 | 46 |
| 10 | | 43 | | 28 | 23 | 18 | 18 | 59 | 66 | 86 | 75 | 59 |
| 11 | | | 33 | 28 | 23 | 18 | 33 | 72 | 72 | 86 | 82 | 62 |
| 12 | | 48 | 18 | | 23 | 18 | 43 | 65 | 65 | 86 | 84 | 53 |
| 13 | | 45 | 20 | | 30 | 18 | 38 | 69 | 72 | 86 | 86 | 43 |
| 14 | 59 | 33 | 20 | | 18 | 18 | 38 | 50 | 79 | 86 | 82 | 40 |
| 15 | 62 | 33 | 18 | | 18 | 18 | 38 | 56 | 76 | 86 | 86 | 50 |
| 16 | 65 | 33 | 18 | | 18 | 18 | 38 | 50 | 72 | 86 | 79 | 56 |
| 17 | 65 | 33 | 18 | | 18 | 18 | 32 | 60 | 66 | 86 | 82 | 56 |
| 18 | 65 | 33 | 38 | | 18 | 18 | 36 | 48 | 75 | 82 | 86 | 59 |
| 19 | 65 | 35 | 23 | 38 | 14 | 16 | 36 | 48 | 72 | 82 | 86 | 59 |
| 20 | 65 | 36 | 18 | 38 | 6 | 14 | 43 | 59 | 75 | 80 | 86 | 59 |
| 21 | 65 | 33 | 18 | 28 | 5 | 23 | 43 | 53 | 79 | 86 | 82 | 59 |
| 22 | 65 | 33 | 18 | 28 | 5 | 23 | 43 | 59 | 79 | 86 | 82 | 28 |
| 23 | 65 | 33 | 20 | 28 | 5 | 23 | 43 | 59 | 86 | 86 | 79 | 48 |
| 24 | 65 | 33 | 18 | | 6 | 23 | 43 | 53 | 82 | 86 | 82 | 50 |
| 25 | 65 | 33 | 18 | | 6 | 23 | 43 | 56 | 86 | 86 | 82 | 50 |
| 26 | | | | | | | | | | | | |
| 27 | 53 | 33 | 9 | | 6 | 23 | 43 | 53 | 82 | 86 | 82 | 48 |
| 28 | 59 | 33 | | | 8 | 23 | 46 | 53 | 79 | 79 | 79 | 48 |
| 29 | 50 | 33 | 30 | | 10 | 23 | 43 | 50 | 79 | 86 | 90 | 48 |
| 30 | 45 | 33 | 28 | | | 23 | 43 | 53 | 82 | 86 | 82 | 48 |
| 31 | 48 | | 28 | | | 23 | 48 | 48 | 75 | 82 | 75 | 48 |

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

Monthly discharge of Swalley canal near Bend, Oreg., for the year ending Sept. 30, 1918.

| Month. | Discharge in second-feet. | | | Run-off in acre-feet. |
|--------------------|---------------------------|----------|-------|-----------------------|
| | Maximum. | Minimum. | Mean. | |
| October (28 days) | 65 | 42 | 58.3 | 3,240 |
| November | 45 | 33 | 38.8 | 2,280 |
| December (28 days) | 59 | 9 | 33.9 | 1,590 |
| January (19 days) | 38 | 26 | 32.7 | 1,120 |
| February (23 days) | 23 | 5 | 15.3 | 688 |
| March | 23 | 10 | 19.0 | 1,170 |
| April | 45 | 10 | 33.2 | 1,660 |
| May | 59 | 49 | 52.9 | 2,300 |
| June | 86 | 59 | 72.5 | 3,570 |
| July | 90 | 75 | 82.4 | 3,190 |
| August | 84 | 72 | 81.6 | 3,030 |
| September | 72 | 28 | 55.6 | 3,310 |
| The year | 94 | 5 | 49.5 | 32,900 |

TUMALO CREEK NEAR BEND, OREG.

LOCATION.—In SE. $\frac{1}{4}$ sec. 23, T. 17 S., R. 11 E., a quarter of a mile above diversion dam of feed canal of 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, 1918. Until May, 1914, this station was maintained only during winter.

GAGE.—April 27, 1915, to September 30, 1917, Stevens continuous water-stage recorder referred to vertical staff nailed to overhanging stump. Staff gage read November, 1910, to April 26, 1915, and during 1918; read by F. H. Dayton and W. H. Gemmill. Previous records at different site.

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

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

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 2.75 feet at 7 a. m. December 29 (discharge, 500 second-feet); minimum stage recorded, 1.18 feet November 23 to 27 (discharge, 47 second-feet; total, including diversions, about 62 second-feet).

1906-1918: Maximum stage recorded, 3.8 feet at old gage, November 14, 1906 (discharge, estimated from extension of rating curve, 820 second-feet). The peak of the flood of November, 1909, was probably considerably greater. Minimum stage recorded, 0.95 foot at 7 a. m. March 20, 1917 (discharge, 31 second-feet).

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

DIVERSIONS.—Columbia Southern canal diverts water above the station. From July 18 to September 30 water was diverted into the head of Tumalo Creek from Crater Creek, a tributary of Deschutes River; no data available as to amount of water diverted from Crater Creek.

ACCURACY.—Stage-discharge relation practically permanent during year. Rating curve well defined between 45 and 300 second-feet. Gage read to quarter-tenths twice daily October 1 to April 16 and June 2 to July 18; high-water peaks which occurred at night observed June 5 to July 1. Daily discharge ascertained as follows: December 14 to January 21, January 30 to March 16, and April 9 to 16 by applying to rating table the mean of two daily gage readings; June 2 to 30 by applying to rating table mean daily gage height obtained by adding twice the two gage readings to the maximum and dividing by 5. October 1 to December 18, January 22-29, March 17 to April 8, and July 1 to September 30, all water was diverted in Tumalo feed canal, and discharges observed in canal have been used (see p. 34). April 17 to May 31 by adding to the discharge observed in the feed canal, the overflow at diversion dam as observed on a gage just below intake. Records excellent except for a few days of considerable fluctuation in stage.

Discharge measurements of Tumalo Creek near Bend, Oreg., during the year ending Sept. 30, 1918.

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---------|-----------------------|--------------|-----------------|--------------|-----------------------|--------------|-----------------|
| | | <i>Feet.</i> | <i>Sec.-ft.</i> | | | <i>Feet.</i> | <i>Sec.-ft.</i> |
| Oct. 6 | C. L. Batchelder..... | 1.28 | 56 | Apr. 16 | F. F. Henshaw..... | 1.37 | 67 |
| Nov. 16 | R. C. Briggs..... | 1.20 | 53.4 | May 29 | C. L. Batchelder..... | 1.80 | 111 |
| 18 |do..... | 1.20 | 47.9 |do..... |do..... | 1.80 | 105 |
| Feb. 9 |do..... | 1.38 | 72 | June 25 | R. C. Briggs..... | 1.72 | 131 |
| 12 |do..... | 1.39 | 71 | July 18 |do..... | 1.38 | 67 |

* Measured in canal and referred to creek gage.

Daily discharge, in second-feet, of Tumalo Creek near Bend, Oreg., for the year ending Sept. 30, 1918.

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---------|------|-------|------|------|-------|------|-------|------|-------|-------|------|-------|
| 1..... | 57 | 50 | 57 | 190 | a 76 | 60 | 70 | 136 | 176 | 143 | 88 | 61 |
| 2..... | 57 | 50 | 54 | 160 | a 74 | 66 | 65 | 142 | 184 | 138 | 88 | 57 |
| 3..... | 57 | 50 | 50 | 175 | 72 | 57 | 65 | 175 | 187 | 116 | 78 | 54 |
| 4..... | 57 | 50 | 50 | 209 | 78 | 59 | 65 | 175 | 206 | 111 | 74 | 56 |
| 5..... | 57 | 50 | 50 | 148 | 81 | a 59 | 65 | 138 | 255 | 111 | 74 | 57 |
| 6..... | 57 | 50 | 50 | 160 | 108 | a 59 | 61 | 121 | 308 | 111 | 65 | 57 |
| 7..... | 57 | 50 | 50 | 160 | 92 | a 58 | 65 | 130 | 342 | 101 | 65 | 57 |
| 8..... | 57 | 50 | 50 | 135 | 78 | a 58 | 65 | 159 | 360 | 101 | 70 | 57 |
| 9..... | 57 | 50 | 50 | 148 | 72 | 58 | 83 | 138 | 360 | 96 | 61 | 57 |
| 10..... | 54 | 50 | 50 | 148 | 74 | 59 | 83 | 121 | 342 | 96 | 74 | 57 |
| 11..... | 57 | 50 | 50 | 124 | 72 | 66 | 83 | 132 | 360 | 88 | 83 | 59 |
| 12..... | 57 | 50 | 54 | 148 | 74 | 59 | 83 | 143 | 360 | 88 | 74 | 61 |
| 13..... | 57 | 50 | 54 | 112 | 78 | 59 | 81 | 141 | 400 | 55 | 70 | 57 |
| 14..... | 57 | 50 | 71 | 112 | a 74 | 59 | 78 | 166 | 290 | 58 | 74 | 57 |
| 15..... | 57 | 50 | 83 | 112 | a 69 | 59 | 71 | 132 | 216 | 58 | 70 | 59 |
| 16..... | 54 | 50 | 83 | 130 | a 64 | 59 | 70 | 132 | 181 | 83 | 65 | 61 |
| 17..... | 50 | 50 | 96 | 124 | 60 | 57 | 74 | 121 | 169 | 78 | 57 | 57 |
| 18..... | 50 | 50 | 112 | 117 | 59 | 57 | 74 | 121 | 142 | 78 | 57 | 57 |
| 19..... | 50 | 50 | 112 | 112 | 60 | 54 | 78 | 111 | 198 | 101 | 57 | 57 |
| 20..... | 50 | 50 | 102 | 140 | a 61 | 54 | 83 | 111 | 222 | 92 | 57 | 57 |
| 21..... | 50 | 47 | 109 | 117 | a 62 | 54 | 92 | 111 | 260 | 83 | 57 | 57 |
| 22..... | 50 | 47 | 102 | 92 | a 63 | 54 | 101 | 121 | 238 | 74 | 65 | 57 |
| 23..... | 50 | 47 | 102 | 92 | a 64 | 57 | 106 | 126 | 285 | 92 | 65 | 57 |
| 24..... | 50 | 47 | 102 | 92 | 65 | 57 | 111 | 126 | 163 | 58 | 65 | 57 |
| 25..... | 50 | 47 | 106 | 101 | a 63 | 61 | 116 | 121 | 175 | 78 | 61 | 57 |
| 26..... | 50 | 47 | 148 | 92 | a 61 | 61 | 106 | 116 | 148 | 78 | 57 | 57 |
| 27..... | 50 | 47 | 184 | 92 | 59 | 57 | 106 | 106 | 206 | 74 | 57 | 57 |
| 28..... | 50 | 50 | 440 | 83 | 58 | 57 | 111 | 101 | 106 | 74 | 57 | 57 |
| 29..... | 50 | 61 | 440 | 83 | ..... | 57 | 116 | 124 | 166 | 83 | 57 | 57 |
| 30..... | 50 | 83 | 290 | a 81 | ..... | 65 | 127 | 166 | 185 | 88 | 57 | 57 |
| 31..... | 50 | ..... | 222 | a 79 | ..... | 70 | ..... | 174 | ..... | 83 | 57 | ..... |

a Stage-discharge relation affected by ice; discharge estimated.

Monthly discharge of Tumalo Creek near Bend, Oreg., for the year ending Sept. 30, 1918.

| Month. | Discharge in second-feet. | | | Run-off in acre-feet. |
|----------------|---------------------------|----------|-------|-----------------------|
| | Maximum. | Minimum. | Mean. | |
| October..... | 87 | 50 | 53.4 | 8,280 |
| November..... | 83 | 47 | 50.3 | 3,020 |
| December..... | 440 | 50 | 115 | 7,070 |
| January..... | 209 | 78 | 126 | 7,690 |
| February..... | 108 | 58 | 70.4 | 3,910 |
| March..... | 70 | 54 | 58.9 | 3,620 |
| April..... | 127 | 61 | 85.1 | 5,060 |
| May..... | 175 | 101 | 133 | 8,180 |
| June..... | 406 | 135 | 240 | 14,300 |
| July..... | 143 | 74 | 92.5 | 5,660 |
| August..... | 88 | 57 | 68.3 | 4,080 |
| September..... | 61 | 54 | 57.4 | 3,420 |
| The year..... | 440 | 47 | 95.7 | 60,300 |

Monthly discharge of Tumalo Creek and Columbia Southern canal less Crater Creek canal, near Bend, Oreg., for the year ending Sept. 30, 1918.

| Month. | Discharge in second-feet. | | | Run-off in acre-feet. |
|----------------|---------------------------|----------|-------|-----------------------|
| | Maximum. | Minimum. | Mean. | |
| October..... | 72 | 65 | 68.4 | 4,210 |
| November..... | 99 | 63 | 66.8 | 3,970 |
| December..... | 455 | 65 | 130 | 7,900 |
| January..... | 224 | 94 | 140 | 8,610 |
| February..... | 123 | 72 | 84.4 | 4,690 |
| March..... | 85 | 60 | 73.9 | 4,540 |
| April..... | 142 | 76 | 100 | 5,930 |
| May..... | 191 | 117 | 149 | 9,160 |
| June..... | 498 | 149 | 300 | 17,900 |
| July..... | 165 | 69 | 101 | 6,210 |
| August..... | 88 | 55 | 65.8 | 4,050 |
| September..... | 70 | 60 | 64.4 | 3,880 |
| The year..... | 498 | 55 | 112 | 81,100 |

NOTE.—Diversion in Crater Creek canal estimated as 20 second-feet July 19 to 31, 14 second-feet in August, and 7 second-feet in September. Maxima and minima October to May computed by assuming the flow of the Columbia Southern canal to have been steady during the month.

COLUMBIA SOUTHERN CANAL NEAR TUMALO, OREG.

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

RECORDS AVAILABLE.—May 15, 1906, to May 23, 1914; May 5 to June 23, 1916; October 1, 1917, to September 30, 1918; also estimates in connection with Tumalo Creek station, beginning October 24, 1916.

GAGE.—Stevens continuous water-stage recorder on left bank referred to vertical staff; inspected by W. H. Gemmill.

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

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

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 1.90 feet June 14 (discharge, 105 second-feet); canal dry at times.

1906-1914; 1916-1918: Maximum discharge recorded, 126 second-feet during July and August, 1907. Canal dry at times.

ACCURACY.—Stage-discharge relation practically permanent. Rating curve well defined. Operation of water-stage recorder satisfactory. Daily discharge ascertained by applying to rating table the daily gage reading June 1 to 25, and the mean daily gage height obtained by inspecting recorder graph June 26 to September 19. Records excellent for period when recorder operated. Monthly estimates explained in footnote to table of monthly discharge.

Columbia Southern canal diverts water from Tumalo Creek in SE. $\frac{1}{4}$ sec. 2, T. 18 S., R. 10 E. for irrigation on the Tumalo project. It has been operated since 1916 primarily to furnish water to a sawmill; most of the water eventually finds its way back to the canals of Tumalo project.

Discharge measurements of Columbia Southern canal near Tumalo, Oreg., during the year ending Sept. 30, 1918.

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---------|-----------------------|--------------|-----------------|---------|-------------------|--------------|-----------------|
| | | <i>Feet.</i> | <i>Sec.-ft.</i> | | | <i>Feet.</i> | <i>Sec.-ft.</i> |
| Feb. 10 | R. C. Briggs..... | 0.95 | 13.7 | June 25 | R. C. Briggs..... | 1.40 | 48.6 |
| June 1 | C. L. Batchelder..... | | 17.2 | July 20 |do..... | .98 | 16.5 |

Daily discharge, in second-feet, of Columbia Southern canal near Tumalo, Oreg., for the year ending Sept. 30, 1918.

| Day. | June. | July. | Aug. | Sept. | Day. | June. | July. | Aug. | Sept. |
|------|-------|-------|------|-------|------|-------|-------|------|-------|
| 1 | 16 | 22 | 14 | 13 | 16 | 84 | 16 | 13 | 14 |
| 2 | 16 | 22 | 14 | 13 | 17 | 91 | 16 | 13 | 14 |
| 3 | 17 | 21 | 14 | 13 | 18 | 91 | 16 | 14 | 15 |
| 4 | 27 | 21 | 14 | 13 | 19 | 78 | 17 | 14 | 16 |
| 5 | 42 | 20 | 14 | 12 | 20 | 78 | 17 | 14 | |
| 6 | 48 | 17 | 15 | 12 | 21 | 91 | 17 | 14 | |
| 7 | 44 | 17 | 15 | 12 | 22 | 84 | 17 | 14 | |
| 8 | 48 | 16 | 15 | 12 | 23 | 60 | 17 | 14 | |
| 9 | 48 | 16 | 14 | 12 | 24 | 55 | 18 | 14 | |
| 10 | 84 | 16 | 12 | 15 | 25 | 55 | 18 | 13 | 14 |
| 11 | 91 | 16 | 13 | 16 | 26 | 72 | 17 | 13 | |
| 12 | 98 | 16 | 13 | 16 | 27 | 28 | 16 | 13 | |
| 13 | 98 | 17 | 13 | 16 | 28 | 17 | 15 | 13 | |
| 14 | 105 | 16 | 13 | 16 | 29 | 14 | 14 | 12 | |
| 15 | 84 | 16 | 13 | 16 | 30 | 14 | 14 | 13 | |
| | | | | | 31 | | 14 | 13 | |

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

Monthly discharge of Columbia Southern canal near Tumalo, Oreg., for the year ending Sept. 30, 1918.

| Month. | Discharge in second-feet. | | | Run-off in acre-feet. |
|-----------|---------------------------|----------|-------|-----------------------|
| | Maximum. | Minimum. | Mean. | |
| October | | | 15.0 | 922 |
| November | | | 16.0 | 962 |
| December | | | 15.0 | 922 |
| January | | | 15.0 | 922 |
| February | | | 14.0 | 778 |
| March | | | 15.0 | 922 |
| April | | | 15.0 | 888 |
| May | | | 16.0 | 984 |
| June | 105 | 14 | 59.3 | 3,530 |
| July | 22 | 14 | 17.0 | 1,060 |
| August | 15 | 12 | 13.5 | 830 |
| September | 16 | 12 | 14.0 | 833 |
| The year | 105 | | 18.7 | 18,600 |

NOTE.—Mean discharge for October and November estimated from records at Pine Tree Lumber Co.'s sawmill; for February from measurement of Feb. 10; for December, January, and March to May flow was practically constant.

TUMALO FLOOD CANAL NEAR BEND, OREG.

LOCATION.—In SE. ¼ sec. 23, T. 17 S., R. 11 E., in concrete-lined section, 300 feet below diversion dam, half a mile below bridge across Tumalo Creek on 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, 1918.

GAGE.—Painted on sloping concrete lining. Stevens continuous water-stage recorder used March 29 to May 29; inspected by F. H. Dayton and W. H. Gemmill.

DISCHARGE MEASUREMENTS.—Made from footbridge at gage.

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

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 3.55 feet at 7.30 p. m. June 9 (discharge, 184 second-feet). Canal dry at various times.

1914-1918: Maximum stage recorded, 3.80 feet May 4, 5, and 6, 1916 (discharge, 219 second-feet). Canal dry at various times.

ICE.—Headgates closed in extremely cold weather.

ACCURACY.—Stage-discharge relation practically permanent during year. Rating curve well defined. Gage read to half-tenths twice daily. Daily discharge ascertained, October 1 to March 28, and May 30 to August 24, by applying to rating table the mean of two daily gage readings; March 29 to May 29, by applying to rating table the mean daily gage height obtained by inspecting recorder graph; August 25 to September 30, by applying to rating table the gage reading for days when gage was read and interpolating for days between. Records excellent.

Tumalo feed canal diverts water from Tumalo Creek in SE. $\frac{1}{4}$ sec. 23, T. 17 S., R. 11 E., for irrigation on the Tumalo project.

Discharge measurements of Tumalo feed canal near Bend, Oreg., during the year ending Sept. 30, 1918.

| Date. | Made by— | Gage height. | Dis-charge. | Date. | Made by— | Gage height. | Dis-charge. |
|---------|-----------------------|--------------|-----------------|---------|-----------------------|--------------|-----------------|
| | | <i>Feet.</i> | <i>Sec.-ft.</i> | | | <i>Feet.</i> | <i>Sec.-ft.</i> |
| Oct. 6 | C. L. Batchelder..... | 2.30 | 56 | Apr. 16 | F. F. Henshaw..... | 2.40 | 71 |
| Nov. 16 | R. C. Briggs..... | 2.16 | 47.9 | May 29 | C. L. Batchelder..... | 2.90 | 111 |
| Feb. 9 |do..... | 2.09 | 41.1 | 30 |do..... | 3.32 | 165 |
| 9 |do..... | 1.60 | 21.2 | June 25 | R. C. Briggs..... | 3.15 | 131 |
| 12 |do..... | 2.45 | 70 | July 18 |do..... | 2.52 | 76 |

Daily discharge, in second-feet, of Tumalo feed canal near Bend, Oreg., for the year ending Sept. 30, 1918.

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---------|------|-------|------|-------|-------|-------|-------|------|-------|-------|------|-------|
| 1..... | 57 | 50 | 57 | 101 | ..... | 57 | 70 | 132 | 166 | 143 | 88 | 61 |
| 2..... | 57 | 50 | 54 | 101 | ..... | 57 | 65 | 132 | 160 | 138 | 88 | 57 |
| 3..... | 57 | 50 | 50 | 92 | 18 | 57 | 65 | 143 | 166 | 116 | 78 | 54 |
| 4..... | 57 | 50 | 50 | 101 | 74 | 57 | 65 | 138 | 178 | 111 | 74 | 56 |
| 5..... | 57 | 50 | 50 | 101 | 74 | 56 | 65 | 138 | 178 | 111 | 74 | 57 |
| 6..... | 57 | 50 | 50 | 96 | 92 | 56 | 61 | 121 | 178 | 111 | 65 | 57 |
| 7..... | 57 | 50 | 50 | 101 | 83 | 55 | 65 | 121 | 178 | 101 | 65 | 57 |
| 8..... | 57 | 50 | 50 | 96 | 74 | 55 | 65 | 154 | 178 | 101 | 70 | 57 |
| 9..... | 57 | 50 | 50 | 88 | 54 | 54 | 70 | 138 | 178 | 96 | 61 | 57 |
| 10..... | 54 | 50 | 50 | 88 | 70 | 57 | 70 | 121 | 178 | 96 | 74 | 57 |
| 11..... | 57 | 50 | 50 | 101 | 74 | 57 | 70 | 132 | 178 | 88 | 83 | 59 |
| 12..... | 57 | 50 | 54 | 101 | 43 | 35 | 74 | 143 | 178 | 88 | 74 | 61 |
| 13..... | 57 | 50 | 54 | 96 | ..... | ..... | 70 | 132 | 178 | 83 | 70 | 57 |
| 14..... | 57 | 50 | 57 | 96 | ..... | ..... | 57 | 138 | 172 | 83 | 74 | 57 |
| 15..... | 57 | 50 | 65 | 96 | ..... | ..... | 65 | 132 | 166 | 83 | 70 | 59 |
| 16..... | 54 | 50 | 74 | 101 | ..... | 21 | 70 | 132 | 166 | 83 | 65 | 61 |
| 17..... | 50 | 50 | 83 | 92 | ..... | 57 | 74 | 121 | 166 | 78 | 57 | 57 |
| 18..... | 50 | 50 | 92 | 101 | ..... | 57 | 74 | 121 | 154 | 78 | 57 | 57 |
| 19..... | 50 | 50 | 92 | 101 | ..... | 54 | 78 | 111 | 160 | 101 | 57 | 57 |
| 20..... | 50 | 50 | 88 | 121 | ..... | 54 | 83 | 111 | 160 | 92 | 57 | 57 |
| 21..... | 50 | 47 | 88 | 101 | ..... | 54 | 92 | 111 | 178 | 85 | 57 | 57 |
| 22..... | 50 | 47 | 88 | 92 | ..... | 54 | 101 | 121 | 166 | 74 | 65 | 57 |
| 23..... | 50 | 47 | 89 | 92 | ..... | 37 | 106 | 126 | 172 | 92 | 65 | 57 |
| 24..... | 50 | 47 | 88 | 92 | ..... | 57 | 111 | 126 | 154 | 83 | 66 | 57 |
| 25..... | 50 | 47 | 92 | 101 | 16 | 61 | 116 | 121 | 154 | 78 | 61 | 57 |
| 26..... | 50 | 47 | 143 | 92 | 36 | 61 | 106 | 116 | 143 | 78 | 57 | 57 |
| 27..... | 50 | 47 | 154 | 92 | 57 | 57 | 106 | 106 | 172 | 74 | 57 | 57 |
| 28..... | 50 | 50 | 143 | 83 | 57 | 57 | 141 | 104 | 166 | 74 | 57 | 57 |
| 29..... | 50 | 61 | 88 | 83 | ..... | 57 | 116 | 121 | 154 | 83 | 57 | 57 |
| 30..... | 50 | 83 | 106 | 55 | ..... | 65 | 126 | 154 | 143 | 89 | 57 | 57 |
| 31..... | 50 | ..... | 101 | ..... | ..... | 70 | ..... | 166 | ..... | 83 | 57 | ..... |

NOTE.—Stage-discharge relation affected by ice Mar. 5-8; discharge estimated. Canal dry during periods for which no discharge is given.

Monthly discharge of Tumalo feed canal near Bend, Oreg., for the year ending Sept. 30, 1918.

| Month. | Discharge in second-feet. | | | Run-off in acre-feet. |
|-------------------------|---------------------------|----------|-------|-----------------------|
| | Maximum. | Minimum. | Mean. | |
| October..... | 57 | 50 | 53.4 | 3,220 |
| November..... | 83 | 47 | 50.8 | 3,026 |
| December..... | 154 | 50 | 77.4 | 4,700 |
| January (30 days)..... | 121 | 55 | 95.1 | 5,690 |
| February (14 days)..... | 92 | 16 | 58.9 | 1,640 |
| March (28 days)..... | 70 | 21 | 55.2 | 3,070 |
| April..... | 126 | 57 | 82.2 | 4,890 |
| May..... | 166 | 101 | 128 | 7,870 |
| June..... | 178 | 143 | 167 | 9,940 |
| July..... | 143 | 74 | 92.5 | 5,690 |
| August..... | 88 | 57 | 66.3 | 4,080 |
| September..... | 61 | 54 | 57.4 | 3,420 |
| The year..... | | | | 57,300 |

SQUAW CREEK NEAR SISTERS, OREG.

LOCATION.—In NW. $\frac{1}{4}$ sec. 32, T. 15 S., R. 10 E., immediately above intake of McCallister ditch and 5 miles by road above Sisters, Deschutes County.

DRAINAGE AREA.—63 square miles.

RECORDS AVAILABLE.—May 30 to December 31, 1913; April 7 to September 13, 1914; March 24 to December 13, 1916; April 5 to December 5, 1917; and March 1 to September 30, 1918. From July 1, 1906, to May 23, 1913, in sec. 29, at station below intake of McCallister ditch, about 700 feet farther downstream.

GAGE.—Stevens eight-day water-stage recorder on right bank; inspected by water-masters. Vertical staff read prior to 1916.

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

CHANNEL AND CONTROL.—Gravel and boulders which shifted during winter of 1917-18.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 3.50 feet at 10 p. m. June 13 (discharge, 490 second-feet) but was probably higher in December; minimum stage recorded, 1.94 feet at noon November 15 (discharge, 49 second-feet).

1906-1918: Maximum stage recorded, 7.5 feet at old station, November 22, 1909 (discharge, estimated from extension of rating curve, 1,940 second-feet); minimum stage recorded, 2.65 feet at old station, March 19, 1912 (discharge, 32 second-feet).

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

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed during high water of December and January, while records were suspended. Two well-defined rating curves used, applicable October 1 to December 5 and March 1 to September 30. Record from water-stage recorder contains several gaps, but estimates of discharge for those periods are considered reliable. Daily discharge ascertained by applying to rating table the mean daily gage height obtained by inspecting recorder graph, except for periods indicated in footnote to table of daily discharge. Records good.

Discharge measurements of Squaw Creek near Sisters, Oreg., during the year ending Sept. 30, 1918.

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---------|-----------------------------------|--------------|-----------------|---------|-------------------------------------|--------------|-----------------|
| | | <i>Feet.</i> | <i>Sec.-ft.</i> | | | <i>Feet.</i> | <i>Sec.-ft.</i> |
| Oct. 30 | Kennard ^a and Cox..... | 2.00 | 56 | May 31 | Batchelder and Kennard..... | 2.55 | 118 |
| Apr. 16 | F. F. Henshaw..... | 2.28 | 70 | July 19 | Briggs and Ellis ^a | 2.79 | 162 |
| 16 |do..... | 2.29 | 63 | | | | |
| May 11 | H. G. Kennard..... | 2.42 | 90 | | | | |

^a Water masters.

Daily discharge, in second-feet, of Squaw Creek near Sisters, Oreg., for the year ending Sept. 30, 1918.

| Day. | Oct. | Nov. | Dec. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---------|------|------|------|------|------|------|-------|-------|------|-------|
| 1..... | 100 | 60 | 84 | 67 | 64 | 93 | 115 | | 166 | 175 |
| 2..... | 98 | 60 | 67 | | 62 | 101 | 120 | | 169 | 166 |
| 3..... | 90 | 77 | 69 | | 67 | 125 | 130 | | 154 | 142 |
| 4..... | 96 | 64 | 64 | | 72 | 139 | 148 | | 169 | 128 |
| 5..... | 98 | 64 | 63 | | 72 | 118 | 166 | | 148 | 130 |
| 6..... | 98 | 59 | | 60 | 71 | 101 | 190 | | 142 | 125 |
| 7..... | 90 | 57 | | | 71 | 103 | 220 | | 151 | 112 |
| 8..... | 90 | 56 | | | 71 | 110 | 238 | | 148 | 125 |
| 9..... | 90 | 55 | | | 78 | 99 | 255 | | 136 | 154 |
| 10..... | 86 | 56 | | | 74 | 93 | 295 | 230 | 163 | 139 |
| 11..... | 86 | 56 | | 61 | 72 | 93 | 340 | | 169 | 139 |
| 12..... | 84 | 57 | | 61 | 67 | 101 | 365 | | 145 | 142 |
| 13..... | 81 | 54 | | 59 | 69 | 115 | 440 | | 136 | 175 |
| 14..... | 79 | 52 | | 57 | 67 | 120 | 390 | | 142 | 198 |
| 15..... | 81 | 52 | | 57 | 65 | 99 | 295 | | 120 | 184 |
| 16..... | 74 | 51 | | 55 | 64 | 95 | 255 | | 99 | 151 |
| 17..... | 64 | 54 | | 57 | 64 | 98 | 255 | | 87 | 145 |
| 18..... | 64 | 54 | | 62 | 64 | 91 | 255 | | | 145 |
| 19..... | 64 | 54 | | 61 | 64 | 87 | 275 | 205 | | 160 |
| 20..... | 63 | 52 | | 57 | 69 | 87 | 275 | 187 | | 160 |
| 21..... | 67 | 54 | | 55 | 76 | 81 | 365 | 175 | 160 | 142 |
| 22..... | 70 | 52 | | 57 | 80 | 85 | 365 | 163 | | 118 |
| 23..... | 70 | 51 | | 59 | 81 | 95 | 318 | 166 | | 95 |
| 24..... | 64 | 51 | | 61 | 85 | 91 | 318 | 145 | 205 | 93 |
| 25..... | 64 | 652 | | 64 | 85 | 89 | 275 | 142 | 184 | 97 |
| 26..... | 62 | 653 | | 65 | 78 | 83 | 255 | 151 | 178 | 95 |
| 27..... | 63 | 653 | | 64 | 76 | 80 | | 130 | 169 | 97 |
| 28..... | 56 | 54 | | 61 | 80 | 76 | | 133 | 145 | 105 |
| 29..... | 63 | 148 | | 61 | 83 | 103 | 275 | 154 | 142 | 122 |
| 30..... | 60 | 188 | | 62 | 89 | 122 | | 181 | 148 | 116 |
| 31..... | 59 | | | 64 | | 125 | | 175 | 172 | |

^a Interpolated.

NOTE.—Braced figures show estimated mean discharge for periods indicated. Records suspended during winter.

Monthly discharge of Squaw Creek near Sisters, Oreg., for the year ending Sept. 30, 1918.

| Month. | Discharge in second-feet. | | | Run-off in acre-feet. |
|-------------------|---------------------------|----------|-------|-----------------------|
| | Maximum. | Minimum. | Mean. | |
| October..... | 100 | 56 | 76.8 | 4,720 |
| November..... | 168 | 51 | 62.7 | 3,730 |
| December 1-5..... | 84 | 63 | 69.4 | 683 |
| March..... | 67 | | 60.2 | 3,700 |
| April..... | 89 | 62 | 72.8 | 4,330 |
| May..... | 139 | 76 | 99.3 | 6,140 |
| June..... | 440 | 115 | 267 | 15,900 |
| July..... | | 130 | 202 | 12,400 |
| August..... | | | 151 | 9,280 |
| September..... | 193 | 93 | 135 | 8,030 |

SQUAW CREEK CANAL NEAR SISTERS, OREG.

LOCATION.—In SW. $\frac{1}{4}$ sec. 28, T. 15 S., R. 10 E., half a mile below intake and 4 miles by road south of Sisters, Deschutes County.

RECORDS AVAILABLE.—Irrigating seasons, 1916 to 1918.

GAGE.—Stevens eight-day water-stage recorder on right side of canal, a short distance below a wasteway; inspected by water masters.

DISCHARGE MEASUREMENTS.—Made by wading near gage.

CHANNEL AND CONTROL.—Channel is excavated in gravelly soil; slightly shifting; a timber placed across canal just below gage forms a control for low water, but has little effect at ordinary stages.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 2.00 feet at 3 a. m. July 30, 1918 (discharge, 138 second-feet); canal dry during winter.

1916-1918: Maximum stage recorded, 2.22 feet, July 10, 1917 (discharge, 182 second-feet).

ACCURACY.—Stage-discharge relation changed during winter. Two well-defined rating curves used applicable respectively October 1 to 27 and May 1 to September 30. Operation of water-stage recorder satisfactory. Daily discharge ascertained by applying to rating table the mean daily gage height obtained by inspecting recorder graph, except for periods indicated in footnote to table of daily discharge. Records excellent.

Squaw Creek canal diverts water from Squaw Creek in SE. $\frac{1}{4}$ sec. 29, T. 15 S., R. 10 E., and irrigates land east and north of Sisters; 8,328 acres have been adjudicated a water right under it.

Discharge measurements of Squaw Creek canal near Sisters, Oreg., during the year ending Sept. 30, 1918.

| Date. | Made by— | Gage height. | Discharge. |
|---------|-------------------------------------|----------------------|-----------------------|
| May 31 | Batchelder and Kennard ^a | <i>Fect.</i> 1.48 | <i>Sec.-ft.</i> 56 |
| June 8 | H. G. Kennard ^a | 1.77 | 100 |
| July 19 | Briggs and Ellis ^a | 1.70 | 91 |

^a Water masters.

Daily discharge, in second-feet, of Squaw Creek canal near Sisters, Oreg., for the year ending Sept. 30, 1918.

| Day. | Oct. | May. | June. | July. | Aug. | Sept. | Day. | Oct. | May. | June. | July. | Aug. | Sept. |
|---------|------|------|------------------|------------------|------|-------|---------|-----------------|------|-------|-------|------|-------|
| 1..... | 37 | 44 | 56 | 92 | 110 | 72 | 16..... | 35 | 44 | 94 | 104 | 77 | 38 |
| 2..... | 39 | 43 | 57 | 103 | 110 | 70 | 17..... | ^a 36 | 42 | 94 | 100 | 68 | 37 |
| 3..... | 41 | 50 | 58 | 113 | 118 | 62 | 18..... | ^a 37 | 42 | 93 | 108 | 62 | 39 |
| 4..... | 41 | 51 | 65 | 111 | 108 | 57 | 19..... | 38 | 41 | 98 | 107 | 62 | 40 |
| 5..... | 44 | 37 | 69 | 105 | 96 | 55 | 20..... | 39 | 41 | 98 | 100 | 56 | 40 |
| 6..... | 44 | 18 | 76 | 110 | 96 | 50 | 21..... | 40 | 39 | 104 | 105 | 56 | 42 |
| 7..... | 41 | 18 | 96 | 111 | 98 | 47 | 22..... | 41 | 40 | 98 | 98 | 55 | 40 |
| 8..... | 41 | 29 | 105 | 118 | 100 | 51 | 23..... | 42 | 48 | 94 | 98 | 62 | 35 |
| 9..... | 40 | 35 | 110 | 118 | 94 | 55 | 24..... | 40 | 48 | 93 | 94 | 93 | |
| 10..... | 39 | 39 | 113 | 121 | 108 | 50 | 25..... | 39 | 47 | 99 | 90 | 94 | 40 |
| 11..... | 38 | 43 | 94 | ^a 118 | 107 | 46 | 26..... | 36 | 46 | 92 | 111 | 89 | |
| 12..... | 37 | 50 | ^a 100 | ^a 114 | 98 | 50 | 27..... | 36 | 44 | 96 | 108 | 89 | |
| 13..... | 37 | 52 | ^a 100 | 111 | 94 | 52 | 28..... | | 47 | 96 | 108 | 88 | 47 |
| 14..... | 36 | 54 | 105 | 123 | 98 | 47 | 29..... | | 55 | 90 | 116 | 80 | 54 |
| 15..... | 36 | 49 | 96 | 118 | 83 | 44 | 30..... | | 58 | 90 | 128 | 80 | 50 |
| | | | | | | | 31..... | | 58 | | 124 | 68 | |

^a Interpolated.

NOTE.—Canal probably dry Oct. 28 to Apr. 30. Mean discharge estimated Sept. 24 to 27.

Monthly discharge of Squaw Creek canal near Sisters, Oreg., for the year ending Sept. 30, 1918.

| Month. | Discharge in second-feet. | | | Run-off in acre-feet. |
|-------------------|---------------------------|----------|-------|-----------------------|
| | Maximum. | Minimum. | Mean. | |
| October 1-27..... | | | 38.9 | 2,080 |
| May..... | 58 | 18 | 42.6 | 2,680 |
| June..... | 113 | 56 | 90.6 | 5,300 |
| July..... | 128 | 90 | 109 | 6,700 |
| August..... | 118 | 55 | 86.8 | 5,240 |
| September..... | 72 | | 47.7 | 2,840 |
| The year..... | | | | 25,000 |

NOTE.—Canal probably dry Oct. 28 to Apr. 30.

CROOKED RIVER NEAR CULVER, OREG.

LOCATION.—In NW. $\frac{1}{4}$ sec. 11, T. 12 S., R. 12 E., an eighth of a mile below Cove power plant and 6 miles west of Culver, Jefferson County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—October 1, 1917, to September 30, 1918.

GAGE.—Inclined staff on left bank 100 feet below highway bridge; read by A. O. Thompson and A. K. McAlpine.

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

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

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 4.40 feet at noon March 25 (discharge, 3,300 second-feet); minimum stage recorded, 1.70 feet during parts of June and August, and all of July and September (discharge, 1,100 second-feet).

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

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

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

ACCURACY.—Stage-discharge relation practically permanent. Rating curve well defined. Gage read to tenths once daily. Daily discharge ascertained by applying daily gage reading to rating table, except for periods indicated in footnote to table of daily discharge. Records excellent.

Discharge measurements of Crooked River near Culver, Oreg., during the year ending Sept. 30, 1918.

| Date. | Made by— | Gage height. | Discharge. |
|---------|-----------------------|--------------|-----------------|
| | | <i>Fed.</i> | <i>Sec. ft.</i> |
| Oct. 17 | C. L. Batchelder..... | 1.80 | 1,110 |
| Apr. 17 | F. F. Henshaw..... | 2.35 | 1,590 |
| June 27 | R. C. Briggs..... | 1.75 | 1,110 |

DESCHUTES RIVER BASIN.

Daily discharge, in second-feet, of Crooked River near Culver, Oreg., for the year ending Sept. 30, 1918.

| Day, | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1 | 1,120 | 1,120 | 1,210 | 1,390 | 1,460 | 1,460 | 2,900 | 1,270 | 1,210 | 1,100 | 1,100 | 1,100 |
| 2 | 1,120 | 1,120 | 1,210 | 1,330 | 1,460 | 1,460 | 2,810 | 1,210 | 1,150 | 1,100 | 1,100 | 1,100 |
| 3 | 1,120 | 1,120 | 1,210 | 1,330 | 1,460 | 1,390 | 2,450 | 1,210 | 1,130 | 1,100 | 1,100 | 1,100 |
| 4 | 1,120 | 1,120 | 1,210 | 1,390 | 1,460 | 1,390 | 2,270 | 1,210 | 1,150 | 1,100 | 1,100 | 1,100 |
| 5 | 1,120 | 1,120 | 1,210 | 1,330 | 1,460 | 1,460 | 2,090 | 1,210 | 1,150 | 1,100 | 1,100 | 1,100 |
| 6 | 1,120 | 1,120 | 1,210 | 1,390 | 1,460 | 1,530 | 2,090 | 1,210 | 1,150 | 1,100 | 1,100 | 1,100 |
| 7 | 1,120 | 1,120 | 1,210 | 1,390 | 1,460 | 1,530 | 1,930 | 1,210 | 1,150 | 1,100 | 1,100 | 1,100 |
| 8 | 1,120 | 1,120 | 1,210 | 1,390 | 2,010 | 1,460 | 1,980 | 1,210 | 1,150 | 1,100 | 1,100 | 1,100 |
| 9 | 1,120 | 1,120 | 1,210 | 1,460 | 1,660 | 1,460 | 1,850 | 1,210 | 1,150 | 1,100 | 1,100 | 1,100 |
| 10 | 1,120 | 1,120 | 1,210 | 1,460 | 1,770 | 1,460 | 1,770 | 1,210 | 1,150 | 1,100 | 1,100 | 1,100 |
| 11 | 1,120 | 1,120 | 1,210 | 1,390 | 1,610 | 1,460 | 2,010 | 1,210 | 1,150 | 1,100 | 1,100 | 1,100 |
| 12 | 1,120 | 1,120 | 1,210 | 1,390 | 1,530 | 1,460 | 2,010 | 1,210 | 1,150 | 1,100 | 1,100 | 1,100 |
| 13 | 1,120 | 1,120 | 1,210 | 1,390 | 1,530 | 1,460 | 1,820 | 1,210 | 1,150 | 1,100 | 1,100 | 1,100 |
| 14 | 1,120 | 1,120 | 1,210 | 1,460 | 1,530 | 1,460 | 1,850 | 1,210 | 1,150 | 1,100 | 1,100 | 1,100 |
| 15 | 1,120 | 1,120 | 1,210 | 1,460 | 1,530 | 1,460 | 1,770 | 1,210 | 1,150 | 1,100 | 1,100 | 1,100 |
| 16 | 1,120 | 1,120 | 1,210 | 1,460 | 1,530 | 1,530 | 1,610 | 1,210 | 1,100 | 1,100 | 1,100 | 1,100 |
| 17 | 1,120 | 1,120 | 1,210 | 1,460 | 1,530 | 1,610 | 1,530 | 1,210 | 1,100 | 1,100 | 1,100 | 1,100 |
| 18 | 1,120 | 1,120 | 1,210 | 1,530 | 1,530 | 1,980 | 1,460 | 1,210 | 1,100 | 1,100 | 1,100 | 1,100 |
| 19 | 1,120 | 1,120 | 1,210 | 1,530 | 1,530 | 2,180 | 1,460 | 1,210 | 1,100 | 1,100 | 1,100 | 1,100 |
| 20 | 1,120 | 1,120 | 1,210 | 1,530 | 1,530 | 2,360 | 1,390 | 1,210 | 1,100 | 1,100 | 1,100 | 1,100 |
| 21 | 1,120 | 1,120 | 1,210 | 1,530 | 1,460 | 2,430 | 1,390 | 1,210 | 1,100 | 1,100 | 1,100 | 1,100 |
| 22 | 1,120 | 1,120 | 1,270 | 1,530 | 1,460 | 2,450 | 1,260 | 1,210 | 1,100 | 1,100 | 1,100 | 1,100 |
| 23 | 1,120 | 1,120 | 1,370 | 1,530 | 1,330 | 2,630 | 1,390 | 1,210 | 1,100 | 1,100 | 1,100 | 1,100 |
| 24 | 1,120 | 1,120 | 1,270 | 1,460 | 1,460 | 3,000 | 1,390 | 1,210 | 1,100 | 1,100 | 1,100 | 1,100 |
| 25 | 1,120 | 1,120 | 1,270 | 1,460 | 1,460 | 3,300 | 1,390 | 1,210 | 1,100 | 1,100 | 1,100 | 1,100 |
| 26 | 1,120 | 1,120 | 1,270 | 1,460 | 1,460 | 3,200 | 1,390 | 1,210 | 1,100 | 1,100 | 1,100 | 1,100 |
| 27 | 1,120 | 1,120 | 1,370 | 1,460 | 1,460 | 3,000 | 1,230 | 1,210 | 1,125 | 1,100 | 1,100 | 1,100 |
| 28 | 1,120 | 1,120 | 1,330 | 1,460 | 1,460 | 2,820 | 1,330 | 1,210 | 1,100 | 1,100 | 1,100 | 1,100 |
| 29 | 1,120 | 1,210 | 1,460 | 1,460 | 1,460 | 2,680 | 1,270 | 1,210 | 1,100 | 1,100 | 1,100 | 1,100 |
| 30 | 1,120 | 1,210 | 1,460 | 1,460 | 1,460 | 2,720 | 1,270 | 1,210 | 1,100 | 1,100 | 1,100 | 1,100 |
| 31 | 1,120 | 1,210 | 1,460 | 1,460 | 1,460 | 2,900 | 1,210 | 1,210 | 1,100 | 1,100 | 1,100 | 1,100 |

* Interpolated.

Monthly discharge of Crooked River near Culver, Oreg., for the year ending Sept. 30, 1918.

| Month. | Discharge in second-feet. | | | Run-off in acre-feet. |
|-----------|---------------------------|----------|-------|-----------------------|
| | Maximum. | Minimum. | Mean. | |
| October | 1,120 | 1,120 | 1,120 | 65,000 |
| November | 1,210 | 1,120 | 1,130 | 67,200 |
| December | 1,460 | 1,210 | 1,250 | 76,900 |
| January | 1,530 | 1,330 | 1,440 | 88,500 |
| February | 2,010 | 1,330 | 1,530 | 124,000 |
| March | 3,300 | 1,390 | 2,020 | 124,000 |
| April | 2,900 | 1,270 | 1,760 | 109,000 |
| May | 1,270 | 1,210 | 1,210 | 74,400 |
| June | 1,210 | 1,100 | 1,130 | 67,200 |
| July | 1,100 | 1,100 | 1,100 | 67,600 |
| August | 1,150 | 1,100 | 1,110 | 68,200 |
| September | 1,100 | 1,100 | 1,100 | 65,500 |
| The year | 3,300 | 1,100 | 1,320 | 958,000 |

OCHOCO CREEK ABOVE MILL CREEK, NEAR PRINEVILLE, OREG.

LOCATION.—In SW. 1/4 sec. 36, T. 14 S., R. 17 E., on Dobb's ranch, 1 1/2 miles above Mill Creek and 12 miles east of Prineville, Crook County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—December 8, 1917, to September 30, 1918, at present location. November 1, 1908, to April 30, 1910; November 23, 1914, to November 22, 1917, at Elliott ranch station near the Ochoco project dam site and below Mill Creek.

GAGE.—Stevens eight-day water-stage recorder on right bank referred to vertical staff braced to gage house; inspected by H. G. Kennard, water master.

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

CHANNEL AND CONTROL.—Bed composed of gravel. Control is gravel riffle just below cable and probably shifts at high stages. Banks of earth.

EXTREMES OF DISCHARGE.—Maximum stage during year, from water-stage recorder, 2.58 feet at 5 a. m. March 26 (discharge, 235 second-feet); minimum stage from water-stage recorder, 0.43 foot during September, exact time not known (discharge, 0.8 second-foot).

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

DIVERSIONS.—Many small private ditches divert water for a distance of about 30 miles above the station.

REGULATION.—None.

ACCURACY.—Stage-discharge relation practically permanent. Rating curve well defined. Operation of water-stage recorder fairly satisfactory. Daily discharge ascertained by applying to rating table the mean daily gage height obtained by inspecting recorder graph, except for periods when recorder was not operating, for which it was ascertained by comparison with flow of Squaw, Tumalo, and McKay creeks. Records good.

Discharge measurements of Ochoco Creek above Mill Creek, near Prineville, Oreg., during the year ending Sept. 30, 1918.

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---------|----------------------------|--------------|-----------------|---------|------------------------------------|--------------|-----------------|
| | | <i>Feet.</i> | <i>Sec.-ft.</i> | | | <i>Feet.</i> | <i>Sec.-ft.</i> |
| Dec. 8 | H. G. Kennard ^a | 0.87 | 8.2 | Mar. 21 | Kennard and Reineking ^b | 2.02 | 123 |
| Feb. 9 | do | 1.58 | 59 | Apr. 19 | Hennaw and Reineking | 1.62 | 70 |
| Mar. 7 | do | 1.31 | 34.7 | May 17 | H. G. Kennard | 1.24 | 33.2 |
| Mar. 11 | do | 1.44 | 45.7 | | | | |

^a Water master.

^b Engineer, Ochoco Irrigation District.

Daily discharge, in second-feet, of Ochoco Creek above Mill Creek, near Prineville, Oreg., for the year ending Sept. 30, 1918.

| Day. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---------|------|------|-----------------|------|------|------|-------|-------|------|-------|
| 1..... | | 30 | 40 | 39 | 172 | 29 | | 8.0 | 2.8 | 0.9 |
| 2..... | | 28 | 42 | 45 | 154 | 31 | | 7.6 | 2.8 | .9 |
| 3..... | | 28 | 37 | 58 | 128 | 28 | | 7.6 | 2.8 | 1.0 |
| 4..... | | 36 | 36 | 51 | 120 | 30 | 10 | 6.4 | 2.6 | 1.0 |
| 5..... | 10 | 34 | 40 | 36 | 112 | 31 | | 5.0 | 2.6 | 1.0 |
| 6..... | | 33 | 62 | 48 | 104 | 31 | | 4.1 | | 1.1 |
| 7..... | | | 79 | 50 | 104 | 28 | 12 | 3.2 | | 1.1 |
| 8..... | | | 64 | 49 | 104 | 25 | 8.0 | 4.3 | | 1.2 |
| 9..... | | | 62 | 46 | 112 | 25 | 8.0 | 4.8 | 2.2 | 1.3 |
| 10..... | | 35 | 63 | 46 | 112 | 25 | 7.6 | 3.6 | | 1.1 |
| 11..... | | | 68 | 48 | 104 | 22 | 6.0 | 4.6 | | 1.1 |
| 12..... | | | 64 | 49 | 97 | 24 | 6.4 | 3.1 | 1.7 | 1.1 |
| 13..... | | 53 | 58 | 44 | 97 | 22 | 7.6 | 2.8 | 1.6 | 1.2 |
| 14..... | | 52 | 54 | 44 | 90 | 24 | 5.8 | 2.6 | 1.5 | 1.2 |
| 15..... | | 48 | 44 | 58 | 83 | 41 | 6.0 | 2.6 | 1.7 | 1.2 |
| 16..... | | 46 | 47 | 69 | 76 | 48 | 6.0 | 2.6 | 1.7 | .9 |
| 17..... | | 58 | ^a 42 | 87 | 74 | 35 | 8.0 | | 1.7 | .9 |
| 18..... | | 66 | ^a 40 | 120 | 68 | 30 | 7.6 | | 1.7 | |
| 19..... | | 63 | ^a 40 | 120 | 62 | 33 | 5.3 | | 1.8 | |
| 20..... | | 48 | ^a 33 | 120 | 51 | 29 | 4.6 | 2.2 | 2.1 | |
| 21..... | | | ^a 35 | 120 | 51 | 25 | 5.8 | | 1.5 | |
| 22..... | | | ^a 42 | 145 | 50 | 23 | 5.3 | 1.7 | 1.4 | |
| 23..... | | 55 | 44 | 163 | 46 | 20 | 4.8 | 4.1 | 1.3 | |
| 24..... | | 30 | 36 | 200 | 47 | 15 | 5.5 | 4.1 | 1.3 | 1.0 |
| 25..... | | 65 | 34 | 210 | 50 | 14 | 7.6 | 3.6 | 1.3 | |
| 26..... | | 62 | 38 | 210 | 41 | 14 | 7.2 | 3.4 | 1.1 | |
| 27..... | | 54 | 34 | 190 | 34 | 12 | 8.4 | 3.4 | 1.1 | |
| 28..... | | 50 | 31 | 163 | 31 | 12 | 8.4 | 3.1 | 1.1 | |
| 29..... | 43 | 47 | | 172 | 29 | 10 | 7.2 | 2.8 | 1.0 | |
| 30..... | 39 | 40 | | 190 | 28 | 9 | 7.6 | 2.8 | .9 | |
| 31..... | 35 | 36 | | 190 | | 9 | | 2.8 | .9 | |

^a Interpolated.

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

Monthly discharge of Ochoco Creek above Mill Creek, near Prineville, Oreg., for the year year ending Sept. 30, 1918.

| Month. | Discharge in second-feet. | | | Run-off in acre-feet. |
|----------------|---------------------------|----------|-------|-----------------------|
| | Maximum. | Minimum. | Mean. | |
| October..... | | | 2.5 | 154 |
| November..... | | | 5.0 | 298 |
| December..... | | | 18.6 | 1,140 |
| January..... | 86 | 28 | 45.4 | 2,780 |
| February..... | 79 | 31 | 46.6 | 2,880 |
| March..... | 210 | 36 | 103 | 6,330 |
| April..... | 172 | 28 | 81.0 | 4,820 |
| May..... | 48 | 9 | 24.3 | 1,480 |
| June..... | | 4.6 | 7.56 | 450 |
| July..... | 3.0 | 1.7 | 3.74 | 230 |
| August..... | 2.8 | .9 | 1.78 | 109 |
| September..... | 1.3 | .9 | 1.04 | 62 |
| The year..... | 210 | .9 | 28.2 | 20,660 |

* Estimated from records at Elliott ranch.

MILL CREEK NEAR PRINEVILLE, OREG.

LOCATION.—In SE. $\frac{1}{4}$ sec. 22, T. 14 S., R. 17 E., on Dill ranch, 1 mile above mouth and 10 miles east of Prineville, Crook County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—December 8, 1917, to July 4, 1918, at present location; March 14 to September 5, 1916, at old station (see under "Gage"). Station temporarily discontinued July 4; stream practically dry.

GAGE.—Stevens eight-day recorder on left bank referred to vertical staff braced to gage house; inspected by watermaster. Gage used in 1916 was vertical staff about 1 mile above.

DISCHARGE MEASUREMENTS.—Made from foot log at gage or by wading.

CHANNEL AND CONTROL.—Bed and control composed of gravel; slightly shifting. Banks of earth.

EXTREMES OF DISCHARGE.—Maximum stage for period from water-stage recorder, 2.15 feet at 6 a. m. March 26 (discharge, 110 second-feet); stream dry in summer owing to diversions above.

1916 and 1918: Maximum stage, 3.0 feet at 7 a. m. March 20, 1916 (discharge, 184 second-feet).

DIVERSIONS.—Many small ditches above station. Two diverted water around gage during year, probably only a few hundred acre-feet.

ACCURACY.—Stage-discharge relation practically permanent. Rating curve well defined above 4 second-feet. Operation of water-stage recorder fairly satisfactory. Daily discharge ascertained by applying to rating table the mean daily gage height obtained by inspecting the recorder graph, except for periods indicated in footnote to table of daily discharge. Records good.

Discharge measurements of Mill Creek near Prineville, Oreg., during the year ending Sept. 30, 1918.

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---------|-----------------|--------------|------------|--------|----------------------|--------------|------------|
| | | Feet. | Sec.-ft. | | | Feet. | Sec.-ft. |
| Feb. 9 | H. G. Kennard * | 1.38 | 34.3 | Apr. 5 | H. G. Kennard * | 1.67 | 63 |
| Mar. 27 | do | 1.14 | 20.2 | 19 | Henshaw and Kennard. | 1.48 | 45 |
| Mar. 14 | do | 1.31 | 32.0 | 19 | do | 1.48 | 45.6 |
| 21 | do | 1.77 | 72 | May 17 | H. G. Kennard..... | 1.14 | 17.9 |

* Water master.

Daily discharge, in second-feet, of Mill Creek near Prineville, Oreg., for the year ending Sept. 30, 1918.

| Day. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | Day. | Dec. | Jan. | Feb. | Mar. | Apr. | May. |
|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 1 | | | 24 | 24 | 85 | 29 | 16 | | | 25 | 40 | 52 | 26 |
| 2 | | | 23 | 29 | 80 | 27 | 17 | | | 22 | 56 | 50 | 19 |
| 3 | | | 20 | 34 | 70 | 20 | 18 | | | 20 | 80 | 46 | 19 |
| 4 | | | 17 | 34 | 65 | 17 | 19 | | | 20 | 85 | 44 | 17 |
| 5 | | | 20 | 27 | 63 | 18 | 20 | | 30 | 13 | 90 | 40 | 17 |
| 6 | | 15 | 29 | 32 | 60 | 19 | 21 | | | 15 | 90 | 41 | 16 |
| 7 | | | 48 | 35 | 60 | 17 | 22 | | | 22 | 90 | 42 | 14 |
| 8 | | | 42 | 32 | 60 | 17 | 23 | 15 | | 22 | 90 | 37 | 15 |
| 9 | | | 37 | 29 | 60 | 17 | 24 | | 40 | 20 | 95 | 37 | 16 |
| 10 | | | 36 | 29 | 60 | 16 | 25 | | | 17 | 95 | 37 | |
| 11 | | | 36 | 29 | 58 | 14 | 26 | | 38 | 21 | 95 | 36 | |
| 12 | | | 30 | 30 | 60 | 10 | 27 | | 33 | 20 | 90 | 36 | 10 |
| 13 | | 36 | 35 | 29 | 60 | 14 | 28 | | 30 | 18 | 80 | 38 | |
| 14 | | 30 | 34 | 30 | 58 | 18 | 29 | 32 | 29 | | 75 | 29 | |
| 15 | | | 15 | 32 | 55 | 22 | 30 | 25 | 26 | | 80 | 29 | |
| | | | | | | | 31 | | 16 | | 85 | | 4.6 |

NOTE.—Braced figures show estimated mean discharge for periods indicated. From Mar. 17 to 24 and May 12 to 16, discharge estimated from maximum and minimum stages indicated by recorder.

Monthly discharge of Mill Creek near Prineville, Oreg., for the year ending Sept. 30, 1918.

| Month. | Discharge in second-feet. | | | Run-off in acre-feet. |
|-------------|---------------------------|----------|-------|-----------------------|
| | Maximum. | Minimum. | Mean. | |
| December | | 0 | 7.5 | 461 |
| January | | | 24.5 | 1,510 |
| February | 48 | 15 | 25.0 | 1,390 |
| March | 95 | 24 | 57.3 | 3,510 |
| April | 85 | 29 | 51.4 | 3,060 |
| May | 29 | 4.6 | 16.1 | 960 |
| June | | | 1.3 | 77 |
| July | | 0 | 1.1 | 6 |
| The period. | | | | 11,000 |

• Estimated.

NOTE.—Stream dry during August and September.

MCKAY CREEK NEAR PRINEVILLE, OREG.

LOCATION.—In SW. $\frac{1}{4}$ sec. 4, T. 14 S., R. 16 E., 1,000 feet east of McKay Creek road and 6 miles north of Prineville, Crook County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—January to June 30, 1918, at present location; February 25 1915, to June 21, 1916, at old location (see under "Gage").

GAGE.—Stevens eight-day water-stage recorder on left bank, inspected by H. G. Kennard, watermaster. Present gage is about $1\frac{1}{2}$ miles above old station.

DISCHARGE MEASUREMENTS.—Made from private bridge 150 feet above gage or by wading near gage.

CHANNEL AND CONTROL.—Bed composed of gravel. Gravel riffle 100 feet below gage acts as control; shifts slightly. Banks of earth.

