DEPARTMENT OF THE INTERIOR
HUBERT WORK, Secretary

UNITED STATES GEOLOGICAL SURVEY
GEORGE OTIS SMITH, Director

WATER-SUPPLY PAPER 527

SURFACE WATER SUPPLY OF THE UNITED STATES

1921

PART VII. LOWER MISSISSIPPI RIVER BASIN

NATHAN C. GROVER, Chief Hydraulic Engineer
ROBERT FOLLANSBEE and E. L. WILLIAMS, District Engineers

Prepared in cooperation with the States of
COLORADO, MISSOURI, and KANSAS

WASHINGTON
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SURFACE WATER SUPPLY OF LOWER MISSISSIPPI RIVER BASIN, 1921.

AUTHORIZATION AND SCOPE OF WORK.

This volume is one of a series of 14 reports presenting results of measurements of flow made on streams in the United States during the year ending September 30, 1921.

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

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

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

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

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

1895	$12,500.00
1896	20,000.00
1897 to 1900, inclusive	50,000.00
1901 to 1902, inclusive	100,000.00
1903 to 1906, inclusive	200,000.00
1907	150,000.00
1908 to 1910, inclusive	100,000.00
1911 to 1917, inclusive	150,000.00
1918	175,000.00
1919	148,244.10
1920	175,000.00
1921	180,000.00
1922	180,000.00

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

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

DEFINITION OF TERMS.

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

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

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

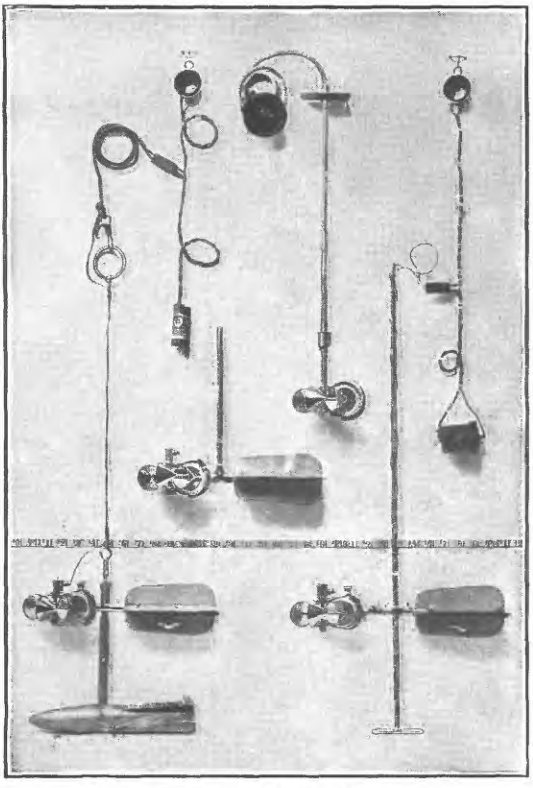
"Run-off in inches" is the depth to which an area would be covered if all the water flowing from it in a given period were uniformly distributed on the surface. It is used for comparing run-off with rainfall, which is usually expressed in depth in inches.

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

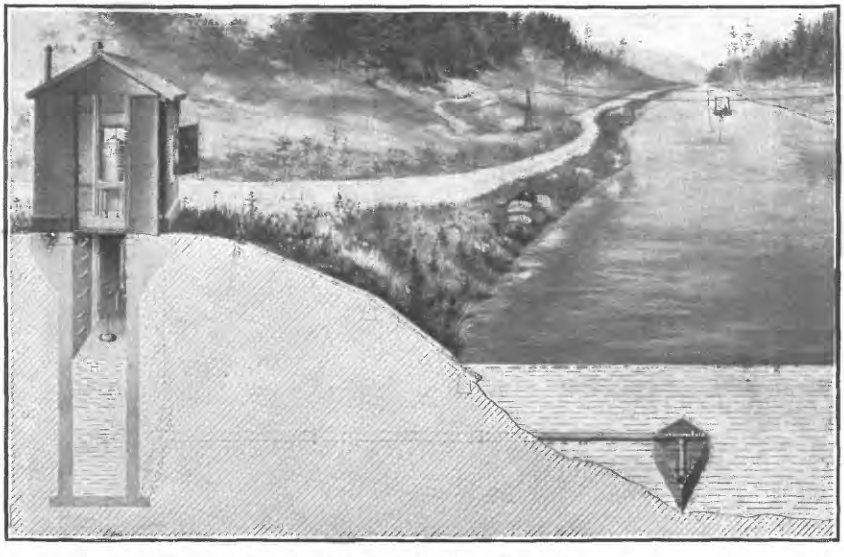
The following terms not in common use are here defined:

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

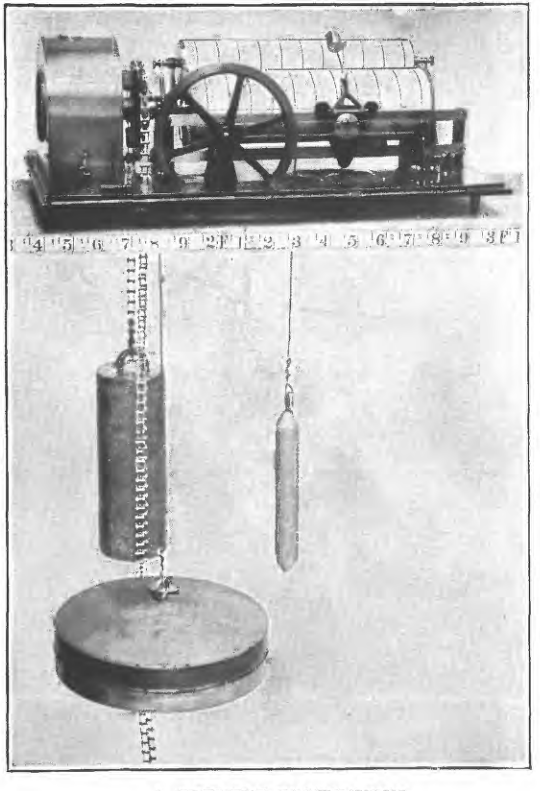
"Control," a term used to designate the section or sections of the stream below the gage which determines the stage-discharge relation at the gage. It should be noted that the control may not be the same section or sections at all stages.



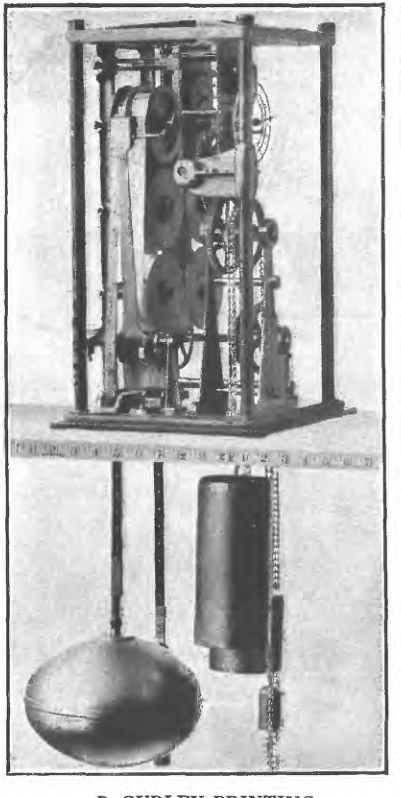
A. PRICE CURRENT METERS.



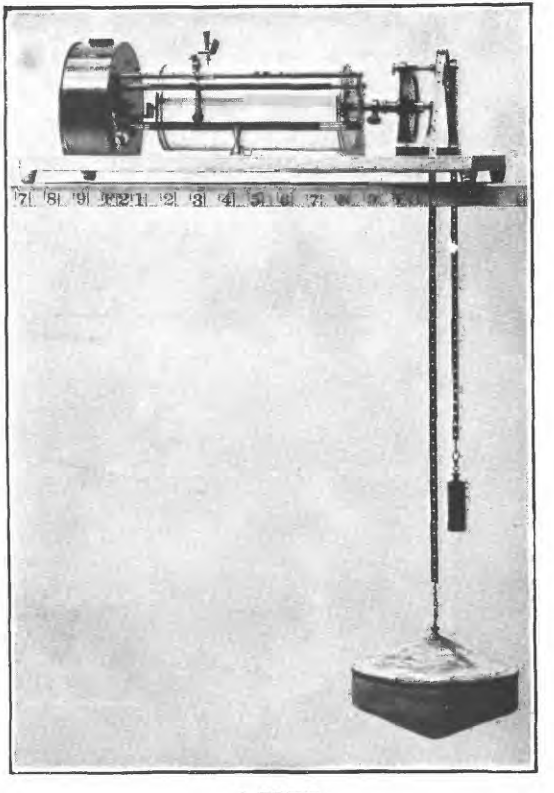
B. TYPICAL GAGING STATION.



A. STEVENS CONTINUOUS.



B. GURLEY PRINTING.



C. FRIEZ.

WATER-STAGE RECORDERS.

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

EXPLANATION OF DATA.

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

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

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

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

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

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

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

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

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

ACCURACY OF FIELD DATA AND COMPUTED RESULTS.

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

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

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

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

in inches" are therefore not computed if such errors appear probable. The computations are also omitted for stations on streams draining areas in which the annual rainfall is less than 20 inches. All figures representing "second-feet per square mile" and "run-off in inches" published in earlier reports by the Survey should be used with caution because of possible inherent sources of error not known to the Survey.

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

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

PUBLICATIONS.

Investigation of water resources by the United States Geological Survey has consisted in large part of measurements of the volume of flow of streams and studies of the conditions affecting that flow, but it has comprised also investigation of such closely allied subjects as irrigation, water storage, water powers, underground waters, and quality of waters. Most of the results of these investigations have been published in the series of water-supply papers, but some have appeared in the bulletins, professional papers, annual reports, and monographs.

The results of stream-flow measurements are now published annually in 12 parts, each part covering an area whose boundaries coincide with natural-drainage features as indicated below:

Part I. North Atlantic slope basins.
II. South Atlantic slope and eastern Gulf of Mexico basins.
III. Ohio River basin.
IV. St. Lawrence River basin.
V. Upper Mississippi River and Hudson Bay basins.
VI. Missouri River basin.
VII. Lower Mississippi River basin.
VIII. Western Gulf of Mexico basins.
IX. Colorado River basin.
X. Great Basin.
XI. Pacific slope basins in California.

XII. North Pacific slope basins, in three volumes:
A. Pacific slope basins in Washington and Upper Columbia River basin.
B. Snake River basin.
C. Lower Columbia River basin and Pacific slope basins in Oregon.

Water-supply papers and other publications of the United States Geological Survey containing data in regard to the water resources of the United States may be obtained or consulted as indicated below.

1. Copies may be obtained free of charge by applying to the Director of the Geological Survey, Washington, D. C. The edition printed for free distribution is, however, small and is soon exhausted.

2. Copies may be purchased at nominal cost from the Superintendent of Documents, Government Printing Office, Washington, D. C., who will furnish lists giving prices.

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

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

Boston, Mass., 2500 Customhouse.
Albany, N. Y., 704 Journal Building.
Trenton, N. J., Statehouse.
Asheville, N. C., 33–35 Broadway.
Chattanooga, Tenn., 37 Municipal Building.
Columbus, Ohio, Orton Hall, Ohio State University.
Chicago, Ill., 1404 Kimball Building.
Madison, Wis., care of Railroad Commission of Wisconsin.
Ames, Iowa, 103 Engineering Hall, Iowa State College.
Rolla, Mo., Rolla Building, School of Mines and Metallurgy.
Topeka, Kans., 23 Federal Building.
Helena, Mont., 52 Montana National Bank Building.
Denver, Colo., 403 Post Office Building.
Salt Lake City, Utah, 313 Federal Building.
Idaho Falls, Idaho, 228 Federal Building.
Boise, Idaho, 615 Idaho Building.
Tacoma, Wash., 406 Federal Building.
Portland, Oreg., 606 Post Office Building.
San Francisco, Calif., 328 Customhouse.
Los Angeles, Calif., 602 Federal Building.
Tucson, Ariz., 210 Agricultural Building, University of Arizona.
Austin, Tex., State Capitol.
Honolulu, Hawaii, 25 Capitol Building.

A list of the Geological Survey's publications may be obtained by applying to the Director of the United States Geological Survey, Washington, D. C.

