DEPARTMENT OF THE INTERIOR
Hubert Work, Secretary

U. S. GEOLOGICAL SURVEY
George Otis Smith, Director

WATER-SUPPLY PAPER 547

SURFACE WATER SUPPLY OF THE UNITED STATES

1922

PART VII. LOWER MISSISSIPPI RIVER BASIN

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

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

WASHINGTON
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CONTENTS

ILLUSTRATIONS

SURFACE WATER SUPPLY OF THE LOWER MISSISSIPPI RIVER BASIN, 1922

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, 1922.

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

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

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

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

Annual appropriations for the fiscal years ending June 30, 1895–1923

1895	$12, 500. 00
1896	20, 000. 00
1897 to 1900, inclusive	50, 000. 00
1901 to 1902, inclusive	100, 000. 00
1903 to 1906, inclusive	200, 000. 00
1907	150, 000. 00
1908 to 1910, inclusive	100, 000. 00
1911 to 1917, inclusive	150, 000. 00
1918	175, 000. 00
1919	148, 244. 10
1920	175, 000. 00
1921 to 1923, inclusive	180, 000. 00

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 5,480 points in the United States and also at many points in Alaska and the Hawaiian Islands. In July, 1922, 1,540 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 inches.

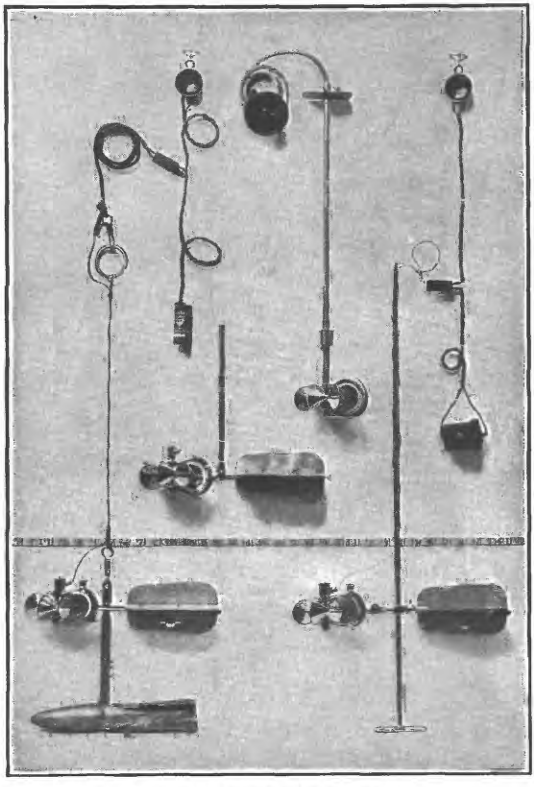
An "acre-foot," equivalent to 43,560 cubic feet, is the quantity required to cover an acre to the depth of 1 foot. The term is commonly used in connection with storage for irrigation.

The following terms not in common use are here defined:

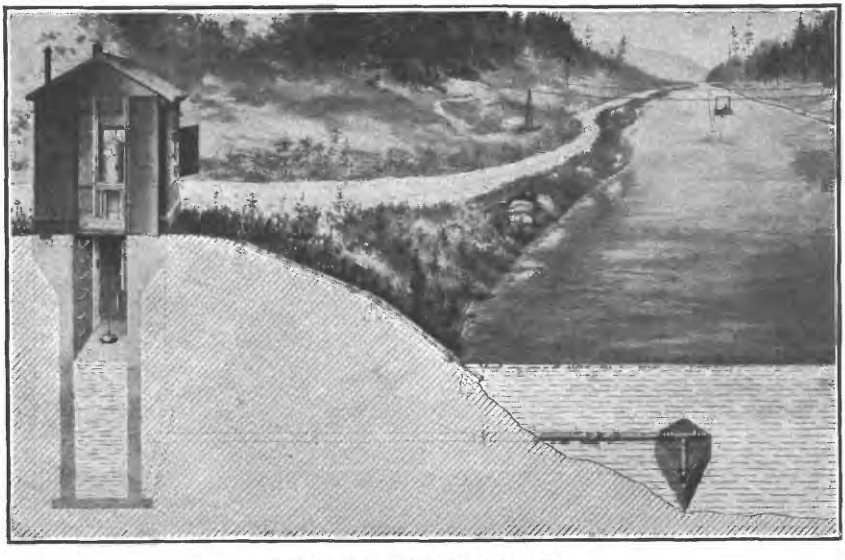
"Stage-discharge relation"; an abbreviation for the term "relation of gage height to discharge."

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

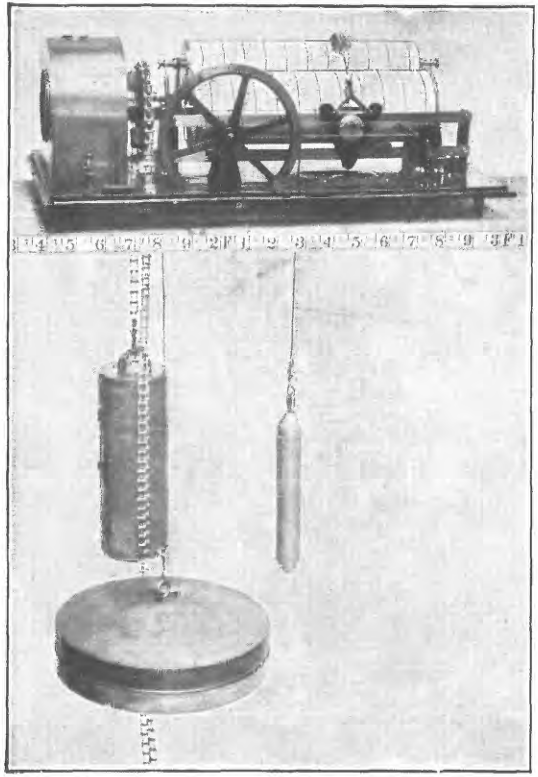
The "point of zero flow" for a gaging station is that point on the gage—the gage height—at which water ceases to flow over the control.



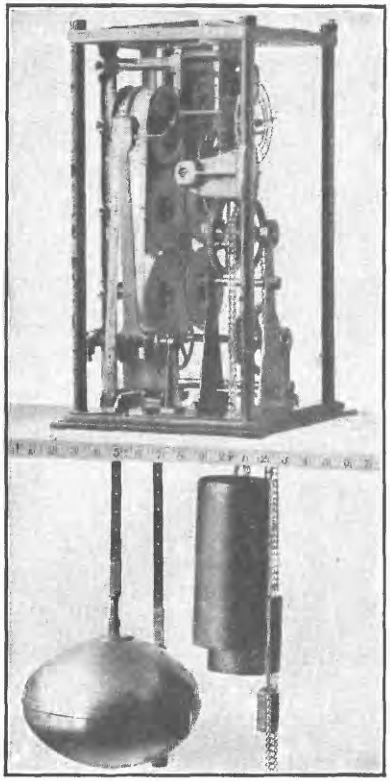
A. PRICE CURRENT METERS.



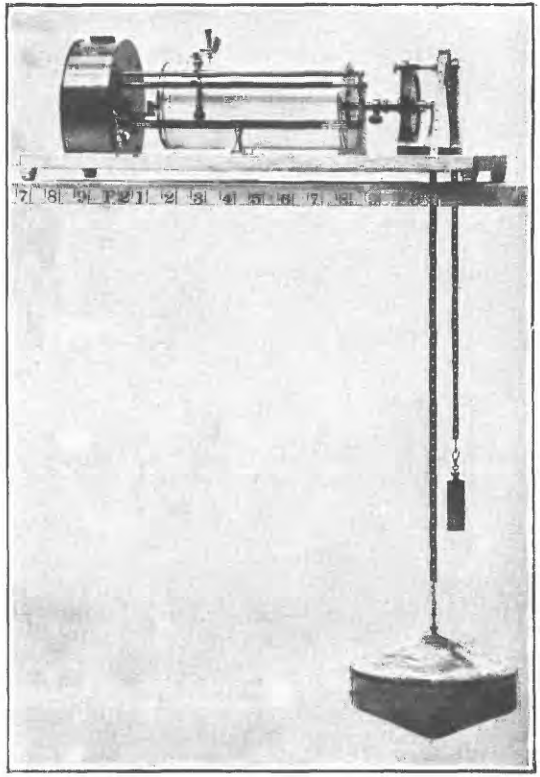
B. TYPICAL GAGING STATION.



A. STEVENS CONTINUOUS.



B. GURLEY PRINTING.



C. FRIEZ.

WATER-STAGE RECORDERS.

EXPLANATION OF DATA

The data presented in this report cover the year beginning October 1, 1921, and ending September 30, 1922. 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 consists of records of stage, measurements of discharge, and general information used to supplement the gage heights and discharge measurements in determining the daily flow. The records of stage are obtained either from direct readings on a staff gage or from a water-stage recorder that gives a continuous record of the fluctuations. Measurements of discharge are made with a current meter. (See Pls. I, II.) The general methods are outlined in standard textbooks on the measurement of river discharge.

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

The data presented for each gaging station in the area covered by this report comprise a description of the station, a table giving 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 fluctuations 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 (1) the 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 depth of 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 in inches" are therefore not computed if such errors

[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.

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 but unknown sources of error.

Many gaging stations on streams in the irrigated sections of the United States are located 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. Where values are given these can not be considered exact but as being 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, ground 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 monographs, bulletins, professional papers, and annual reports.

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

Part I. North Atlantic slope basins.
II. South Atlantic slope and eastern Gulf of Mexico basins.
III. Ohio River basin.
IV. St. Lawrence River basin.
V. Upper Mississippi River and Hudson Bay basins.
VI. Missouri River basin.
VII. Lower Mississippi River basin.
VIII. Western Gulf of Mexico basins.
IX. Colorado River basin.
X. Great Basin.
XI. Pacific slope basins in California.
XII. North Pacific slope basins in three parts:
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, on application, furnish lists giving prices.

3. Sets of the reports may be consulted in the libraries of the principal cities of 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., 316 Jackson Building.
Chattanooga, Tenn., 37 Municipal Building.
Columbus, Ohio, Brown Hall, Ohio State University.
Chicago, Ill., 940 Transportation Building.
Madison, Wis., care of Railroad Commission of Wisconsin.
Ames, Iowa, Highway Commission Building.
Rolla, Mo., Rolla Building, School of Mines and Metallurgy.
Topeka, Kans., 23 Federal Building.
Helena, Mont., 45–46 Federal Building.
Denver, Colo., 403 Post Office Building.
Salt Lake City, Utah, 313 Federal Building.
Idaho Fall, Idaho, 228 Federal Building.
Boise, Idaho, Federal Building.
Tacoma, Wash., 406 Federal Building.
Portland, Oreg., 606 Post Office Building.
San Francisco, Calif., 328 Customhouse.
Los Angeles, Calif., 600 Federal Building.
Tucson, Ariz., 210 Agricultural Building, University of Arizona.
Austin, Tex., State Capitol.
Honolulu, Hawaii, 25 Capitol Building.

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

Stream-flow records have been obtained at about 5,480 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	Descriptions, measurements, gage heights, and ratings	1893 and 1894.
16th A, pt. 2	Descriptive information only	
B 140	Descriptions, measurements, gage heights, ratings, and monthly discharge (also many data covering earlier years).	1895.
W 11	Gage heights (also gage heights for earlier years)	1896.
18th A, pt. 4	Descriptions, measurements, ratings, and monthly discharge (also similar data for some earlier years).	1895 and 1896.
W 15	Descriptions, measurements, and gage heights, eastern United States, eastern Mississippi River, and Missouri River above junction with Kansas.	1897.
W 16	Description, 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.
W 541 to 554	do	1922.