EXTREMES OF DISCHARGE.—Maximum stage during period from water-stage recorder, 2.07 feet at 6 a. m. March 25 (discharge, 130 second-feet); stream dry prior to January and subsequent to June.

1915-1916, 1918: Maximum stage recorded, 2.5 feet on former staff gage March 20, 1916 (discharge, 202 second-feet).

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

DIVERSIONS.—Five small ditches divert water above the gage to irrigate about 1,000 acres.

REGULATION.—None.

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

Discharge measurements of McKay Creek near Prineville, Oreg., during the year ending Sept. 30, 1918.

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|--------|----------------------------------|--------------|---------------|---------|----------------------------------|--------------|------------|
| Feb. 5 | H. G. Kennard ^a | Feet. 1.90 | Sec.-ft. 19.0 | Mar. 31 | H. G. Kennard ^a | Feet. 1.61 | 68 |
| Mar. 1 |do..... | 1.24 | 23.1 | Apr. 19 | Henshaw and Kennard | 1.03 | 14.9 |
| 24 |do..... | 1.90 | 106 | | | | |

^a Water master.

Daily discharge, in second-feet, of McKay Creek near Prineville, Oreg., for the year ending Sept. 30, 1918.

| Day. | Jan. | Feb. | Mar. | Apr. | May. |
|---------|------|------|-----------------|-----------------|------|
| 1..... | | 18 | 26 | 57 | |
| 2..... | | 21 | 33 | 46 | 8.2 |
| 3..... | | 21 | 43 | 39 | |
| 4..... | | 21 | 40 | 34 | |
| 5..... | | 23 | 30 | 36 | |
| 6..... | | 36 | 23 | 27 | |
| 7..... | | 61 | 20 | 26 | |
| 8..... | | 49 | 25 | 24 | |
| 9..... | 15 | 42 | 27 | 23 | 2.5 |
| 10..... | | 63 | 26 | 24 | |
| 11..... | | 41 | 27 | ^a 22 | |
| 12..... | | 40 | 27 | ^a 18 | |
| 13..... | | 36 | 25 | 16 | |
| 14..... | | 33 | 24 | | |
| 15..... | | 27 | 22 | | 11 |
| 16..... | | 23 | 23 | 15 | |
| 17..... | 30 | 31 | 42 | | |
| 18..... | 13 | 29 | 68 | | |
| 19..... | 28 | 29 | 71 | 14 | |
| 20..... | 62 | 21 | 77 | 13 | |
| 21..... | 72 | 22 | 77 | 14 | |
| 22..... | 93 | 21 | 89 | 15 | 9 |
| 23..... | 122 | 25 | ^a 97 | ^a 12 | |
| 24..... | 105 | 21 | 112 | ^a 10 | |
| 25..... | 100 | 19 | 126 | 8.2 | |
| 26..... | 84 | 23 | 112 | 6.0 | |
| 27..... | 70 | 21 | 89 | 4.2 | |
| 28..... | 165 | 20 | 71 | | |
| 29..... | 50 | | 70 | 6.0 | 4.6 |
| 30..... | 21 | | 75 | | |
| 31..... | 16 | | 67 | | |

^a Interpolated.

NOTE.—Braced figures show estimated mean discharge for periods indicated. Stream dry prior to Jan. 1 and after June 30; monthly mean estimated for June.

Monthly discharge of McKay Creek near Prineville, Oreg., for the year ending Sept. 30, 1918.

| Month. | Discharge in second-feet. | | | Run-off in acre-feet. |
|---------------|---------------------------|----------|-------|-----------------------|
| | Maximum. | Minimum. | Mean. | |
| January..... | 105 | | 38.4 | 2,300 |
| February..... | 61 | 18 | 29.4 | 1,630 |
| March..... | 128 | 24 | 55.4 | 3,410 |
| April..... | 57 | | 19.1 | 1,140 |
| May..... | | | 7.06 | 434 |
| June..... | | | 2.00 | 119 |
| The year..... | | | | 9,000 |

* Estimated.

NOTE.—Stream practically dry Oct. 1 to Dec. 31 and July 1 to Sept. 30.

LAKE CREEK NEAR SISTERS, OREG.

LOCATION.—In SE. $\frac{1}{4}$ sec. 24, T. 13 S., R. 8 E., a quarter of a mile below outlet of Suttle Lake, 6 miles from mouth of creek, and 15 miles northwest of Sisters, Jefferson County.

DRAINAGE AREA.—20.5 square miles.

RECORDS AVAILABLE.—April 7, 1915, to September 30, 1918; occasional readings, May to November, 1911; March to September, 1912; May to October, 1913.

GAGE.—Stevens continuous water-stage recorder on left bank beginning October 16; vertical staff used in 1917. Gage about 20 feet above a 15-foot weir read April 7, 1915, to April 30, 1916. Gage in natural channel, near site of weir, used 1911 to 1913. Inspected by Harry Heising and William Heathman.

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

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 2.24 feet at 7 a. m. December 30 (discharge, 247 second-feet); minimum stage recorded, 0.55 foot October 16 and 17 (discharge, 32 second-feet).

1911-1913; 1915-1918: Maximum stage recorded same as for 1918; minimum stage recorded, 0.31 foot October 18, 1917 (discharge, 20 second-feet).

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

DIVERSIONS.—None above station; only one small ditch diverts from Lake Creek.

REGULATION.—None.

ACCURACY.—Stage-discharge relation practically permanent. Rating curve well defined. Operation of water-stage recorder rather unsatisfactory during period October 16 to July 19. Staff gage read once daily to hundredths October 1 to 16 and July 21 to September 30. Daily discharge ascertained October 16 to July 19, by applying to rating table the mean daily gage height obtained by inspecting the recorder graph, except for periods when recorder was not operating, for which it was ascertained by estimation and interpolation using maximum and minimum points from recorder sheet as a basis; October 1 to 16 and July 21 to September 30, by applying to rating table the daily gage reading. Records good.

Discharge measurements of Lake Creek near Sisters, Oreg., during the year ending Sept. 30, 1918.

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---------|-----------------------|--------------|-----------------|---------|--------------------|--------------|-----------------|
| | | <i>Feet.</i> | <i>Sec.-ft.</i> | | | <i>Feet.</i> | <i>Sec.-ft.</i> |
| Oct. 11 | C. L. Batchelder..... | 0.57 | 34.2 | June 7 | H. G. Kennard..... | 0.80 | 50 |
| Nov. 16 | R. C. Briggs..... | .57 | 33.3 | 26 | R. C. Briggs..... | .70 | 40.4 |
| Feb. 14 |do..... | 1.16 | 88 | July 18 |do..... | .68 | 37.7 |
| Apr. 17 | F. F. Henshaw..... | 1.01 | 70 | | | | |

Daily discharge, in second-feet, of Lake Creek near Sisters, Oreg., for the year ending Sept. 30, 1918.

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|------|------|------|------|------|------|------|------|------|-------|-------|------|-------|
| 1. | 36 | 33 | 61 | 185 | | 61 | | 69 | 53 | 40 | 36 | 34 |
| 2. | 36 | 33 | 55 | 153 | | 60 | | 69 | 52 | 40 | 36 | 34 |
| 3. | 36 | 34 | 53 | 143 | | 59 | | 69 | 51 | 41 | 36 | 34 |
| 4. | 36 | 34 | 50 | 140 | 85 | 61 | | 70 | 59 | 40 | 36 | 34 |
| 5. | 36 | 35 | 48 | 137 | | 59 | | 72 | 50 | 39 | 36 | 34 |
| 6. | 36 | 35 | 45 | 134 | | 59 | | 72 | | 39 | 36 | 34 |
| 7. | 36 | 35 | 44 | 131 | 85 | 58 | | 73 | | 39 | 36 | 34 |
| 8. | 35 | 34 | 44 | 127 | 84 | 58 | | 74 | | 39 | 36 | 34 |
| 9. | 34 | 34 | 41 | 124 | | 60 | 65 | 75 | | 40 | 36 | 34 |
| 10. | 33 | 34 | 40 | 121 | | 59 | | 75 | | 40 | 36 | 34 |
| 11. | 33 | 34 | 38 | 118 | | 59 | | 74 | | 40 | 35 | 33 |
| 12. | 33 | 34 | 40 | 122 | | 59 | | 72 | | 40 | 35 | 32 |
| 13. | 33 | 34 | 44 | 125 | 85 | 58 | | 70 | | 38 | 35 | 34 |
| 14. | 34 | 34 | 44 | 129 | 86 | 56 | | 70 | | 38 | 35 | 34 |
| 15. | 33 | 34 | 44 | 125 | 88 | | | 70 | | 38 | 35 | 34 |
| 16. | 32 | 33 | 47 | 121 | 82 | | | 69 | 56 | 38 | 35 | 34 |
| 17. | 32 | 33 | 58 | 117 | 82 | | 68 | 68 | | 38 | 35 | 34 |
| 18. | 32 | 33 | 66 | 113 | 78 | | 68 | | | 38 | 35 | 34 |
| 19. | 33 | 34 | 96 | 110 | 76 | | 69 | | | 37 | 35 | 34 |
| 20. | 33 | 34 | 150 | 106 | 74 | | 66 | | | 38 | 35 | 34 |
| 21. | 34 | 34 | 195 | 102 | 72 | | 66 | | | 38 | 35 | 34 |
| 22. | 34 | 35 | 193 | 98 | 70 | | 65 | | | 38 | 35 | 34 |
| 23. | 34 | 35 | 188 | 94 | 70 | 60 | | 65 | | 38 | 35 | 34 |
| 24. | 34 | 34 | 209 | 90 | 69 | | | 66 | 70 | 38 | 34 | 34 |
| 25. | 32 | 34 | 214 | 90 | 65 | | | 67 | | 38 | 34 | 34 |
| 26. | 32 | 34 | 201 | 90 | 64 | | | 68 | | 42 | 34 | 34 |
| 27. | 32 | 34 | 196 | 90 | 68 | | | 69 | | 41 | 34 | 35 |
| 28. | 32 | 39 | 217 | 84 | 69 | | | 70 | | 41 | 34 | 35 |
| 29. | 32 | 43 | 242 | 81 | 70 | | | 70 | | 40 | 34 | 35 |
| 30. | 32 | 64 | 344 | 78 | 70 | | | 69 | | 40 | 34 | 35 |
| 31. | 33 | | 322 | 76 | | | | | | | 34 | |

Interpolated.

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

Monthly discharge of Lake Creek near Sisters, Oreg., for the year ending Sept. 30, 1918.

| Month. | Discharge in second-feet. | | | Run-off in acre-feet. |
|-----------|---------------------------|----------|-------|-----------------------|
| | Maximum. | Minimum. | Mean. | |
| October | 36 | 32 | 33.6 | 2,976 |
| November | 64 | 33 | 35.6 | 2,120 |
| December | 185 | 38 | 111 | 6,629 |
| January | 185 | 75 | 115 | 7,079 |
| February | | 62 | 72.7 | 4,370 |
| March | | | 69.6 | 3,660 |
| April | | | 66.1 | 3,950 |
| May | | | 70.7 | 4,350 |
| June | | | 48.7 | 2,906 |
| July | 41 | 36 | 38.5 | 2,370 |
| August | 36 | 34 | 34.9 | 2,150 |
| September | 35 | 32 | 33.9 | 2,020 |
| The year | 244 | 32 | 60.5 | 43,800 |

WARM SPRINGS RIVER NEAR WARM SPRING, OREG.

LOCATION.—In NE. $\frac{1}{4}$ sec. 19, T. 8 S., R. 13 E., in Wasco County, at bridge on road between Warm Spring and Simnasho, 9 miles from Warm Spring and 15 miles from Simnasho.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—July 29, 1911, to September 30, 1918 (fragmentary period to 1914).

GAGE.—Stevens water-stage recorder since July 1, 1914; fastened to downstream side of right abutment; inspected by Jerry Brance and Willie Palmer. Vertical staff 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.—Control composed of gravel and small boulders, about 100 yards below bridge; practically permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 3.27 feet at 8 p. m. December 28 (discharge, 2,130 second-feet); minimum stage recorded, 0.87 foot September 13 (discharge, 228 second-feet).

1911-1918: Maximum stage recorded 4.0 feet at 10 p. m. March 9, 1916 (discharge, 2,930 second-feet); minimum stage recorded, 0.73 foot January 15, 1915 (discharge, 192 second-feet).

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

DIVERSIONS.—None.

REGULATIONS.—None.

ACCURACY.—Stage-discharge relation changed slightly during March. Two rating curves used, both well defined; old rating applicable to April 7, and new rating used thereafter. Gage-height record during March, April, and May fragmentary owing to lack of attention to water-stage recorder. Daily discharge ascertained by applying to rating table the mean daily gage height obtained by inspecting the recorder graph, except for periods when recorder was not operating, for which it was ascertained by comparison with flow of White River and Clear Creek. Records good.

Discharge measurements of Warm Springs River near Warm Spring, Oreg., during the year ending Sept. 30, 1918.

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---------|-----------------------|--------------|-----------------|----------|-----------------------|--------------|-----------------|
| | | <i>Feet.</i> | <i>Sec.-ft.</i> | | | <i>Feet.</i> | <i>Sec.-ft.</i> |
| Feb. 17 | R. C. Briggs..... | 1.69 | 701 | June 27 | R. C. Briggs..... | 1.01 | 228 |
| Apr. 18 | F. F. Henshaw..... | 1.38 | 468 | Sept. 27 | C. L. Batchelder..... | .98 | 378 |
| May 28 | C. L. Batchelder..... | 1.18 | 378 | | | | |

DESCHUTES RIVER BASIN.

Daily discharge, in second-feet, of Warm Springs River near Warm Spring, Oreg., for the year ending Sept. 30, 1918.

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|-------|
| 1..... | 305 | 288 | 534 | 1,100 | 612 | 594 | ..... | 496 | 365 | 285 | 296 | 285 |
| 2..... | 305 | 288 | 410 | 936 | 665 | 564 | ..... | 502 | 360 | 266 | 308 | 276 |
| 3..... | 305 | 288 | 370 | 890 | 644 | 528 | ..... | 508 | 355 | 280 | 312 | 272 |
| 4..... | 305 | 288 | 360 | 1,240 | 644 | ..... | ..... | 514 | 360 | 286 | 312 | 267 |
| 5..... | 291 | 288 | 350 | 975 | 1,240 | ..... | ..... | 526 | 346 | 276 | 316 | 262 |
| 6..... | 301 | 288 | 350 | 850 | 1,430 | ..... | ..... | 508 | 335 | 276 | 321 | 238 |
| 7..... | 301 | 288 | 346 | 906 | 1,580 | ..... | 562 | 466 | 326 | 272 | 330 | 254 |
| 8..... | 296 | 288 | 356 | 842 | 1,240 | ..... | ..... | 442 | 321 | 272 | 330 | 244 |
| 9..... | 296 | 288 | 332 | 770 | 1,120 | ..... | ..... | 426 | 316 | 272 | 330 | 244 |
| 10..... | 292 | 288 | 323 | 700 | 1,020 | ..... | ..... | 436 | 321 | 272 | 330 | 240 |
| 11..... | | 288 | 328 | 693 | 948 | ..... | ..... | ..... | 321 | 267 | 330 | 226 |
| 12..... | | 288 | 332 | 1,340 | 832 | ..... | ..... | ..... | 316 | 267 | 330 | 232 |
| 13..... | | 288 | 369 | 1,180 | 834 | ..... | ..... | ..... | 312 | 262 | 326 | 228 |
| 14..... | 290 | 288 | 474 | 1,380 | 786 | ..... | 526 | ..... | 308 | 262 | 321 | 244 |
| 15..... | | 288 | 322 | 1,290 | 728 | ..... | ..... | ..... | 303 | 256 | 316 | 272 |
| 16..... | | 288 | 456 | 1,140 | 721 | ..... | ..... | ..... | 363 | 267 | 321 | 262 |
| 17..... | | 288 | 568 | 1,110 | 700 | ..... | ..... | ..... | 298 | 267 | 321 | 240 |
| 18..... | 288 | 288 | 1,290 | 1,380 | 679 | ..... | 478 | ..... | 294 | 262 | 316 | 249 |
| 19..... | 288 | 288 | 1,630 | 1,140 | 644 | ..... | 460 | ..... | 290 | 262 | 312 | 249 |
| 20..... | 288 | 288 | 1,880 | 984 | 600 | ..... | 502 | ..... | 290 | 267 | 312 | 254 |
| 21..... | 288 | 288 | 1,290 | 990 | 570 | ..... | 529 | ..... | 290 | 262 | 312 | 254 |
| 22..... | 288 | 288 | 1,060 | 858 | 546 | ..... | 508 | ..... | 290 | 272 | 312 | ..... |
| 23..... | 288 | 288 | 1,180 | 826 | 536 | ..... | 520 | ..... | 294 | 266 | 312 | ..... |
| 24..... | 288 | 288 | 1,129 | 770 | 564 | ..... | 526 | ..... | 308 | 264 | 312 | ..... |
| 25..... | 288 | 288 | 890 | 693 | 540 | ..... | 550 | ..... | 296 | 260 | 306 | 254 |
| 26..... | 288 | 292 | 1,200 | 906 | 582 | ..... | 532 | ..... | 294 | 265 | 308 | ..... |
| 27..... | 288 | 292 | 1,080 | 850 | 570 | ..... | 508 | ..... | 290 | 265 | 308 | 254 |
| 28..... | 288 | 305 | 2,989 | 786 | 530 | ..... | 490 | 375 | 290 | 265 | 294 | 258 |
| 29..... | 288 | 300 | 1,660 | 786 | ..... | ..... | 490 | 376 | 286 | 265 | 286 | 258 |
| 30..... | 288 | 721 | 1,420 | 728 | ..... | ..... | 490 | 365 | 285 | 260 | 290 | 267 |
| 31..... | 288 | ..... | 1,340 | 582 | ..... | ..... | ..... | 365 | ..... | 294 | 265 | ..... |

* Interpolated.

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

Monthly discharge of Warm Springs River near Warm Spring, Oreg., for the year ending Sept. 30, 1918.

| Month. | Discharge in second-feet. | | | Run-off in acre-feet. |
|----------------|---------------------------|----------|-------|-----------------------|
| | Maximum. | Minimum. | Mean. | |
| October..... | 305 | 288 | 293 | 18,000 |
| November..... | 721 | 288 | 307 | 18,300 |
| December..... | 2,080 | 323 | 882 | 54,200 |
| January..... | 1,380 | 562 | 983 | 60,200 |
| February..... | 1,580 | 546 | 798 | 44,000 |
| March..... | ..... | ..... | 500 | 80,700 |
| April..... | ..... | ..... | 520 | 80,900 |
| May..... | 526 | ..... | 420 | 25,800 |
| June..... | 365 | 285 | 312 | 18,600 |
| July..... | 294 | 258 | 276 | 17,000 |
| August..... | 330 | 285 | 313 | 19,200 |
| September..... | 285 | 228 | 255 | 15,200 |
| The year..... | 2,080 | 228 | 485 | 351,000 |

* Estimated.

WHITE RIVER NEAR TYGH VALLEY, OREG.

LOCATION.—In SW. $\frac{1}{4}$ sec. 10, T. 4 S., R. 13 E., 1 mile south of Tygh Valley, Wasco County, 1 mile above mouth of Tygh Creek, and 4 miles above Tygh Valley plant of Pacific Power & Light Co. at fall of White River.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—June 18, 1911, to December 10, 1918, when station was discontinued.

GAGE.—Vertical staff on lower corner of left pier of highway bridge; read by Mrs. Bessie Nickerson.

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

CHANNEL AND CONTROL.—Gravel and sand; slightly shifting. White River carries a large amount of glacial sediment at times.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period, 4.90 feet at 8 a. m. December 19 (discharge, 3,400 second-feet); minimum stage recorded, 0.58 foot November 26 and 27, 1917 (discharge, 110 second-feet).

1911-1918: Maximum stage recorded, 5.8 feet January 9, 1912 (probably ice-affected); maximum open-water stage recorded, December 19, 1917 (see preceding paragraph); minimum stage recorded, 0.30 foot September 7, 20, 24, and 27, 1915 (discharge, 82 second-feet).

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

DIVERSIONS.—The Wapinitia Irrigation Co. began diverting a small quantity of water in the spring of 1917 from Clear Creek, a tributary of White River. This water is used to irrigate land lying south of White River known as Juniper Flats.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed during high water of December and January. Two rating curves used, both well defined; old rating applicable to December 18 and new rating used thereafter. Gage read to quarter-tenths once daily. Daily discharge ascertained by applying daily gage height to rating table. Records good.

Discharge measurements of White River, near Tygh Valley, Oreg., during the period Oct. 1, 1917, to Dec. 10, 1918.

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---------|------------------------|--------------|-----------------|---------|-----------------------|--------------|-----------------|
| | | <i>Feet.</i> | <i>Sec.-ft.</i> | | | <i>Feet.</i> | <i>Sec.-ft.</i> |
| Oct. 18 | C. L. Batchelder..... | 0.60 | 115 | June 28 | R. C. Briggs..... | 0.75 | 190 |
| Apr. 10 | C. E. Stricklin *..... | 1.35 | 453 | Aug. 5 | C. E. Stricklin..... | .60 | 147 |
| 24 | do..... | 1.55 | 577 | Oct. 12 | C. L. Batchelder..... | .55 | 124 |

* Assistant to State engineer.

Daily discharge, in second-feet, of White River near Tygh Valley, Oreg., for the period Oct. 1, 1917, to Dec. 10, 1918.

| Day. | Oct. | Nov. | Dec. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. | Nov. | Dec. |
|---------|------|-------|-------|-------|------|-------|-------|------|-------|------|-------|-------|
| 1..... | 139 | 115 | 322 | ..... | 490 | 330 | 175 | 145 | 130 | 130 | 145 | 160 |
| 2..... | 139 | 115 | 215 | ..... | 490 | 285 | 169 | 154 | 130 | 130 | 145 | 160 |
| 3..... | 130 | 124 | 145 | ..... | 508 | 285 | 169 | 145 | 130 | 139 | 139 | 160 |
| 4..... | 130 | 124 | 173 | ..... | 562 | 285 | 169 | 145 | 124 | 139 | 139 | 160 |
| 5..... | 130 | 124 | 180 | ..... | 508 | 330 | 169 | 145 | 124 | 145 | 186 | 192 |
| 6..... | 130 | 130 | 180 | ..... | 480 | 355 | 169 | 145 | 121 | 145 | 130 | 210 |
| 7..... | 130 | 130 | 162 | ..... | 455 | 355 | 175 | 145 | 115 | 154 | 130 | 210 |
| 8..... | 130 | 115 | 162 | ..... | 430 | 355 | 169 | 145 | 115 | 130 | 130 | 210 |
| 9..... | 130 | 115 | 162 | ..... | 430 | 330 | 169 | 145 | 124 | 124 | 130 | 210 |
| 10..... | 130 | 115 | 162 | 455 | 405 | 330 | 169 | 145 | 124 | 115 | 130 | 192 |
| 11..... | 130 | 115 | 145 | 455 | 380 | 308 | 169 | 145 | 115 | 130 | 160 | ..... |
| 12..... | 124 | 130 | 255 | 455 | 380 | 308 | 169 | 145 | 115 | 130 | 160 | ..... |
| 13..... | 124 | 180 | 890 | 455 | 380 | 808 | 269 | 145 | 121 | 139 | 160 | ..... |
| 14..... | 124 | 173 | 950 | 405 | 405 | 285 | 160 | 145 | 490 | 139 | 160 | ..... |
| 15..... | 124 | 130 | 710 | 405 | 405 | 265 | 160 | 145 | 175 | 145 | 245 | ..... |
| 16..... | 124 | 124 | 532 | 405 | 380 | 245 | 169 | 139 | 145 | 285 | 220 | ..... |
| 17..... | 115 | 115 | 1,160 | 405 | 380 | 245 | 169 | 139 | 145 | 175 | 203 | ..... |
| 18..... | 115 | 115 | 2,010 | 380 | 380 | 245 | 175 | 139 | 145 | 145 | 186 | ..... |
| 19..... | 115 | 115 | 3,400 | 380 | 380 | 245 | 169 | 139 | 145 | 145 | 186 | ..... |
| 20..... | 115 | 115 | 1,780 | 430 | 380 | 220 | 169 | 130 | 145 | 139 | 175 | ..... |
| 21..... | 124 | 115 | 1,130 | 480 | 355 | 220 | 160 | 130 | 139 | 139 | 175 | ..... |
| 22..... | 124 | 115 | 1,440 | 508 | 355 | 210 | 154 | 130 | 139 | 139 | 169 | ..... |
| 23..... | 124 | 115 | 1,280 | 508 | 355 | 210 | 175 | 130 | 139 | 139 | 160 | ..... |
| 24..... | 124 | 115 | 1,060 | 535 | 330 | 210 | 160 | 136 | 130 | 136 | 169 | ..... |
| 25..... | 130 | 115 | 1,060 | 480 | 330 | 210 | 160 | 139 | 130 | 139 | 175 | ..... |
| 26..... | 130 | 110 | 1,130 | 480 | 330 | 200 | 160 | 139 | 130 | 139 | 175 | ..... |
| 27..... | 124 | 110 | 1,520 | 480 | 308 | 200 | 154 | 139 | 115 | 145 | 175 | ..... |
| 28..... | 124 | 130 | 2,230 | 455 | 308 | 192 | 145 | 130 | 115 | 245 | 175 | ..... |
| 29..... | 115 | 180 | 2,320 | 465 | 308 | 182 | 189 | 136 | 116 | 203 | 169 | ..... |
| 30..... | 115 | 560 | 1,870 | 456 | 330 | 175 | 145 | 130 | 115 | 175 | 154 | ..... |
| 31..... | 115 | ..... | 1,440 | ..... | 330 | ..... | 145 | 130 | ..... | 166 | ..... | ..... |

Monthly discharge of White River near Tygh Valley, Oreg., for the period Oct. 1, 1917, to Dec. 10, 1918.

| Month. | Discharge in second-feet. | | | Run-off in acre-feet. |
|--------------------|---------------------------|----------|-------|-----------------------|
| | Maximum. | Minimum. | Mean. | |
| October..... | 139 | 115 | 135 | 7,600 |
| November..... | 560 | 110 | 139 | 8,270 |
| December..... | 3,400 | 145 | 973 | 59,800 |
| April 10-30..... | 535 | 380 | 451 | 18,800 |
| May..... | 522 | 308 | 394 | 24,200 |
| June..... | 355 | 175 | 264 | 15,700 |
| July..... | 175 | 139 | 164 | 10,100 |
| August..... | 480 | 115 | 141 | 8,610 |
| September..... | 285 | 115 | 151 | 8,380 |
| October..... | 245 | 130 | 164 | 9,280 |
| November..... | 245 | 130 | 164 | 9,760 |
| December 1-10..... | 210 | 169 | 156 | 4,600 |

WHITE RIVER BELOW TYGH VALLEY, OREG.

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

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—November 20, 1917, to September 30, 1918.

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

DISCHARGE MEASUREMENTS.—Made from cable a quarter of a mile below gage or by wading.

CHANNEL AND CONTROL.—Control of rock overlain with sand deposits; somewhat shifting.

EXTREMES OF DISCHARGE.—Maximum stage from water-stage recorder, 8.24 feet at 1 a. m. December 19 (discharge, 5,940 second-feet); minimum stage, 0.50 foot at 5 p. m. November 26 (discharge, 105 second-feet).

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

DIVERSIONS.—Numerous small irrigation ditches divert above this station.

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

ACCURACY.—Stage-discharge relation changed on December 19. Fairly well defined rating curve used after December 19; same rating used for shifting-control method November 20 to December 18. Operation of recorder satisfactory except for gap January 5 to February 3 when well was filled with sand. Daily discharge ascertained by applying to rating table the mean daily gage height obtained by inspecting recorder graph, or at times of considerable fluctuation by subdividing days. Records good.

Discharge measurements of White River below Tygh Valley, Oreg., during the year ending Sept. 30, 1918.

| Date. | Made by— | Gage height. | Dis-charge. | Date. | Made by— | Gage height. | Dis-charge. |
|---------|-----------------------|--------------|-----------------|---------|-----------------------|--------------|-----------------|
| | | <i>Feet.</i> | <i>Sec.-ft.</i> | | | <i>Feet.</i> | <i>Sec.-ft.</i> |
| Nov. 11 | C. L. Batchelder..... | 1.00 | 142 | May 27 | C. L. Batchelder..... | 1.82 | 408 |
| Feb. 6 | E. C. Briggs..... | 3.24 | 1,180 | June 28 | R. C. Briggs..... | 1.35 | 226 |
| Apr. 10 | C. E. Stricklin..... | 2.41 | 595 | July 9 | C. E. Stricklin..... | 1.13 | 182 |
| 25 |do..... | 2.54 | 694 | Aug. 25 |do..... | 1.00 | 168 |
| May 22 |do..... | 1.96 | 452 | | | | |

* Assistant to State engineer.

Daily discharge, in second-feet, of White River below Tygh Valley, Oreg., for the year ending Sept. 30, 1918.

| Day. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|------|------|-------|-------|-------|------|------|------|-------|-------|------|-------|
| 1 | | 350 | 1,920 | | 515 | 690 | 690 | 370 | 220 | 184 | 151 |
| 2 | | 245 | 1,680 | 700 | 540 | 640 | 715 | 370 | 214 | 187 | 156 |
| 3 | | 212 | 1,520 | | 540 | 590 | 740 | 350 | 206 | 182 | 146 |
| 4 | | 208 | 1,840 | 860 | 540 | 565 | 800 | 350 | 204 | 176 | 140 |
| 5 | | 206 | | 1,100 | 530 | 565 | 770 | 479 | 202 | 167 | 138 |
| 6 | | 808 | | 1,870 | 520 | 540 | 715 | 390 | 202 | 171 | 138 |
| 7 | | 198 | | 1,600 | 510 | 540 | 665 | 390 | 198 | 167 | 141 |
| 8 | | 187 | | 1,230 | 500 | 540 | 640 | 390 | 196 | 160 | 141 |
| 9 | | 185 | | 1,100 | 490 | 565 | 615 | 390 | 196 | 160 | 145 |
| 10 | 147 | 189 | | 1,100 | 490 | 640 | 590 | 380 | 202 | 167 | 149 |
| 11 | | 184 | 1,040 | 470 | 665 | 540 | 390 | 202 | 167 | 143 | 143 |
| 12 | | 295 | 950 | 430 | 665 | 540 | 370 | 200 | 166 | 145 | 145 |
| 13 | | 1,040 | 890 | 390 | 640 | 540 | 350 | 194 | 166 | 144 | 144 |
| 14 | | 1,230 | 830 | 370 | 565 | 590 | 330 | 191 | 162 | 140 | 140 |
| 15 | | 660 | 770 | 370 | 540 | 565 | 312 | 193 | 162 | 139 | 139 |
| 16 | | 740 | | 770 | 370 | 540 | 565 | 295 | 198 | 162 | 139 |
| 17 | | 1,600 | 830 | 370 | 540 | 515 | 295 | 196 | 162 | 141 | 141 |
| 18 | | 3,600 | 882 | 770 | 410 | 490 | 490 | 200 | 160 | 140 | 140 |
| 19 | | 4,980 | | 690 | 410 | 490 | 490 | 290 | 196 | 160 | 157 |
| 20 | 136 | 3,000 | | 615 | 410 | 540 | 470 | 265 | 187 | 160 | 156 |
| 21 | 136 | 2,600 | | 586 | 410 | 640 | 450 | 265 | 176 | 159 | 152 |
| 22 | 135 | 2,080 | | 565 | 430 | 770 | 450 | 258 | 169 | 160 | 149 |
| 23 | 133 | 2,800 | | 390 | 470 | 740 | 430 | 256 | 198 | 167 | 146 |
| 24 | 132 | 1,600 | | 615 | 515 | 776 | 410 | 252 | 194 | 166 | 144 |
| 25 | 132 | 1,230 | | 590 | 640 | 715 | 390 | 240 | 196 | 162 | 143 |
| 26 | 126 | 1,840 | | 590 | 590 | 640 | 370 | 240 | 193 | 157 | 144 |
| 27 | 120 | 2,700 | | 549 | 580 | 649 | 379 | 233 | 187 | 151 | 145 |
| 28 | 166 | 3,980 | | 545 | 565 | 640 | 370 | 229 | 176 | 146 | 146 |
| 29 | 216 | 3,800 | | | 565 | 649 | 379 | 227 | 180 | 149 | 144 |
| 30 | 665 | 2,900 | | | 640 | 665 | 390 | 222 | 187 | 153 | 142 |
| 31 | | 2,240 | | | 715 | | 390 | | 187 | 154 | |

NOTE.—Braced figures show estimated mean discharge for periods indicated. Discharge estimated Oct. 1-31, 185 second-feet, and Nov. 1-19 by adding estimated flow of Tygh Creek to observed flow of White River near Tygh Valley; Jan. 5 to Feb. 3 from comparison of flow of Sandy, Hood, and White Salmon rivers. Discharge interpolated Mar. 5-10, Aug. 11-12, Sept. 26, 27, 29, 30.

Monthly discharge of White River below Tygh Valley, Oreg., for the year ending Sept. 30, 1918.

| Month. | Discharge in second-feet. | | | Run-off in acre-feet. |
|----------------|---------------------------|----------|-------|-----------------------|
| | Maximum. | Minimum. | Mean. | |
| October..... | | | 145 | 8,920 |
| November..... | | 126 | 163 | 9,700 |
| December..... | 4,980 | 184 | 1,490 | 91,600 |
| January..... | | | 1,080 | 66,400 |
| February..... | 1,600 | 515 | 828 | 46,000 |
| March..... | 715 | 370 | 493 | 36,300 |
| April..... | 770 | 490 | 614 | 36,500 |
| May..... | 800 | 370 | 537 | 33,000 |
| June..... | 390 | 232 | 312 | 18,600 |
| July..... | 220 | 176 | 195 | 12,000 |
| August..... | 187 | 146 | 164 | 10,100 |
| September..... | 410 | 138 | 160 | 9,520 |
| The year..... | 4,980 | 126 | 515 | 373,000 |

27.79

CLEAR CREEK ABOVE INTAKE, NEAR WAPINITIA, OREG.

LOCATION.—In SW. $\frac{1}{4}$ sec. 10, T. 5 S., R. 9 E., 300 feet above intake of Wapinitia Irrigation Co.'s canal, 4 miles below outlet of Clear Lake, and 22 miles west of Wapinitia, Wasco County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—May 16 to September 20, 1918.

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

DISCHARGE MEASUREMENTS.—Made by wading near intake of canal.

CHANNEL AND CONTROL.—Sand, gravel, and small boulders; may shift slightly.

EXTREMES OF DISCHARGE.—Maximum stage during period from water-stage recorder, 1.70 feet at 5 p. m., May 16 (discharge, 44 second-feet); minimum stage from water-stage recorder, 1.23 feet August 31, September 3 to 8, and 11 to 12 (discharge, 5.0 second-feet).

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

REGULATION.—None.

ACCURACY.—Stage-discharge relation practically permanent. Rating curve fairly well defined. Gage record is incomplete and no estimates have been made during gage, except a three-day interpolation in August. Daily discharge ascertained by applying to rating table the mean daily gage height obtained by inspecting recorder graph. Records good.

Discharge measurements of Clear Creek above intake, near Wapinitia, Oreg., during the year ending Sept. 30, 1918.

[Made by C. E. Stricklin.]

| Date. | Gage height. | Discharge. |
|--------------|--------------|------------|
| | Feet. | Sec.-ft. |
| June 4..... | 1.50 | 23.1 |
| July 8..... | 1.86 | 19.6 |
| Aug. 27..... | 1.80 | 6.5 |

* Assistant to State engineer.

Daily discharge, in second-feet, of Clear Creek above intake near Wapinitia, Oreg., for the year ending Sept. 30, 1918.

| Day. | May. | June. | July. | Aug. | Sept. | Day. | May. | June. | July. | Aug. | Sept. |
|---------|------|---------|-------|------|-------|---------|---------|-------|-------|------|-------|
| 1..... | | 25..... | | 8.1 | 5.5 | 16..... | 44..... | | 9.5 | 6.0 | 6.7 |
| 2..... | | 24..... | | 8.1 | 5.5 | 17..... | 42..... | | 8.8 | 6.0 | 5.5 |
| 3..... | | 23..... | | 8.1 | 5.0 | 18..... | 41..... | | 8.1 | 6.0 | 5.5 |
| 4..... | | 23..... | | 7.4 | 5.0 | 19..... | 41..... | | 7.4 | 6.0 | 5.5 |
| 5..... | | 24..... | | 7.4 | 5.0 | 20..... | 41..... | | 7.4 | 6.0 | 5.5 |
| 6..... | | 23..... | | 6.7 | 5.0 | 21..... | 40..... | | 6.7 | 6.0 | |
| 7..... | | 23..... | | 6.7 | 5.0 | 22..... | 37..... | | 6.7 | 6.0 | |
| 8..... | | 22..... | 10.0 | 6.7 | 5.0 | 23..... | 36..... | | 7.4 | 6.0 | |
| 9..... | | | 9.5 | 6.7 | 5.5 | 24..... | 35..... | | 7.4 | 6.0 | |
| 10..... | | | 10.0 | 6.7 | 5.5 | 25..... | 34..... | | 8.1 | 6.0 | |
| 11..... | | | 9.5 | 6.7 | 5.0 | 26..... | 32..... | | 8.1 | 6.0 | |
| 12..... | | | 10.0 | 6.0 | 5.0 | 27..... | 31..... | | 7.4 | 6.0 | |
| 13..... | | | 9.5 | 6.0 | 5.5 | 28..... | 29..... | | 8.1 | 5.5 | |
| 14..... | | | 9.5 | 6.0 | 6.0 | 29..... | 29..... | | 8.1 | 5.5 | |
| 15..... | | | 8.8 | 6.0 | 8.8 | 30..... | 27..... | | 8.8 | 5.5 | |
| | | | | | | 31..... | 27..... | | 8.8 | 5.0 | |

^a Interpolated.

Monthly discharge of Clear Creek above intake near Wapinitia, Oreg., for the year ending Sept. 30, 1918.

| Month. | Discharge in second-feet. | | | Run-off in acre-feet. |
|---------------------|---------------------------|----------|-------|-----------------------|
| | Maximum. | Minimum. | Mean. | |
| May 16-31..... | 44 | 27 | 35.4 | 1,120 |
| June 1-8..... | 25 | 22 | 23.4 | 371 |
| July 8-31..... | 10 | 6.7 | 8.48 | 404 |
| August..... | 8.1 | 5.0 | 6.35 | 390 |
| September 1-20..... | 8.8 | 5.0 | 5.53 | 226 |

CLEAR CREEK AT OAK GROVE ROAD, NEAR WAPINITIA, OREG.

LOCATION.—In SW. $\frac{1}{4}$ sec. 8, T. 5 S., R. 10 E., where Oak Grove road crosses creek, 18 miles west of Wapinitia, Wasco County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—November 1, 1917, to August 26, 1918, when station was discontinued.

GAGE.—Vertical staff on left bank about 25 feet above highway bridge. Stevens continuous water-stage recorder referred to this staff gage from November to May 15; inspected by J. L. Maddren.

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

CHANNEL AND CONTROL.—Composed of gravel and sand; subject to shift. Banks of earth.

EXTREMES OF DISCHARGE.—Maximum stage from water-stage recorder, 2.03 feet at 9 p. m. December 19 (discharge, 226 second-feet); minimum stage recorded, 0.47 foot November 1 (discharge, 17 second-feet).

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

DIVERSIONS.—Wapinitia Irrigation Co.'s canal diverts water about 3 miles above station.

REGULATION.—None.

ACCURACY.—Stage-discharge relation not permanent. Two fairly well defined rating curves used, applicable November 1 to January 12 and February 8 to August 26; indirect method for shifting control used January 13 to February 7. Operation of recorder fairly satisfactory. Daily discharge ascertained by applying to rating table the mean daily gage height obtained from inspecting recorder graph, or, after May 15, by applying the occasional daily gage readings. Records good November to May, fair June to August.

Discharge measurements of Clear Creek at Oak Grove road, near Wapinitia, Oreg., during the period Nov. 1, 1917, to Dec. 3, 1918.

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---------|-----------------------|--------------|-----------------|---------|----------------------|--------------|-----------------|
| | | <i>Feet.</i> | <i>Sec.-ft.</i> | | | <i>Feet.</i> | <i>Sec.-ft.</i> |
| Nov. 1 | C. L. Batchelder..... | 0.47 | 16.4 | June 4 | C. E. Stricklin..... | 0.62 | 31.5 |
| Jan. 9 | C. E. Stricklin..... | 1.38 | 120 | July 16 | do..... | .48 | 20.0 |
| Apr. 11 | do..... | .95 | 78 | Dec. 3 | F. F. Henshaw..... | .47 | 19.4 |
| May 1 | do..... | .85 | 63 | | | | |

• Assistant to State engineer.

Daily discharge, in second-feet, of Clear Creek at Oak Grove road near Wapinitia, Oreg., for the year ending Sept. 30, 1918.

| Day. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. |
|---------|------|------|------|------|------|------|------|-------|-------|------|
| 1..... | 17 | | 154 | 126 | 70 | 83 | 62 | | | |
| 2..... | 18 | | 146 | 116 | 67 | 81 | 64 | | | |
| 3..... | 18 | | 139 | 115 | 70 | 78 | 64 | | | |
| 4..... | 18 | | 162 | 138 | 70 | 76 | | 33 | | |
| 5..... | 18 | | 154 | 146 | 62 | 75 | | | | |
| 6..... | 18 | | 146 | 186 | 62 | 73 | | | | 30 |
| 7..... | 18 | 30 | 137 | 178 | 64 | 72 | | | | |
| 8..... | 18 | | 129 | 175 | 61 | 73 | | | | |
| 9..... | 18 | | 121 | 166 | 60 | 73 | | | | |
| 10..... | 18 | | 115 | 157 | 60 | 75 | 60 | | | 20 |
| 11..... | 18 | | 112 | 146 | 60 | 78 | | | | |
| 12..... | 19 | | 139 | 137 | 58 | 78 | | | | |
| 13..... | 19 | | 146 | 130 | 58 | 72 | | | | |
| 14..... | 19 | | 146 | 119 | 56 | 60 | | | | |
| 15..... | 18 | 34 | 154 | 116 | 55 | 62 | | | | |
| 16..... | 19 | 33 | 146 | 112 | 56 | 66 | 55 | | 20 | |
| 17..... | 19 | 46 | 146 | 110 | 56 | 67 | | | | |
| 18..... | 19 | 102 | 162 | | 56 | 67 | | | | |
| 19..... | 19 | 202 | 154 | | 56 | 66 | | | | |
| 20..... | 19 | 194 | 146 | | 56 | 66 | | | | |
| 21..... | 19 | 162 | 139 | | 56 | 66 | | | | |
| 22..... | | 154 | 133 | | 62 | 66 | | | | |
| 23..... | | 162 | 127 | 90 | 66 | 67 | | | | |
| 24..... | | 139 | 127 | | 66 | 67 | 40 | | | |
| 25..... | | 120 | 162 | | 70 | 67 | | | | |
| 26..... | 18 | 132 | 146 | | 72 | 66 | | | | 19 |
| 27..... | | 170 | 139 | | 72 | 64 | | | | |
| 28..... | | 194 | 139 | | 72 | 64 | | | | |
| 29..... | | 202 | 146 | | 75 | 62 | | | | |
| 30..... | 60 | 186 | 138 | | 78 | 62 | | | 20 | |
| 31..... | | 170 | 121 | | 81 | | | | | |

• Interpolated.

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

Monthly discharge of Clear Creek at Oak Grove road, near Wapinitia, Oreg., for the year ending Sept. 30, 1918,

| Month. | Discharge in second-feet. | | | Run-off in acre-feet. |
|-----------------|---------------------------|----------|-------|-----------------------|
| | Maximum. | Minimum. | Mean. | |
| November..... | | 17 | 19.7 | 1,170 |
| December..... | 202 | | 91.0 | 5,608 |
| January..... | 162 | 112 | 141 | 8,670 |
| February..... | 186 | | 120 | 6,660 |
| March..... | 81 | 55 | 63.9 | 3,920 |
| April..... | 83 | 60 | 68.7 | 4,150 |
| May..... | | | 50.0 | 3,070 |
| June..... | | | 28.0 | 1,670 |
| July..... | | | 22.0 | 1,350 |
| August..... | | | 19.0 | 1,170 |
| September..... | | | 18.0 | 1,070 |
| The period..... | | | | 38,500 |

^a Estimated.

GATE CREEK NEAR WAMIC, OREG.

LOCATION.—In sec. 33, T. 4 S., R. 12 E., at Mulvany Bros.' sawmill, 2 miles below a possible reservoir site and 5 miles southwest of Wamic, Wasco County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—October 7, 1917, to September 30, 1918, when station was discontinued.

GAGE.—Vertical staff on left bank, about 600 feet below a wagon bridge; read by Myrtle Mulvany.

DISCHARGE MEASUREMENTS.—Made by wading.

CHANNEL AND CONTROL.—Control not well defined. Banks of earth overgrown with brush.

EXTREMES OF DISCHARGE.—Maximum stage recorded, 3.3 feet January 3 and 15 (discharge, estimated from extension of rating curve, 122 second-feet). Minimum discharge probably occurred in August.

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

DIVERSIONS.—Three small ditches divert above station. Ordinarily water is not diverted in an appreciable quantity until June.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent until August 3, when a dam put in creek below gage caused backwater. Rating curve well defined below 20 second-feet. Gage read to hundredths once daily. Daily discharge ascertained by applying daily gage height to rating table. Records good except December to February, for which period they are poor on account of poor definition of rating curve at high stages.

COOPERATION.—Records furnished by State engineer.

Discharge measurements of Gate Creek near Wamic, Oreg., during the year ending Sept. 30, 1918.

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---------|------------------------------------|--------------|-----------------|---------|----------------------|--------------|-----------------|
| | | <i>Feet.</i> | <i>Sec.-ft.</i> | | | <i>Feet.</i> | <i>Sec.-ft.</i> |
| Oct. 7 | C. E. Stricklin ^a | 0.58 | 1.61 | May 2 | C. E. Stricklin..... | 1.24 | 10.8 |
| Mar. 30 | H. K. Donnelly ^a | 1.54 | 22.5 | June 6 |do..... | .96 | 6.4 |
| Apr. 12 | C. E. Stricklin..... | 1.40 | 14.9 | Aug. 27 |do..... | .98 | .41 |

^a Assistant to State engineer.

Daily discharge, in second-feet, of Gate Creek near Wamic, Oreg., for the year ending Sept. 30, 1918.

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. |
|-----|------|-------|------|------|-------|------|-------|------|-------|-------|
| 1 | | 2.9 | 3.7 | 64 | 50 | 30 | 20 | 12 | 6.4 | 1.3 |
| 2 | | 2.0 | 2.9 | 53 | 50 | 30 | 19 | 12 | 6.1 | 1.3 |
| 3 | | 2.2 | 3.0 | 122 | 66 | 30 | 18 | 11 | 6.0 | 1.3 |
| 4 | 1.6 | 2.4 | 2.9 | 118 | 65 | 30 | 18 | 11 | 5.9 | 1.3 |
| 5 | | 2.4 | 2.9 | 56 | 80 | 29 | 17 | 11 | 5.6 | 1.2 |
| 6 | | 2.4 | 2.9 | 57 | 80 | 29 | 16 | 10 | 5.3 | 1.2 |
| 7 | 1.6 | 2.4 | 3.0 | 56 | 86 | 28 | 16 | 10 | 5.0 | 1.2 |
| 8 | 1.6 | 2.3 | 3.3 | 61 | 100 | 28 | 16 | 12 | 5.3 | 1.0 |
| 9 | 1.6 | 2.3 | 3.4 | 68 | 107 | 26 | 15 | 11 | 5.2 | 1.2 |
| 10 | 1.6 | 2.3 | 3.3 | 37 | 100 | 26 | 15 | 11 | 5.2 | 1.0 |
| 11 | 1.6 | 2.4 | 3.3 | 69 | 100 | 26 | 15 | 11 | 5.0 | 1.6 |
| 12 | 1.6 | 2.4 | 3.5 | 94 | 80 | 26 | 15 | 10 | 4.8 | 1.5 |
| 13 | 1.6 | 2.4 | 3.6 | 94 | 86 | 27 | 15 | 10 | 4.3 | 1.3 |
| 14 | 1.6 | 2.4 | 6.9 | 121 | 90 | 26 | 14 | 12 | 3.6 | 1.2 |
| 15 | 1.7 | 2.4 | 8.0 | 122 | 93 | 26 | 14 | 11 | 3.2 | 1.0 |
| 16 | 1.7 | 2.4 | 9.0 | 93 | 74 | 26 | 14 | 10 | 2.6 | 1.0 |
| 17 | 1.8 | 2.4 | 10 | 93 | 56 | 26 | 12 | 10 | 2.2 | 1.0 |
| 18 | 1.8 | 2.5 | 10 | 100 | 55 | 26 | 13 | 10 | 1.8 | 1.0 |
| 19 | 1.8 | 2.5 | 12 | 107 | 53 | 22 | 13 | 10 | 1.6 | .8 |
| 20 | 1.7 | 2.5 | 12 | 93 | 53 | 20 | 12 | 9.6 | 1.6 | .8 |
| 21 | 1.8 | 2.5 | 15 | 82 | 49 | 22 | 12 | 9.2 | 1.6 | 1.8 |
| 22 | 1.8 | 2.5 | 16 | 79 | 48 | 22 | 12 | 8.8 | 1.6 | 1.6 |
| 23 | 1.7 | 2.5 | 35 | 66 | 45 | 22 | 12 | 8.4 | 2.6 | 1.6 |
| 24 | 1.7 | 2.6 | 39 | 74 | 22 | 22 | 12 | 8.0 | 2.2 | 1.5 |
| 25 | 1.8 | 2.7 | 40 | 75 | 24 | 22 | 12 | 7.7 | 1.8 | 1.2 |
| 26 | 1.8 | 2.8 | 45 | 80 | 26 | 22 | 12 | 7.4 | 1.6 | 1.2 |
| 27 | 1.9 | 2.8 | 65 | 68 | 30 | 22 | 12 | 7.0 | 1.6 | 1.0 |
| 28 | 1.8 | 2.9 | 68 | 65 | 29 | 22 | 12 | 7.0 | 1.6 | 1.0 |
| 29 | 1.7 | 3.1 | 77 | 68 | ..... | 22 | 12 | 6.7 | 1.5 | 1.0 |
| 30 | 1.8 | 3.3 | 68 | 71 | ..... | 20 | 12 | 6.7 | 1.3 | .8 |
| 31 | 2.0 | ..... | 65 | 62 | ..... | 20 | ..... | 6.4 | ..... | .8 |

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

Monthly discharge of Gate Creek near Wamic, Oreg., for the year ending Sept. 30, 1918.

| Month. | Discharge in second-feet. | | | Run-off in acre-feet. |
|-----------|---------------------------|----------|-------|-----------------------|
| | Maximum. | Minimum. | Mean. | |
| October | 2.0 | 1.6 | 1.70 | 195 |
| November | 3.3 | 2.0 | 2.49 | 148 |
| December | 77 | 2.9 | 20.7 | 1,370 |
| January | 122 | 53 | 81.9 | 5,049 |
| February | 107 | 22 | 63.8 | 3,540 |
| March | 30 | 20 | 25.0 | 1,549 |
| April | 20 | 12 | 14.2 | 845 |
| May | 12 | 6.4 | 9.61 | 591 |
| June | 6.4 | 1.3 | 3.48 | 207 |
| July | 1.6 | .8 | 1.16 | 71 |
| August | ..... | ..... | 6.60 | 37 |
| September | ..... | ..... | 6.100 | 60 |
| The year | 122 | ..... | 18.6 | 13,500 |

^a Estimated.

TYGH CREEK AT TYGH VALLEY, OREG.

LOCATION.—In sec. 4, T. 4 S., R. 13 E., 1½ miles above mouth of creek and 100 yards west of Tygh Valley post office, Wasco County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—June 9 to October 31, 1913; May 13 to December 2, 1918; records fragmentary.

GAGE.—Vertical staff fastened to tree on right bank; read by Claude Hart. Prior to 1918 gage was at highway bridge a quarter of a mile below.

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

CHANNEL AND CONTROL.—Bed and control composed of sand and gravel; shifting. Banks of earth.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period, 2.1 feet May 13 (discharge, 94 second-feet); minimum stage recorded, 1.54 feet August 31 (discharge, 15 second-feet).

1911-1918: Maximum stage recorded, 2.55 feet May 26, 1913 (discharge, 354 second-feet); minimum stage recorded, 0.80 foot August 31 to September 4, 1911 (discharge, 11 second-feet).

DIVERSIONS.—A considerable area irrigated above the station; practically no diversions below.

REGULATION.—None.

ACCURACY.—Stage-discharge relation not permanent. Rating curves used as follows:

May 25 to August 5, well defined; August 6 to 31, shifting-control method used; October 12 to December 2, fairly well defined. Gage read once daily to hundredths. Daily discharge ascertained by applying daily gage height to rating table, and interpolating for days of no gage reading. Records good.

Discharge measurements of Tygh Creek at Tygh Valley, Oreg., during the period May 13 to Dec. 2, 1918.

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---------|------------------------------------|--------------|-----------------|---------|-----------------------|--------------|-----------------|
| | | <i>Feet.</i> | <i>Sec.-ft.</i> | | | <i>Feet.</i> | <i>Sec.-ft.</i> |
| May 13 | C. E. Stricklin ^a | 2.10 | 92 | July 31 | C. E. Stricklin..... | 1.60 | 20.2 |
| 25 | do..... | 1.97 | 69 | Aug. 26 | do..... | 1.58 | 16.4 |
| June 28 | E. C. Briggs..... | 1.75 | 33.1 | Oct. 12 | C. L. Batchelder..... | 1.62 | 17.9 |

^a Assistant to State engineer.

Daily discharge, in second-feet, of Tygh Creek at Tygh Valley, Oreg., for the period May 13 to Dec. 2, 1918.

| Day. | May. | June. | July. | Aug. | Oct. | Nov. | Dec. |
|---------|------|-----------------|-----------------|-----------------|-----------------|------|------|
| 1..... | | 70 | 30 | 20 | | 27 | 33 |
| 2..... | | 68 | 29 | 20 | | 25 | 33 |
| 3..... | | 66 | 28 | 20 | | 28 | |
| 4..... | | 64 | 28 | 20 | | 30 | |
| 5..... | | 66 | 28 | 20 | | 25 | |
| 6..... | | 70 | 27 | 19 | | 27 | |
| 7..... | | 74 | ^a 26 | 18 | | 26 | |
| 8..... | | 70 | 26 | 18 | | 25 | |
| 9..... | | 68 | 25 | 18 | | 27 | |
| 10..... | | 66 | 25 | 18 | | 28 | |
| 11..... | | 64 | 25 | ^a 18 | | 30 | |
| 12..... | | 63 | 25 | 18 | 17 | 35 | |
| 13..... | 94 | 61 | 25 | 18 | ^a 17 | 30 | |
| 14..... | | 61 | ^a 25 | 18 | 17 | 33 | |
| 15..... | | 59 | 25 | 18 | 16 | 59 | |
| 16..... | | 52 | 25 | 17 | 21 | 56 | |
| 17..... | | 50 | 24 | 18 | 25 | 49 | |
| 18..... | | 49 | 24 | ^a 18 | 35 | 43 | |
| 19..... | | 49 | 23 | 18 | 28 | 40 | |
| 20..... | | 46 | 23 | 18 | 25 | 40 | |
| 21..... | | 46 | ^a 23 | 18 | 24 | 38 | |
| 22..... | | 40 | 23 | 18 | 25 | 38 | |
| 23..... | | ^a 39 | 23 | 18 | 24 | 35 | |
| 24..... | | 38 | 22 | 18 | 22 | 35 | |
| 25..... | 70 | 38 | 22 | ^a 17 | 24 | 35 | |
| 26..... | 66 | 36 | 22 | 16 | 59 | 35 | |
| 27..... | 63 | 35 | 22 | 16 | 70 | 38 | |
| 28..... | 61 | 34 | ^a 22 | 16 | 59 | 33 | |
| 29..... | 63 | 33 | 22 | 16 | 43 | 36 | |
| 30..... | 66 | 32 | 21 | 15 | 30 | 30 | |
| 31..... | 70 | | 20 | 15 | 22 | | |

^a Interpolated.

Monthly discharge of Tygh Creek at Tygh Valley, Oreg., for the period May 25 to Nov. 30, 1918.

| Month. | Discharge in second-feet. | | | Run-off in acre-feet. |
|--------------------|---------------------------|----------|-------|-----------------------|
| | Maximum. | Minimum. | Mean. | |
| May 25-31..... | 70 | 61 | 65.6 | 911 |
| June..... | 74 | 32 | 52.4 | 3,180 |
| July..... | 36 | 20 | 24.5 | 1,516 |
| August..... | 20 | 15 | 17.8 | 1,080 |
| October 12-31..... | 70 | 17 | 30.2 | 1,200 |
| November..... | 59 | 25 | 34.2 | 2,640 |

FIFTEENMILE CREEK NEAR DUFUR, OREG.

LOCATION.—In NW. $\frac{1}{4}$ sec. 21, T. 2 S., R. 12 E., on road to Friend, 10 miles south of Dufur, Wasco County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—January 1 to September 30, 1918.

GAGE.—Vertical staff on log abutment at left of creek; read by W. R. Ragsdale.

DISCHARGE MEASUREMENTS.—Made by wading.

CHANNEL AND CONTROL.—Gravel bar and brush foundation of old dam 50 feet below gage; fairly permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded, 1.70 feet, January 2 (discharge, 113 second-feet); minimum stage recorded, 0.46 foot, August 28 (discharge, 0.6 second-foot).

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

DIVERSIONS.—About 1,150 acres irrigated above station.

REGULATION.—None.

ACCURACY.—Stage-discharge relation fairly permanent. Rating curve well defined.

Gage read to hundredths once daily, except Sundays. Daily discharge ascertained by applying daily gage height to rating table and interpolating for days of no gage reading. Records good.

COOPERATION.—Field data furnished by State engineer.

Discharge measurements of Fifteenmile Creek near Dufur, Oreg., during the year ending Sept. 30, 1918.

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---------|----------------------|--------------|------------|---------|----------------------|--------------|------------|
| | | Feet. | Sec.-ft. | | | Feet. | Sec.-ft. |
| Jan. 12 | C. E. Stricklin..... | 1.35 | 75.3 | July 5 | C. E. Stricklin..... | 0.62 | 3.2 |
| Mar. 29 | H. K. Donnelly..... | .90 | 32.4 | July 27 |do..... | .52 | 4.2 |
| Apr. 9 | C. E. Stricklin..... | .85 | 25.7 | | | | |

* Assistant to State engineer.