Stream-flow records have been obtained at about 5,200 points in the United States, and the data obtained have been published in the reports tabulated below:

Stream-flow data in reports of the United States Geological Survey.

[A=Annual Report; B=Bulletin; W=Water-Supply Paper.]

Report.	Character of data.	Year.
10th A, pt. 2	Descriptive information only	
11th A, pt. 2	Monthly discharge and descriptive information	1884 to Sept., 1890.
12th A, pt. 2	....do	1884 to June 30, 1891.
13th A, pt. 3	Mean discharge in second-feet	1884 to Dec. 31, 1892.
14th A, pt. 2	Monthly discharge (long-time records, 1871 to 1893)	1888 to Dec. 31, 1893.
B 131	Description, measurements, gage heights, and ratings	1893 and 1894.
16th A, pt. 2	Descriptive information only	
B 140	Descriptions, measurements, gage heights, ratings, and monthly discharge (also many data covering earlier years).	1895.
W 11	Gage heights (also gage heights for earlier years)	1896.
18th A, pt. 4	Descriptions, measurements, ratings, and monthly discharge (also similar data for some earlier years).	1895 and 1896.
W 15	Descriptions, measurements, and gage heights, eastern United States, eastern Mississippi River, and Missouri River above junction with Kansas.	1897.
W 16	Descriptions, measurements, and gage heights, western Mississippi River below junction of Missouri and Platte, and western United States.	1897.
19th A, pt. 4	Descriptions, measurements, ratings, and monthly discharge (also some long-time records).	1897.
W 27	Measurements, ratings, and gage heights, eastern United States, eastern Mississippi River, and Missouri River.	1898.
W 28	Measurements, ratings, and gage heights, Arkansas River and western United States.	1898.
20th A, pt. 4	Monthly discharge (also for many earlier years)	1898.
W 35 to 39	Descriptions, measurements, gage heights, and ratings	1899.
21st A, pt. 4	Monthly discharge	1899.
W 47 to 52	Descriptions, measurements, gage heights, and ratings	1900.
22d A, pt. 4	Monthly discharge	1900.
W 65, 66	Descriptions, measurements, gage heights, and ratings	1901.
W 75	Monthly discharge	1901.
W 82 to 85	Complete data	1902.
W 97 to 100	....do	1903.
W 124 to 135	....do	1904.
W 165 to 178	....do	1905.
W 201 to 214	....do	1906.
W 241 to 252	....do	1907–8.
W 261 to 272	....do	1909.
W 281 to 292	....do	1910.
W 301 to 312	....do	1911.
W 321 to 332	....do	1912.
W 351 to 362	....do	1913.
W 381 to 394	....do	1914.
W 401 to 414	....do	1915.
W 431 to 444	....do	1916.
W 451 to 464	....do	1917.
W 471 to 484	....do	1918.
W 501 to 514	....do	1919–20.
W 521 to 534	....do	1921.

The records at most of the stations discussed in these reports extend over a series of years, and miscellaneous measurements at many points other than regular gaging stations have been made each year. An index of the reports containing records obtained prior to 1904 has been published in Water-Supply Paper 119.

The table following gives, by years and drainage basins, the numbers of the papers on surface-water supply published from 1899 to 1921. The data for any particular station will, as a rule, be found in the reports covering the years during which the station was maintained. For example, data for Machias River at Whitneyville, Maine, 1903 to 1921, are published in Water-Supply Papers 97, 124, 165, 201, 241, 261, 281, 301, 321, 351, 381, 401, 431, 451, 471, 501, and 521, which contain records for the New England streams from 1903 to 1921. Results of miscellaneous measurements are published by drainage basins.

Numbers of water-supply papers containing results of stream measurements, 1899–1921.

Year.	North Atlantic coast (St. John River to York River).	South Atlantic coast and eastern Gulf of Mexico (James River to the Mississippi).	Ohio River.	St. Lawrence River and Great Lakes.	Hudson Bay and upper Mississippi River.	Missouri River.	Lower Mississippi River.	Western Gulf of Mexico.	Colorado River	Great Basin.	Pacific coast in California.	North Pacific drainage basins.		
												Pacific basins in Washington and upper Columbia River.	Snake River basin.	Lower Columbia River and Pacific basins in Oregon.
1899 [a]	35	[b] 35, 36	36	36	36	[c] 36, 37	37	37	[d] 37, 38	38, [e] 39	38, [f] 39	38	38	38
1900 [g]	47, [h] 48	48	48, [i] 49	49	49	49, [j] 50	50	50	50	51	51	51	51	51
1901	65, 75	65, 75	65, 75	65, 75	[k] 65, 66, 75	66, 75	[k] 65, 66, 75	66, 75	66, 75	66, 75	66, 75	66, 75	66, 75	66, 75
1902	82	[b] 82, 83	84	[l] 82, 83	[k] 83, 85	84	[k] 83, 84	84	85	85	85	85	85	85
1903	97	[b] 97, 98	98	97	[k]98,99, [m]100	99	[k] 98, 99	99	100	100	100	100	100	100
1904	[n] 124, [o] 125, [p] 126	[p] 126, 127	128	129	[k] 128, 130	130, [q] 131	[k] 128, 131	132	133	133, [r] 134	134	135	135	135
1905	[n] 165, [o] 166, [p] 167	[p] 167, 168	169	170	171	172	[k] 169, 173	174	175, [s] 177	176, [r] 177	177	178	178	[t] 177, 178
1906	[n] 201, [o] 202 [p] 203	[p] 203, 204	205	206	207	208	[k] 205, 209	210	211	212, [r] 213	213	214	214	214
1907–8	241	242	243	244	245	246	247	248	249	250, [r] 251	251	252	252	252
1909	261	262	263	264	265	266	267	268	269	270, [r] 271	271	272	272	272
1910	281	282	283	284	285	286	287	288	289	290	291	292	292	292
1911	301	302	303	304	305	306	307	308	309	310	311	312	312	312
1912	321	322	323	324	325	326	327	328	329	330	331	332A	332B	332C
1913	351	352	353	354	355	356	357	358	359	360	361	362A	362B	362C
1914	381	382	383	384	385	386	387	388	389	390	391	392	393	394
1915	401	402	403	404	405	406	407	408	409	410	411	412	413	414
1916	431	432	433	434	435	436	437	438	439	440	441	442	443	444
1917	451	452	453	454	455	456	457	458	459	460	461	462	463	464
1918	471	472	473	474	475	476	477	478	479	480	481	482	483	484
1919–20	501	502	503	504	505	506	507	508	509	510	511	512	513	514
1921	521	522	523	524	525	526	527	528	529	530	531	532	533	534

[a] Rating tables and index to Water-Supply Papers 35–39 contained in Water-Supply Paper 39. Tables for monthly discharge for 1899 in Twenty-first Annual Report, Part IV.
[b] James River only.
[c] Gallatin River.
[d] Green and Gunnison rivers and Grand River above junction with Gunnison.
[e] Mohave River only.
[f] Kings and Kern rivers and south Pacific coast basins.
[g] Rating tables and index to Water-Supply Papers 47–52 and data on precipitation, wells, and irrigation in California and Utah contained in Water-Supply Paper 52. Tables for monthly discharge for 1900 in Twenty-second Annual Report, Part IV.
[h] Wissahickon and Schuylkill rivers to James River.
[i] Scioto River.
[j] Loup and Platte rivers near Columbus, Nebr., and all tributaries below junction with Platte.
[k] Tributaries of Mississippi from east.
[l] Lake Ontario and tributaries to St. Lawrence River proper.
[m] Hudson Bay only.
[n] New England rivers only.
[o] Hudson River to Delaware River, inclusive.
[p] Susquehanna River to Yadkin River, inclusive.
[q] Platte and Kansas rivers.
[r] Great Basin in California, except Truckee and Carson River basins.
[s] Below junction with Gila.
[t] Rogue, Umpqua, and Siletz rivers only.

COOPERATION.

In Missouri the work has been carried on in cooperation with the State Geological Survey, through H. A. Buehler, State geologist. The United States Weather Bureau cooperated in the maintenance of the station on Bourbeuse River near Union, Mo. The Western Tie & Timber Co., of St. Louis, paid the gage reader's salary for the station on Current River near Eminence, Mo.

In Colorado the United States Forest Service furnished the services of a hydrographer during a part of the winter.

In Kansas the work was done in cooperation with the Kansas Water Commission, H. A. Rice, secretary. The station on Arkansas River near Wichita was maintained in cooperation with the city of Wichita, P. L. Brockway, city engineer.

DIVISION OF WORK.

Data for stations in Missouri were collected and prepared for publication under the direction of E. L. Williams, district engineer, assisted by Reginald Waldo, V. L. Austin, and H. E. Zoller.

Data from stations in Colorado were collected and prepared for publication under the direction of Robert Follansbee, district engineer, assisted by P. V. Hodges, H. E. Grosbach, T. J. Watkins, and Mrs. Esther D. Rae.

Data for stations in Kansas were collected and prepared for publication by R. C. Rice and E. L. Williams, district engineers, assisted by A. K. Gowans, H. B. Kinnison, and Miss Maude A. Ten Eyck.

The manuscript was reviewed and assembled by B. J. Peterson.

GAGING STATION RECORDS.

MERAMEC RIVER BASIN.

BOURBEUSE RIVER NEAR UNION, MO.

LOCATION.—In S. ½ sec. 26, T. 43 N., R. 1 W., at highway bridge on St. Clair-Union road, 800 feet above Flat Creek, 1 mile east of Union, Franklin County, 4 miles below Hamilton Creek, 7 miles above Birch Creek, and 13 miles above mouth of river.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—June 7 to September 30, 1921. The United States Weather Bureau has records of stage since October 19, 1916.

GAGE.—Chain gage on downstream side of highway bridge, installed September 24, 1921. Previous to this date a vertical staff on left bank 150 feet above bridge.

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

CHANNEL AND CONTROL.—Bed composed of clay and coarse gravel; some water-logged drift; fairly permanent. Control is bar of clean, coarse gravel 800 feet below gage; practically permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of record, 6.4 feet at 8 a. m. September 25 (discharge, 3,640 second-feet); minimum stage, 0.9 foot, August 2–16 (discharge, 76 second-feet).

Maximum stage recorded by United States Weather Bureau, 27.3 feet at 3 p. m. August 22, 1915. Flood of 1897 reached a stage of 26.0 feet (exact date unknown).

REGULATION.—None.

DIVERSIONS.—None.

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

Discharge measurements of Bourbeuse River near Union, Mo., during the year ending Sept. 30, 1921.

[Made by Reginald Waldo.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
June 7	1.23	122
Sept. 24	4.90	2,200

Daily discharge, in second-feet, of Bourbeuse River near Union, Mo., for the year ending Sept. 30, 1921.

Day.	June.	July.	Aug.	Sept.	Day.	June.	July.	Aug.	Sept.
1		156	88	156	16	1,680	88	76	156
2		156	76	156	17	930	88	178	930
3		1,220	76	156	18	520	88	286	430
4		520	76	136	19	390	88	202	286
5		352	76	118	20	318	88	156	228
6		256	76	118	21	286	88	228	228
7	136	202	76	256	22	256	88	118	178
8	136	202	76	202	23	228	88	102	620
9	1,150	156	76	178	24	228	136	102	2,160
10	352	118	76	156	25	202	102	136	3,640
11	2,400	102	76	136	26	202	88	390	3,540
12	2,560	102	76	136	27	178	88	740	2,500
13	1,220	102	76	178	28	178	88	620	2,500
14	680	102	76	256	29	178	88	286	570
15	680	102	76	228	30	156	88	352	430
					31		88	228	

Monthly discharge of Bourbeuse River near Union, Mo., for the year ending Sept. 30, 1921.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
June 7-30	2,560	136	635	30,200
July	1,220	88	172	10,600
August	740	76	173	10,600
September	3,640	118	699	41,600
The period				93,000

ST. FRANCIS RIVER BASIN.

ST. FRANCIS RIVER NEAR PATTERSON, MO.

LOCATION.—In N. ½ sec. 16, T. 29 N., R. 5 E., at Black's highway bridge, 1½ miles above Clarks Creek, 4 miles below Big Creek, and 3 miles east of Patterson, Wayne County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—June 16 to September 30, 1921.