The records at the 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 following table gives, by years and drainage basins, the numbers of papers on surface-water supply published from 1899 to 1922. The data for any particular station will 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, 1899–1922

Year	I North Atlantic slope basins (St. John River to York River)	II South Atlantic and eastern Gulf of Mexico (James River to the Mississippi)	III Ohio River basin	IV St. Lawrence River and Great Lakes basins	V Hudson Bay and upper Mississippi River basins	VI Missouri River basin	VII Lower Mississippi River basin	VIII Western Gulf of Mexico basin	IX Colorado River basin	X Great Basin	XI Pacific slope basins in California	XII North Pacific slope basins		
												Pacific slope basins in Washington and upper Columbia River	Snake River basin	Lower Columbia River and Pacific slope basins in Oregon
1899 [a]	35	[b] 35, 36	36	36	36	[c] 36, 37	37	37	[d] 37, 38	38, [e] 39	38, [f] 39	38	38	38
1900 [g]	47, [h] 48	48	48, [i] 49	49	49	49, [j] 50	50	50	50	51	51	51	51	51
1901	65, 75	65, 75	65, 75	65, 75	[k] 65, 66, 75	66, 75	[k] 65, 66, 75	66, 75	66, 75	66, 75	66, 75	66, 75	66, 75	66, 75
1902	82	[b] 82, 83	83	[l] 82, 83	[k] 83, 85	84	[k] 83, 84	84	85	85	85	85	85	85
1903	97	[b] 97, 98	98	97	[k] 98, 99, [m] 100	99	[k] 98, 99	99	100	100	100	100	100	100
1904	[n] 124, [o] 125, [p] 126	[p] 126, 127	128	129	[k] 128, 130	130, [q] 131	[k] 128, 131	132	133	133, [r] 134	134	135	135	135
1905	[n] 165, [o] 166, [p] 167	[p] 167, 168	169	170	171	172	[k] 169, 173	174	175, [s] 177	176, [r] 177	177	178	178	[t] 177, 178
1906	[n] 201, [o] 202, [p] 203	[p] 203, 204	205	206	207	208	[k] 205, 209	210	211	212, [r] 213	213	214	214	214
1907–8	241	242	243	244	245	246	247	248	249	250, [r] 251	251	252	252	252
1909	261	262	263	264	265	266	267	268	269	270, [r] 271	271	272	272	272
1910	281	282	283	284	285	286	287	288	289	290	291	292	292	292
1911	301	302	303	304	305	306	307	308	309	310	311	312	312	312
1912	321	322	323	324	325	326	327	328	329	330	331	332–A	332–B	332–C
1913	351	352	353	354	355	356	357	358	359	360	361	362–A	362–B	362–C
1914	381	382	383	384	385	386	387	388	389	390	391	392	393	394
1915	401	402	403	404	405	406	407	408	409	410	411	412	413	414
1916	431	432	433	434	435	436	437	438	439	440	441	442	443	444
1917	451	452	453	454	455	456	457	458	459	460	461	462	463	464
1918	471	472	473	474	475	476	477	478	479	480	481	482	483	484
1919–20	501	502	503	504	505	506	507	508	509	510	511	512	513	514
1921	521	522	523	524	525	526	527	528	529	530	531	532	533	534
1922	541	542	543	544	545	546	547	548	549	550	551	552	553	554

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

COOPERATION

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 at Union, Mo. The Little River Drainage District cooperated in the maintenance of the stations on Castor and Whitewater rivers and on the three Little River ditches at Kirk. The Western Tie & Timber Co., of St. Louis, paid the gage reader's salary for the station on Current River near Eminence, Mo. The Dixie Power Co. paid the gage reader for the North Fork of White River near Tecumseh. The Caddo River Power & Irrigation Co., Little Rock, Ark., cooperated in the installation and operation of stations on Ouachita River in Arkansas.

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, Gov. H. A. Allen, chairman; H. A. Rice, secretary; and H. B. Walker. The station on Arkansas River at Garden City was maintained in cooperation with the State irrigation commissioner, George S. Knapp, and with Finney County through Ben Allen, county engineer. The city of Wichita through P. L. Brockway, city engineer, cooperated in operation of the station on Arkansas River near Wichita. The Kansas Gas & Electric Co., through E. C. Curtis, engineer, cooperated in operation of stations on Arkansas River and the diversion canal (at Arkansas City), Little Arkansas River, Walnut River, Verdigris River, and Neosho River (near Parsons).

DIVISION OF WORK

Data for stations in Missouri and Arkansas were collected and prepared for publication under the direction of E. L. Williams, district engineer, assisted by Reginald Waldo, V. L. Austin, W. R. Denison, H. E. Zoller, and Miss Jean I. McCaw.

Data for stations in Colorado were collected and prepared for publication under the direction of Robert Follansbee, district engineer, assisted by P.V. Hodges, M. B. Arthur, T. J. Watkins, and Miss Florence M. Hall.

Data for stations in Kansas were collected and prepared for publication under the direction of E. L. Williams, district engineer, assisted by H. B. Kinnison, W. R. Denison, Reginald Waldo, G. H. Barger, and Miss Maude A. Ten Eyck.

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

GAGING-STATION RECORDS

MERAMEC RIVER BASIN

MERAMEC RIVER NEAR SULLIVAN, MO.

LOCATION.—In N. ½ SW. ¼ sec. 35, T. 40 N., R. 2 W., at Sappington highway bridge, 3½ miles below Brazil Creek, 4½ miles below Thickety Creek, and 6 miles southeast of Sullivan, Franklin County.

DRAINAGE AREA.—1,550 square miles (measured on topographic and soil survey maps).

RECORDS AVAILABLE.—September 9, 1921, to September 30, 1922.

GAGE.—Chain gage bolted to upstream side of highway bridge; read by John V. Sappington.

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

CHANNEL AND CONTROL.—Bed composed of silt, gravel, and rock; clean and fairly permanent. Control is a bar of gravel and boulders 400 feet below the gage; fairly permanent. Small trees and brush grow on high parts of the bar.

EXTREMES OF DISCHARGE.—Maximum stage recorded during the period of records, 16.80 feet at 6.35 p. m. April 17 (discharge, 14,800 second-feet); minimum stage, 1.58 feet, at 10.40 a. m. August 14 (discharge, 273 second-feet). The flood of August, 1915, reached a stage of about 30.7 feet, determined by leveling on somewhat indefinite flood marks.

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

REGULATION.—Natural regulation through large springs.

ACCURACY.—Stage-discharge relation changed during the high water on April 18; not affected by ice. Rating curves used before and after the change 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 Meramec River near Sullivan, Mo., for the period September 9, 1921, to September 30, 1922

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
1921		*Feet*	*Sec.-ft.*	1922		*Feet*	*Sec.-ft.*
Sept. 9	E. L. Williams	2.18	399	Mar. 15	V. L. Austin	11.88	8,400
Oct. 4	Reginald Waldo	6.43	2,990	Apr. 7	do	7.44	3,650
Dec. 21	do	2.73	601	20	Reginald Waldo	8.07	4,190
				May 8	Austin and Williams	4.68	1,810
				July 10	Denison and Zoller	2.24	468

Daily discharge, in second-feet, of Meramec River near Sullivan, Mo., for the period September 9, 1921, to September 30, 1922

Day	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	------	810	405	960	860	590	860	12,800	3,080	630	720	392	585
2	------	1,120	375	1,350	810	1,010	760	8,550	2,570	630	1,560	376	630
3	------	3,000	375	3,720	760	1,230	715	4,530	2,220	585	1,800	360	500
4	------	3,000	345	2,760	760	1,010	715	3,320	2,040	585	1,080	360	462
5	------	1,660	345	2,140	810	910	810	3,560	1,860	585	820	360	462
6	------	1,180	345	1,860	860	810	1,120	3,640	2,100	540	675	345	426
7	------	910	345	1,600	760	715	1,230	3,640	2,100	540	585	345	392
8	------	810	345	1,350	715	630	1,180	3,000	1,800	540	540	330	376
9	375	760	375	1,120	670	590	1,120	3,880	1,560	540	500	330	360
10	550	670	345	1,010	670	590	1,540	5,100	1,440	540	462	350	675
11	470	590	375	960	630	550	2,360	8,790	1,380	540	500	330	585
12	435	550	345	910	630	550	2,140	7,350	1,260	820	462	317	540
13	910	510	345	810	590	510	1,800	4,360	1,140	1,200	462	278	462
14	1,470	470	345	760	550	470	4,530	5,850	1,080	920	462	278	426
15	1,860	470	345	715	550	470	8,790	6,180	1,020	675	426	291	376
16	1,660	435	345	670	510	470	7,590	5,520	970	585	426	317	360
17	960	435	345	630	510	435	3,320	12,000	1,020	540	426	330	317
18	715	405	550	670	510	435	2,760	13,800	970	500	720	330	360
19	590	405	9,030	670	510	435	2,280	8,790	920	500	585	317	360
20	550	375	10,500	630	470	435	4,200	4,120	870	462	500	317	345
21	550	375	4,120	590	470	435	4,040	3,240	820	462	500	360	345
22	490	375	2,140	590	470	435	2,760	2,640	820	462	462	2,100	345
23	490	375	1,600	760	470	715	2,140	2,290	820	462	630	1,620	345
24	670	375	1,410	2,920	435	1,470	2,000	2,100	820	426	426	920	345
25	1,410	375	2,760	4,800	435	1,410	2,520	2,040	770	426	426	585	330
26	1,230	375	2,760	2,440	435	1,230	3,800	1,980	770	426	426	540	330
27	910	375	1,800	1,730	435	1,010	7,590	2,100	770	462	462	376	330
28	715	375	1,470	1,410	435	910	4,900	7,590	720	500	462	392	330
29	630	375	1,230	1,180	435	------	3,880	9,030	675	540	462	376	330
30	630	375	1,120	1,060	435	------	5,850	4,280	675	540	462	376	330
31	------	405	------	960	435	------	12,800	------	630	------	392	426	------

Monthly discharge of Meramec River near Sullivan, Mo., for the period September 9, 1921, to September 30, 1922

[Drainage area, 1,550 square miles]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
1921					
September 9–30	1,860	375	1,040	0.671	0.55
1921–22					
October	3,000	375	733	.473	.55
November	10,500	345	1,550	1.00	1.12
December	4,800	590	1,410	.910	1.05
January	860	435	581	.375	.43
February	1,470	435	731	.472	.49
March	12,800	715	3,290	2.12	2.44
April	13,800	1,980	5,540	3.57	3.98
May	3,080	630	1,280	.826	.95
June	1,200	426	572	.369	.41
July	1,800	392	607	.392	.45
August	2,100	278	474	.306	.35
September	675	317	412	.266	.30
The year	13,800	278	1,430	.923	12.52

MERAMEC RIVER NEAR EUREKA, MO.

LOCATION.—In SE. ¼ sec. 32, T. 44 N., R. 4 E., at Votaw Ford highway bridge on Eureka-Valley Park road, one-fourth mile below Antire Creek, 1½ miles above St. Louis-San Francisco Railway bridge, 2 miles east of Eureka, St. Louis County, and 3 miles below Big River.

DRAINAGE AREA.—3,800 square miles (revised; measured on topographic and soil survey maps.)

RECORDS AVAILABLE.—August 26, 1903, to July 21, 1906; October 6, 1921, to September 30, 1922.

GAGE.—Chain gage bolted to handrail on downstream side of bridge; read by J. W. Paul. Datum of present gage not the same as that used 1903–1906.

DISCHARGE MEASUREMENTS.—Made from downstream side of highway bridge or by wading. Flood measurements are made from railroad bridge 1½ miles below gage.

CHANNEL AND CONTROL.—Bed composed of coarse gravel and boulders. Control is a short section of river just below gage; fairly permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during the year, 24.45 feet at 10.30 a. m. April 19 (discharge, 38,600 second-feet); minimum stage, 0.60 foot at 5 p. m. September 28 (discharge, 320 second-feet).

The flood of August 22, 1915, reached a stage of 38.8 feet, and the flood of February 1, 1916, a stage of 35.6 feet, determined by levels on high-water marks.

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

REGULATION.—Some natural regulation due to springs.

ACCURACY.—Stage-discharge relation fairly permanent; not affected by ice. Rating curve fairly well defined between 600 and 30,000 second-feet; extended beyond these limits. Gage read to hundredths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table. Records good except those below 500 second-feet.