Daily discharge, in second-feet, of Fifteenmile Creek near Dufur, Oreg., for the year ending Sept. 30, 1918.

| Day. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---------|-------|------|------|------|------|-------|-------|------|-------|
| 1..... | a 125 | 54 | 36 | 36 | 36 | 31 | 10 | 7 | 5 |
| 2..... | 113 | 60 | 38 | 36 | 36 | b 31 | 10 | 7 | 5 |
| 3..... | 102 | b 84 | b 38 | 35 | 40 | 31 | 10 | 6 | 5 |
| 4..... | 109 | 48 | 38 | 33 | 46 | 31 | b 10 | b 6 | 4 |
| 5..... | 102 | 50 | 36 | 33 | b 45 | 31 | 10 | 7 | 4 |
| 6..... | b 102 | 80 | 36 | 33 | 44 | 36 | 17 | 6 | 4 |
| 7..... | 102 | 91 | 36 | 33 | 44 | 38 | b 14 | 6 | 4 |
| 8..... | 95 | 80 | 36 | 33 | 44 | 40 | 10 | 5 | 5 |
| 9..... | 91 | 76 | 35 | 33 | 44 | b 40 | 10 | 6 | 6 |
| 10..... | 80 | b 71 | b 33 | 33 | 40 | 40 | 10 | 5 | 6 |
| 11..... | 80 | 66 | 31 | 32 | 40 | 38 | 10 | b 5 | 6 |
| 12..... | 76 | 60 | 31 | 33 | b 38 | 36 | 10 | 5 | 5 |
| 13..... | b 74 | 60 | 31 | 31 | 36 | 35 | b 10 | 5 | 4 |
| 14..... | 72 | 38 | 31 | b 31 | b 37 | 33 | 10 | 5 | 40 |
| 15..... | 70 | 52 | 31 | 31 | 38 | 31 | 10 | 7 | 24 |
| 16..... | 70 | 50 | 31 | 31 | 38 | b 31 | 9 | 5 | 7 |
| 17..... | 70 | b 48 | b 31 | 31 | 40 | 31 | 7 | 6 | 7 |
| 18..... | 72 | 46 | 31 | 31 | 40 | 33 | 7 | b 6 | 7 |
| 19..... | 70 | 46 | 31 | 31 | b 39 | 31 | 7 | 5 | 6 |
| 20..... | b 67 | 40 | 31 | 31 | 38 | 31 | 7 | 6 | 4 |
| 21..... | 64 | 40 | 31 | b 31 | 38 | 23 | b 8 | 6 | 5 |
| 22..... | 60 | b 40 | 33 | 33 | 36 | 21 | 8 | 6 | 5 |
| 23..... | 60 | 40 | 33 | 31 | 31 | b 20 | 9 | 6 | 6 |
| 24..... | 60 | b 39 | b 34 | 33 | 31 | 18 | 8 | 5 | 6 |
| 25..... | 60 | 38 | 36 | 33 | 29 | 21 | 11 | b 5 | 6 |
| 26..... | 58 | 36 | 36 | 33 | b 28 | 17 | 10 | 4 | 5 |
| 27..... | b 57 | 36 | 36 | 33 | 28 | 21 | 7 | 4 | 6 |
| 28..... | 56 | 36 | 35 | b 33 | 28 | 17 | b 6 | 4 | 5 |
| 29..... | 56 | 36 | 36 | b 34 | 31 | 14 | 6 | 5 | 5 |
| 30..... | 54 | 36 | 35 | b 35 | b 31 | 10 | 5 | 5 | 5 |
| 31..... | 50 | 36 | 36 | 36 | 31 | 31 | 6 | 5 | 5 |

a Estimated by comparison with flow of Ramsey Creek.

b Interpolated.

Monthly discharge of Fifteenmile Creek near Dufur, Oreg., for the year ending Sept. 30, 1918.

| Month. | Discharge in second-feet. | | | Run-off in acre-feet. |
|-----------------|---------------------------|----------|-------|-----------------------|
| | Maximum. | Minimum. | Mean. | |
| January..... | a 125 | 50 | 76.7 | 4,720 |
| February..... | 91 | 36 | 53.4 | 2,970 |
| March..... | 38 | 31 | 33.9 | 2,060 |
| April..... | 36 | 31 | 32.7 | 1,960 |
| May..... | 46 | 23 | 36.9 | 2,270 |
| June..... | 40 | 10 | 28.7 | 1,710 |
| July..... | 17 | 5 | 9.1 | 500 |
| August..... | 7 | 4 | 5.5 | 338 |
| September..... | 40 | 4 | 7.0 | 417 |
| The period..... | | | | 17,000 |

a Estimated.

Klickitat River Basin.

Klickitat River near Glenwood, Wash.

LOCATION.—In NE. $\frac{1}{4}$ sec. 14, T. 7 N., R. 12 E., just below Dairy Creek, $2\frac{1}{2}$ miles below southern boundary of 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, 1918, at present site; October 29, 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; inspected by A. G. Hanson. Prior to July 19, 1910, several vertical staffs were used.

DISCHARGE MEASUREMENTS.—Made from cable just below gage.

CHANNEL AND CONTROL.—Heavy gravel; shifts during high water.

EXTREMES OF DISCHARGE.—Maximum stage during year from water-stage recorder 4.2 feet probably December 29 (recorder clock not running) (discharge, 6,20, second-feet); minimum stage from water-stage recorder, 0.20 foot at 7 p. m., December 7 (discharge, 330 second-feet).

1909-1918: Maximum stage recorded, 5.20 feet on original gage, November 24, 1909 (discharge, estimated by extension of rating curve, 6,250 second-feet). Minimum discharge, 285 second-feet at 11 a. m. Jan. 22, 1916 (gage height, 0.55 foot).

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

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed during December flood. Two rating curves used as follows: October 1 to December 17, well defined; January 9 to September 30, fairly well defined. The gage-height record was excellent except for breaks during November, December, and January, when recorder clock stopped. Daily discharge ascertained by applying to rating table mean daily gage heights obtained by inspecting recorder graph, or in time of considerable fluctuation by subdividing days, except for periods when recorder clock was not running, for which it was ascertained by comparison with flow of White Salmon River at Husum. Records good.

Discharge measurements of Klickitat River near Glenwood, Wash., during the year ending Sept. 30, 1918.

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---------|-------------------|--------------|-----------------|----------|----------------------|--------------|-----------------|
| | | <i>Feet.</i> | <i>Sec.-ft.</i> | | | <i>Feet.</i> | <i>Sec.-ft.</i> |
| Oct. 14 | A. G. Hanson..... | 0.43 | 446 | May 26 | A. G. Hanson..... | 0.93 | 1,140 |
| Jan. 9 |do..... | 1.69 | 2,060 | June 16 |do..... | 1.12 | 1,380 |
| Mar. 29 |do..... | .71 | 922 | July 1 | Hanson and Henshaw.. | .73 | 917 |
| Apr. 18 |do..... | .82 | 1,030 | Sept. 15 | A. G. Hanson..... | .26 | 546 |
| May 5 |do..... | 1.56 | 1,860 | | | | |

Daily discharge, in second-feet, of Kllickitat River near Glenwood, Wash., for the year ending Sept. 30, 1918.

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May | June. | July. | Aug. | Sept. |
|---------|------|------|-------|-------|-------|-------|-------|-------|-------|-------|------|-------|
| 1..... | 494 | | 416 | | 784 | 758 | 1,120 | 1,670 | 1,490 | 947 | 734 | 605 |
| 2..... | 494 | | 386 | | 812 | 752 | 1,070 | 1,800 | 1,310 | 956 | 698 | 600 |
| 3..... | 494 | | 380 | | 920 | 752 | 1,020 | 2,000 | 1,260 | 912 | 650 | 585 |
| 4..... | 488 | | 380 | | 1,110 | 746 | 1,000 | 2,070 | 1,260 | 888 | 640 | 580 |
| 5..... | 488 | 425 | 360 | 2,600 | 1,200 | 728 | 992 | 1,930 | 1,430 | 888 | 630 | 585 |
| 6..... | 488 | | 365 | | 1,310 | 710 | 992 | 1,740 | 1,670 | 888 | 635 | 575 |
| 7..... | 488 | | 340 | | 1,260 | 728 | 992 | 1,670 | 1,860 | 880 | 640 | 590 |
| 8..... | 506 | | 390 | | 1,180 | 728 | 1,090 | 1,610 | 1,930 | 880 | 620 | 590 |
| 9..... | 506 | | 365 | 2,070 | 1,130 | 716 | 1,190 | 1,560 | 1,860 | 880 | 615 | 600 |
| 10..... | 494 | | 355 | 1,860 | 1,160 | 710 | 1,260 | 1,430 | 2,000 | 864 | 674 | 600 |
| 11..... | 482 | | 360 | 1,860 | 1,120 | 722 | 1,310 | 1,370 | 1,930 | 833 | 630 | 595 |
| 12..... | 464 | | 386 | 1,930 | 1,090 | 704 | 1,370 | 1,370 | 1,860 | 805 | 630 | 600 |
| 13..... | 476 | | 608 | 1,740 | 1,050 | 692 | 1,260 | 1,490 | 1,930 | 805 | 630 | 625 |
| 14..... | 476 | 400 | 877 | 1,670 | 1,010 | 686 | 1,200 | 1,930 | 1,800 | 819 | 625 | 674 |
| 15..... | 476 | | 676 | 1,550 | 983 | 686 | 1,140 | 1,930 | 1,490 | 920 | 605 | 630 |
| 16..... | 458 | | 913 | 1,490 | 983 | 698 | 1,110 | 1,740 | 1,370 | 1,010 | 590 | 600 |
| 17..... | 440 | | 1,450 | 1,490 | 947 | 716 | 1,080 | 1,670 | 1,370 | 1,020 | 575 | 590 |
| 18..... | 434 | | | 1,610 | 912 | 770 | 1,050 | 1,550 | 1,310 | 1,020 | 575 | 590 |
| 19..... | 434 | 398 | | 1,430 | 888 | 740 | 1,080 | 1,430 | 1,260 | 920 | 580 | 605 |
| 20..... | 440 | 404 | | 1,370 | 840 | 734 | 1,170 | 1,370 | 1,260 | 791 | 585 | 600 |
| 21..... | 446 | 422 | | 1,310 | 752 | 734 | 1,310 | 1,260 | 1,310 | 746 | 600 | 570 |
| 22..... | 440 | 410 | | 1,260 | 805 | 880 | 1,550 | 1,200 | 1,370 | 752 | 615 | 560 |
| 23..... | 440 | 404 | | 1,260 | 848 | 880 | 1,670 | 1,200 | 1,310 | 777 | 656 | 540 |
| 24..... | 440 | 398 | | 1,260 | 812 | 920 | 1,670 | 1,190 | 1,260 | 752 | 674 | 540 |
| 25..... | 440 | 392 | 3,100 | 1,200 | 802 | 992 | 1,610 | 1,160 | 1,150 | 724 | 866 | 540 |
| 26..... | 434 | 380 | | 1,180 | 791 | 983 | 1,490 | 1,130 | 1,089 | 722 | 680 | 550 |
| 27..... | 428 | 375 | | 1,140 | 780 | 965 | 1,430 | 1,120 | 1,070 | 704 | 615 | 550 |
| 28..... | 428 | 380 | | 1,120 | 770 | 948 | 1,490 | 1,120 | 1,610 | 710 | 606 | 560 |
| 29..... | | 386 | | 1,090 | | 956 | 1,550 | 1,260 | 938 | 704 | 620 | 560 |
| 30..... | | 425 | 416 | 1,040 | | 1,050 | 1,670 | 1,560 | 938 | 740 | 620 | 560 |
| 31..... | | | | 826 | | 1,130 | | 1,670 | | 728 | 615 | |

a Interpolated.

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

Monthly discharge of Kllickitat River near Glenwood, Wash., for the year ending Sept. 30, 1918.

[Drainage area, 356 square miles.]

| Month. | Discharge in second-feet. | | | | Run-off. | |
|----------------|---------------------------|----------|-------|------------------|----------|------------|
| | Maximum. | Minimum. | Mean. | Per square mile. | Inches. | Acre-feet. |
| October..... | 506 | 425 | 461 | 1.29 | 1.49 | 28,300 |
| November..... | | 375 | 406 | 1.14 | 1.27 | 24,200 |
| December..... | 5,500 | 340 | 1,690 | 4.75 | 5.45 | 104,000 |
| January..... | | 826 | 1,730 | 4.86 | 5.60 | 106,000 |
| February..... | 1,810 | 752 | 966 | 2.71 | 2.82 | 53,600 |
| March..... | 1,130 | 686 | 803 | 2.26 | 2.61 | 49,400 |
| April..... | 1,676 | 992 | 1,260 | 3.54 | 3.95 | 75,000 |
| May..... | 2,070 | 1,120 | 1,520 | 4.27 | 4.92 | 93,500 |
| June..... | 2,000 | 938 | 1,440 | 4.04 | 4.51 | 85,700 |
| July..... | 1,020 | 710 | 839 | 2.36 | 2.72 | 51,600 |
| August..... | 734 | 575 | 650 | 1.77 | 2.04 | 38,700 |
| September..... | 674 | 540 | 585 | 1.64 | 1.83 | 34,800 |
| The year..... | 5,500 | 340 | 1,030 | 2.89 | 39.24 | 745,000 |

BIG MUDDY CREEK NEAR GLENWOOD, WASH.

LOCATION.—In NE. $\frac{1}{4}$ sec. 3, T. 8 N., R. 12 E., a few hundred feet above mouth of Cougar Creek and 9 miles north of Glenwood, Klickitat County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—November 12, 1916, to September 30, 1918, when station was discontinued. Record almost directly comparable with that obtained about 3 miles above mouth August 28 to November 12, 1916.

WAGE.—Stevens continuous water-stage recorder on right bank. Location changed March 30, 1918, about 200 feet below previous site. Observer, A. G. Hanson.

DISCHARGE MEASUREMENTS.—Made from foot log just above gage.

CHANNEL AND CONTROL.—Heavy boulders; shifting. Velocities very high; bottom rough. Several channels at high stages.

EXTREMES OF DISCHARGE.—Maximum stage during year from high-water marks, about 4.5 feet during flood of December (discharge not determined); minimum stage from water-stage recorder, 1.83 feet December 8 (discharge, 65 second-feet).

1916-1918: Maximum stage same as for 1918; minimum stage recorded, 1.21 feet April 3, 1917 (discharge, 35 second-feet).

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

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed frequently during the year. Several rating curves were used, based on fourteen discharge measurements. Water-stage recorder did not operate satisfactorily there being many breaks in the record. Daily discharge ascertained by applying to rating table mean daily gage height obtained by inspecting recorder graph, except for periods when recorder did not operate for which it was ascertained by comparison with flow of Klickitat River below Big Muddy Creek; maximum and minimum points from the recorder sheet aided materially in this comparison. Records good.

Discharge measurements of Big Muddy Creek near Glenwood, Wash., during the period Oct. 1, 1917, to Nov. 6, 1918.

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---------|-------------------|--------------|-----------------|---------|--------------------|--------------|-----------------|
| | | <i>Feet.</i> | <i>Sec.-ft.</i> | | | <i>Feet.</i> | <i>Sec.-ft.</i> |
| Oct. 7 | A. G. Hanson..... | 2.12 | 161 | June 9 | A. G. Hanson..... | 2.59 | 261 |
| 21 |do..... | 2.00 | 78 | 23 |do..... | 2.57 | 322 |
| Nov. 15 |do..... | 1.78 | 56 | 30 | Henshaw and Hanson | 2.31 | 240 |
| Mar. 30 |do..... | 2.00 | 101 | July 28 | A. G. Hanson..... | 1.91 | 200 |
| Apr. 14 |do..... | 2.04 | 104 | Aug. 14 |do..... | 2.01 | 230 |
| 28 |do..... | 2.07 | 109 | Oct. 8 |do..... | 1.91 | 90 |
| May 26 |do..... | 2.04 | 112 | Nov. 6 |do..... | 1.28 | 83 |

Daily discharge, in second-feet, of Big Muddy Creek near Glenwood, Wash., for the year ending Sept. 30, 1918.

| Day. | Oct. | Nov. | Dec. | Apr. | May. | June. | July. | Aug. |
|---------|------|------|------|------|------------------|-------|-------|------|
| 1..... | 158 | 69 | 69 | 100 | 132 | | 270 | |
| 2..... | 158 | 69 | 60 | 102 | 152 | | 270 | |
| 3..... | 158 | 116 | 64 | 105 | 185 | | 255 | |
| 4..... | 158 | 109 | 64 | 112 | 185 | | 240 | |
| 5..... | 158 | 96 | 67 | 130 | 158 | 175 | 255 | |
| 6..... | 158 | 90 | 64 | 128 | 155 | | 270 | |
| 7..... | 158 | 84 | 64 | 125 | 150 | | 270 | 250 |
| 8..... | 108 | 76 | 65 | | 140 | | 270 | |
| 9..... | 108 | 71 | | | 130 | 250 | 270 | |
| 10..... | 158 | 65 | | | ^a 125 | | 270 | |
| 11..... | 148 | 64 | | 120 | ^a 120 | | 255 | |
| 12..... | 138 | 71 | | | 114 | | | |
| 13..... | 130 | 69 | | | | | | 240 |
| 14..... | 136 | 64 | | 108 | | | | 225 |
| 15..... | 122 | 60 | | 108 | | | | |
| 16..... | 112 | 60 | | 108 | | 275 | | 210 |
| 17..... | 94 | 60 | | 108 | | | | 182 |
| 18..... | 90 | 60 | | 112 | | | | 172 |
| 19..... | 80 | 60 | | 114 | 125 | | | 165 |
| 20..... | 76 | 78 | | | | | 250 | 152 |
| 21..... | 78 | 80 | | | | | | 145 |
| 22..... | 80 | 76 | | | | | | 155 |
| 23..... | 80 | 74 | | | | 315 | | 190 |
| 24..... | 80 | 73 | | 120 | | | | 240 |
| 25..... | 78 | 71 | | | | | | 240 |
| 26..... | 78 | 67 | | | 108 | 300 | | 270 |
| 27..... | 76 | 65 | | | | | | |
| 28..... | 74 | 65 | | 120 | | | 225 | |
| 29..... | 74 | 60 | | 125 | 115 | | 270 | 200 |
| 30..... | 73 | 71 | | 130 | | 285 | 300 | |
| 31..... | 69 | | | | | | 300 | |

^a Interpolated.

NOTE.—Braced figures show mean discharge for periods indicated, estimated by comparison with flow of Klickitat River using maximum and minimum points from recorder sheet.

Monthly discharge of Big Muddy Creek near Glenwood, Wash., for the year ending Sept. 30, 1918.

| Month. | Discharge in second-feet. | | | Run-off in acre-feet. |
|-------------------|---------------------------|----------|-------|--------------------------|
| | Maximum. | Minimum. | Mean. | |
| October..... | 188 | 69 | 115 | 7,070 |
| November..... | 116 | 60 | 73.1 | 4,800 |
| December 1-8..... | 69 | 60 | 64.6 | 1,020 |
| April..... | | | 117 | 6,960 |
| May..... | | | 131 | 8,060 |
| June..... | | | 254 | 15,100 |
| July..... | | | 258 | 15,900 |
| August..... | | | 221 | 13,600 |

HOOD RIVER BASIN.

HOOD RIVER AT POWERDALE, NEAR HOOD RIVER, OREG.

LOCATION.—In NE. $\frac{1}{4}$ sec. 36, T. 3 N., R. 10 E., at Powerdale, three-quarters of a mile south of Hood River, Hood River County, above discharge of tailrace of Powerdale plant of Pacific Power & Light Co., and $1\frac{1}{2}$ miles above mouth of stream.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—March 31, 1913, to September 30, 1918.

GAGE.—Vertical staff on right bank opposite power plant, about half a mile above railroad bridge, used March 31, 1913, to September 30, 1914, and since December 21, 1915; read by A. Rogers. Vertical staff on left bank just below bridge of Mount Hood Railway, October 1, 1914, to July 26, 1915; water-stage recorder at same location July 27 to December 21, 1915.

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

CHANNEL AND CONTROL.—Rock and boulders; shifts slightly.

EXTREMES OF DISCHARGE.—Maximum stage during year determined from high-water marks, 8.9 feet December 18 or 19 (occurred during night) (discharge, 17,200 second-feet); minimum stage recorded, 1.00 foot at noon September 4 (discharge, 210 second-feet), owing to ponding of water at Dee.

1913-1918: Maximum stage recorded same as for 1918; minimum stage recorded, 1.33 feet September 4, 1915 (discharge, estimated from extension of rating curve, 176 second-feet).

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

DIVERSIONS.—Large diversions for irrigation above station; water for power plant is diverted around upper gage but is returned above the bridge gage. A record of this diversion has been kept (p. 69).

REGULATION.—Water stored at sawmill at Dee causes sudden fluctuations at low water, but this has been much less noticeable since 1916 than in 1914 or 1915.

ACCURACY.—Stage-discharge relation changed December 18. Two well defined rating curves used, applicable October 1 to December 18, and December 19 to September 30. Gage read to quarter-tenths four times daily to August 23; after that date read hourly during daylight and mean of readings used as mean for the day. Daily discharge ascertained by applying mean daily gage height to rating table. Records excellent.

Discharge measurements of Hood River at Powerdale, near Hood River, Oreg., during the year ending Sept. 30, 1918.

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---------|-----------------------|--------------|-----------------|---------|-----------------------|--------------|-----------------|
| | | <i>Feet.</i> | <i>Sec.-ft.</i> | | | <i>Feet.</i> | <i>Sec.-ft.</i> |
| Nov. 23 | R. C. Briggs..... | 1.57 | 331 | Feb. 5 | R. C. Briggs..... | 4.21 | 3,100 |
| Dec. 29 | C. L. Batchelder..... | 6.57 | 9,000 | May 24 | C. L. Batchelder..... | 2.28 | 899 |
| 29 |do..... | 6.13 | 8,100 | June 28 | F. F. Henshaw..... | 1.91 | 637 |
| 30 |do..... | 5.64 | 6,450 | July 18 |do..... | 1.89 | 687 |
| Jan. 14 |do..... | 4.05 | 2,930 | Sept. 2 |do..... | 1.53 | 418 |

Daily discharge, in second-feet, of Hood River at Powerdale, near Hood River, Oreg., for the year ending Sept. 30, 1918.

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|------|------|-------|--------|-------|-------|-------|-------|-------|-------|-------|------|-------|
| 1 | 530 | 400 | 1,420 | 4,120 | 1,530 | 1,140 | 1,430 | 1,140 | 830 | 635 | 545 | 435 |
| 2 | 530 | 370 | 1,060 | 3,500 | 1,530 | 1,140 | 1,330 | 1,230 | 795 | 635 | 575 | 410 |
| 3 | 565 | 430 | 980 | 3,140 | 1,630 | 1,230 | 1,140 | 1,230 | 760 | 635 | 460 | 295 |
| 4 | 495 | 430 | 1,060 | 4,120 | 1,850 | 1,140 | 1,140 | 1,430 | 780 | 605 | 410 | 284 |
| 5 | 530 | 315 | 940 | 3,320 | 2,800 | 1,140 | 1,140 | 1,230 | 795 | 605 | 410 | 254 |
| 6 | 495 | 340 | 1,060 | 3,140 | 4,340 | 1,050 | 1,050 | 1,050 | 970 | 575 | 360 | 275 |
| 7 | 480 | 330 | 860 | 3,900 | 3,900 | 1,050 | 970 | 1,050 | 970 | 545 | 360 | 287 |
| 8 | 460 | 340 | 820 | 3,320 | 2,800 | 1,050 | 1,050 | 970 | 970 | 460 | 360 | 295 |
| 9 | 460 | 310 | 780 | 2,800 | 2,370 | 1,050 | 1,330 | 1,140 | 970 | 487 | 360 | 348 |
| 10 | 430 | 340 | 780 | 2,370 | 2,230 | 1,050 | 1,330 | 970 | 1,050 | 487 | 410 | 315 |
| 11 | 370 | 286 | 740 | 2,510 | 1,970 | 1,050 | 1,260 | 970 | 1,050 | 460 | 460 | 311 |
| 12 | 430 | 400 | 1,820 | 3,320 | 2,100 | 1,050 | 1,230 | 1,140 | 1,140 | 435 | 385 | 311 |
| 13 | 460 | 530 | 5,250 | 2,650 | 1,970 | 1,050 | 1,140 | 970 | 1,050 | 410 | 315 | 385 |
| 14 | 480 | 495 | 5,500 | 3,140 | 1,850 | 970 | 1,140 | 1,140 | 865 | 435 | 315 | 890 |
| 15 | 460 | 400 | 3,140 | 3,320 | 1,740 | 970 | 1,050 | 1,140 | 760 | 460 | 303 | 695 |
| 16 | 430 | 400 | 3,500 | 3,700 | 1,630 | 970 | 1,140 | 1,140 | 695 | 575 | 291 | 487 |
| 17 | 400 | 400 | 8,900 | 3,500 | 1,630 | 1,050 | 1,140 | 1,050 | 695 | 575 | 348 | 435 |
| 18 | 400 | 400 | 13,000 | 3,500 | 1,530 | 1,330 | 1,140 | 1,050 | 635 | 635 | 360 | 435 |
| 19 | 400 | 330 | 12,700 | 2,800 | 1,230 | 1,140 | 1,140 | 1,230 | 635 | 575 | 315 | 435 |
| 20 | 400 | 370 | 5,540 | 2,370 | 1,330 | 1,140 | 1,140 | 1,140 | 635 | 460 | 279 | 410 |
| 21 | 400 | 370 | 3,900 | 2,100 | 1,330 | 1,140 | 1,330 | 1,050 | 695 | 460 | 254 | 410 |
| 22 | 430 | 370 | 5,800 | 1,970 | 1,230 | 1,530 | 1,430 | 970 | 830 | 515 | 303 | 385 |
| 23 | 460 | 370 | 4,340 | 1,850 | 1,330 | 1,430 | 1,330 | 970 | 795 | 635 | 360 | 348 |
| 24 | 430 | 286 | 3,140 | 2,100 | 1,230 | 1,430 | 1,330 | 900 | 760 | 487 | 860 | 348 |
| 25 | 400 | 278 | 2,230 | 2,510 | 1,140 | 1,630 | 1,230 | 865 | 760 | 515 | 410 | 348 |
| 26 | 495 | 400 | 3,500 | 2,100 | 1,330 | 1,530 | 1,140 | 830 | 695 | 487 | 385 | 349 |
| 27 | 430 | 430 | 6,880 | 1,970 | 1,140 | 1,530 | 1,140 | 830 | 695 | 460 | 360 | 360 |
| 28 | 370 | 740 | 12,300 | 1,850 | 1,140 | 1,530 | 1,140 | 880 | 635 | 435 | 307 | 385 |
| 29 | 370 | 1,420 | 8,360 | 2,100 | ..... | 1,430 | 1,140 | 830 | 635 | 460 | 295 | 515 |
| 30 | 370 | 2,490 | 6,600 | 1,850 | ..... | 1,630 | 1,140 | 900 | 605 | 460 | 315 | 385 |
| 31 | 370 | ..... | 5,280 | 1,530 | ..... | 1,530 | ..... | 900 | ..... | 487 | 315 | ..... |

Monthly discharge of Hood River at Powerdale, near Hood River, Oreg., for the year ending Sept. 30, 1918.

| Month. | Discharge in second-feet. | | | Run-off in acre-feet. |
|-----------|---------------------------|----------|-------|-----------------------|
| | Maximum. | Minimum. | Mean. | |
| October | 565 | 370 | 442 | 27,200 |
| November | 2,490 | 278 | 492 | 29,300 |
| December | 13,000 | 740 | 4,260 | 262,000 |
| January | 4,120 | 1,530 | 2,790 | 172,000 |
| February | 4,340 | 1,140 | 1,850 | 103,000 |
| March | 1,630 | 970 | 1,230 | 75,600 |
| April | 1,430 | 970 | 1,190 | 70,800 |
| May | 1,430 | 830 | 1,040 | 64,000 |
| June | 1,140 | 605 | 804 | 47,800 |
| July | 635 | 410 | 519 | 31,900 |
| August | 575 | 254 | 364 | 22,400 |
| September | 830 | 254 | 391 | 23,300 |
| The year | 13,000 | 254 | 1,280 | 929,000 |

Combined daily discharge, in second-feet, of Hood River and Pacific Power & Light Co.'s tailrace at Powerdale, near Hood River, Oreg., for the year ending Sept. 30, 1918.

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---------|------|-------|--------|-------|-------|-------|-------|-------|-------|-------|------|-------|
| 1..... | 582 | 483 | 1,420 | 4,120 | 1,530 | 1,140 | 1,490 | 1,190 | 838 | 635 | 628 | 498 |
| 2..... | 579 | 450 | 1,060 | 3,500 | 1,530 | 1,140 | 1,390 | 1,290 | 859 | 635 | 658 | 421 |
| 3..... | 615 | 510 | 980 | 3,140 | 1,630 | 1,230 | 1,200 | 1,290 | 771 | 635 | 543 | 385 |
| 4..... | 544 | 513 | 1,060 | 4,120 | 1,850 | 1,140 | 1,200 | 1,480 | 812 | 605 | 490 | 354 |
| 5..... | 579 | 401 | 940 | 3,320 | 2,800 | 1,140 | 1,170 | 1,230 | 850 | 605 | 493 | 344 |
| 6..... | 544 | 426 | 1,060 | 3,140 | 4,340 | 1,050 | 1,100 | 1,110 | 981 | 575 | 443 | 366 |
| 7..... | 482 | 420 | 860 | 3,900 | 3,900 | 1,050 | 970 | 1,100 | 981 | 597 | 443 | 377 |
| 8..... | 482 | 437 | 820 | 3,320 | 2,800 | 1,050 | 1,100 | 1,020 | 981 | 536 | 443 | 381 |
| 9..... | 550 | 407 | 780 | 2,800 | 2,370 | 1,050 | 1,330 | 1,190 | 1,050 | 563 | 443 | 438 |
| 10..... | 520 | 434 | 780 | 2,370 | 2,230 | 1,050 | 1,390 | 1,020 | 1,060 | 584 | 490 | 405 |
| 11..... | 460 | 369 | 740 | 2,510 | 1,970 | 1,050 | 1,280 | 1,020 | 1,060 | 557 | 524 | 401 |
| 12..... | 520 | 497 | 1,900 | 3,320 | 2,100 | 1,050 | 1,290 | 1,150 | 1,150 | 525 | 468 | 401 |
| 13..... | 550 | 634 | 5,340 | 2,650 | 1,970 | 1,050 | 1,200 | 1,040 | 1,100 | 507 | 398 | 475 |
| 14..... | 474 | 592 | 5,600 | 3,140 | 1,850 | 1,010 | 1,150 | 1,210 | 948 | 525 | 398 | 920 |
| 15..... | 546 | 497 | 3,240 | 3,320 | 1,740 | 1,050 | 1,110 | 1,210 | 843 | 550 | 386 | 709 |
| 16..... | 516 | 497 | 3,550 | 3,700 | 1,630 | 1,010 | 1,200 | 1,210 | 778 | 665 | 352 | 577 |
| 17..... | 486 | 497 | 8,970 | 3,500 | 1,630 | 1,100 | 1,200 | 1,120 | 778 | 665 | 431 | 525 |
| 18..... | 490 | 497 | 13,000 | 3,500 | 1,530 | 1,390 | 1,200 | 1,120 | 718 | 718 | 374 | 525 |
| 19..... | 490 | 427 | 12,700 | 2,800 | 1,230 | 1,210 | 1,200 | 1,240 | 732 | 672 | 401 | 525 |
| 20..... | 483 | 467 | 5,540 | 2,370 | 1,330 | 1,190 | 1,200 | 1,200 | 725 | 557 | 369 | 496 |
| 21..... | 483 | 467 | 3,900 | 2,100 | 1,330 | 1,210 | 1,390 | 1,120 | 785 | 512 | 344 | 496 |
| 22..... | 516 | 467 | 5,800 | 1,970 | 1,230 | 1,600 | 1,490 | 1,040 | 875 | 612 | 393 | 469 |
| 23..... | 546 | 467 | 4,340 | 1,850 | 1,330 | 1,500 | 1,390 | 1,040 | 795 | 711 | 450 | 431 |
| 24..... | 516 | 383 | 3,140 | 2,100 | 1,230 | 1,510 | 1,390 | 952 | 760 | 577 | 450 | 431 |
| 25..... | 486 | 375 | 2,230 | 2,510 | 1,140 | 1,710 | 1,290 | 917 | 760 | 605 | 496 | 431 |
| 26..... | 495 | 400 | 3,500 | 2,100 | 1,330 | 1,600 | 1,200 | 882 | 695 | 577 | 475 | 438 |
| 27..... | 500 | 430 | 6,890 | 1,970 | 1,140 | 1,580 | 1,200 | 838 | 695 | 550 | 450 | 443 |
| 28..... | 460 | 740 | 12,300 | 1,850 | 1,140 | 1,580 | 1,140 | 838 | 635 | 532 | 397 | 468 |
| 29..... | 453 | 1,420 | 8,360 | 2,100 | ..... | 1,440 | 1,200 | 838 | 635 | 557 | 385 | 570 |
| 30..... | 456 | 2,490 | 6,600 | 1,850 | ..... | 1,640 | 1,200 | 908 | 605 | 557 | 405 | 468 |
| 31..... | 453 | ..... | 5,280 | 1,530 | ..... | 1,540 | ..... | 908 | ..... | 577 | 405 | ..... |

Combined monthly discharge of Hood River and Pacific Power & Light Co.'s tailrace at Powerdale, near Hood River, Oreg., for the year ending Sept. 30, 1918.

| Month. | Discharge in second-feet. | | | Run-off in acre-feet. |
|----------------|---------------------------|----------|-------|-----------------------|
| | Maximum. | Minimum. | Mean. | |
| October..... | 615 | 453 | 511 | 31,400 |
| November..... | 2,490 | 369 | 570 | 33,900 |
| December..... | 13,000 | 740 | 4,280 | 263,000 |
| January..... | 4,120 | 1,530 | 2,790 | 172,000 |
| February..... | 4,340 | 1,140 | 1,850 | 103,000 |
| March..... | 1,710 | 1,010 | 1,260 | 77,500 |
| April..... | 1,490 | 970 | 1,240 | 73,800 |
| May..... | 1,480 | 838 | 1,090 | 67,000 |
| June..... | 1,150 | 605 | 842 | 50,100 |
| July..... | 718 | 507 | 590 | 36,300 |
| August..... | 658 | 344 | 446 | 27,400 |
| September..... | 920 | 344 | 472 | 28,100 |
| The year..... | 13,000 | 344 | 1,330 | 963,000 |

EAST FORK OF HOOD RIVER NEAR MOUNT HOOD, OREG.

LOCATION.—In SW. $\frac{1}{4}$ sec. 4, T. 1 S., R. 10 E., 1,000 feet above intake of East Fork Irrigation District canal, three-quarters of a 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, 1915, to October 16, 1918, when record was temporarily discontinued.

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

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

CHANNEL AND CONTROL.—Heavy boulders; shifts during floods.

EXTREMES OF DISCHARGE.—Maximum stage during year from water-stage recorder, 5.9 feet December 18 (discharge, 2,420 second-feet); minimum stage recorded, 0.80 foot at 5 p. m. September 7 (discharge, 152 second-feet).

1915-1918: Maximum stage from recorder same as for 1918; minimum stage recorded, 1.20 feet November 11, 1915 (discharge, 108 second-feet).

ICE.—Stage-discharge relation not affected by ice, but float is sometimes frozen in.

DIVERSIONS.—Glacier ditch and other small ditches divert water for irrigation above the station.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed December 18 and again about June 10.

Rating curves used as follows: October 1 to December 18, well defined below 600 second-feet; March 1 to June 9, fairly well defined; June 10 to September 30, well defined between 150 and 300 second-feet. Operation of recorder satisfactory except December 19 to February 28, when well was filled with sand, and a few days June to September, when sand caused trouble; see footnote to table of daily discharge. Daily discharge ascertained by applying to rating table mean daily gage height obtained by inspecting recorder graph, or in time of considerable fluctuation by subdividing days. Records good, except for short periods during summer, for which they are fair.

Discharge measurements of East Fork of Hood River near Mount Hood, Oreg., during the year ending Sept. 30, 1918.

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---------|------------------------|--------------|--------------|---------|---------------------|--------------|--------------|
| Nov. 24 | R. C. Briggs | Feet. 1.25 | Sec.-ft. 129 | July 18 | F. F. Henshaw | Feet. 1.19 | Sec.-ft. 232 |
| May 25 | C. L. Batchelder | 1.19 | 247 | Aug. 31 |do..... | .86 | 161 |
| June 29 | F. F. Henshaw | 1.16 | 218 | | | | |

Daily discharge, in second-feet, of East Fork of Hood River near Mount Hood, Oreg., for the year ending Sept. 30, 1918.

| Day. | Oct. | Nov. | Dec. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|------|------|-------|-------|------|-------|------|-------|-------|-------|-------|
| 1. | 172 | 142 | 210 | 262 | 275 | 300 | 275 | 235 | 208 | 172 |
| 2. | 168 | 143 | 178 | 262 | 275 | 315 | 275 | 230 | 210 | 170 |
| 3. | 168 | 152 | 170 | 265 | 268 | 345 | 275 | 220 | 202 | 166 |
| 4. | 166 | 142 | 168 | 260 | 265 | 360 | 288 | 214 | 194 | 165 |
| 5. | 166 | 142 | 164 | 252 | 265 | 345 | 300 | 210 | 188 | 163 |
| 6. | 164 | 137 | 162 | 252 | 260 | 330 | 345 | 210 | 188 | 159 |
| 7. | 164 | 136 | 154 | 255 | 260 | 330 | 360 | 212 | 188 | 159 |
| 8. | 168 | 136 | 150 | 250 | 262 | 315 | 360 | 216 | 186 | 165 |
| 9. | 172 | 134 | 149 | 250 | 275 | 315 | 360 | 222 | 186 | 178 |
| 10. | 172 | 136 | 148 | 248 | 275 | 300 | 380 | 222 | 200 | 178 |
| 11. | 166 | 137 | 149 | 250 | 272 | 288 | 395 | 212 | 198 | 172 |
| 12. | 162 | 168 | 192 | 248 | 275 | 300 | 380 | 210 | 184 | 174 |
| 13. | 160 | 149 | 505 | 242 | 268 | 300 | 380 | 210 | 184 | 188 |
| 14. | 158 | 140 | 470 | 238 | 270 | 315 | 335 | 216 | 186 | 268 |
| 15. | 156 | 137 | 310 | 238 | 262 | 300 | 292 | 222 | 176 | 230 |
| 16. | 149 | 134 | 364 | 240 | 268 | 300 | 280 | 230 | 170 | 206 |
| 17. | 142 | 134 | a 975 | 250 | 265 | 288 | 292 | 235 | 172 | 198 |
| 18. | 142 | 134 | 1,860 | 260 | 262 | 288 | 280 | 238 | a 170 | 194 |
| 19. | 140 | 134 | ..... | 255 | 275 | 280 | 290 | a 169 | 196 | 196 |
| 20. | 140 | 137 | ..... | 248 | 288 | 275 | 292 | a 168 | 196 | 196 |
| 21. | 143 | 138 | ..... | 250 | 300 | 272 | 292 | 204 | 166 | 180 |
| 22. | 144 | 137 | ..... | 268 | 300 | 272 | 305 | 206 | 180 | 180 |
| 23. | 142 | 136 | ..... | 258 | 300 | 275 | 305 | 200 | 196 | a 178 |
| 24. | 142 | 134 | ..... | 268 | 300 | 270 | 292 | 195 | 194 | a 175 |
| 25. | 142 | 131 | ..... | 272 | 300 | 258 | a 279 | a 190 | 194 | a 173 |
| 26. | 142 | 128 | ..... | 270 | 288 | 248 | a 266 | a 185 | 194 | a 170 |
| 27. | 142 | 137 | ..... | 262 | 275 | 260 | a 252 | a 180 | 184 | a 168 |
| 28. | 138 | 154 | ..... | 260 | 288 | 255 | a 239 | 186 | a 181 | 166 |
| 29. | 142 | 1,020 | ..... | 265 | 300 | 275 | 226 | 196 | a 178 | a 163 |
| 30. | 142 | 355 | ..... | 275 | 300 | 300 | 230 | 204 | a 175 | a 160 |
| 31. | 138 | ..... | ..... | 288 | ..... | 288 | ..... | 208 | 172 | ..... |

a Interpolated.

Monthly discharge of East Fork of Hood River near Mount Hood, Oreg., for the year ending Sept. 30, 1918.

| Month. | Discharge in second-feet. | | | Run-off in acre-feet. |
|--------------------|---------------------------|----------|-------|-----------------------|
| | Maximum. | Minimum. | Mean. | |
| October..... | 172 | 138 | 153 | 9,410 |
| November..... | 1,020 | 128 | 176 | 10,500 |
| December 1-18..... | 1,860 | 148 | 360 | 12,900 |
| March..... | 288 | 238 | 257 | 15,800 |
| April..... | 300 | 260 | 278 | 16,500 |
| May..... | 360 | 248 | 295 | 18,100 |
| June..... | 395 | 226 | 304 | 18,100 |
| July..... | 238 | 180 | 212 | 13,000 |
| August..... | 210 | 166 | 185 | 11,400 |
| September..... | 268 | 159 | 180 | 10,700 |

EAST FORK IRRIGATION DISTRICT CANAL NEAR MOUNT HOOD, OREG.

LOCATION.—In SE. $\frac{1}{4}$ sec. 33, T. 1 N., R. 10 E., 1 mile below intake, $1\frac{1}{2}$ miles south of Mount Hood post office, Hood River County, and 2 miles east of Parkdale station on Mount Hood Railroad.

RECORDS AVAILABLE.—June 17, 1913, to October 26, 1914; July 21, 1915, to September 30, 1918.

GAGE.—Stevens eight-day water-stage recorder on left side of canal just above road crossing, inspected by F. A. McDonald and C. H. Shaw. Vertical staff on side of flume, 1,000 feet downstream, in SW. $\frac{1}{4}$ sec. 34, used until October, 1914.

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

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

EXTREMES OF DISCHARGE.—Maximum stage during year from water-stage recorder, 3.42 feet at 4 a. m. July 17 (discharge, 138 second-feet); canal dry at various times.

1913-1918: Maximum stage recorded, 3.35 feet at 2 a. m. July 17, 1917 (discharge, 143 second-feet).

ICE.—No water carried in cold weather.

ACCURACY.—Stage-discharge relation not permanent. Standard rating curve well defined above 20 second-feet. Operation of recorder satisfactory. Daily discharge ascertained by shifting-control method; mean daily gage height obtained by inspecting recorder graph. Records good.

East Fork Irrigation District canal diverts water in SW. $\frac{1}{4}$ sec. 4, T. 1 S., R. 10 E., and irrigates land lying east of Hood River. Most of the return water reaches Neal Creek and lower part of Hood River.

Discharge measurements of East Fork Irrigation District canal near Mount Hood, Oreg., during the year ending Sept. 30, 1918.

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---------|-----------------------|--------------|-----------------|---------|--------------------|--------------|-----------------|
| | | <i>Feet.</i> | <i>Sec.-ft.</i> | | | <i>Feet.</i> | <i>Sec.-ft.</i> |
| Nov. 24 | R. C. Briggs..... | 1.75 | 29.5 | July 18 | F. F. Henshaw..... | 3.24 | 124 |
| May 25 | C. L. Batchelder..... | 2.45 | 68 | Aug. 31 |do..... | 3.00 | 107 |
| June 29 | F. F. Henshaw..... | 3.21 | 110 | | | | |

Daily discharge, in second-feet, of East Fork Irrigation District canal near Mount Hood, Oreg., for the year ending Sept. 30, 1918.

| Day. | Oct. | Nov. | Apr. | May. | June. | July. | Aug. | Sept. |
|---------|------|------|------|------|-------|-------|------|-------|
| 1..... | 34 | 32 | 22 | 44 | 100 | 116 | 129 | 112 |
| 2..... | 34 | 32 | 22 | 47 | 100 | 112 | 124 | 108 |
| 3..... | 35 | 33 | 22 | 51 | 100 | 112 | 120 | 108 |
| 4..... | 35 | 32 | 22 | 55 | 112 | 112 | 116 | 108 |
| 5..... | a 34 | 31 | 22 | 54 | 120 | 112 | 112 | 104 |
| 6..... | 34 | 30 | 22 | 55 | 124 | 112 | 116 | 100 |
| 7..... | 34 | 30 | 22 | 59 | 124 | 112 | 116 | 100 |
| 8..... | 34 | 30 | 22 | 73 | 120 | 116 | 120 | 104 |
| 9..... | 34 | 30 | 23 | 78 | 120 | 120 | 116 | 104 |
| 10..... | 35 | 32 | 24 | 78 | 120 | 120 | 129 | 100 |
| 11..... | 34 | 32 | 24 | 78 | 120 | 120 | 124 | 96 |
| 12..... | 34 | 35 | 24 | 81 | 120 | 120 | 116 | 96 |
| 13..... | 33 | 34 | 24 | 81 | 120 | 120 | 120 | 96 |
| 14..... | 33 | 32 | 24 | 81 | 116 | 120 | 120 | 88 |
| 15..... | 33 | 32 | 24 | 73 | 112 | 129 | 112 | 71 |
| 16..... | 33 | 32 | 24 | 72 | 116 | 134 | 108 | 67 |
| 17..... | 33 | 31 | 24 | 72 | 116 | 134 | 108 | 58 |
| 18..... | 33 | 31 | 24 | 72 | 112 | 129 | 108 | 52 |
| 19..... | 33 | 31 | 24 | 71 | 116 | 124 | 108 | 52 |
| 20..... | 32 | 31 | 24 | 71 | 116 | 124 | 104 | 53 |
| 21..... | 33 | 32 | 25 | 70 | 120 | 124 | 104 | 47 |
| 22..... | 33 | 31 | 25 | 70 | 120 | 124 | 116 | 44 |
| 23..... | 33 | 30 | 24 | 71 | 120 | 120 | 120 | 44 |
| 24..... | 34 | 30 | 24 | 70 | 116 | 120 | 116 | 42 |
| 25..... | 34 | 30 | 24 | 73 | 112 | 124 | 112 | 42 |
| 26..... | 33 | 30 | 23 | 71 | 112 | 120 | 108 | 43 |
| 27..... | 32 | 31 | 23 | 68 | 116 | 116 | 104 | 38 |
| 28..... | 31 | 33 | 23 | 73 | 116 | 120 | 104 | 32 |
| 29..... | 32 | 29 | 23 | 81 | 112 | 124 | 108 | 32 |
| 30..... | 32 | 11 | 36 | 84 | 112 | 129 | 108 | 32 |
| 31..... | 32 | | | 96 | | 129 | 112 | |

a Interpolated.

Monthly discharge of East Fork Irrigation District canal near Mount Hood, Oreg., for the year ending Sept. 30, 1918.

| Month. | Discharge in second-feet. | | | Run-off in acre-feet. |
|----------------|---------------------------|----------|-------|-----------------------|
| | Maximum. | Minimum. | Mean. | |
| October..... | 35 | 31 | 33.3 | 2,050 |
| November..... | 35 | 11 | 30.7 | 1,830 |
| April..... | 36 | 22 | 28.8 | 1,420 |
| May..... | 96 | 44 | 70.1 | 4,310 |
| June..... | 124 | 100 | 115 | 6,840 |
| July..... | 134 | 112 | 121 | 7,440 |
| August..... | 129 | 104 | 114 | 7,010 |
| September..... | 112 | 32 | 72.4 | 4,310 |

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

LOCATION.—In SE. $\frac{1}{4}$ sec. 36, T. 3 N., R. 10 E., just below power house, opposite upper gage on Hood River, three-quarters of a mile south of Hood River, Hood River County.

RECORDS AVAILABLE.—October 1, 1913, to September 30, 1914; January 1, 1916, to September 30, 1918.

GAGE.—Vertical staff on right bank of tailrace, at different datum from that of gage used 1913 to 1914; read by A. Rogers.

DISCHARGE MEASUREMENTS.—Made from footbridge just below gage.

CHANNEL AND CONTROL.—Flume 11 feet wide extends a few feet down from gage; below this the canal is excavated in gravel.

EXTREMES OF DISCHARGE.—Maximum stage recorded, 2.10 feet November 13 and December 14 and 17 (discharge, 104 second-feet); canal dry at various times.

1914 and 1916-1918: Maximum discharge, 110 second-feet, determined from electric output February 20, 1914; canal dry at various times.

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

ACCURACY.—Stage-discharge relation changed during winter when power plant was not in use. Two well-defined rating curves used, applicable October 1 to December 17 and March 14 to September 30. Gage read to half-tenths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table except for days when there was a great difference in the two readings. For such days discharge is average of results obtained by applying both gage heights to rating table. Records good.

Pacific Power & Light Co.'s canal diverts water from Hood River at a dam in NE $\frac{1}{4}$ sec. 1, T. 2 N., R. 10 E., to a power plant in SE $\frac{1}{4}$ sec. 36, T. 3 N., and the tailrace empties into the river in NE $\frac{1}{4}$ sec. 36, below gage on Hood River at Powerdale and above gage at bridge.

Discharge measurements of Pacific Power & Light Co.'s tailrace near Hood River, Oreg., during the year ending Sept. 30, 1918.

| Date. | Made by— | Gage height. | Dis-charge. | Date. | Made by— | Gage height. | Dis-charge. |
|---------|-----------------------|--------------|-----------------|---------|--------------------|--------------|-----------------|
| | | <i>Feet.</i> | <i>Sec.-ft.</i> | | | <i>Feet.</i> | <i>Sec.-ft.</i> |
| Oct. 13 | C. E. Stricklin..... | 1.95 | 92 | July 18 | F. F. Henshaw..... | 1.70 | 68 |
| May 25 | C. L. Batchelder..... | 1.40 | 51 | Sept. 2 |do..... | .50 | 11.9 |

Daily discharge, in second-feet, of Pacific Power & Light Co.'s tailrace near Hood River, Oreg., for the year ending Sept. 30, 1918.

| Day. | Oct. | Nov. | Dec. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---------|-------|-------|-------|-------|-------|-------|-------|-------|------|-------|
| 1..... | 52 | 83 | ..... | ..... | 64 | 52 | 8 | ..... | 83 | 58 |
| 2..... | 49 | 80 | ..... | ..... | 61 | 58 | 64 | ..... | 83 | 11 |
| 3..... | 50 | 80 | ..... | ..... | 55 | 58 | 11 | ..... | 83 | 90 |
| 4..... | 49 | 83 | ..... | ..... | 55 | 55 | 52 | ..... | 80 | 90 |
| 5..... | 49 | 86 | ..... | ..... | 28 | ..... | 55 | ..... | 83 | 90 |
| 6..... | 49 | 86 | ..... | ..... | 52 | 58 | 11 | ..... | 83 | 90 |
| 7..... | 22 | 90 | ..... | ..... | 52 | 52 | 11 | 52 | 83 | 90 |
| 8..... | 22 | 97 | ..... | ..... | 52 | 55 | 11 | 76 | 83 | 86 |
| 9..... | 90 | 97 | ..... | ..... | 52 | 52 | 83 | 76 | 83 | 90 |
| 10..... | 90 | 94 | ..... | ..... | 64 | 52 | 11 | 97 | 80 | 90 |
| 11..... | 90 | 83 | ..... | ..... | 52 | 52 | 11 | 97 | 64 | 90 |
| 12..... | 90 | 97 | 83 | ..... | 58 | 8 | 11 | 90 | 83 | 90 |
| 13..... | 90 | 104 | 86 | ..... | 58 | 67 | 47 | 97 | 83 | 90 |
| 14..... | 14 | 97 | 104 | 37 | 8 | 73 | 83 | 90 | 83 | 90 |
| 15..... | 86 | 97 | 97 | 83 | 64 | 70 | 83 | 90 | 83 | 14 |
| 16..... | 86 | 97 | 47 | 41 | 64 | 67 | 83 | 90 | 61 | 90 |
| 17..... | 86 | 97 | 69 | 52 | 64 | 70 | 83 | 90 | 83 | 90 |
| 18..... | 90 | 97 | ..... | 61 | 61 | 70 | 83 | 53 | 14 | 90 |
| 19..... | 90 | 97 | ..... | 70 | 64 | 8 | 97 | 97 | 86 | 90 |
| 20..... | 83 | 97 | ..... | 46 | 64 | 61 | 90 | 97 | 90 | 86 |
| 21..... | 83 | 97 | ..... | 70 | 64 | 70 | 90 | 52 | 90 | 86 |
| 22..... | 86 | 97 | ..... | 70 | 53 | 67 | 45 | 97 | 90 | 83 |
| 23..... | 86 | 97 | ..... | 70 | 61 | 70 | ..... | 76 | 90 | 83 |
| 24..... | 86 | 97 | ..... | 76 | 53 | 52 | ..... | 90 | 90 | 53 |
| 25..... | 86 | 97 | ..... | 76 | 64 | 52 | ..... | 90 | 86 | 83 |
| 26..... | ..... | ..... | ..... | 73 | 58 | 52 | ..... | 90 | 90 | 90 |
| 27..... | 70 | ..... | ..... | 52 | 53 | 8 | ..... | 90 | 90 | 83 |
| 28..... | 90 | ..... | ..... | 52 | ..... | 8 | ..... | 97 | 90 | 83 |
| 29..... | 83 | ..... | ..... | 8 | ..... | 8 | ..... | 97 | 90 | 55 |
| 30..... | 86 | ..... | ..... | 8 | 55 | 8 | ..... | 97 | 90 | 83 |
| 31..... | 83 | ..... | ..... | 8 | ..... | 8 | ..... | 90 | 90 | ..... |

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

Monthly discharge of Pacific Power & Light Co.'s tailrace near Hood River, Oreg., for the year ending Sept. 30, 1918.

| Month. | Discharge in second-feet. | | | Run-off in acre-feet. |
|-------------------------|---------------------------|----------|-------|-----------------------|
| | Maximum. | Minimum. | Mean. | |
| October (30 days)..... | 90 | 14 | 72.2 | 4,300 |
| November (25 days)..... | 104 | 80 | 93.0 | 4,610 |
| December (6 days)..... | 104 | 47 | 81.0 | 964 |
| March (18 days)..... | 83 | 8 | 52.9 | 1,890 |
| April (27 days)..... | 64 | 8 | 56.5 | 3,030 |
| May (30 days)..... | 73 | 8 | 48.0 | 2,860 |
| June (22 days)..... | 97 | 8 | 51.0 | 2,230 |
| July (25 days)..... | 97 | 52 | 87.5 | 4,340 |
| August..... | 90 | 14 | 81.9 | 5,040 |
| September..... | 90 | 11 | 80.6 | 4,800 |
| The year..... | | | | 34,100 |

WHITE SALMON RIVER BASIN.

WHITE SALMON RIVER NEAR GULER, WASH.

LOCATION.—In SE. $\frac{1}{4}$ sec. 24, T. 6 N., R. 10 E., at highway bridge a quarter of a mile above intake of Huber ditch, three-quarters of a mile below mouth of Trout Creek, and 3 miles below Guler post office, Klickitat County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—July 17 to September 30, 1918.

GAGE.—Chain gage on chord of bridge, read by C. H. Gossett, engineer for Northwestern Electric Co.

DISCHARGE MEASUREMENTS.—Made from highway bridge.

CHANNEL AND CONTROL.—Bed composed of rock thinly overlain with gravel. Control is a large log placed just below intake of Huber ditch; somewhat shifting. Current sluggish.

ACCURACY.—Stage-discharge relation not permanent. Rating curve based on two measurements, used July 17 to August 21; shifting-control method used thereafter.

Gage read to hundredths once nearly every day. Daily discharge prior to August 21, ascertained by applying mean daily gage height to rating table. Records good.

COOPERATION.—Field data furnished by Northwestern Electric Co.

Discharge measurements of White Salmon River near Guler, Wash., during the year ending Sept. 30, 1918.

| Date. | Made by— | Gage height. | Discharge. |
|----------|----------------------------------|--------------|-----------------|
| | | <i>Fect.</i> | <i>Sec.-ft.</i> |
| July 17 | F. F. Henshaw..... | 2.00 | 404 |
| Aug. 20 | C. H. Gossett ^a | 1.32 | 170 |
| Sept. 23 |do..... | 1.30 | 132 |

^a Engineer for Northwestern Electric Co.

Daily discharge, in second-feet, of White Salmon River near Guler, Wash., for the year ending Sept. 30, 1918.

| Day. | July. | Aug. | Sept. | Day. | July. | Aug. | Sept. | Day. | July. | Aug. | Sept. |
|---------|-------|-------|-------|---------|-------|-------|-------|---------|-------|-------|-------|
| 1..... | | 196 | | 11..... | | a 174 | 132 | 21..... | a 196 | 169 | 136 |
| 2..... | | 196 | | 12..... | | 169 | 130 | 22..... | 208 | 169 | a 134 |
| 3..... | | 185 | | 13..... | | a 169 | a 130 | 23..... | 223 | 182 | 132 |
| 4..... | | a 184 | | 14..... | | 169 | 185 | 24..... | 196 | 177 | 134 |
| 5..... | | a 182 | | 15..... | | a 159 | a 166 | 25..... | 202 | a 172 | 136 |
| 6..... | | a 181 | | 16..... | | 149 | 146 | 26..... | 196 | 167 | 140 |
| 7..... | | 180 | 122 | 17..... | 405 | 169 | 144 | 27..... | 185 | a 162 | 144 |
| 8..... | | 164 | a 130 | 18..... | 323 | 172 | 138 | 28..... | a 197 | 157 | 144 |
| 9..... | | 155 | 138 | 19..... | 220 | 174 | 140 | 29..... | a 208 | 162 | a 146 |
| 10..... | | 180 | 126 | 20..... | 185 | 169 | 144 | 30..... | 220 | 162 | 149 |
| | | | | | | | | 31..... | 202 | | |

a Interpolated.

Monthly discharge of White Salmon River near Guler, Wash., for the year ending Sept. 30, 1918.

| Month. | Discharge in second-feet. | | | Run-off in acre-feet. |
|---------------------|---------------------------|----------|-------|-----------------------|
| | Maximum. | Minimum. | Mean. | |
| July 17-31..... | 405 | 185 | 225 | 6,690 |
| August 1-30..... | 196 | 149 | 172 | 10,200 |
| September 7-30..... | 185 | 122 | 140 | 6,660 |

WHITE SALMON RIVER AT HUSUM, WASH.

LOCATION.—In SE. $\frac{1}{4}$ sec. 25, T. 4 N., R. 10 E., 1,000 feet above falls and power house at Husum, Klickitat County, and three-quarters of a mile above Rattlesnake Creek.

DRAINAGE AREA.—293 square miles (measured on map of Columbia National Forest).

This is a revision, the area being given in previous reports as 300 square miles.

RECORDS AVAILABLE.—September 23, 1909, to September 30, 1918.

GAGE.—Vertical staff on right bank; read by John Wassell and Clark McClellan.

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 during year as determined from high-water marks, 10.0 feet about 4 p. m. December 29, 1917 (discharge, 7,500 second-feet); minimum stage recorded, 3.09 feet November 26 and 27 (discharge, 505 second-feet).

1909-1918: Maximum stage same as for 1918; minimum stage recorded, 2.66 feet at 2 p. m. September 30, 1915 (discharge, 432 second-feet).

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

DIVERSIONS.—About 3,500 acres irrigated above this station.

REGULATION.—None. Flow formerly affected at times by operation of splash dam 10 miles upstream; no logging on stream at present.

ACCURACY.—Stage-discharge relation changed October 28, owing to fallen tree below gage, and December 17 during flood. Two well-defined rating curves used, applicable October 1 to December 17 and December 18 to September 30. Gage read to hundredths once daily. Daily discharge ascertained by applying daily gage height to rating table, except for period August 8 to 30, when intake to stilling well was clogged with silt, making the gage readings considerably in error, for which it was ascertained by comparison with flow of White Salmon River near Underwood. Gage heights October 28 to December 17 corrected for effect of backwater due to fallen tree, before applying them to rating table. Records good.

Discharge measurements of White Salmon River at Husum, Wash., during the year ending Sept. 30, 1918.

| Date. | Made by— | Gage height. | Dis-charge. | Date. | Made by— | Gage height. | Dis-charge. |
|---------|-----------------------|--------------|--------------|---------|--------------------|--------------|-------------|
| Oct. 20 | C. L. Batchelder..... | Feet. 3.10 | Sec.-ft. 582 | July 2 | F. F. Henshaw..... | Feet. 3.80 | 800 |
| Jan. 16 |do..... | 5.38 | 1,910 | July 17 |do..... | 3.82 | 828 |
| May 24 |do..... | 4.02 | 882 | Sept. 1 |do..... | 3.32 | 569 |

Daily discharge, in second-feet, of White Salmon River at Husum, Wash., for the year ending Sept. 30, 1918.