GAGE.—Chain gage on upstream side of highway bridge near pier; read by G. Bennett.

DISCHARGE MEASUREMENT.—Made from downstream side of bridge or by wading.

CHANNEL AND CONTROLS.—Bed composed of clean sand and gravel; fairly permanent. Control is a heavy gravel bar 1,000 feet below gage; practically permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of record, 5.70 feet at 2 p. m. September 30 (discharge, 2,490 second-feet); minimum stage, 2.30 feet September 2 (discharge, 45 second-feet).

REGULATION.—None.

DIVERSIONS.—None.

ACCURACY.—Stage-discharge relation practically permanent. Rating curve fairly well defined. Gage read to hundredths twice daily except Sunday; readings not absolutely reliable. Daily discharge ascertained by applying mean daily gage height to rating table. Records fair.

Discharge measurements of St. Francis River near Patterson, Mo., during the year ending Sept. 30, 1921.

[Made by Reginald Waldo.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
June 16	3.51	705
Aug. 2	2.34	56.4

Daily discharge, in second-feet, of St. Francis River near Patterson, Mo., for the year ending Sept. 30, 1921.

Day.	June.	July.	Aug.	Sept.	Day.	June.	July.	Aug.	Sept.
1		168	155	51	16	695	72	260	107
2		265	57	45	17	452	69	173	99
3		200	119	79	18	336	66	131	132
4		135	143	65	19	293	69	107	164
5		135	107	51	20	250	63	99	182
6		119	99	83	21	195	452	84	139
7		103	84	354	22	164	235	69	131
8		107	69	205	23	348	230	69	360
9		147	57	625	24	260	170	69	555
10		111	57	270	25	205	111	63	572
11		75	63	222	26	180	103	69	590
12		75	69	173	27	155	87	69	360
13		72	139	173	28	164	69	66	290
14		72	139	147	29	139	63	63	230
15		72	139	131	30	173	54	57	1,640
					31		105	51	

NOTE.—Discharge interpolated June 19, 26, July 3, 10, 17, 24, 31, Aug. 7, 14, 21, 28, Sept. 4, 11, 18, and 25; gage not read.

Monthly discharge of St. Francis River near Patterson, Mo., for the year ending Sept. 30, 1921.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
June 16–30	695	139	267	7,940
July	452	54	125	7,690
August	260	51	96.6	5,940
September	1,640	45	274	16,300
The period				37,900

WHITE RIVER BASIN.

BLACK RIVER AT LEEPER, MO.

LOCATION.—In SW. ¼ NE. ¼ sec. 27, T. 28 N., R. 3 E., at Missouri Southern Railway Co.'s bridge at Leeper, Wayne County, 600 feet above highway bridge, one-fourth mile above Greenwood Valley Creek, 3 miles below McKenzie Creek, 5 miles below Deer Creek, and 8 miles above Brush Creek.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—June 15 to September 30, 1921.

GAGE.—Chain gage on downstream side of main span of railroad bridge; read by Lawrence Sanders.

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

CHANNEL AND CONTROL.—Bed composed of clean, coarse gravel and sand; fairly permanent. Bank-full stage, 12 feet. Control is a bar of coarse gravel and boulders 800 feet below gage; fairly permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of record, 4.30 feet at 5.10 p. m. September 24 (discharge, 2,140 second-feet); minimum stage, 1.84 feet August 30 and September 2 (discharge, 286 second-feet).

REGULATION.—None.

DIVERSIONS.—None.

ACCURACY.—Stage-discharge relation changed during high water in September. Rating curve used June 15 to September 25, well defined; curve used September 26–30, fairly well defined. Gage read to hundredths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table. Records good.

Discharge measurements of Black River at Leeper, Mo., during the year ending Sept. 30, 1921.

[Made by Reginald Waldo.]

Date.	Gage height.	Discharge.
	Feet.	*Sec.-ft.*
June 4	2.56	613
15	2.92	824
Aug. 3	2.08	382

Daily discharge, in second-feet, of Black River at Leeper, Mo., for the year ending Sept. 30, 1921.

Day.	June.	July.	Aug.	Sept.	Day.	June.	July.	Aug.	Sept.
1		530	310	290	16	750	435	435	435
2		580	310	290	17	690	412	412	435
3		555	370	310	18	662	390	390	608
4		505	370	310	19	608	390	370	458
5		480	330	310	20	580	435	350	458
6		458	330	330	21	608	555	330	435
7		458	330	310	22	608	480	330	390
8		435	330	350	23	580	435	330	920
9		480	310	458	24	555	412	310	1,600
10		458	290	505	25	530	390	310	1,700
11		435	310	458	26	555	370	330	1,100
12		390	350	458	27	530	370	310	835
13		390	370	435	28	555	350	310	730
14		390	412	458	29	530	330	310	640
15	810	390	435	435	30	530	330	290	700
					31	.....	330	290	.....

Monthly discharge of Black River at Leeper, Mo., for the year ending Sept. 30, 1921.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
June 15-30	810	530	605	19,200
July	580	330	431	26,500
August	435	290	341	21,000
September	1,700	290	572	34,000
The period				101,000

CURRENT RIVER NEAR EMINENCE, MO.

LOCATION.—In SE. ¼ NW. ¼ sec. 15, T. 29 N., R. 3 W., at foot of Coot Mountain, 600 feet below dam site of Western Tie & Timber Co., 1 mile below Jack's Fork, 3 miles below Blair Creek, 6 miles below Big Creek, and 8 miles east of Eminence, Shannon County.

DRAINAGE AREA.—Not measured.

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

GAGE.—Vertical staff fastened to tree and rock on right bank; read by O. A. Hunt.

DISCHARGE MEASUREMENTS.—Made from cable or by wading.

CHANNEL AND CONTROL.—Bed composed of clean, coarse gravel; loose and shifting. Control formed by heavy gravel bar and boulders; clean and practically permanent.

EXTREMES OF STAGE.—Maximum stage recorded during period, 7.4 feet at 8 a. m. September 24; minimum stage, 1.50 feet on several days in August and September.

REGULATION.—Natural regulation through large springs.

DIVERSIONS.—None.

ACCURACY.—Gage read to half-tenths once daily. Records good. Data inadequate for determination of discharge.

COOPERATION.—Gage-height record furnished by Western Tie & Timber Co., of St. Louis, Mo.

The following discharge measurement was made by E. L. Williams:

August 24, 1921: Gage height, 1.55 feet; discharge, 722 second-feet.

Daily gage height, in feet, of Current River near Eminence, Mo., for the year ending Sept. 30, 1921.

Day.	Aug.	Sept.	Day.	Aug.	Sept.	Day.	Aug.	Sept.
1		1.5	11		1.55	21		2.15
2		1.6	12		1.6	22		2.0
3		1.6	13		1.6	23		2.9
4		1.6	14		4.0	24	1.55	7.4
5		1.5	15		5.35	25	1.55	3.45
6		1.5	16		2.9	26	1.5	2.9
7		1.5	17		2.5	27	1.5	2.7
8		1.55	18		2.4	28	1.6	2.4
9		1.6	19		2.7	29	1.6	2.25
10		1.55	20		2.25	30	1.5	2.25
						31	1.5	

CURRENT RIVER AT VAN BUREN, MO.

LOCATION.—In NE. ¼ NW. ¼ sec. 25, T. 27 N., R. 1 W., at highway bridge in Van Buren, Carter County, half a mile below Pike Creek, 3 miles below Henpeck Creek, 3 miles above Carlos Creek, 4 miles above Big Spring, and 5 miles below Mill Creek.

DRAINAGE AREA.—1,810 square miles (measured by Missouri Engineering Experiment Station).

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RECORDS AVAILABLE.—June 18 to September 30, 1921. The Missouri Engineering Experiment Station has records at the same site from August 25, 1912, to July 30, 1921.[1]

GAGE.—Chain gage on downstream side of highway bridge near right bank; read by Z. Chilton.

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

CHANNEL AND CONTROL.—Bed composed of clean coarse gravel; fairly permanent. No well-defined control; low-water control probably at constricted section of channel at former bridge site 800 feet below gage; stage-discharge relation fairly permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of record, 5.90 feet at 6 p. m. September 24 (discharge, 7,700 second-feet); minimum stage, 1.10 feet on September 1, 2, 7, 8, and 11 (discharge, 910 second-feet).

The Missouri Engineering Experiment Station has published a maximum discharge of 125,000 second-feet on August 21, 1915, and a minimum discharge of 540 second-feet in September, 1913. On March 26, 1904, the river reached a stage about 5 feet higher than the flood of 1915.

REGULATION.—Natural regulation through large springs.

DIVERSIONS.—None.

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

Discharge measurements of Current River at Van Buren, Mo., during the year ending Sept. 30, 1921.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
June 6	Waldo and Williams	2.01	[a] 1,500
18	Reginald Waldo	2.01	1,710
Aug. 4	....do	1.28	1,040

[a] Result questionable.

Daily discharge, in second-feet, of Current River at Van Buren, Mo., for the year ending Sept. 30, 1921.

Day.	June.	July.	Aug.	Sept.	Day.	June.	July.	Aug.	Sept.
1		2,420	1,030	910	16		2,180	1,340	2,660
2		2,540	1,030	950	17		1,950	1,160	1,840
3		2,300	1,070	990	18	1,730	1,530	1,120	1,730
4		1,950	1,070	950	19	1,630	1,430	1,070	1,730
5		1,840	1,030	950	20	1,630	1,430	1,030	1,630
6		1,630	1,160	950	21	1,730	1,340	1,030	1,430
7		1,630	1,070	910	22	2,060	1,250	1,030	1,340
8		1,630	1,030	950	23	1,840	1,160	990	1,730
9		1,530	990	1,030	24	1,730	1,160	990	5,080
10		1,430	990	990	25	1,730	1,120	990	3,140
11		1,340	1,030	910	26	1,630	1,160	990	2,420
12		1,340	1,160	990	27	1,630	1,160	950	1,950
13		1,250	1,200	1,030	28	1,530	1,120	990	1,730
14		1,250	1,250	1,840	29	1,630	1,070	990	1,630
15		1,250	1,430	4,050	30	2,180	1,070	990	1,530
					31		1,070	950	

[1] See Missouri Univ. Eng. Exper. Sta. Bull., ser. 22, vol. 21, No. 35.

Monthly discharge of Current River at Van Buren, Mo., for the year ending Sept. 30, 1921.

[Drainage area, 1,810 square miles.]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
June 18–30	2,180	1,630	1,740	0.961	0.46
July	2,540	1,070	1,500	.828	.95
August	1,430	950	1,070	.591	.68
September	5,080	910	1,630	.900	1.00

CURRENT RIVER NEAR DONIPHAN, MO.

LOCATION.—In N. ½ sec. 27, T. 23 N., R. 2 E., at highway bridge three-fourths of a mile west of Doniphan, Ripley County, 2 miles above Briar Creek, 12 miles below Buffalo Creek, 14 miles below Running Water Creek, and 17 miles below Sinking Creek.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—June 14 to September 30, 1921. The United States Engineer office, Memphis, Tenn., has records of stage since August 1, 1918.

GAGE.—Vertical staff graduated from 0 to 28 feet painted on west face of downstream center pier of highway bridge; an auxiliary vertical staff, 0 to 4 feet, is located near right end of bridge; read by T. B. Swindel.

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

CHANNEL AND CONTROL.—Bed composed of clean, coarse gravel; fairly permanent. No well-defined control.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period June 14 to September 30, 1921, 4.8 feet on September 25 (discharge, 7,000 second-feet); minimum stage, 1.1 feet on various dates in July, August, and September (discharge, 1,620 second-feet).

1918–1921: Maximum stage recorded by United States Engineer office, 14.2 feet on April 27, 1921; minimum stage recorded, 0.8 foot in August, 1918.

The flood of August, 1915, reached a stage of 25.5 feet, determined by level from flood mark, by United States Engineer office.

REGULATION.—Low-water flow largely supplied by springs.

DIVERSIONS.—A small canal diverts water above the bridge for industrial use in Doniphan, but the canal passes under the bridge, and the flow is included in the discharge for the station.

ACCURACY.—Stage-discharge relation practically permanent. Rating curve fairly well defined. Gage read to tenths once daily; readings not reliable for stages below 1.0 foot. Daily discharge ascertained by applying daily gage height to rating table. Records fair.