Discharge measurements of Meramec River near Eureka, Mo., during the year ending September 30, 1922

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Oct. 5	Waldo and Williams	6.34	6,280	Apr. 14	Reginald Waldo	11.64	15,000
6	Reginald Waldo	4.35	3,620	21	do	9.50	10,100
Dec. 22	do	2.20	1,420	May 9	E. L. Williams	4.73	3,980
Mar. 17	V. L. Austin	13.19	18,600	July 12	Denison and Zoller	1.46	787

Daily discharge, in second-feet, of Meramec River near Eureka, Mo., for the year ending September 30, 1922

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	------	740	2,810	2,070	1,770	2,170	26,000	9,100	1,180	880	610	525
2	------	775	3,910	1,870	4,470	2,270	28,700	6,030	1,180	1,310	640	580
3	------	775	4,240	1,870	5,790	1,970	12,700	5,550	1,180	1,400	580	1,580
4	------	775	6,150	1,770	4,830	1,970	13,700	4,350	1,080	2,270	550	845
5	------	775	6,280	1,870	3,470	2,070	10,700	3,910	1,040	1,670	580	880
6	3,690	740	5,310	1,770	3,580	2,370	8,500	3,910	960	1,490	550	845
7	3,690	705	4,020	2,270	2,480	2,700	8,500	5,070	920	1,400	550	705
8	3,250	670	3,580	1,970	2,370	2,370	12,100	5,790	1,220	1,180	525	640
9	2,170	740	3,140	1,670	2,070	2,920	14,500	4,350	1,220	1,040	580	640
10	2,170	640	2,590	1,970	1,870	2,810	15,400	3,360	1,400	1,000	610	705
11	1,400	640	2,370	1,870	1,770	2,810	16,800	2,920	1,040	920	640	920
12	1,220	640	2,170	1,670	1,770	3,910	19,000	2,590	1,080	1,130	580	960
13	1,130	610	1,970	1,770	1,580	5,430	15,200	2,170	1,180	1,130	580	775
14	960	670	1,770	1,670	1,580	14,500	15,000	2,070	1,310	1,089	475	740
15	1,130	610	1,670	1,670	1,400	15,400	17,900	2,070	1,180	810	428	670
16	845	670	1,670	1,580	1,310	18,400	17,200	2,070	1,080	670	500	640
17	705	670	1,490	1,580	1,310	16,600	26,800	1,870	1,000	610	450	550
18	670	1,310	1,400	1,490	1,400	8,200	31,900	1,970	920	640	475	550
19	810	12,700	1,400	1,490	1,310	6,410	38,400	1,870	845	1,400	450	550
20	640	21,300	1,400	1,490	1,310	6,540	29,800	1,580	1,130	670	428	525
21	610	23,200	1,400	1,490	1,310	8,060	10,400	1,670	1,180	880	428	500
22	610	13,400	1,400	1,310	1,220	6,670	6,670	1,580	1,220	740	450	475
23	610	5,190	1,400	2,170	1,310	5,670	5,310	1,400	810	880	1,180	475
24	580	3,800	4,130	2,920	1,670	4,590	4,830	1,400	880	775	2,070	500
25	580	4,130	10,100	2,070	2,480	4,130	4,710	1,490	525	740	2,270	428
26	610	4,710	9,580	2,070	2,810	7,640	4,350	1,400	810	610	1,400	450
27	610	4,830	5,910	2,070	3,140	8,350	4,590	1,400	1,130	640	1,040	382
28	610	3,360	3,800	1,580	2,590	17,200	10,100	1,400	580	640	845	340
29	610	2,810	3,360	1,490	------	11,400	16,400	1,490	640	640	740	382
30	610	2,370	2,700	1,580	------	11,900	16,800	1,400	705	640	740	428
31	640	------	2,370	1,490	------	19,400	------	1,310	------	640	640	------

Monthly discharge of Meramec River near Eureka, Mo., for the year ending September 30, 1922

[Drainage area, 3,800 square miles]

Month	Discharge in second-feet				Run-off in inches
	Maximum	Minimum	Mean	Per square mile	
October 6–31	3,690	580	1,200	0.316	0.31
November	23,200	610	3,830	1.01	1.13
December	10,100	1,400	3,400	.895	1.03
January	2,920	1,490	1,790	.471	.54
February	5,790	1,220	2,280	.600	.62
March	19,400	1,970	7,320	1.93	2.22
April	38,400	4,350	15,400	4.05	4.52
May	9,100	1,310	2,860	.753	.87
June	1,400	525	1,020	.268	.30
July	2,270	610	985	.259	.30
August	2,270	428	729	.192	.22
September	1,580	382	640	.168	.19

18569°—25†—WSP 547——2

MERAMEC SPRING NEAR ST. JAMES, MO.

LOCATION.—In SE. ¼ sec. 1, T. 37 N., R. 6 W., 30 feet above log bridge, 600 feet below outlet of spring, 1 mile above mouth of spring branch, and 6 miles southeast of St. James, Phelps County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—March 1, 1903, to July 21, 1906,[2] and November 11, 1921, to September 30, 1922.

GAGE.—Vertical staff gage in two sections fastened to overhanging oak tree on right bank about 100 feet downstream from gage used from 1903 to 1906 and set at different datum; read by F. E. Beezley.

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

CHANNEL AND CONTROL.—Bed composed of coarse gravel; small growth of aquatic plants in channel. Control is a coarse gravel bar 200 feet below gage; clean and practically permanent. Stage-discharge relation affected by backwater from Meramec River during high stages.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period November 11, 1921, to September 30, 1922, 2.08 feet at 9 a. m. April 1 (affected by backwater from Meramec River); maximum discharge, 406 second-feet April 17; minimum discharge, 85 second-feet September 27–30.

1903–1906: Maximum discharge uncertain owing to backwater from Meramec River; minimum discharge, 73 second-feet during large part of January and February, 1904.

ACCURACY.—Stage-discharge relation changed May 14 when the log bridge below gage fell into water; not affected by ice but affected by backwater from Meramec River whenever river is more than about 6 feet above low-water stage. Rating curves well defined. Gage read to hundredths once daily except Sundays. Daily discharge ascertained by applying daily gage height to rating table. Records good except for periods of backwater from Meramec River.

Discharge measurements of Meramec Spring near St. James, Mo., during the year ending September 30, 1922

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Nov. 11	Reginald Waldo	1.04	89.9	May 25	E. L. Williams	1.37	146
Mar. 7	E. L. Williams	1.33	163	July 10	Denison and Zoller	1.27	116
May 6	Austin and Williams	1.43	235	Aug. 12	W. R. Denison	1.20	93.1

[2] Called Meramec Spring near Meramec, Mo., in Water-Supply Papers 99, 131, 173, and 209. High discharges given in those reports are probably much too large, as no allowance was made for backwater from Meramec River.

Daily discharge, in second-feet, of Meramec Spring near St. James, Mo., for the year ending September 30, 1922

Day	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1		146	a 142	118	128	370	266	124	137	102	120
2		283	a 137	152	123	361	250	122	a 144	102	114
3		283	133	144	118	352	218	122	152	102	a 112
4		a 250	130	136	126	317	209	a 120	a 140	102	a 109
5		218	152	a 131	a 147	300	203	117	127	102	107
6		206	146	126	168	352	197	114	127	102	104
7		188	138	118	168	317	a 190	114	122	102	100
8		174	a 136	116	155	283	182	122	117	102	100
9		163	133	116	146	a 292	180	122	a 116	102	97
10		155	130	116	234	300	177	120	114	102	100
11	93	a 148	130	113	a 221	352	168	a 121	112	100	114
12		141	123	a 110	a 207	317	166	a 122	a 110	100	110
13		138	120	106	194	300	160	122	a 109	a 98	104
14		133	120	106	317	370	a 156	117	a 108	97	102
15		128	a 116	103	334	388	152	114	107	95	100
16		126	113	100	317	a 397	152	114	104	95	97
17		123	110	100	250	406	152	112	104	95	a 96
18		a 126	118	100	234	388	152	a 112	117	100	95
19		128	113	a 100	a 226	334	147	112	110	100	92
20		126	110	100	218	283	142	110	107	a 104	90
21	197	120	108	98	212	266	a 141	107	104	107	90
22	166	120	a 106	a 143	200	218	140	107	104	110	90
23	152	126	103	188	185	a 215	137	107	a 106	120	90
24	a 179	234	100	197	212	212	137	104	107	114	a 90
25	206	a 216	100	177	218	206	134	a 107	a 110	112	90
26	188	197	103	a 163	a 285	203	134	110	112	110	87
27	a 177	177	103	149	352	200	132	122	114	a 106	85
28	166	166	100	136	317	370	a 131	120	114	102	85
29	155	155	a 100		283	317	130	117	112	100	85
30	149	149	a 100		334	a 292	a 128	122	107	97	85
31		146	103		352		127		104	97	

a Gage not read; discharge interpolated.

NOTE.—Backwater from Meramec River Mar. 31, Apr. 1 and 2; discharge estimated.

Monthly discharge of Meramec Spring near St. James, Mo., for the year ending September 30, 1922

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
December	283	120	167	10,300
January	152	100	119	7,320
February	197	98	127	7,050
March	352	118	225	13,800
April	406	200	309	18,400
May	266	127	164	10,100
June	124	104	116	6,900
July	152	104	115	7,070
August	120	95	103	6,330
September	120	85	98.0	5,830

BOURBEUSE RIVER AT UNION, MO.

LOCATION.—In SW. ¼ 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, and 7 miles above Birch Creek.

DRAINAGE AREA.—767 square miles (measured on topographic maps and map of Missouri).

RECORDS AVAILABLE.—June 7, 1921, to September 30, 1922. The United States Weather Bureau has records of stage since October 19, 1916.

GAGE.—Chain gage on downstream side of highway bridge; read by William J. Keller. Prior to September 24, 1921, a vertical staff gage on left bank 150 feet upstream, set to same datum. Sea-level elevation of zero of gage, 491.9 feet, as reported by the United States Weather Bureau.

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

CHANNEL AND CONTROL.—Bed composed of clay and coarse gravel. Control is coarse gravel bar 800 feet below gage; fairly permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during the year, 14.70 feet at 4 p. m. April 2 (discharge, 14,600 second-feet); minimum stage, 0.84 foot September 29 and 30 (discharge, 42 second-feet).

1921–1922: Maximum and minimum discharge occurred in 1922 as given above.

The United States Weather Bureau reports a maximum stage of 27.3 feet on August 22, 1915.

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed during high water April 2; not affected by ice. Rating curve used before the change, fairly well defined; curve used after the change, 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 Bourbeuse River at Union, Mo., during the year ending September 30, 1922

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Oct. 5	Waldo and Williams	4.04	1,570	May 8	Austin and Williams	3.52	1,060
Dec. 21	Reginald Waldo	2.04	330	9	Williams and Austin	3.04	696
Feb. 13	Waldo and Austin	1.63	240	June 7	V. L. Austin	1.39	87.2
Mar. 16	V. L. Austin	11.05	8,810	July 11	Denison and Zoller	1.30	76.1
Apr. 20	Reginald Waldo	4.18	1,630				

Daily discharge, in second-feet, of Bourbeuse River at Union, Mo., for the year ending September 30, 1922

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	318	228	271	352	352	410	11,200	1,080	160	66	62	61
2	318	215	335	318	1,680	352	14,100	775	138	82	59	1,460
3	430	318	860	302	3,340	302	5,630	610	123	103	56	400
4	2,950	242	2,160	335	1,220	286	1,800	525	113	198	54	220
5	1,520	202	1,150	318	800	302	1,250	450	105	152	51	155
6	710	167	1,000	710	570	475	1,040	500	98	130	51	111
7	452	156	1,000	770	430	860	2,320	1,340	92	111	50	91
8	352	136	860	520	371	930	3,140	1,340	98	87	49	76
9	302	136	650	410	318	680	6,650	670	113	76	49	71
10	242	136	545	335	271	545	5,410	475	202	75	47	80
11	228	127	430	318	242	710	3,540	400	105	73	47	76
12	202	136	390	286	228	1,520	3,740	360	88	73	50	67
13	178	167	335	271	215	1,000	1,800	320	86	70	50	64
14	146	156	302	242	202	4,040	1,890	280	80	66	46	60
15	156	146	286	228	190	8,040	3,340	265	84	60	45	58
16	146	146	256	228	178	6,420	2,680	265	97	59	47	56
17	136	136	242	202	156	1,760	10,100	250	88	58	46	54
18	136	286	228	190	146	1,150	11,300	235	103	58	46	51
19	118	2,590	242	178	146	930	8,040	235	103	56	45	51
20	118	7,340	286	178	146	770	1,720	220	94	55	44	49
21	110	5,520	352	178	136	800	1,160	210	86	55	44	48
22	110	1,380	286	156	136	860	845	202	81	53	49	48
23	110	800	475	146	190	850	670	192	76	57	51	46
24	102	620	1,840	146	271	520	580	182	69	83	920	46
25	95	497	4,970	136	1,300	570	610	175	67	77	340	46
26	102	410	1,840	146	800	3,240	610	180	66	76	205	44
27	102	352	930	127	570	7,000	775	208	64	78	134	43
28	95	318	680	127	475	7,920	1,640	155	61	69	97	43
29	95	302	520	127	------	2,000	5,300	143	60	68	70	42
30	95	271	452	127	------	2,240	1,980	138	60	74	70	42
31	146	------	390	127	------	6,880	------	138	------	69	65	------

Monthly discharge of Bourbeuse River at Union, Mo., for the year ending September 30, 1922

[Drainage area, 767 square miles]

Month	Discharge in second-feet				Run-off in inches
	Maximum	Minimum	Mean	Per square mile	
October	2,950	95	323	0.421	0.49
November	7,340	127	788	1.03	1.15
December	4,970	228	792	1.03	1.19
January	770	127	266	.347	.40
February	3,340	136	539	.703	.73
March	8,040	286	2,070	2.70	3.11
April	14,100	580	3,830	4.99	5.57
May	1,340	138	404	.527	.61
June	202	60	95.3	.124	.14
July	198	53	79.6	.104	.12
August	920	44	98.0	.128	.15
September	1,460	42	125	.163	.18
The year	14,100	42	784	1.02	13.84

BIG RIVER AT BYRNESVILLE, MO.

LOCATION.—In SE. ¼ sec. 12, T. 42 N., R. 3 E., at highway bridge in Byrnesville, Jefferson County, 200 feet below dam and mill at Byrnesville, 4 miles above Head's Creek and Rockford dam, and 13 miles above mouth.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—May 10 to September 30, 1922.