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1..... | 675 | 565 | 630 | 8,980 | 1,420 | 1,200 | 1,340 | 1,200 | 840 | 790 | 672 | 565 |
| 2..... | 675 | 545 | 505 | 3,380 | 1,420 | 1,200 | 1,340 | 1,200 | 890 | 790 | 672 | 565 |
| 3..... | 630 | 565 | 525 | 3,160 | 1,420 | 1,200 | 1,270 | 1,200 | 890 | 790 | 672 | 565 |
| 4..... | 630 | 585 | 675 | 3,270 | 1,500 | 1,200 | 1,200 | 1,200 | 890 | 790 | 650 | 565 |
| 5..... | 630 | 585 | 630 | 2,830 | 1,500 | 1,130 | 1,200 | 1,200 | 890 | 790 | 650 | 565 |
| 6..... | 630 | 585 | 545 | 2,520 | 2,320 | 1,130 | 1,200 | 1,200 | 890 | 790 | 650 | 565 |
| 7..... | 630 | 565 | 445 | 2,420 | 2,320 | 1,130 | 1,200 | 1,200 | 840 | 790 | 650 | 565 |
| 8..... | 630 | 545 | 545 | 2,220 | 2,020 | 1,130 | 1,200 | 1,270 | 840 | 740 | 565 | 565 |
| 9..... | 630 | 545 | 525 | 1,930 | 1,930 | 1,130 | 1,200 | 1,130 | 840 | 740 | 565 | 565 |
| 10..... | 630 | 565 | 525 | 1,930 | 1,930 | 1,130 | 1,420 | 1,130 | 890 | 740 | 565 | 565 |
| 11..... | 630 | 545 | 525 | 1,930 | 1,840 | 1,130 | 1,420 | 1,130 | 890 | 740 | 565 | 565 |
| 12..... | 608 | 585 | 545 | 1,750 | 1,750 | 1,130 | 1,340 | 1,070 | 840 | 740 | 565 | 565 |
| 13..... | 608 | 585 | 675 | 1,660 | 1,750 | 1,130 | 1,270 | 1,130 | 840 | 740 | 565 | 565 |
| 14..... | 608 | 565 | 870 | 1,660 | 1,660 | 1,070 | 1,200 | 1,130 | 840 | 790 | 605 | 605 |
| 15..... | 608 | 545 | 1,440 | 1,660 | 1,580 | 1,070 | 1,200 | 1,070 | 790 | 790 | 605 | 605 |
| 16..... | 585 | 525 | 2,220 | 1,930 | 1,580 | 1,070 | 1,200 | 1,010 | 790 | 790 | 605 | 605 |
| 17..... | 585 | 525 | 2,800 | 2,020 | 1,580 | 1,070 | 1,130 | 1,010 | 790 | 790 | 605 | 605 |
| 18..... | 585 | 545 | 6,670 | 2,120 | 1,500 | 1,130 | 1,130 | 1,010 | 790 | 790 | 605 | 605 |
| 19..... | 585 | 545 | 6,280 | 2,120 | 1,420 | 1,130 | 1,130 | 1,010 | 790 | 740 | 580 | 585 |
| 20..... | 585 | 545 | 4,100 | 1,930 | 1,420 | 1,130 | 1,200 | 1,010 | 790 | 718 | 585 | 585 |
| 21..... | 585 | 525 | 2,120 | 1,840 | 1,340 | 1,130 | 1,270 | 950 | 840 | 695 | 585 | 585 |
| 22..... | 585 | 525 | 2,940 | 1,750 | 1,340 | 1,420 | 1,340 | 950 | 840 | 695 | 585 | 585 |
| 23..... | 585 | 525 | 2,940 | 1,750 | 1,340 | 1,420 | 1,340 | 890 | 840 | 695 | 585 | 585 |
| 24..... | 585 | 505 | 2,420 | 1,750 | 1,270 | 1,420 | 1,340 | 890 | 840 | 718 | 585 | 585 |
| 25..... | 585 | 505 | 1,750 | 1,750 | 1,270 | 1,580 | 1,270 | 890 | 840 | 695 | 585 | 585 |
| 26..... | 585 | 505 | 1,750 | 1,660 | 1,270 | 1,500 | 1,270 | 890 | 790 | 695 | 565 | 565 |
| 27..... | 585 | 505 | 3,050 | 1,680 | 1,270 | 1,420 | 1,200 | 890 | 840 | 695 | 545 | 545 |
| 28..... | 585 | 525 | 2,220 | 1,580 | 1,270 | 1,340 | 1,200 | 840 | 790 | 695 | 545 | 545 |
| 29..... | 585 | 630 | 7,220 | 1,580 | ..... | 1,340 | 1,270 | 840 | 790 | 695 | 545 | 545 |
| 30..... | 565 | 630 | 6,240 | 1,500 | ..... | 1,340 | 1,200 | 890 | 790 | 672 | 545 | 545 |
| 31..... | 565 | ..... | 6,240 | 1,420 | ..... | 1,420 | ..... | 890 | ..... | 695 | ..... | ..... |

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

Monthly discharge of White Salmon River at Husum, Wash., for the year ending Sept. 30, 1918.

| Month. | Discharge in second-feet. | | | Run-off in acre-feet. |
|----------------|---------------------------|----------|-------|-----------------------|
| | Maximum. | Minimum. | Mean. | |
| October..... | 675 | 565 | 606 | 37,300 |
| November..... | 630 | 505 | 551 | 32,800 |
| December..... | 7,220 | 505 | 2,280 | 140,000 |
| January..... | 3,980 | 1,420 | 2,080 | 128,000 |
| February..... | 2,320 | 1,270 | 1,580 | 87,800 |
| March..... | 1,580 | 1,070 | 1,220 | 75,000 |
| April..... | 1,420 | 1,130 | 1,250 | 74,400 |
| May..... | 1,270 | 840 | 1,040 | 64,000 |
| June..... | 890 | 790 | 835 | 49,700 |
| July..... | 790 | 672 | 743 | 45,700 |
| August..... | 672 | ..... | 598 | 36,800 |
| September..... | 605 | 545 | 573 | 34,100 |
| The year..... | 7,220 | 505 | 1,110 | 806,000 |

WHITE SALMON RIVER NEAR UNDERWOOD, WASH.

LOCATION.—In NW. $\frac{1}{4}$ sec. 14, T. 3 N., R. 10 E., 200 yards below Northwestern Electric Co.'s power plant and 2 miles north of Underwood, Skamania County.

DRAINAGE AREA.—384 square miles (measured on map of Columbia National Forest).

RECORDS AVAILABLE.—March 1, 1915, to September 30, 1918; October 18, 1912, to February 26, 1913, at dam about a mile above.

GAGE.—Gurley water-stage recorder on left bank June 27 to July 16, 1918; moved to right bank July 17 at datum 1.0 foot lower. Friez and Fuller recorders on left bank prior to June 27, inspected by D. J. Shore, foreman of power plant.

DISCHARGE MEASUREMENTS.—Made from cable at gage; measuring conditions good.

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

EXTREMES OF DISCHARGE.—Maximum stage from high-water marks, 9.5 feet (old gage datum) January 17 (discharge, estimated from extension of rating curve, 9,700 second-feet); minimum stage occurred 8 to 11 a. m. August 18, when a shut-down of the power plant reduced the discharge practically to zero.

1915-1918: Maximum and minimum stages same as for 1918.

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

DIVERSIONS.—About 3,500 acres irrigated above this station.

REGULATIONS.—At low and medium stages practically all the water is used through the wheels of the power plant. The pond above the dam covers about 80 acres.

ACCURACY.—Stage-discharge relation changed July 17 owing to moving of water-stage recorder to new location. (See under "Gage.") Two rating curves, both well defined above 300 second-feet, used as follows: Rating curve for 1917 applicable prior to July 17; a new curve, based on discharge measurements for 1918 and previous measurements above 3.0 feet corrected to new datum, used thereafter. Operation of water-stage recorder satisfactory beginning June 27 except for a few days. Daily discharge ascertained by use of discharge integrator, or, for periods when water was practically all used through wheels of power plant, by averaging discharge for two-hour intervals computed from electrical output of the plant; the daily discharge thus obtained, when under 1,000 second-feet, has been corrected for effect of storage of water behind dam at plant. Records good October to December, excellent June to September.

Discharge measurements of White Salmon River near Underwood, Wash., during the year ending Sept. 30, 1918.

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---------|-----------------------|--------------|-----------------|---------|--------------------|--------------|-----------------|
| Nov. 13 | C. L. Batchelder..... | Feet 1.40 | Sec.-ft. 794 | June 26 | F. F. Henshaw..... | Feet 1.44 | Sec.-ft. 999 |
| Jan. 17 |do..... | 3.48 | 2,570 | 27 |do..... | 1.02 | 750 |
| June 26 | F. F. Henshaw..... | 1.06 | 1,100 | Sept. 1 |do..... | 1.32 | 402 |

* Referred to new gage on right bank.

Daily discharge, in second-feet, of White Salmon River near Underwood, Wash., for the years ending Sept. 30, 1915-1918.

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|----------|------|-------|------|------|------|--------|--------|--------|--------|-------|--------|-------|
| 1915. | | | | | | | | | | | | |
| 1 | | | | | | 980 | 1,710 | 1,280 | | | a590 | 564 |
| 2 | | | | | | 920 | a2,800 | 1,220 | | | a590 | 578 |
| 3 | | | | | | 980 | a3,000 | 1,160 | | | a680 | 564 |
| 4 | | | | | | 1,100 | 2,130 | 1,160 | | | a635 | 554 |
| 5 | | | | | | 1,100 | 1,790 | 1,160 | | | a590 | 554 |
| 6 | | | | | | 1,100 | 1,630 | 1,160 | | | a590 | 606 |
| 7 | | | | | | | 1,630 | 1,160 | | | a590 | 582 |
| 8 | | | | | | | 1,560 | 1,160 | | | a590 | 582 |
| 9 | | | | | | | 1,420 | 1,040 | | | a590 | 538 |
| 10 | | | | | | a920 | 1,350 | 1,160 | | | a590 | |
| 11 | | | | | | | 1,490 | 1,160 | | | 580 | a547 |
| 12 | | | | | | | 1,490 | 1,160 | | | 590 | |
| 13 | | | | | | 980 | 1,420 | 1,180 | | | 590 | |
| 14 | | | | | | 1,160 | 1,350 | 1,220 | | | 590 | 576 |
| 15 | | | | | | 1,350 | 1,350 | 1,220 | | | 590 | 578 |
| 16 | | | | | | 1,490 | 1,350 | 1,280 | | | 587 | 565 |
| 17 | | | | | | 1,490 | 1,490 | 1,280 | | | 568 | 570 |
| 18 | | | | | | 1,490 | a1,660 | 1,220 | | | 570 | 525 |
| 19 | | | | | | 1,490 | a1,660 | 1,220 | | | 580 | 524 |
| 20 | | | | | | 1,280 | 1,710 | 1,160 | | | 600 | 547 |
| 21 | | | | | | 1,350 | 1,630 | a1,110 | | | 620 | 547 |
| 22 | | | | | | 1,350 | 1,630 | a1,050 | | | 650 | 522 |
| 23 | | | | | | 1,490 | 1,420 | a1,050 | | | 590 | 546 |
| 24 | | | | | | 1,560 | 1,350 | a1,050 | | | 600 | 550 |
| 25 | | | | | | 1,350 | 1,350 | a1,050 | | | 600 | 581 |
| 26 | | | | | | 1,280 | 1,350 | a1,050 | | | 570 | 580 |
| 27 | | | | | | 1,280 | 1,420 | a1,050 | | | 597 | 537 |
| 28 | | | | | | a1,440 | 1,350 | a1,170 | | | 591 | 537 |
| 29 | | | | | | a1,440 | 1,350 | a1,170 | | | 600 | 558 |
| 30 | | | | | | a1,600 | 1,350 | a1,050 | | | 599 | 532 |
| 31 | | | | | | a1,600 | | a1,050 | | | 568 | |
| 1915-16. | | | | | | | | | | | | |
| 1 | 584 | 659 | 664 | | | 1,400 | 2,400 | 2,310 | | 2,150 | 1,390 | 1,050 |
| 2 | 548 | 567 | 658 | | | 1,390 | 2,400 | 2,400 | | 2,570 | 1,310 | 1,030 |
| 3 | 516 | 589 | 672 | | | 1,450 | 2,490 | 2,580 | | 2,900 | 1,280 | 1,120 |
| 4 | 526 | 565 | 736 | | | 1,420 | 2,490 | 2,870 | | 2,500 | 1,300 | 1,120 |
| 5 | 544 | 537 | 864 | | | 1,490 | 2,400 | 2,870 | | 2,280 | 1,320 | 1,100 |
| 6 | 538 | 535 | 844 | | | 1,560 | 2,310 | 2,870 | a2,300 | 2,120 | 1,350 | 1,070 |
| 7 | 519 | 496 | | | | 1,550 | 2,310 | 2,779 | | 2,150 | 1,400 | 1,050 |
| 8 | 520 | 512 | | | | 1,960 | 2,310 | 2,580 | | 2,130 | 1,300 | 1,050 |
| 9 | 487 | 530 | | | | 2,350 | | 2,400 | | 2,130 | 1,300 | 1,070 |
| 10 | 524 | 552 | | | | 2,550 | | 2,310 | | 2,100 | 1,860 | 1,060 |
| 11 | 483 | 520 | | | | 2,630 | a2,400 | 2,130 | | 2,020 | 1,310 | 1,050 |
| 12 | 516 | 509 | | | | 2,710 | | 1,950 | | 2,000 | 1,320 | 1,040 |
| 13 | 512 | 490 | | | | 2,670 | | | 2,130 | 2,000 | a1,310 | 1,030 |
| 14 | 525 | 492 | | | | 2,330 | | | 2,210 | 1,918 | | 1,020 |
| 15 | 514 | 537 | | | | 1,870 | 2,400 | a2,000 | 2,330 | 1,950 | | 1,010 |
| 16 | 498 | 592 | | | | 1,660 | 2,310 | | 2,556 | 2,020 | a1,240 | 1,040 |
| 17 | 489 | 629 | | | | 1,690 | 2,310 | 2,040 | 2,700 | 2,050 | | 1,040 |
| 18 | 501 | 742 | | | | 1,710 | 2,310 | 2,170 | a3,306 | 1,950 | | 1,030 |
| 19 | 493 | 750 | | | | a2,000 | 2,220 | 2,210 | a3,000 | 1,900 | 1,160 | 1,010 |
| 20 | 498 | 780 | | | | a3,000 | 2,130 | 2,200 | 2,580 | 1,850 | 1,140 | 980 |
| 21 | 480 | 860 | | | | 3,470 | 2,220 | 1,990 | 2,270 | 1,810 | 1,150 | 980 |
| 22 | 496 | 860 | | | | 3,470 | 2,130 | 1,990 | 2,140 | 1,710 | 1,140 | 900 |
| 23 | 536 | 1,120 | | | | 3,070 | 2,100 | 1,990 | 2,150 | 1,590 | 1,150 | 950 |
| 24 | 504 | 912 | | | | 2,770 | 2,040 | 1,940 | 2,220 | 1,610 | 1,130 | 910 |
| 25 | 588 | 980 | | | | 3,070 | 2,040 | 1,910 | 2,220 | 1,550 | 1,150 | 931 |
| 26 | 539 | 814 | | | | 3,570 | 2,220 | 1,950 | 2,230 | 1,490 | 1,130 | 903 |
| 27 | 527 | 762 | | | | 3,470 | 2,310 | | 2,250 | 1,440 | 1,120 | 879 |
| 28 | 522 | 716 | | | | 3,070 | 2,310 | | 2,180 | 1,420 | 1,100 | 861 |
| 29 | 529 | 754 | | | | 2,770 | 2,310 | a2,000 | 2,050 | 1,350 | 1,080 | 858 |
| 30 | 509 | 690 | | | | 2,490 | 2,310 | | 2,030 | 1,340 | 1,060 | 878 |
| 31 | 502 | | | | | 2,400 | | | | 1,370 | 1,020 | |

a Estimated by comparison with flow of White Salmon River at Husum.

WHITE SALMON RIVER BASIN.

Daily discharge, in second-feet, of White Salmon River near Underwood, Wash., for the year ending Sept. 30, 1915-1918—Continued.

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|-----------------|-------|-------|--------|-------|-------|-------|---------|--------|--------|--------|-------|-------|
| 1916-17. | | | | | | | | | | | | |
| 1..... | 871 | 700 | 768 | 744 | 644 | 666 | 1,140 | 1,400 | 1,950 | 1,630 | 1,070 | 878 |
| 2..... | 889 | 740 | 734 | 738 | 664 | 664 | 1,190 | 1,430 | 1,900 | 1,690 | 1,070 | 850 |
| 3..... | 859 | 734 | 901 | 760 | 724 | 646 | 1,120 | 1,410 | 1,840 | 1,680 | 1,060 | 974 |
| 4..... | 869 | 1,030 | 821 | 784 | 1,240 | 664 | 1,140 | 1,370 | 1,790 | 1,750 | 1,060 | 918 |
| 5..... | 889 | 804 | 884 | 956 | 824 | 720 | 1,230 | 1,410 | 1,800 | 1,620 | 1,040 | 864 |
| 6..... | 842 | 634 | 760 | 982 | 800 | 746 | 1,260 | 1,550 | 1,810 | 1,600 | 1,020 | 796 |
| 7..... | 835 | 674 | 742 | 924 | 806 | 756 | 1,590 | 1,670 | 1,910 | 1,430 | 1,010 | 888 |
| 8..... | a 800 | 700 | 730 | 816 | 812 | 745 | 1,630 | 1,830 | 1,960 | 1,470 | 1,010 | 824 |
| 9..... | 740 | 726 | 698 | 804 | 702 | 736 | 1,560 | 1,890 | 2,130 | | 1,040 | 804 |
| 10..... | 758 | 720 | 653 | 814 | 750 | 724 | 1,550 | 2,010 | 1,960 | | 980 | 882 |
| 11..... | 774 | 680 | 676 | 776 | 744 | 720 | 1,520 | 1,970 | 1,800 | a1,440 | 990 | 866 |
| 12..... | 746 | 604 | 720 | 880 | 758 | 718 | 1,450 | | 1,630 | | 990 | 832 |
| 13..... | 742 | 584 | 732 | 720 | 744 | 740 | 1,370 | | 1,660 | | 980 | 828 |
| 14..... | 740 | 614 | 700 | a 700 | 760 | 712 | 1,370 | | 1,750 | | 980 | 770 |
| 15..... | a 750 | 622 | 696 | a 680 | 758 | 702 | 1,320 | | 1,880 | 1,420 | 940 | 854 |
| 16..... | 742 | 644 | 702 | 652 | 756 | 696 | 1,290 | a1,700 | 1,950 | 1,380 | 920 | 818 |
| 17..... | 780 | 648 | 664 | 644 | 782 | 692 | 1,250 | | | 1,340 | 910 | 868 |
| 18..... | 770 | 678 | 652 | 656 | 702 | 632 | 1,220 | | | 1,280 | 910 | 814 |
| 19..... | 774 | 586 | 696 | 664 | 744 | 708 | 1,160 | | | 1,270 | a 910 | 820 |
| 20..... | 760 | 572 | 718 | 696 | 766 | 736 | 1,230 | 1,660 | a1,870 | 1,230 | a 920 | 810 |
| 21..... | 770 | 686 | 740 | 842 | 756 | 744 | a 1,300 | 1,700 | | 1,200 | 960 | 778 |
| 22..... | a 730 | 714 | 764 | 670 | 732 | 726 | a 1,300 | 1,680 | | 1,180 | 918 | 818 |
| 23..... | a 724 | 734 | 734 | 687 | 690 | 832 | a 1,400 | 1,690 | | 1,150 | 982 | 788 |
| 24..... | 744 | 700 | 780 | 745 | 720 | 1,044 | a 1,400 | 1,730 | 1,790 | 1,130 | 894 | 702 |
| 25..... | 744 | 796 | 770 | 639 | 692 | 973 | 1,490 | 1,720 | 1,690 | 1,090 | 890 | 738 |
| 26..... | 758 | 837 | 640 | 681 | 718 | 900 | 1,540 | 1,710 | 1,590 | 1,100 | a 890 | 772 |
| 27..... | 784 | 949 | 658 | 681 | 700 | 1,160 | 1,620 | 1,920 | 1,590 | 1,100 | a 900 | 754 |
| 28..... | 756 | 869 | 634 | 842 | 690 | 1,440 | 1,560 | 2,000 | 1,580 | 1,090 | 920 | 750 |
| 29..... | a 718 | 779 | 622 | 708 | | 1,280 | 1,520 | 2,020 | 1,570 | 1,080 | 920 | 742 |
| 30..... | 762 | 804 | 608 | 684 | | 1,210 | 1,490 | 2,030 | 1,560 | 1,070 | 930 | 752 |
| 31..... | 742 | | 636 | 624 | | 992 | | 2,020 | | 1,070 | 980 | |
| 1917-18. | | | | | | | | | | | | |
| 1..... | 660 | 576 | 708 | | | | | | 966 | 868 | 785 | 634 |
| 2..... | 710 | 582 | 626 | | | | | | 892 | 862 | 740 | 662 |
| 3..... | 700 | 590 | 610 | | | | | | 954 | 816 | 696 | 655 |
| 4..... | a 696 | a 596 | 630 | | | | | | 922 | 812 | 702 | 650 |
| 5..... | 712 | a 592 | 600 | | | | | | 948 | 842 | 716 | 652 |
| 6..... | 700 | a 600 | 598 | | | | | | 966 | 822 | 676 | 652 |
| 7..... | 682 | a 612 | 572 | | | | | | 996 | 774 | 666 | 640 |
| 8..... | 624 | a 576 | 552 | | | | | | 996 | 856 | 672 | 568 |
| 9..... | 674 | 568 | 552 | | | | | | 964 | 828 | 644 | 600 |
| 10..... | 666 | 582 | 504 | | | | | | 898 | 810 | 666 | 604 |
| 11..... | a 660 | a 572 | 560 | | | | | | 966 | 840 | 631 | 606 |
| 12..... | 640 | a 562 | 594 | | | | | | 958 | 802 | 644 | 606 |
| 13..... | 676 | 510 | 818 | | | | | | 970 | 792 | 638 | 596 |
| 14..... | a 678 | 612 | 1,200 | | | | | | 988 | 786 | 637 | 682 |
| 15..... | a 642 | 570 | a1,920 | | | | | | 916 | 848 | 620 | 666 |
| 16..... | 632 | 548 | a2,960 | | | | | | 902 | 878 | 623 | 662 |
| 17..... | 634 | 556 | a3,730 | | | | | | 864 | 912 | 592 | 635 |
| 18..... | 624 | 530 | a8,890 | | | | | | 906 | 964 | 647 | 595 |
| 19..... | 648 | 530 | a8,370 | | | | | | 874 | 860 | 626 | 630 |
| 20..... | 652 | 566 | a6,070 | | | | | | 890 | 746 | 614 | 676 |
| 21..... | 576 | 558 | a2,830 | | | | | | 852 | 738 | 635 | 590 |
| 22..... | 608 | 550 | a3,920 | | | | | | 936 | 791 | 623 | 574 |
| 23..... | 640 | 544 | a3,920 | | | | | | 872 | 780 | 654 | 606 |
| 24..... | 610 | 554 | a3,230 | | | | | | 948 | 726 | 656 | 594 |
| 25..... | 610 | 498 | a2,330 | | | | | | 880 | 808 | 636 | 585 |
| 26..... | 616 | 530 | a2,330 | | | | | | 882 | 808 | 645 | 606 |
| 27..... | 716 | 538 | a4,070 | | | | | | 869 | 810 | 624 | 590 |
| 28..... | a 584 | 696 | a5,630 | | | | | | 892 | 809 | 608 | 596 |
| 29..... | a 564 | 682 | a9,200 | | | | | | 846 | 790 | 601 | 586 |
| 30..... | 600 | 710 | a6,990 | | | | | | 842 | 774 | 609 | 628 |
| 31..... | 590 | | a6,990 | | | | | | | 781 | 648 | |

a Estimated by comparison with flow of White Salmon River at Husum.

NOTE.—Daily discharge less than 1,000 second-feet has been corrected for effect of storage. Some records for October, 1916, and September, 1917, have been revised on the basis of further study, and do not agree with those published in Water-Supply Paper 464. Discharge for March to May, 1915, has not been previously published; operation of recorder not satisfactory during this period, but results are consistent with those at Husum and are considered fair.

Monthly discharge of White Salmon River near Underwood, Wash., for the years ending Sept. 30, 1915-1918.

| Month. | Discharge in second-feet. | | | Run-off in acre-feet. |
|-----------------|---------------------------|----------|---------|-----------------------|
| | Maximum. | Minimum. | Mean. | |
| 1915. | | | | |
| March..... | a 1,600 | 920 | 1,230 | 75,600 |
| April..... | a 3,000 | 1,350 | 1,610 | 95,800 |
| May..... | 1,288 | 1,040 | 1,150 | 70,100 |
| June..... | a 1,050 | a 725 | a 812 | 48,300 |
| July..... | a 770 | a 590 | a 687 | 42,200 |
| August..... | a 680 | 568 | 596 | 36,600 |
| September..... | 606 | 522 | 556 | 33,100 |
| The period..... | | | | 401,700 |
| 1915-16. | | | | |
| October..... | 584 | 469 | 517 | 31,800 |
| November..... | 1,120 | 490 | 668 | 39,700 |
| December..... | a 2,920 | 658 | a 1,110 | 68,200 |
| January..... | a 1,430 | a 735 | a 874 | 53,700 |
| February..... | a 1,960 | a 825 | a 1,400 | 80,500 |
| March..... | 3,570 | 1,390 | 2,360 | 145,000 |
| April..... | 2,490 | 2,040 | 2,310 | 137,000 |
| May..... | 2,870 | 1,910 | 2,210 | 136,000 |
| June..... | a 3,300 | 2,030 | 2,340 | 139,000 |
| July..... | 2,800 | 1,340 | 1,910 | 117,000 |
| August..... | 1,400 | 1,020 | 1,220 | 75,000 |
| September..... | 1,120 | 858 | 1,000 | 59,500 |
| The year..... | 3,570 | 469 | 1,490 | 1,080,000 |
| 1916-17. | | | | |
| October..... | 889 | 702 | 775 | 47,700 |
| November..... | 1,030 | 572 | 719 | 42,800 |
| December..... | 901 | 608 | 716 | 44,000 |
| January..... | 955 | 624 | 744 | 45,700 |
| February..... | 1,240 | 644 | 757 | 42,000 |
| March..... | 1,440 | 1,120 | 821 | 50,500 |
| April..... | 1,630 | 1,120 | 1,370 | 81,500 |
| May..... | 2,080 | 1,370 | 1,720 | 106,000 |
| June..... | 2,130 | 1,560 | 1,810 | 108,000 |
| July..... | 1,750 | 1,070 | 1,340 | 82,400 |
| August..... | 1,070 | 890 | 964 | 59,300 |
| September..... | 974 | 702 | 816 | 48,600 |
| The year..... | 2,130 | 572 | 1,050 | 760,000 |
| 1917-18. | | | | |
| October..... | 718 | 564 | 645 | 39,700 |
| November..... | 710 | 493 | 576 | 34,300 |
| December..... | a 9,200 | 504 | 2,980 | 183,000 |
| January..... | a 5,310 | a 1,890 | a 2,780 | 171,000 |
| February..... | a 3,090 | a 1,690 | a 2,110 | 117,000 |
| March..... | a 2,110 | a 1,430 | a 1,630 | 100,000 |
| April..... | a 1,470 | a 1,230 | a 1,370 | 81,500 |
| May..... | a 1,390 | a 900 | a 1,140 | 70,100 |
| June..... | 996 | 842 | 918 | 54,600 |
| July..... | 954 | 726 | 817 | 50,200 |
| August..... | 785 | 592 | 651 | 40,000 |
| September..... | 682 | 568 | 619 | 36,800 |
| The year..... | 9,200 | 498 | 1,350 | 978,000 |

a Estimated by comparison with flow of White Salmon River at Husum.

SANDY RIVER BASIN.

SANDY RIVER BELOW DAM, NEAR MARMOT, OREG.

LOCATION.—In NE. $\frac{1}{4}$ sec. 13, T. 2 S., R. 5 E., a quarter of a mile below diversion dam for Bull Run plant of Portland Railway, Light & Power Co., 1 mile southwest of Marmot, Clackamas County, and 9 miles east of Bull Run.

DRAINAGE AREA.—267 square miles at cable (measured on Mount Hood topographic map and on map of Oregon National Forest).

RECORDS AVAILABLE.—December 22, 1915, to September 30, 1918. When discharge of Sandy River canal is added results are directly comparable with those at station above dam near Marmot, August 15, 1911, to December 21, 1915.

GAGE.—Stevens eight-day water-stage recorder on right bank since December 9, 1916; vertical staff in gage well on right bank October 16 to December 8, 1916, vertical staff on right abutment of dam near head gates of canal used prior to October 16, 1916, and during periods in 1918 when recorder was not operating. Friez water-stage recorder about 2½ miles above present station August 15, 1911, to December 21, 1915.

DISCHARGE MEASUREMENTS.—Made from cable just above backwater of dam (discharge of Sandy River canal deducted) or by wading near gage.

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

EXTREMES OF DISCHARGE.—Maximum stage 15.3 feet (recorder datum), as observed from high-water marks, and 39.0 feet as read on staff gage at dam at 9:30 p. m. December 18 (discharge, 22,800 second-feet; canal dry); minimum stage recorded, 0.27 foot September 17 (discharge, 4 second-feet); minimum discharge of river and canal combined, 302 second-feet November 1.

1911–1918: Maximum stage recorded same as for 1918. The stage of 38.4 feet at dam during night of December 21–22, 1915, determined from high-water marks the next morning, gives a discharge of 19,900 second-feet as recomputed on the basis of later measurements. Minimum stage recorded, 0.95 foot September 29 and 30, 1915, at station above dam (discharge, 285 second-feet).

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

DIVERSIONS.—Sandy River canal of Portland Railway, Light & Power Co. takes out at dam. Its flow is included with that of river to give total run-off.

REGULATION.—The storage back of dam serves to lessen diurnal fluctuation caused by melting glaciers but has no effect for period of a day or more.

ACCURACY.—Stage-discharge relation changed December 18 and April 26. Three well-defined rating curves used as follows: October 1 to December 18, December 20 to April 15 and indirectly to April 25, and April 26 to September 30. Rating curve for dam gage fairly well defined by measurements to 8,500 second-feet, and by weir formula to maximum flood stage. Operation of water-stage recorder fairly satisfactory. Daily discharge ascertained by applying to rating table the mean daily gage height obtained by inspecting the recorder graph, or, for days when there was considerable fluctuation, by averaging discharge determinations obtained by applying to rating table mean gage height for various subdivisions of the day, or, for days when recorder was not operating, by applying to rating table the mean daily gage height obtained from twice-daily readings of gage at dam and by comparison with flow at Bull Run River. Records excellent except those of December, which are good.

Discharge measurements of Sandy River below dam, near Marmot, Oreg., during the year ending Sept. 30, 1918.

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---------|--------------------------|--------------|-----------------|----------|-----------------------------|--------------|-----------------|
| | | <i>Feet.</i> | <i>Sec.-ft.</i> | | | <i>Feet.</i> | <i>Sec.-ft.</i> |
| Oct. 25 | C. L. Batchelder..... | 0.43 | 10.6 | July 16 | C. L. Batchelder..... | 1.43 | 205 |
| Dec. 20 | F. F. Henshaw..... | 8.02 | 7,500 | 22 | Henshaw and Batchelder..... | 1.12 | 95 |
| 29 | do..... | 8.35 | 8,590 | 22 | do..... | 1.86 | 462 |
| Mar. 20 | Stewart and Henshaw..... | 3.21 | 1,100 | Sept. 17 | F. F. Henshaw..... | .27 | a 4.0 |
| Apr. 10 | C. L. Batchelder..... | 3.57 | 1,500 | | | | |
| May 15 | do..... | 3.63 | 1,690 | | | | |

a Estimated.

Daily discharge, in second-feet, of Sandy River below dam, near Marmot, Oreg., for the year ending Sept. 30, 1918.

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---------|------|-------|--------|-------|-------|-------|-------|-------|-------|-------|------|-------|
| 1..... | 27 | 10 | 2,140 | 3,820 | 1,700 | 1,080 | 1,629 | 1,320 | 1,040 | 286 | 112 | 12 |
| 2..... | 18 | 8 | 1,370 | 3,040 | 1,620 | 1,040 | 1,380 | 1,320 | 930 | 390 | 124 | 12 |
| 3..... | 56 | 9 | 1,190 | 3,020 | 1,620 | 1,070 | 1,190 | 1,490 | 895 | 210 | 154 | 12 |
| 4..... | 61 | 13 | 1,220 | 4,400 | 1,740 | 1,000 | 1,040 | 1,670 | 860 | 173 | 38 | 12 |
| 5..... | 12 | 10 | 1,250 | 3,550 | 3,160 | 930 | 1,000 | 1,510 | 895 | 197 | 32 | 12 |
| 6..... | 12 | 17 | 1,620 | 3,160 | 5,270 | 860 | 930 | 1,390 | 965 | 163 | 25 | 12 |
| 7..... | 11 | 9 | 1,340 | 4,100 | 4,740 | 825 | 930 | 1,290 | 965 | 112 | 19 | 12 |
| 8..... | 11 | 8 | 995 | 4,100 | 3,040 | 790 | 965 | 1,240 | 895 | 152 | 12 | 12 |
| 9..... | 11 | 9 | 895 | 3,550 | 2,360 | 825 | 1,220 | 1,240 | 825 | 200 | 14 | 12 |
| 10..... | 13 | 9 | 895 | 2,920 | 2,060 | 860 | 1,460 | 1,180 | 895 | 152 | 24 | 13 |
| 11..... | 14 | 10 | 920 | 4,600 | 2,160 | 860 | 1,420 | 1,070 | 965 | 134 | 59 | 5 |
| 12..... | 22 | 173 | 5,120 | 7,700 | 2,060 | 895 | 1,380 | 1,040 | 895 | 109 | 16 | 5 |
| 13..... | 9 | 454 | 11,600 | 4,250 | 1,960 | 860 | 1,340 | 1,070 | 895 | 100 | 12 | 5 |
| 14..... | 10 | 165 | 9,600 | 4,100 | 1,780 | 790 | 1,180 | 1,210 | 895 | 95 | 12 | 60 |
| 15..... | 10 | 42 | 5,840 | 3,820 | 1,660 | 790 | 1,180 | 1,320 | 720 | 124 | 12 | 40 |
| 16..... | 11 | 30 | 4,600 | 3,960 | 1,660 | 930 | 1,340 | 1,710 | 603 | 183 | 11 | 8 |
| 17..... | 11 | 18 | 10,600 | 3,550 | 1,620 | 1,000 | 1,620 | 1,590 | 596 | 222 | 11 | 4 |
| 18..... | 11 | 10 | 14,800 | 3,420 | 1,540 | 1,380 | 1,540 | 1,470 | 564 | 262 | 14 | 4 |
| 19..... | 11 | 14 | 19,800 | 2,920 | 1,420 | 1,380 | 1,500 | 1,550 | 544 | 179 | 31 | 4 |
| 20..... | 10 | 9 | 8,340 | 2,360 | 1,220 | 1,180 | 1,660 | 1,670 | 551 | 77 | 14 | 4 |
| 21..... | 9 | 9 | 4,710 | 2,060 | 1,100 | 1,100 | 1,780 | 1,750 | 570 | 67 | 11 | 4 |
| 22..... | 9 | 9 | 6,060 | 1,870 | 1,040 | 1,420 | 1,960 | 1,550 | 584 | 196 | 12 | 4 |
| 23..... | 9 | 9 | 6,430 | 1,740 | 1,040 | 1,620 | 1,700 | 1,390 | 570 | 243 | 22 | 4 |
| 24..... | 9 | 9 | 3,960 | 2,200 | 1,000 | 1,620 | 1,700 | 1,280 | 558 | 163 | 21 | 4 |
| 25..... | 12 | 9 | 3,040 | 4,620 | 895 | 1,060 | 1,580 | 1,210 | 551 | 144 | 17 | 4 |
| 26..... | 10 | 9 | 5,100 | 2,920 | 1,140 | 1,960 | 1,430 | 1,100 | 465 | 231 | 17 | 4 |
| 27..... | 9 | 12 | 6,740 | 2,360 | 1,000 | 1,780 | 1,350 | 1,070 | 405 | 144 | 14 | 4 |
| 28..... | 9 | 491 | 9,800 | 2,260 | 1,160 | 1,700 | 1,160 | 1,040 | 290 | 90 | 14 | 4 |
| 29..... | 9 | 2,540 | 8,000 | 2,800 | ..... | 1,740 | 1,240 | 1,040 | 317 | 130 | 14 | 4 |
| 30..... | 9 | 4,870 | 6,060 | 2,260 | ..... | 1,960 | 1,240 | 1,100 | 205 | 95 | 13 | 5 |
| 31..... | 9 | ..... | 4,550 | 1,780 | ..... | 1,870 | ..... | 1,140 | ..... | 106 | 12 | ..... |

Monthly discharge of Sandy River below dam near Marmot, Oreg., for the year ending Sept. 30, 1918.

| Month. | Discharge in second-feet. | | | Run-off in acre-feet. |
|----------------|---------------------------|----------|-------|-----------------------|
| | Maximum. | Minimum. | Mean. | |
| October..... | 61 | 9 | 14.6 | 898 |
| November..... | 4,870 | 8 | 300 | 17,900 |
| December..... | 19,800 | 895 | 5,440 | 334,000 |
| January..... | 7,700 | 1,740 | 3,330 | 205,000 |
| February..... | 5,270 | 895 | 1,880 | 104,000 |
| March..... | 1,960 | 790 | 1,230 | 75,600 |
| April..... | 1,960 | 930 | 1,370 | 81,500 |
| May..... | 1,750 | 1,040 | 1,320 | 81,200 |
| June..... | 1,040 | 205 | 697 | 41,500 |
| July..... | 390 | 67 | 164 | 10,100 |
| August..... | 154 | 11 | 29.5 | 1,810 |
| September..... | 60 | 4 | 10 | 595 |
| The year..... | 19,800 | 4 | 1,320 | 954,000 |

SANDY RIVER BASIN.

Combined daily discharge, in second-feet, of Sandy River and canal near Marmot, Oreg., for the year ending Sept. 30, 1918.

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---------|------|-------|--------|-------|-------|-------|-------|-------|-------|-------|------|-------|
| 1..... | 450 | 302 | 2,380 | 3,840 | 1,880 | 1,220 | 1,890 | 1,610 | 1,330 | 608 | 516 | 400 |
| 2..... | 441 | 308 | 1,610 | 3,110 | 1,800 | 1,320 | 1,650 | 1,610 | 1,220 | 562 | 528 | 384 |
| 3..... | 424 | 357 | 1,420 | 3,240 | 1,810 | 1,350 | 1,500 | 1,790 | 1,240 | 582 | 457 | 368 |
| 4..... | 416 | 385 | 1,460 | 4,650 | 1,980 | 1,280 | 1,400 | 1,970 | 1,210 | 577 | 442 | 352 |
| 5..... | 417 | 374 | 1,490 | 3,790 | 3,370 | 1,200 | 1,360 | 1,880 | 1,250 | 585 | 436 | 352 |
| 6..... | 408 | 389 | 1,860 | 3,380 | 5,430 | 1,130 | 1,270 | 1,680 | 1,320 | 551 | 445 | 352 |
| 7..... | 407 | 333 | 1,580 | 4,320 | 4,960 | 1,140 | 1,270 | 1,560 | 1,320 | 516 | 439 | 362 |
| 8..... | 399 | 324 | 1,220 | 4,340 | 3,250 | 1,140 | 1,300 | 1,520 | 1,250 | 540 | 432 | 352 |
| 9..... | 391 | 317 | 1,130 | 3,780 | 2,550 | 1,170 | 1,570 | 1,520 | 1,210 | 588 | 434 | 384 |
| 10..... | 383 | 317 | 1,130 | 3,120 | 2,250 | 1,210 | 1,820 | 1,470 | 1,280 | 540 | 444 | 385 |
| 11..... | 376 | 318 | 1,250 | 4,780 | 2,340 | 1,210 | 1,680 | 1,380 | 1,210 | 522 | 479 | 377 |
| 12..... | 330 | 553 | 5,340 | 7,800 | 2,280 | 1,240 | 1,640 | 1,350 | 1,280 | 497 | 420 | 361 |
| 13..... | 357 | 754 | 11,600 | 4,520 | 2,170 | 1,170 | 1,600 | 1,380 | 1,200 | 488 | 416 | 409 |
| 14..... | 350 | 457 | 9,620 | 4,350 | 1,970 | 1,110 | 1,520 | 1,520 | 1,110 | 483 | 416 | 480 |
| 15..... | 350 | 383 | 6,050 | 4,070 | 1,850 | 1,140 | 1,470 | 1,640 | 922 | 512 | 416 | 460 |
| 16..... | 351 | 375 | 4,770 | 4,230 | 1,840 | 1,280 | 1,630 | 2,030 | 991 | 587 | 383 | 396 |
| 17..... | 343 | 390 | 10,700 | 3,800 | 1,890 | 1,360 | 1,920 | 1,910 | 952 | 642 | 383 | 360 |
| 18..... | 343 | 382 | 14,800 | 3,670 | 1,810 | 1,760 | 1,830 | 1,790 | 920 | 682 | 434 | 344 |
| 19..... | 343 | 378 | 19,800 | 3,150 | 1,700 | 1,650 | 1,800 | 1,870 | 884 | 583 | 451 | 344 |
| 20..... | 334 | 365 | 8,350 | 2,580 | 1,490 | 1,450 | 1,960 | 1,990 | 907 | 449 | 434 | 344 |
| 21..... | 333 | 349 | 4,720 | 2,280 | 1,370 | 1,360 | 2,080 | 1,920 | 942 | 489 | 399 | 344 |
| 22..... | 325 | 341 | 6,070 | 2,080 | 1,310 | 1,690 | 2,260 | 1,720 | 956 | 486 | 416 | 344 |
| 23..... | 317 | 341 | 6,440 | 1,950 | 1,320 | 1,890 | 2,009 | 1,690 | 958 | 619 | 442 | 312 |
| 24..... | 317 | 333 | 3,970 | 2,420 | 1,270 | 1,900 | 2,009 | 1,570 | 914 | 551 | 441 | 312 |
| 25..... | 352 | 357 | 3,170 | 4,640 | 1,160 | 2,230 | 1,870 | 1,510 | 834 | 516 | 437 | 312 |
| 26..... | 350 | 373 | 5,220 | 3,130 | 1,430 | 2,130 | 1,720 | 1,410 | 837 | 593 | 437 | 312 |
| 27..... | 357 | 376 | 6,820 | 2,450 | 1,280 | 1,950 | 1,640 | 1,370 | 793 | 532 | 402 | 328 |
| 28..... | 341 | 831 | 9,840 | 2,350 | 1,160 | 1,970 | 1,440 | 1,340 | 646 | 494 | 386 | 328 |
| 29..... | 325 | 2,800 | 8,040 | 3,020 | ..... | 2,010 | 1,530 | 1,340 | 689 | 477 | 386 | 344 |
| 30..... | 317 | 5,020 | 6,080 | 2,450 | ..... | 2,230 | 1,530 | 1,410 | 606 | 469 | 385 | 329 |
| 31..... | 317 | ..... | 4,570 | 1,960 | ..... | 2,140 | ..... | 1,440 | ..... | 510 | 400 | ..... |

Combined monthly discharge of Sandy River and canal near Marmot, Oreg., for the year ending Sept. 30, 1918.

[Drainage area, 267 square miles.]

| Month. | Discharge in second-feet. | | | | Run-off. | |
|----------------|---------------------------|----------|-------|------------------|----------|------------|
| | Maximum. | Minimum. | Mean. | Per square mile. | Inches. | Acro-feet. |
| October..... | 450 | 317 | 363 | 1.36 | 1.57 | 22,300 |
| November..... | 5,020 | 302 | 629 | 2.36 | 2.63 | 37,400 |
| December..... | 19,800 | 1,130 | 5,560 | 20.8 | 23.98 | 342,000 |
| January..... | 7,800 | 1,950 | 3,520 | 13.2 | 15.22 | 216,000 |
| February..... | 5,430 | 1,160 | 2,100 | 7.87 | 8.20 | 117,000 |
| March..... | 2,230 | 1,100 | 1,520 | 5.69 | 6.56 | 93,500 |
| April..... | 2,260 | 1,270 | 1,670 | 6.25 | 6.97 | 99,400 |
| May..... | 2,030 | 1,340 | 1,620 | 6.07 | 7.00 | 99,600 |
| June..... | 1,330 | 609 | 1,040 | 3.90 | 4.35 | 61,900 |
| July..... | 682 | 439 | 543 | 2.03 | 2.34 | 33,400 |
| August..... | 528 | 383 | 430 | 1.61 | 1.86 | 26,400 |
| September..... | 480 | 312 | 361 | 1.35 | 1.51 | 21,500 |
| The year..... | 19,800 | 302 | 1,620 | 6.07 | 82.19 | 1,170,000 |

LOST CREEK NEAR BRIGHTWOOD, OREG.

LOCATION.—In NE. $\frac{1}{4}$ sec. 25, T. 2 S., R. 7 E., 100 yards above mouth, 1 mile southeast of Truman's ranch, and 8 miles east of Brightwood, Clackamas County.

DRAINAGE AREA.—11.2 square miles (measured on topographic map).

RECORDS AVAILABLE.—September 17, 1913, to October 9, 1918, when station was discontinued.

GAGE.—Stevens continuous water-stage recorder referred to a vertical staff on left bank; inspected by Carl Raithel and J. S. Malcomson.

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, 4.32 feet at 7 p. m. December 18 (discharge, 1,610 second-feet); minimum stage recorded, 0.40 foot October 1, 1918 (discharge, 15 second-feet).

1913-1918: Maximum and minimum stages recorded same as for 1918; minimum discharge September 25, 1915, was equally low (gage height, 0.38 foot).

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

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed December 12. Two rating curves, well defined below 450 second-feet were used, applicable respectively October 1 to December 11 and December 12 to September 30. Operation of water-stage recorder satisfactory except for breaks in October, November, and February. Daily discharge ascertained by applying to rating table the mean daily gage height obtained by inspecting recorder graph, or, for days of considerable fluctuation, by averaging discharge of bi-hourly periods, or, for periods when recorder was not operating, by comparison with flow of Bull Run River. Records excellent except those of October, November, and February, which are good.

Discharge measurements of Lost Creek near Brightwood, Oreg., during the period Oct. 1, 1917, to Oct. 9, 1918.

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---------|-----------------------|--------------|-----------------|---------|-----------------------|--------------|-----------------|
| | | <i>Feet.</i> | <i>Sec.-ft.</i> | | | <i>Feet.</i> | <i>Sec.-ft.</i> |
| Oct. 30 | C. L. Batchelder..... | 0.35 | 16.2 | July 15 | C. L. Batchelder..... | 0.56 | 21.0 |
| Dec. 16 | F. F. Henshaw..... | 2.23 | 325 | Aug. 24 | F. F. Henshaw..... | .50 | 20.1 |
| May 17 | C. L. Batchelder..... | 1.36 | 112 | Nov. 9 |do..... | .89 | 41.6 |

Daily discharge, in second-feet, of Lost Creek near Brightwood, Oreg., for the period Oct. 1, 1917, to Oct. 9, 1918.

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. |
|---------|------|------|-------|------|-------|------|-------|------|-------|-------|------|-------|-------|
| 1..... | | 17 | 138 | 250 | 91 | 49 | 112 | 93 | 75 | 28 | 22 | 17 | 15 |
| 2..... | | 17 | 93 | 188 | 84 | 50 | 94 | 106 | 67 | 27 | 21 | 17 | 15 |
| 3..... | 18 | 17 | 77 | 235 | 89 | 50 | 85 | 130 | 74 | 27 | 19 | 17 | 16 |
| 4..... | | 17 | 82 | 301 | | 49 | 78 | 134 | 85 | 26 | 19 | 17 | 16 |
| 5..... | | 19 | 87 | 247 | | 45 | 75 | 108 | 98 | 26 | 19 | 16 | 22 |
| 6..... | | 21 | 96 | 230 | | 42 | 74 | 91 | 120 | 25 | 19 | 16 | 20 |
| 7..... | 17 | 19 | 76 | 319 | | 42 | 74 | 85 | 112 | 24 | 19 | 16 | 21 |
| 8..... | | 19 | 61 | 289 | | 43 | 84 | 84 | 98 | 24 | 19 | 16 | 18 |
| 9..... | | 19 | 58 | 222 | | 43 | 112 | 80 | 104 | 23 | 21 | 16 | 17 |
| 10..... | | 19 | 56 | 175 | | 41 | 120 | 74 | 108 | 23 | 21 | 16 | ..... |
| 11..... | 17 | 19 | 74 | 328 | 160 | 41 | 108 | 74 | 108 | 22 | 22 | 17 | ..... |
| 12..... | | 34 | 319 | 435 | | 41 | 98 | 80 | 94 | 21 | 21 | 16 | ..... |
| 13..... | | 37 | 930 | 271 | | 40 | 89 | 84 | 69 | 21 | b 20 | 18 | ..... |
| 14..... | | 28 | 590 | 262 | | 40 | 80 | 91 | 50 | 21 | 18 | 25 | ..... |
| 15..... | | 25 | 322 | 241 | | 43 | 75 | 91 | 40 | 21 | 20 | 20 | ..... |
| 16..... | | 24 | 332 | 247 | | 49 | 89 | 118 | 38 | 23 | 19 | 17 | ..... |
| 17..... | 17 | 24 | 834 | 247 | | 62 | 94 | 112 | 41 | 26 | 19 | 16 | ..... |
| 18..... | | | 1,020 | 228 | | 89 | 91 | 104 | 33 | 26 | 25 | 16 | ..... |
| 19..... | | 17 | 960 | 168 | | 80 | 96 | 100 | 37 | 23 | 25 | 16 | ..... |
| 20..... | | | 403 | 130 | 57 | 72 | 106 | 108 | 40 | 21 | 22 | 16 | ..... |
| 21..... | | 22 | 262 | 114 | 52 | 67 | 120 | 96 | 41 | 21 | 21 | 17 | ..... |
| 22..... | | | 370 | 104 | 52 | 102 | 118 | 91 | 41 | 24 | b 20 | 17 | ..... |
| 23..... | | | 356 | 98 | 51 | 104 | 102 | 87 | 40 | 29 | b 19 | 17 | ..... |
| 24..... | | | 225 | 172 | 50 | 128 | 100 | 80 | 35 | 26 | 19 | 17 | ..... |
| 25..... | | 21 | 170 | 256 | 48 | 153 | 89 | 75 | 31 | 23 | 19 | 16 | ..... |
| 26..... | | a 21 | 353 | 168 | 56 | 132 | 80 | 70 | 31 | 30 | 19 | 16 | ..... |
| 27..... | | a 25 | 451 | 140 | 49 | 114 | 77 | 67 | 31 | 24 | 18 | 15 | ..... |
| 28..... | | | 600 | 149 | 47 | 116 | 84 | 99 | 30 | 21 | 18 | b 15 | ..... |
| 29..... | | 143 | 443 | 149 | ..... | 128 | 91 | 89 | 29 | 21 | 17 | b 15 | ..... |
| 30..... | 17 | | 411 | 120 | ..... | 144 | 93 | 110 | 29 | 20 | 17 | b 15 | ..... |
| 31..... | 18 | | 316 | 98 | ..... | 130 | ..... | 96 | ..... | 20 | 17 | ..... | ..... |

a Estimated.

b Interpolated.

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

Monthly discharge of Lost Creek near Brightwood, Oreg., for the year ending Sept. 30, 1918.

[Drainage area, 11.2 square miles.]

| Month. | Discharge in second-feet. | | | | Run-off. | |
|----------------|---------------------------|----------|-------|------------------|----------|------------|
| | Maximum. | Minimum. | Mean. | Per square mile. | Inches. | Acre-feet. |
| October..... | | | 17.3 | 1.54 | 1.78 | 1,060 |
| November..... | | | 34.2 | 3.05 | 3.40 | 2,040 |
| December..... | 1,020 | 56 | 341 | 30.4 | 35.05 | 21,000 |
| January..... | 435 | 98 | 212 | 18.9 | 21.79 | 13,000 |
| February..... | | 47 | 117 | 10.4 | 10.83 | 6,500 |
| March..... | 144 | 40 | 75.1 | 6.71 | 7.74 | 4,620 |
| April..... | 120 | 74 | 92.9 | 8.29 | 9.25 | 5,330 |
| May..... | 134 | 67 | 92.8 | 8.29 | 9.56 | 5,710 |
| June..... | 130 | 29 | 61.1 | 5.46 | 6.09 | 3,640 |
| July..... | 30 | 20 | 23.8 | 2.12 | 2.44 | 1,460 |
| August..... | 25 | 17 | 19.8 | 1.77 | 2.04 | 1,220 |
| September..... | 25 | 15 | 16.7 | 1.49 | 1.66 | 994 |
| The year..... | 1,020 | 15 | 92.3 | 8.24 | 111.63 | 66,800 |

SANDY RIVER CANAL NEAR MARMOT, OREG.

LOCATION.—In NE. $\frac{1}{4}$ sec. 13, T. 2 S., R. 5 E., 500 feet below headgate, 1 mile southwest of Marmot, and 9 miles east of Bull Run, Clackamas County.

RECORDS AVAILABLE.—December 22, 1915, to September 30, 1918.

GAGE.—Vertical staff in stilling well; datum even with bottom of canal; read by O. G. Olson. Gurley two-day water-stage recorder used July 24 to November 7, 1916.

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

CHANNEL AND CONTROL.—Concrete-lined canal 13 feet wide on bottom, side slopes about 1 to 1. Control is at intake of first tunnel about 200 yards below gage, where there is a drop in grade.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 4.05 feet at 7.30 a. m. August 24 (discharge, 428 second-feet); canal dry at times.

1916-1918: Maximum stage recorded, 4.40 feet August 13 and 14, 1917 (discharge, 504 second-feet); canal dry at times.

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

ACCURACY.—Stage-discharge relation changed slightly April 4. Two well-defined rating curves used, applicable, respectively, October 1 to April 3 and April 4 to September 30. Gage read to hundredths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table. Records excellent.

Sandy River canal diverts water from Sandy River in NE. $\frac{1}{4}$ sec. 13, T. 2 S., R. 5 E., into a reservoir near Bull Run post office, from which it is drawn for the Bull Run hydroelectric plant of the Portland Railway, Light & Power Co. The tailrace of the power plant discharges into Bull Run River in NE. $\frac{1}{4}$ sec. 6, T. 2 S., R. 5 E.

Discharge measurements of Sandy River canal near Marmot, Oreg., during the year ending Sept. 30, 1918.

| Date. | Made by— | Gage height. | Dis-charge. | Date. | Made by— | Gage height. | Dis-charge. |
|---------|-----------------------|--------------|-----------------|----------|---------------------|--------------|-----------------|
| | | <i>Feet.</i> | <i>Sec.-ft.</i> | | | <i>Feet.</i> | <i>Sec.-ft.</i> |
| May 16 | C. L. Batchelder..... | 3.33 | 315 | July 22 | Batchelder and Hen- | | |
| July 16 |do..... | 3.99 | 410 | Sept. 17 | shaw..... | 1.26 | 57 |
| 22 | Batchelder and Hen- | | | | F. F. Henshaw..... | 3.48 | 344 |
| | shaw..... | 3.74 | 384 | | | | |

Daily discharge, in second-feet, of Sandy River canal near Marmot, Oreg., for the year ending Sept. 30, 1918.

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|------|------|-------|------|------|-------|------|-------|------|-------|-------|------|-------|
| 1. | 423 | 292 | 236 | 16 | 190 | 139 | 268 | 292 | 292 | 372 | 404 | 388 |
| 2. | 423 | 300 | 236 | 66 | 190 | 276 | 268 | 292 | 290 | 202 | 404 | 372 |
| 3. | 368 | 348 | 229 | 215 | 187 | 276 | 316 | 300 | 348 | 372 | 303 | 356 |
| 4. | 355 | 372 | 236 | 252 | 194 | 276 | 356 | 300 | 351 | 404 | 404 | 340 |
| 5. | 405 | 364 | 236 | 236 | 208 | 268 | 356 | 292 | 355 | 388 | 404 | 340 |
| 6. | 396 | 372 | 244 | 222 | 158 | 268 | 340 | 292 | 355 | 388 | 420 | 340 |
| 7. | 396 | 324 | 236 | 222 | 222 | 316 | 340 | 284 | 355 | 404 | 420 | 340 |
| 8. | 388 | 316 | 222 | 236 | 208 | 348 | 340 | 284 | 352 | 388 | 420 | 340 |
| 9. | 380 | 308 | 236 | 229 | 194 | 348 | 356 | 284 | 388 | 388 | 420 | 372 |
| 10. | 370 | 308 | 236 | 201 | 187 | 348 | 356 | 292 | 388 | 388 | 420 | 372 |
| 11. | 362 | 208 | 332 | 180 | 190 | 348 | 260 | 308 | 242 | 388 | 420 | 372 |
| 12. | 308 | 380 | 215 | 98 | 222 | 348 | 260 | 308 | 388 | 388 | 404 | 356 |
| 13. | 348 | 300 | 17 | 268 | 208 | 308 | 260 | 308 | 307 | 388 | 404 | 404 |
| 14. | 340 | 292 | 15 | 252 | 194 | 308 | 340 | 308 | 219 | 388 | 404 | 420 |
| 15. | 340 | 341 | 208 | 252 | 187 | 348 | 292 | 324 | 202 | 388 | 404 | 420 |
| 16. | 340 | 345 | 173 | 268 | 190 | 348 | 292 | 324 | 388 | 404 | 372 | 388 |
| 17. | 332 | 372 | 68 | 252 | 268 | 356 | 300 | 324 | 356 | 420 | 372 | 356 |
| 18. | 332 | 372 | 13 | 252 | 268 | 380 | 292 | 324 | 356 | 320 | 420 | 340 |
| 19. | 332 | 364 | 13 | 239 | 276 | 268 | 306 | 324 | 340 | 404 | 420 | 340 |
| 20. | 324 | 356 | 13 | 222 | 268 | 268 | 300 | 324 | 356 | 372 | 420 | 340 |
| 21. | 324 | 340 | 9 | 215 | 268 | 260 | 300 | 166 | 372 | 372 | 388 | 340 |
| 22. | 316 | 352 | 10 | 208 | 268 | 308 | 300 | 170 | 372 | 290 | 404 | 340 |
| 23. | 308 | 352 | 8 | 208 | 276 | 268 | 300 | 300 | 388 | 376 | 420 | 308 |
| 24. | 308 | 324 | 7 | 215 | 268 | 276 | 300 | 292 | 356 | 388 | 420 | 308 |
| 25. | 340 | 348 | 134 | 20 | 268 | 268 | 292 | 300 | 288 | 372 | 420 | 308 |
| 26. | 340 | 364 | 116 | 208 | 292 | 173 | 292 | 308 | 372 | 362 | 420 | 308 |
| 27. | 348 | 364 | 82 | 90 | 284 | 170 | 292 | 300 | 388 | 388 | 388 | 324 |
| 28. | 332 | 340 | 44 | 94 | 2 | 268 | 284 | 300 | 356 | 404 | 372 | 324 |
| 29. | 316 | 260 | 41 | 215 | ..... | 268 | 292 | 300 | 372 | 347 | 372 | 340 |
| 30. | 308 | 148 | 18 | 194 | ..... | 268 | 292 | 308 | 404 | 404 | 372 | 324 |
| 31. | 308 | ..... | 7 | 190 | ..... | 268 | ..... | 300 | ..... | 404 | 388 | ..... |

Monthly discharge of Sandy River canal near Marmot, Oreg., for the year ending Sept. 30, 1918.

| Month. | Discharge in second-feet. | | | Run-off in acre-feet. |
|----------------|---------------------------|----------|-------|-----------------------|
| | Maximum. | Minimum. | Mean. | |
| October..... | 423 | 308 | 349 | 21,500 |
| November..... | 380 | 148 | 330 | 19,680 |
| December..... | 332 | 7 | 126 | 7,750 |
| January..... | 268 | 16 | 194 | 11,900 |
| February..... | 292 | 2 | 218 | 12,180 |
| March..... | 380 | 139 | 287 | 17,600 |
| April..... | 356 | 260 | 305 | 18,100 |
| May..... | 324 | 166 | 295 | 18,100 |
| June..... | 404 | 202 | 343 | 20,400 |
| July..... | 420 | 202 | 379 | 23,300 |
| August..... | 420 | 303 | 401 | 24,700 |
| September..... | 420 | 308 | 351 | 20,900 |
| The year..... | 423 | 2 | 298 | 216,000 |

BULL RUN RIVER NEAR BULL RUN, OREG.

LOCATION.—In sec. 25, T. 1 S., R. 5 E., $1\frac{1}{4}$ 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, 1918; also readings on a gage of city water department, January 5, 1895, to November 13, 1906.

GAGE.—Friez water-stage recorder referred to vertical staff on left bank; datum raised 2.0 feet July 26, 1916. Prior to July 28, 1909, and during periods when recorder was not operating an inclined staff at headworks $1\frac{1}{4}$ miles below present gage was used. Observer, W. B. Wilson.

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

CHANNEL AND CONTROL.—Rocks and gravel; shifting in extreme floods.

EXTREMES OF DISCHARGE.—Maximum stage during year from high-water marks, 11.0 feet at 6 a. m. December 13 (discharge, 15,800 second-feet); minimum stage recorded, 0.36 foot September 29 and 30 (discharge, 69 second-feet).

1895-1918: Maximum and minimum stages same as for 1918.