COOPERATION.—Gage-height record furnished by United States Engineer office, Memphis, Tenn.

Discharge measurements of Current River near Doniphan, Mo., during the year ending Sept. 30, 1921.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
June 14	Reginald Waldo	2.66	3,560
Sept. 15	E. L. Williams	2.06	2,650

Daily discharge, in second-feet, of Current River near Doniphan, Mo., for the year ending Sept. 30, 1921.

Day.	June.	July.	Aug.	Sept.	Day.	June.	July.	Aug.	Sept.
1	.....	2,090	1,620	1,620	16	2,710	1,790	1,790	4,920
2	.....	3,310	1,620	1,620	17	2,450	2,200	1,790	2,710
3	.....	3,310	1,880	1,620	18	2,450	2,450	1,790	2,710
4	.....	3,150	1,790	1,620	19	2,200	2,200	1,700	2,450
5	.....	2,710	1,790	1,620	20	2,090	2,200	1,700	2,450
6	.....	2,450	1,790	1,620	21	1,980	1,980	1,620	2,450
7	.....	2,450	1,790	1,620	22	1,980	1,980	1,620	2,710
8	.....	2,450	1,790	1,620	23	2,450	1,880	1,620	2,320
9	.....	2,200	1,790	1,620	24	2,580	1,790	1,620	2,200
10	.....	2,090	1,790	1,620	25	2,200	1,790	1,620	7,000
11	.....	1,980	1,790	1,620	26	1,980	1,790	1,620	4,600
12	.....	1,980	1,880	1,620	27	2,090	1,700	1,620	2,710
13	.....	1,880	1,880	1,620	28	2,320	1,700	1,620	2,320
14	3,630	1,790	1,880	1,620	29	2,320	1,700	1,620	2,090
15	3,150	1,790	1,880	2,450	30	2,090	1,700	1,620	2,090
					31	.....	1,620	1,620	.....

NOTE.—Discharge, Aug. 21 to Sept. 14, should be used with caution, because gage is not read accurately at low stages.

Monthly discharge of Current River near Doniphan, Mo., for the year ending Sept. 30, 1921.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
June 14–30	3,630	1,980	2,390	80,500
July	3,310	1,620	2,130	133,000
August	1,880	1,620	1,730	106,000
September	7,000	1,620	2,360	145,000
The period	.....	.....	.....	464,000

ARKANSAS RIVER BASIN.

EAST FORK OF ARKANSAS RIVER NEAR LEADVILLE, COLO.

LOCATION.—In sec. 16, T. 9 S., R. 80 W., at highway bridge 200 yards above mouth of Tennessee Fork and 3 miles northwest of Leadville, Lake County.

DRAINAGE AREA.—52 square miles (measured on topographic map).

RECORDS AVAILABLE.—April 25 to August 31, 1890; June 18 to October 11, 1903; June 5, 1911, to September 30, 1921.

GAGE.—Vertical staff on left bridge abutment, near upstream end; read by Fred Coquoz. No known relation between present gage and gages used prior to 1911.

DISCHARGE MEASUREMENTS.—Made from bridge or by wading.

CHANNEL AND CONTROL.—Bed composed of coarse gravel and small boulders. Control 30 feet downstream from gage; slightly shifting. Banks low, subject to overflow at extreme high water.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 2.03 feet at 8.30 a. m. June 15 (discharge, 794 second-feet); minimum discharge occurred during winter.

1911–1921: Maximum discharge occurred on June 15, 1921; minimum discharge recorded, 5.4 second-feet January 18, 1918.

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

DIVERSIONS.—The Leadville Water Co. makes a continuous diversion of 2 second-feet from East Fork above station. During the winter this diversion may be increased to 3 second-feet.

REGULATION.—None. During spring diurnal fluctuation is caused by alternate melting and freezing of mountain snow.

ACCURACY.—Stage-discharge relation not permanent; affected by ice during winter. Standard rating curve well defined below 200 second-feet. Gage read to hundredths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table; shifting-control method used June 15 to September 30. Records good below 200 second-feet; fair above that stage.

Discharge measurements of East Fork of Arkansas River near Leadville, Colo., during the year ending Sept. 30, 1921.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Nov. 4	H. E. Grosbach	[a] 0.70	21.1	Mar. 4	Peck and Smith	.....	7.7
Dec. 18	P. V. Hodges	[a] 1.60	7.5	June 24	Robert Follansbee	1.10	175
Jan 27	Hodges and Peck	.....	8.8				

[a] Stage-discharge relation affected by ice.

Daily discharge, in second-feet, of East Fork of Arkansas River near Leadville, Colo., for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Apr.	May.	June.	July.	Aug.	Sept.
1	25	16	.....	12	220	112	60	71
2	20	19	.....	15	200	121	57	68
3	19	20	.....	20	200	118	48	66
4	14	20	.....	25	230	121	44	57
5	16	14	.....	50	220	115	40	51
6	17	19	.....	55	220	98	35	51
7	16	.....	.....	42	200	92	30	46
8	17	.....	.....	39	190	98	31	51
9	20	.....	.....	25	220	82	31	46
10	20	.....	.....	20	220	82	30	28
11	32	.....	.....	20	300	90	31	44
12	30	.....	.....	20	400	64	30	31
13	17	.....	.....	35	500	80	31	30
14	16	.....	.....	57	661	121	35	20
15	11	.....	.....	75	773	85	37	21
16	10	.....	.....	80	556	85	60	20
17	17	.....	.....	95	514	82	31	20
18	14	.....	.....	95	480	82	42	30
19	12	.....	.....	80	409	78	30	30
20	17	.....	.....	80	316	80	28	22
21	14	.....	.....	75	178	71	37	25
22	15	.....	.....	115	195	82	34	23
23	16	.....	.....	115	212	78	66	19
24	16	.....	.....	106	148	73	37	20
25	16	.....	.....	115	207	73	34	27
26	16	.....	.....	148	166	66	37	23
27	17	.....	.....	148	148	60	30	20
28	17	.....	.....	148	166	53	75	20
29	16	.....	8	186	148	46	51	18
30	16	.....	.....	190	152	48	53	16
31	17	.....	.....	200	.....	44	53	.....

NOTE.—Discharge, May 1-7 and May 30 to June 13, based on comparison with records of flow of Tennessee Fork; gage not read.

Monthly discharge of East Fork of Arkansas River near Leadville, Colo., for the year ending Sept. 30, 1921.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
October	32	10	17.3	1,060
November 1–6	20	14	18.0	214
May	200	12	80.2	4,930
June	773	148	292	17,400
July	121	44	83.2	5,120
August	75	28	40.9	2,510
September	71	16	33.8	2,010

ARKANSAS RIVER AT GRANITE, COLO.

LOCATION.—In sec. 31, T. 11 S., R. 79 W., at Granite, Lake County, below mouth of Lake Creek and above Lost Canyon and Clear creeks.

DRAINAGE AREA.—425 square miles.

RECORDS AVAILABLE.—May 1, 1897, to September 10, 1899; April 6, 1910, to September 30, 1921.

GAGE.—Bristol water-stage recorder of float type on right bank 200 feet below highway bridge at Granite. Prior to October 26, 1917, inclined gage on left bank half a mile upstream. Relation between gages not determined.

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

CHANNEL AND CONTROL.—Bed composed of coarse gravel and small boulders. Control shifting. Banks not subject to overflow.

EXTREMES OF DISCHARGE.—Maximum stage during year from water-stage recorder, 3.8 feet at 9 a. m. July 1 (discharge, 1,340 second-feet); minimum discharge occurred during winter.

1910–1921: Maximum stage, 4.7 feet June 11, 1918 (discharge, 2,630 second-feet); minimum discharge recorded, 11 second-feet on March 15, 1918.

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

DIVERSIONS.—Court decrees for diversions of 90 second-feet from Arkansas River between this station and junction of Tennessee and East forks.

REGULATION.—Discharge affected by operation of Twin Lakes reservoir, which has a storage decree for 54,450 acre-feet.

COOPERATION.—Complete records furnished by State engineer.

Daily discharge, in second-feet, of Arkansas River at Granite, Colo., for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Apr.	May.	June.	July.	Aug.	Sept.
1	163	136	136	78	212	1,190	1,310	554	592
2	163	124	136	78	354	1,190	1,250	554	511
3	136	112	90	78	438	1,160	1,110	506	469
4	136	112	112	78	544	866	980	425	447
5	163	112	90	78	564	894	866	395	425
6	150	124	112	78	627	922	783	358	366
7	150	136	78	78	627	866	730	334	323
8	136	136	90	78	460	756	627	334	312
9	136	124	90	85	395	980	602	327	298
10	136	124	90	102	245	1,130	554	316	298
11	163	124	90	124	235	1,190	530	334	309
12	179	112	112	141	255	1,130	554	334	279
13	163	101	112	108	255	1,220	627	342	262
14	163	78	112	124	334	1,250	756	366	245
15	163	78	112	85	506	1,130	894	366	242
16	150	78	90	104	460	1,070	894	374	221
17	163	112	90	108	483	1,100	894	354	212
18	136	101	90	117	530	1,070	866	327	228
19	136	101	112	136	544	951	866	334	238
20	136	101	112	141	374	894	866	354	212
21	136	108	90	124	316	838	783	395	182
22	124	101	90	136	354	838	627	395	173
23	124	90	78	158	438	866	678	492	179
24	136	90	78	163	578	894	783	460	169
25	150	78	78	124	612	894	602	425	173
26	136	78	78	112	704	1,030	602	395	169
27	101	78	78	112	704	1,160	578	408	163
28	112	78	78	117	866	1,100	506	554	155
29	101	90	78	141	951	1,100	506	429	141
30	136	112	78	163	1,070	1,190	530	395	139
31	124	.....	112	.....	1,160	.....	554	451	.....

Monthly discharge of Arkansas River at Granite, Colo., for the year ending Sept. 30, 1921.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
October	179	101	142	8,730
November	136	78	104	6,190
December	136	78	95.9	5,900
April	163	78	112	6,660
May	1,160	212	522	32,100
June	1,250	756	1,030	61,300
July	1,310	506	752	46,200
August	554	316	400	24,600
September	592	139	271	16,100

ARKANSAS RIVER AT SALIDA, COLO.

LOCATION.—In sec. 32, T. 50 N., R. 9 E., at Salida, Chaffee County, some distance above mouth of South Fork of Arkansas River, the nearest important tributary.

DRAINAGE AREA.—1,160 square miles.

RECORDS AVAILABLE.—April 11, 1895, to October 31, 1903; November 3, 1909, to September 30, 1921.

GAGE.—Bristol water-stage recorder on right bank in City Park 400 feet below highway bridge.

DISCHARGE MEASUREMENTS.—Made from highway bridge.

CHANNEL AND CONTROL.—Bed composed of coarse gravel; shifts at intervals. No well-defined control. Banks not subject to overflow.

EXTREMES OF DISCHARGE.—Maximum stage during year from water-stage recorder, 5.0 feet on June 16 (discharge, 3,880 second-feet); minimum discharge, 186 second-feet, December 24.

1909–1921: Maximum stage, 6.2 feet June 13, 14, and 17, 1918 (discharge, 4,840 second-feet); minimum stage, 0.10 foot January 28, 1915 (discharge, 155 second-feet).

ICE.—Stage-discharge relation not affected by ice as river is kept open by springs.

DIVERSIONS.—Court decrees for diversions of 154 second-feet from Arkansas River between this station and Granite.

REGULATION.—Flow at station regulated to some extent by Twin Lakes and Clear Creek reservoirs which have storage decrees for 54,450 and 11,500 acre-feet, respectively.

COOPERATION.—Complete records furnished by State engineer.