GAGE.—Chain gage bolted to downstream side of bridge; read by Charles Stiedle.

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

CHANNEL AND CONTROL.—Bed composed of solid rock, gravel, and silt. Control is a bar of clean coarse gravel 500 feet below gage; fairly permanent.

EXTREMES OF STAGE.—Maximum stage recorded during the period of record, 5.13 feet at 1.35 p. m. May 10; minimum stage, 2.02 feet at 6 p. m. September 30.

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

REGULATION.—Several small low-head dams developing power for local grist mills have little effect on the flow.

ACCURACY.—Gage read to hundredths twice daily. Records excellent. Data not sufficient for determination of daily discharge.

Discharge measurements of Big River at Byrnesville, Mo., during the year ending September 30, 1922

Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*
May 10	E. L. Williams	5.12	830
June 17	Reginald Waldo	3.00	223
July 13	Zoller and Denison	2.48	570

Daily gage height, in feet, of Big River at Byrnesville, Mo., for the year ending September 30, 1922

Day	May	June	July	Aug.	Sept.	Day	May	June	July	Aug.	Sept.
1	------	3.46	3.44	2.71	2.70	16	4.50	3.12	3.06	2.74	2.72
2	------	3.41	4.11	2.82	2.66	17	4.29	2.95	2.92	2.73	2.50
3	------	3.33	4.50	2.73	2.72	18	4.36	2.90	2.82	2.61	2.44
4	------	3.27	4.18	2.47	3.47	19	4.15	2.88	3.88	2.22	2.40
5	------	3.23	3.58	2.50	3.27	20	4.00	2.97	3.76	2.45	2.60
6	------	3.23	3.43	2.41	3.10	21	3.89	3.19	3.22	2.73	2.47
7	------	3.20	3.26	2.59	2.84	22	3.84	3.41	3.05	2.74	2.38
8	------	4.28	3.10	2.31	2.73	23	3.70	3.02	2.86	4.34	2.25
9	------	3.64	2.95	2.35	2.54	24	3.79	2.85	3.02	4.74	2.22
10	5.10	3.32	2.92	2.28	3.00	25	3.75	2.96	3.08	4.00	2.29
11	4.87	3.20	2.94	2.39	3.25	26	3.64	2.79	2.84	3.81	2.33
12	4.92	3.18	3.11	2.28	3.41	27	4.33	2.69	2.70	3.35	2.37
13	4.61	3.16	4.30	2.09	3.16	28	4.12	2.86	2.74	3.07	2.40
14	4.46	3.42	3.60	2.10	2.90	29	3.95	3.28	2.69	2.90	2.19
15	4.50	3.27	3.16	2.21	2.86	30	3.65	3.23	2.72	2.84	2.05
						31	3.50	------	2.68	2.73	------

HEADWATER DIVERSION CHANNEL

CASTOR RIVER AT ZALMA, MO.

LOCATION.—In S. ½ sec. 29, T. 29 N., R. 9 E., at highway bridge in Zalma, Bollinger County, 2 miles below Perkins Creek, 4 miles above Cato Slough, and 7 miles above Headwater Diversion levee of Little River Drainage District.

DRAINAGE AREA.—395 square miles (measured on topographic maps, soil survey maps, and map of Missouri).

RECORDS AVAILABLE.—September 12, 1921, to September 30, 1922. The Little River Drainage District, Cape Girardeau, has records of stage since July 1, 1919.

GAGE.—Chain gage bolted to downstream side of bridge; read by Lowell King. Zero of gage 300 feet above mean sea level.

DISCHARGE MEASUREMENTS.—Made from downstream side of bridge.

CHANNEL AND CONTROL.—Bed composed of sand, gravel, and silt; fairly permanent. No well-defined control; probably shifting.

EXTREMES OF DISCHARGE.—Maximum stage recorded during the period of records, 74.0 feet at 8 a. m. November 20 (discharge, 8,100 second-feet); minimum stage, 51.31 feet at 8 a. m. August 21 (discharge, 36 second-feet).

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

REGULATION.—None.

DIVERSIONS.—During extremely high stages the river overflows the neck of a horseshoe bend and all flow does not pass the bridge section. Records, however, show the entire flow of the stream. Entire flow is diverted 7 miles below gage into Headwater Diversion Channel, which empties into Mississippi River 3½ miles south of Cape Girardeau.

ACCURACY.—Stage-discharge relation has remained permanent; not affected by ice. Gage read to hundredths twice daily. Rating curve fairly well defined up to 4,000 second-feet and extended above that point. Daily discharge ascertained by applying mean daily gage height to rating table. Records good.

COOPERATION.—Gage-height record, prior to November 29, 1921, furnished by Little River Drainage District, through L. L. Hidinger, chief engineer.

Discharge measurements of Castor River at Zalma, Mo., for the period September 12, 1921, to September 30, 1922

Date	Made by—	Gage height[a]	Discharge	Date	Made by—	Gage height	Discharge
1921		*Feet*	*Sec.-ft.*	1922		*Feet*	*Sec.-ft.*
Sept. 12	Williams and Mulholland [b]	52.36	134	Mar. 16	E. L. Williams	64.78	3,230
				16	do	63.36	2,680
Nov. 29	Waldo and Mulholland [b]	57.18	720	June 14	Reginald Waldo	51.95	90.8
Dec. 30	Reginald Waldo	55.41	524				

[a] Gage heights may be referred to mean sea level by adding 300.00 feet.
[b] Engineer for Little River Drainage District.

Daily discnarge, in second-feet, of Castor River at Zalma, Mo., for the period September 12, 1921, to September 30, 1922

Day	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	------	590	117	556	437	1,040	437	7,680	896	159	87	51	69
2	------	409	107	510	381	2,780	395	5,050	683	159	92	51	78
3	------	299	107	451	353	1,490	381	2,060	608	137	112	49	78
4	------	299	107	495	353	960	395	1,490	540	137	273	47	87
5	------	261	107	465	395	723	395	1,290	556	127	181	45	92
6	------	237	97	423	381	644	437	3,200	495	117	132	43	82
7	------	203	97	395	353	525	590	1,810	451	117	299	43	74
8	------	192	97	381	423	465	626	1,220	409	117	203	41	64
9	------	181	107	353	423	437	556	1,270	367	117	117	40	60
10	------	170	117	325	423	409	1,840	1,190	353	112	97	40	60
11	------	148	137	299	395	381	1,840	2,290	312	107	97	38	82
12	137	137	127	286	381	353	1,160	2,060	286	102	92	38	82
13	127	127	127	273	353	325	852	1,240	273	97	78	38	69
14	117	117	117	261	339	299	1,160	960	261	97	92	38	74
15	107	117	107	249	325	286	2,600	852	237	92	87	41	60
16	97	117	107	237	299	261	2,920	764	225	82	78	41	56
17	97	107	127	395	299	249	1,430	1,490	225	82	74	43	51
18	97	107	1,270	590	286	237	1,040	1,520	214	78	69	43	49
19	78	97	7,200	540	286	237	1,220	990	192	78	69	43	46
20	97	87	8,100	495	273	273	2,000	743	181	74	64	39	48
21	87	87	5,200	437	261	465	1,570	626	170	78	60	35	48
22	97	87	2,120	409	249	423	1,040	540	181	82	60	87	49
23	97	87	1,540	437	237	480	786	480	339	78	56	299	49
24	830	87	1,240	2,530	225	626	663	451	261	69	78	181	48
25	556	78	1,780	1,750	225	540	573	423	214	69	69	127	45
26	325	87	1,380	1,380	214	495	644	409	249	69	69	102	43
27	273	107	2,670	990	203	495	2,220	451	225	82	64	87	42
28	237	97	1,380	743	203	451	1,780	3,280	203	82	69	78	43
29	214	97	896	525	203	------	1,220	2,560	192	82	60	69	42
30	299	107	703	510	192	------	3,580	1,240	170	102	56	64	42
31	------	117	------	465	192	------	7,080	------	159	------	56	64	------

Monthly discharge of Castor River at Zalma, Mo., for the period September 12, 1921, to September 30, 1922

[Drainage area, 395 square miles]

Month	Discharge in second-feet				Run-off in inches
	Maximum	Minimum	Mean	Per square mile	
1921					
September 12-30	830	78	209	0.529	0.37
1921-22					
October	590	78	163	.413	.48
November	8,100	97	1,250	3.16	3.53
December	2,530	237	586	1.48	1.71
January	437	192	308	.780	.90
February	2,780	237	584	1.48	1.54
March	7,080	381	1,400	3.54	4.08
April	7,680	409	1,650	4.18	4.66
May	896	159	327	.828	.95
June	159	69	99.4	.252	.28
July	299	56	99.7	.252	.29
August	299	36	66.0	.167	.19
September	92	42	60.1	.152	.17
The year	8,100	36	549	1.39	18.78

WHITEWATER RIVER AT WHITEWATER, MO.

LOCATION.—In grant 2271, T. 30 N., R. 11 E., at the St. Louis, Iron Mountain & Southern Railway bridge half a mile west of Whitewater, Cape Girardeau County, 1 mile above Crooked Creek, 3 miles above Headwater Diversion Channel, and 10 miles below Byrd's Creek.

DRAINAGE AREA.—326 square miles (measured on United States soil survey maps).

RECORDS AVAILABLE.—September 12, 1921, to September 30, 1922. The Little River Drainage District has records of stage since February, 1911.

GAGE.—Chain gage fastened to upstream side of railroad bridge; read by William Fingerhut. Prior to November 30, 1921, a vertical staff gage in two sections fastened to bridge piers on downstream side. Both gages set to same datum.

DISCHARGE MEASUREMENTS.—Made from upstream side of highway bridge 2,000 feet below gage or by wading.

CHANNEL AND CONTROL.—Bed composed of sand, gravel, and silt; shifting; channel obstructed by driftwood at railroad bridge. Control is a section of rocks and boulders just above the highway bridge; permanent.

EXTREMES OF STAGE.—Maximum stage recorded during the period of records, 55.5 feet on November 10; minimum stage, 31.08 feet at 7 a. m. August 10.

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

REGULATION.—None.

DIVERSIONS.—Entire flow of river is diverted 3 miles below gage into Headwater Diversion Channel, which empties into Mississippi River 3½ miles south of Cape Girardeau.

ACCURACY.—Stage-discharge relation subject to back water effect from Headwater Diversion Channel. Gage read to hundredths once daily. Data inadequate for determination of discharge.

COOPERATION.—Gage-height record prior to November 30, 1921, was furnished by Little River Drainage District through L. L. Hidinger, chief engineer.

Discharge measurements of Whiiewater River at Whitewater, Mo., for the period September 12, 1921, to September 30, 1922

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Sept. 12	Williams and Mulholland [a]	32.3	64.6	Mar. 17	E. L. Williams	40.67	757
				17	do	40.53	730
Nov. 30	Waldo and Mulholland	38.85	352	June 15	Reginald Waldo	32.17	55.8
Dec. 29	Reginald Waldo	35.60	317				

a Engineer for Little River Drainage District.

Daily gage height, in feet, of Whitewater River at Whitewater, Mo., for the period September 12, 1921, to September 30, 1922.