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

DIVERSIONS.—None above station. The two water-supply pipes divert practically all the low-water flow $1\frac{1}{4}$ miles below the station.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed February 6. Rating curve for 1917, well defined to 12,000 second-feet, was used prior to that date, and an equally well-defined curve thereafter. Operation of water-stage recorder fairly satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height obtained by inspecting recorder graph, or, in time of considerable fluctuation, by subdividing days, or, for periods when recorder was not operating, by estimation, using flood marks in combination with twice-daily gage readings at the headworks as a basis. Records excellent.

Discharge measurements of Bull Run River near Bull Run, Oreg., during the year ending Sept. 30, 1918.

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---------|-----------------------------|--------------|-----------------|----------|-----------------------|--------------|-----------------|
| | | <i>Fect.</i> | <i>Sec.-ft.</i> | | | <i>Fect.</i> | <i>Sec.-ft.</i> |
| Oct. 24 | C. L. Batchelder..... | 0.78 | 122 | Mar. 20 | Stewart and Henshaw | 1.94 | 724 |
| Dec. 15 | F. F. Henshaw..... | 4.80 | 3,650 | Apr. 9 | C. L. Batchelder..... | 2.30 | 927 |
| 29 | James E. Stewart..... | 5.55 | 4,850 | July 14 |do..... | .56 | 104 |
| 29 |do..... | 5.26 | 4,240 | Aug. 27 | F. F. Henshaw..... | .56 | 88 |
| Feb. 6 | Batchelder and Henshaw..... | 6.70 | 6,850 | Sept. 24 |do..... | .40 | 75 |
| 6 |do..... | 6.78 | 7,040 | | | | |

Daily discharge, in second-feet, of Bull Run River near Bull Run, Oreg., for the year ending Sept. 30, 1918.

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---------|------|-------|--------|-------|-------|-------|-------|-------|-------|-------|------|-------|
| 1..... | 125 | 94 | 1,480 | 2,360 | 725 | 482 | 1,110 | 608 | 382 | 132 | 107 | 87 |
| 2..... | 118 | 94 | 1,100 | 1,540 | 630 | 445 | 736 | 644 | 350 | 130 | 109 | 83 |
| 3..... | 114 | 195 | 1,260 | 2,420 | 795 | 448 | 626 | 694 | 328 | 128 | 107 | 83 |
| 4..... | 114 | 180 | 1,480 | 3,200 | 1,180 | 430 | 560 | 708 | 324 | 125 | 105 | 81 |
| 5..... | 111 | 164 | 1,180 | 2,220 | 2,810 | 388 | 524 | 662 | 324 | 125 | 105 | 79 |
| 6..... | 104 | 183 | 1,480 | 1,740 | 4,700 | 354 | 485 | 578 | 332 | 125 | 103 | 79 |
| 7..... | 104 | 142 | 1,100 | 2,810 | 3,060 | 336 | 495 | 512 | 324 | 120 | 103 | 79 |
| 8..... | 102 | 128 | 802 | 2,420 | 1,780 | 360 | 530 | 542 | 310 | 118 | 101 | 79 |
| 9..... | 102 | 118 | 830 | 1,630 | 1,270 | 367 | 960 | 620 | 306 | 115 | 103 | 79 |
| 10..... | 100 | 116 | 774 | 1,180 | 1,270 | 345 | 1,030 | 536 | 306 | 111 | 125 | 79 |
| 11..... | 100 | 114 | 2,000 | 2,420 | 1,580 | 345 | 855 | 490 | 286 | 109 | 140 | 81 |
| 12..... | 100 | 596 | 6,480 | 3,620 | 1,400 | 345 | 820 | 475 | 266 | 107 | 115 | 81 |
| 13..... | 98 | 539 | 12,900 | 2,220 | 1,150 | 336 | 722 | 455 | 252 | 107 | 107 | 87 |
| 14..... | 96 | 320 | 7,430 | 3,000 | 960 | 345 | 701 | 614 | 235 | 107 | 103 | 118 |
| 15..... | 96 | 257 | 3,920 | 3,340 | 785 | 368 | 662 | 890 | 221 | 107 | 103 | 95 |
| 16..... | 94 | 214 | 3,920 | 3,620 | 820 | 420 | 1,030 | 1,230 | 210 | 105 | 103 | 83 |
| 17..... | 94 | 195 | 9,500 | 2,740 | 750 | 536 | 1,070 | 1,000 | 204 | 103 | 103 | 79 |
| 18..... | 94 | 183 | 11,400 | 2,480 | 650 | 1,000 | 925 | 1,000 | 194 | 103 | 118 | 75 |
| 19..... | 92 | 169 | 10,300 | 1,740 | 572 | 820 | 1,000 | 1,270 | 182 | 103 | 135 | 75 |
| 20..... | 90 | 158 | 4,700 | 1,180 | 500 | 708 | 1,110 | 1,000 | 179 | 103 | 115 | 74 |
| 21..... | 90 | 150 | 2,030 | 900 | 458 | 694 | 1,360 | 925 | 173 | 101 | 107 | 74 |
| 22..... | 88 | 142 | 3,770 | 760 | 423 | 1,190 | 1,110 | 785 | 164 | 101 | 111 | 74 |
| 23..... | 88 | 138 | 3,340 | 690 | 460 | 1,230 | 925 | 662 | 164 | 204 | 113 | 75 |
| 24..... | 107 | 138 | 1,790 | 1,490 | 465 | 1,320 | 855 | 608 | 161 | 152 | 107 | 75 |
| 25..... | 107 | 145 | 1,260 | 2,420 | 430 | 1,580 | 736 | 506 | 155 | 122 | 101 | 74 |
| 26..... | 107 | 135 | 3,340 | 1,340 | 548 | 1,400 | 650 | 470 | 149 | 164 | 99 | 72 |
| 27..... | 114 | 207 | 4,070 | 1,140 | 470 | 1,230 | 620 | 435 | 143 | 152 | 95 | 70 |
| 28..... | 109 | 734 | 8,450 | 1,530 | 520 | 1,320 | 632 | 410 | 138 | 132 | 93 | 70 |
| 29..... | 100 | 2,710 | 5,040 | 1,680 | ..... | 1,270 | 644 | 396 | 135 | 120 | 91 | 69 |
| 30..... | 98 | 2,740 | 3,700 | 1,180 | ..... | 1,320 | 620 | 425 | 135 | 113 | 89 | 69 |
| 31..... | 98 | ..... | 3,000 | 865 | ..... | 1,110 | ..... | 420 | ..... | 109 | 87 | ..... |

Monthly discharge of Bull Run River near Bull Run, Oreg., for the year ending Sept. 30, 1918.

[Drainage area, 102 square miles.]

| Month. | Discharge in second-feet. | | | | Run-off. | |
|----------------|---------------------------|----------|-------|------------------|----------|------------|
| | Maximum. | Minimum. | Mean. | Per square mile. | Inches. | Acre-feet. |
| October..... | 125 | 88 | 102 | 1.00 | 1.15 | 6,270 |
| November..... | 2,740 | 94 | 380 | 3.73 | 4.16 | 22,600 |
| December..... | 12,900 | 774 | 3,990 | 39.1 | 45.08 | 245,000 |
| January..... | 3,620 | 690 | 2,000 | 19.6 | 22.60 | 128,000 |
| February..... | 4,700 | 423 | 1,110 | 10.9 | 11.35 | 61,600 |
| March..... | 1,580 | 336 | 737 | 7.23 | 8.34 | 45,300 |
| April..... | 1,360 | 485 | 803 | 7.87 | 8.78 | 47,800 |
| May..... | 1,270 | 396 | 664 | 6.51 | 7.50 | 40,800 |
| June..... | 382 | 135 | 234 | 2.29 | 2.56 | 13,900 |
| July..... | 204 | 101 | 121 | 1.19 | 1.37 | 7,440 |
| August..... | 140 | 87 | 107 | 1.05 | 1.21 | 6,580 |
| September..... | 118 | 69 | 79.3 | .777 | .87 | 4,720 |
| The year..... | 12,900 | 69 | 864 | 8.47 | 114.97 | 625,000 |

LITTLE SANDY RIVER NEAR MARMOT, OREG.

LOCATION.—In SW. $\frac{1}{4}$ sec. 6, T. 2 S., R. 6 E., at trail bridge at Little Sandy ranger station, $1\frac{1}{2}$ miles north of Marmot, Clackamas County.

DRAINAGE AREA.—17.2 square miles (measured on topographic map).

RECORDS AVAILABLE.—August 14, 1913, to September 30, 1918.

GAGE.—Stevens continuous water-stage recorder referred to vertical staff on left bank just below bridge; inspected by 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 from water-stage recorder, 4.56 feet at 9 p. m. December 18 (discharge, 1,710 second-feet); minimum stage recorded, 0.23 foot September 27 and 30 (discharge, 14 second-feet).

1913-1918: Maximum stage from water-stage recorder same as for 1918; minimum stage recorded, 0.21 foot August 28, 1914 (discharge, 12 second-feet).

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

DIVERSIONS.—None above station.

REGULATION.—None.

ACCURACY.—Stage-discharge relation practically permanent. Rating curve well defined below 800 second-feet, except at extreme low water. Operation of water-stage recorder satisfactory except for short periods when sand collected in well. Daily discharge ascertained by applying to rating table mean daily gage height obtained by inspecting recorder graph, or, for days of large fluctuation, by subdividing days, except as indicated in footnote to table of daily discharge. Records good.

Discharge measurements of Little Sandy River near Marmot, Oreg., during the year ending Sept. 30, 1918.

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---------|-----------------------|--------------|-----------------|-----------------------|-----------------------|--------------|-----------------|
| | | <i>Feet.</i> | <i>Sec.-ft.</i> | | | <i>Feet.</i> | <i>Sec.-ft.</i> |
| Apr. 9 | C. L. Batchelder..... | 1.75 | 203 | July 14 ^a | C. L. Batchelder..... | .31 | 20.4 |
| Apr. 10 |do..... | 1.66 | 168 | 15 |do..... | .31 | 16.9 |
| May 17 |do..... | 1.82 | 222 | Sept. 18 ^a | F. F. Henshaw..... | .24 | 9.4 |

^a Measurement somewhat in error on account of low velocities.

Daily discharge, in second-feet, of Little Sandy River near Marmot, Oreg., for the year ending Sept. 30, 1918.

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---------|------|------|-------|------|------|------|------|------|-------|-------|------|-------|
| 1..... | 22 | 16 | 265 | 318 | 145 | 82 | 167 | 135 | 145 | 19 | 17 | 16 |
| 2..... | 20 | 15 | 178 | 237 | 135 | 78 | 135 | 156 | 135 | | 17 | 16 |
| 3..... | 20 | 26 | 178 | 305 | 167 | 76 | 114 | 167 | 116 | | 16 | 16 |
| 4..... | 19 | 29 | 224 | 430 | 200 | 71 | 99 | 178 | 101 | | 16 | 15 |
| 5..... | 18 | 28 | 200 | 335 | 318 | 68 | 93 | 156 | 91 | | 16 | 15 |
| 6..... | 18 | 35 | 300 | 300 | 615 | 64 | 86 | 135 | 85 | | 16 | 15 |
| 7..... | 18 | 24 | 224 | 410 | 472 | 63 | 88 | 114 | 80 | 18 | 16 | 15 |
| 8..... | 17 | 22 | 167 | 430 | 282 | 63 | 94 | 135 | 78 | | 16 | 15 |
| 9..... | 17 | 20 | 178 | 318 | 212 | 61 | 167 | 135 | 71 | | 17 | 15 |
| 10..... | 17 | 19 | 167 | 224 | 212 | 61 | 178 | 120 | 63 | | 22 | 15 |
| 11..... | 17 | 19 | 236 | 596 | 237 | 62 | 156 | 107 | 60 | | 23 | 15 |
| 12..... | 16 | 101 | 800 | 690 | 200 | 63 | 145 | 107 | 58 | | 19 | 15 |
| 13..... | 16 | 149 | 1,280 | 370 | 178 | 61 | 135 | 105 | 54 | | 18 | 16 |
| 14..... | 16 | 66 | 855 | 450 | 156 | 59 | 118 | 135 | 48 | 16 | 17 | 19 |
| 15..... | 15 | 47 | 450 | 495 | 135 | 60 | 107 | 251 | 45 | 16 | 18 | 17 |
| 16..... | 15 | 37 | 450 | 518 | 125 | a 70 | 167 | 232 | 42 | 16 | 18 | 16 |
| 17..... | 15 | 32 | 983 | 410 | 121 | 84 | 200 | 212 | 40 | 16 | 18 | 15 |
| 18..... | 15 | 29 | 1,230 | 352 | 100 | | 167 | 200 | 38 | 18 | 23 | 14 |
| 19..... | 15 | 26 | 1,350 | 251 | 97 | | 178 | 224 | 36 | 17 | 26 | 14 |
| 20..... | 15 | 25 | 640 | 200 | 85 | 150 | 200 | 251 | 35 | 16 | 22 | 14 |
| 21..... | 15 | 24 | 390 | 167 | 79 | | 224 | 200 | 32 | 16 | 20 | 14 |
| 22..... | 15 | 23 | 450 | 145 | 75 | 224 | 212 | 189 | 30 | 16 | 22 | 14 |
| 23..... | 15 | 22 | 450 | 135 | 78 | 189 | 167 | 178 | 28 | 35 | 22 | 14 |
| 24..... | 19 | 22 | 282 | 406 | 73 | 212 | 178 | 167 | 28 | 30 | 20 | 14 |
| 25..... | 20 | 26 | 224 | 450 | 70 | 265 | 145 | 156 | 28 | 22 | 19 | 14 |
| 26..... | 20 | 24 | 377 | 265 | 107 | 251 | 125 | 152 | 26 | 32 | a 18 | 14 |
| 27..... | 23 | 53 | 468 | 237 | 90 | 212 | 125 | 148 | 24 | 26 | 17 | 14 |
| 28..... | 21 | 181 | 855 | 300 | 84 | 237 | 135 | 145 | 23 | 21 | 17 | 14 |
| 29..... | 18 | 414 | 640 | 300 | | 224 | 145 | 135 | 21 | 19 | 17 | 14 |
| 30..... | 17 | 540 | 565 | 224 | | 224 | 135 | 135 | 20 | 18 | 17 | 14 |
| 31..... | 16 | | 410 | 189 | | 200 | | 135 | | 18 | 16 | |

a Interpolated.

NOTE.—Braced figures show mean discharge for periods indicated; estimated by comparison with flow of Bull Run River.

Monthly discharge of Little Sandy River near Marmot, Oreg., for the year ending Sept. 30, 1918.

[Drainage area, 17.2 square miles.]

| Month. | Discharge in second-feet. | | | | Run-off. | |
|----------------|---------------------------|----------|-------|------------------|----------|------------|
| | Maximum. | Minimum. | Mean. | Per square mile. | Inches. | Acro-feet. |
| October..... | 23 | 15 | 17.4 | 1.01 | 1.16 | 1,070 |
| November..... | 540 | 15 | 69.8 | 4.06 | 4.53 | 4,150 |
| December..... | 1,350 | 167 | 496 | 28.8 | 33.20 | 30,500 |
| January..... | 690 | 135 | 337 | 19.6 | 22.60 | 20,700 |
| February..... | 615 | 70 | 173 | 10.1 | 10.52 | 9,610 |
| March..... | 265 | 59 | 129 | 7.50 | 8.65 | 7,930 |
| April..... | 224 | 88 | 146 | 8.49 | 9.47 | 8,690 |
| May..... | 282 | 105 | 163 | 9.48 | 10.93 | 10,000 |
| June..... | 145 | 20 | 56.0 | 3.26 | 3.64 | 3,330 |
| July..... | 35 | 16 | 19.4 | 1.13 | 1.30 | 1,190 |
| August..... | 26 | 16 | 18.6 | 1.08 | 1.24 | 1,140 |
| September..... | 19 | 14 | 14.9 | .866 | .97 | 887 |
| The year..... | 1,350 | 14 | 137 | 7.97 | 108.21 | 99,200 |

WILLAMETTE RIVER BASIN.

WILLAMETTE RIVER AT ALBANY, OREG.

LOCATION.—In SW. $\frac{1}{4}$ sec. 6, T. 11 S., R. 3 W., at end of Broadalbin Street, Albany, Linn County, half a mile above Southern Pacific Railroad bridge (formerly Corvallis & Eastern) just below mouth of Calapooya Creek and 9 miles by river above Santiam River.

DRAINAGE AREA.—4,860 square miles.

RECORDS AVAILABLE.—November 24, 1878, to April 30, 1882; January 21, 1892, to September 30, 1918; fragmentary records 1888 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; practically permanent. Above gage height 17 feet some water flows through a slough several hundred feet to left of main channel.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 20.5 feet at noon December 25 (discharge, 91,200 second-feet); minimum stage recorded, 0.5 foot September 29 and 30 (discharge, 2,470 second-feet.)

1878–1882 and 1892–1918: 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, 1905, and September 5 to 14, and October 13–15, 20–22, 1915 (discharge, 2,400 second-feet). The highest stage ever known was 36.0 feet December 8, 1861 (discharge estimated from extension of rating curve, 302,000 second-feet).

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

DIVERSIONS.—Albany power canal has diverted water from South Santiam River near Lebanon and discharged into Willamette River above the gage and measuring section since the early nineties. It ordinarily carries between 200 and 250 second-feet. Records for run-off per square mile and depth in inches published in Water-Supply Papers 370, 312, 332, 363, and 394 are in error.

REGULATION.—Practically none.

ACCURACY.—Stage-discharge relation changed since last medium-stage discharge measurements; it was assumed that this change occurred on October 1. New rating curve fairly well defined. Gage read to tenths once daily. Daily discharge ascertained by applying daily gage height to rating table. Records good.

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

Discharge measurements of Willamette River at Albany, Oreg., during the year ending Sept. 30, 1918.

[Made by C. L. Batchelder.]

| Date. | Gage height. | Discharge. |
|--------------|--------------|------------|
| Dec. 21..... | 16.9 | 68,500 |
| June 10..... | 2.55 | 7,130 |

Daily discharge, in second-feet, of Willamette River at Albany, Oreg., for the year ending Sept. 30, 1918.

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---------|-------|--------|--------|--------|--------|--------|--------|--------|-------|-------|-------|-------|
| 1..... | 3,420 | 3,030 | 34,800 | 35,700 | 24,000 | 19,200 | 20,000 | 11,500 | 7,000 | 4,270 | 3,620 | 3,220 |
| 2..... | 3,420 | 3,030 | 45,200 | 28,500 | 22,000 | 17,500 | 19,200 | 10,900 | 7,000 | 4,270 | 3,620 | 3,220 |
| 3..... | 3,420 | 3,030 | 29,400 | 23,600 | 23,600 | 17,500 | 17,200 | 10,300 | 7,000 | 4,270 | 3,620 | 3,030 |
| 4..... | 3,420 | 3,030 | 18,600 | 24,400 | 23,600 | 18,900 | 15,500 | 9,950 | 7,000 | 4,060 | 3,420 | 3,030 |
| 5..... | 3,420 | 3,030 | 15,100 | 32,100 | 30,800 | 20,000 | 14,100 | 10,900 | 6,740 | 4,050 | 3,420 | 3,030 |
| 6..... | 3,220 | 3,620 | 12,500 | 31,600 | 43,800 | 17,900 | 13,100 | 11,200 | 6,740 | 4,050 | 3,420 | 3,030 |
| 7..... | 3,220 | 4,270 | 10,900 | 27,600 | 59,500 | 16,500 | 12,500 | 11,200 | 6,740 | 4,050 | 3,420 | 3,030 |
| 8..... | 3,220 | 4,050 | 10,300 | 29,000 | 70,700 | 15,500 | 11,800 | 10,900 | 7,000 | 4,050 | 3,420 | 3,030 |
| 9..... | 3,220 | 3,620 | 9,050 | 31,200 | 60,500 | 14,500 | 12,100 | 10,600 | 7,280 | 3,830 | 3,220 | 2,840 |
| 10..... | 3,220 | 3,220 | 8,450 | 33,900 | 42,900 | 15,500 | 12,100 | 10,300 | 7,000 | 3,830 | 3,220 | 2,840 |
| 11..... | 3,220 | 3,220 | 6,740 | 29,800 | 33,900 | 19,600 | 11,500 | 9,950 | 7,000 | 3,830 | 3,220 | 2,840 |
| 12..... | 3,220 | 3,420 | 7,000 | 36,200 | 29,800 | 24,000 | 13,100 | 9,650 | 6,740 | 3,830 | 3,220 | 2,840 |
| 13..... | 3,220 | 3,620 | 8,150 | 62,000 | 29,000 | 22,000 | 11,500 | 9,050 | 6,740 | 3,830 | 3,220 | 2,840 |
| 14..... | 3,030 | 2,830 | 18,200 | 87,500 | 34,400 | 20,800 | 13,100 | 8,750 | 6,740 | 3,830 | 3,220 | 2,840 |
| 15..... | 3,030 | 3,830 | 35,200 | 71,200 | 34,800 | 19,600 | 12,500 | 8,750 | 6,480 | 3,830 | 3,220 | 2,840 |
| 16..... | 3,030 | 3,420 | 35,700 | 71,200 | 32,600 | 17,200 | 12,500 | 8,450 | 6,480 | 3,830 | 3,220 | 3,030 |
| 17..... | 3,030 | 3,420 | 30,300 | 67,400 | 36,200 | 17,200 | 12,100 | 8,750 | 6,480 | 3,830 | 3,220 | 3,030 |
| 18..... | 3,030 | 3,220 | 37,000 | 60,000 | 42,400 | 18,600 | 12,100 | 8,750 | 6,480 | 3,830 | 3,420 | 2,840 |
| 19..... | 3,030 | 3,220 | 58,000 | 55,500 | 38,800 | 21,200 | 12,100 | 8,750 | 5,960 | 3,830 | 3,420 | 2,840 |
| 20..... | 3,030 | 3,220 | 69,600 | 50,600 | 31,600 | 22,000 | 12,100 | 9,050 | 5,710 | 3,620 | 3,420 | 2,840 |
| 21..... | 3,030 | 3,220 | 68,500 | 41,100 | 26,000 | 19,200 | 12,100 | 8,750 | 5,460 | 3,620 | 3,220 | 2,840 |
| 22..... | 3,030 | 3,230 | 53,500 | 36,200 | 22,400 | 18,200 | 12,100 | 8,450 | 4,970 | 3,620 | 3,220 | 2,650 |
| 23..... | 3,030 | 3,030 | 41,600 | 27,600 | 19,600 | 20,400 | 13,400 | 8,150 | 4,730 | 3,620 | 3,220 | 2,650 |
| 24..... | 3,030 | 3,030 | 60,500 | 23,200 | 20,400 | 25,200 | 13,400 | 7,850 | 4,500 | 3,620 | 3,220 | 2,650 |
| 25..... | 3,030 | 3,030 | 89,000 | 25,200 | 23,200 | 25,600 | 13,400 | 7,860 | 4,500 | 3,620 | 3,220 | 2,650 |
| 26..... | 3,030 | 3,030 | 80,300 | 23,600 | 20,800 | 26,400 | 12,800 | 7,280 | 4,500 | 3,830 | 3,220 | 2,650 |
| 27..... | 3,030 | 3,030 | 64,100 | 22,400 | 20,000 | 26,800 | 12,500 | 7,280 | 4,500 | 3,830 | 3,220 | 2,650 |
| 28..... | 3,030 | 3,220 | 62,000 | 21,200 | 20,000 | 24,000 | 11,800 | 7,000 | 4,500 | 3,830 | 3,220 | 2,650 |
| 29..... | 3,030 | 4,050 | 60,000 | 20,400 | ..... | 21,200 | 11,500 | 7,000 | 4,500 | 3,620 | 3,220 | 2,470 |
| 30..... | 3,030 | 10,900 | 55,500 | 24,000 | ..... | 19,600 | 11,500 | 7,000 | 4,500 | 3,620 | 3,220 | 2,470 |
| 31..... | 3,030 | ..... | 45,600 | 24,000 | ..... | 19,600 | ..... | 7,000 | ..... | 3,620 | 3,220 | ..... |

Monthly discharge of Willamette River at Albany, Oreg., for the year ending Sept. 30, 1918.

| Month. | Discharge in second-feet. | | | Run-off in acre-feet. |
|----------------|---------------------------|----------|--------|-----------------------|
| | Maximum. | Minimum. | Mean. | |
| October..... | 3,420 | 3,030 | 3,140 | 193,000 |
| November..... | 10,900 | 3,030 | 3,600 | 214,000 |
| December..... | 89,000 | 6,740 | 38,100 | 2,340,000 |
| January..... | 87,500 | 20,400 | 38,000 | 2,340,000 |
| February..... | 70,700 | 19,600 | 32,800 | 1,820,000 |
| March..... | 26,800 | 14,500 | 20,000 | 1,230,000 |
| April..... | 20,000 | 11,500 | 13,200 | 786,000 |
| May..... | 11,500 | 7,000 | 9,060 | 557,000 |
| June..... | 7,280 | 4,500 | 6,030 | 359,000 |
| July..... | 4,270 | 3,620 | 3,850 | 237,000 |
| August..... | 3,620 | 3,220 | 3,310 | 204,000 |
| September..... | 3,220 | 2,470 | 2,850 | 170,000 |
| The year..... | 89,000 | 2,470 | 14,400 | 10,400,000 |

SALMON CREEK NEAR OAKRIDGE, OREG.

LOCATION.—In NW. ¼ sec. 13, T. 21 S., R. 3 E., 1 mile above Flat Creek ranger station, 1½ miles above old inclined gage near Southern Pacific Railroad bridge, and 3 miles above Oakridge, Lane County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—February 6, 1913, to September 30, 1918.

GAGE.—Stevens continuous water-stage recorder on right bank about a mile above railroad bridge used since October 1, 1914. Vertical staff on right bank 500 feet above railroad bridge used February 6 to November 21, 1913. Inclined staff on right bank 200 feet above railroad bridge used November 22, 1913, to September 30, 1914; observer, Mrs. J. W. Michael.

DISCHARGE MEASUREMENTS.—Made from railroad bridge 1½ miles below gage or by wading.

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

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 4.35 feet at 6 a. m. January 12 (discharge, estimated from extension of rating curve, 6,400 second-feet); minimum stage recorded, 0.41 foot September 25 (discharge, 112 second-feet); minimum discharge estimated as 110 second-feet earlier in September.

1913–1918: Maximum stage recorded, probably same as for 1918; minimum stage recorded, 0.23 foot October 30, 1915 (discharge, 98 second-feet).

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

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed June 17, affecting only low stages.

Two fairly well defined rating curves used October 1 to June 12 and June 17 to September 30. Operation of water-stage recorder generally unsatisfactory, due largely to incorrect setting of pencil by observer. Daily discharge ascertained by applying to rating table mean daily gage height obtained by inspecting recorder-graph, except for periods when recorder was not operating for which it was ascertained by comparison with flow of Clackamas River. Records fair.

Discharge measurements of Salmon Creek near Oakridge, Oreg., during the year ending Sept. 30, 1918.

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---------|-----------------------|--------------|-----------------|---------|---------------------|--------------|-----------------|
| | | <i>Feet.</i> | <i>Sec.-ft.</i> | | | <i>Feet.</i> | <i>Sec.-ft.</i> |
| June 10 | C. L. Batchelder..... | 1.32 | 419 | Aug. 14 | M. L. Bugbee a..... | 0.55 | 137 |
| Aug. 5 | M. L. Bugbee a..... | .58 | 145 | | | | |

a Engineer, Waldo Lake Irrigation & Power Co.

Daily discharge, in second-feet, of Salmon Creek near Oakridge, Oreg., for the year ending Sept. 30, 1918.

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---------|------|------|-------|-------|-------|------|------|------|-------|-------|------|-------|
| 1..... | 157 | 130 | 450 | 740 | 650 | 440 | 930 | 580 | 410 | 180 | 148 | 110 |
| 2..... | 154 | 128 | | 650 | 610 | 470 | 830 | 610 | 410 | 178 | 150 | |
| 3..... | 151 | 160 | 325 | 780 | 580 | 500 | 740 | 410 | 175 | 148 | | |
| 4..... | 148 | 142 | a 300 | 1,100 | 690 | 500 | 650 | 780 | 470 | 178 | 150 | |
| 5..... | 145 | 178 | a 250 | 1,040 | 1,040 | 470 | 650 | 740 | 540 | 180 | 148 | |
| 6..... | 145 | 151 | 234 | 980 | 2,130 | 440 | 580 | 610 | 540 | 182 | 148 | |
| 7..... | 148 | 135 | 218 | 1,650 | 440 | 580 | 580 | 500 | 188 | 148 | | |
| 8..... | 151 | 130 | 200 | 960 | 1,240 | 440 | 540 | 540 | 440 | 190 | 146 | |
| 9..... | 148 | 122 | 192 | 1,040 | 440 | 580 | 540 | 470 | 191 | 143 | | |
| 10..... | 145 | 120 | 186 | 930 | 930 | 440 | 650 | 470 | 410 | 175 | 143 | |
| 11..... | 145 | 120 | 175 | 1,580 | 880 | 470 | 650 | 440 | 410 | 188 | 141 | 115 |
| 12..... | 148 | | 265 | 2,800 | 880 | 500 | 610 | 440 | 392 | 139 | | |
| 13..... | 148 | | 830 | 780 | 540 | 610 | 440 | 170 | 137 | | | |
| 14..... | 145 | | 980 | 740 | 470 | 540 | 470 | | 137 | | | |
| 15..... | 145 | | 830 | 650 | 470 | 500 | 500 | 325 | 165 | 150 | | |
| 16..... | 140 | | 114 | 740 | 2,130 | 650 | 470 | 540 | 500 | 162 | 152 | |
| 17..... | 138 | | | 1,100 | 690 | 540 | 580 | 500 | 265 | 162 | 150 | |
| 18..... | 135 | | | 1,170 | 610 | 830 | 580 | 470 | 265 | 162 | 152 | |
| 19..... | 138 | | | 1,100 | 580 | 880 | 580 | 470 | 254 | 160 | 148 | |
| 20..... | 138 | | | 1,100 | 1,170 | 540 | 880 | 610 | 440 | 240 | 158 |  | 143 |
| 21..... | 138 | 110 | | 880 | 1,040 | 470 | 740 | 780 | 410 | 237 | 158 | 146 |
| 22..... | 135 | | | 980 | 880 | 440 | 690 | 880 | 386 | 234 | 160 | 139 |
| 23..... | 138 | | | 2,340 | 830 | 440 | 830 | 830 | 386 | 221 | 182 | 139 |
| 24..... | 138 | | | 2,040 | 440 | 830 | 780 | 368 | a 214 | 192 | 137 | a 114 |
| 25..... | 135 | | | 1,480 | 470 | 980 | 780 | 362 | 206 | 178 | 135 | a 112 |
| 26..... | 135 | | 400 | 1,400 | 850 | 500 | 980 | 690 | 350 | 203 | 172 | 130 |
| 27..... | 138 | | | 1,240 | 470 | 880 | 610 | 340 | 198 | 168 | 126 | |
| 28..... | 135 | | | 1,170 | 440 | 830 | 540 | 335 | 192 | 160 | 124 | |
| 29..... | 132 | | | 1,040 | 830 | 580 | 350 | 188 | 152 | 119 | | |
| 30..... | 132 | | | 980 | 780 | 980 | 580 | 398 | 182 | 150 | 112 | |
| 31..... | 130 | 830 | | 740 | 980 | 410 | 150 | 110 | 110 | | | |

a Interpolated.

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

Monthly discharge of Salmon Creek near Oakridge, Oreg., for the year ending Sept. 30, 1918.

| Month. | Discharge in second-feet. | | | Run-off in acre-feet. |
|----------------|---------------------------|----------|-------|-----------------------------|
| | Maximum. | Minimum. | Mean. | |
| October..... | 157 | 130 | 142 | 8,730 |
| November..... | | | 151 | 8,980 |
| December..... | 2,340 | 175 | 820 | 50,400 |
| January..... | | 650 | 1,260 | 77,500 |
| February..... | 2,130 | 440 | 758 | 42,100 |
| March..... | 980 | 440 | 649 | 39,900 |
| April..... | 930 | 500 | 658 | 38,900 |
| May..... | 730 | 335 | 482 | 29,000 |
| June..... | 540 | 182 | 327 | 19,500 |
| July..... | 192 | 150 | 171 | 10,500 |
| August..... | 152 | 110 | 140 | 8,610 |
| September..... | | | 118 | 6,720 |
| The year..... | | | 471 | 341,000 |

McKENZIE RIVER AT McKENZIE BRIDGE, OREG. 5466

LOCATION.—In sec. 14, T. 16 S., R. 6 E., at highway bridge at McKenzie Bridge, Lane County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—August 8, 1910, to September 30, 1916; April 1, 1917, to September 30, 1918.

GAGE.—Vertical staff attached to right abutment of highway bridge at McKenzie Bridge; old staff washed out December 16, 1917, and a new staff was established March 12, 1918, at different datum; read by S. L. Taylor. Another gage, which was formerly read, is at Hayes ranch, half a mile above McKenzie Bridge; and a third is on left bank at Paradise ranger station about 2 miles above bridge.

DISCHARGE MEASUREMENTS.—Made from cable three-eighths of a mile above the ranger station.

CHANNEL AND CONTROL.—Rocky; practically permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 3.2 feet November 30 (discharge, 4,260 second-feet); stage may have gone higher after gage was washed out December 16; minimum stage recorded, 0.44 foot September 24 to 29 (discharge, 1,140 second-feet).

1910-1918: Maximum stage recorded, 5.0 feet on gage at highway bridge, January 13, 1912 (discharge, 7,400 second-feet); minimum stage recorded, 1.42 feet November 7, 1915 (discharge, 924 second-feet).

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

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed March 12 on account of change in gage datum; otherwise practically permanent. Two well-defined rating curves used, one applicable to each datum. Gage read once to hundredths nearly every day. Daily discharge ascertained by applying daily gage height to rating table, except for periods when gage was not read, for which it was ascertained by estimation and interpolation. Records good.

COOPERATION.—Gage records furnished by United States Forest Service, C. R. Seitz, supervisor.

The following measurement was made by R. C. Briggs:

March 12: Gage height, 1.18 feet; discharge, 1,700 second-feet.

Daily discharge, in second-feet, of McKenzie River at McKenzie Bridge, Oreg., for the year ending Sept. 30, 1918.

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|------|-------|-------|-------|------|------|-------|-------|-------|-------|-------|-------|-------|
| 1. | | 1,260 | 2,160 | | | | 2,210 | 1,900 | 1,630 | 1,390 | 1,320 | 1,180 |
| 2. | | 1,260 | 1,760 | | | | 2,100 | 2,000 | 1,630 | 1,390 | 1,320 | 1,180 |
| 3. | | 1,260 | 1,670 | | | | 2,100 | 2,000 | 1,630 | 1,390 | 1,320 | 1,180 |
| 4. | | 1,260 | 1,580 | | | | 2,000 | 2,100 | 1,630 | 1,390 | 1,320 | 1,180 |
| 5. | | 1,260 | | | | | 1,900 | 2,000 | 1,630 | 1,390 | 1,320 | 1,180 |
| 6. | | 1,260 | | | | | 1,900 | | 1,630 | 1,390 | 1,250 | 1,180 |
| 7. | | 1,260 | 1,580 | | | | 1,900 | | 1,630 | 1,390 | 1,250 | 1,180 |
| 8. | | 1,260 | | | | | 1,900 | | 1,630 | 1,390 | 1,250 | 1,180 |
| 9. | | 1,260 | | | | | 2,000 | | 1,630 | 1,390 | 1,250 | 1,180 |
| 10. | | 1,260 | 1,580 | | | | 2,000 | 1,900 | 1,540 | 1,390 | 1,250 | 1,180 |
| 11. | | 1,260 | 1,580 | | | | 2,000 | | | 1,390 | | 1,180 |
| 12. | | 1,260 | 1,670 | | | | 2,000 | | | 1,390 | 1,250 | 1,180 |
| 13. | | 1,260 | 3,150 | | | 1,720 | 2,000 | 1,810 | | 1,390 | | 1,180 |
| 14. | | 1,260 | 3,450 | | | 1,720 | 1,900 | 1,810 | 1,500 | 1,390 | 1,250 | 1,180 |
| 15. | | 1,260 | 3,300 | | | 1,630 | 1,900 | 1,810 | | 1,390 | 1,250 | 1,180 |
| 16. | | 1,260 | | | | 1,630 | 1,900 | 1,810 | | 1,360 | 1,250 | 1,180 |
| 17. | 1,340 | 1,260 | | | | 1,760 | 1,900 | 1,810 | 1,460 | 1,320 | 1,250 | 1,180 |
| 18. | 1,340 | 1,260 | | | | 1,900 | 1,900 | 1,810 | 1,460 | 1,320 | 1,250 | 1,180 |
| 19. | 1,340 | 1,260 | | | | 1,900 | 1,900 | 1,720 | 1,460 | 1,320 | 1,250 | 1,180 |
| 20. | 1,260 | 1,190 | | | | 1,860 | 1,950 | 1,720 | 1,460 | 1,320 | 1,250 | 1,140 |
| 21. | | 1,190 | | | | 1,810 | 2,000 | 1,720 | 1,460 | 1,320 | | 1,140 |
| 22. | | 1,190 | | | | 1,900 | 2,100 | 1,720 | 1,460 | 1,320 | 1,250 | 1,140 |
| 23. | 1,260 | 1,190 | | | | 2,210 | 2,100 | 1,720 | 1,460 | 1,320 | | 1,140 |
| 24. | | 1,190 | | | | 2,210 | 2,100 | 1,680 | | 1,320 | 1,250 | 1,140 |
| 25. | | 1,190 | | | | 2,430 | 2,050 | 1,630 | 1,460 | 1,320 | 1,250 | 1,140 |
| 26. | 1,260 | 1,190 | | | | 2,320 | 2,000 | 1,630 | | 1,320 | 1,180 | 1,140 |
| 27. | 1,260 | 1,190 | | | | 2,210 | 2,000 | 1,630 | 1,390 | 1,320 | 1,180 | 1,140 |
| 28. | 1,260 | 1,420 | | | | 2,100 | 1,900 | 1,630 | 1,390 | 1,320 | 1,180 | 1,140 |
| 29. | 1,260 | 1,500 | | | | 2,210 | 1,900 | 1,630 | 1,390 | 1,320 | 1,180 | 1,140 |
| 30. | 1,260 | 4,260 | | | | 2,320 | 1,900 | 1,630 | 1,390 | 1,320 | 1,180 | 1,140 |
| 31. | 1,260 | | | | | 2,320 | | 1,630 | | 1,320 | 1,180 | |

° Interpolated.

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

Monthly discharge of McKenzie River at McKenzie Bridge, Oreg., for the year ending Sept. 30, 1918.

| Month. | Discharge in second-feet. | | | Run-off in acre-feet. |
|----------------|---------------------------|----------|-------|-----------------------------|
| | Maximum. | Minimum. | Mean. | |
| October 17-31. | 1,340 | 1,260 | 1,260 | 38,100 |
| November | 4,260 | 1,190 | 1,350 | 80,300 |
| December 1-15 | 3,450 | 1,580 | 1,990 | 59,200 |
| March 12-31. | 2,430 | 1,630 | 1,990 | 78,900 |
| April | 2,210 | 1,900 | 1,980 | 118,000 |
| May | 2,100 | 1,630 | 1,800 | 111,000 |
| June | 1,630 | 1,390 | 1,510 | 89,800 |
| July | 1,390 | 1,320 | 1,360 | 83,000 |
| August | 1,320 | 1,180 | 1,250 | 76,900 |
| September | 1,180 | 1,140 | 1,170 | 69,600 |

NORTH SANTIAM RIVER AT NIAGARA, OREG.

LOCATION.—In sec. 29, T. 9 S., R. 4 E., just below Badbanks Creek, half a mile below Niagara, Marion County, and 15 miles below Breitenbush Creek.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—December 21, 1908, to November 17, 1910; June 7, 1911, to September 30, 1918.

GAGE.—Vertical staff in two sections (0 to 6 feet and 6 to 14 feet) on right bank, about 200 feet below the mouth of Badbanks Creek; read by H. D. Bondy.

DISCHARGE MEASUREMENTS.—Made from cable 75 feet above gage. Prior to 1913 made from a boat.

CHANNEL AND CONTROL.—Bed composed of gravel and boulders. Control of huge boulders 50 feet below gage; practically permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 12.7 feet December 19 (discharge, 37,200 second-feet) river may have reached higher stage during night; minimum stage recorded, 1.4 feet September 26 to 30 (discharge, 520 second-feet).

1908-1918: Maximum stage (determined from high-water mark), 16.4 feet about 1 p. m. November 22, 1909 (discharge, 63,200 second-feet); minimum stage, 1.25 feet September 23 to 25, 1915 (discharge, 430 second-feet).

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

DIVERSIONS.—None above station. The Salem power canal diverts water near Stayton.

REGULATION.—None.

ACCURACY.—Stage-discharge relation practically permanent. Rating curve well defined between 400 and 2,000 second-feet and fairly well defined above 2,000 second-feet. Gage read to half-tenths once daily. Daily discharge ascertained by applying daily gage height to rating table. Records good except during December and September for which they are fair.

Discharge measurements of North Santiam River at Niagara, Oreg., during the year ending Sept. 30, 1918.

[Made by C. L. Batchelder.]

| Date. | Gage height. | Discharge. |
|--------------|----------------------|---------------------------|
| Dec. 18..... | <i>Fect.</i> 9.90 | <i>Sec.-ft.</i> 20,400 |
| 19..... | 12.25 | 35,000 |

Daily discharge, in second-feet, of North Santiam River at Niagara, Oreg., for the year ending Sept. 30, 1918.

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---------|------|--------|--------|--------|--------|-------|-------|-------|-------|-------|------|-------|
| 1..... | 720 | 580 | 4,800 | 5,000 | 2,600 | 1,560 | 3,880 | 2,740 | 1,920 | 970 | 720 | 650 |
| 2..... | 720 | 580 | 4,240 | 4,240 | 2,600 | 1,560 | 3,360 | 2,740 | 1,680 | 970 | 720 | 650 |
| 3..... | 720 | 580 | 4,060 | 5,000 | 2,740 | 1,680 | 2,880 | 3,040 | 1,680 | 880 | 720 | 650 |
| 4..... | 720 | 615 | 3,700 | 6,680 | 2,880 | 1,680 | 2,600 | 2,880 | 1,800 | 880 | 650 | 580 |
| 5..... | 720 | 580 | 3,520 | 6,460 | 7,120 | 1,800 | 2,460 | 3,040 | 2,040 | 880 | 650 | 580 |
| 6..... | 720 | 615 | 3,520 | 6,240 | 13,000 | 1,800 | 2,180 | 2,740 | 2,180 | 900 | 650 | 580 |
| 7..... | 720 | 580 | 3,360 | 6,020 | 7,580 | 1,800 | 2,180 | 2,460 | 2,040 | 800 | 650 | 580 |
| 8..... | 720 | 580 | 3,200 | 5,400 | 5,800 | 1,680 | 2,320 | 2,320 | 2,040 | 800 | 650 | 580 |
| 9..... | 685 | 580 | 2,880 | 4,600 | 5,400 | 1,560 | 2,740 | 2,180 | 1,920 | 800 | 650 | 580 |
| 10..... | 685 | 580 | 2,740 | 3,880 | 4,800 | 1,560 | 3,200 | 2,040 | 2,040 | 800 | 650 | 580 |
| 11..... | 685 | 615 | 2,740 | 7,120 | 4,240 | 1,560 | 3,200 | 1,920 | 1,920 | 800 | 650 | 580 |
| 12..... | 660 | 650 | 3,520 | 10,600 | 3,700 | 1,680 | 2,740 | 1,920 | 1,920 | 800 | 650 | 580 |
| 13..... | 660 | 685 | 11,200 | 7,120 | 3,200 | 1,620 | 2,600 | 2,040 | 1,800 | 800 | 650 | 580 |
| 14..... | 615 | 650 | 10,600 | 6,900 | 2,880 | 1,560 | 2,460 | 2,180 | 1,680 | 800 | 650 | 580 |
| 15..... | 615 | 580 | 9,020 | 7,340 | 2,600 | 1,560 | 2,320 | 2,320 | 1,680 | 800 | 650 | 580 |
| 16..... | 615 | 580 | 9,750 | 6,240 | 2,880 | 1,560 | 2,460 | 2,180 | 1,560 | 800 | 650 | 580 |
| 17..... | 615 | 580 | 20,500 | 6,460 | 2,740 | 1,920 | 2,460 | 2,320 | 1,560 | 800 | 720 | 580 |
| 18..... | 615 | 580 | 25,800 | 7,580 | 2,460 | 2,880 | 2,460 | 2,320 | 1,350 | 800 | 720 | 580 |
| 19..... | 615 | 580 | 34,200 | 6,240 | 2,180 | 2,880 | 2,460 | 2,320 | 1,250 | 720 | 720 | 580 |
| 20..... | 615 | 580 | 24,600 | 5,400 | 2,040 | 3,040 | 2,740 | 2,180 | 1,350 | 720 | 720 | 580 |
| 21..... | 615 | 580 | 8,060 | 4,240 | 1,920 | 3,200 | 3,360 | 2,040 | 1,250 | 720 | 720 | 580 |
| 22..... | 615 | 580 | 8,060 | 3,360 | 1,920 | 5,200 | 3,520 | 2,040 | 1,250 | 720 | 720 | 580 |
| 23..... | 615 | 580 | 8,060 | 3,200 | 1,920 | 4,600 | 3,360 | 1,920 | 1,250 | 800 | 650 | 580 |
| 24..... | 650 | 550 | 3,040 | 1,800 | 1,800 | 4,600 | 3,200 | 1,800 | 1,150 | 970 | 650 | 580 |
| 25..... | 650 | 580 | 3,040 | 1,800 | 4,240 | 3,040 | 3,040 | 1,680 | 1,150 | 800 | 650 | 580 |
| 26..... | 615 | 580 | 8,000 | 3,360 | 1,800 | 3,880 | 2,740 | 1,680 | 1,060 | 900 | 650 | 520 |
| 27..... | 615 | 650 | 8,000 | 3,520 | 1,800 | 3,880 | 2,460 | 1,560 | 1,060 | 800 | 650 | 520 |
| 28..... | 615 | 1,450 | 8,000 | 3,360 | 1,680 | 3,700 | 2,460 | 1,560 | 970 | 800 | 650 | 520 |
| 29..... | 615 | 4,600 | 8,000 | 3,200 | ..... | 3,520 | 2,600 | 1,450 | 970 | 800 | 650 | 520 |
| 30..... | 580 | 10,600 | 8,000 | 3,040 | ..... | 3,700 | 2,600 | 1,800 | 970 | 800 | 650 | 520 |
| 31..... | 580 | ..... | 8,000 | 2,740 | ..... | 3,700 | ..... | 1,920 | ..... | 900 | 650 | 580 |

• Interpolated.

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

Monthly discharge of North Santiam River at Niagara, Oreg., for the year ending Sept. 30, 1918.

| Month. | Discharge in second-feet. | | | Run-off in acre-feet. |
|----------------|---------------------------|----------|-------|-----------------------|
| | Maximum. | Minimum. | Mean. | |
| October..... | 720 | 580 | 651 | 40,000 |
| November..... | 10,600 | 550 | 1,060 | 64,800 |
| December..... | 34,200 | 2,740 | 5,900 | 547,000 |
| January..... | 10,600 | 2,740 | 5,180 | 319,000 |
| February..... | 13,000 | 1,680 | 3,500 | 194,000 |
| March..... | 5,200 | 1,560 | 2,620 | 161,000 |
| April..... | 3,880 | 2,180 | 2,770 | 165,000 |
| May..... | 3,040 | 1,450 | 2,170 | 133,000 |
| June..... | 2,180 | 970 | 1,550 | 92,200 |
| July..... | 970 | 720 | 814 | 50,100 |
| August..... | 720 | 580 | 668 | 41,100 |
| September..... | 650 | 520 | 577 | 34,300 |
| The year..... | 34,200 | 520 | 2,540 | 1,840,000 |

CLACKAMAS RIVER NEAR CAZADERO, OREG.

LOCATION.—In NE. $\frac{1}{4}$ sec. 11, T. 4 S., R. 4 E., a short distance above backwater from Cazadero dam of Portland Railway, Light & Power Co. and 3 miles southeast of Cazadero, Clackamas County.

DRAINAGE AREA.—685 square miles.

RECORDS AVAILABLE.—January 1, 1909, to September 30, 1918.

GAGE.—Friez water-stage recorder referred to a vertical staff on right bank; inspected by employees of Portland Railway, Light & Power Co. During intervals of missing record, discharge was based on gage at River mill dam 6 miles below, and Weather Bureau gage, below North Fork, 5 miles above station.

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

CHANNEL AND CONTROL.—Bed composed of rocks and gravel; shifting in extreme floods. No well-defined control.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 95.2 feet at fore-bay staff, above River mill dam, 11 a. m. to 1 p. m. December 19 (discharge, 44,800 second-feet); minimum stage from water-stage recorder, 25.07 feet, September 29 and 30 (discharge, 759 second-feet).

1909–1918: Maximum stage recorded, 43.7 feet at 1 p. m. November 22, 1909 (discharge, 46,800 second-feet); minimum discharge of 705 second-feet occurred September 21 to 23 and October 8 to 10, 1915, at a stage of 25.7 feet.

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

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation shifted during flood of December, 1917. Two well-defined rating curves for regular gage used October 1 to December 10, and March 17 to September 30. Operation of recorder satisfactory during these periods. Daily discharge obtained by applying to rating curve mean daily gage height obtained by inspection of recorder graph. From December 11 to March 16, when recorder was washed out, low-stage discharge from December 9 to 12 and February 16 to March 16 was based on Weather Bureau gage; flood discharge from December 13 to February 15 was based on hourly readings at River mill dam. Records from December to March good, and excellent for remainder of year.

Discharge measurements of Clackamas River near Cazadero, Oreg., during the year ending Sept. 30, 1918.

| Date. | Made by— | Gage height. | Dis-charge. | Date. | Made by— | Gage height. | Dis-charge. |
|---------|---------------------------------|--------------|-----------------|----------|-------------------|--------------|-----------------|
| | | <i>Feet.</i> | <i>Sec.-ft.</i> | | | <i>Feet.</i> | <i>Sec.-ft.</i> |
| Oct. 15 | Frank Ewing ^a | 25.93 | 945 | June 26 | F. G. Robley..... | 26.65 | 1,230 |
| 25 |do..... | 25.85 | 950 | July 3 |do..... | 25.50 | 1,120 |
| Apr. 19 | Batchelder and Robley | 27.35 | 2,990 | Aug. 8 |do..... | 25.30 | 940 |
| June 3 | Ewing and Robley..... | 26.45 | 1,900 | 29 |do..... | 25.20 | 855 |
| 15 | F. G. Robley ^a | 26.00 | 1,590 | Sept. 23 |do..... | 25.10 | 788 |

^a Employee of Portland Railway, Light & Power Co.

Daily discharge, in second-feet, of Clackamas River near Cazadero, Oreg., for the year ending Sept. 30, 1918.

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---------|-------|-------|--------|--------|--------|-------|-------|-------|-------|-------|------|-------|
| 1..... | 1,020 | 926 | 4,480 | 7,580 | 4,100 | 2,480 | 4,740 | 3,180 | 2,100 | 1,160 | 972 | 860 |
| 2..... | 1,010 | 910 | 3,050 | 6,890 | 2,840 | 2,480 | 4,220 | 3,310 | 2,000 | 1,100 | 980 | 852 |
| 3..... | 1,010 | 990 | 2,480 | 6,120 | 3,190 | 2,480 | 3,570 | 3,570 | 1,950 | 1,110 | 948 | 860 |
| 4..... | 1,060 | 1,080 | 2,420 | 6,750 | 3,970 | 2,480 | 3,310 | 3,960 | 1,900 | 1,110 | 940 | 852 |
| 5..... | 990 | 1,080 | 2,320 | 6,550 | 8,080 | 2,350 | 2,940 | 3,880 | 2,000 | 1,110 | 940 | 844 |
| 6..... | 990 | 1,050 | 2,370 | 5,090 | 11,600 | 2,350 | 2,820 | 3,310 | 2,150 | 1,110 | 940 | 836 |
| 7..... | 982 | 974 | 2,150 | 5,900 | 16,500 | 2,000 | 2,820 | 3,060 | 2,150 | 1,060 | 940 | 836 |
| 8..... | 982 | 950 | 1,890 | 6,230 | 10,200 | 2,000 | 2,820 | 3,060 | 2,000 | 1,060 | 940 | 820 |
| 9..... | 982 | 924 | 1,740 | 6,180 | 7,200 | 2,230 | 3,310 | 2,940 | 1,950 | 1,060 | 940 | 820 |
| 10..... | 982 | 926 | 1,570 | 5,800 | 5,600 | 3,000 | 4,350 | 2,700 | 1,900 | 1,060 | 940 | 820 |
| 11..... | 974 | 910 | 1,640 | 7,570 | 5,810 | 2,480 | 3,960 | 2,470 | 1,900 | 1,020 | 940 | 820 |
| 12..... | 966 | 1,080 | 4,780 | 16,500 | 4,850 | 2,480 | 3,700 | 2,470 | 1,750 | 1,020 | 940 | 820 |
| 13..... | 966 | 1,290 | 11,400 | 12,300 | 4,850 | 2,230 | 3,440 | 2,580 | 1,700 | 1,020 | 900 | 820 |
| 14..... | 966 | 1,070 | 15,200 | 9,400 | 5,040 | 2,230 | 3,310 | 2,940 | 1,600 | 1,020 | 900 | 844 |
| 15..... | 966 | 1,020 | 12,000 | 9,860 | 4,070 | 2,230 | 2,940 | 2,940 | 1,560 | 1,020 | 940 | 860 |
| 16..... | 958 | 990 | 8,820 | 8,920 | 3,800 | 2,000 | 2,940 | 3,060 | 1,520 | 1,020 | 900 | 836 |
| 17..... | 958 | 974 | 18,200 | 8,840 | 3,800 | 2,820 | 3,060 | 2,940 | 1,420 | 1,020 | 940 | 812 |
| 18..... | 950 | 958 | 29,100 | 8,300 | 3,520 | 3,960 | 2,940 | 2,820 | 1,340 | 988 | 940 | 804 |
| 19..... | 950 | 950 | 40,500 | 8,320 | 3,520 | 3,700 | 3,060 | 2,820 | 1,380 | 988 | 980 | 796 |
| 20..... | 950 | 942 | 20,300 | 5,670 | 3,000 | 3,310 | 3,310 | 2,820 | 1,340 | 980 | 972 | 788 |
| 21..... | 942 | 942 | 11,200 | 5,040 | 2,740 | 3,180 | 3,830 | 2,700 | 1,340 | 956 | 948 | 788 |
| 22..... | 942 | 934 | 10,900 | 4,330 | 2,610 | 4,740 | 4,220 | 2,580 | 1,290 | 980 | 924 | 780 |
| 23..... | 942 | 918 | 14,300 | 4,640 | 2,610 | 5,650 | 4,090 | 2,470 | 1,280 | 1,160 | 908 | 778 |
| 24..... | 942 | 910 | 11,900 | 3,310 | 2,610 | 5,390 | 3,960 | 2,350 | 1,290 | 1,200 | 884 | 778 |
| 25..... | 950 | 910 | 7,900 | 7,890 | 2,480 | 5,910 | 3,700 | 2,200 | 1,290 | 1,060 | 876 | 773 |
| 26..... | 958 | 910 | 11,900 | 5,090 | 3,260 | 5,780 | 3,440 | 2,100 | 1,240 | 1,110 | 868 | 766 |
| 27..... | 966 | 1,010 | 16,200 | 5,250 | 2,480 | 5,130 | 3,180 | 2,050 | 1,200 | 1,060 | 880 | 766 |
| 28..... | 934 | 1,740 | 16,000 | 5,710 | 2,460 | 4,740 | 3,060 | 2,000 | 1,200 | 1,020 | 880 | 766 |
| 29..... | 934 | ..... | 16,200 | 5,590 | ..... | 4,610 | 3,060 | 2,000 | 1,160 | 1,020 | 860 | 756 |
| 30..... | 934 | ..... | 11,500 | 5,480 | ..... | 5,130 | 3,180 | 2,200 | 1,160 | 986 | 866 | 759 |
| 31..... | 926 | ..... | 9,670 | 4,610 | ..... | 5,260 | ..... | 2,250 | ..... | 972 | 880 | ..... |

a Interpolated.

Monthly discharge of Clackamas River near Cazadero, Oreg., for the year ending Sept. 30, 1918.

[Drainage area, 685 square miles.]

| Month. | Discharge in second-feet. | | | | Run-off. | |
|----------------|---------------------------|-----------|--------|------------------|----------|-------------|
| | Maxi-mum. | Mini-mum. | Mean. | Per square mile. | Inches. | Acres-feet. |
| October..... | 1,020 | 926 | 965 | 1.41 | 1.63 | 59,300 |
| November..... | 7,750 | 910 | 1,340 | 1.96 | 2.19 | 79,700 |
| December..... | 40,500 | 1,570 | 10,500 | 15.3 | 17.64 | 646,000 |
| January..... | 16,500 | 3,310 | 6,960 | 10.2 | 11.76 | 428,000 |
| February..... | 16,500 | 2,460 | 4,890 | 7.14 | 7.44 | 272,000 |
| March..... | 5,910 | 2,000 | 3,450 | 5.04 | 5.81 | 212,000 |
| April..... | 4,740 | 2,820 | 3,480 | 5.08 | 5.67 | 207,000 |
| May..... | 3,960 | 2,000 | 2,760 | 4.03 | 4.65 | 170,000 |
| June..... | 2,150 | 1,160 | 1,600 | 2.34 | 2.61 | 95,200 |
| July..... | 1,200 | 956 | 1,050 | 1.53 | 1.76 | 64,600 |
| August..... | 980 | 860 | 921 | 1.34 | 1.54 | 56,600 |
| September..... | 860 | 759 | 810 | 1.18 | 1.32 | 48,200 |
| The year..... | 40,500 | 759 | 3,230 | 4.72 | 64.02 | 2,338,600 |

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, 11½ miles above station at intake, 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 November 26, 1916, and July 14 to September 30, 1918.

GAGE.—Stevens continuous water-stage recorder on right bank; inspected by employees of Portland Railway, Light & Power Co.

DISCHARGE MEASUREMENTS.—Made from footbridge 20 feet above gage.

CHANNEL AND CONTROL.—Bed composed of gravel. Control fairly permanent.

EXTREMES OF DISCHARGE.—Maximum stage for year occurred prior to period; minimum stage during period, from water-stage recorder, 0.60 foot July 28 (discharge, 134 second-feet).

1913-1916 and 1918: Maximum stage from water-stage recorder 237 feet June 17, 1916 (discharge, 584 second-feet); minimum stage from recorder 0.43 foot November 11, 1915 (discharge, 100 second-feet).

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

DIVERSIONS.—None.

REGULATION.—None.

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

COOPERATION.—Field data furnished by Portland Railway, Light & Power Co.

Discharge measurements of Oak Grove Fork of Clackamas River at Timothy Meadows near Cazadero, Oreg., during the year ending Sept. 30, 1918.

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|--------|--------------------|--------------|-----------------|---------|-----------------------|--------------|-----------------|
| | | <i>Feet.</i> | <i>Sec.-ft.</i> | | | <i>Feet.</i> | <i>Sec.-ft.</i> |
| Oct. 8 | Frank Ewing e..... | 0.70 | 152 | July 14 | F. G. Robley e..... | .70 | 165 |
| 9 | do..... | .70 | 143 | Aug. 13 | Ewing and Robley..... | .67 | 147 |

e Employee of Portland Railway, Light & Power Co.