Daily discharge, in second-feet, of Arkansas River at Salida, Colo., for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	398	418	270	248	234	292	234	338	2,680	2,690	1,020	1,020
2	378	418	287	248	210	292	234	487	2,620	2,600	976	958
3	398	418	287	248	210	309	234	534	2,730	2,340	928	928
4	340	439	270	256	234	327	234	716	2,460	2,050	846	841
5	322	439	287	267	234	327	248	869	2,360	1,910	759	797
6	304	418	287	267	234	327	248	1,060	2,260	1,560	716	711
7	304	439	270	267	221	309	234	1,240	2,360	1,390	689	631
8	287	439	270	262	190	276	221	1,000	1,750	1,170	600	605
9	304	398	270	234	190	262	221	781	2,110	1,100	568	579
10	270	378	270	229	200	256	234	600	2,680	1,100	534	563
11	270	378	270	239	234	256	234	510	3,170	1,200	574	553
12	322	378	304	234	248	262	234	548	3,640	1,200	584	520
13	304	418	236	221	234	276	248	652	3,220	2,340	574	478
14	340	439	253	221	234	276	262	662	3,410	1,910	574	460
15	359	322	236	234	234	248	292	1,030	3,760	2,000	600	460
16	359	304	236	262	239	234	292	1,240	3,580	2,100	589	464
17	340	322	236	276	210	234	262	1,270	3,340	2,050	589	464
18	359	359	253	276	210	248	276	1,240	3,150	1,980	568	464
19	359	359	270	276	214	262	292	910	2,600	2,050	558	497
20	378	340	253	267	229	262	309	770	2,310	1,940	639	442
21	398	322	270	256	234	248	327	584	2,090	1,700	705	420
22	378	304	219	256	234	234	309	584	2,000	1,560	738	412
23	378	304	202	262	239	234	292	636	1,860	1,560	738	399
24	359	287	186	256	239	234	309	824	2,260	1,910	786	407
25	359	287	219	229	239	234	327	1,010	2,230	1,600	846	386
26	378	304	219	210	256	234	309	1,160	2,240	1,480	840	382
27	378	304	219	221	262	234	292	1,200	2,710	1,360	852	382
28	378	270	219	234	286	234	292	1,560	2,560	1,290	1,000	362
29	378	253	253	239	.....	234	286	1,880	2,490	1,150	958	342
30	398	253	236	229	.....	234	302	2,430	2,430	988	813	342
31	378	.....	253	221	.....	234	.....	2,560	.....	988	824	.....

Monthly discharge of Arkansas River at Salida, Colo., for the year ending Sept. 30, 1921.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
October	398	270	350	21,500
November	439	253	357	21,200
December	304	186	252	15,500
January	276	210	247	15,200
February	286	190	230	12,800
March	327	234	262	16,100
April	327	221	270	16,100
May	2,560	338	996	16,200
June	3,760	1,750	2,640	157,000
July	2,690	988	1,690	104,000
August	1,020	534	729	44,800
September	1,020	342	542	32,300
The year	3,760	186	714	473,000

ARKANSAS RIVER AT CANON CITY, COLO.

LOCATION.—Just below Hot Springs Hotel, at mouth of canyon, 1 mile above Canon City, Fremont County. Nearest important tributary, Grape Creek, enters some distance above.

DRAINAGE AREA.—3,060 square miles.

RECORDS AVAILABLE.—May 1, 1888, to September 30, 1921.

GAGE.—Bristol float-type water-stage recorder.

DISCHARGE MEASUREMENTS.—Made from car and cable.

CHANNEL AND CONTROL.—Bed composed of gravel; very shifting. No well-defined control.

EXTREMES OF DISCHARGE.—Maximum stage during year, 10.7 feet at 8 p. m. August 2 (discharge, 19,000 second-feet); minimum stage, 0.50 foot on April 11 (discharge, 210 second-feet).

1888–1921: Maximum stage occurred August 2, 1921; minimum discharge, 108 second-feet April 10, 1897.

ICE.—Stage-discharge relation affected by ice.

DIVERSIONS.—Court decrees for diversions of 176 second-feet from Arkansas River between this station and Salida.

REGULATION.—Flow regulated to slight extent by operation of reservoirs on headwaters.

COOPERATION.—Complete records furnished by State engineer.

Daily discharge, in second-feet, of Arkansas River at Canon City, Colo., for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	380	520	502	450	345	379	252	331	3,130	2,850	1,500	973
2	380	538	463	364	317	379	262	331	3,060	2,850	4,100	1,190
3	408	550	479	415	308	394	268	449	3,130	2,710	2,000	1,090
4	391	580	435	460	317	449	288	573	3,430	2,430	1,190	1,090
5	370	580	424	449	345	449	288	751	3,500	2,020	1,170	1,000
6	380	610	424	415	331	404	242	927	3,500	1,970	955	982
7	380	622	424	404	317	379	236	1,130	3,500	1,730	982	892
8	380	610	408	379	308	354	231	1,170	3,130	1,560	892	822
9	380	610	408	331	300	317	236	927	2,850	1,340	822	740
10	380	562	435	345	331	300	223	789	3,280	1,240	588	662
11	380	538	408	364	364	308	210	586	3,730	1,340	625	740
12	391	520	391	354	317	308	231	533	4,420	1,340	2,100	625
13	391	520	435	345	308	308	236	533	4,580	1,290	1,210	588
14	408	538	435	345	308	317	236	692	4,340	1,790	781	520
15	408	550	424	415	317	288	304	781	4,900	2,500	822	520
16	435	538	446	449	288	276	308	927	4,980	2,290	610	534
17	424	490	391	460	288	268	359	970	4,500	2,810	554	489
18	435	490	446	449	317	288	415	988	4,020	2,500	603	554
19	424	502	490	415	331	276	508	1,010	3,800	2,790	588	520
20	424	490	502	354	308	308	812	844	3,200	2,500	625	527
21	408	490	490	331	317	308	621	692	2,850	2,290	740	489
22	408	446	435	308	331	276	490	628	2,570	2,850	765	477
23	435	435	370	331	308	268	404	714	2,500	2,640	1,190	453
24	435	408	338	354	354	268	404	789	2,640	2,290	1,090	489
25	446	391	424	317	354	252	404	1,130	2,500	2,500	1,000	470
26	479	446	435	331	354	268	354	1,190	2,360	2,570	982	448
27	479	435	435	354	345	276	331	1,290	2,850	1,890	910	448
28	463	435	462	394	364	268	308	1,580	2,710	1,770	1,050	432
29	463	391	550	345	.....	276	308	2,010	2,640	1,620	1,270	432
30	502	446	580	331	.....	276	308	2,780	2,570	1,400	1,000	406
31	562	.....	610	308	.....	268	.....	2,990	.....	1,240	955	.....

Monthly discharge of Arkansas River at Canon City, Colo., for the year ending Sept. 30, 1921.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
October	562	370	420	25,800
November	622	391	509	30,300
December	610	338	448	27,500
January	460	308	376	23,100
February	364	288	325	18,100
March	449	252	315	19,400
April	812	210	336	20,000
May	2,990	331	1,000	61,500
June	4,980	2,360	3,370	201,000
July	2,850	1,240	2,090	129,000
August	4,100	554	1,090	67,000
September	1,190	406	653	38,900
The year	4,980	210	913	662,000

ARKANSAS RIVER AT PUEBLO, COLO.

LOCATION.—150 feet below Main Street Bridge in Pueblo, Pueblo County. Nearest tributary, Fountain Creek, enters 2 miles below.

DRAINAGE AREA.—4,600 square miles.

RECORDS AVAILABLE.—May 1, 1885, to September 30, 1886; September 19, 1894, to September 30, 1921. From June 1 to September 30, 1887, and May 1 to August 31, 1889, station maintained at point 9 miles above Pueblo.

GAGE.—Bristol float-type water-stage recorder on right bank.

DISCHARGE MEASUREMENTS.—Made from Main Street Bridge.

CHANNEL AND CONTROL.—Bed composed of gravel and sand; shifting. No well-defined control.

EXTREMES OF DISCHARGE.—Maximum stage from high-water mark, 24.66 feet at midnight June 3 (discharge estimated at 100,000 second-feet); minimum stage, 2.00 feet on March 11 and 13 (discharge, 103 second-feet).

1894–1921: Maximum stage in 1921; minimum discharge, 25 second-feet on September 11, 1908.

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

DIVERSIONS.—Court decrees for diversion of 648 second-feet from Arkansas River between Pueblo and Canon City.

COOPERATION.—Complete records furnished by State engineer.

Daily discharge, in second-feet, of Arkansas River at Pueblo, Colo., for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	423	621	434	400	269	170	178	388	2,380	2,860	1,820	1,200
2	423	621	423	313	228	189	129	415	5,300	3,070	2,690	1,030
3	406	621	406	378	256	163	142	471	20,700	2,840	4,800	857
4	434	505	493	431	228	189	135	532	34,600	2,900	1,270	726
5	406	464	336	399	240	313	152	734	19,200	3,050	1,080	750
6	367	493	378	399	248	327	129	926	10,800	2,590	978	680
7	378	505	446	415	282	290	129	1,110	6,650	2,660	960	613
8	378	543	434	399	282	290	129	1,330	5,480	2,320	1,040	571
9	434	524	406	362	240	282	142	1,080	5,080	1,980	934	532
10	378	505	378	346	256	200	142	734	5,140	2,050	782	483
11	325	505	378	362	290	103	142	564	5,950	2,030	1,020	513
12	325	505	378	336	269	109	163	471	5,840	2,100	1,860	519
13	325	493	481	346	240	103	170	442	6,470	2,090	1,710	477
14	352	524	481	327	208	109	208	500	5,910	2,540	2,320	415
15	434	524	464	362	216	208	290	702	6,350	3,830	2,110	448
16	493	493	446	378	200	193	336	883	5,950	3,100	1,200	426
17	493	493	464	362	178	189	313	1,070	5,480	3,510	943	431
18	464	493	493	378	178	178	378	1,150	5,280	3,660	824	465
19	481	512	543	415	189	170	488	1,150	4,400	6,240	766	442
20	464	493	524	415	178	163	388	874	3,760	2,760	710	420
21	434	505	493	299	178	216	774	750	3,600	2,740	782	383
22	406	505	505	327	208	200	672	599	3,260	3,130	849	431
23	406	505	389	290	208	189	599	620	2,940	3,980	1,160	410
24	464	493	481	327	170	152	726	695	2,940	2,320	1,120	362
25	493	493	446	313	200	129	634	1,050	3,020	3,230	960	431
26	493	493	493	290	152	152	672	1,250	2,940	2,350	969	346
27	505	493	493	290	163	170	500	1,370	2,720	3,260	926	352
28	505	493	464	313	189	189	442	1,400	2,870	2,290	908	308
29	493	481	524	346	.....	152	415	1,670	2,520	1,940	1,020	313
30	505	434	505	269	.....	152	388	1,880	2,640	1,530	900	318
31	543	.....	493	240	.....	163	.....	2,190	.....	1,430	1,430	.....

Monthly discharge of Arkansas River at Pueblo, Colo., for the year ending Sept. 30, 1921.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
October	543	325	433	26,600
November	621	434	511	30,400
December	543	336	454	27,900
January	431	240	349	21,500
February	290	152	219	12,200
March	327	103	187	11,500
April	774	129	337	20,100
May	2,190	388	935	57,500
June	34,600	2,380	6,670	397,000
July	6,240	1,430	2,790	172,000
August	4,800	710	1,320	81,200
September	1,200	308	522	31,100
The year	34,600	103	1,230	889,000

ARKANSAS RIVER NEAR WICHITA, KANS.

LOCATION.—Near center of line between secs. 7 and 18, T. 27 S., R. 1 E., at Thirteenth Avenue highway bridge, 1½ miles above Little Arkansas River and 2 miles northwest of Wichita, Sedgwick County.

DRAINAGE AREA.—Not measured.

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

GAGE.—Chain gage on upstream handrail of highway bridge; read by P. L. Brockway, city engineer.

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

CHANNEL AND CONTROL.—Wide, flat bed of shifting, loose, clean sand and low banks, form channel and control.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period, 16.52 feet at 8.30 p. m. June 16 (discharge, 7,510 second-feet); minimum stage, 10.52 feet at 5.30 p. m. September 30 (discharge, 151 second-feet).

DIVERSIONS.—Most of low-water flow during irrigation season is diverted for use in western Kansas and Colorado.

ACCURACY.—Stage-discharge relation not permanent. Rating curve fairly well defined below 3,000 second-feet. Gage read to hundredths twice daily. Daily discharge ascertained by shifting-control method. Records poor.

Discharge measurements of Arkansas River near Wichita, Kans., during the year ending Sept. 30, 1921.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
June 10	E. L. Williams	15.09	4,690
July 14	H. B. Kinnison	12.47	1,620
Aug. 22	.....do	13.20	2,700

Daily discharge, in second-feet, of Arkansas River near Wichita, Kans., for the year ending Sept. 30, 1921.