Day	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	------	38.6	32.2	37.5	33.97	34.46	33.90	53.73	39.85	32.36	32.22	31.93	32.25
2	------	34.2	32.1	35.4	33.60	48.71	33.84	50.30	38.52	32.46	33.32	31.82	38.67
3	------	33.4	32.1	34.6	33.43	43.10	33.62	46.58	37.26	32.42	42.14	31.71	32.34
4	------	33.7	32.1	34.7	33.43	39.00	34.20	44.72	36.50	32.37	35.55	31.64	32.02
5	------	33.0	32.1	35.9	36.60	37.15	34.61	43.04	35.85	32.30	34.31	31.64	32.00
6	------	32.8	32.1	34.3	34.60	36.42	35.25	42.37	35.01	32.63	32.93	31.92	32.92
7	------	32.6	32.1	34.0	33.90	35.40	37.18	41.40	34.37	32.26	32.64	31.78	31.78
8	------	32.5	32.1	33.7	33.93	34.39	36.74	40.45	33.94	32.24	37.85	31.60	31.74
9	------	32.5	32.1	33.5	35.77	34.02	35.45	39.85	33.65	32.24	33.77	31.16	31.72
10	------	32.5	33.2	33.14	34.80	33.90	42.00	40.08	33.41	32.24	32.50	31.08	31.68
11	------	32.3	32.5	33.18	34.45	33.75	43.15	41.32	33.32	32.16	32.34	31.64	32.28
12	32.2	32.3	32.3	33.12	34.10	33.59	39.51	42.86	33.14	33.22	32.22	31.65	32.14
13	32.2	32.3	32.3	33.02	33.65	33.41	37.78	41.09	33.00	35.10	35.14	31.66	31.82
14	32.2	32.3	32.2	33.00	33.55	33.18	37.97	40.62	32.91	32.50	32.54	31.66	31.70
15	32.1	32.2	32.2	32.84	33.35	33.03	45.10	40.52	32.86	32.25	32.26	31.62	31.69
16	32.0	32.2	32.1	32.74	33.28	32.98	45.80	40.52	32.80	32.16	32.18	31.67	31.67
17	32.7	32.2	32.5	34.86	33.10	32.85	41.03	40.68	32.76	32.10	32.12	31.67	31.64
18	32.2	32.2	39.9	42.20	33.14	32.85	39.49	44.35	32.74	32.08	32.05	31.88	31.62
19	32.0	32.2	51.9	36.20	33.30	32.86	39.64	41.87	32.67	32.47	32.02	31.72	31.58
20	32.0	32.2	55.5	34.91	33.14	32.90	43.21	41.32	32.60	32.60	31.97	31.68	31.62
21	32.0	32.2	52.2	34.30	33.00	36.82	41.03	40.96	32.54	33.29	31.92	31.68	31.65
22	32.0	32.2	48.5	33.90	32.98	35.21	38.92	40.99	32.55	32.50	31.92	31.71	31.71
23	32.0	32.2	46.1	33.93	32.80	34.77	37.31	40.58	38.33	32.23	31.90	37.34	31.62
24	41.2	32.0	44.0	44.92	32.79	36.35	36.15	39.95	33.64	32.13	34.57	32.82	31.65
25	36.5	32.0	45.5	49.46	32.64	35.23	35.55	39.56	32.96	32.09	32.56	32.20	31.60
26	34.5	32.0	42.0	41.65	32.74	34.58	35.17	38.96	32.82	36.35	32.04	31.98	31.56
27	33.0	32.0	47.9	39.13	32.76	34.38	45.61	38.27	32.83	33.14	31.96	31.88	32.00
28	32.7	32.1	46.6	37.58	32.60	34.26	43.40	47.92	32.72	32.32	31.90	31.81	31.70
29	32.5	32.2	41.5	35.78	32.62	------	40.26	48.67	32.56	33.51	31.90	31.78	32.04
30	37.2	32.3	39.3	34.73	32.70	------	47.06	41.74	32.50	32.34	31.91	31.77	31.50
31	------	32.2	------	34.25	32.78	------	53.08	------	32.48	------	32.12	31.76	------

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 Clark's Creek, 4 miles below Big Creek and 3 miles east of Patterson, Wayne County.

DRAINAGE AREA.—956 square miles (measured on topographic maps and base map of Missouri).

RECORDS AVAILABLE.—June 16, 1921, to September 30, 1922.

GAGE.—Chain gage fastened to upstream side of highway bridge; read by G. Bennett and William Harris.

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

CHANNEL AND CONTROL.—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 the year, 20.0 feet (estimated from flood marks) on November 19 (discharge, 36,600 second-feet); minimum stage, 2.11 feet August 21 (discharge, 6 second-feet).

1921–1922: Maximum and minimum discharge same as given above.

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

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent during year; not affected by ice. Rating curve 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 St. Francis River near Patterson, Mo., during the year ending September 30, 1922

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Nov. 14	Reginald Waldo	2.55	140	Mar. 18	E. L. Williams	5.06	1,990
22	do	5.16	2,000	June 8	Reginald Waldo	2.67	141

Daily discharge, in second-feet, of St. Francis River near Patterson, Mo., for the year ending September 30, 1922

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	1,730	235	1,010	788	1,910	788	15,300	1,910	415	196	60	96
2	a1,170	160	975	680	5,500	750	5,340	1,550	388	187	76	92
3	610	144	1,050	578	2,460	680	3,320	1,460	344	900	96	116
4	578	120	a1,090	715	1,730	645	2,180	1,380	205	788	64	108
5	348	120	1,130	750	1,380	788	3,440	1,300	174	578	60	96
6	360	a112	1,380	1,010	1,130	1,460	8,360	1,380	164	310	52	108
7	182	104	1,380	862	938	2,280	3,680	1,130	156	270	56	112
8	255	104	1,210	825	715	1,730	2,460	1,050	205	192	44	96
9	a168	100	788	825	645	1,380	2,660	975	160	148	32	76
10	80	120	750	862	645	4,180	2,960	788	192	92	25	76
11	178	144	680	788	878	3,800	11,400	750	156	152	20	68
12	160	144	545	645	545	2,280	4,460	645	174	164	22	52
13	132	a144	512	610	512	1,910	2,660	610	148	160	14	40
14	136	144	415	578	480	2,560	2,090	512	148	128	15	38
15	136	144	415	512	415	11,600	3,320	545	136	164	13	28
16	a124	144	349	448	360	4,890	2,560	480	136	136	64	32
17	112	415	750	480	310	2,560	2,660	415	128	182	52	38
18	104	1,210	788	512	300	1,820	4,890	448	116	140	40	35
19	96	36,600	862	480	285	2,090	2,280	388	108	124	32	28
20	88	a19,900	715	448	415	6,810	1,730	360	96	124	15	35
21	80	3,200	578	415	645	3,320	1,460	344	108	116	6	32
22	80	1,640	610	354	715	2,280	1,300	415	116	84	512	25
23	a68	4,320	900	332	305	1,820	1,050	354	124	76	975	22
24	56	5,190	13,200	250	1,460	1,460	975	448	112	72	388	25
25	72	5,820	4,600	310	1,130	1,210	938	448	100	76	305	18
26	72	4,890	2,370	290	1,050	1,380	1,380	388	116	72	225	15
27	80	a3,140	1,730	275	900	4,460	1,820	388	148	132	174	12
28	80	1,380	1,380	260	825	4,040	13,500	388	192	140	132	10
29	160	1,460	1,210	240	-------	2,840	4,740	480	220	140	120	12
30	a208	1,210	975	200	-------	11,600	2,460	388	196	116	108	10
31	255	-------	900	220	-------	26,800	-------	388	-------	88	100	-------

a Discharge interpolated; gage not read.

Monthly discharge of St. Francis River near Patterson, Mo., for the year ending September 30, 1922

[Drainage area, 956 square miles]

Month	Discharge in second-feet				Run-off in inches
	Maximum	Minimum	Mean	Per square mile	
October	1,730	56	257	0.269	0.31
November	36,600	100	3,090	3.23	3.60
December	13,200	349	1,460	1.53	1.76
January	1,010	200	534	.559	.64
February	5,500	285	1,000	1.05	1.09
March	26,800	645	3,750	3.92	4.52
April	15,300	938	3,910	4.09	4.56
May	1,910	344	726	.759	.88
June	415	100	173	.181	.20
July	900	72	202	.211	.24
August	975	6	190	.199	.23
September	116	10	51.7	.054	.06
The year	36,600	6	1,270	1.34	18.09

LITTLE RIVER DITCH NO. 1 AT KIRK, MO.

LOCATION.—In sec. 27, T. 19 N., R. 10 E., at St. Louis-San Francisco Railway bridge at Kirk, Dunklin County, 9½ miles below ditch 63, the nearest lateral, and 20 miles above Arkansas State line where ditch empties into Big Lake.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—September 13, 1921, to September 30, 1922. The Little River Drainage District, Cape Girardeau, Mo., has records of stage since May, 1920.

GAGE.—Chain gage bolted to downstream guardrail of railroad pile trestle; read by B. F. Brewer. Prior to December 2, 1921, a painted vertical staff fastened to pile trestle on downstream side. Zeros of both gages 200 feet above mean sea level.

DISCHARGE MEASUREMENTS.—Made from downstream side of highway bridge on Kennett-Hayti road, 1½ miles below the gage or by wading near highway bridge.

CHANNEL AND CONTROL.—Bed composed of clean sand and small gravel; fairly permanent; occasional snags lodged in bed. No well-defined control.

EXTREMES OF DISCHARGE.—Maximum stage recorded during the period of records, 56.25 feet on April 4 (discharge, 5,940 second-feet); minimum discharge, 110 second-feet September 17 and 19–21, 1921.

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

REGULATION.—None.

DIVERSIONS.—Entire flow of Castor and Whitewater rivers, and other small streams formerly flowing into Little River, are now diverted into Mississippi River 70 miles north of the station. The drainage west and south of ditch 44, which enters 17 miles above, is diverted into ditch 81; and the drainage south of ditch 63, which enters 9½ miles above, is diverted into ditch 66. The three main ditches, Nos. 1, 66, and 81, run parallel from a point 9 miles above the station to the Arkansas State line, where the drainage district ends.

ACCURACY.—Stage-discharge relation changed slightly during the high water on March 16; not affected by ice. Rating curve used October 1 to March 15, fairly well defined; curve used, March 16 to September 30, well defined. Gage read to half-tenths once daily; readings not absolutely reliable. Daily discharge ascertained by applying daily gage height to rating table. Records fair.

COOPERATION.—Gage-height record prior to December 2, 1921, furnished by Little River Drainage District, through L. L. Hidinger, chief engineer.

Discharge measurements of Little River ditch No. 1 at Kirk, Mo., for the period September 13, 1921, to September 30, 1922

Date	Made by—	Gage height[a]	Discharge	Date	Made by—	Gage height[a]	Discharge
1921		*Feet*	*Sec.-ft.*	1922		*Feet*	*Sec.-ft.*
Sept. 13	Williams and Mulholland[b]	45.35	163	Mar. 15	E. L. Williams	54.02	4,380
Dec. 2	Waldo and Mulholland	52.97	3,430	May 11	Reginald Waldo	48.04	1,050
28	Reginald Waldo	50.98	2,440	June 13	do	45.91	388

[a] Add 200 feet to gage height to obtain elevation above mean sea level.
[b] Engineer for Little River Drainage District.

Daily discharge, in second-feet, of Little River ditch No. 1 at Kirk, Mo., for the period September 13, 1921, to September 30, 1922

Day	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	------	480	215	4,080	1,680	745	1,580	5,460	2,580	545	292	192	242
2	------	390	215	3,570	1,490	1,180	1,580	5,720	1,740	515	292	192	242
3	------	390	215	3,270	1,310	2,530	1,490	5,890	1,780	485	318	192	242
4	------	390	215	2,860	1,400	1,980	1,490	5,890	1,740	455	318	192	242
5	------	390	215	2,800	1,400	1,680	1,400	5,890	1,600	455	318	192	242
6	------	390	215	2,030	1,310	1,490	1,400	5,720	1,520	455	318	192	242
7	------	390	215	1,880	1,220	1,680	1,400	5,550	1,430	455	330	192	230
8	------	420	215	1,680	1,140	1,630	1,260	5,210	1,270	430	455	192	218
9	------	175	215	1,490	1,100	1,400	1,260	4,720	1,190	430	885	180	192
10	------	195	215	1,400	1,060	1,310	1,630	4,290	1,110	405	1,190	180	180
11	------	235	215	1,220	1,310	1,220	2,580	4,020	1,070	405	815	180	180
12	------	235	215	1,220	1,400	1,140	2,580	4,430	1,030	405	575	180	170
13	305	235	215	1,140	1,490	1,060	2,130	3,630	990	380	515	180	170
14	305	235	215	1,060	1,310	985	1,980	2,800	955	368	430	180	160
15	235	235	215	985	1,220	905	3,630	2,690	885	355	392	180	160
16	175	215	215	945	1,140	865	4,880	2,690	815	342	368	170	150
17	110	215	215	985	1,060	825	4,720	2,280	815	330	355	170	150
18	195	215	330	985	1,060	825	3,630	2,080	755	330	342	160	150
19	110	215	1,220	1,140	1,060	825	3,330	2,690	755	330	330	150	150
20	110	215	3,630	1,060	985	825	4,290	2,180	695	330	318	150	150
21	110	215	4,220	985	985	1,140	4,290	1,880	695	330	305	140	150
22	155	215	4,360	985	945	2,690	3,450	1,700	665	318	292	170	150
23	195	235	4,080	905	905	2,330	2,800	1,520	635	305	268	255	150
24	195	235	2,970	1,220	865	2,330	2,380	1,430	695	292	255	292	140
25	1,180	235	2,910	3,690	825	2,280	2,180	1,350	635	292	242	368	140
26	1,100	215	2,860	3,690	825	1,880	1,980	1,270	635	292	230	292	130
27	605	215	3,270	2,910	825	1,730	2,740	1,270	635	292	218	292	130
28	540	215	4,880	2,430	745	1,580	3,510	1,740	635	292	218	292	130
29	480	215	5,120	2,180	745	------	5,150	2,800	635	292	205	242	130
30	480	215	4,960	1,880	745	------	4,020	2,480	575	292	205	242	130
31	------	215	------	1,680	710	------	5,210	------	575	------	192	242	------

Monthly discharge of Little River ditch No. 1 at Kirk, Mo., for the period September 13, 1921, to September 30, 1922

Month	Discharge in second-feet		
	Maximum	Minimum	Mean
1921			
September	1,180	110	366
1921-22			
October	480	175	267
November	5,120	215	1,680
December	4,080	905	1,880
January	1,680	710	1,110
February	2,530	745	1,470
March	5,210	1,260	2,770
April	5,890	1,270	3,380
May	2,580	575	1,020
June	545	292	373
July	1,190	192	380
August	368	140	207
September	242	130	175
The year	5,890	130	1,220

LITTLE RIVER DITCH NO. 81 AT KIRK, MO.