Daily discharge, in second-feet, of Oak Grove Fork of Clackamas River at Timothy Meadows near Cazadero, Oreg., for the year ending Sept. 30, 1918.

| Day. | July. | Aug. | Sept. | Day. | July. | Aug. | Sept. | Day. | July. | Aug. | Sept. |
|---------|-------|------|-------|---------|-------|------|-------|---------|-------|------|-------|
| 1..... | | 139 | 170 | 11..... | | 147 | 186 | 21..... | 142 | 152 | 181 |
| 2..... | | 139 | 173 | 12..... | | 150 | 186 | 22..... | 147 | 152 | 178 |
| 3..... | | 137 | 178 | 13..... | | 152 | 186 | 23..... | 152 | 155 | 178 |
| 4..... | | 137 | 181 | 14..... | 160 | 152 | 199 | 24..... | 147 | 157 | 173 |
| 5..... | | 139 | 183 | 15..... | 157 | 152 | 186 | 25..... | 139 | 160 | 170 |
| 6..... | 139 | 183 | 183 | 16..... | 155 | 152 | 186 | 26..... | 139 | 160 | 165 |
| 7..... | 139 | 183 | 177 | 17..... | 155 | 152 | 186 | 27..... | 137 | 160 | 163 |
| 8..... | 142 | 183 | 183 | 18..... | 155 | 152 | 186 | 28..... | 134 | 163 | 160 |
| 9..... | 144 | 186 | 186 | 19..... | 150 | 152 | 186 | 29..... | 137 | 165 | 152 |
| 10..... | 144 | 186 | 186 | 20..... | 144 | 152 | 183 | 30..... | 137 | 165 | 147 |
| | | | | | | | | 31..... | 137 | 163 | ..... |

Monthly discharge of Oak Grove Fork of Clackamas River at Timothy Meadows near Cazadero, Oreg., for the year ending Sept. 30, 1918.

| Month. | Discharge in second-feet. | | | Run-off in acre-feet. |
|-----------------|---------------------------|----------|-------|-----------------------------|
| | Maximum. | Minimum. | Mean. | |
| July 14-31..... | 160 | 134 | 146 | 5,210 |
| August..... | 168 | 137 | 151 | 9,280 |
| September..... | 199 | 147 | 178 | 10,600 |
| The period..... | 199 | 134 | 160 | 25,100 |

OAK GROVE FORK OF CLACKAMAS RIVER AT INTAKE NEAR CAZADERO, OREG.

LOCATION.—In SW. $\frac{1}{4}$ sec. 4, T. 6 S., R. 7 E., 2,000 feet above proposed intake of Oak Grove power development of Portland Railway, Light & Power Co., and 35 miles above Cazadero, Clackamas County.

DRAINAGE AREA.—131 square miles (measured by Portland Railway, Light & Power Co.).

RECORDS AVAILABLE.—May 21, 1909, to August 4, 1917, and June 8 to August 24, 1918.

GAGE.—Stevens water-stage recorder installed on right bank, used since December, 1916; Watson recording gage on left bank used March, 1912, to September, 1913; Friez recorder October, 1913, to October, 1916.

DISCHARGE MEASUREMENTS.—Made from cable at gage.

CHANNEL AND CONTROL.—Boulders; irregular but apparently permanent.

EXTREMES OF DISCHARGE.—Maximum stage during period, from water-stage recorder, 1.35 feet June 8 (discharge, 670 second-feet); minimum stage during period, from water-stage recorder, 0.82 foot August 16 (discharge, 403 second-feet).

1909-1918: 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.—Stage-discharge relation not affected by ice.

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined. Operation of water-stage recorder satisfactory except from July 25 to August 11 when it was somewhat uncertain. Daily discharge ascertained by applying to rating table mean daily gage height obtained by inspecting recorder graph. Records good.

COOPERATION.—Field data furnished by Portland Railway, Light & Power Co.

The following discharge measurement was made by Frank Ewing:

October 5, 1917: Gage height, 0.80 foot; discharge, 406 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, 1918.

| Day. | June. | July. | Aug. | Day. | June. | July. | Aug. | Day. | June. | July. | Aug. |
|---------|-------|-------|------|---------|-------|-------|------|---------|-------|-------|-------|
| 1..... | | 520 | 570 | 11..... | 610 | 466 | 415 | 21..... | 565 | 458 | 476 |
| 2..... | | 520 | 570 | 12..... | 592 | 458 | 435 | 22..... | 570 | 490 | 453 |
| 3..... | | 525 | 555 | 13..... | 586 | 458 | 423 | 23..... | 570 | 585 | 440 |
| 4..... | | 525 | 540 | 14..... | 580 | 453 | 419 | 24..... | 570 | 500 | 448 |
| 5..... | | 520 | 530 | 15..... | 575 | 453 | 403 | 25..... | 555 | 505 | ..... |
| 6..... | | 520 | 530 | 16..... | 570 | 458 | 403 | 26..... | 540 | 540 | ..... |
| 7..... | | 505 | 476 | 17..... | 570 | 462 | 431 | 27..... | 535 | 540 | ..... |
| 8..... | 670 | 480 | 435 | 18..... | 570 | 453 | 463 | 28..... | 530 | 540 | ..... |
| 9..... | 646 | 490 | 440 | 19..... | 565 | 448 | 490 | 29..... | 520 | 555 | ..... |
| 10..... | 628 | 480 | 444 | 20..... | 565 | 444 | 476 | 30..... | 520 | 555 | ..... |
| | | | | | | | | 31..... | ..... | 570 | ..... |

Monthly discharge of Oak Grove Fork of Clackamas River at intake, near Cazadero, Oreg., for the year ending Sept. 30, 1918.

| Month. | Discharge in second-feet. | | | Run-off in acre-feet. |
|------------------|---------------------------|----------|-------|-----------------------------|
| | Maximum. | Minimum. | Mean. | |
| June 8-30..... | 670 | 520 | 574 | 26, 200 |
| July..... | 570 | 444 | 497 | 30, 600 |
| August 1-24..... | 570 | 408 | 468 | 22, 300 |
| The period..... | 670 | 408 | 511 | 79, 100 |

LEWIS RIVER BASIN.

LEWIS RIVER NEAR AMBOY, WASH.

LOCATION.—In sec. 36, T. 6, N., R. 3 E., at Cresap's ferry crossing, on county road from Amboy to Cougar, $1\frac{1}{2}$ miles below Canyon Creek, 2 miles above Speilei Creek, and 5 miles northwest of Amboy, Clarke County.

DRAINAGE AREA.—665 square miles (measured on map in Water-Supply Paper 253, page 74, and checked on Forest Service map).

RECORDS AVAILABLE.—January 20, 1911, to September 30, 1918.

GAGE.—Inclined and vertical staffs on left bank; read by James Hanley.

DISCHARGE MEASUREMENTS.—Made from cable near gage.

CHANNEL AND CONTROL.—Bed composed of gravel and small boulders; will shift during extreme floods. No well defined control.

EXTREMES OF DISCHARGE.—Maximum stage during year determined by leveling to high-water marks, 16.4 feet during afternoon of December 18 (discharge, estimated from extension of rating curve, 60,000 feet); minimum stage recorded, 0.00 foot September 23 to 27 (discharge, 730 second-feet).

1911-1918: Maximum stage recorded that of 1918; minimum discharge recorded, 686 second-feet September 30, 1915 (gage height, 0.08 foot).

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

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation shifted during flood of December 18. Rating curve used from October 1 to December 18, and curve used December 19 to September 30, both well defined between 800 and 14,000 second-feet, but poorly defined above. Gage read twice daily to half-tenths at medium and high stages, and to quarter-tenths at low water. Daily discharge ascertained by applying mean daily gage height to rating table. Records good except during December for which they are fair on account of lack of high-water measurements, and during July, for which they are poor because of uncertain gage heights.

Discharge measurements of Lewis River near Amboy, Wash., during the year ending Sept. 30, 1918.

| Date. | Made by— | Gage height. | Dis-charge. |
|---------|-----------------------|--------------|--------------|
| Oct. 27 | C. L. Batchelder..... | Feet. 0.30 | Sec.-ft. 822 |
| Apr. 18 |do..... | 2.55 | 4,280 |
| Aug. 15 | F. F. Henshaw..... | .34 | 993 |

Daily discharge, in second-feet, of Lewis River near Amboy, Wash., for the year ending Sept. 30, 1918.

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---------|-------|-------|--------|--------|--------|--------|-------|-------|-------|-------|-------|-------|
| 1..... | 1,120 | 770 | 3,450 | 27,900 | 4,420 | 2,840 | 6,890 | 4,200 | 2,250 | 1,330 | 1,050 | 840 |
| 2..... | 1,070 | 770 | 3,110 | 15,800 | 4,420 | 2,840 | 6,360 | 4,420 | 2,220 | 1,330 | 1,050 | 840 |
| 3..... | 1,030 | 840 | 3,450 | 14,400 | 4,880 | 3,020 | 6,100 | 4,880 | 1,940 | 1,230 | 1,050 | 800 |
| 4..... | 990 | 840 | 4,200 | 15,200 | 6,890 | 2,840 | 5,360 | 5,120 | 1,940 | 1,230 | 1,000 | 800 |
| 5..... | 990 | 1,070 | 3,450 | 11,800 | 12,100 | 2,840 | 4,880 | 4,880 | 2,220 | 1,230 | 1,000 | 800 |
| 6..... | 910 | 1,070 | 3,280 | 13,100 | 16,200 | 2,680 | 4,650 | 4,420 | 2,520 | 1,230 | 1,000 | 840 |
| 7..... | 910 | 990 | 2,780 | 13,800 | 13,400 | 2,680 | 4,200 | 4,000 | 2,680 | 1,230 | 1,000 | 840 |
| 8..... | 910 | 910 | 2,470 | 11,800 | 10,500 | 2,680 | 4,420 | 3,600 | 2,520 | 1,230 | 1,000 | 800 |
| 9..... | 875 | 840 | 2,470 | 9,840 | 8,600 | 3,020 | 6,890 | 3,600 | 2,520 | 1,230 | 1,050 | 840 |
| 10..... | 875 | 840 | 2,620 | 8,600 | 10,200 | 2,520 | 6,360 | 3,200 | 2,360 | 1,220 | 1,000 | 800 |
| 11..... | 875 | 840 | 4,200 | 8,300 | 10,200 | 2,520 | 6,100 | 3,020 | 2,360 | 1,230 | 1,000 | 800 |
| 12..... | 840 | 1,250 | 5,600 | 9,220 | 9,220 | 2,520 | 5,850 | 3,200 | 2,360 | 1,230 | 920 | 800 |
| 13..... | 840 | 1,250 | 8,000 | 8,600 | 7,430 | 2,520 | 5,360 | 3,200 | 2,360 | 1,180 | 960 | 920 |
| 14..... | 805 | 1,160 | 22,700 | 8,600 | 6,620 | 2,520 | 4,880 | 3,200 | 2,220 | 1,180 | 1,000 | 960 |
| 15..... | 805 | 1,160 | 15,200 | 9,220 | 5,850 | 2,520 | 4,880 | 3,200 | 1,940 | 1,180 | 960 | 920 |
| 16..... | 805 | 1,070 | 22,700 | 11,100 | 5,600 | 2,520 | 4,880 | 3,400 | 1,940 | 1,230 | 960 | 880 |
| 17..... | 805 | 1,070 | 37,700 | 10,500 | 5,360 | 3,200 | 4,200 | 3,200 | 1,940 | 1,230 | 1,000 | 800 |
| 18..... | 770 | 990 | 52,500 | 11,800 | 4,880 | 5,600 | 4,420 | 3,200 | 1,800 | 1,230 | 1,140 | 800 |
| 19..... | 770 | 910 | 39,000 | 10,800 | 4,420 | 4,000 | 4,420 | 3,600 | 1,660 | 1,230 | 1,050 | 800 |
| 20..... | 770 | 840 | 30,000 | 8,600 | 4,000 | 4,000 | 4,420 | 3,600 | 1,660 | 1,230 | 1,000 | 765 |
| 21..... | 735 | 840 | 26,700 | 7,710 | 3,600 | 4,420 | 4,880 | 3,200 | 1,800 | 1,230 | 920 | 765 |
| 22..... | 735 | 840 | 23,100 | 6,620 | 3,200 | 10,500 | 5,360 | 3,200 | 1,800 | 1,330 | 960 | 765 |
| 23..... | 735 | 840 | 18,800 | 6,100 | 3,200 | 9,840 | 5,360 | 3,020 | 1,660 | 1,330 | 960 | 730 |
| 24..... | 805 | 805 | 15,800 | 5,600 | 3,400 | 11,400 | 5,360 | 2,840 | 1,660 | 1,180 | 1,000 | 730 |
| 25..... | 840 | 770 | 10,500 | 6,360 | 3,200 | 12,700 | 4,880 | 2,680 | 1,540 | 1,140 | 960 | 730 |
| 26..... | 840 | 770 | 9,840 | 5,600 | 3,200 | 10,800 | 4,420 | 2,520 | 1,540 | 1,050 | 960 | 730 |
| 27..... | 840 | 1,910 | 18,800 | 5,600 | 3,020 | 9,220 | 4,420 | 2,520 | 1,540 | 1,000 | 860 | 730 |
| 28..... | 770 | 1,670 | 29,200 | 5,120 | 2,840 | 8,300 | 4,200 | 2,520 | 1,430 | 1,000 | 880 | 765 |
| 29..... | 770 | 1,910 | 30,000 | 6,620 | ..... | 7,430 | 4,200 | 2,840 | 1,330 | 960 | 880 | 765 |
| 30..... | 770 | 2,470 | 27,500 | 5,600 | ..... | 7,430 | 4,200 | 2,680 | 1,330 | 960 | 880 | 800 |
| 31..... | 805 | ..... | 25,500 | 4,650 | ..... | 7,430 | ..... | 2,520 | ..... | 960 | 880 | ..... |

Monthly discharge of Lewis River near Amboy, Wash., for the year ending Sept. 30, 1918.

[Drainage area, 665 square miles.]

| Month. | Discharge in second-feet. | | | | Run-off. | |
|----------------|---------------------------|----------|--------|------------------|----------|-------------|
| | Maximum. | Minimum. | Mean. | Per square mile. | Inches. | Acres-feet. |
| October..... | 1,120 | 735 | 852 | 1.28 | 1.48 | 52,400 |
| November..... | 2,470 | 770 | 1,080 | 1.62 | 1.81 | 64,300 |
| December..... | 52,500 | 2,470 | 16,600 | 25.0 | 28.82 | 1,020,000 |
| January..... | 27,900 | 4,650 | 9,810 | 14.8 | 17.06 | 608,000 |
| February..... | 16,200 | 2,840 | 6,460 | 9.71 | 10.11 | 359,000 |
| March..... | 12,700 | 2,520 | 5,140 | 7.73 | 8.91 | 316,000 |
| April..... | 6,890 | 4,200 | 5,100 | 7.67 | 8.56 | 308,000 |
| May..... | 5,120 | 2,520 | 3,410 | 5.13 | 5.91 | 210,000 |
| June..... | 2,680 | 1,330 | 1,980 | 2.98 | 3.32 | 118,000 |
| July..... | 1,830 | 960 | 1,190 | 1.79 | 2.06 | 78,200 |
| August..... | 1,140 | 880 | 979 | 1.47 | 1.70 | 60,200 |
| September..... | 960 | 730 | 805 | 1.21 | 1.35 | 47,900 |
| The year..... | 52,500 | 730 | 4,460 | 6.71 | 91.09 | 3,230,000 |

KALAMA RIVER BASIN.

KALAMA RIVER NEAR KALAMA, WASH.

LOCATION.—In sec. 7, T. 6 N., R. 1 E., 150 feet below power house of North Coast Power Co. and 10 miles east of Kalama, Cowlitz County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—July 6, 1911, to January 11, 1912; December 1, 1912, to September 30, 1913; August 19, 1916, to September 30, 1918.

GAGE.—Vertical staff bolted to rock ledge; lower section up to 8 feet on left bank; upper section, 8 to 12 feet, in a cove on right bank opposite lower section; read by L. A. Van Fleet. Gage at same location, but with datum 2.0 feet lower, used 1911 to January, 1912, and one with datum 3.0 feet lower used December, 1912, to September, 1913.

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

CHANNEL AND CONTROL.—Control is rock reef and bar of heavy gravel about 100 feet below gage; slightly shifting as shown by low-water measurements.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 10.3 feet at 3.20 p. m. December 18, observed by hydrographer (discharge, 11,700 second-feet); minimum stage recorded, 0.08 foot September 30 (discharge, 175 second-feet).

1911-1913 and 1916-1918: Maximum and minimum stages those of 1917-18.

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

DIVERSIONS.—None.

REGULATION.—Operation of power plant causes some fluctuation, but gage is read only at times when load is steady.

ACCURACY.—Stage-discharge relation slightly shifting during extreme low stages. Two well-defined rating curves, which are the same above a stage of 2.0 feet, used during year, one from October 1 to March 31, and other for remainder of year; indirect method for shifting control used October 7 to 23 on account of drift on control. Records excellent, except during October, for which they are good.

Discharge measurements of Kalama River near Kalama, Wash., during the year ending Sept. 30, 1918.

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---------|------------------------|--------------|-----------------|----------|------------------------|--------------|-----------------|
| | | <i>Feet.</i> | <i>Sec.-ft.</i> | | | <i>Feet.</i> | <i>Sec.-ft.</i> |
| Oct. 23 | C. L. Batchelder | 0.84 | 203 | May 22 | C. L. Batchelder | 1.87 | 638 |
| Dec. 18 | James E. Stewart | 10.30 | 11,700 | June 28 |do..... | 1.08 | 302 |
| 19 |do..... | 8.20 | 7,630 | Sept. 24 |do..... | .71 | 186 |
| Feb. 20 |do..... | 8.03 | 1,350 | | | | |

Daily discharge, in second-feet, of Kalama River near Kalama, Wash., for the year ending Sept. 30, 1918.

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---------|------|-------|--------|-------|-------|-------|-------|-------|-------|-------|------|-------|
| 1..... | 261 | 218 | 1,250 | 3,390 | 1,320 | 1,180 | 1,620 | 930 | 532 | 310 | 240 | 210 |
| 2..... | 261 | 218 | 1,110 | 3,750 | 1,320 | 1,110 | 1,460 | 930 | 510 | 292 | 234 | 204 |
| 3..... | 261 | 570 | 930 | 3,630 | 1,620 | 1,050 | 1,320 | 930 | 488 | 292 | 231 | 204 |
| 4..... | 246 | 415 | 1,620 | 3,630 | 2,930 | 1,050 | 1,250 | 1,050 | 465 | 310 | 225 | 201 |
| 5..... | 246 | 435 | 1,180 | 3,040 | 5,350 | 1,050 | 1,180 | 1,050 | 465 | 310 | 234 | 201 |
| 6..... | 246 | 415 | 1,250 | 2,820 | 6,360 | 990 | 1,180 | 990 | 465 | 310 | 228 | 204 |
| 7..... | 232 | 378 | 1,050 | 3,510 | 5,070 | 930 | 930 | 870 | 465 | 292 | 222 | 204 |
| 8..... | 232 | 342 | 930 | 3,040 | 3,270 | 930 | 990 | 705 | 465 | 292 | 234 | 204 |
| 9..... | 232 | 292 | 990 | 2,310 | 2,710 | 930 | 1,860 | 680 | 442 | 282 | 237 | 204 |
| 10..... | 218 | 292 | 930 | 1,950 | 3,390 | 930 | 1,620 | 655 | 442 | 292 | 222 | 201 |
| 11..... | 218 | 292 | 990 | 2,130 | 3,390 | 1,110 | 1,180 | 630 | 420 | 292 | 234 | 204 |
| 12..... | 218 | 645 | 2,310 | 2,410 | 2,610 | 1,110 | 1,320 | 630 | 420 | 292 | 228 | 204 |
| 13..... | 218 | 645 | 7,290 | 2,130 | 2,410 | 1,060 | 1,110 | 690 | 400 | 292 | 228 | 204 |
| 14..... | 218 | 500 | 8,730 | 3,150 | 1,950 | 1,050 | 1,180 | 630 | 400 | 275 | 225 | 204 |
| 15..... | 218 | 415 | 4,400 | 3,150 | 1,960 | 990 | 1,110 | 630 | 380 | 275 | 275 | 196 |
| 16..... | 205 | 378 | 6,960 | 3,510 | 1,950 | 990 | 1,960 | 655 | 362 | 275 | 240 | 196 |
| 17..... | 205 | 308 | 7,110 | 3,750 | 1,950 | 1,250 | 1,960 | 655 | 345 | 275 | 275 | 196 |
| 18..... | 205 | 308 | 10,700 | 3,880 | 1,780 | 1,250 | 1,950 | 705 | 345 | 275 | 310 | 196 |
| 19..... | 205 | 292 | 7,650 | 3,150 | 1,460 | 990 | 1,960 | 705 | 328 | 275 | 275 | 192 |
| 20..... | 205 | 292 | 4,530 | 2,510 | 1,320 | 1,320 | 1,960 | 705 | 328 | 258 | 240 | 189 |
| 21..... | 205 | 276 | 3,150 | 2,040 | 1,320 | 1,700 | 1,320 | 680 | 328 | 258 | 240 | 186 |
| 22..... | 205 | 276 | 5,770 | 1,780 | 1,250 | 4,660 | 1,320 | 630 | 328 | 310 | 258 | 186 |
| 23..... | 205 | 276 | 4,530 | 1,620 | 1,260 | 3,270 | 1,250 | 605 | 328 | 328 | 258 | 186 |
| 24..... | 292 | 261 | 2,930 | 1,620 | 1,320 | 3,880 | 1,060 | 930 | 328 | 275 | 240 | 183 |
| 25..... | 292 | 276 | 2,130 | 1,620 | 1,260 | 3,750 | 1,050 | 565 | 328 | 258 | 240 | 183 |
| 26..... | 276 | 246 | 2,820 | 1,540 | 1,250 | 2,710 | 990 | 532 | 310 | 275 | 231 | 180 |
| 27..... | 261 | 276 | 4,660 | 2,310 | 1,180 | 2,510 | 1,050 | 532 | 310 | 258 | 225 | 180 |
| 28..... | 246 | 455 | 6,360 | 1,780 | 1,180 | 2,130 | 990 | 532 | 310 | 240 | 216 | 178 |
| 29..... | 232 | 645 | 5,490 | 1,950 | ..... | 2,040 | 990 | 532 | 310 | 240 | 216 | 178 |
| 30..... | 232 | 1,390 | 4,530 | 1,780 | ..... | 2,040 | 990 | 555 | 310 | 240 | 210 | 175 |
| 31..... | 218 | ..... | 7,650 | 1,460 | ..... | 1,780 | ..... | 555 | ..... | 240 | 210 | ..... |

Monthly discharge of Kalama River near Kalama, Wash., for the year ending Sept. 30, 1918.

| Month. | Discharge in second-feet. | | | Run-off in acre-feet. |
|----------------|---------------------------|----------|-------|-----------------------|
| | Maximum. | Minimum. | Mean. | |
| October..... | 292 | 205 | 233 | 14,300 |
| November..... | 1,390 | 218 | 402 | 23,900 |
| December..... | 10,700 | 930 | 3,930 | 242,000 |
| January..... | 3,880 | 1,460 | 2,590 | 159,000 |
| February..... | 6,360 | 1,180 | 2,290 | 127,000 |
| March..... | 4,660 | 930 | 1,670 | 103,000 |
| April..... | 1,950 | 930 | 1,340 | 79,700 |
| May..... | 1,050 | 532 | 698 | 42,900 |
| June..... | 532 | 310 | 388 | 23,100 |
| July..... | 328 | 240 | 281 | 17,360 |
| August..... | 310 | 210 | 238 | 14,600 |
| September..... | 210 | 175 | 194 | 11,500 |
| The year..... | 10,700 | 175 | 1,190 | 858,000 |

COWLITZ RIVER BASIN.

COWLITZ RIVER AT LEWIS, WASH.

LOCATION.—In sec. 15, T. 13 N., R. 9 E., at suspension bridge 1 mile northeast of Lewis and $1\frac{1}{2}$ miles below Lake Creek, Lewis County.

DRAINAGE AREA.—275 square miles (measured on Plate I, Water-Supply Paper 313).

RECORDS AVAILABLE.—July 1, 1911, to September 30, 1918.

GAGE.—Vertical and inclined staffs on left bank 100 feet below suspension bridge, installed January 26, 1918; read by William Sethe and J. A. Combs. Two temporary staff gages at same site as present gage were read December 20, 1917, to January 26, 1918. A vertical staff on left bank 40 feet above bridge, and at independent datum, was read May 3, 1915, to December 17, 1917, when it was washed out. Original gage, read until May 3, 1915, was installed August 15, 1907, by Valley Development Co. at same site as present gage. Datum of original gage was 1.98 feet higher than present datum. Original gage was washed out November 20, 1911, and November 3, 1914, but was replaced each time at same site and datum. Datum of published gage heights for year ending September 30, 1913, is 0.07 foot lower than correct datum for that period, as corrections to gage heights were not applied for that year.

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

CHANNEL AND CONTROL.—Bed of stream composed of gravel and sand; shifts at high water. Right bank subject to overflow at extremely high stages. Control is gravel and boulder riffle 150 feet below gage. Stage of zero flow, according to measurement made September 17, 1918, gage height -0.3 foot ± 0.1 foot.

EXTREMES OF DISCHARGE.—Maximum stage during year, 10.1 feet at 8 a. m. December 29, estimated by J. A. Combs (discharge, from extension of rating curve, 22,700 second-feet); minimum stage recorded, 0.58 foot September 25 (discharge, 332 second-feet).

1911-1918—Maximum stage, that for 1918; minimum stage recorded, 0.95 foot October 30 to November 3, 1911 (discharge, 285 second-feet).

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

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed December 18 and March 13 to 25. Rating curve used October 1 to December 17 fairly well defined; curve used December 20 to March 12 fairly well defined below 5,000 second-feet, and poorly defined above; curve used March 26 to September 30 well defined below 3,000 second-feet and fairly well defined above. Staff gage read to hundredths once daily about two-thirds of the time. Daily discharge ascertained by applying daily gage height to rating table, and interpolating discharge for days when gage was not read; shifting-control method used March 13 to 25. Records fair; except for period December 18 to January 7, for which they are poor.

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, 1918.

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---------|-----------------------|--------------|-----------------|----------|-----------------------|--------------|-----------------|
| | | <i>Feet.</i> | <i>Sec.-ft.</i> | | | <i>Feet.</i> | <i>Sec.-ft.</i> |
| Jan. 23 | Carson and Combs..... | 1.97 | 1,780 | Apr. 29 | Carson and Combs..... | 2.50 | 2,260 |
| 26 |do..... | 2.01 | 1,750 | July 27 | Lasley Lee..... | 1.36 | 838 |
| 28 | L. D. Carson..... | 1.88 | 1,630 | Sept. 17 | T. G. Bedford..... | 1.02 | 611 |
| Apr. 25 |do..... | 2.48 | 2,240 | 18 |do..... | .80 | 493 |
| 26 |do..... | 2.29 | 2,000 | | | | |

Daily discharge, in second-feet, of Cowlitz River at Lewis, Wash., for the year ending Sept. 30, 1918.

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. | |
|---------|------|-------|--------|-------|-------|-------|-------|-------|-------|-------|------|-------|-----|
| 1..... | 655 | 439 | 616 | 8,300 | 1,200 | 545 | 1,270 | 2,260 | 2,130 | 2,130 | 776 | 660 | |
| 2..... | 655 | 439 | 547 | | 1,150 | 545 | 1,240 | 2,800 | 1,950 | 2,130 | | 620 | |
| 3..... | 655 | 610 | 547 | | 1,520 | 534 | 1,200 | 3,280 | 1,770 | 1,890 | | 545 | |
| 4..... | 715 | 781 | 573 | | 6,400 | 1,890 | 522 | 1,140 | 3,770 | 2,130 | | 1,770 | 785 |
| 5..... | 685 | 685 | 500 | | 5,060 | 2,260 | 510 | 1,060 | 3,300 | 3,590 | | 1,840 | 545 |
| 6..... | 655 | 599 | 547 | 6,150 | 2,950 | 475 | 980 | 2,830 | 4,970 | 1,910 | 700 | 510 | |
| 7..... | 627 | 547 | 524 | 5,900 | 2,660 | 475 | 1,040 | 2,360 | 5,190 | 1,990 | | 475 | |
| 8..... | 627 | 513 | 500 | 4,340 | 2,130 | 468 | 1,090 | 1,890 | 4,750 | 2,060 | | 510 | |
| 9..... | 599 | 479 | 524 | 3,570 | 1,770 | 462 | 1,890 | 1,770 | 5,080 | 2,130 | | 740 | 580 |
| 10..... | 573 | 458 | 547 | 2,800 | 1,410 | 435 | 2,130 | 1,650 | 5,420 | 1,780 | | 980 | 785 |
| 11..... | 548 | 490 | 738 | 3,100 | 1,060 | 468 | 2,010 | 1,530 | 4,340 | 1,420 | 980 | 890 | |
| 12..... | 524 | 502 | 929 | 4,140 | 700 | 442 | 1,830 | 1,830 | 5,120 | 1,540 | 740 | 620 | |
| 13..... | 500 | 524 | 5,030 | 3,860 | 1,530 | 395 | 1,650 | 2,130 | 5,900 | 1,660 | 890 | 725 | |
| 14..... | 547 | 500 | 10,700 | 3,590 | 1,360 | 418 | 1,450 | 2,520 | 3,950 | 1,770 | 830 | 830 | |
| 15..... | 547 | 458 | 5,030 | 2,520 | 1,200 | 440 | 1,250 | 2,010 | 3,720 | 1,890 | 785 | 785 | |
| 16..... | 500 | 448 | 7,340 | 2,390 | 1,150 | 462 | 1,150 | 2,010 | 3,490 | 2,010 | 620 | 620 | |
| 17..... | 458 | 439 | 9,200 | 2,520 | 1,040 | 561 | 1,040 | 2,010 | 3,290 | 1,950 | 580 | 580 | |
| 18..... | 446 | 420 | ..... | 2,590 | 930 | 660 | 1,100 | 1,890 | 2,800 | 1,890 | 740 | 510 | |
| 19..... | 433 | 420 | ..... | 2,660 | 815 | 660 | 1,150 | 1,710 | 2,950 | 1,490 | 660 | 580 | |
| 20..... | 420 | 500 | 10,400 | 2,340 | 700 | 660 | 1,650 | 1,580 | 2,950 | 1,090 | 580 | 475 | |
| 21..... | 458 | 627 | 7,740 | 2,010 | 660 | 660 | 2,520 | 1,440 | 3,770 | 1,070 | 620 | 448 | |
| 22..... | 448 | 572 | 13,700 | 1,890 | 700 | 1,420 | 2,660 | 1,360 | 3,590 | 1,040 | 700 | 357 | |
| 23..... | 439 | 516 | 9,770 | 1,770 | 660 | 1,200 | 2,660 | 1,420 | 3,340 | 1,020 | 740 | 357 | |
| 24..... | 500 | 458 | 8,220 | 2,010 | 646 | 1,730 | 2,390 | 1,420 | 3,100 | 1,000 | 785 | 344 | |
| 25..... | 458 | 448 | 6,660 | 1,890 | 634 | 2,260 | 2,260 | 1,250 | 2,520 | 976 | 785 | 332 | |
| 26..... | 449 | 439 | 9,170 | 1,770 | 620 | 1,890 | 2,010 | 1,200 | 2,390 | 953 | 785 | 456 | |
| 27..... | 440 | 458 | 17,000 | 1,710 | 545 | 1,650 | 1,890 | 1,150 | 2,390 | 930 | 740 | 580 | |
| 28..... | 430 | 500 | ..... | 1,650 | 545 | 1,420 | 2,080 | 1,530 | 2,260 | ..... | 580 | 700 | |
| 29..... | 420 | 547 | 22,700 | 1,650 | ..... | 1,380 | 2,260 | 1,680 | 2,130 | 882 | 620 | 574 | |
| 30..... | 439 | 685 | ..... | 1,420 | ..... | 1,350 | 2,390 | 1,830 | 2,130 | | 580 | 448 | |
| 31..... | 420 | ..... | ..... | 1,200 | ..... | 1,310 | ..... | 1,980 | ..... |  | 580 | ..... |  |

NOTE.—Discharge not determined Dec. 18, 19, 28, 30, and 31, because gage was not read, and flood stage rendered interpolation very unreliable.

Monthly discharge of Cowlitz River at Lewis, Wash., for the year ending Sept. 30, 1918.

[Drainage area, 275 square miles.]

| Month. | Discharge in second-feet. | | | | Run-off. | | |
|----------------|---------------------------|----------|-------|------------------|----------|------------|-----------|
| | Maximum. | Minimum. | Mean. | Per square mile. | Inches. | Acre-feet. | |
| October..... | 715 | 420 | 525 | 1.91 | 2.20 | 32,300 | |
| November..... | 781 | 420 | 516 | 1.88 | 2.10 | 30,700 | |
| December..... | ..... | 500 | 6,800 | 24.7 | 28.48 | 418,000 | |
| January..... | ..... | 1,200 | 3,500 | 12.7 | 14.64 | 215,000 | |
| February..... | 2,950 | 545 | 1,230 | 4.47 | 4.66 | 68,300 | |
| March..... | 2,260 | 395 | 1,850 | 3.09 | 3.56 | 52,300 | |
| April..... | 2,660 | 980 | 1,680 | 6.11 | 6.82 | 100,000 | |
| May..... | 3,770 | 1,150 | 1,980 | 7.20 | 8.30 | 122,000 | |
| June..... | 5,900 | 1,770 | 3,440 | 12.5 | 13.95 | 205,000 | |
| July..... | 2,130 | ..... | 1,510 | 5.49 | 6.33 | 92,800 | |
| August..... | 980 | ..... | 733 | 2.67 | 3.08 | 45,100 | |
| September..... | 830 | 332 | 572 | 2.08 | 2.32 | 34,000 | |
| The year..... | | | 332 | 1,980 | 7.09 | 96.44 | 1,420,000 |

* Estimated.

LAKE CREEK AT OUTLET OF PACKWOOD LAKE, NEAR LEWIS, WASH.

LOCATION.—In sec. 21, T. 13 N., R. 10 E., 400 feet below outlet of Packwood Lake and 5 miles east of Lewis, Lewis County.

DRAINAGE AREA.—About 18 square miles (measured on Pl. I, Water-Supply Paper 313).

RECORDS AVAILABLE.—September 2, 1911, to September 30, 1918.

GAGE.—Friez water-stage recorder on left bank with outside and inside staff gages, installed August 3, 1918; inspected by J. A. Combs. Original gage read September, 1911, to December 17, 1917, was vertical staff on right bank about 100 feet downstream, at independent datum; washed out by flood on December 18, 1917. Temporary staff gage near site of present recorder, at independent datum was read December 18, 1917, to January 24, 1918. Gage read January 24 to July 28, 1918, was vertical staff at site of original gage, and at datum 2.00 feet lower.

DISCHARGE MEASUREMENTS.—Made by wading near gage, or from footbridge 200 feet upstream.

CHANNEL AND CONTROL.—Bed composed of gravel and small boulders. Partial control about 20 feet downstream from gage formed by several trees felled across the stream from both banks. Trees partly broken and wedged against a large boulder in midstream. Control for original gage was timber weir with rectangular opening 19.94 feet long, 4.4 feet high, and one-inch crest; destroyed by flood December 18 1917. Control for temporary gages was flood-scoured channel.

EXTREMES OF DISCHARGE.—Maximum stage during the year occurred during flood on December 18, estimated 6 feet, original gage datum (discharge not determined); minimum stage recorded, 0.28 foot on March 21 (discharge, 29 second-feet).

1911-1918: Maximum stage recorded, 4.00 feet, morning reading June 18, 1916 (discharge, 582 second-feet), actual maximum occurred December 18, 1917; minimum stage recorded in 1918.

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

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed December 18 when gage and weir were destroyed by flood; changed again January 24 when gage was moved to different site; and again August 1 when artificial control for recorder station was constructed. Rating curve used October 1 to December 17 well defined by measurements in 1916 and 1917; no rating December 18 to January 23; curve used January 24 to July 31 fairly well defined between 40 and 150 second-feet; curve used August 3 to September 30 well defined. Gage read to hundredths twice daily except as indicated in footnote to table of daily discharge. Daily discharge ascertained by applying daily mean gage height to rating table. Records good for periods October to December 15, and August and September; fair for period May to July; poor for remainder of year.

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, 1918.

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---------|-----------------------|--------------|-----------------|----------|-----------------------|--------------|-----------------|
| | | <i>Feet.</i> | <i>Sec.-ft.</i> | | | <i>Feet.</i> | <i>Sec.-ft.</i> |
| Jan. 24 | Carson and Combs..... | 1.12 | 142 | July 28 | Lee and Combs..... | 1.92 | 104 |
| Apr. 28 | L. D. Carson..... | .95 | 110 | Sept. 18 | Bedford and Combs.... | 1.88 | 51 |
| 28 |do..... | .95 | 106 | | | | |

^a Reading at recorder site; former staff gage read 0.971 out.

^b Reading at recorder site; former staff gage read 0.51f out.

Daily discharge, in second-feet, of Lake Creek at outlet of Packwood Lake near Lewis, Wash., for the year ending Sept. 30, 1918.

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|------|------|------|------|------|------|------|------|------|-------|-------|------|-------|
| 1. | 66 | 38 | 48 | | 113 | 82 | 53 | 117 | 137 | 190 | 188 | 67 |
| 2. | 65 | 37 | 47 | | 113 | 78 | 52 | 121 | 139 | 180 | 100 | 67 |
| 3. | 62 | 36 | 47 | | 113 | 75 | 51 | 129 | 139 | 171 | 97 | 62 |
| 4. | 90 | 41 | 47 | | 113 | 72 | 50 | 146 | 121 | 162 | 92 | 58 |
| 5. | 59 | 42 | 46 | | 129 | 67 | 50 | 154 | 137 | 154 | 82 | 55 |
| 6. | 58 | 44 | 47 | | 125 | 66 | 52 | 162 | 180 | 154 | 77 | 54 |
| 7. | 58 | 42 | 45 | | 121 | 64 | 54 | 137 | 273 | 184 | 77 | 52 |
| 8. | 57 | 42 | 46 | | 121 | 61 | 56 | 135 | 367 | 145 | 77 | 51 |
| 9. | 52 | 40 | 46 | | 121 | 60 | 58 | 129 | 350 | 162 | 92 | 51 |
| 10. | 53 | 39 | 45 | | 121 | 58 | 65 | 121 | 330 | 171 | 113 | 51 |
| 11. | 49 | 38 | 45 | | 121 | 56 | 65 | 121 | 354 | 162 | 125 | 51 |
| 12. | 48 | 40 | 63 | 190 | 113 | 82 | 70 | 113 | 378 | 146 | 113 | 50 |
| 13. | 46 | 46 | 124 | | 113 | 52 | 69 | 113 | 408 | 145 | 97 | 51 |
| 14. | 45 | 43 | 152 | | 113 | 52 | 67 | 121 | 408 | 154 | 92 | 54 |
| 15. | 43 | 43 | 152 | | 113 | 50 | 66 | 121 | 330 | 154 | 92 | 55 |
| 16. | 42 | 42 | 287 | | 108 | 49 | 65 | 121 | 273 | 180 | 90 | 54 |
| 17. | 42 | 41 | 422 | | 103 | 48 | 64 | 121 | 262 | 199 | 87 | 54 |
| 18. | 42 | 41 | | | 98 | 46 | 64 | 113 | 240 | 199 | 84 | 52 |
| 19. | 40 | 40 | | | 95 | 45 | 65 | 110 | 230 | 190 | 82 | 51 |
| 20. | 39 | 40 | | | 92 | 38 | | 106 | 240 | 162 | 80 | 51 |
| 21. | 38 | 39 | | | 90 | 29 | | 106 | 240 | 145 | 77 | 51 |
| 22. | 38 | 38 | | | 87 | 36 | | 106 | 254 | 129 | 77 | 49 |
| 23. | 38 | 38 | | | 87 | 46 | 86 | 106 | 296 | 145 | 82 | 47 |
| 24. | 36 | 38 | | 137 | 87 | 54 | | 106 | 273 | 129 | 82 | 47 |
| 25. | 37 | 40 | 600 | 136 | 84 | 50 | | 106 | 262 | 129 | 82 | 47 |
| 26. | 43 | 42 | | 134 | 84 | 45 | | 88 | 240 | 121 | 77 | 47 |
| 27. | 42 | 47 | | 132 | 84 | 44 | | 84 | 230 | 121 | 77 | 47 |
| 28. | 41 | 51 | | 130 | 84 | | | 82 | 219 | 106 | 72 | 47 |
| 29. | 40 | 51 | | 129 | 44 | 54 | 106 | 89 | 206 | 106 | 72 | 47 |
| 30. | 40 | 49 | | 121 | | 54 | 113 | 95 | 199 | 106 | 67 | 46 |
| 31. | 38 | | | 117 | | 53 | | 113 | | 106 | 67 | |

NOTE.—Fragmentary record of daily gage height from Dec. 18 to Jan. 24 are given in separate table; discharge determined by comparison with records of flow of Cowlitz River at Lewis, Wash. Gage not read, discharge interpolated Oct. 17, 21, Nov. 25, numerous days Jan. to Apr. May 1, 5, 8, 19, Aug. 1, 2, 16-20. Braced figure shows estimated mean discharge for period indicated.

Daily gage height, in feet, of Lake Creek at outlet of Packwood Lake, near Lewis, Wash., for the period, Dec. 18, 1917, to Jan. 24, 1918.

| Day. | Dec. | Jan. | Day. | Dec. | Jan. | Day. | Dec. | Jan. |
|------|------|------|------|------|------|------|------|------|
| 1. | | | 11. | | 0.41 | 21. | | 1.95 |
| 2. | | | 12. | | | 22. | | |
| 3. | | 1.32 | 13. | | | 23. | | |
| 4. | | 1.20 | 14. | | | 24. | | 1.62 |
| 5. | | | 15. | | | 25. | | |
| 6. | | | 16. | | | 26. | | |
| 7. | | .56 | 17. | | .22 | 27. | | 1.82 |
| 8. | | .50 | 18. | | 4.80 | 28. | | 2.55 |
| 9. | | .46 | 19. | | | 29. | | |
| 10. | | | 20. | | 2.60 | 30. | | |
| | | | | | | 31. | | 2.60 |

NOTE.—Gage for this period at independent datum.

Monthly discharge of Lake Creek at outlet of Packwood Lake, near Lewis, Wash., for the year ending Sept. 30, 1918.

| Month. | Discharge in second-feet. | | | Run-off in acre-feet. |
|----------------|---------------------------|----------|-------|-----------------------|
| | Maximum. | Minimum. | Mean. | |
| October..... | 66 | 36 | 47.0 | 2,890 |
| November..... | 53 | 36 | 41.6 | 2,480 |
| December..... | | 45 | 325 | 20,000 |
| January..... | | 117 | 175 | 19,390 |
| February..... | 126 | 84 | 105 | 5,860 |
| March..... | 83 | 29 | 54.2 | 3,260 |
| April..... | 115 | 50 | 71.8 | 4,290 |
| May..... | 162 | 80 | 115 | 7,070 |
| June..... | 403 | 121 | 255 | 15,200 |
| July..... | 190 | 106 | 151 | 9,260 |
| August..... | 125 | 67 | 85.6 | 5,320 |
| September..... | 67 | 46 | 52.2 | 3,110 |
| The year..... | | 29 | 124 | 89,680 |

STREAMS BETWEEN COLUMBIA RIVER AND WILAMETH RIVER.

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, Jackson County, 47 miles northeast of Medford, 1 mile below mouth of Mill Creek, and 2 miles above Middle Fork.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—August 3, 1913, to September 30, 1918.

GAGE.—Vertical staff on right bank about 100 feet above power house; read by O. L. Irwin and S. Pardee.

DISCHARGE MEASUREMENTS.—Made from cable about 500 feet above gage.

CHANNEL AND CONTROL.—Control composed of large boulders; fairly permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 5.4 feet January 12 (discharge, 3,540 second-feet; total, including discharge of flume, 3,720 second-feet); minimum stage recorded, 2.5 feet on various days in November, December, August, and September (discharge, 410 second-feet); total minimum, including flume, occurred August 12 to 14 (discharge, 554 second-feet).

1918-1918: Maximum stage recorded is that of 1918; minimum stage recorded, 2.3 feet September 30 to October 3, October 10, and November 7, 1915 (discharge, 400 second-feet; total, including flume, 544 second-feet).

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

DIVERSIONS.—The California-Oregon Power Co.'s flume diverts around this station; a record is kept of this diversion (see p. 109).

REGULATION.—None.

ACCURACY.—Stage-discharge relation practically permanent during year. Rating curve well defined; gage read to quarter-tenths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table. Records excellent.

Discharge measurements of Rogue River below Prospect, Oreg., during the year ending Sept. 30, 1918.

[Made by C. L. Batchelder.]

| Date. | Gage height | Discharge. |
|---------------|-------------|--------------|
| June 15..... | Feet. 3.03 | Sec.-ft. 805 |
| Sept. 18..... | 2.55 | 432 |

Daily discharge, in second-feet, of Rogue River below Prospect, Oreg., for the year ending Sept. 30, 1918.

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------|-------|
| 1 | 550 | 470 | 970 | 1,166 | 925 | 790 | 1,910 | 1,740 | 1,110 | 590 | 470 | 440 |
| 2 | 550 | 510 | 670 | 1,060 | 925 | 835 | 1,800 | 1,800 | 1,060 | 630 | 479 | 440 |
| 3 | 550 | 510 | 590 | 970 | 880 | 970 | 1,580 | 1,800 | 1,060 | 590 | 440 | 440 |
| 4 | 550 | 510 | 470 | 1,470 | 880 | 970 | 1,470 | 2,020 | 1,060 | 530 | 470 | 440 |
| 5 | 550 | 590 | 470 | 1,310 | 1,589 | 925 | 1,420 | 1,800 | 1,110 | 550 | 479 | 410 |
| 6 | 550 | 550 | 470 | 1,160 | 2,370 | 790 | 1,360 | 1,640 | 1,260 | 590 | 470 | 410 |
| 7 | 510 | 510 | 449 | 1,580 | 2,250 | 835 | 1,420 | 1,589 | 1,160 | 590 | 479 | 440 |
| 8 | 510 | 510 | 410 | 1,473 | 1,800 | 835 | 1,420 | 1,580 | 1,110 | 590 | 440 | 410 |
| 9 | 510 | 470 | 410 | 1,360 | 1,580 | 835 | 1,690 | 1,580 | 1,060 | 590 | 440 | 470 |
| 10 | 510 | 510 | 410 | 1,210 | 1,470 | 790 | 1,740 | 1,470 | 1,060 | 590 | 479 | 479 |
| 11 | 510 | 510 | 410 | 1,210 | 1,420 | 835 | 1,690 | 1,420 | 970 | 550 | 440 | 479 |
| 12 | 510 | 630 | 410 | 3,400 | 1,360 | 835 | 1,690 | 1,420 | 970 | 590 | 410 | 479 |
| 13 | 510 | 550 | 510 | 2,250 | 1,310 | 790 | 1,580 | 1,470 | 1,060 | 550 | 440 | 470 |
| 14 | 510 | 810 | 790 | 1,910 | 1,210 | 790 | 1,520 | 1,470 | 925 | 550 | 410 | 470 |
| 15 | 510 | 470 | 790 | 1,800 | 1,110 | 790 | 1,360 | 1,470 | 880 | 550 | 470 | 470 |
| 16 | 470 | 470 | 750 | 1,800 | 1,110 | 790 | 1,360 | 1,860 | 790 | 550 | 510 | 470 |
| 17 | 470 | 479 | 1,110 | 1,910 | 1,060 | 925 | 1,360 | 1,360 | 790 | 630 | 540 | 470 |
| 18 | 470 | 470 | 1,360 | 2,250 | 970 | 1,260 | 1,360 | 1,360 | 790 | 550 | 510 | 440 |
| 19 | 470 | 470 | 1,160 | 1,800 | 970 | 1,260 | 1,360 | 1,260 | 790 | 550 | 510 | 440 |
| 20 | 510 | 470 | 1,470 | 1,690 | 880 | 1,260 | 1,520 | 1,260 | 790 | 550 | 470 | 440 |
| 21 | 510 | 470 | 1,020 | 1,470 | 835 | 1,160 | 1,800 | 1,210 | 710 | 550 | 470 | 440 |
| 22 | 510 | 440 | 880 | 1,360 | 880 | 1,360 | 1,860 | 1,160 | 710 | 550 | 470 | 440 |
| 23 | 510 | 440 | 1,580 | 1,310 | 880 | 1,470 | 1,800 | 1,210 | 710 | 630 | 470 | 440 |
| 24 | 510 | 440 | 2,480 | 1,160 | 880 | 1,640 | 1,860 | 1,160 | 710 | 590 | 470 | 410 |
| 25 | 510 | 410 | 1,690 | 1,360 | 790 | 1,910 | 1,800 | 1,160 | 630 | 590 | 470 | 410 |
| 26 | 510 | 410 | 1,580 | 1,210 | 835 | 1,800 | 1,690 | 1,160 | 710 | 550 | 470 | 410 |
| 27 | 510 | 410 | 2,020 | 1,160 | 790 | 1,690 | 1,690 | 1,110 | 630 | 510 | 440 | 410 |
| 28 | 470 | 470 | 2,020 | 1,060 | 790 | 1,580 | 1,580 | 1,060 | 710 | 510 | 440 | 410 |
| 29 | 470 | 1,360 | 1,800 | 1,160 | ..... | 1,690 | 1,640 | 1,060 | 710 | 470 | 440 | 410 |
| 30 | 470 | 1,690 | 1,520 | 1,060 | ..... | 1,910 | 1,690 | 1,210 | 590 | 470 | 440 | 410 |
| 31 | 470 | ..... | 1,310 | 880 | ..... | 2,020 | ..... | 1,160 | ..... | 470 | 440 | ..... |

Monthly discharge of Rogue River below Prospect, Oreg., for the year ending Sept. 30, 1918.

| Month. | Discharge in second-feet. | | | Run-off in acre-feet. |
|-----------|---------------------------|----------|-------|-----------------------------|
| | Maximum. | Minimum. | Mean. | |
| October | 550 | 470 | 507 | 31,200 |
| November | 1,690 | 410 | 557 | 33,100 |
| December | 2,480 | 410 | 1,030 | 63,300 |
| January | 3,400 | 880 | 1,480 | 91,000 |
| February | 2,370 | 790 | 1,170 | 65,000 |
| March | 2,020 | ..... | 1,170 | 71,900 |
| April | 1,910 | 1,360 | 1,000 | 95,200 |
| May | 2,020 | 1,060 | 1,400 | 86,100 |
| June | 1,260 | 590 | 888 | 52,800 |
| July | 630 | 470 | 588 | 34,200 |
| August | 510 | 440 | 461 | 28,300 |
| September | 470 | 410 | 442 | 26,500 |
| The year | 3,400 | 410 | 988 | 678,000 |

Combined monthly discharge of Rogue River and California-Oregon Power Co.'s dams below Prospect, Oreg., for the year ending Sept. 30, 1918.

| Month. | Discharge in second-feet. | | | Run-off in acre-feet. |
|----------------|---------------------------|----------|-------|-----------------------|
| | Maximum. | Minimum. | Mean. | |
| October..... | 720 | 640 | 677 | 41,000 |
| November..... | 1,870 | 594 | 740 | 44,000 |
| December..... | 2,670 | 600 | 1,220 | 75,000 |
| January..... | 3,590 | 1,069 | 1,970 | 109,000 |
| February..... | 2,550 | 960 | 1,340 | 74,400 |
| March..... | 2,190 | 960 | 1,340 | 82,400 |
| April..... | 2,970 | 1,520 | 1,760 | 106,800 |
| May..... | 2,190 | 1,220 | 1,560 | 95,900 |
| June..... | 1,420 | 747 | 1,046 | 61,900 |
| July..... | 780 | 614 | 702 | 48,200 |
| August..... | 654 | 554 | 608 | 37,400 |
| September..... | 667 | 567 | 599 | 35,600 |
| The year..... | 3,580 | 554 | 1,100 | 799,000 |

ROGUE RIVER NEAR TOLO, OREG.

LOCATION.—In sec. 18, T. 36 S., R. 2 W., at Ray Gold railroad station, just below Gold Ray dam and power house of California-Oregon Power Co., 1½ miles below Tolo, Jackson County, 7 miles above Gold Hill, and half a mile below mouth of Bear Creek.

DRAINAGE AREA.—2,020 square miles.

RECORDS AVAILABLE.—August 30, 1905, to September 30, 1918.

GAGE.—Friez water-stage recorder referred to vertical staff bolted to concrete pier of bridge near right bank; read by operators of Gold Ray plant.

DISCHARGE MEASUREMENTS.—Made from cable 300 feet below gage.

CHANNEL AND CONTROL.—Composed of rock and boulders; slightly shifting. One channel at all stages.

EXTREMES OF DISCHARGE.—Maximum stage during year from water-stage recorder, 10.9 feet at noon January 12 (discharge, 25,800 second-feet); minimum stage indeterminate, as water went below intake pipe of well (gage height 0.20 foot), for a few minutes practically every night during low water (discharge probably 400 second-feet or less).

1905-1918: Maximum stage recorded, 20 feet at 7.30 a. m. November 23, 1909 (discharge, estimated by extension of rating curve, 60,000 second-feet); minimum discharge in 1918.

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

DIVERSIONS.—A large area of land is irrigated from Rogue River and its tributaries.

REGULATION.—Discharge is influenced by changes of load on power plant just above station.

ACCURACY.—Stage-discharge relation shifted slightly during flood of January 12.

Two well defined rating curves used, one from October 1 to January 11 and other for remainder of year. Discharge integrated October 1 to July 31; rating table applied to mean daily gage height obtained by inspecting the recorder graph for remainder of year. Operation of water-stage recorder satisfactory. Records excellent.

Discharge measurements of Rogue River near Tolo, Oreg., during the year ending Sept. 30, 1918.

| Date. | Made by— | Gage height. | Dis-charge. | Date. | Made by— | Gage height. | Dis-charge. |
|---------|---------------|--------------|-------------|----------|------------------|--------------|-------------|
| | | Feet. | Sec.-ft. | | | Feet. | Sec.-ft. |
| Dec. 21 | R. P. Cowgill | 2.12 | 2,670 | Jan. 14 | R. C. Briggs | 6.25 | 11,000 |
| Jan. 10 | R. C. Briggs | 2.48 | 3,070 | June 17 | C. L. Batchelder | 1.35 | 1,640 |
| Jan. 12 | do. | 10.40 | 24,000 | Sept. 15 | do. | .99 | 1,320 |

* Engineer, Rogue River Valley Canal Co.

Daily discharge, in second-feet, of Rogue River near Tolo, Oreg., for the year ending Sept. 30, 1918.

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|------|-------|-------|-------|--------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1 | 1,300 | 1,220 | 6,340 | 2,620 | 2,740 | 3,030 | 4,220 | 3,050 | 1,980 | 1,340 | 1,190 | 1,160 |
| 2 | 1,290 | 1,230 | 2,850 | 2,350 | 2,940 | 3,040 | 3,380 | 3,110 | 2,000 | 1,860 | 1,160 | 1,080 |
| 3 | 1,270 | 1,260 | 1,930 | 2,260 | 2,920 | 3,520 | 3,470 | 3,280 | 2,020 | 1,820 | 1,120 | 1,060 |
| 4 | 1,280 | 1,350 | 1,620 | 2,640 | 2,950 | 3,600 | 3,230 | 2,260 | 2,040 | 1,820 | 1,140 | 1,060 |
| 5 | 1,240 | 1,360 | 1,580 | 2,700 | 4,920 | 3,240 | 3,070 | 3,210 | 2,040 | 1,290 | 1,150 | 1,100 |
| 6 | 1,240 | 1,420 | 1,520 | 2,450 | 9,120 | 2,980 | 3,010 | 2,970 | 2,120 | 1,280 | 1,190 | 1,060 |
| 7 | 1,280 | 1,300 | 1,500 | 2,790 | 9,500 | 2,750 | 3,120 | 3,880 | 2,220 | 1,270 | 1,140 | 1,060 |
| 8 | 1,310 | 1,270 | 1,430 | 3,080 | 6,010 | 2,780 | 3,180 | 2,840 | 1,950 | 1,330 | 1,160 | 1,180 |
| 9 | 1,210 | 1,250 | 1,510 | 4,540 | 4,380 | 3,080 | 3,340 | 2,280 | 2,020 | 1,400 | 1,120 | 1,260 |
| 10 | 1,210 | 1,270 | 1,530 | 2,730 | 4,150 | 3,160 | 3,500 | 2,940 | 1,880 | 1,310 | 1,110 | 1,280 |
| 11 | 1,260 | 1,300 | 1,460 | 2,660 | 3,570 | 3,090 | 3,440 | 2,780 | 1,840 | 1,380 | 1,100 | 1,180 |
| 12 | 1,240 | 1,320 | 1,480 | 16,700 | 4,520 | 3,450 | 3,420 | 2,590 | 1,780 | 1,320 | 1,080 | 1,180 |
| 13 | 1,220 | 1,400 | 1,590 | 9,600 | 6,140 | 3,880 | 3,340 | 2,880 | 1,850 | 1,360 | 1,080 | 1,180 |
| 14 | 1,200 | 1,360 | 2,220 | 9,580 | 5,400 | 3,370 | 3,220 | 2,530 | 1,760 | 1,370 | 1,080 | 1,260 |
| 15 | 1,300 | 1,250 | 2,250 | 7,040 | 4,490 | 3,140 | 3,040 | 2,670 | 1,670 | 1,270 | 1,180 | 1,320 |
| 16 | 1,240 | 1,270 | 2,020 | 7,720 | 4,570 | 3,160 | 2,950 | 2,500 | 1,630 | 1,260 | 1,120 | 1,260 |
| 17 | 1,250 | 1,280 | 2,410 | 7,230 | 5,040 | 3,720 | 2,860 | 2,430 | 1,580 | 1,260 | 1,120 | 1,260 |
| 18 | 1,240 | 1,200 | 2,690 | 6,950 | 4,400 | 4,280 | 3,280 | 2,350 | 1,590 | 1,260 | 1,160 | 1,180 |
| 19 | 1,300 | 1,270 | 2,480 | 5,980 | 3,770 | 5,100 | 2,850 | 2,270 | 1,540 | 1,260 | 1,140 | 1,180 |
| 20 | 1,290 | 1,250 | 2,750 | 4,710 | 3,400 | 4,380 | 2,960 | 1,990 | 1,560 | 1,260 | 1,120 | 1,170 |
| 21 | 1,170 | 1,260 | 2,510 | 4,230 | 3,180 | 4,110 | 2,170 | 2,150 | 1,480 | 1,260 | 1,140 | 1,180 |
| 22 | 1,220 | 1,260 | 2,200 | 3,660 | 3,250 | 4,090 | 3,470 | 2,060 | 1,380 | 1,240 | 1,140 | 1,140 |
| 23 | 1,200 | 1,280 | 4,960 | 3,200 | 3,620 | 4,070 | 3,480 | 2,060 | 1,420 | 1,200 | 1,140 | 1,180 |
| 24 | 1,220 | 1,300 | 7,720 | 3,150 | 4,170 | 4,140 | 3,400 | 2,070 | 1,440 | 1,320 | 1,140 | 1,180 |
| 25 | 1,210 | 1,220 | 4,700 | 3,060 | 3,580 | 5,310 | 3,330 | 2,010 | 1,400 | 1,190 | 1,120 | 1,180 |
| 26 | 1,260 | 1,240 | 4,190 | 3,090 | 3,400 | 5,150 | 3,320 | 2,050 | 1,390 | 1,330 | 1,100 | 1,170 |
| 27 | 1,210 | 1,280 | 4,660 | 2,840 | 3,270 | 4,800 | 3,200 | 2,130 | 1,400 | 1,210 | 1,100 | 1,180 |
| 28 | 1,190 | 1,460 | 5,130 | 2,730 | 3,060 | 4,210 | 3,100 | 2,090 | 1,390 | 1,190 | 1,080 | 1,180 |
| 29 | 1,220 | 2,360 | 4,070 | 2,960 | 3,950 | 3,060 | 2,030 | 1,330 | 1,100 | 1,100 | 1,080 | 1,120 |
| 30 | 1,260 | 4,510 | 3,800 | 3,110 | 4,100 | 3,400 | 2,070 | 1,330 | 1,180 | 1,180 | 1,180 | 1,120 |
| 31 | 1,180 | 2,880 | 2,800 | 4,340 | 2,050 | 1,190 | 1,100 | 1,160 | 1,100 | 1,100 | 1,100 | 1,100 |

* Interpolated.