Day.	June.	July.	Aug.	Sept.	Day.	June.	July.	Aug.	Sept.
1	.....	2,850	2,560	685	16	7,340	1,410	1,530	285
2	.....	2,560	2,560	685	17	7,340	1,300	1,410	268
3	.....	2,700	2,290	615	18	6,700	1,190	1,090	300
4	.....	2,290	2,030	580	19	5,930	1,240	1,040	290
5	.....	2,160	2,030	510	20	5,390	1,140	810	268
6	.....	2,030	1,990	510	21	5,390	990	3,300	248
7	.....	2,290	1,590	480	22	5,390	1,650	2,700	236
8	.....	2,030	4,720	450	23	5,390	1,990	2,160	224
9	.....	2,290	3,920	480	24	6,110	4,880	1,990	200
10	.....	1,770	3,150	390	25	5,750	4,720	1,530	264
11	5,220	1,770	2,420	360	26	5,220	3,760	1,300	220
12	5,220	1,770	2,030	360	27	4,560	3,000	1,140	208
13	5,570	1,770	1,770	360	28	3,920	3,450	945	200
14	6,110	1,650	1,770	330	29	3,450	4,400	900	188
15	6,910	1,590	1,990	325	30	3,150	4,240	855	151
					31	.....	3,300	765	.....

Monthly discharge of Arkansas River near Wichita, Kans., for the year ending Sept. 30, 1921.

Month.	Discharge in second-feet.			Run off in acre-feet.
	Maximum.	Minimum.	Mean.	
June 11-30	7,340	3,150	5,500	218,000
July	4,880	990	2,390	147,000
August	4,720	765	1,940	119,000
September	685	151	356	21,200
The period	.....	.....	.....	505,000

TENNESSEE FORK NEAR LEADVILLE, COLO.

LOCATION.—In sec. 16, T. 9 S., R. 80 W., at highway bridge a few hundred yards above junction with East Fork and 3 miles northwest of Leadville, Lake County.

DRAINAGE AREA.—45 square miles (measured on topographic map).

RECORDS AVAILABLE.—May 10 to October 31, 1890; June 18 to October 16, 1903; February 8, 1911, to September 30, 1921.

GAGE.—Vertical staff on downstream side of left bridge abutment; datum lowered 0.40 foot October 6, 1914. Read by Fred Coquoz during summer and by forest ranger during winter. No known relation between present gage and gages used in 1890 and 1903.

DISCHARGE MEASUREMENTS.—Made from single-span bridge or by wading.

CHANNEL AND CONTROL.—Bed rough and composed of small boulders. Control at rapids a short distance below gage; shifts occasionally. Banks subject to overflow at extreme high water. High-water control changed during last few years.

EXTREMES OF DISCHARGE.—Maximum stage recorded, 2.3 feet at 8.30 a. m. June 14 (discharge, 395 second-feet); minimum stage, 0.20 foot October 18 and 30 (discharge, 2 second-feet).

1911–1921: Maximum discharge recorded June 14, 1921; minimum stage, 0.10 foot from October 26 to November 3, 1917 (discharge, 1 second-foot).

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

DIVERSIONS.—Court decrees for diversions of 8 second-feet above the station; also a decree for diversions of 18.5 second-feet from the basin of Eagle River through Ewing ditch to that of Tennessee Fork above station. During the year, 1,850 acre-feet were diverted.

ACCURACY.—Stage-discharge relation not permanent; affected by ice during winter. Well-defined rating curves used October 1 to November 13 and March 26 to September 30. Gage read to hundredths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table; shifting-control method used June 15 to September 30. Records fair.

Discharge measurements of Tennessee Fork near Leadville, Colo., during the year ending Sept. 30, 1921.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Nov. 4	H. E. Grosbach	0.48	16.0	Mar. 4	Peck and Smith	[a]0.60	9.6
Dec. 18	P. V. Hodges	[a].80	8.2	June 14	Robert Follansbee	2.28	388
Jan. 27	Hodges and Peck	[a].48	7.6	24	do	1.09	127

[a] Stage-discharge relation affected by ice.

Daily discharge, in second-feet, of Tennessee Fork near Leadville, Colo., for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	13	5					30	252	107	44	42
2	10	3				17	40	240	86	45	42
3	13	4					60	240	107	44	47
4	13	9			10		80	286	112	36	40
5	18	6					100	252	95	36	30
6	11	7					145	252	68	29	47
7	14	3					140	240	74	29	36
8	17	4					135	229	76	23	34
9	10	7				17	120	252	64	22	22
10	17	7					139	252	64	23	23
11	19	7					130	264	86	29	32
12	18	5					99	310	74	24	29
13	18	7					141	298	82	23	29
14	12						110	358	101	24	16
15	10						141	324	64	32	12
16	6						126	200	66	26	13
17	3						126	178	72	21	14
18	2		8			22	141	181	58	29	18
19	17						126	203	68	19	14
20	13						99	167	58	21	13
21	7						135	130	47	29	12
22	14						139	124	66	45	13
23	11						141	124	80	45	11
24	6						126	128	64	32	11
25	5						152	124	49	32	14
26	4				16		135	118	49	29	15
27	2			8			150	118	42	24	14
28	4						174	118	42	49	12
29	6					21	218	118	37	39	13
30	2						229	116	33	39	11
31	7						240		32	37	

NOTE.—No gage-height record May 1-7; discharge based on comparison with records of flow of Blue River at Dillon and of Roaring Fork at Glenwood Springs.

Monthly discharge of Tennessee Fork near Leadville, Colo., for the year ending Sept. 30, 1921.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
October	19	2	10.4	640
November			6	357
December			8	492
January			8	492
February			8	444
March			12	738
April			19	1,130
May	240	30	131	8,060
June	358	116	207	12,300
July	112	32	68.5	4,210
August	49	19	31.6	1,940
September	47	11	22.6	1,340
The year	358	2	44.4	32,100

NOTE.—Monthly discharge, from December to April and for part of November, based on four discharge measurements, weekly gage readings, and temperature records.

COTTONWOOD CREEK BELOW HOT SPRINGS, NEAR BUENA VISTA, COLO.

LOCATION.—In sec. 22, T. 14 S., R. 79 W., half a mile below old Hot Springs Hotel and 6 miles west of Buena Vista, Chaffee County. Nearest tributary, North Cottonwood Creek, enters 2 miles downstream.

DRAINAGE AREA.—69 square miles. (Measured on Hayden atlas.)

RECORDS AVAILABLE.—April 7, 1911, to September 30, 1921. From September 23, 1910, to September 13, 1911, station maintained in section 21, one mile above present site. Flow at two sites comparable.

GAGE.—Vertical staff; read by E. D. Masters. On February 19, 1915, gage was moved from side of left abutment to downstream end and reset to same datum. In present position water does not pile up on gage, especially during high water, and therefore for same discharge gage height is less.

DISCHARGE MEASUREMENTS.—Made from bridge or by wading.

CHANNEL AND CONTROL.—Bed composed of boulders; very rough. Control short distance below gage; shifts at long intervals. Banks not subject to overflow.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 2.1 feet at 6 a. m June 12 (discharge, 495 second-feet); minimum stage, 0.28 foot at 6 a. m. April 8 (discharge, 22 second-feet).

1911–1921: Maximum discharge recorded June 12, 1921; minimum discharge, 10 second-feet April 9 and 19, 1914 (gage height, 0.50 foot).

ICE.—Stage-discharge relation not affected by ice: hot springs keep creek open.

DIVERSIONS.—Court decrees for diversions of 148 second-feet from Cottonwood Creek, of which 28 second-feet are above gaging station.

ACCURACY.—Stage-discharge relation not permanent; not affected by ice. Well-defined rating curves used October 1–31, and November 1 to September 30. Gage read to hundredths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table. Records good.

Discharge measurements of Cottonwood Creek below Hot Springs, near Buena Vista, Colo., during the year ending Sept. 30, 1921.

Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*
Nov. 5	H. E. Grosbach	0.58	33.1
June 15	Robert Follansbee	2.00	446
July 20	....do	1.19	126

Daily discharge, in second-feet, of Cottonwood Creek below Hot Springs, near Buena Vista, Colo., for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	36	34	31	25	24	24	24	24	305	204	94	99
2	36	34	32	25	24	26	24	24	284	194	89	99
3	36	34	33	25	25	25	24	26	271	194	82	99
4	36	33	33	25	25	25	23	33	284	194	79	75
5	36	33	33	26	24	25	23	59	271	187	72	68
6	34	33	32	25	24	25	23	66	262	171	66	66
7	34	33	32	25	24	25	22	46	242	168	61	66
8	34	33	29	25	24	25	22	42	254	168	56	62
9	34	33	29	24	24	24	23	39	305	158	56	54
10	36	32	28	24	24	24	23	36	350	155	56	50
11	38	32	28	24	24	24	23	40	397	149	62	50
12	38	33	28	24	24	24	23	46	470	141	59	49
13	38	35	28	24	24	24	23	59	422	174	59	49
14	37	34	27	24	24	24	23	61	446	181	62	44
15	37	33	27	26	24	25	23	66	446	181	64	46
16	38	33	27	24	24	25	22	66	446	181	64	42
17	34	34	28	24	24	25	23	69	397	174	62	43
18	34	33	28	24	24	25	24	66	328	171	59	44
19	34	33	28	24	24	25	24	54	271	171	55	43
20	32	33	27	25	24	26	24	44	254	155	62	40
21	32	33	27	24	24	25	24	62	230	147	69	40
22	31	33	26	24	24	25	24	77	230	149	72	38
23	31	33	26	24	25	24	26	82	271	141	82	36
24	31	33	25	24	26	24	28	94	271	161	75	36
25	31	30	25	24	24	24	25	94	271	181	69	35
26	32	30	25	24	24	25	25	96	242	155	72	34
27	33	30	25	24	24	24	24	122	242	127	69	33
28	34	31	26	24	24	24	24	187	254	122	66	33
29	32	31	26	24	.....	25	24	242	230	99	64	33
30	31	30	27	24	.....	25	23	328	215	89	62	33
31	32	.....	26	24	.....	24	.....	305	.....	89	64	.....

Monthly discharge of Cottonwood Creek below Hot Springs, near Buena Vista, Colo., for the year ending Sept. 30, 1921.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
October	38	31	34.3	2,110
November	35	30	32.6	1,940
December	33	25	28.1	1,730
January	26	24	24.4	1,500
February	26	24	24.2	1,340
March	26	24	24.6	1,510
April	28	22	23.7	1,410
May	328	24	85.6	5,260
June	470	215	305	18,100
July	204	89	159	9,780
August	94	55	67.2	4,130
September	99	33	51.3	3,050
The year	470	22	71.8	51,900

WEST BEAVER CREEK NEAR VICTOR, COLO.

LOCATION.—In sec. 30, T. 16 S., R. 68 W., at Skaguay power station of Arkansas Valley Railway, Light & Power Co., 7 miles southeast of Victor, Fremont County.

DRAINAGE AREA.—70 square miles.

RECORDS AVAILABLE.—January 1, 1905, to September 30, 1921.

DETERMINATION OF DISCHARGE.—Water used through power house is brought by pipe line from reservoir 3½ miles upstream; quantity measured hourly by weir, and a quantity representing the gain or loss in the reservoir during the period is added or subtracted. To determine the natural flow of the stream the seepage through the dam is measured by weir and added to the total quantity thus obtained. This method takes no account of evaporation from the surface of the reservoir.

DIVERSIONS.—Above the power reservoir are three reservoirs from which the town of Victor obtains its municipal supply. In the upper basin are four reservoirs from which water is diverted through St. John tunnel into Lake Moraine, and thence by natural channels to Colorado Springs, where it is used as municipal supply. During 1921, 4,360 acre-feet were diverted through St. John tunnel. The town of Altman, for municipal supply, has also filed on five reservoir sites in the upper basin, having a combined capacity of 2,300 acre-feet. Below the power plant, adjudicated decrees for diversions of 126 second-feet from Beaver Creek, which is formed by East and West Beaver creeks. In addition, there is an irrigation reservoir in operation which has a filing for 4,760 acre-feet.

COOPERATION.—Records are furnished through courtesy of Arkansas Valley Railway, Light & Power Co.