LOCATION.—In sec. 27, T. 19 N., R. 10 E., at St. Louis-San Francisco Railway bridge at Kirk, Dunklin County, 1 mile below nearest lateral entering above, and 20 miles above outlet into Big Lake at Arkansas State line.

RECORDS AVAILABLE.—September 13, 1921, to September 30, 1922. The Little River Drainage District, Cape Girardeau, Mo., has records of stage since May, 1920.

GAGE.—Chain gage bolted to guard timber on downstream side of railroad pile trestle; read by B. F. Brewer. Prior to December 2, 1921, a painted vertical staff gage fastened to downstream side of pile bent of railroad bridge. Zeros of both gages 200 feet above mean sea level.

DISCHARGE MEASUREMENTS.—Made from downstream side of highway bridge on Kennett–Hayti road 5 miles east of Kennett and 1½ miles below gage or by wading.

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

EXTREMES OF DISCHARGE.—Maximum stage recorded during the period of records, 54.05 feet April 4 and 5 (discharge, 2,390 second-feet); minimum stage, 43.75 feet August 11–20 (discharge, 20 second-feet).

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

REGULATION.—None.

DIVERSIONS.—This ditch drains all the area west and south of ditch No. 44 in the Little River basin and diverts the natural flow from ditch No. 1, which is now the main stream. (See Little River ditch No. 1 at Kirk, Mo.)

ACCURACY.—Stage-discharge relation has remained permanent; not affected by ice. Rating curve well defined. Gage read to half-tenths once daily; not absolutely reliable. Daily discharge ascertained by applying mean daily gage height to rating table. Records fair.

COOPERATION.—Gage-height record prior to December 2, 1921, furnished by Little River Drainage District, through L. L. Hidinger, chief engineer.

Discharge measurements of Little River ditch No. 81 at Kirk, Mo., for the period September 13, 1921, to September 30, 1922

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
1921		*Feet*	*Sec.-ft.*	1922		*Feet*	*Sec.-ft.*
Sept. 13	Williams and Mulholland[a]	43.95	50.4	Mar. 14	E. L. Williams	49.19	1,090
				15	do	52.38	1,920
Dec. 2	Waldo and Mulholland	49.76	1,140	May 11	Reginald Waldo	46.18	384
28	Reginald Waldo	48.76	928	June 13	do	44.47	149

[a] Engineer for Little River drainage district.

Daily discharge, in second-feet, of Little River ditch No. 81 at Kirk, Mo., for the period September 13, 1921, to September 30, 1922

Day	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	------	140	40	1,510	541	323	621	2,320	481	215	82	33	89
2	------	260	40	1,230	501	541	641	2,320	581	200	82	33	89
3	------	110	40	1,160	463	825	621	2,380	621	185	110	33	89
4	------	110	40	800	463	601	621	2,380	621	178	110	33	89
5	------	110	40	707	445	541	621	2,380	581	170	110	33	89
6	------	110	40	621	427	501	581	2,320	581	162	103	33	89
7	------	110	40	581	427	641	564	2,210	541	162	96	33	82
8	------	96	40	541	427	541	521	1,880	501	162	125	33	75
9	------	96	40	501	391	481	521	1,540	463	162	155	33	61
10	------	82	40	463	391	463	950	1,430	427	155	148	26	47
11	------	68	40	445	581	445	1,370	1,370	391	148	125	20	40
12	------	68	40	427	621	427	1,100	1,370	373	140	110	20	40
13	50	68	40	409	663	391	875	1,100	355	132	110	20	40
14	50	68	40	391	581	373	850	900	339	125	110	20	40
15	50	54	40	355	501	355	1,880	950	323	118	103	20	40
16	50	68	40	355	481	355	1,880	1,000	307	118	89	20	40
17	50	68	40	355	463	323	1,480	900	291	110	89	20	40
18	50	68	215	373	445	323	1,100	950	291	110	89	20	40
19	50	68	900	391	427	323	1,710	900	260	110	82	20	40
20	50	68	1,290	373	323	323	2,070	707	260	110	75	20	40
21	50	68	1,050	355	427	541	1,880	621	230	110	68	26	40
22	50	68	707	339	391	950	1,370	541	230	103	61	47	40
23	50	68	501	339	391	800	1,050	541	230	96	54	118	47
24	50	68	521	581	391	850	900	501	230	89	54	103	54
25	185	68	775	1,650	409	751	800	501	230	82	54	89	54
26	260	68	751	1,570	260	621	775	481	230	82	54	68	47
27	200	54	1,790	1,260	260	581	1,400	501	230	82	47	68	47
28	200	54	2,040	751	291	561	1,760	800	230	82	47	68	47
29	125	40	1,990	775	323	------	1,540	1,000	260	82	40	89	47
30	125	40	1,760	663	323	------	1,740	751	260	82	40	89	47
31	------	40	------	581	323	------	2,270	------	230	------	40	89	------

NOTE.—Gage record not accurate Sept. 13-24, 1921; discharge estimated from discharge measurement.

Monthly discharge of Little River ditch No. 81 at Kirk Mo., for the period September 13, 1921, to September 30, 1922

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1921				
September 13-30	260	50	94.1	3,360
1921-22				
October	260	40	81.5	5,010
November	2,040	40	499	29,700
December	1,650	339	673	41,400
January	663	260	431	26,500
February	950	323	527	29,300
March	2,270	521	1,160	71,300
April	2,380	501	1,250	74,400
May	621	230	361	22,200
June	215	82	129	7,680
July	155	40	85.9	5,280
August	118	20	44.4	2,730
September	89	40	55.6	3,310
The year	2,380	20	441	319,000

LITTLE RIVER DITCH No. 66 AT KIRK, MO.

LOCATION.—In sec. 27, T. 19 N., R. 10 E., at St. Louis-San Francisco Railway bridge at Kirk, Dunklin County, half a mile below ditch 72, half a mile above ditch 73, 8 miles below ditch 64, the most northerly lateral, and 20 miles above outlet into Big Lake at the Arkansas State line.

RECORDS AVAILABLE.—September 13, 1921, to September 30, 1922. The Little River Drainage District, Cape Girardeau, Mo., has records of stage since May, 1920.

GAGE.—Chain gage bolted to downstream guardrail of railroad pile trestle; read by B. F. Brewer. Prior to December, 2, 1921, a painted vertical staff gage fastened to downstream side of pile trestle. Zeros of both gages 200 feet above mean sea level.

DISCHARGE MEASUREMENTS.—Made from downstream side of highway bridge on Kennett-Hayti road, 1½ miles below gage or by wading.

CHANNEL AND CONTROL.—Bed composed of sand and small gravel; fairly permanent. Some snags lodged in bed of stream. No well-defined control.

EXTREMES OF DISCHARGE.—Maximum stage recorded during the period of records, 53.5 feet April 3–6 (discharge, 1,520 second-feet); minimum stage, 43.2 feet October 30 to November 17 (discharge, 1 second-foot).

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

REGULATION.—None.

DIVERSIONS.—This ditch drains the old Little River channel below ditch 51, the last diversion into ditch 1 and all the Little River basin south and east of ditch 63 (see Little River ditch 1 at Kirk Mo.).

ACCURACY.—Stage-discharge relation changed during year; not affected by ice. Rating curve fairly well defined. Gage read to half-tenths once daily; readings not absolutely reliable. Daily discharge ascertained by applying daily gage height to rating table; shifting-control method used July 14 to September 30, 1922. Records fair.

COOPERATION.—Gage-height record prior to December 2, 1921, furnished by Little River Drainage District through L. L. Hidinger, chief engineer.

Discharge measurements of Little River ditch No. 66 at Kirk Mo., for the period September 13, 1921, to September 30, 1922

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
1921		*Feet*	*Sec.-ft.*	1922		*Feet*	*Sec.-ft.*
Sept. 13	Williams and Mulholland [a]	43.63	6.8	Mar. 15	E. L. Williams	51.40	1,120
				May 11	Reginald Waldo	46.02	211
Dec. 2	Waldo and Mulholland	46.08	237	June 13	do	44.25	47.8
28	Reginald Waldo	46.21	247				

[a] Engineer for Little River Drainage District.

Daily discharge, in second-feet, of Little River ditch No. 66 at Kirk, Mo., for the period September 13, 1921, to September 30, 1922

Day	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar	Apr.	May	June	July	Aug.	Sept.
1	------	10	1	273	173	107	303	1,500	303	84	28	8	25
2	------	10	1	221	162	157	378	1,500	273	80	28	8	25
3	------	10	1	185	147	173	363	1,520	484	75	39	8	25
4	------	10	1	173	221	162	318	1,520	550	71	39	8	24
5	------	10	1	162	185	157	260	1,520	484	71	39	7	24
6	------	5	1	152	142	152	234	1,520	438	65	43	7	24
7	------	5	1	142	132	152	221	1,500	378	65	32	7	21
8	------	5	1	132	127	147	197	1,480	318	65	55	7	17
9	------	5	1	127	122	142	197	1,460	273	65	88	5	14
10	------	5	1	122	117	132	686	1,380	247	61	75	5	11
11	------	5	1	117	247	127	812	1,300	221	57	59	5	11
12	------	5	1	102	247	127	669	1,120	221	49	51	5	11
13	7	5	1	98	247	122	516	1,260	221	45	43	5	10
14	7	5	1	93	221	117	618	669	234	47	35	5	10
15	7	5	1	88	197	107	1,100	635	234	43	32	5	10
16	7	5	1	88	173	102	1,100	601	209	39	27	5	10
17	7	5	1	88	162	98	992	484	173	35	27	4	7
18	7	5	51	93	162	98	758	438	157	35	27	4	7
19	7	5	51	93	147	98	1,080	393	152	35	24	4	7
20	7	5	102	88	147	98	1,150	363	142	35	21	4	7
21	7	5	93	84	142	234	1,080	303	132	35	20	4	7
22	7	5	75	84	132	333	884	288	122	32	20	10	7
23	7	3	59	84	127	318	618	260	117	28	20	20	8
24	7	3	93	260	122	438	468	234	117	28	20	17	8
25	22	3	152	393	117	318	393	234	117	28	20	17	8
26	22	2	173	333	117	260	348	234	112	28	20	14	8
27	16	2	288	273	117	247	920	234	209	28	17	14	8
28	10	1	516	247	107	234	974	393	209	28	16	14	8
29	10	1	468	221	102	------	866	423	197	28	13	26	7
30	10	1	348	209	93	------	1,140	363	88	28	11	25	7
31	------	1	------	185	98	------	1,420	------	84	------	11	25	------

NOTE.—Gage not read to required refinement Sept. 13–24, 1921; daily discharge estimated from discharge measurement.

Monthly discharge of Little River ditch No. 66 at Kirk, Mo., for the period September 13, 1921, to September 30, 1922

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1921				
September	22	7	9.67	345
1921–22				
October	10	1	4.90	301
November	468	1	82.9	4,930
December	393	84	162	9,960
January	247	93	153	9,410
February	438	98	177	9,830
March	1,420	197	679	41,800
April	1,520	234	838	49,900
May	550	84	233	14,300
June	84	28	47.1	2,800
July	88	11	32.3	1,990
August	26	4	9.74	599
September	25	7	12.5	744
The year	1,520	1	202	147,000

18569°—25†—WSP 547——3

WHITE RIVER BASIN

JAMES RIVER AT GALENA, MO.

LOCATION.—In NW. ¼ sec. 7, T. 24 N., R. 23 W., at highway bridge in Galena, Stone County, one-fourth mile above Missouri Pacific Railway bridge, half a mile above Railey Creek, and 8 miles below Crane Creek.

DRAINAGE AREA.—1,000 square miles (measured on topographic and soil survey maps).

RECORDS AVAILABLE.—October 28, 1921, to September 30, 1922.

GAGE.—Chain gage bolted to upstream side of bridge; read by B. W. Stewart.

DISCHARGE MEASUREMENTS.—Made from bridge or by wading.

CHANNEL AND CONTROL.—Bed composed of sand, gravel, and silt. Small trees and brush grow on gravel bars which are exposed at low stages. Low-water control is a heavy gravel riffle 100 feet below gage; fairly permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during the period, 8.35 feet at 8.15 a. m. April 1 (discharge, 7,220 second-feet); minimum stage recorded, 0.78 foot, September 26–27 and 30 (discharge, 80 second-feet).

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

REGULATION.—None.

ACCURACY.—Stage-discharge relation has remained permanent; not affected by ice. Gage read to hundredths twice daily. One rating curve fairly well-defined used for the entire period. Daily discharge ascertained by applying mean daily gage height to rating table. Records good.