Monthly discharge of Rogue River near Tolo, Oreg., for the year ending Sept. 30, 1918.

| Month. | Discharge in second-feet. | | | Run-off in acre-feet. |
|-----------|---------------------------|----------|-------|-----------------------|
| | Maximum. | Minimum. | Mean. | |
| October | 1,310 | 1,170 | 1,240 | 76,200 |
| November | 4,510 | 1,200 | 1,430 | 85,100 |
| December | 7,720 | 1,430 | 2,890 | 178,000 |
| January | 16,700 | 2,260 | 4,510 | 277,600 |
| February | 9,500 | 2,740 | 4,420 | 245,000 |
| March | 5,310 | 2,750 | 3,770 | 282,000 |
| April | 4,220 | 2,850 | 3,250 | 198,000 |
| May | 3,360 | 1,990 | 2,510 | 184,000 |
| June | 2,280 | 1,330 | 1,700 | 101,000 |
| July | 1,370 | 1,108 | 1,270 | 78,100 |
| August | 1,190 | 1,000 | 1,130 | 69,500 |
| September | 1,320 | 1,080 | 1,160 | 69,000 |
| The year | 16,700 | 1,000 | 2,430 | 1,760,000 |

CALIFORNIA-OREGON POWER CO.'S FLUME NEAR PROSPECT, OREG.

LOCATION.—In sec. 6, T. 33 S., R. 3 E., at lower end of power flume, just above forebay and 2 miles below Prospect, Jackson County.

RECORDS AVAILABLE.—August 1, 1913, to September 30, 1918.

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 MEASUREMENT.—Made from collar of flume.

CHANNEL AND CONTROL.—Wooden flume at the end of which there is a free fall into the forebay; practically permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 2.6 feet on various days in December and January (discharge, 198 second-feet); minimum stage recorded 2.2 feet on various days during June, July, and August (discharge, 144 second-feet).

1916-1918: Maximum stage recorded, 2.7 feet April 25, 26, 30, May 1 and 2, 1916 (discharge, 212 second-feet); minimum stage 1.90 feet December 27, 1916 (discharge, 108 second-feet).

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

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

California-Oregon Power Co.'s flume diverts water from Rogue River in SE. $\frac{1}{4}$ sec. 30, T. 32 S., R. 3 E., and delivers it to the power plant in NW, $\frac{1}{4}$ sec. 6, T. 33 S., R. 3 E., where a head of about 500 feet is obtained. No discharge measurements were made during the year.

Daily discharge, in second-feet, of California-Oregon Power Co.'s flume near Prospect, Oreg., for the year ending Sept. 30, 1918.

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|------|------|-------|------|------|-------|------|-------|------|-------|-------|------|-------|
| 1 | 170 | 170 | 184 | 184 | 184 | 170 | 164 | 170 | 157 | 144 | 144 | 157 |
| 2 | 170 | 170 | 184 | 184 | 184 | 170 | 164 | 170 | 157 | 144 | 144 | 157 |
| 3 | 170 | 170 | 184 | 184 | 184 | 170 | 170 | 170 | 157 | 144 | 144 | 157 |
| 4 | 170 | 184 | 184 | 184 | 177 | 170 | 170 | 170 | 157 | 157 | 144 | 157 |
| 5 | 170 | 184 | 184 | 184 | 177 | 170 | 170 | 170 | 157 | 157 | 144 | 157 |
| 6 | 170 | 184 | 184 | 177 | 177 | 170 | 170 | 170 | 157 | 157 | 144 | 157 |
| 7 | 170 | 184 | 184 | 177 | 184 | 170 | 164 | 170 | 144 | 144 | 144 | 157 |
| 8 | 170 | 184 | 184 | 184 | 184 | 170 | 164 | 170 | 144 | 144 | 144 | 157 |
| 9 | 170 | 184 | 191 | 184 | 184 | 170 | 170 | 170 | 157 | 144 | 144 | 157 |
| 10 | 170 | 184 | 191 | 184 | 184 | 170 | 170 | 170 | 157 | 144 | 144 | 157 |
| 11 | 170 | 184 | 198 | 184 | 177 | 170 | 170 | 170 | 157 | 144 | 144 | 157 |
| 12 | 170 | 184 | 198 | 184 | 184 | 170 | 164 | 170 | 157 | 144 | 144 | 157 |
| 13 | 170 | 184 | 198 | 191 | 184 | 170 | 187 | 157 | 157 | 144 | 144 | 157 |
| 14 | 170 | 184 | 198 | 191 | 184 | 170 | 157 | 157 | 157 | 144 | 144 | 157 |
| 15 | 170 | 184 | 198 | 184 | 184 | 170 | 157 | 157 | 157 | 144 | 144 | 157 |
| 16 | 170 | 184 | 184 | 191 | 184 | 170 | 157 | 157 | 157 | 144 | 144 | 157 |
| 17 | 170 | 184 | 184 | 198 | 170 | 170 | 187 | 157 | 157 | 144 | 144 | 157 |
| 18 | 170 | 184 | 198 | 198 | 170 | 170 | 164 | 157 | 157 | 144 | 144 | 157 |
| 19 | 170 | 184 | 198 | 191 | 157 | 170 | 164 | 157 | 157 | 144 | 144 | 157 |
| 20 | 170 | 184 | 198 | 184 | 157 | 177 | 157 | 157 | 157 | 144 | 144 | 157 |
| 21 | 170 | 184 | 184 | 184 | 157 | 177 | 157 | 157 | 157 | 144 | 144 | 157 |
| 22 | 170 | 184 | 184 | 184 | 170 | 170 | 157 | 157 | 157 | 144 | 144 | 157 |
| 23 | 170 | 184 | 184 | 184 | 170 | 170 | 157 | 157 | 157 | 144 | 144 | 157 |
| 24 | 170 | 184 | 184 | 184 | 157 | 170 | 157 | 157 | 157 | 144 | 144 | 157 |
| 25 | 170 | 184 | 184 | 184 | 157 | 170 | 157 | 157 | 157 | 144 | 150 | 157 |
| 26 | 170 | 184 | 184 | 184 | 157 | 170 | 157 | 157 | 157 | 144 | 157 | 157 |
| 27 | 170 | 184 | 184 | 184 | 170 | 170 | 157 | 157 | 157 | 144 | 157 | 157 |
| 28 | 170 | 184 | 184 | 184 | 170 | 170 | 164 | 157 | 157 | 144 | 157 | 157 |
| 29 | 170 | 184 | 184 | 184 | ..... | 170 | 170 | 157 | 157 | 144 | 157 | 157 |
| 30 | 170 | 184 | 184 | 184 | ..... | 170 | 170 | 157 | 157 | 144 | 157 | 157 |
| 31 | 170 | ..... | 184 | 184 | ..... | 170 | ..... | 157 | ..... | 144 | 157 | ..... |

Monthly discharge of California-Oregon Power Co.'s flume near Prospect, Oreg., for the year ending Sept. 30, 1918.

| Month. | Discharge in second-feet. | | | Run-off in acre feet. |
|----------------|---------------------------|----------|-------|-----------------------|
| | Maximum. | Minimum. | Mean. | |
| October..... | 170 | 170 | 170 | 10,600 |
| November..... | 184 | 170 | 183 | 10,800 |
| December..... | 198 | 184 | 188 | 11,000 |
| January..... | 198 | 177 | 185 | 11,400 |
| February..... | 184 | 157 | 174 | 9,660 |
| March..... | 177 | 170 | 170 | 10,500 |
| April..... | 170 | 157 | 163 | 9,750 |
| May..... | 170 | 157 | 163 | 9,960 |
| June..... | 157 | 144 | 156 | 9,280 |
| July..... | 157 | 144 | 146 | 8,960 |
| August..... | 157 | 144 | 147 | 9,040 |
| September..... | 157 | 157 | 157 | 9,340 |
| The year..... | 198 | 144 | 167 | 121,000 |

SOUTH FORK OF BIG BUTTE CREEK NEAR BUTTE FALLS, OREG.

LOCATION.—In SE. $\frac{1}{4}$ sec. 11, T. 35 S., R. 2 E., at covered highway bridge 1 mile above Butte Falls, Jackson County, and 2 miles above junction of North and South forks.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—September 20, 1910, to October 5, 1911; August 5 to October 10, 1915; October 31, 1917, to September 30, 1918.

GAGE.—Vertical staff on pier near left bank; read about 3 times a week by C. W. H. Heideman.

DISCHARGE MEASUREMENTS.—Made in 1918 by wading.

CHANNEL AND CONTROL.—Composed of rocks and gravel; slightly shifting at intervals.

EXTREMES OF DISCHARGE.—Maximum stage recorded 5.2 feet at 1.30 p. m. January 13 (discharge, 1,280 second-feet); minimum stage recorded 1.3 feet on various days during August and September (discharge, 92 second-feet).

1910-11, 1915, and 1918: Maximum stage recorded in 1918; minimum stage recorded, 1.41 feet in August and September, 1915 (discharge, 85 second-feet).

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

DIVERSIONS.—A small amount of land is irrigated above this station. The flume supplying water to the State fish hatchery diverts 4 or 5 second-feet around the gage.

REGULATION.—None.

ACCURACY.—Stage-discharge relation practically permanent during year. Rating curve fairly well defined below 100 second-feet but poorly defined above. Gage read once on days for which discharge is given. Daily discharge ascertained by applying daily gage height to rating table. Records fair during high stages and good during remainder of year.

Discharge measurements of South Fork of Big Butte Creek near Butte Falls, Oreg., during the year ending Sept. 30, 1918.

| Date. | Made by— | Gage height. | Discharge. | |
|----------|----------------------------------|--------------|------------|----------|
| | | | Creek. | Flume. |
| | | Feet. | Sec.-ft. | Sec.-ft. |
| Oct. 31 | R. P. Cowgill ^a | 1.40 | 104 | 4.9 |
| June 15 | C. L. Batchelder..... | 1.41 | 102 | 4.5 |
| 15 | J. B. Platt ^b | 1.41 | 106 | 4.6 |
| 30 | do..... | 1.37 | 98 | ..... |
| Aug. 20 | do..... | 1.31 | 95 | ..... |
| Sept. 17 | C. L. Batchelder..... | 1.30 | 92 | 3.6 |
| Oct. 14 | J. B. Platt..... | 1.29 | 93 | 4.4 |

^a Engineer, Rogue River Valley Canal Co.

^b Engineer, Medford Irrigation District.

Daily discharge, in second-feet, of South Fork of Big Butte Creek near Butte Falls, Oreg., for the year ending Sept. 30, 1918.

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|------|------|------|------|-------|------|------|------|------|-------|-------|------|-------|
| 1 | | | 230 | | | | | | | | | |
| 2 | | | 150 | | | 230 | | 150 | 102 | | | 92 |
| 3 | | | | | | 230 | | 120 | | | | |
| 4 | | 102 | 120 | | | | 230 | | 120 | 102 | | |
| 5 | | | | | | | | | | | 92 | |
| 6 | | | | 120 | | | | 120 | 120 | | | 92 |
| 7 | | | | | | 230 | | | | 102 | | |
| 8 | | | | | | | 230 | | | | | |
| 9 | | | | | 430 | 230 | | 135 | 120 | | | 92 |
| 10 | | 102 | 102 | 330 | | 270 | 150 | | | | | |
| 11 | | 102 | | | | | | | | | 92 | |
| 12 | | | | | 270 | | | 120 | | | | |
| 13 | | 102 | | 1,280 | | | | | 102 | 102 | | |
| 14 | | 102 | 102 | 570 | | 230 | | | | | | 92 |
| 15 | | | | 570 | | | | | 104 | | | |
| 16 | | 102 | 120 | | | | | 190 | | | | |
| 17 | | 102 | | | | 270 | | | | | | 92 |
| 18 | | 102 | | 570 | 230 | | | | | 102 | | |
| 19 | | | 120 | | | | 150 | | | | 92 | |
| 20 | | 102 | | | | | | | | | 92 | |
| 21 | | | | | | | 150 | 150 | 102 | | | |
| 22 | | 102 | | | | | 190 | | | | | 92 |
| 23 | | | | | 230 | 320 | | | | | 92 | |
| 24 | | 102 | 120 | 230 | | | | | | | | 92 |
| 25 | | 102 | | | | | | | | 102 | | |
| 26 | | 102 | | | | 270 | 150 | 150 | | | | |
| 27 | | | 150 | 230 | 230 | | | | | | | |
| 28 | | | | 150 | | | 190 | | | | | |
| 29 | | | | | | | | | 102 | | | |
| 30 | | | 120 | | | | | 120 | 99 | 102 | 94 | |
| 31 | 102 | | | | | 320 | | | | | | |

NOTE.—These discharges do not include the water diverted around gage in fish hatchery flume, estimated as 4 or 5 second-feet.

Monthly discharge of South Fork of Big Butte Creek near Butte Falls, Oreg., for the year ending Sept. 30, 1918.

| Month. | Discharge in second-feet. | | | Run-off in acre-feet. |
|-----------|---------------------------|----------|-------|-----------------------|
| | Maximum. | Minimum. | Mean. | |
| October | | | 102 | 6,270 |
| November | 102 | 102 | 102 | 6,070 |
| December | | | 133 | 8,130 |
| January | 1,280 | 120 | 430 | 27,000 |
| February | | | 278 | 15,480 |
| March | | 230 | 283 | 16,300 |
| April | | | 195 | 11,040 |
| May | 190 | 120 | 139 | 8,550 |
| June | 120 | 99 | 108 | 6,430 |
| July | 102 | 102 | 102 | 6,370 |
| August | 94 | 92 | 92.5 | 5,690 |
| September | 92 | 92 | 92.0 | 5,470 |
| The year | 1,280 | 92 | 170 | 123,000 |

NOTE.—Monthly mean discharge taken as mean of days when gage was read.

BIG BUTTE CREEK BELOW BUTTE FALLS, OREG.

LOCATION.—In sec. 4, T. 35 S., R. 2 E., 1 mile below town of Butte Falls, Jackson County, and just below junction of North and South forks.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—June 9 to September 30, 1918.

GAGE.—Lietz eight-day water-stage recorder on left bank.

DISCHARGE MEASUREMENTS.—Made by wading at gage.

CHANNEL AND CONTROL.—Composed of rocks and small boulders; may shift slightly.

EXTREMES OF DISCHARGE.—Maximum stage for period of record from water-stage recorder 1.57 feet June 9 (discharge, 168 second-feet); minimum stage 1.20 feet reached momentarily on several days in August and September owing to operation of mill just above (discharge not computed); minimum daily mean 1.44 feet September 23 (discharge, 135 second-feet).

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

DIVERSIONS.—A few small tracts irrigated above station.

REGULATION.—Mill dam at Butte Falls affects flow by ponding water for short periods.

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

Discharge measurements of Big Butte Creek below Butte Falls, Oreg., during the year ending Sept. 30, 1918.

| Date. | Made by— | Gage height. | Dis-charge. | Date. | Made by— | Gage height. | Dis-charge. |
|---------|-----------------------------------|--------------|-----------------|----------|-----------------------|--------------|-----------------|
| | | <i>Feet.</i> | <i>Sec.-ft.</i> | | | <i>Feet.</i> | <i>Sec.-ft.</i> |
| June 15 | Batchelder and Platt ^a | 1.58 | 170 | Aug. 12 | J. B. Platt | 1.50 | 156 |
| 30 | J. B. Platt | 1.59 | 168 | 20 | do | 1.49 | 146 |
| July 7 | do | 1.51 | 157 | Sept. 17 | Batchelder and Rhodes | 1.49 | 139 |
| 28 | do | 1.50 | 154 | 24 | J. B. Platt | 1.49 | 151 |
| Aug. 8 | Cawgill and Dillard | 1.53 | 135 | | | | |

^a Engineer, Medford Irrigation District.

^b Gage height uncertain.

Daily discharge, in second-feet, of Big Butte Creek below Butte Falls, Oreg., for the year ending Sept. 30, 1918.

| Day. | June. | July. | Aug. | Sept. | Day. | June. | July. | Aug. | Sept. | Day. | June. | July. | Aug. | Sept. |
|------|-------|-------|------|-------|------|-------|-------|------|-------|------|-------|-------|------|-------|
| 1 | | 158 | 145 | 138 | 11 | 166 | 154 | 145 | 148 | 21 | 155 | 150 | 145 | 142 |
| 2 | | 186 | 145 | 138 | 12 | 166 | 154 | 143 | 148 | 22 | 155 | 150 | 145 | 150 |
| 3 | 175 | 155 | 145 | 138 | 13 | 166 | 155 | 143 | 148 | 23 | 155 | 152 | 145 | 135 |
| 4 | | 163 | 145 | 143 | 14 | 165 | 155 | 145 | 148 | 24 | 155 | 155 | 143 | 143 |
| 5 | | 150 | 145 | 143 | 15 | 165 | 155 | 148 | 148 | 25 | 155 | 152 | 140 | 149 |
| 6 | | 150 | 145 | 145 | 16 | 160 | 155 | 150 | 148 | 26 | 155 | 150 | 143 | 145 |
| 7 | 170 | 152 | 143 | 145 | 17 | 160 | 153 | 150 | 148 | 27 | 155 | 150 | 140 | 144 |
| 8 | | 153 | 143 | 150 | 18 | 158 | 153 | 150 | 146 | 28 | 155 | 150 | 143 | 145 |
| 9 | 168 | 153 | 145 | 153 | 19 | 155 | 150 | 150 | 145 | 29 | 155 | 150 | 143 | 145 |
| 10 | 167 | 154 | 145 | 150 | 20 | 165 | 150 | 145 | 145 | 30 | 155 | 148 | 143 | 145 |
| | | | | | | | | | | 31 | 155 | 148 | 140 | |

^a Interpolated.

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

Monthly discharge of Big Butte Creek below Butte Falls, Oreg., for the year ending Sept. 30, 1918.

| Month. | Discharge in second-feet. | | | Run-off in acre-feet. |
|-----------------|---------------------------|----------|-------|-----------------------|
| | Maximum. | Minimum. | Mean. | |
| June..... | | 155 | 163 | 9,700 |
| July..... | 158 | 148 | 152 | 9,350 |
| August..... | 150 | 140 | 145 | 8,920 |
| September..... | 152 | 135 | 145 | 8,620 |
| The period..... | | | | 36,600 |

SOUTH FORK OF LITTLE BUTTE CREEK NEAR DEADWOOD, OREG.

LOCATION.—In sec. 9, T. 38 S., R. 4 E., 1½ miles east of Deadwood, 4 miles east of Lilyglen, and 21 miles east of Ashland, Jackson County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—Fragmentary records November 19, 1916, to May 31, 1918, when station was discontinued.

GAGE.—Lietz eight-day water-stage recorder on left bank. Barrett & Lawrence water-stage recorder used 1916 and 1917.

DISCHARGE MEASUREMENTS.—Made from foot log or by wading.

CHANNEL AND CONTROL.—Composed of gravel and boulders; probably permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded for period of record, from water-stage recorder, 0.84 foot at 4 p. m. April 24 (discharge, 17 second-feet); creek dry at times.

1916-1918: Maximum stage recorded, 2.08 feet at 2 a. m. June 19, 1917 (discharge, 60 second-feet).

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

DIVERSIONS.—None at present. Water can be diverted above station and stored in the proposed Beaver Creek reservoir.

REGULATION.—None.

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

Discharge measurements of South Fork of Little Butte Creek near Deadwood, Oreg., during the year ending Sept. 30, 1918.

| Date. | Made by— | Gage height. | Discharge. |
|---------|---------------------|--------------|------------|
| | | Feet. | Sec.-ft. |
| Feb. 28 | J. B. Piatt c..... | 0.35 | 2.44 |
| Apr. 7 | C. Z. Boyden c..... | .60 | 8.75 |
| 7 | do..... | .60 | 8.72 |

* Engineer, Medford Irrigation District.

Daily discharge, in second-feet, of South Fork of Little Butte Creek near Deadwood, Oreg., for the year ending Sept. 30, 1918.

| Day. | Mar. | Apr. | May. | Day. | Mar. | Apr. | May. | Day. | Mar. | Apr. | May. |
|---------|------|------|------|---------|------|------|------|---------|------|------|------|
| 1..... | 3.0 | 13 | 14 | 11..... | 2.4 | 12 | 11 | 21..... | 5.2 | 13 | 8.1 |
| 2..... | 3.2 | 13 | 15 | 12..... | 2.4 | 12 | 10 | 22..... | 6.0 | 14 | 7.5 |
| 3..... | 3.6 | 12 | 15 | 13..... | 2.4 | 12 | 9.9 | 23..... | 6.9 | 15 | 6.9 |
| 4..... | 3.6 | 11 | 15 | 14..... | 2.4 | 11 | 11 | 24..... | 8.1 | 16 | 6.9 |
| 5..... | 3.2 | 11 | 14 | 15..... | 3.4 | 11 | 11 | 25..... | 10 | 16 | 6.6 |
| 6..... | 3.0 | 10 | 14 | 16..... | 3.6 | 12 | 10 | 26..... | 10 | 15 | 6.8 |
| 7..... | 3.0 | 9.6 | 13 | 17..... | 4.0 | 12 | 9.6 | 27..... | 9.6 | 15 | 7.5 |
| 8..... | 3.0 | 9.9 | 13 | 18..... | 4.4 | 12 | 9.0 | 28..... | 10 | 15 | 7.5 |
| 9..... | 2.8 | 12 | 13 | 19..... | 4.4 | 12 | 8.4 | 29..... | 11 | 14 | 6.9 |
| 10..... | 2.8 | 12 | 12 | 20..... | 5.0 | 12 | 8.1 | 30..... | 12 | 14 | 6.0 |
| | | | | | | | | 31..... | 13 | | 5.4 |

Monthly discharge of South Fork of Little Butte Creek near Deadwood, Oreg., for the year ending Sept. 30, 1918.

| Month. | Discharge in second-feet. | | | Run-off in acre-feet. |
|-----------------|---------------------------|----------|-------|-----------------------|
| | Maximum. | Minimum. | Mean. | |
| March..... | 13 | 2.4 | 5.40 | 333 |
| April..... | 16 | 3.6 | 12.6 | 750 |
| May..... | 15 | 5.4 | 10.1 | 621 |
| The period..... | | | | 1,704 |

LITTLE BUTTE CREEK ABOVE EAGLE POINT, OREG.

LOCATION.—In sec. 31, T. 35 S., R. 1 E., at Bieberstedt's ranch, a quarter of a mile above intake of Eagle Point ditch and 3 miles east of Eagle Point, Jackson County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—April 24, 1916, to September 30, 1918.

GAGE.—Vertical staff; low-water section nailed to stump on right bank; high-water section on left bank directly opposite; read by Carl Bieberstedt and Mrs. W. E. Butler.

CHANNEL AND CONTROL.—Bed composed of smooth gravel. Control is diversion dam of Eagle Point ditch, which may change occasionally.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 11.3 feet at 8 a. m. January 12 (discharge, 6,200 second-feet); minimum stage recorded, 1.50 feet July 28, and August 1 and 2 (discharge, 10 second-feet).

1916-1918: Maximum and minimum stages recorded in 1918. The flood of 1884 is said to have reached a stage of about 15 feet.

ICE.—No records during winter.

DIVERSIONS.—Rogue River Valley canal diverts water above the station, the record at Bradshaw drop showing about the quantity carried past the gage; also, the municipal water supply (about 7.5 second-feet) for Medford is diverted above. Several hundred acres are irrigated along the creek above the station. Eagle Point ditch diverts about 8 second-feet just below this station, but above the old station at Tronson's ranch.

REGULATION.—Water was being stored in Fish Lake reservoir from March 17 to about April 18 and released during August and September, (see record of stage of reservoir, page 120).

ACCURACY.—Stage-discharge relation changed on January 12 and June 8. Rating curves used October 1 to January 11, January 12 to June 8, and June 26 to September 30 fairly well defined. Indirect method for shifting control, June 9-25. Gage read to quarter-tenths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table. Records excellent from October to May, and good for remainder of year.

Discharge measurements of Little Butte Creek above Eagle Point, Oreg., during the year ending Sept. 30, 1918.

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---------|--------------------|--------------|-----------------|----------|------------------------|--------------|-----------------|
| | | <i>Fect.</i> | <i>Sec.-ft.</i> | | | <i>Fect.</i> | <i>Sec.-ft.</i> |
| Oct. 9 | R. P. Cowgill | 2.38 | 85.7 | June 14 | Batchelder and Cowgill | 2.16 | 26.2 |
| Dec. 20 | do | 2.90 | 125 | July 1 | R. P. Cowgill | 1.90 | 15.7 |
| Jan. 11 | do | 4.00 | 449 | July 22 | do | 1.84 | 13.7 |
| Mar. 15 | Briggs and Cowgill | 3.08 | 237 | July 31 | do | 1.60 | 11.8 |
| Apr. 12 | R. P. Cowgill | 3.00 | 202 | Sept. 7 | do | 1.79 | 16.3 |
| June 2 | do | 2.18 | 50 | Sept. 18 | Batchelder and Rhodes | 2.55 | 56 |

• Engineer, Rogue River Valley Canal Co.

Daily discharge, in second-feet, of Little Butte Creek above Eagle Point, Oreg., for the year ending Sept. 30, 1918.

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|------|------|------|------|-------|-------|------|------|------|-------|-------|------|-------|
| 1. | 62 | 60 | 580 | 96 | 205 | 205 | 220 | 130 | 48 | 18 | 10 | 15 |
| 2. | 59 | 60 | 178 | 89 | 235 | 205 | 220 | 131 | 47 | 17 | 19 | 16 |
| 3. | 55 | 67 | 112 | 83 | 205 | 235 | 270 | 131 | 47 | 17 | 11 | 16 |
| 4. | 55 | 66 | 94 | 90 | 177 | 270 | 242 | 131 | 37 | 17 | 11 | 14 |
| 5. | 55 | 90 | 86 | 90 | 252 | 235 | 230 | 142 | 33 | 17 | 11 | 14 |
| 6. | 58 | 78 | 83 | 89 | 1,150 | 220 | 191 | 131 | 26 | 17 | 15 | 14 |
| 7. | 59 | 94 | 83 | 128 | 590 | 220 | 191 | 115 | 21 | 18 | 16 | 16 |
| 8. | 59 | 90 | 78 | 235 | 350 | 235 | 205 | 111 | 22 | 16 | 15 | 18 |
| 9. | 55 | 89 | 72 | 240 | 290 | 310 | 220 | 133 | | 17 | 17 | 24 |
| 10. | 46 | 84 | 71 | 137 | 252 | 270 | 230 | 206 | | 17 | 15 | 23 |
| 11. | 46 | 82 | 70 | 318 | 270 | 235 | 205 | 121 | | 17 | 14 | 30 |
| 12. | 49 | 91 | 71 | 2,600 | 730 | 395 | 230 | 109 | | 17 | 14 | 32 |
| 13. | 55 | 86 | 89 | 590 | 730 | 350 | 220 | 95 | | 17 | 14 | 32 |
| 14. | 55 | 83 | 112 | 1,150 | 610 | 270 | 230 | 102 | 30 | 17 | 14 | 33 |
| 15. | 54 | 82 | 97 | 495 | 395 | 235 | 230 | 111 | | 16 | 13 | 30 |
| 16. | 60 | 82 | 91 | 670 | 670 | 220 | 205 | 111 | | 15 | 20 | 54 |
| 17. | 60 | 84 | 97 | 445 | 445 | 205 | 205 | 111 | | 15 | 20 | 50 |
| 18. | 60 | 83 | 96 | 495 | 350 | 350 | 177 | 97 | | 15 | 20 | 48 |
| 19. | 62 | 82 | 91 | 350 | 270 | 250 | 177 | 92 | | 15 | 20 | 45 |
| 20. | 62 | 77 | 123 | 270 | 235 | 290 | 177 | 84 | | 15 | 20 | 45 |
| 21. | 54 | 77 | 97 | 235 | 220 | 270 | 177 | 75 | 24 | 15 | 21 | 46 |
| 22. | 52 | 73 | 91 | 205 | 235 | 270 | 177 | 65 | | 14 | 22 | 49 |
| 23. | 60 | 72 | 89 | 191 | 235 | 270 | 177 | 64 | | 14 | 22 | 51 |
| 24. | 60 | 71 | 570 | 177 | 395 | 290 | 177 | 58 | | 15 | 17 | 51 |
| 25. | 60 | 71 | 202 | 205 | 270 | 395 | 166 | 53 | | 12 | 16 | 51 |
| 26. | 64 | 71 | 145 | 177 | 270 | 395 | 177 | 57 | 22 | 12 | 15 | 51 |
| 27. | 61 | 71 | 300 | 177 | 252 | 372 | 177 | 64 | 18 | 14 | 15 | 55 |
| 28. | 60 | 73 | 190 | 165 | 235 | 350 | 177 | 64 | 18 | 10 | 16 | 55 |
| 29. | 60 | 166 | 123 | 270 | | 310 | 165 | 70 | 18 | 11 | 17 | 56 |
| 30. | 60 | 370 | 112 | 220 | | 310 | 153 | 71 | 18 | 12 | 16 | 56 |
| 31. | 60 | | 104 | 165 | | 310 | | 53 | | 12 | 16 | |

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

Monthly discharge of Little Butte Creek above Eagle Point, Oreg., for the year ending Sept. 30, 1918.

| Month. | Discharge in second-feet. | | | Run-off in acre-feet. |
|----------------|---------------------------|----------|-------|-----------------------|
| | Maximum. | Minimum. | Mean. | |
| October..... | 64 | 46 | 57.7 | 2,580 |
| November..... | 370 | 60 | 90.9 | 5,410 |
| December..... | 570 | 70 | 140 | 8,610 |
| January..... | 2,600 | 83 | 351 | 22,260 |
| February..... | 1,150 | 177 | 375 | 20,800 |
| March..... | 395 | 205 | 295 | 17,500 |
| April..... | 270 | 153 | 200 | 14,800 |
| May..... | 205 | 53 | 100 | 6,150 |
| June..... | 48 | 18 | 28.3 | 1,260 |
| July..... | 12 | 10 | 15.3 | 941 |
| August..... | 25 | 10 | 15.2 | 926 |
| September..... | 80 | 14 | 39.2 | 2,550 |
| The year..... | 7,600 | 10 | 141 | 102,000 |

DEAD INDIAN CREEK NEAR LILYGLEN, OREG.

LOCATION.—In NW. $\frac{1}{4}$ sec. 22, T. 38 S., R. 3 E., at Neill's ranch, 1 mile west of Lilyglen, a former post office, and 17 miles east of Ashland, Jackson County.

DRAINAGE AREA.—Not measured; no adequate maps available.

RECORDS AVAILABLE.—February 16 to May 25, 1916; October 19, 1916, to June 30, 1917; March 1 to May 31, 1918, when station was discontinued.

GAGE.—Lietz eight-day water-stage recorder; Stevens recorder used 1916 and 1917 in same location. Vertical staff on left bank, one-eighth mile upstream used until May, 1916; read by William Lindsay.

DISCHARGE MEASUREMENTS.—Made by wading.

CHANNEL AND CONTROL.—Closely packed clay; practically permanent.

EXTREMES OF DISCHARGE.—Maximum stage during period from water-stage recorder, 0.72 foot at 6 p. m. March 31 (discharge, 29 second-feet); stream dry in summer. 1916-1918: Maximum stage recorded, 3.12 feet March 29, 1917 (discharge uncertain).

ICE.—Stage-discharge relation apparently affected by ice from March 5 to 9. Discharge estimated from observer's notes and temperature records.

DIVERSIONS.—None at present. Water can be diverted from a point about 1,500 feet above the gage into the proposed Beaver Creek reservoir.

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent. Rating curve fairly well defined below 100 second-feet. Operation of water-stage recorder satisfactory. Daily discharge ascertained by applying to rating table mean daily gage height determined by inspecting gage-height graph. Records good.

Discharge measurements of Dead Indian Creek near Lilyglen, Oreg., during the year ending Sept. 30, 1918.

| Date. | Made by— | Gage height. | Discharge. |
|--------|---------------------|--------------|------------|
| Mar. 2 | J. B. Platt a..... | Fect. | Sec-ft. |
| Apr. 5 | L. Z. Boyden a..... | 0.40 | 5.1 |
| | | .54 | 15.7 |

a Engineer, Medford Irrigation District.

Daily discharge, in second-feet, of Dead Indian Creek near Lilyglen, Oreg., for the year ending Sept. 30, 1918.

| Day. | Mar. | Apr. | May. | Day. | Mar. | Apr. | May. | Day. | Mar. | Apr. | May. |
|---------|------|------|------|---------|------|------|------|---------|------|------|------|
| 1..... | 5.0 | 27.0 | 5.7 | 11..... | 5.4 | 18.0 | 3.3 | 21..... | 16.0 | 11.0 | 2.2 |
| 2..... | 6.0 | 25.0 | 5.4 | 12..... | 4.2 | 18.0 | 2.8 | 22..... | 19.0 | 11.0 | 2.0 |
| 3..... | 4.8 | 24.0 | 5.1 | 13..... | 3.6 | 18.0 | 2.5 | 23..... | 18.0 | 11.0 | 1.0 |
| 4..... | 9.0 | 19.0 | 4.8 | 14..... | 4.8 | 16.0 | 2.8 | 24..... | 19.0 | 11.0 | 1.5 |
| 5..... | | 18.0 | 4.5 | 15..... | 6.0 | 13.0 | 2.5 | 25..... | 25.0 | 11.0 | 1.0 |
| 6..... | | 17.0 | 4.2 | 16..... | 5.4 | 13.0 | 2.5 | 26..... | 24.0 | 10.0 | 1.5 |
| 7..... | 12 | 16.0 | 3.9 | 17..... | 7.5 | 11.0 | 2.5 | 27..... | 25.0 | 8.4 | 2.0 |
| 8..... | | 17.6 | 3.9 | 18..... | 12.0 | 10.0 | 2.2 | 28..... | 23.0 | 7.2 | 1.5 |
| 9..... | | 19.8 | 4.5 | 19..... | 13.0 | 10.0 | 2.2 | 29..... | 25.0 | 6.6 | 1.0 |
| 10..... | 11.0 | 18.0 | 4.2 | 20..... | 13.0 | 10.0 | 2.2 | 30..... | 25.0 | 6.0 | 1.5 |
| | | | | | | | | 31..... | 27.0 | | 1.5 |

* Estimated.

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

Monthly discharge of Dead Indian Creek near Lilyglen, Oreg., for the year ending Sept. 30, 1918.

| Month. | Discharge in second-feet. | | | Run-off in acre-feet. |
|-----------------|---------------------------|----------|-------|-----------------------|
| | Maximum. | Minimum. | Mean. | |
| March..... | 27 | 3.6 | 13.4 | 824 |
| April..... | 27 | 6.0 | 14.3 | 351 |
| May..... | 5.7 | .5 | 2.77 | 170 |
| The period..... | | | | 1,345 |

NOTE.—Total run-off for December, January, and February estimated as 1,100 acre-feet.

FISH LAKE RESERVOIR NEAR LAKE CREEK, OREG.

LOCATION.—At dam of Fish Lake reservoir, in SW 1/4 sec. 3 T. 36 S., R. 4 E., 18 miles east of Lake Creek post office, Jackson County.

RECORDS AVAILABLE.—December 8, 1915, to September 30, 1918.

GAGE.—Vertical staff on gate tower, gage graduated in feet and inches. Zero is at 4,799 feet, canal company datum, which is 2 feet below normal level of Fish Lake; read by G. H. Frey, J. E. Boyer, G. H. Snyder, and F. B. Frey.

METHOD OF COMPUTATION.—A table showing areas and capacities for various stages in the reservoir has been prepared from a survey made by the Medford Irrigation District in November, 1919. The contents of the reservoir at the end of each month and the net gain or loss during the month have been computed from records of stage by use of this table.

EXTREMES OF STAGE.—The maximum stages recorded each year are as follows: 1916, 17.54 feet, May 9 (contents, 4,020 acre-feet); 1917, 21.38 feet, June 4, at 8 a. m. (contents, 5,260 acre-feet); 1918, 9.26 feet, April 27 (contents, 1,520 acre-feet). Reservoir began filling about November 1, 1915, and was drawn down to natural lake level from October 15 to November 11, 1916, and from about October 5, 1917, to March 18, 1918.

COOPERATION.—Data furnished by Rogue River Valley Canal Co.

Gage height and contents of Fish Lake reservoir near Lake Creek, Oreg., at end of each month for 1913-1918.

| Month. | 1915-16. | | | 1916-17. | | | 1917-18. | | |
|----------------|--------------|------------|---------------|--------------|------------|---------------|--------------|------------|---------------|
| | Gage height. | Contents. | Gain or loss. | Gage height. | Contents. | Gain or loss. | Gage height. | Contents. | Gain or loss. |
| | Feet. | Acre-feet. | Acre-feet. | Feet. | Acre-feet. | Acre-feet. | Feet. | Acre-feet. | Acre-feet. |
| October..... | | | | | 0 | -2,540 | | 0 | -53 |
| November..... | | | | 7.7 | 1,120 | +1,120 | | 0 | 0 |
| December..... | 8.83 | 1,410 | + 810 | 11.7 | 2,200 | +1,080 | | 0 | 0 |
| January..... | 10.83 | 1,950 | + 540 | 14.1 | 2,910 | + 710 | | 0 | 0 |
| February..... | 12.18 | 2,330 | + 380 | 15.4 | 3,320 | + 410 | | 0 | 0 |
| March..... | 13.75 | 2,810 | + 480 | 16.2 | 3,580 | + 280 | 6.46 | 823 | +323 |
| April..... | 16.44 | 3,660 | + 850 | 16.8 | 3,780 | + 200 | 9.18 | 1,500 | +672 |
| May..... | 16.81 | 3,780 | + 120 | 20.6 | 5,070 | +1,290 | 9.08 | 1,470 | - 30 |
| June..... | 16.81 | 3,780 | 0 | 7.8 | 1,145 | -3,925 | 8.95 | 1,440 | - 30 |
| July..... | 16.43 | 3,650 | - 130 | 8.0 | 1,195 | + 50 | 9.16 | 1,490 | + 50 |
| August..... | 15.73 | 3,440 | - 210 | 8.1 | 1,220 | + 35 | 7.79 | 1,340 | -350 |
| September..... | 13.56 | 2,750 | - 690 | 2.5 | 53 | -1,170 | 4.54 | 418 | -723 |
| Year..... | | | +2,750 | | | -2,480 | | | +365 |

• Estimated.

NORTH FORK OF LITTLE BUTTE CREEK AT FISH LAKE, NEAR LAKE CREEK, OREG.

LOCATION.—In SW. $\frac{1}{4}$ sec. 3, T. 36 S., R. 4 E., at outlet of Fish Lake, 18 miles east of Lake Creek post office, Jackson County.

DRAINAGE AREA.—15 square miles.

RECORDS AVAILABLE.—October 21, 1914, to July 20, 1915; June 1 to November 5, 1916; and May 26, 1917, to September 30, 1918.

GAGE.—Vertical staff just above wasteway in temporary dam used during 1914 and 1915; vertical staff below permanent dam used from June 11, 1916, to July 10, 1918, when a Lietz water-stage recorder was installed; read by G. H. Frey, G. H. Snyder, T. G. Cowgill, and E. W. Frey.

DISCHARGE MEASUREMENTS.—Made by wading.

CHANNEL AND CONTROL.—Composed of gravel and boulders; shifting at intervals.

EXTREMES OF DISCHARGE.—1914-15: Maximum stage recorded, 0.34 foot. October 22 (discharge, 32 second-feet); minimum stage recorded 0.12 foot (discharge, 23 second-feet).

1916-1918: Maximum stage occurred in June, 1917, no record; minimum stage recorded 0.11 foot at 6 p. m. March 16, immediately after gates were shut, discharge, 5.2 second-feet.

ICE.—Stage-discharge relation seldom affected as lake is spring-fed.

DIVERSIONS.—None.

REGULATION.—Permanent dam at Fish Lake completed in fall of 1915; since completion record of storage in reservoir has been kept most of the time. (See above.)

ACCURACY.—1914-15: Stage-discharge relation probably permanent. Rating curve fairly well defined. Gage read to hundredths, from two to four times a month. Daily discharge ascertained by applying daily gage readings to rating curve. Monthly mean estimated, as springs give stream a uniform flow. Records fair.

1916-1918: Stage-discharge relation shifted during 1917, change assumed to have occurred during break in record, but may have come during high water in June. Rating curve for 1916, fairly well defined; for 1917 and 1918, well defined. Gage read to hundredths once daily until July 10, 1918, operation of water-stage recorder satisfactory thereafter. Daily discharge ascertained by applying to rating table the daily gage reading or the mean gage height obtained by inspecting recorder graph. Records good.

Discharge measurements of North Fork of Little Butte Creek at Fish Lake, near Lake Creek, Oreg., during the years ending Sept. 30, 1915-1918.

| Date | Made by | Gage height | Discharge | Date | Made by | Gage height | Discharge |
|---------|----------------------------------|--------------|-----------------|----------|------------------------|--------------|-----------------|
| 1914 | | <i>Fect.</i> | <i>Sec.-ft.</i> | 1918 | | <i>Fect.</i> | <i>Sec.-ft.</i> |
| Oct. 21 | Henshaw and Cowgill ^a | 0.31 | 31.3 | Oct. 7 | R. P. Cowgill | 0.66 | 30.4 |
| 22 | do. | .34 | 27.3 | Nov. 18 | do. | 1.08 | 45.7 |
| 22 | do. | .31 | 34.1 | July 9 | do. | .65 | 21.9 |
| 1916 | | | | Sept. 12 | do. | .74 | 25.6 |
| June 11 | R. P. Cowgill | 1.00 | 32.4 | 16 | Batchelder and Cowgill | 1.00 | 33.0 |
| July 13 | do. | .96 | 27.8 | 17 | do. | 1.15 | 48.6 |
| Sept. 9 | do. | .93 | 24.4 | 30 | Cowgill and Dillard | 1.17 | 77 |

^a Chief engineer, Rogue River Valley Canal Co.

Daily discharge, in second-feet, of North Fork of Little Butte Creek at Fish Lake, near Lake Creek, Oreg., for 1915-1918.

| Day | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|----------|------|------|------|------|------|------|------|------|-------|-------|------|-------|
| 1914-15. | | | | | | | | | | | | |
| 1 | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | |
| 3 | | | 27 | | | | | 28 | | | | |
| 4 | | | | | | | | | | 24 | | |
| 5 | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | |
| 11 | | | | | | | | | 27 | | | |
| 12 | | | | | | | | | | | | |
| 13 | | | | | | | | | | | | |
| 14 | | | 27 | | | | | 28 | | | | |
| 15 | | | | | | 25 | | | | | | |
| 16 | | | | 31 | | | | | | | | |
| 17 | | | | | | | | | | | | |
| 18 | | | | | | | | | | | | |
| 19 | | | | | | 28 | | 27 | | | | |
| 20 | | | 29 | | | | | | | 25 | | |
| 21 | | 30 | 29 | | | | | | | | | |
| 22 | | 31 | 29 | | | | | | | | | |
| 23 | | | 29 | | | | | | | | | |
| 24 | | | 29 | | | | | | | 23 | | |
| 25 | | | 28 | | | | | | | | | |
| 26 | | | 28 | 26 | | | | | | | | |
| 27 | | | 27 | | | | | | | | | |
| 28 | | | 27 | 26 | 26 | | | | | | | |
| 29 | | | 27 | 26 | 26 | 30 | 28 | | | | | |
| 30 | | | 28 | | | | | | | | | |
| 31 | | | | | | | | 27 | | | | |

Daily discharge, in second-feet, of North Fork of Little Butte Creek at Fish Lake, near Lake Creek, Oreg., for 1916-1918—Continued.

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|----------|------|------|------|------|------|------|------|------|-------|-------|------|-------|
| 1916. | | | | | | | | | | | | |
| 1 | | | | | | | | | | 29 | 27 | 27 |
| 2 | | | | | | | | | | 30 | 27 | 27 |
| 3 | | | | | | | | | | 30 | 27 | 27 |
| 4 | | | | | | | | | | 30 | 27 | 27 |
| 5 | | | | | | | | | 32 | 30 | 27 | 27 |
| 6 | | | | | | | | | | 30 | 27 | 27 |
| 7 | | | | | | | | | | 30 | 27 | 27 |
| 8 | | | | | | | | | | 30 | 27 | 27 |
| 9 | | | | | | | | | | 30 | 27 | 27 |
| 10 | | | | | | | | | | 30 | 27 | 27 |
| 11 | | | | | | | | | 31 | 29 | 27 | 24 |
| 12 | | | | | | | | | 31 | 29 | 27 | 23 |
| 13 | | | | | | | | | 31 | 29 | 27 | 23 |
| 14 | | | | | | | | | 30 | 29 | 27 | 23 |
| 15 | | | | | | | | | 30 | 29 | 27 | 23 |
| 16 | | | | | | | | | 30 | 29 | 27 | 27 |
| 17 | | | | | | | | | 30 | 30 | 27 | 27 |
| 18 | | | | | | | | | 30 | 30 | 27 | 28 |
| 19 | | | | | | | | | 30 | 30 | 27 | 28 |
| 20 | | | | | | | | | 30 | 30 | 27 | 28 |
| 21 | | | | | | | | | 30 | 30 | 27 | 28 |
| 22 | | | | | | | | | 30 | 30 | 27 | 28 |
| 23 | | | | | | | | | 30 | 30 | 27 | 28 |
| 24 | | | | | | | | | 30 | 30 | 27 | 28 |
| 25 | | | | | | | | | 30 | 28 | 27 | 28 |
| 26 | | | | | | | | | 30 | 28 | 27 | 28 |
| 27 | | | | | | | | | 30 | 28 | 27 | 28 |
| 28 | | | | | | | | | 30 | 28 | 27 | 28 |
| 29 | | | | | | | | | 30 | 28 | 27 | 28 |
| 30 | | | | | | | | | 30 | 28 | 27 | 28 |
| 31 | | | | | | | | | 30 | 28 | 27 | 28 |
| 1916-17. | | | | | | | | | | | | |
| 1 | 61 | 30 | | | | | | | 42 | 43 | 45 | 51 |
| 2 | 61 | 29 | | | | | | | 42 | 43 | 45 | 51 |
| 3 | 61 | 29 | | | | | | | 42 | 43 | 45 | 51 |
| 4 | | 30 | | | | | | | | 54 | 45 | 54 |
| 5 | | 27 | | | | | | | | 51 | 45 | 54 |
| 6 | | | | | | | | | | | 42 | 54 |
| 7 | | | | | | | | | | 51 | 45 | 54 |
| 8 | | | | | | | | | | | 42 | 54 |
| 9 | 136 | | | | | | | | 283 | 50 | 42 | 54 |
| 10 | | | | | | | | | | | 42 | 54 |
| 11 | | | | | | | | | | 39 | 45 | 54 |
| 12 | | | | | | | | | | 39 | 45 | 54 |
| 13 | | | | | | | | | | 39 | 45 | 54 |
| 14 | 68 | | | | | | | 23 | 39 | 39 | 42 | 54 |
| 15 | 40 | | | | | | | 24 | 36 | 36 | 42 | 54 |
| 16 | 34 | | | | | | | | 65 | 39 | 42 | 54 |
| 17 | 35 | | | | | | | | 98 | 39 | 42 | 54 |
| 18 | 36 | | | | | | | | 98 | 39 | 42 | 54 |
| 19 | 34 | | | | | | | | 86 | 42 | 45 | 54 |
| 20 | 32 | | | | | | | | 82 | 45 | 42 | 54 |
| 21 | 31 | | | | | | | | 68 | 48 | 42 | 54 |
| 22 | 30 | | | | | | | | 65 | 48 | 42 | 53 |
| 23 | 30 | | | | | | | | 54 | 45 | 39 | 53 |
| 24 | 30 | | | | | | | | 65 | 45 | 39 | 54 |
| 25 | 30 | | | | | | | | 65 | 48 | 39 | 54 |
| 26 | 30 | | | | | | | 39 | 65 | 45 | 39 | 54 |
| 27 | 29 | | | | | | | 39 | 65 | 45 | 39 | 51 |
| 28 | 30 | | | | | | | 42 | 62 | 42 | 39 | 45 |
| 29 | 30 | | | | | | | 42 | 62 | 42 | 39 | 42 |
| 30 | 30 | | | | | | | 42 | 62 | 42 | 39 | 39 |
| 31 | 30 | | | | | | | 42 | 62 | 42 | 45 | |

Daily discharge, in second-feet, of North Fork of Little Butte Creek at Fish Lake, near Lake Creek, Oreg., for 1915-1918—Continued.

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|----------|------|------|------|------|------|------|------|------|-------|-------|------|-------|
| 1917-18. | | | | | | | | | | | | |
| 1..... | 39 | 20 | 42 | 30 | 31 | 29 | 10 | a 36 | 39 | 22 | 20 | 29 |
| 2..... | 39 | 20 | 42 | 30 | 32 | 29 | 10 | a 36 | 29 | 22 | 23 | 28 |
| 3..... | 36 | 20 | 39 | 30 | 30 | 30 | 9.4 | 36 | 29 | 22 | 25 | 28 |
| 4..... | 36 | 20 | 36 | 31 | 30 | 29 | 9.7 | 36 | 29 | 22 | 30 | 28 |
| 5..... | 36 | 20 | a 35 | 30 | 30 | 30 | 10 | 36 | 29 | 22 | 29 | 29 |
| 6..... | 36 | 20 | a 35 | 31 | 32 | 30 | 10 | 36 | 28 | 22 | 29 | 29 |
| 7..... | 36 | 34 | a 35 | 31 | 32 | 29 | 10 | 39 | 28 | 22 | 29 | 29 |
| 8..... | 36 | 54 | 34 | 32 | 32 | 29 | 10 | 39 | 28 | 22 | 29 | 29 |
| 9..... | 36 | 54 | 33 | 32 | 30 | 29 | 10 | 39 | 28 | 22 | 29 | 29 |
| 10..... | 21 | 54 | 33 | 34 | 30 | 29 | 10 | 39 | 28 | 22 | 29 | 29 |
| 11..... | 21 | 51 | 32 | 36 | 30 | 28 | 11 | 39 | 28 | 22 | 30 | 30 |
| 12..... | 45 | 51 | 34 | 45 | 30 | a 29 | 11 | 39 | 28 | 22 | 30 | 30 |
| 13..... | 36 | 51 | 34 | 42 | 34 | a 29 | 10 | 39 | 28 | 22 | 30 | 30 |
| 14..... | 36 | 48 | 34 | a 40 | 31 | 30 | 10 | 39 | 28 | 22 | 30 | 30 |
| 15..... | 36 | 48 | 36 | 39 | 30 | 28 | 10 | | 28 | 22 | 30 | 29 |
| 16..... | 39 | 48 | 36 | 36 | 30 | 17 | 10 | | 28 | 22 | 30 | 34 |
| 17..... | 39 | 45 | 36 | 34 | 30 | 5.4 | 11 | | 28 | 22 | 29 | 39 |
| 18..... | 36 | 45 | 34 | 36 | 29 | 12 | 12 | | 28 | 22 | 28 | 36 |
| 19..... | 36 | 42 | 34 | 34 | a 29 | 14 | 15 | 36 | 28 | 21 | 28 | 36 |
| 20..... | 36 | 42 | 34 | 32 | a 29 | 14 | 20 | | 28 | 22 | 28 | 45 |
| 21..... | | 36 | 34 | 32 | a 29 | 14 | 22 | | 28 | 22 | 28 | 48 |
| 22..... | | 36 | a 34 | 32 | a 29 | 14 | 24 | | 28 | 22 | 28 | 48 |
| 23..... | | 36 | 34 | 32 | a 29 | 12 | 24 | 33 | 28 | 22 | 29 | 48 |
| 24..... | | 36 | 34 | 31 | a 29 | 12 | 24 | 34 | 27 | 22 | 29 | 48 |
| 25..... | 20 | 34 | a 33 | 32 | 30 | 13 | 29 | 29 | 25 | 22 | 29 | 48 |
| 26..... | | 34 | 32 | 32 | 30 | 13 | 30 | 29 | 24 | 22 | 29 | 48 |
| 27..... | | 34 | 32 | 32 | 30 | 13 | 34 | 29 | 24 | 22 | 30 | 48 |
| 28..... | 20 | 34 | 32 | 31 | 28 | 14 | 34 | 29 | 24 | 22 | 30 | 45 |
| 29..... | 20 | 42 | 32 | a 31 | | 10 | 34 | 29 | 23 | 21 | 30 | 45 |
| 30..... | 20 | 42 | 32 | 32 | | 9.1 | 36 | 29 | 22 | 21 | 29 | 54 |
| 31..... | 20 | | 32 | 32 | | 10 | | 29 | | 20 | 29 | |

a Interpolated.

NOTE.—Braced figures show estimated mean discharge for periods indicated. For October, 1916, June and July, 1917, mean discharge estimated from storage draft on reservoir, and natural flow before and after the periods of missing records.

Monthly discharge of North Fork of Little Butte Creek at Fish Lake, near Lake Creek, Oreg., for 1915-1918.

| Month. | Discharge in second-feet. | | | Run-off in acre-feet. | | |
|-----------------|---------------------------|----------|-------|-----------------------|----------|----------|
| | Maximum. | Minimum. | Mean. | Measured. | Storage. | Natural. |
| 1914-1915. | | | | | | |
| October..... | | | a 30 | | | 1,840 |
| November..... | | | a 29 | | | 1,730 |
| December..... | | | a 27 | | | 1,660 |
| January..... | | | a 28 | | | 1,720 |
| February..... | | | a 27 | | | 1,500 |
| March..... | | | a 26 | | | 1,600 |
| April..... | | | a 27 | | | 1,610 |
| May..... | | | a 28 | | | 1,720 |
| June..... | | | a 25 | | | 1,490 |
| July..... | | | a 24 | | | 1,480 |
| August..... | | | | | | |
| September..... | | | | | | |
| The period..... | | | | | | 16,400 |
| 1916. | | | | | | |
| June..... | | 30 | 30.8 | 1,830 | 0 | 1,830 |
| July..... | 30 | 27 | 29.3 | 1,800 | — 130 | 1,690 |
| August..... | 27 | 27 | 27.0 | 1,660 | — 210 | 1,450 |
| September..... | 64 | 24 | 37.3 | 2,220 | — 690 | 1,530 |
| The period..... | | | | 7,510 | | 6,500 |

a Estimated.

Monthly discharge of North Fork of Little Butte Creek at Fish Lake, near Lake Creek, Oreg., for 1915-1918—Continued.

| Month. | Discharge in second-feet. | | | Run-off in acre-feet. | | |
|----------------|---------------------------|---------------|-------|-----------------------|----------|----------|
| | Maxi- mum. | Mini- mum. | Mean. | Meas- ured. | Storage. | Natural. |
| 1916-1917. | | | | | | |
| October..... | | 30 | 69.4 | 4,270 | -2,540 | 1,730 |
| November..... | | | | a 680 | +1,120 | 1,800 |
| December..... | | | | a 600 | +1,080 | 1,680 |
| January..... | | | | a 1,170 | + 710 | 1,680 |
| February..... | | | | a 1,090 | + 410 | 1,500 |
| March..... | | | | a 1,240 | + 290 | 1,500 |
| April..... | | | | a 2,800 | + 200 | 3,000 |
| May..... | | | | a 2,310 | +1,290 | 3,600 |
| June..... | | 23 | 136 | 6,090 | -3,820 | 4,070 |
| July..... | 54 | 36 | 45.0 | 2,779 | + 50 | 2,820 |
| August..... | 45 | 39 | 42.3 | 2,600 | + 35 | 2,640 |
| September..... | 58 | 39 | 52.7 | 3,140 | -1,170 | 1,970 |
| The year..... | | | | 30,800 | | 28,000 |
| 1917-1918. | | | | | | |
| October..... | 45 | 20 | 30.0 | 1,840 | - 53 | 1,790 |
| November..... | 54 | 20 | 38.4 | 2,280 | 0 | 2,280 |
| December..... | 42 | 32 | 34.5 | 2,120 | 0 | 2,120 |
| January..... | 45 | 30 | 33.4 | 2,050 | 0 | 2,050 |
| February..... | 34 | 28 | 30.2 | 1,680 | 0 | 1,680 |
| March..... | 30 | 5.4 | 20.4 | 1,250 | + 828 | 2,080 |
| April..... | 36 | 9.4 | 17.0 | 1,010 | + 672 | 1,680 |
| May..... | 39 | 29 | 35.0 | 2,150 | - 30 | 2,120 |
| June..... | 29 | 22 | 27.3 | 1,620 | - 30 | 1,590 |
| July..... | 22 | 20 | 21.8 | 1,340 | + 50 | 1,390 |
| August..... | 30 | 20 | 28.5 | 1,750 | - 350 | 1,400 |
| September..... | 54 | 28 | 36.9 | 2,200 | - 722 | 1,480 |
| The year..... | 54 | 5.4 | 29.4 | 21,300 | | 21,700 |

a Estimated.

NOTE.—Natural flow obtained by applying to measured run-off the effect of storage in Fish Lake reservoir. No water stored during 1915. Mean discharge estimated as follows from comparison with discharge of other years: October 1, 1915, to March 31, 1916, 24 second-feet; April, 1916, 28 second-feet; May, 1916, 35 second-feet. Total run-off for year 18,900 acre-feet.

NORTH FORK OF LITTLE BUTTE CREEK NEAR LAKE CREEK, OREG.

LOCATION.—In sec. 21, T. 36 S., R. 2 E., one-eighth mile above intake of Rogue River Valley canal and 1 mile above Lake Creek post office, Jackson County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—April 20 to October 13, 1916; May 7, 1917, to September 30, 1918. At station above city intake, about 3 miles above present station, September 10, 1911, to March 31, 1913 (gives discharge slightly greater than present station).

GAGE.—Stevens continuous water-stage recorder installed June 17, 1918, to replace vertical staff on right bank; used previously; read by I. C. Daly.

DISCHARGE MEASUREMENTS.—Made by wading near gage.

CHANNEL AND CONTROL.—Composed of boulders and gravel; fairly permanent except in extreme floods.

EXTREMES OF DISCHARGE.—Maximum discharge during year, obtained from flood marks, 6.02 feet January 12 (discharge not computed); minimum stage recorded, 1.89 feet 4 p. m. July 25 (discharge, 24 second-feet.)

1916-1918: Maximum and minimum stages that of 1918.

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

DIVERSIONS.—Pipe line for water supply of city of Medford, capacity about 7.5 second-feet, carries water past the gage. Several hundred acres irrigated above the station.

REGULATION.—Water stored in Fish Lake reservoir, 15 miles above station. (See page 120 for record of storage.)

ACCURACY.—Stage-discharge relation changed during high water. Two fairly well defined rating curves used during year, one from October 1 to January 11, and the other for remainder of year. Gage read to quarter-tenths once daily prior to May 10. Operation of water-stage recorder fairly satisfactory. Daily discharge ascertained by applying to the rating tables, mean daily gage height obtained by inspecting recorder graph, or the daily gage reading. Records good.

Discharge measurements of North Fork of Little Butte Creek near Lake Creek, Oreg., during the year ending Sept. 30, 1918.

| Date. | Made by— | Gage height. | Dis-charge. | Date. | Made by— | Gage height. | Dis-charge. |
|---------|-------------------------|--------------|-------------|----------|-----------------------|--------------|-------------|
| | | Feet. | Sec.-ft. | | | Feet. | Sec.-ft. |
| Oct. 10 | R. P. Cowgilla..... | 1.92 | 33.0 | June 17 | C. L. Batchelder..... | 2.03 | 39.6 |
| Jan. 11 | R. C. Briggs..... | 2.44 | 141 | Aug. 23 | R. P. Cowgill..... | 2.00 | 37.2 |
| Mar. 15 | Briggs and Cowgill..... | 2.22 | 73 | Sept. 18 |do..... | 2.13 | 54 |
| Apr. 29 | R. P. Cowgill..... | 2.10 | 54.6 | | | | |

a Chief engineer, Rogue River Valley Canal Co.

Daily discharge, in second-feet, of North Fork of Little Butte Creek near Lake Creek, Oreg., for the year ending Sept. 30, 1918.