Monthly discharge of West Beaver Creek near Victor, Colo., for the year ending Sept. 30, 1921.

Month.	Mean discharge in second-feet.	Run-off in acre-feet.	Month.	Mean discharge in second-feet.	Run-off in acre-feet.
October	14.1	867	May	65.2	4,010
November	8.97	534	June	338	20,100
December	4.58	282	July	48.0	2,950
January	4.29	264	August	60.6	3,730
February	5.57	309	September	31.1	1,850
March	14.5	892			
April	21.0	1,250	The year	51.2	37,000

BOEHMER CREEK NEAR PIKES PEAK, COLO.

LOCATION.—In NW. ¼ sec. 32, T. 14 S., R. 68 W., 3½ miles south of Pikes Peak, El Paso County, above Little Beaver and Sackett creeks. Elevation of station, 11,000 feet.

DRAINAGE AREA.—7.2 square miles (measured on topographic map). About 75 per cent of this area is above timber line. To the natural drainage has been added that of West Beaver Creek above intake of Strickler tunnel.

RECORDS AVAILABLE.—October 1, 1909, to September 30, 1921.

DETERMINATION OF DISCHARGE.—Flow measured by sharp-crested weir, 60 inches long, with complete end contraction. A stake is driven into bed of stream in pool above weir so that its head is level with crest of weir; depth of water over stake is measured by steel scale. Discharge is computed by Francis formula.

REGULATION.—Flow regulated by series of three reservoirs having an aggregate capacity of 1,400 acre-feet; reservoirs operated by Colorado Springs Water Department.

DIVERSIONS.—Water diverted above weir for use in Victor is measured and added to flow over Boehmer Creek weir to show total run-off.

COOPERATION.—Monthly discharge computed from records furnished by Colorado Springs Water Department.

Monthly discharge of Boehmer Creek near Pikes Peak, Colo., for the year ending Sept. 30, 1921.

[Drainage area, 7.2 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	4.84	3.81	4.37	0.607	0.70	269
November	3.81	2.61	3.51	.488	.54	209
December	3.20	1.82	2.49	.346	.40	153
January	1.82	1.35	1.70	.236	.27	105
February	6.75	1.13	3.94	.547	.57	219
March	1.58	1.58	1.58	.219	.25	97
April	1.95	1.58	1.75	.243	.27	104
May	23.4	2.07	6.97	.968	1.12	429
June	63.2	19.9	30.5	4.24	4.73	1,810
July	19.1	17.1	17.9	2.49	2.87	1,100
August	21.8	19.1	20.2	2.81	3.24	1,240
September	21.8	9.57	14.4	2.00	2.23	857
The year	63.2	1.13	9.11	1.27	17.19	6,590

LITTLE BEAVER CREEK NEAR PIKES PEAK, COLO.

LOCATION.—In NW. ¼ NW. ¼ sec. 32, T. 14 S., R. 68 W., just above mouth of creek and 3½ miles south of Pikes Peak, El Paso County. Little Beaver Creek enters Boehmer Creek from west 0.3 mile above reservoir No. 4. Elevation of station, 11,000 feet.

DRAINAGE AREA.—1.00 square mile (measured on topographic map). About 25 per cent of area above timber line; remainder sparsely timbered.

RECORDS AVAILABLE.—October 1, 1909, to September 30, 1921.

DETERMINATION OF DISCHARGE.—Flow measured by sharp-crested weir 24 inches long with complete end contraction. A stake is driven into bed of stream in pool above weir so that its head is level with crest of weir; depth of water over stake is measured by steel scale. Discharge is computed by Francis formula.

DIVERSIONS.—None.

REGULATION.—None.

COOPERATION.—Monthly discharge computed from records furnished by Colorado Springs Water Department.

Monthly discharge of Little Beaver Creek near Pikes Peak, Colo., for the year ending Sept. 30, 1921.

[Drainage area, 1.0 square mile.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	0.82	0.54	0.70	0.700	0.81	43.0
November	.54	.29	.36	.360	.40	21.4
December	.29	.10	.19	.190	.22	11.7
January	.12	.12	.12	.120	.14	7.4
February	.10	.05	.07	.070	.07	3.9
March	.05	.05	.05	050	.06	3.1
April	.16	.05	.09	.090	.10	5.4
May	2.96	.16	.96	.960	1.11	59.0
June	5.83	1.93	4.01	4.01	4.47	239
July	2.06	.82	1.36	1.36	1.57	83.6
August	1.28	.82	.98	.980	1.13	60.3
September	1.28	.63	.92	.920	1.03	54.7
The year	5.83	.05	.82	.826	11.11	592

SACKETT CREEK NEAR PIKES PEAK, COLO.

LOCATION.—In SE. ¼ NW. ¼ sec. 32, T. 14 S., R. 68 W., just above mouth of creek and 4 miles southeast of Pikes Peak, El Paso County. Sackett Creek enters Boehmer Creek from north a short distance above reservoir No. 4. Elevation of station, 11,000 feet.

DRAINAGE AREA.—0.65 square mile (measured on topographic map). About 30 per cent of area above timber line; remainder sparsely timbered.

RECORDS AVAILABLE.—October 1, 1909, to September 30, 1921.

DETERMINATION OF DISCHARGE.—Flow measured by sharp-crested weir 24 inches long with complete end contraction. A stake is driven into bed of stream in pool above weir so that its head is level with crest of weir; depth of water over stake is measured by steel scale. Discharge is computed by Francis formula.

DIVERSIONS.—None.

REGULATION.—None.

COOPERATION.—Monthly discharge computed from records furnished by Colorado Springs Water Department.

Monthly discharge of Sackett Creek near Pikes Peak, Colo., for the year ending Sept. 30, 1921.

[Drainage area, 0.65 square mile.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	0.45	0.22	0.28	0.431	0.50	17.2
November 1-12	.16	.16	.16	.246	.11	3.8
May 14-31	2.64	1.53	1.78	2.74	1.83	63.5
June	6.64	1.53	3.17	4.88	5.44	189
July	1.53	.72	1.08	1.66	1.91	66.4
August	1.28	.82	.97	1.49	1.72	59.6
September	1.28	.45	.88	1.35	1.51	52.4

LION CREEK NEAR HALFWAY, COLO.

LOCATION.—In NE. ¼ sec. 15, T. 14 S., R. 68 W., at mouth of creek, half a mile southwest of Halfway, El Paso County. Lion Creek enters Ruxton Creek from west. Elevation of station, 9,250 feet.

DRAINAGE AREA.—2.00 square miles (measured on topographic map). Includes all area above the Crater apparently tributary to Sheep Creek. About 30 per cent of area above timber line; remainder sparsely timbered.

RECORDS AVAILABLE.—April 1, 1908, to September 30, 1921.

DETERMINATION OF DISCHARGE.—Flow measured by sharp-crested weir 30 inches long with complete end contraction. A stake is driven into bed of stream in pool above weir so that its head is level with crest of weir; depth of water over stake is measured by steel scale. Discharge is computed by Francis formula.

DIVERSIONS.—None.

REGULATION.—None.

COOPERATION.—Monthly discharge computed from records furnished by Colorado Springs Water Department.

Monthly discharge of Lion Creek near Halfway, Colo., for the year ending Sept. 30, 1921.

[Drainage area, 2.00 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	1.90	1.45	1.72	0.860	0.99	106
November	1.52	1.03	1.33	.665	.74	79.1
December	1.24	.79	1.04	.520	.60	64.0
January	.67	.51	.62	.310	.36	38.1
February	.61	.51	.54	.270	.28	30.0
March	1.03	.61	.71	.355	.41	43.7
April	3.50	.23	1.09	.545	.61	64.9
May	3.22	1.03	1.68	.840	.97	103
June	11.6	.97	3.23	1.62	1.81	192
July	2.84	1.75	2.26	1.13	1.30	139
August	3.12	2.10	2.46	1.23	1.42	151
September	2.75	2.38	2.54	1.27	1.42	151
The year	11.6	.23	1.61	.805	10.91	1,160

SHEEP CREEK NEAR HALFWAY, COLO.

LOCATION.—In SW. ¼ sec. 11, T. 14 S., R. 68 W., a quarter of a mile west of Halfway, El Paso County. No tributary between station and mouth, a short distance below. Sheep Creek enters Ruxton Creek from west a short distance above Halfway. Elevation of station, 9,100 feet.

DRAINAGE AREA.—0.73 square mile (measured on topographic map). Does not include any area above the Crater as this is most probably tributary to Lion Creek. Practically all below timber line, but sparsely timbered.

RECORDS AVAILABLE.—April 1, 1908, to September 30, 1921.

DETERMINATION OF DISCHARGE.—Flow measured by sharp-crested weir 30 inches long with complete end contraction. A stake is driven into bed of stream in pool above weir so that its head is level with crest of weir; depth of water over stake is measured by steel scale. Discharge is computed by Francis formula.

DIVERSIONS.—None.

REGULATION.—None.

COOPERATION.—Monthly discharge computed from records furnished by Colorado Springs Water Department.

Monthly discharge of Sheep Creek near Halfway, Colo., for the year ending Sept. 30, 1921.

[Drainage area, 0.73 square mile.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	0.67	0.45	0.55	0.753	0.87	33.8
November	1.10	.32	.48	.658	.73	28.6
December	.36	.27	.29	.397	.46	17.8
January	.27	.20	.23	.315	.36	14.1
February	.23	.20	.21	.288	.30	11.7
March	.32	.27	.28	.384	.44	17.2
April	1.60	.05	.57	.781	.87	33.9
May	2.75	.79	1.42	1.95	2.25	87.3
June	12.8	.73	2.95	4.04	4.51	176
July	2.75	1.03	1.49	2.04	2.35	91.6
August	1.75	1.10	1.43	1.96	2.26	87.9
September	2.10	1.03	1.29	1.77	1.98	76.8
The year	12.8	.05	.93	1.27	17.38	677

SOUTH RUXTON CREEK AT HALFWAY, COLO.

LOCATION.—In SW. ¼ sec. 11, T. 14 S., R. 68 W., just above hydroelectric intake at Halfway, El Paso County. No tributary between station and mouth, a short distance below. South Ruxton Creek enters Ruxton Creek from south at Halfway. Elevation of station, 9,000 feet.

DRAINAGE AREA.—3.95 square miles (measured on topographic map). Practically all below timber line and heavily timbered.

RECORDS AVAILABLE.—June 1, 1906, to September 30, 1921.

DETERMINATION OF DISCHARGE.—Flow measured by two sharp-crested weirs, with complete end contraction. Discharge is computed by Francis formula. Main weir is one-third mile above mouth of creek and a short distance above hydroelectric intake which has a capacity of 4.63 second-feet. Second weir is halfway between main weir and mouth of creek and measures inflow chiefly from springs below intake and a small amount of seepage. At all times except during high water capacity of intake is sufficient to take entire flow passing main weir, and flow at two weirs is combined to give total run-off of basin. During high water excess passing intake and recorded at lower weir does not represent increased flow between weirs and is discarded. In its place is used a constant quantity based on inflow and seepage at other times.

DIVERSIONS.—None.

REGULATION.—None.

COOPERATION.—Monthly discharge computed from records furnished by Colorado Springs Water Department.

Monthly discharge of South Ruxton Creek at Halfway, Colo., for the year ending Sept. 30, 1921.

[Drainage area, 3.95 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	2.57	1.90	2.26	0.572	0.66	139
November	1.98	1.45	1.77	.448	.50	105
December	1.63	1.30	1.37	.347	.40	84.2
January	1.38	1.10	1.20	.304	.35	73.8
February	1.10	.97	1.00	.253	.26	55.5
March	1.45	1.03	1.12	.284	.33	68.9
April	2.93	.27	1.66	.420	.47	98.8
May	8.31	2.84	5.52	1.40	1.61	339
June	48.0	6.68	15.0	3.80	4.24	893
July	7.04	5.51	6.34	1.61	1.86	390
August	5.40	3.80	4.38	1.11	1.28	269
September	4.31	2.57	3.39	.858	.96	202
The year	48.0	.27	3.76	.952	12.92	2,720

CABIN CREEK NEAR HALFWAY, COLO.