Discharge measurements of James River at Galena, Mo., during the year ending September 30, 1922

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Oct. 26	Reginald Waldo	1.00	116	Apr. 1	V. L. Austin	8.28	7,120
Jan. 9	do	1.81	331	May 15	Austin and Williams	2.57	657
Mar. 27	V. L. Austin	7.40	5,740	July 5	W. R. Denison	1.26	187
Mar. 28	do	6.14	4,050	Aug. 24	do	1.06	121

Daily discharge, in second-feet, of James River at Galena, Mo., for the year ending September 30, 1922

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1		193	510	297	184	1,100	6,850	2,450	598	219	1,400	109
2		196	552	312	170	670	4,920	1,950	552	225	1,570	105
3		147	810	328	178	750	3,600	1,660	510	213	575	105
4		147	1,100	328	181	900	2,890	1,480	490	196	490	112
5		153	960	344	210	328	2,670	1,480	450	173	378	107
6		153	780	344	205	328	2,670	2,050	392	176	361	92
7		142	720	344	202	530	2,450	1,750	378	176	282	88
8		144	620	344	213	810	2,560	1,320	361	178	190	93
9		136	552	344	208	900	2,350	1,170	361	181	181	100
10		142	530	344	210	1,240	2,670	1,030	378	190	176	88
11		132	510	344	213	2,350	2,670	960	344	199	190	89
12		123	470	328	210	2,250	2,450	720	328	249	202	93
13		142	432	297	208	2,150	2,050	645	328	361	184	89
14		134	396	297	213	2,050	2,250	620	328	344	178	89
15		139	361	297	208	2,050	2,890	620	312	312	173	86
16		134	344	297	208	1,950	2,890	645	282	252	178	83
17		136	361	297	213	1,320	5,060	598	282	237	170	85
18		187	344	252	202	1,400	4,780	575	267	225	173	92
19		246	361	243	173	2,150	3,860	575	267	216	167	90
20		267	328	246	240	2,450	2,250	552	252	228	173	86
21		312	297	237	1,750	2,670	2,050	530	237	213	178	93
22		312	297	237	1,100	2,350	1,750	530	237	193	167	90
23		297	297	237	2,350	1,950	1,480	490	225	173	167	93
24		297	297	222	3,600	1,480	1,400	2,250	213	167	125	89
25		371	297	213	2,450	1,320	1,480	1,660	208	156	118	83
26		450	328	210	2,250	3,860	1,400	1,400	208	3,360	121	81
27		645	361	208	1,850	6,400	1,480	1,100	344	1,100	110	81
28	114	695	361	216	1,850	4,250	1,660	840	312	645	101	86
29	134	695	344	208	-------	3,240	2,560	780	252	470	105	83
30	187	530	328	208	-------	4,920	2,670	720	237	432	105	81
31	178	-------	328	199	-------	6,700	-------	695	-------	378	112	-----

NOTE.—Gage not read Nov. 25 and Jan. 6–8; daily discharge interpolated.

Monthly discharge of James River at Galena, Mo., for the year ending September 30, 1922

[Drainage area, 1,000 square miles]

Month	Discharge in second-feet				Run-off in inches
	Maximum	Minimum	Mean	Per square mile	
October 28–31	187	114	153	0.153	0.02
November	695	123	260	.260	.29
December	1,100	297	470	.470	.54
January	344	199	278	.278	.32
February	3,600	170	759	.759	.79
March	6,700	328	2,160	2.16	2.49
April	6,850	1,400	2,760	2.76	3.08
May	2,450	490	1,090	1.09	1.26
June	598	208	331	.331	.37
July	3,360	156	382	.382	.44
August	1,570	101	284	.284	.33
September	112	81	91.4	.091	.10

NORTH FORK OF WHITE RIVER AT TECUMSEH, MO.

LOCATION.—In sec. 16, T. 22 N., R. 12 W., at Hodo's ferry on West Plains-Gainsville road, one-fourth mile west of Tecumseh, Ozark County, half a mile below Bryant's Creek, 3 miles above Lick Creek, and 8 miles above Arkansas State line.

DRAINAGE AREA.—1,180 square miles (measured on United States soil survey maps).

RECORDS AVAILABLE.—October 24, 1921, to September 30, 1922.

GAGE.—Vertical staff gage bolted to outcropping rocks on left bank 25 feet below landing for Hodo's ferry; read by Edward Hodo.

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

CHANNEL AND CONTROL.—Bed composed of sand, gravel, and boulders. Control is flat outcropping rock and coarse gravel; permanent.

EXTREMES OF STAGE.—Maximum stage recorded during the period, 7.10 feet at 4.30 p. m. March 31; minimum stage, 0.38 foot September 26, 27, 29, and 30.

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

REGULATION.—Natural regulation due to flow from large springs.

ACCURACY.—Stage-discharge relation permanent; not affected by ice. Gage read to hundredths twice daily. Data inadequate for determination of daily discharge.

Discharge measurements of North Fork of White River at Tecumseh, Mo., during the year ending September 30, 1922

Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*
Oct. 24	Waldo and Williams	0.58	546
Jan. 7	Reginald Waldo	.82	758
May 1	do	1.39	1,320

Daily gage height, in feet, of North Fork of White River at Tecumseh, Mo., for the year ending September 30, 1922

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1		0.59	1.31	0.85	0.78	1.62	5.00	2.26	1.23	0.85	0.57	0.46
2		.58	1.79	.82	1.02	1.50	3.85	2.12	1.19	1.00	.57	.44
3		.58	1.98	.81	1.09	1.42	3.30	2.03	1.15	1.47	.56	.44
4		.56	1.80	.87	1.02	1.40	2.92	2.13	1.09	.93	.56	.55
5		.56	1.64	.86	.98	1.42	3.38	2.06	1.05	.81	.55	.75
6		.56	1.49	.84	.94	1.51	3.25	2.11	1.02	.77	.53	.60
7		.56	1.39	.82	.90	1.53	2.91	2.06	1.00	.74	.53	.52
8		.55	1.30	.84	.82	1.46	2.72	1.88	1.01	.70	.53	.50
9		.58	1.20	.85	.81	1.87	3.80	1.79	.99	.71	.52	.48
10		.56	1.14	.87	.80	3.60	4.60	1.69	.95	.69	.51	.52
11		.56	1.09	.87	.79	2.71	5.85	1.62	.93	.78	.50	.49
12		.54	1.05	.84	.76	2.30	4.05	1.55	.91	.84	.52	.47
13		.55	1.01	.82	.73	2.09	3.50	1.53	.90	.80	.52	.46
14		.54	.97	.80	.70	2.70	3.03	1.47	.87	.74	.51	.45
15		.54	.92	.78	.69	2.95	2.88	1.41	.86	.73	.50	.44
16		.57	.90	.75	.67	2.49	2.71	1.38	.84	.72	.50	.44
17		.62	.92	.75	.66	2.25	3.45	1.39	.82	.69	.50	.42
18		2.24	.88	.76	.66	2.11	2.80	1.36	.80	.68	.50	.42
19		5.90	.85	.75	.66	2.10	2.47	1.31	.80	.67	.58	.42
20		2.56	.84	.73	.73	2.14	2.26	1.26	.78	.66	.51	.41
21		1.84	.81	.72	2.26	2.02	2.13	1.21	.76	.65	.50	.41
22		1.51	.80	.70	1.71	1.87	2.02	1.29	.76	.64	.51	.42
23		1.31	.82	.68	3.80	1.78	1.93	1.25	.74	.62	.50	.40
24	0.58	2.47	.95	67	3.32	1.70	1.87	1.85	.74	.61	.48	.40
25	.57	2.46	1.07	.65	2.47	1.64	1.87	1.71	.78	.62	.47	.40
26	.58	1.86	1.06	.68	2.14	2.18	1.82	1.53	.74	.72	.47	.38
27	.57	1.66	1.03	.67	1.94	3.22	1.95	1.55	.74	.68	.47	.38
28	.57	1.40	.99	.66	1.72	2.87	3.02	2.28	.74	.66	.46	.40
29	.61	1.28	.95	.66	-------	2.66	2.80	1.54	.72	.60	.46	.39
30	.62	1.19	.91	.64	-------	4.75	2.45	1.36	.70	.59	.46	.39
31	.60	-------	.88	.63	-------	6.95	-------	1.27	-------	.58	.46	-------

BLACK RIVER AT LEEPER, MO.

LOCATION.—In SW. ¼ NE. ¼ sec. 27, T. 28 N., R. 3 E., on Missouri Southern Railway bridge at Leeper, Wayne County, 1½ miles above Greenwood Valley Creek, 3 miles below McKenzie Creek, 5 miles below Deer Creek, and 8 miles above Brushy Creek.

DRAINAGE AREA.—957 square miles (measured on United States soil survey maps).

RECORDS AVAILABLE.—June 15, 1921, to September 30, 1922.

GAGE.—Chain gage fastened to guard timber on downstream side of railroad bridge; read by Lawrence Sanders. Elevation of zero of gage above mean sea level, 423.95 feet.

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

CHANNEL AND CONTROL.—Bed composed of coarse gravel and sand. Control is a bar of coarse gravel and boulders 800 feet below gage; fairly permanent.

EXTREMES OF STAGE.—Maximum stage recorded during year, 13.40 feet at 4.30 p. m. November 19; minimum stage, 1.91 feet at 6.45 p. m. September 30. 1921–1922: Maximum and minimum stages same as given above.

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

REGULATION.—None.

ACCURACY.—Stage-discharge relation changed during high water in November; not affected by ice. Gage read to hundredths twice daily. Records of discharge not computed owing to lack of sufficient discharge measurements.

Discharge measurements of Black River at Leeper, Mo., during the year ending September 30, 1922

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Nov. 16	Reginald Waldo	2.06	321	Jan. 2	Reginald Waldo	3.10	780
22	do	4.68	2,250	Mar. 19	E. L. Williams	4.09	1,650
25	do	5.14	2,970	June 19	Reginald Waldo	2.48	435

Daily gage height, in feet, of Black River at Leeper, Mo., for the year ending September 30, 1922

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	3.12	2.02	3.55	3.15	4.20	3.34	10.42	4.88	2.56	2.42	2.07	2.15
2	2.98	2.02	3.58	3.10	4.15	3.29	6.92	4.38	2.56	2.38	2.08	2.12
3	2.94	1.97	3.85	3.02	3.98	3.17	5.58	4.05	2.53	2.40	2.06	2.10
4	2.94	1.98	3.95	3.03	3.85	3.10	5.32	3.92	2.50	2.41	2.07	2.10
5	2.83	2.00	3.88	3.10	3.62	3.09	5.70	3.82	2.52	2.46	2.03	2.15
6	2.72	2.00	3.78	3.05	3.45	3.28	5.32	3.65	2.54	2.42	2.04	2.18
7	2.69	2.02	3.65	2.99	3.32	3.68	5.40	3.58	2.54	2.37	1.99	2.18
8	2.58	2.00	3.52	2.98	3.22	3.72	5.05	3.48	2.52	2.35	1.98	2.13
9	2.50	2.13	3.42	2.98	3.14	3.80	4.78	3.30	2.49	2.34	1.99	2.10
10	2.45	2.16	3.32	2.95	2.55	4.25	4.85	3.22	2.42	2.32	1.99	2.09
11	2.41	2.11	3.22	2.94	2.94	4.45	6.52	3.16	2.40	2.28	1.96	2.10
12	2.36	2.06	3.14	2.86	2.90	4.35	5.95	3.11	2.38	2.27	2.03	2.06
13	2.32	2.06	3.04	2.84	2.84	4.15	5.42	3.08	2.37	2.29	1.96	2.08
14	2.25	2.04	2.96	2.88	2.79	5.30	4.85	3.04	2.44	2.26	1.97	2.02
15	2.17	2.04	2.92	2.86	2.76	5.58	4.78	2.99	2.46	2.24	2.03	2.02
16	2.13	2.02	2.88	2.83	2.72	5.15	4.80	2.94	2.42	2.24	2.21	2.00
17	2.11	2.16	2.83	2.72	2.68	4.45	6.05	2.91	2.36	2.26	2.13	1.97
18	2.11	3.40	2.84	2.70	2.63	4.25	7.52	2.88	2.32	2.29	2.04	1.92
19	2.08	12.28	2.83	2.67	2.59	-------	5.42	2.84	2.29	2.29	2.06	1.97
20	2.05	8.50	2.79	2.64	2.62	5.65	4.62	2.81	2.27	2.31	2.06	2.00
21	2.00	5.58	2.73	2.61	3.10	5.15	4.28	2.79	2.26	2.32	2.07	1.98
22	1.98	4.75	2.70	2.60	3.75	4.55	3.98	2.76	2.24	2.35	2.22	1.98
23	1.98	4.38	2.84	2.58	3.60	4.02	3.82	2.72	2.22	2.38	2.53	1.96
24	2.01	4.45	3.52	2.57	3.45	3.55	3.68	2.68	2.19	2.20	2.67	1.96
25	1.98	5.10	4.85	2.54	3.36	3.25	3.60	2.74	2.21	2.22	2.51	1.92
26	1.96	4.65	4.35	2.53	3.52	3.70	3.82	2.78	2.26	2.24	2.41	1.94
27	1.95	4.30	3.88	2.50	3.42	4.48	4.48	2.72	2.30	2.24	2.35	1.94
28	1.98	4.15	3.68	2.47	3.38	5.10	6.72	2.67	2.35	2.19	2.26	1.94
29	2.04	3.92	3.55	2.39	-------	5.08	6.12	2.64	2.39	2.16	2.20	1.95
30	2.10	3.70	3.35	2.36	-------	5.65	5.10	2.61	2.45	2.13	2.18	1.92
31	2.06	-------	3.25	3.00	-------	11.49	-------	2.59	-------	2.10	2.18	-------

CURRENT RIVER NEAR EMINENCE, MO.