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---------|------|-------|------|------|-------|------|-------|------|-------|-------|------|-------|
| 1..... | 60 | 43 | 114 | 46 | 70 | 74 | a52 | 52 | | 31 | | 37 |
| 2..... | a60 | a44 | 79 | 46 | 80 | 74 | 52 | 52 | | 31 | | 37 |
| 3..... | 60 | 46 | 64 | 52 | 70 | 80 | 49 | 49 | | 30 | 46 | 36 |
| 4..... | a61 | 43 | 60 | 52 | 70 | 90 | 44 | 52 | | 29 | | 36 |
| 5..... | a63 | 60 | 60 | 52 | 80 | 74 | 44 | 52 | | 30 | 43 | 38 |
| 6..... | 64 | a75 | 60 | 52 | 192 | 70 | 40 | 52 | | 29 | 48 | 38 |
| 7..... | a64 | 90 | 57 | 60 | 140 | 70 | 37 | 52 | | 29 | 43 | 35 |
| 8..... | 64 | a87 | 57 | 122 | 102 | 90 | 37 | 52 | | 30 | 48 | |
| 9..... | a64 | 84 | 57 | 102 | 90 | 102 | 37 | 56 | 40 | 33 | 42 | |
| 10..... | 36 | a77 | 57 | 70 | 74 | 90 | 37 | 56 | | 33 | 40 | 40 |
| 11..... | a36 | 70 | 52 | 127 | 74 | 74 | 37 | | | 31 | 42 | |
| 12..... | 84 | a72 | 52 | 520 | 140 | 90 | 37 | | | 27 | 42 | |
| 13..... | a72 | a73 | 68 | 168 | 127 | 90 | 37 | | | 29 | 38 | 44 |
| 14..... | 60 | a74 | 64 | 244 | 114 | 80 | 37 | | | 30 | 38 | 50 |
| 15..... | a62 | a76 | 60 | 140 | 90 | 70 | 37 | | | 31 | 42 | 43 |
| 16..... | 64 | a78 | 62 | 228 | 90 | 70 | 37 | | | 33 | 42 | a48 |
| 17..... | a67 | 79 | 60 | 119 | 90 | 52 | 37 | | 38 | 33 | 42 | a52 |
| 18..... | 70 | 70 | 60 | 140 | 90 | 52 | 37 | | 40 | 33 | 42 | 56 |
| 19..... | a65 | a67 | 60 | 114 | 80 | 80 | 37 | | 38 | 33 | 42 | 56 |
| 20..... | 60 | 64 | 70 | 90 | 70 | 70 | 44 | | 37 | 33 | 43 | 59 |
| 21..... | 36 | a67 | 60 | 80 | 70 | 70 | 44 | 47 | 36 | 35 | 35 | 68 |
| 22..... | a38 | 60 | 60 | 70 | 70 | 66 | 52 | | 37 | 32 | 36 | 72 |
| 23..... | a40 | a60 | 57 | 70 | 70 | 56 | 52 | | 38 | 35 | 37 | 66 |
| 24..... | 43 | 60 | 198 | 70 | 90 | 61 | 52 | | 37 | 35 | 37 | 68 |
| 25..... | a43 | 60 | a100 | 74 | 70 | 80 | 52 | | 35 | 29 | 38 | 68 |
| 26..... | 43 | a60 | 60 | 70 | a73 | 70 | 52 | | 35 | 35 | 37 | 66 |
| 27..... | a43 | 60 | 60 | 70 | a77 | 80 | 52 | | 33 | 33 | 36 | 65 |
| 28..... | 43 | a60 | 64 | 66 | 80 | 70 | 52 | | 31 | 31 | 35 | 65 |
| 29..... | a43 | 102 | 60 | 102 | ..... | 61 | 61 | | 31 | 35 | 36 | 63 |
| 30..... | 43 | 230 | 57 | 90 | ..... | 52 | 52 | | 31 | | 36 | 66 |
| 31..... | a43 | ..... | 52 | 49 | ..... | 52 | ..... |  | ..... |  | 37 | ..... |

a Interpolated.

NOTE.—Braced figures show estimated mean discharge for periods indicated, based on records at Fish Lake.

Monthly discharge of North Fork of Little Butte Creek near Lake Creek, Oreg., for the year ending Sept. 30, 1918.

| Month. | Discharge in second-feet. | | | Run-off in acre-feet. | | |
|----------------|---------------------------|----------|-------|-----------------------|----------|----------|
| | Maximum. | Minimum. | Mean. | Measured. | Storage. | Natural. |
| October..... | 84 | 36 | 54.6 | 3,360 | -53 | 3,310 |
| November..... | 230 | 43 | 73.0 | 4,340 | 0 | 4,340 |
| December..... | 198 | 52 | 67.8 | 4,170 | 0 | 4,170 |
| January..... | 520 | 46 | 108 | 6,640 | 0 | 6,640 |
| February..... | 192 | 70 | 90.5 | 5,080 | 0 | 5,080 |
| March..... | 102 | 52 | 72.9 | 4,480 | +828 | 5,310 |
| April..... | 61 | 37 | 44.2 | 2,630 | +672 | 3,300 |
| May..... | 56 | ..... | 48.8 | 3,000 | -30 | 2,970 |
| June..... | ..... | 31 | 37.9 | 2,260 | -80 | 2,280 |
| July..... | 35 | 27 | 32.1 | 1,970 | +50 | 2,020 |
| August..... | 48 | 35 | 39.7 | 2,440 | -350 | 2,090 |
| September..... | 72 | 35 | 51.1 | 3,040 | -722 | 2,320 |
| The year..... | 520 | 27 | 59.9 | 43,400 | +865 | 43,700 |

NOTE.—Natural flow obtained by applying to measured run-off the effect of storage in Fish Lake reservoir.

ROGUE RIVER VALLEY CANAL NEAR BROWNSBORO, OREG.

LOCATION.—In SW. $\frac{1}{4}$ sec. 8, T. 36 S., R. 1 E., at head of Bradshaw drop, 2 miles southwest of Brownsboro, 8 miles below intake, and 16 miles from Medford, Jackson County.

RECORDS AVAILABLE.—Irrigation seasons of 1913 and 1915 to 1918.

GAGE.—Stevens eight-day water-stage recorder installed April 24, 1918, and referred to vertical staff just at head of drop, installed June 5, 1916. Former gages were a few feet upstream.

DISCHARGE MEASUREMENTS.—Made by wading or from a plank.

CHANNEL AND CONTROL.—Composed of solid rock at head of drop; practically permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during season, 2.06 feet 1 p. m. August 17 (discharge, 36 second-feet). Canal dry during winter.

1913 and 1915-1918: Maximum discharge was 41 second-feet June 19 to August 20, 1917 (gauge height, 2.0 feet). Canal dry at times.

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

Rogue River Valley canal diverts water from North Fork of Little Butte Creek in SE. $\frac{1}{4}$ sec. 22, T. 36 S., R. 2 E., to irrigate land lying in the basin of Bear Creek. Any seepage or return water from irrigation of about 300 acres above this point reaches Little Butte Creek above the station above Eagle Point.

Discharge measurements of Rogue River Valley canal near Brownsboro, Oreg., during the year ending Sept. 30, 1918.

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---------|-------------------------|--------------|-----------------|---------|--------------------|--------------|-----------------|
| | | <i>Feet.</i> | <i>Sec.-ft.</i> | | | <i>Feet.</i> | <i>Sec.-ft.</i> |
| Oct. 10 | R. P. Cowgill a..... | 0.65 | 3.82 | Aug. 5 | J. B. Platt b..... | 1.90 | 27.5 |
| Apr. 24 |do..... | 1.71 | 21.0 | 23 | R. P. Cowgill..... | 1.84 | 27.5 |
| June 2 |do..... | 1.83 | 28.5 | Sept. 5 |do..... | 1.84 | 26.6 |
| July 14 | Batchelder and Cowgill. | 1.82 | 26.2 | 22 |do..... | 1.60 | 17.9 |
| July 31 | R. P. Cowgill..... | 1.80 | 23.7 | | | | |

a Chief engineer, Rogue River Valley Canal Co.

b Engineer, Medford Irrigation District.

Daily discharge, in second-feet, of Rogue River Valley canal near Brownsboro, Oreg., for the period from Apr. 24 to Oct. 16, 1918.

| Day. | Apr. | May. | June. | July. | Aug. | Sept. | Oct. |
|---------|------|------|-------|-------|------|-------|-------|
| 1..... | | a 26 | 27 | 21 | 25 | 28 | 32 |
| 2..... | | 26 | 25 | 21 | 23 | 27 | 24 |
| 3..... | | 25 | 27 | 20 | 22 | 27 | 16 |
| 4..... | | 24 | 28 | 20 | 24 | 26 | 12 |
| 5..... | | 24 | 28 | 19 | a 26 | 26 | 12 |
| 6..... | | 25 | 29 | 16 | a 28 | 25 | 12 |
| 7..... | | 26 | a 29 | a 19 | a 30 | 23 | 11 |
| 8..... | | 27 | 29 | a 22 | 32 | 23 | 10 |
| 9..... | | 27 | 28 | 24 | 34 | 27 | 10 |
| 10..... | | a 28 | 27 | 27 | 34 | 27 | 9.5 |
| 11..... | | 29 | 26 | 27 | 34 | 26 | 9.2 |
| 12..... | | 27 | 23 | 22 | a 32 | 25 | 9.0 |
| 13..... | | 27 | 26 | 22 | 30 | 25 | 9.0 |
| 14..... | | 27 | 26 | 27 | 29 | 14 | 9.0 |
| 15..... | | 28 | 26 | 26 | 33 | a 16 | 9.0 |
| 16..... | | 28 | 27 | 27 | 34 | a 17 | 10 |
| 17..... | | 27 | 24 | a 28 | 35 | 19 | ..... |
| 18..... | | 27 | 26 | 30 | 34 | 16 | ..... |
| 19..... | | 27 | 25 | 29 | a 34 | 19 | ..... |
| 20..... | | 26 | 24 | 27 | 34 | 21 | ..... |
| 21..... | | 25 | 23 | 27 | 32 | 21 | ..... |
| 22..... | | 26 | 25 | 27 | 25 | a 21 | ..... |
| 23..... | | 23 | 25 | 26 | 26 | a 21 | ..... |
| 24..... | | 22 | a 22 | 25 | 27 | 28 | 21 |
| 25..... | | 25 | 20 | 24 | 27 | 29 | a 21 |
| 26..... | | 28 | 23 | 24 | 27 | 29 | 21 |
| 27..... | | 14 | 25 | 25 | 27 | 28 | 17 |
| 28..... | | 27 | 27 | 22 | 27 | 27 | 16 |
| 29..... | | 26 | 24 | 21 | 21 | 26 | 16 |
| 30..... | | a 26 | 29 | 21 | a 28 | a 16 | ..... |
| 31..... | | | a 28 | 24 | 29 |  | ..... |

a Interpolated.

NOTE.—Canal dry from October 1, 1917, to some time in April, 1918, probably a few days before the record began.

Monthly discharge of Rogue River Valley canal near Brownsboro, Oreg., for the period from Apr. 24, to Oct. 16, 1918.

| Month. | Discharge in second-feet. | | | Run-off in acre-feet. |
|-------------------|---------------------------|----------|-------|-----------------------|
| | Maximum. | Minimum. | Mean. | |
| April 24-30..... | 28 | 14 | 24.0 | 333 |
| May..... | 29 | 20 | 25.9 | 1,599 |
| June..... | 29 | 21 | 25.5 | 1,520 |
| July..... | 30 | 16 | 24.5 | 1,510 |
| August..... | 35 | 22 | 29.5 | 1,810 |
| September..... | 28 | 14 | 21.6 | 1,290 |
| October 1-16..... | 32 | 9 | 12.7 | 403 |
| The period..... | | | | 8,460 |

BEAR CREEK AT MEDFORD, OREG.

LOCATION.—In NW. ¼ sec. 30, T. 37 S., R. 1 W., just above Main Street Bridge in Medford, Jackson County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—March 13, 1915, to June 30, 1918; fragmentary.

GAGE.—Vertical staff at southeast corner of Page theater building, on left bank; read by R. P. Cowgill.

DISCHARGE MEASUREMENTS.—Made from bridge or by wading.

CHANNEL AND CONTROL.—Bed composed of loose gravel; a concrete sewer passing under creek forms a partial control which shifts during high water.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 3.80 feet at 8 and 10 a. m. January 12 (discharge, 655 second-feet); stream practically dry in latter part of summer owing to diversions above.

1915-1918: Maximum stage recorded, 4.75 feet at 8 a. m. February 10, 1916 (discharge, 1,240 second-feet); stream practically dry in latter part of 1918.

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

DIVISIONS.—A large area above station is irrigated from flood waters of Bear Creek.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed during flood of January 12. Two rating curves both well defined, used during year; one from November 27 to January 11, and other for remainder of year. Gage read to hundredths once daily with two readings during periods of considerable fluctuation. Daily discharge ascertained by applying daily gage height to rating table. Records good except during October, November, and June for which they are approximate.

Discharge measurements of Bear Creek at Medford, Oreg., during the year ending Sept. 30, 1918.

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|---------|-------------------------|--------------|-----------------|---------|------------------------|--------------|-----------------|
| | | <i>Feet.</i> | <i>Sec.-ft.</i> | | | <i>Feet.</i> | <i>Sec.-ft.</i> |
| Dec. 1 | Briggs and Cowgill a... | 2.26 | 127 | Mar. 14 | J. B. Platt b..... | 2.11 | 105 |
| 20 | R. P. Cowgill..... | 1.70 | 27.0 | 23 | R. P. Cowgill..... | 2.32 | 152 |
| Jan. 12 | R. C. Briggs..... | 3.76 | 637 | Apr. 30 | Cowgill and Platt..... | 1.72 | 35.9 |
| Feb. 7 | R. P. Cowgill..... | 2.70 | 273 | May 16 | R. P. Cowgill..... | 1.50 | 14.4 |
| 11 | do..... | 2.03 | 89 | June 29 | do..... | 1.10 | c. 1 |
| 18 | do..... | 2.20 | 126 | July 15 | do..... | 1.04 | c. 05 |
| Mar. 14 | Briggs and Cowgill..... | 2.13 | 104 | | | | |

a Chief engineer, Rogue River Valley Canal Co. b Engineer, Medford Irrigation District. c Estimated.

Daily discharge, in second-feet, of Bear Creek at Medford, Oreg., for the year ending Sept. 30, 1918.

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. |
|---------|------|------|------|------|------|------|------|------|-------|
| 1..... | | | 142 | 28 | 47 | 121 | 138 | 30 | 9.0 |
| 2..... | | | a 90 | 27 | 44 | 128 | 128 | 25 | 9.0 |
| 3..... | | | a 37 | 25 | 40 | 140 | 112 | 24 | 8.2 |
| 4..... | | | a 33 | 26 | 40 | 99 | 105 | 23 | 5.8 |
| 5..... | | | a 29 | 27 | 36 | 95 | 101 | 28 | 4.1 |
| 6..... | | | 25 | 25 | 382 | 86 | 95 | 27 | 4.1 |
| 7..... | | | a 24 | 27 | 298 | 90 | 90 | 24 | 5.0 |
| 8..... | | | 22 | 25 | 171 | 97 | 86 | 21 | a 4.3 |
| 9..... | | | a 22 | a 26 | 126 | 99 | 119 | 25 | a 3.6 |
| 10..... | | | a 21 | 27 | 103 | 101 | 117 | 34 | 2.9 |
| 11..... | | | a 20 | 27 | 90 | 103 | 105 | 32 | 2.6 |
| 12..... | | | 19 | 400 | 121 | 128 | 103 | 26 | |
| 13..... | | | a 22 | 100 | 130 | 121 | 108 | 25 | 2.0 |
| 14..... | | | 25 | 204 | 155 | 108 | 101 | 18 | |
| 15..... | | 1.0 | 22 | 126 | 136 | 103 | 92 | 16 | |
| 16..... | 1.0 | | 22 | 166 | 126 | 108 | 90 | 14 | |
| 17..... | | | 22 | 140 | 138 | 126 | 86 | 14 | |
| 18..... | | | 22 | 126 | 126 | 190 | 82 | 14 | 1.0 |
| 19..... | | | 23 | 95 | 97 | 190 | 78 | 14 | |
| 20..... | | | a 24 | a 79 | 88 | 160 | 74 | 14 | |
| 21..... | | | 26 | 63 | 84 | 145 | 74 | 12 | |
| 22..... | | | 22 | 60 | 103 | 153 | 74 | 12 | .5 |
| 23..... | | | 22 | 57 | 126 | 153 | 67 | 10 | |
| 24..... | | | 50 | 53 | 150 | 158 | 61 | 9 | |
| 25..... | | | 39 | 50 | 112 | 190 | 63 | 9 | .1 |
| 26..... | | | 33 | 47 | 128 | 176 | 57 | 9 | |
| 27..... | | | 56 | 47 | 136 | 166 | 55 | 12 | |
| 28..... | | | 42 | 47 | 100 | 155 | 46 | 12 | .1 |
| 29..... | | 5 | 39 | 44 | | 145 | 43 | 12 | |
| 30..... | | 46 | 33 | 53 | | 180 | 34 | 11 | |
| 31..... | | | 29 | 46 | | 160 | | 10 | |

* Interpolated.

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

Monthly discharge of Bear Creek at Medford, Oreg., for the year ending Sept. 30, 1918.

| Month. | Discharge in second-feet. | | | Run-off in acre-feet. |
|-----------------|---------------------------|----------|-------|-----------------------|
| | Maximum. | Minimum. | Mean. | |
| October..... | | | 1.0 | 61 |
| November..... | 46 | | 4.1 | 244 |
| December..... | 142 | 19 | 34.1 | 2,100 |
| January..... | 400 | 25 | 74.0 | 4,550 |
| February..... | 382 | 40 | 127 | 7,060 |
| March..... | 190 | 86 | 133 | 8,180 |
| April..... | 138 | 33 | 86.1 | 5,120 |
| May..... | 34 | 9 | 18.3 | 1,130 |
| June..... | 9.0 | .1 | 2.48 | 148 |
| The period..... | | | | 28,800 |

PHOENIX DITCH AT TALENT, OREG.

LOCATION.—In NW. $\frac{1}{4}$ sec. 23, T. 38 S., R. 1 W., a quarter of a mile below old bridge across Bear Creek and half a mile north of Talent, Jackson County.

RECORDS AVAILABLE.—April 19, 1916, to September 30, 1918.

GAGE.—Barrett & Lawrence water-stage recorder on right bank installed May 5, 1917, and referred to vertical staff on left of flume about 80 feet below intake used previously; inspected by R. P. Cowgill.

DISCHARGE MEASUREMENTS.—Made from collar of flume.

CHANNEL AND CONTROL.—Flume extends only a few feet below gage; no defined control.

EXTREMES OF DISCHARGE.—Maximum stage for period of record, from water-stage recorder, 1.75 feet at 8 a. m. May 27 (discharge, 22 second-feet.) Canal dry in winter.

ACCURACY.—Stage-discharge relation shifting. Three rating curves used as follows: May 4 to 25, well defined; June 6 to 12, fairly well defined; June 14 to July 15, fairly well defined. Indirect method for shifting control used from May 26 to June 5 and June 13. Daily discharge ascertained by applying to rating table mean daily gage height determined by inspecting recorder graph. Records for May good, and for June and July, fair.

The Phoenix ditch diverts water from Bear Creek in NW. $\frac{1}{4}$ sec. 23, T. 38 S., R. 1 W., for irrigation of about 1,000 acres of land between Medford and Talent.

Discharge measurements of Phoenix ditch at Talent, Oreg., during the year ending Sept. 30, 1918.

| Date. | Made by— | Gage height. | Discharge. | Date. | Made by— | Gage height. | Discharge. |
|--------|----------------------------------|--------------|-----------------|---------|-----------------------------|--------------|-----------------|
| | | <i>Feet.</i> | <i>Sec.-ft.</i> | | | <i>Feet.</i> | <i>Sec.-ft.</i> |
| May 4 | R. P. Cowgill ^a | 1.47 | 16.8 | June 12 | R. P. Cowgill..... | 1.36 | 8.9 |
| 15 |do..... | 1.42 | 16.2 | 14 | Batchelder and Cowgill..... | 1.54 | 11.8 |
| 25 |do..... | 1.52 | 18.0 | 18 | R. P. Cowgill..... | 1.18 | 3.6 |
| June 6 |do..... | 1.67 | 17.7 | July 1 |do..... | .90 | 1.0 |
| 10 | Cowgill and Platt..... | 1.54 | 13.3 | 15 |do..... | .74 | .4 |

^a Chief engineer, Rogue River Valley Land Co.

Daily discharge, in second-feet, of Phoenix ditch at Talent, Oreg., for the year ending Sept. 30, 1918.

| Day. | May. | June. | July. | Day. | May. | June. | July. | Day. | May. | June. | July. |
|---------|------|-------|-------|---------|------|-------|-------|---------|------|-------|-------|
| 1..... | | 14 | 1.0 | 11..... | 17 | 12 | .6 | 21..... | 16 | 3.2 | ..... |
| 2..... | | 13 | .8 | 12..... | 17 | 10 | .6 | 22..... | 14 | 2.3 | ..... |
| 3..... | | 12 | .9 | 13..... | 16 | 14 | .3 | 23..... | 14 | 2.4 | ..... |
| 4..... | 17 | 12 | .8 | 14..... | 18 | 9.5 | .1 | 24..... | 15 | 3.9 | ..... |
| 5..... | 19 | 11 | .6 | 15..... | 17 | 10 | .1 | 25..... | 15 | 2.9 | ..... |
| 6..... | 19 | 16 | .6 | 16..... | 17 | 6.9 | ..... | 26..... | 19 | 2.4 | ..... |
| 7..... | 18 | 14 | .5 | 17..... | 17 | 6.4 | ..... | 27..... | 20 | 2.2 | ..... |
| 8..... | 17 | 12 | .6 | 18..... | 17 | 3.3 | ..... | 28..... | 19 | 1.2 | ..... |
| 9..... | 17 | 12 | .7 | 19..... | 16 | 2.6 | ..... | 29..... | 18 | 1.0 | ..... |
| 10..... | 17 | 12 | .8 | 20..... | 16 | 2.9 | ..... | 30..... | 16 | 1.0 | ..... |
| | | | | | | | | 31..... | 16 | ..... | ..... |

NOTE.—Flow in canal started about April 20; no record prior to May 4. No flow subsequent to July 15.

Monthly discharge of Phoenix ditch at Talent, Oreg., for the year ending Sept. 30, 1918.

| Month. | Discharge in second-feet. | | | Run-off in acre-feet. |
|-----------------|---------------------------|----------|-------|-----------------------------|
| | Maximum. | Minimum. | Mean. | |
| May 4-31..... | 20 | 14 | 16.9 | 939 |
| June..... | 16 | 1.0 | 7.61 | 453 |
| July 1-15..... | 1.0 | .1 | .60 | 18 |
| The period..... | | | | 1,410 |

COQUILLE RIVER BASIN.

SOUTH FORK OF COQUILLE RIVER AT POWERS, OREG.

LOCATION.—In SW. $\frac{1}{4}$ sec. 13, T. 31 S., R. 12 W., a quarter of a mile due west of Powers post office, Coos County, at present terminus of Marshfield branch of Southern Pacific Railroad. Salmon Creek enters 1,000 feet above and Bingham Creek 200 feet below station.

DRAINAGE AREA.—168 square miles (measured on topographic map and on Douglas County Abstract Co.'s map).

RECORDS AVAILABLE.—September 4, 1916, to September 30, 1918.

GAGE.—Inclined staff in three sections on left bank under footbridge; read by L. F. Brown.

DISCHARGE MEASUREMENTS.—Made by wading or from footbridge.

CHANNEL AND CONTROL.—Composed of gravel and solid rock; shifts during high water.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 10.8 feet at 4.30 p. m. February 6 (discharge, 10,200 second-feet); minimum stage recorded, 2.38 feet September 26 and 28 (discharge, 18 second-feet).

1916-1918: Maximum and minimum stages, those of 1918.

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

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation shifted during high water of January. Two rating curves used, both well defined for low stages and fairly well for high by measurement made February 17, 1919. Gage read to hundredths once daily, and twice in case of very high water. Daily discharge ascertained by applying mean daily gage height to rating table. Records good.

Discharge measurements of South Fork of Coquille River at Powers, Oreg., during the year ending Sept. 30, 1918.

[Made by C. L. Batchelder.]

| Date. | Gage height. | Discharge. |
|-----------|----------------------|-----------------------|
| June 12. | <i>Fect.</i> 2.95 | <i>Sec.-ft.</i> 87 |
| Sept. 12. | 2.43 | 18.7 |

Daily discharge, in second-feet, of South Fork of Coquille River at Powers, Oreg., for the year ending Sept. 30, 1918.

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|------|------|-------|-------|-------|-------|-------|-------|------|-------|-------|------|-------|
| 1 | 31 | 27 | 5,350 | 800 | 1,170 | 870 | 870 | 225 | 93 | 38 | 27 | 18 |
| 2 | 31 | 27 | 3,360 | 730 | 2,550 | 870 | 730 | 225 | 93 | 38 | 26 | 18 |
| 3 | 31 | 266 | 1,360 | 730 | 1,660 | 1,090 | 600 | 195 | 93 | 36 | 24 | 18 |
| 4 | 30 | 116 | 940 | 1,170 | 3,670 | 940 | 500 | 195 | 93 | 36 | 26 | 18 |
| 5 | 30 | 385 | 600 | 800 | 4,450 | 940 | 455 | 195 | 75 | 36 | 26 | 18 |
| 6 | 29 | 200 | 550 | 730 | 8,650 | 800 | 415 | 195 | 75 | 36 | 24 | 18 |
| 7 | 29 | 93 | 500 | 870 | 4,060 | 730 | 482 | 195 | 75 | 36 | 24 | 18 |
| 8 | 28 | 75 | 455 | 870 | 2,550 | 660 | 550 | 165 | 75 | 36 | 24 | 19 |
| 9 | 27 | 61 | 375 | 870 | 1,760 | 1,460 | 2,090 | 212 | 75 | 34 | 24 | 19 |
| 10 | 27 | 32 | 335 | 730 | 1,360 | 2,090 | 1,360 | 260 | 75 | 34 | 24 | 19 |
| 11 | 27 | 61 | 295 | 730 | 1,260 | 2,430 | 1,010 | 195 | 75 | 34 | 20 | 18 |
| 12 | 27 | 343 | 295 | 4,450 | 1,260 | 2,310 | 940 | 180 | 75 | 34 | 20 | 18 |
| 13 | 27 | 284 | 335 | 2,670 | 1,660 | 1,660 | 800 | 165 | 59 | 32 | 20 | 41 |
| 14 | 27 | 170 | 550 | 3,540 | 2,090 | 1,260 | 730 | 156 | 59 | 32 | 20 | 36 |
| 15 | 28 | 93 | 660 | 2,910 | 2,910 | 1,090 | 660 | 148 | 59 | 29 | 27 | 36 |
| 16 | 28 | 61 | 2,550 | 2,310 | 3,540 | 1,090 | 600 | 140 | 59 | 29 | 32 | 34 |
| 17 | 28 | 61 | 4,750 | 2,200 | 3,030 | 1,460 | 455 | 140 | 59 | 29 | 27 | 27 |
| 18 | 28 | 61 | 2,550 | 2,310 | 2,200 | 2,430 | 500 | 165 | 59 | 29 | 27 | 20 |
| 19 | 27 | 258 | 1,980 | 1,760 | 1,560 | 1,760 | 500 | 165 | 46 | 29 | 26 | 20 |
| 20 | 27 | 56 | 1,980 | 1,360 | 1,090 | 1,260 | 500 | 165 | 46 | 27 | 26 | 19 |
| 21 | 27 | 50 | 1,360 | 1,260 | 940 | 1,170 | 455 | 165 | 46 | 27 | 21 | 18 |
| 22 | 27 | 50 | 1,010 | 870 | 870 | 2,430 | 415 | 140 | 46 | 27 | 21 | 18 |
| 23 | 27 | 50 | 3,030 | 560 | 1,170 | 2,790 | 375 | 140 | 46 | 32 | 20 | 18 |
| 24 | 27 | 46 | 2,430 | 550 | 1,170 | 2,670 | 375 | 140 | 46 | 36 | 20 | 18 |
| 25 | 27 | 45 | 4,940 | 550 | 1,170 | 2,550 | 335 | 115 | 44 | 36 | 20 | 18 |
| 26 | 27 | 44 | 7,450 | 550 | 1,170 | 1,870 | 295 | 115 | 44 | 36 | 20 | 18 |
| 27 | 27 | 44 | 3,800 | 550 | 1,090 | 1,560 | 295 | 115 | 44 | 36 | 20 | 18 |
| 28 | 27 | 116 | 3,540 | 455 | 940 | 1,170 | 260 | 115 | 44 | 34 | 20 | 18 |
| 29 | 27 | 3,410 | 2,430 | 660 | ----- | 1,170 | 260 | 115 | 41 | 29 | 19 | 18 |
| 30 | 27 | 8,050 | 1,560 | 660 | ----- | 1,170 | 225 | 115 | 41 | 27 | 18 | 18 |
| 31 | 27 | ----- | 1,090 | 660 | ----- | 1,010 | ----- | 93 | ----- | 27 | 18 | ----- |

α Interpolated.

Monthly discharge of South Fork of Coquille River at Powers, Oreg., for the year ending Sept. 30, 1918.

[Drainage area, 168 square miles.]

| Month. | Discharge in second-feet. | | | | Run-off. | |
|-----------|---------------------------|----------|-------|------------------|----------|------------|
| | Maximum. | Minimum. | Mean. | Per square mile. | Inches. | Acre-feet. |
| October | 31 | 27 | 27.9 | 0.166 | 0.19 | 1,720 |
| November | 8,050 | 27 | 481 | 2.88 | 3.21 | 28,600 |
| December | 7,450 | 295 | 2,010 | 12.0 | 13.83 | 124,000 |
| January | 4,450 | 455 | 1,290 | 7.68 | 8.86 | 79,300 |
| February | 8,650 | 870 | 2,170 | 12.9 | 13.43 | 121,000 |
| March | 2,790 | 660 | 1,510 | 8.99 | 10.36 | 92,800 |
| April | 2,090 | 225 | 604 | 3.60 | 4.02 | 35,900 |
| May | 260 | 93 | 163 | .970 | 1.12 | 10,000 |
| June | 93 | 41 | 62.0 | .369 | .41 | 3,690 |
| July | 38 | 27 | 32.6 | .194 | .22 | 2,000 |
| August | 32 | 18 | 22.9 | .136 | .16 | 1,410 |
| September | 41 | 18 | 21.1 | .126 | .14 | 1,260 |
| The year | 8,650 | 18 | 692 | 4.12 | 55.95 | 502,000 |

55.60

TENMILE CREEK BASIN.

CLEAR LAKE OUTLET NEAR REEDSPORT, OREG.

LOCATION.—In NW. $\frac{1}{4}$ sec. 30, T. 22 S., R. 12 W., at outlet of Clear Lake, 8 miles southwest of Reedsport, Douglas County.

DRAINAGE AREA.—About 4 square miles (measured on large scale county map).

RECORDS AVAILABLE.—July 21, 1917, to May 16, 1918.

GAGE.—Stevens eight-day water-stage recorder; inspected by F. P. Mallory.

CONTROL.—Cippoletti weir, 10-foot crest, with knife edges. (Rating not checked with current meter.)

EXTREMES OF DISCHARGE.—Maximum height over weir during period from water-stage recorder 2.07 feet, Dec. 23 (discharge, 100 second-feet); minimum stage from recorder 0.25 foot (discharge, 4.2 second-feet).

DIVERSIONS.—None.

REGULATION.—Run-off is considerably retarded by natural storage in Clear Lake.

ACCURACY.—Operation of water-stage recorder satisfactory October to April, somewhat unsatisfactory at times during July to September. Cippoletti weir formula used without allowance for velocity of approach, which is believed to give quite accurate results. Daily discharge ascertained by applying to weir formula mean daily gage height obtained by inspecting recorder graph.

COOPERATION.—Base data furnished by J. G. Kelley, hydraulic engineer.

Daily discharge, in second-feet, of Clear Lake outlet near Reedsport, Oreg., for the period July 21, 1917, to May 16, 1918.

| Day. | July. | Aug. | Sept. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. |
|---------|-------|------|-----------------|-----------------|-----------------|-----------------|------|-----------------|------|-----------------|-------|
| 1..... | | 12 | 4.5 | | 8.5 | ^a 52 | 79 | 57 | 64 | ^a 49 | ..... |
| 2..... | | 12 | 4.2 | 10 | 8.2 | ^a 62 | 74 | 59 | 62 | ^a 49 | ..... |
| 3..... | | 12 | 4.2 | | 8.5 | ^a 72 | 74 | 58 | 63 | 48 | ..... |
| 4..... | | 12 | 4.2 | 9.8 | 9.2 | 71 | 75 | 61 | 64 | 46 | ..... |
| 5..... | | 11 | 5.5 | 10 | 9.8 | 66 | 72 | 63 | 63 |  | ..... |
| 6..... | | 11 | 5.8 | 10 | 11 | 62 | 70 | ^a 67 | 61 | 47 | ..... |
| 7..... | | 11 | 7.9 | 10 | 12 | 58 | 69 | 71 | 59 |  | ..... |
| 8..... | | 9.5 | ^a 10 | ^a 11 | 13 | 55 | 68 | 69 | 58 | 48 | ..... |
| 9..... | | 9.5 | ^a 12 | 12 | 13 | 53 | 66 | 66 | | 50 | ..... |
| 10..... | | 9.8 | 14 | 13 | 14 | 50 | 64 | 65 | | 49 | 43 |
| 11..... | | 8.8 | 15 | 13 | 15 | 49 | 69 | 65 | 58 | 49 | 41 |
| 12..... | | 8.8 | 16 | 13 | 19 | 48 | 80 | 68 | | 49 | 40 |
| 13..... | | 8.8 | 18 | 13 | 18 | 58 | 80 | 69 | 58 | 50 | 40 |
| 14..... | | 8.8 | 18 | 12 | ^a 18 | 66 | 81 | 69 | 57 | 51 | 40 |
| 15..... | | 8.0 | 18 | 11 | 19 | 68 | 80 | 71 | 56 | 51 | 41 |
| 16..... | | 7.3 | ^a 16 | 11 | 19 | 71 | 79 | 86 | 55 | 51 | 41 |
| 17..... | | 7.6 | 15 | 11 | 19 | 73 | 79 | 92 | 54 | 50 | ..... |
| 18..... | | 7.3 | 15 | 11 | 19 | 74 | 77 | 90 | 55 | 50 | ..... |
| 19..... | | 7.0 | 14 | 10 | 18 | 81 | 73 | 85 | 53 | 49 | ..... |
| 20..... | | 7.3 | 14 | 11 | 18 | 89 | 69 | 80 | | 48 | ..... |
| 21..... | 13 | 7.9 | 14 | 10 | 18 | 85 | 66 | 75 | | 48 | ..... |
| 22..... | 13 | 7.6 | 13 | 10 | 18 | 81 | 64 | 71 | 54 | 47 | ..... |
| 23..... | 14 | 7.3 | 15 | 10 | 18 | 97 | 61 | 72 | | 46 | ..... |
| 24..... | 13 | 6.7 | 14 | 10 | 18 | 99 | 60 | 71 | | 46 | ..... |
| 25..... | 13 | 5.8 | 15 | 10 | 18 | 97 | 59 | | 54 | 46 | ..... |
| 26..... | 12 | 5.8 | 15 | 10 | 18 | 95 | 58 | 68 | 55 | 45 | ..... |
| 27..... | 12 | 5.5 | 10 | 10 | 20 | 94 | 57 | | 54 | 45 | ..... |
| 28..... | 13 | 4.7 | 12 | 10 | 27 | 89 | 57 | 66 | 53 |  | ..... |
| 29..... | 14 | 4.5 | 11 | 10 | ^a 35 | 84 | 59 | | 52 | 45 | ..... |
| 30..... | 13 | 5.0 | 10 | 10 | ^a 43 | 84 | 59 | | 51 |  | ..... |
| 31..... | 13 | 4.5 | | 9.2 | ..... | 82 | 57 | | 50 |  | ..... |

^a Interpolated.

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

Monthly discharge of Clear Lake outlet near Reedsport, Oreg., for the period July 21, 1917, to May 16, 1918.

| Month. | Discharge in second-feet. | | | Run-off in acre-feet. |
|-----------------|---------------------------|----------|-------|-----------------------|
| | Maximum. | Minimum. | Mean. | |
| July 21-31..... | 14 | 12 | 13.0 | 284 |
| August..... | 12 | 4.5 | 8.22 | 505 |
| September..... | 18 | 4.2 | 12.0 | 714 |
| October..... | 13 | 9.2 | 10.7 | 658 |
| November..... | 43 | 8.2 | 17.4 | 1,040 |
| December..... | 90 | 48 | 73.1 | 4,490 |
| January..... | 81 | 57 | 68.9 | 4,240 |
| February..... | 92 | 57 | 70.4 | 3,910 |
| March..... | 64 | 50 | 56.5 | 3,470 |
| April..... | 51 | 45 | 47.9 | 2,850 |
| The period..... | | | | 22,200 |

NOTE.—Mean discharge for May estimated as 35 second-feet, for June, 20 second-feet, for year ending June 30, 36.1 second-feet, or 9.25 second-feet per square mile, giving 126 inches depth of run-off on drainage area of 4 square miles.

UMPQUA RIVER BASIN.

UMPQUA RIVER NEAR ELKTON, OREG.

LOCATION.—In sec. 8, T. 23 S., R. 7 W., at ferry crossing 4 miles south (by road) from Elkton, Douglas County, and 8 miles (by river) above Elk Creek.

DRAINAGE AREA.—3,680 square miles.

RECORDS AVAILABLE.—October 18, 1905, to December 31, 1906; May 12, 1907, to September 30, 1918.

GAGE.—Staff in five sections; low-water section inclined, the others vertical; read by D. C. Higginbotham. Datum lowered 0.52 foot September 2, 1910.

DISCHARGE MEASUREMENTS.—Made from car on ferry cable 100 feet below gage.

CHANNEL AND CONTROL.—Bed composed of gravel; somewhat shifting. Rock control; practically permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 20.0 feet at 7 a. m. January 13 (discharge, 67,000 second-feet); minimum stage recorded, 0.17 foot August 9 to 15, 28 to 31, and September 1 to 9 (discharge, 930 second-feet).

1905-1918: Maximum stage recorded, 38.5 feet (present datum) at 7 a. m.

November 23, 1909 (discharge, estimated from extension of rating curve, 163,000 second-feet); minimum stage recorded that of 1918.

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

DIVERSIONS.—Practically none.

REGULATION.—Practically none.

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

Discharge measurements of Umpqua River near Elkton, Oreg., during the year ending Sept. 30, 1918.

| Date. | Made by— | Gage height. | Discharge. |
|----------|-----------------------|--------------|------------|
| Jan. 18 | R. C. Briggs..... | Feet. | Sec.-ft. |
| Sept. 10 | C. L. Batchelder..... | 10.95 | 29,000 |
| | | .27 | 1,020 |

Daily discharge, in second-feet, of Umpqua River near Elkton, Oreg., for the year ending Sept. 30, 1918.

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|---------|-------|--------|--------|--------|--------|--------|--------|-------|-------|-------|-------|-------|
| 1..... | 1,180 | 1,070 | 37,100 | 9,900 | 11,100 | 11,100 | 15,000 | 5,630 | 3,290 | 1,240 | 1,120 | 930 |
| 2..... | 1,180 | 1,070 | 28,000 | 9,100 | 10,200 | 9,600 | 13,800 | 5,260 | 2,990 | 1,300 | 1,120 | 930 |
| 3..... | 1,180 | 1,070 | 13,200 | 8,600 | 9,600 | 9,350 | 12,300 | 4,900 | 2,690 | 1,360 | 1,120 | 930 |
| 4..... | 1,180 | 1,120 | 9,100 | 10,200 | 10,800 | 10,200 | 10,800 | 5,820 | 2,690 | 1,300 | 1,120 | 930 |
| 5..... | 1,180 | 1,420 | 8,360 | 10,800 | 19,900 | 11,400 | 9,600 | 6,600 | 2,990 | 1,240 | 1,020 | 930 |
| 6..... | 1,180 | 1,360 | 6,800 | 9,600 | 41,100 | 10,200 | 8,120 | 6,800 | 2,690 | 1,360 | 1,020 | 930 |
| 7..... | 1,180 | 1,660 | 6,010 | 9,600 | 55,800 | 9,600 | 7,660 | 6,400 | 2,900 | 1,300 | 1,020 | 930 |
| 8..... | 1,180 | 1,720 | 5,260 | 11,700 | 33,100 | 10,200 | 7,220 | 6,800 | 2,690 | 1,180 | 1,020 | 930 |
| 9..... | 1,180 | 1,480 | 4,560 | 13,800 | 24,400 | 12,000 | 8,120 | 6,800 | 2,410 | 1,120 | 930 | 930 |
| 10..... | 1,180 | 1,420 | 4,230 | 15,000 | 21,300 | 17,400 | 9,350 | 6,200 | 2,150 | 1,120 | 930 | 1,020 |
| 11..... | 1,180 | 1,360 | 3,590 | 15,700 | 17,800 | 18,500 | 12,000 | 5,630 | 1,900 | 1,120 | 930 | 1,180 |
| 12..... | 1,180 | 1,360 | 2,990 | 28,700 | 14,700 | 15,700 | 11,100 | 5,260 | 1,900 | 1,120 | 930 | 1,070 |
| 13..... | 1,180 | 1,600 | 2,690 | 58,000 | 12,600 | 13,800 | 9,100 | 5,090 | 2,150 | 1,120 | 930 | 1,020 |
| 14..... | 1,180 | 1,720 | 4,230 | 37,100 | 18,800 | 12,600 | 8,600 | 4,230 | 1,120 | 1,120 | 930 | 1,020 |
| 15..... | 1,180 | 1,480 | 12,600 | 41,900 | 20,200 | 11,400 | 8,120 | 4,390 | 1,840 | 1,120 | 930 | 1,070 |
| 16..... | 1,180 | 1,300 | 11,400 | 32,300 | 20,600 | 10,800 | 8,900 | 4,590 | 1,780 | 1,120 | 1,070 | 960 |
| 17..... | 1,180 | 1,300 | 9,600 | 29,900 | 22,400 | 10,800 | 9,100 | 5,260 | 1,540 | 1,120 | 1,300 | 960 |
| 18..... | 1,070 | 1,180 | 17,100 | 28,700 | 20,200 | 13,200 | 8,850 | 4,900 | 1,420 | 1,120 | 1,480 | 960 |
| 19..... | 1,070 | 1,120 | 17,400 | 27,600 | 18,500 | 18,500 | 8,600 | 4,560 | 1,300 | 1,120 | 1,360 | 960 |
| 20..... | 1,070 | 1,070 | 15,000 | 21,300 | 17,100 | 17,800 | 8,600 | 4,560 | 1,120 | 1,120 | 1,180 | 960 |
| 21..... | 1,070 | 1,070 | 12,300 | 19,200 | 14,700 | 15,700 | 9,100 | 4,900 | 1,300 | 1,120 | 1,120 | 960 |
| 22..... | 1,070 | 1,120 | 11,100 | 16,400 | 12,900 | 14,400 | 8,360 | 4,900 | 1,240 | 1,120 | 1,070 | 960 |
| 23..... | 1,070 | 1,300 | 10,800 | 14,700 | 13,800 | 14,700 | 7,660 | 4,560 | 1,180 | 1,300 | 1,020 | 960 |
| 24..... | 1,070 | 1,120 | 13,200 | 12,900 | 16,800 | 17,100 | 7,890 | 4,230 | 1,120 | 1,480 | 1,020 | 960 |
| 25..... | 1,070 | 1,070 | 13,800 | 11,700 | 16,000 | 18,500 | 8,600 | 4,230 | 1,180 | 1,300 | 1,020 | 960 |
| 26..... | 1,070 | 1,180 | 15,000 | 10,800 | 14,400 | 16,400 | 8,120 | 3,910 | 1,300 | 1,240 | 1,020 | 960 |
| 27..... | 1,070 | 1,240 | 21,300 | 10,200 | 12,900 | 14,700 | 7,220 | 3,910 | 1,240 | 1,240 | 1,020 | 960 |
| 28..... | 1,070 | 1,480 | 18,500 | 11,400 | 12,000 | 13,200 | 6,800 | 3,590 | 1,300 | 1,240 | 930 | 960 |
| 29..... | 1,070 | 1,660 | 15,700 | 12,600 | 12,900 | 12,900 | 6,400 | 3,290 | 1,420 | 1,120 | 930 | 960 |
| 30..... | 1,070 | 15,000 | 13,800 | 13,200 | ..... | 14,400 | 6,010 | 3,590 | 1,300 | 1,120 | 930 | 960 |
| 31..... | 1,070 | ..... | 12,000 | 12,000 | ..... | 14,700 | ..... | 3,290 | ..... | 1,120 | 930 | ..... |

Monthly discharge of Umpqua River near Elkton, Oreg., for the year ending Sept. 30, 1918.

[Drainage area, 3,680 square miles.]

| Month. | Discharge in second-feet. | | | | Run-off. | |
|----------------|---------------------------|---------------|--------|------------------------|----------|------------|
| | Maxi- mum. | Mini- mum. | Mean. | Per square mile. | Inches. | Acre-feet. |
| October..... | 1,180 | 1,070 | 1,130 | 0.307 | 0.35 | 69,500 |
| November..... | 15,000 | 1,070 | 1,770 | .451 | .54 | 105,000 |
| December..... | 37,100 | 2,690 | 12,200 | 3.32 | 3.83 | 750,000 |
| January..... | 58,000 | 8,600 | 18,500 | 5.03 | 5.80 | 1,140,000 |
| February..... | 55,800 | 9,600 | 19,100 | 5.19 | 5.40 | 1,060,000 |
| March..... | 18,500 | 9,350 | 13,600 | 3.69 | 4.25 | 826,000 |
| April..... | 15,000 | 6,010 | 9,030 | 2.45 | 2.73 | 537,000 |
| May..... | 6,800 | 3,290 | 4,980 | 1.35 | 1.56 | 306,000 |
| June..... | 3,290 | 1,120 | 1,900 | .516 | .58 | 113,000 |
| July..... | 1,480 | 1,120 | 1,200 | .326 | .38 | 73,800 |
| August..... | 1,480 | 930 | 1,050 | .285 | .33 | 64,600 |
| September..... | 1,180 | 930 | 972 | .264 | .29 | 57,800 |
| The year..... | 58,000 | 930 | 7,050 | 1.92 | 26.04 | 5,110,000 |

NORTH UMPQUA RIVER NEAR GLIDE, OREG.

LOCATION.—In SW. $\frac{1}{4}$ sec. 13, T. 26 S., R. 4 W., at Hughes ferry, 2 miles below Glide, Douglas County, just off main road to Roseburg.

DRAINAGE AREA.—1,210 square miles (measured on topographic and Forest Service maps).

RECORDS AVAILABLE.—September 1, 1915, to September 30, 1918.

GAGE.—Vertical staff on left bank just below ferry landing; read by J. H. Hayes.

DISCHARGE MEASUREMENTS.—Made from ferry up to a stage of about 6 feet. Flood measurements have been made from the bridge at Winchester, about 20 miles downstream, and the inflow, estimated from measurements of Oak Creek, deducted.

CHANNEL AND CONTROL.—Composed of solid rock; practically permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 12.9 feet at 8 a. m. **January 12** (discharge, 42,500 second-feet); minimum stage recorded, 0.20 foot **September 20 to 30** (discharge, 850 second-feet).

1915-1918: Maximum stage recorded, that of 1918; minimum stage recorded, 0.05 foot **October 1, 2, 7 to 13, and 18 to 22, 1915** (discharge, 750 second-feet).

Maximum stage in many years occurred during night of **November 22, 1909**; gage height 22 feet as determined by leveling to well-defined high-water mark on **September 1, 1917** (discharge, estimated from extension of rating curve, 90,000 second-feet).

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

DIVERSIONS.—None.

REGULATION.—None.

ACCURACY.—Stage-discharge relation practically permanent. Rating curve well defined below 10,000 second-feet. Gage read to quarter or half tenths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table. Records excellent.

Discharge measurements of North Umpqua River near Glide, Oreg., during the year ending Sept. 30, 1918.

[Made by C. L. Batchelder.]

| Date. | | Gage height. | Discharge. |
|-----------|-------|----------------------|--------------------------|
| June 13. | ..... | <i>Feet.</i> 1.18 | <i>Sec.-ft.</i> 1,950 |
| Sept. 11. | ..... | .30 | 928 |

Daily discharge, in second-feet, of North Umpqua River near Glide, Oreg., for the year ending Sept. 30, 1918.

| Day. | Oct. | Nov. | Dec. | Jan. | Feb. | Mar. | Apr. | May. | June. | July. | Aug. | Sept. |
|------|-------|--------|--------|--------|--------|-------|-------|-------|-------|-------|-------|-------|
| 1. | 1,020 | 980 | 8,350 | 3,100 | 4,700 | 4,320 | 3,610 | 3,100 | 2,150 | 1,220 | 1,020 | 930 |
| 2. | 1,020 | 1,070 | 3,610 | 2,780 | 4,700 | 5,100 | 4,510 | 3,100 | 2,150 | 1,220 | 1,020 | 930 |
| 3. | 1,020 | 1,170 | 2,940 | 2,620 | 4,320 | 5,100 | 3,960 | 3,100 | 2,000 | 1,220 | 1,020 | 930 |
| 4. | 980 | 1,220 | 2,460 | 5,500 | 4,700 | 5,100 | 3,610 | 3,270 | 1,930 | 1,220 | 1,020 | 930 |
| 5. | 980 | 1,280 | 1,860 | 4,510 | 15,600 | 4,320 | 3,440 | 3,270 | 2,080 | 1,220 | 1,020 | 930 |
| 6. | 980 | 1,170 | 1,790 | 4,140 | 18,800 | 3,780 | 3,270 | 3,100 | 2,220 | 1,220 | 1,020 | 930 |
| 7. | 980 | 1,170 | 1,930 | 6,100 | 15,300 | 3,610 | 3,270 | 2,780 | 2,220 | 1,220 | 1,020 | 930 |
| 8. | 980 | 1,070 | 1,650 | 7,600 | 13,200 | 3,270 | 3,270 | 2,780 | 2,150 | 1,220 | 1,020 | 930 |
| 9. | 980 | 1,020 | 1,650 | 8,350 | 7,850 | 3,610 | 4,140 | 3,440 | 2,080 | 1,220 | 1,020 | 1,020 |
| 10. | 980 | 980 | 1,520 | 6,350 | 5,900 | 3,960 | 4,140 | 3,270 | 2,000 | 1,170 | 1,020 | 930 |
| 11. | 980 | 980 | 1,450 | 7,350 | 5,500 | 4,510 | 3,960 | 3,100 | 2,000 | 1,170 | 1,020 | 850 |
| 12. | 980 | 1,280 | 1,390 | 29,700 | 5,100 | 5,300 | 3,100 | 3,100 | 2,000 | 1,120 | 1,020 | 930 |
| 13. | 980 | 1,120 | 1,860 | 13,900 | 6,350 | 4,700 | 3,610 | 3,100 | 2,000 | 1,120 | 1,020 | 930 |
| 14. | 980 | 1,070 | 6,100 | 16,700 | 5,500 | 4,140 | 3,610 | 3,270 | 1,930 | 1,120 | 1,070 | 930 |
| 15. | 980 | 1,070 | 6,600 | 15,300 | 5,100 | 4,320 | 3,610 | 3,100 | 1,720 | 1,120 | 1,280 | 930 |
| 16. | 980 | 1,020 | 4,320 | 13,900 | 4,900 | 4,900 | 4,140 | 2,940 | 1,580 | 1,120 | 1,220 | 930 |
| 17. | 980 | 980 | 10,900 | 12,800 | 5,900 | 5,500 | 4,320 | 3,100 | 1,580 | 1,120 | 1,120 | 930 |
| 18. | 980 | 980 | 8,100 | 10,000 | 5,100 | 4,600 | 3,960 | 3,270 | 1,520 | 1,120 | 1,120 | 890 |
| 19. | 980 | 980 | 5,900 | 13,600 | 4,700 | 7,350 | 4,140 | 3,100 | 1,520 | 1,120 | 1,120 | 850 |
| 20. | 980 | 980 | 7,100 | 7,350 | 4,140 | 5,900 | 3,960 | 2,940 | 1,450 | 1,120 | 1,070 | 850 |
| 21. | 980 | 980 | 4,900 | 5,900 | 3,610 | 5,100 | 3,960 | 2,780 | 1,450 | 1,120 | 1,070 | 850 |
| 22. | 980 | 980 | 4,320 | 5,100 | 3,610 | 5,900 | 4,140 | 2,620 | 1,450 | 1,120 | 1,020 | 850 |
| 23. | 980 | 980 | 14,600 | 3,960 | 4,140 | 7,850 | 3,610 | 2,460 | 1,390 | 1,220 | 1,020 | 860 |
| 24. | 980 | 980 | 10,300 | 3,960 | 4,900 | 7,350 | 3,610 | 2,460 | 1,390 | 1,220 | 1,020 | 850 |
| 25. | 980 | 980 | 6,350 | 5,100 | 4,510 | 9,400 | 3,270 | 2,460 | 1,390 | 1,170 | 1,020 | 850 |
| 26. | 980 | 980 | 6,850 | 4,700 | 4,320 | 7,350 | 3,440 | 2,220 | 1,220 | 1,170 | 980 | 850 |
| 27. | 980 | 980 | 7,600 | 4,140 | 4,140 | 6,350 | 3,270 | 2,460 | 1,220 | 1,120 | 980 | 850 |
| 28. | 980 | 1,120 | 6,350 | 3,610 | 3,960 | 5,500 | 3,270 | 2,460 | 1,220 | 1,120 | 980 | 850 |
| 29. | 980 | 7,850 | 5,100 | 7,850 | ..... | 5,500 | 3,100 | 2,380 | 1,220 | 1,070 | 930 | 850 |
| 30. | 980 | 16,400 | 4,320 | 5,900 | ..... | 6,100 | 3,100 | 2,300 | 1,280 | 1,070 | 930 | 850 |
| 31. | 980 | ..... | 3,610 | 5,900 | ..... | 5,100 | ..... | 2,220 | ..... | 1,020 | 930 | ..... |

Monthly discharge of North Umpqua River near Glide, Oreg., for the year ending Sept. 30, 1918.

[Drainage area, 1,210 square miles.]

| Month. | Discharge in second-feet. | | | | Run-off. | |
|----------------|---------------------------|----------|-------|------------------|----------|------------|
| | Maximum. | Minimum. | Mean. | Per square mile. | Inches. | Acre-feet. |
| October..... | 1,020 | 980 | 984 | 0.813 | 0.94 | 60,500 |
| November..... | 16,400 | 980 | 1,790 | 1.48 | 1.65 | 107,000 |
| December..... | 14,600 | 1,930 | 5,030 | 4.16 | 4.80 | 309,000 |
| January..... | 29,700 | 2,620 | 8,170 | 6.75 | 7.78 | 502,000 |
| February..... | 18,800 | 3,610 | 6,450 | 5.33 | 5.55 | 358,000 |
| March..... | 9,400 | 3,270 | 5,460 | 4.51 | 5.20 | 336,000 |
| April..... | 4,510 | 3,100 | 3,700 | 3.06 | 3.41 | 220,000 |
| May..... | 3,440 | 2,220 | 2,870 | 2.37 | 2.73 | 176,000 |
| June..... | 2,220 | 1,720 | 1,720 | 1.42 | 1.58 | 102,000 |
| July..... | 1,220 | 1,020 | 1,160 | .959 | 1.11 | 71,300 |
| August..... | 1,280 | 930 | 1,040 | .860 | .99 | 64,000 |
| September..... | 1,020 | 850 | 900 | .744 | .83 | 53,600 |
| The year..... | 29,700 | 850 | 3,270 | 2.69 | 36.57 | 2,360,000 |

MISCELLANEOUS DISCHARGE MEASUREMENTS.

Records of measurements of the flow of streams at points other than those at which gaging stations were maintained are presented in the following tables:

Miscellaneous discharge measurements in lower Columbia River and Pacific slope drainage basins during the year ending Sept. 30, 1918.

Umatilla River basin.

| Date. | Stream. | Tributary to— | Locality. | Gage height. | Discharge. |
|---------|------------------------------------|----------------------------------|----------------------------|--------------|------------|
| | | | | Feet. | Sec.-ft. |
| June 5 | Umatilla River..... | Columbia River..... | Below Yoakum reservoir.... | 1.35 | 254 |
| July 15 | do..... | do..... | West Extension dam..... | .08 | 64 |
| Aug. 19 | do..... | do..... | do..... | .08 | 55 |
| July 15 | Oregon Land & Water Co. canal..... | Diverts from Umatilla River..... | Near Umatilla..... | 2.18 | 13.5 |
| Aug. 19 | do..... | do..... | do..... | .90 | 5.5 |

Deschutes River basin.

| | | | | | |
|----------|------------------------------|----------------------|--|------|------|
| Feb. 12 | Tumalo Creek..... | Deschutes River..... | Below feed canal dam..... | 0.42 | 1.0 |
| 13 | do..... | do..... | do..... | 1.51 | 71 |
| Apr. 16 | do..... | do..... | do..... | 1.46 | 60 |
| Oct. 7 | Columbia Southern canal..... | Tumalo Creek..... | Upper spillway..... | 1.25 | 15.7 |
| Feb. 10 | do..... | do..... | do..... | 1.25 | 16.0 |
| June 1 | do..... | do..... | do..... | 1.30 | 18.5 |
| Oct. 7 | do..... | do..... | Pine Tree Timber Co..... | .38 | 4.0 |
| Feb. 10 | do..... | do..... | do..... | .16 | 6.6 |
| May 31 | do..... | do..... | do..... | .18 | 6.8 |
| Oct. 4 | White River..... | Deschutes River..... | 200 feet below mouth of Clear Creek..... | | 90 |
| June 3 | Clear Creek..... | White River..... | Clear Lake outlet..... | | 13.9 |
| July 8 | do..... | do..... | do..... | | 6.4 |
| Sept. 30 | do..... | do..... | do..... | | 9.4 |
| Oct. 4 | Frog Creek..... | Clear Creek..... | Near proposed intake..... | | 14.4 |
| Apr. 12 | Tygh Creek..... | White River..... | 600 feet above Gordon Creek..... | | 8.7 |
| May 25 | do..... | do..... | do..... | | 3.6 |

White Salmon River basin.

| | | | | | |
|---------|----------------------|---------------------|---|--|-----|
| July 17 | White Salmon River.. | Columbia River..... | Below Big Springs in sec. 25, T. 5 N., R. 10 E. | | 484 |
|---------|----------------------|---------------------|---|--|-----|

Willamette River basin.

| | | | | | |
|---------|----------------------------------|----------------------------------|-------------------------------|--|------|
| June 12 | North Fork of Yamhill River..... | Yamhill River..... | Mouth of Fairchild Creek..... | | 16.8 |
| 14 | do..... | do..... | 2 miles west of Yamhill..... | | 38.7 |
| 12 | Fairchild Creek..... | North Fork of Yamhill River..... | Near mouth..... | | 7.8 |
| 13 | Turner Creek..... | do..... | do..... | | 4.5 |
| 15 | Cedar Creek..... | do..... | do..... | | 4.3 |
| 14 | Haskins Creek..... | do..... | do..... | | 10.8 |

Rogue River basin.

| | | | | | |
|---------|------------------------------------|-----------------------------|--|------|------|
| Oct. 30 | Big Butte Creek..... | Rogue River..... | Butte Falls Lumber Co.'s mill..... | | 119 |
| July 7 | North Fork of Big Butte Creek..... | Big Butte..... | 3 miles above mouth, near Butte Falls..... | | 4.9 |
| Oct. 31 | do..... | do..... | do..... | | 4.0 |
| Mar. 30 | Emigrant Creek..... | Bear Creek..... | Klamath road bridge..... | 4.90 | 36.3 |
| 31 | do..... | do..... | do..... | | 44.0 |
| Apr. 15 | do..... | do..... | do..... | 4.68 | 17.8 |
| 27 | do..... | do..... | do..... | 4.47 | 9.0 |
| 29 | do..... | do..... | ½ mile below mouth of Hill Creek..... | 1.35 | 10.6 |
| May 5 | do..... | do..... | do..... | 1.23 | 7.2 |
| Apr. 2 | Walker Creek..... | Emigrant Creek..... | Near mouth..... | 1.00 | 10.9 |
| 15 | do..... | do..... | do..... | .86 | 5.4 |
| May 2 | do..... | do..... | do..... | 1.25 | 1.6 |
| 2 | do..... | do..... | do..... | .58 | 1.3 |
| Apr. 26 | McDonald Creek..... | Little Applegate River..... | 1 mile above mouth..... | 1.21 | 13.1 |
| May 3 | do..... | do..... | do..... | 1.22 | 15.4 |
| June 6 | do..... | do..... | do..... | 1.10 | 9.2 |
| July 9 | do..... | do..... | do..... | .74 | 3.6 |
| Aug. 23 | do..... | do..... | do..... | 1.09 | 3.9 |



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