LOCATION.—In SW. ¼ NW. ¼ sec. 11, T. 14 S., R. 68 W., just above hydroelectric intake, about three-eighths mile north of Halfway, El Paso County. Cabin Creek enters Ruxton Creek half a mile below Halfway. Elevation of station, about 9,000 feet.

DRAINAGE AREA.—2.4 square miles (measured on topographic map). About 15 per cent of area above timber line; remainder sparsely timbered.

RECORDS AVAILABLE.—October 1, 1906, to September 30, 1921.

DETERMINATION OF DISCHARGE.—Flow measured by two sharp-crested weirs with complete end contraction. Discharge computed by Francis formula. Main weir is about one-third of a mile above mouth of creek and just above hydroelectric intake. Second weir is 50 feet above mouth of creek and measures flow from springs and small tributaries entering below intake. Except during high water measured flow at weirs is combined to give the run-off from basin. Record from lower weir is discarded during high water and inflow estimated. (See description of South Ruxton Creek at Halfway, Colo.).

DIVERSIONS.—None.

REGULATION.—None.

COOPERATION.—Monthly discharge computed from records furnished by Colorado Springs Water Department.

Monthly discharge of Cabin Creek near Halfway, Colo., for the year ending Sept. 30, 1921.

[Drainage area, 2.4 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	1.90	1.30	1.56	0.650	0.75	95.9
November	1.30	.73	1.03	.429	.48	61.3
December	.85	.61	.69	.288	.33	42.4
January	.56	.41	.48	.200	.23	29.5
February	.56	.46	.52	.217	.23	28.9
March	.85	.56	.66	.275	.32	40.6
April	5.40	.36	1.30	.542	.60	77.4
May	6.56	2.38	3.96	1.65	1.90	243
June	12.80	2.49	5.72	2.38	2.66	340
July	6.44	3.12	4.23	1.76	2.03	260
August	4.73	3.31	4.01	1.67	1.92	247
September	4.84	2.75	3.87	1.61	1.80	230
The year	12.80	.36	2.34	.975	13.25	1,700

SUTHERLAND CREEK NEAR MANITOU, COLO.

LOCATION.—In SW. ¼ sec. 9, T. 14 S., R. 67 W., 1½ miles southeast of Manitou, El Paso County. No large tributary between station and mouth, 1 mile below. Elevation of station, 6,600 feet.

DRAINAGE AREA.—4.4 square miles (measured on topographic map). Practically all below timber line.

RECORDS AVAILABLE.—January 1, 1918, to September 30, 1921.

DETERMINATION OF DISCHARGE.—Flow measured by sharp-crested weir, 30 inches long, with complete end constraction. A stake is driven into bed of stream in pool above weir so that its head is level with crest of weir; depth of water over stake is measured by steel scale. Discharge is computed by Francis formula.

DIVERSIONS.—None.

REGULATION.—None.

COOPERATION.—Monthly discharge computed from records furnished by Colorado Springs Water Department.

Monthly discharge of Sutherland Creek near Manitou, Colo., for the year ending Sept. 30, 1921.

[Drainage area, 4.4 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	0.91	0.67	0.79	0.180	0.21	48.6
November	.91	.67	.73	.166	.19	43.4
December	.67	.56	.64	.145	.17	39.4
January	.56	.56	.56	.127	.15	34.4
February	.56	.56	.56	.127	.13	31.1
March	.79	.56	.69	.157	.18	42.4
April	2.57	.61	1.40	.318	.35	83.3
May	4.95	2.75	4.04	.918	1.06	248
June	30.0	3.70	8.31	1.89	2.11	494
July	4.52	2.93	3.28	.745	.86	202
August	2.93	1.9	2.24	.509	.59	138
September	1.75	.79	1.50	.341	.38	89.3
The year	30.0	.56	2.06	.468	6.38	1,490

BEAR CREEK NEAR COLORADO SPRINGS, COLO.

LOCATION.—In NE. ¼ sec. 21, T. 14 S., R. 67 W., 3½ miles west of Colorado Springs, El Paso County. Nearest tributary, Hunters Run, enters a short distance above. Elevation of station, 6,615 feet.

DRAINAGE AREA.—6.9 square miles (measured on topographic map). Practically all below timber line.

RECORDS AVAILABLE.—March 1, 1918, to September 30, 1921.

DETERMINATION OF DISCHARGE.—Flow measured by sharp-crested weir, 30 inches long, with complete end contraction. A stake is driven into bed of stream in pool above weir so that its head is level with crest of weir; depth of water over stake is measured by steel scale. Discharge is computed by Francis formula.

DIVERSIONS.—None.

REGULATION.—None.

COOPERATION.—Monthly discharge computed from records furnished by Colorado Springs Water Department.

Monthly discharge of Bear Creek near Colorado Springs, Colo., for the year ending Sept. 30, 1921.

[Drainage area, 6.9 square miles.]

Month.	Discharge in second-feet.				Run-off.	
	Maximum.	Minimum.	Mean.	Per square mile.	Inches.	Acre-feet.
October	2.38	1.83	2.06	0.299	0.34	127
November	2.58	1.90	2.12	.307	.34	126
December	1.90	1.52	1.70	.246	.28	105
January	1.75	1.38	1.55	.225	.26	95.3
February	1.63	1.45	1.54	.223	.23	85.5
March	2.07	1.45	1.66	.241	.28	102
April	8.40	1.10	4.12	.597	.67	245
May	8.90	4.41	6.83	.990	1.14	420
June	57.5	4.31	19.2	2.78	3.10	1,140
July	8.57	4.41	6.39	.926	1.07	393
August	7.38	3.06	3.99	.578	.67	245
September	4.31	2.23	2.88	.417	.47	171
The year	57.5	1.10	4.50	.652	8.85	3,250

NEOSHO RIVER NEAR IOLA, KANS.

LOCATION.—In NE. ¼ sec. 9, T. 25 S., R. 18 E., 2½ miles south and 1½ miles west from Iola, Allen County, 1 mile below Elm Creek and 8 miles above Owl Creek.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—October 12, 1917, to September 30, 1921. August 1, 1895, to November 30, 1903, at a site 4 miles upstream at city water and power-house dam. United States Weather Bureau staff gage is located a short distance above this dam.

GAGE.—Stevens water-stage recorder on left bank three-fourths of a mile above Pipe Line ford; inspected weekly by Homer L. Teats.

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

CHANNEL AND CONTROL.—Bed composed of gravel and silt. Control is long shale riffle, half a mile downstream; practically permanent. Channel is straight for long distance upstream and bends slightly downstream from gage.

EXTREMES OF DISCHARGE.—Maximum stage during year from water-stage recorder, 15.1 feet at 11 p. m. June 9 (discharge, 14,900 second-feet); minimum stage from water-stage recorder, 2.72 feet at 10 p. m. August 5 (discharge, 24 second-feet).

1917–1921: Maximum stage recorded, 19.4 feet at 4 a. m. March 21, 1919 (discharge, 23,700 second-feet); minimum stage, 1.9 feet June 23, 1920 (discharge, 1 second-foot).

1895–1903: United States Geological Survey record: Maximum stage, 24.0 feet July 10, 1904, determined from high-water marks (discharge estimated at 74,600 second-feet); minimum discharge, zero, several days in September and October, 1897.

ICE.—Stage-discharge relation affected by ice December 28.

DIVERSIONS.—Water is taken from river for domestic use by cities upstream.

REGULATION.—Low-water flow is regulated by dams upstream.

ACCURACY.—Stage-discharge relation practically permanent; not seriously affected by ice during year. Rating curve well defined below 8,000 second-feet. Operation of water-stage recorder satisfactory. Daily discharge ascertained by applying mean daily gage height to rating table. Records excellent.

Discharge measurements of Neosho River near Iola, Kans., during the year ending Sept. 30, 1921.

Date.	Made by—	Gage height.	Discharge.	Date.	Made by—	Gage height.	Discharge.
		Feet.	*Sec.-ft.*			*Feet.*	*Sec.-ft.*
Oct. 3	A. K. Gowans	2.93	59	June 14	Williams and Kinnison.	4.41	688
Jan. 12	do	3.17	114	Sept. 28	H. B. Kinnison	3.36	200
Mar. 18	do	3.43	192				

Daily discharge, in second-feet, of Neosho River near Iola, Kans., for the year ending Sept. 30, 1921.

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
1	66	342	51	182	388	106	435	365	1,150	460	57	62
2	55	227	64	178	365	101	388	342	435	320	44	57
3	59	143	80	174	320	90	342	320	615	256	36	46
4	62	118	219	171	298	101	320	276	485	104	31	44
5	31	93	276	164	256	98	276	276	342	212	30	44
6	34	85	164	160	235	90	256	256	256	207	235	44
7	41	140	136	143	235	93	256	256	231	160	320	42
8	48	485	160	136	235	98	276	900	276	157	216	41
9	49	435	146	129	235	98	276	9,800	9,320	256	182	34
10	49	256	118	120	219	1,150	276	2,490	10,900	200	171	29
11	48	178	104	118	204	1,520	365	5,110	3,370	167	342	46
12	46	153	123	112	200	725	342	4,980	1,840	115	840	1,360
13	41	123	115	106	196	510	388	4,330	1,020	101	780	4,210
14	51	104	98	98	196	388	615	1,760	725	93	780	1,440
15	55	90	90	95	189	320	725	900	485	98	670	698
16	171	82	98	95	167	256	1,150	670	510	143	460	698
17	256	72	98	85	160	235	840	560	725	101	615	342
18	140	66	104	85	153	216	840	460	460	88	510	535
19	90	66	95	101	136	204	725	410	276	200	435	780
20	77	64	85	109	129	235	642	342	256	435	342	642
21	80	64	189	120	123	4,590	560	298	276	189	256	388
22	118	62	960	153	123	3,970	560	276	189	109	196	535
23	388	55	725	212	112	1,440	460	235	143	88	140	410
24	535	57	485	535	112	1,020	410	216	615	75	126	276
25	840	66	298	2,100	126	870	960	185	1,080	62	98	231
26	840	66	256	1,360	120	2,690	2,390	185	2,590	44	85	388
27	582	59	189	1,220	106	2,010	960	200	5,380	37	82	320
28	388	55	200	900	106	1,840	560	365	7,780	31	66	212
29	256	51	192	698	.....	900	460	276	2,010	80	118	174
30	185	49	182	588	.....	670	388	235	725	95	112	388
31	136	.....	182	485	.....	535	.....	1,600	.....	80	75	.....

NOTE.—Stage-discharge relation affected by ice Dec. 28; discharge estimated from a study of gage-height records.

Monthly discharge of Neosho River near Iola, Kans., for the year ending Sept. 30, 1921.

Month.	Discharge in second-feet.			Run-off in acre-feet.
	Maximum.	Minimum.	Mean.	
October	840	31	188	11,600
November	485	49	130	7,740
December	960	51	203	12,500
January	2,100	85	353	21,700
February	388	106	194	10,800
March	4,590	90	876	53,900
April	2,390	256	581	34,600
May	9,800	185	1,250	76,900
June	10,900	143	1,820	108,000
July	460	31	154	9,470
August	840	30	273	16,800
September	4,210	29	484	28,800
The year	10,900	29	543	393,000

MISCELLANEOUS MEASUREMENTS.

Miscellaneous discharge measurements in lower Mississippi River drainage basin during the year ending Sept. 30, 1921.

Date.	Stream.	Tributary to—	Locality.	Gage height.	Discharge.
				Feet.	*Sec.-ft.*
June 8	Meramec River	Mississippi River	2½ miles north of Steelville, Mo.		1,820
8	do	do	4 miles southwest of Pacific, Mo.		1,080
Sept. 22	do	do	Valley Park, Mo	1.46	1,370
Aug. 5	Big Spring	Current River	4 miles southeast of Van Buren, Mo.		367
Jan. 27	Arkansas River	Mississippi River	Below East Fork of Arkansas River near Leadville, Colo.		16.4
Mar. 4	do	do	do		17.3
Sept. 23	Red River	Mississippi River	Highway bridge, near Denison, Tex. ½ mile below Missouri, Kansas & Texas Railway bridge.	a3.6	1,540
25	do	do	Highway bridge, 200 feet below Paris & Great Northern Railroad bridge, Arthur City, Tex.	a9.1	1,570
Apr. 4	Wichita River	Red River	Wichita Falls, Tex		54

a U. S. Weather Bureau gage.

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