LOCATION.—In SE. ¼ NW. ¼ sec. 15, T. 29 N., R. 3 W., at foot of Coot Mountain, 1 mile below Jack's Fork, 3 miles above Blair Creek, and 8 miles northeast of Eminence, Shannon County.

DRAINAGE AREA.—1,230 square miles (measured on United States soil survey maps).

RECORDS AVAILABLE.—August 24, 1921, to September 30, 1922. The Western Tie & Timber Co., St. Louis, has records of stage since December 6, 1920.

GAGE.—Vertical staff gage in two sections; lower section, 0.0 to 10.1 feet bolted to outcropping ledge on right bank; upper section, 10.0 to 26.0 feet fastened to tree on right bank at same site. Prior to October 19, 1921, a painted vertical staff on right bank 1,200 feet above present gage was used; readings corrected so as to refer to datum of present gage.

DISCHARGE MEASUREMENTS.—Made from cable or by wading.

CHANNEL AND CONTROL.—Bed composed of coarse gravel. Control is heavy gravel and boulders at riffle below gage; fairly permanent.

EXTREMES OF STAGE.—Maximum stage recorded during the period of records 14.20 feet at 5 p. m. November 19, 1921; minimum stage, 1.24 feet September 29 and 30, 1922.

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

REGULATION.—No appreciable regulation from small dams above, but there is natural regulation due to large springs.

ACCURACY.—Stage-discharge relation has remained permanent; not affected by ice. Gage read to hundredths once daily. Data inadequate for determination of discharge.

COOPERATION.—Gage-height record prior to October 19, 1921, furnished by Western Tie & Timber Co., of St. Louis, Mo.

Discharge measurements of Current River near Eminence, Mo., during the year ending September 30, 1922

Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*
Mar. 24	E. L. Williams	3.71	2,550
May 15	Reginald Waldo	2.70	1,640
Sept. 26	Denison and Austin	1.27	595

Daily gage height, in feet, of Current River near Eminence, Mo., for the year ending September 30, 1922

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	2.25	1.58	3.16	2.30	3.00	2.94	10.60	4.80	2.10	4.00	1.66	1.58
2	2.15	1.56	4.50	2.26	3.70	2.70	6.90	4.45	2.10	3.50	1.54	1.56
3	3.35	1.52	4.50	2.22	3.28	2.62	5.75	4.20	2.08	2.74	1.42	1.56
4	2.85	1.52	4.20	2.32	2.96	2.62	5.00	3.95	2.06	2.44	1.48	2.80
5	2.60	1.50	3.95	2.30	2.80	2.78	5.30	3.80	2.02	2.00	1.50	2.16
6	2.35	1.50	3.60	2.20	2.68	3.10	5.50	3.65	1.98	2.00	1.50	2.00
7	2.25	1.50	3.40	2.16	2.38	3.40	5.15	3.40	2.00	2.00	1.48	1.62
8	2.20	1.50	3.00	2.28	2.30	3.00	4.75	3.28	2.18	1.90	1.46	1.60
9	2.00	1.54	2.98	2.20	2.24	3.00	5.80	3.24	2.00	1.88	1.44	1.50
10	2.00	1.52	2.82	2.20	2.18	3.85	5.25	3.08	1.96	1.78	1.44	1.50
11	2.00	1.50	2.70	2.18	2.18	4.80	8.40	2.98	1.96	1.80	1.42	1.48
12	1.90	1.50	2.62	2.14	2.12	4.20	6.00	2.94	1.92	1.90	1.42	1.40
13	1.80	1.50	2.56	2.12	2.06	3.85	5.30	2.82	1.88	1.82	1.42	1.40
14	1.75	1.48	2.46	2.10	2.00	4.00	5.10	2.70	1.80	1.80	1.40	1.36
15	1.70	1.48	2.36	2.00	1.94	5.85	5.40	-------	1.82	1.72	1.40	1.32
16	1.70	1.48	2.30	1.98	1.90	-------	5.00	2.64	1.84	1.70	1.50	1.32
17	1.70	1.56	2.36	2.98	1.88	4.40	10.00	2.64	1.84	1.68	1.50	1.32
18	1.70	2.00	2.30	2.98	1.86	4.20	5.80	2.60	1.82	1.66	1.56	1.30
19	1.65	14.20	2.22	1.94	1.86	4.20	5.00	2.54	1.80	1.62	1.62	1.28
20	1.64	6.00	2.20	1.92	2.26	5.50	4.55	2.50	1.78	1.60	1.54	1.28
21	1.62	5.10	2.14	1.90	2.42	4.90	4.20	2.50	1.74	1.58	1.54	1.28
22	1.62	4.20	2.14	1.90	2.52	4.35	4.00	2.70	1.72	1.58	1.74	1.28
23	1.60	3.70	2.20	1.80	3.70	4.00	3.80	2.46	1.68	1.60	1.60	1.28
24	1.60	5.00	2.64	1.78	5.00	3.75	3.75	2.40	1.70	2.75	1.50	1.30
25	1.58	5.50	3.20	1.76	4.15	3.55	3.90	2.36	1.70	2.30	1.48	1.28
26	1.60	4.00	2.86	1.84	3.80	3.85	3.90	2.34	1.96	2.00	1.44	1.28
27	1.58	3.90	2.76	1.80	3.30	6.80	4.10	2.30	1.84	1.90	1.42	1.26
28	1.58	3.65	2.70	1.80	3.00	5.40	8.70	2.28	2.18	1.74	1.38	1.26
29	1.62	3.30	2.58	1.78	-------	5.15	5.90	2.20	2.04	1.68	1.38	1.24
30	1.64	3.10	2.42	1.78	-------	7.90	5.00	2.16	1.90	1.68	1.36	1.24
31	1.60	-------	2.38	1.80	-------	12.20	-------	2.12	-------	1.68	1.70	-------

NOTE.—Gage not read Mar. 16 and May 15.

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 Davis Creek, 3 miles above Carlos Creek, 3 miles below Henpeck Creek, and 4 miles above Big Spring.

DRAINAGE AREA.—1,640 square miles, revised (measured on United States soil survey maps).

RECORDS AVAILABLE.—June 18, 1921, to September 30, 1922. The Engineering Experiment Station, University of Missouri, has records at the same site from August 25, 1912, to July 30, 1921.

GAGE.—Chain gage bolted to downstream side of bridge; read by Z. Chilton.

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

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

EXTREMES OF DISCHARGE.—Maximum stage recorded during the period of records, 10.25 feet at 7 a. m. November 20, 1921 (discharge, 22,100 second-feet); minimum discharge, 790 second-feet on September 28 and 30, 1922.

The University of Missouri 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.

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

REGULATION.—Several small dams above have no appreciable effect on the flow; but natural regulation due to numerous large springs is evident.

ACCURACY.—Stage-discharge relation changed during the high water in March and April; not affected by ice. Rating curve, used October 1 to March 22, well defined; curve used May 12 to September 30, fairly well defined. Gage read to hundredths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table; shifting-control method used March 23 to May 11. Records good.

Discharge measurements of Current River at Van Buren, Mo., during the year ending September 30, 1922

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Oct. 20	Reginald Waldo	1.20	1,000	Nov. 28	Reginald Waldo	3.46	3,480
Nov. 19	do	8.54	16,000	Jan. 5	do	1.90	1,660
20	do	9.90	20,700	Mar. 22	E. L. Williams	4.06	4,240
21	do	5.30	6,350	May 12	Reginald Waldo	2.88	2,350
26	do	4.15	4,360	Sept. 27	Austin and Denison	1.08	789

Daily discharge, in second-feet, of Current River at Van Buren, Mo., for the year ending September 30, 1922

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	1,530	910	2,540	1,730	1,840	2,420	17,000	4,890	1,490	1,240	1,010	1,040
2	1,430	875	3,140	1,680	3,140	2,180	10,500	4,340	1,490	1,760	1,010	1,010
3	2,060	875	4,180	1,530	3,140	2,060	8,220	4,020	1,490	2,260	1,010	1,010
4	2,180	860	3,920	1,630	2,660	2,060	6,780	3,700	1,490	1,950	1,010	1,320
5	1,950	850	3,660	1,630	2,300	2,180	6,350	3,550	1,490	1,490	975	1,670
6	1,730	840	3,270	1,530	2,060	2,420	7,000	3,260	1,400	1,320	940	1,320
7	1,530	840	2,900	1,530	1,950	2,660	6,150	3,110	1,400	1,320	940	1,080
8	1,530	840	2,660	1,530	1,730	2,780	5,550	2,870	1,400	1,240	940	1,010
9	1,430	875	2,420	1,530	1,530	2,660	5,550	2,740	1,400	1,160	940	940
10	1,340	875	2,180	1,530	1,530	3,660	6,140	2,610	1,400	1,160	940	940
11	1,250	840	2,060	1,530	1,530	4,920	9,620	2,480	1,400	1,160	940	940
12	1,200	840	2,060	1,530	1,530	4,180	8,780	2,370	1,320	1,240	908	908
13	1,160	840	1,950	1,430	1,430	3,660	6,560	2,260	1,320	1,240	908	908
14	1,120	840	1,840	1,430	1,340	3,530	5,730	2,150	1,320	1,160	940	875
15	1,070	840	1,730	1,340	1,340	5,780	5,330	2,050	1,240	1,160	975	875
16	1,070	840	1,730	1,340	1,250	5,420	4,780	2,050	1,240	1,160	1,080	875
17	1,070	910	1,630	1,340	1,250	4,610	6,780	1,950	1,240	1,080	1,040	875
18	1,030	1,340	1,630	1,340	1,250	3,920	12,000	1,950	1,240	1,080	1,010	842
19	1,030	15,600	1,630	1,250	1,250	4,180	6,720	1,950	1,240	1,080	1,010	842
20	990	16,400	1,530	1,250	1,340	5,250	4,760	1,850	1,160	1,040	1,010	842
21	950	6,160	1,530	1,250	1,730	5,080	4,260	1,850	1,160	1,040	975	842
22	950	4,460	1,430	1,200	1,950	4,320	3,800	1,850	1,160	1,040	1,010	842
23	910	3,660	1,530	1,160	2,660	3,780	3,650	1,850	1,160	1,040	1,160	842
24	910	3,790	2,180	1,120	5,080	3,380	3,370	1,760	1,160	1,320	1,040	842
25	910	5,420	2,660	1,120	4,050	3,110	3,360	1,760	1,160	1,760	975	810
26	910	4,460	2,540	1,120	3,270	3,490	3,350	1,670	1,160	1,400	975	810
27	910	3,790	2,300	1,160	2,900	6,780	3,620	1,670	1,320	1,280	940	810
28	910	3,400	2,180	1,120	2,660	7,220	8,780	1,670	1,240	1,160	908	810
29	950	3,020	1,950	1,120	-------	5,770	8,780	1,580	1,240	1,080	908	810
30	950	2,660	1,840	1,120	-------	7,460	6,130	1,580	1,320	1,080	875	778
31	910	-------	1,730	1,120	-------	14,200	-------	1,500	-------	1,010	940	-------

NOTE.—Gage not read Nov. 4, 5, and July 27; discharge interpolated. Gage not read Sept. 2-6; discharge estimated from comparison with records for adjacent stations on the same river.

Monthly discharge of Current River at Van Buren, Mo., for the year ending September 30, 1922

[Drainage area, 1,640 square miles]

Month	Discharge in second-feet				Run-off in inches
	Maximum	Minimum	Mean	Per square mile	
October	2,180	910	1,220	0.744	0.86
November	16,400	840	2,960	1.80	2.01
December	4,180	1,430	2,280	1.39	1.60
January	1,730	1,120	1,360	.829	.96
February	5,080	1,250	2,130	1.30	1.35
March	14,200	2,060	4,360	2.66	3.07
April	17,000	3,350	6,610	4.03	4.50
May	4,890	1,500	2,420	1.48	1.71
June	1,490	1,160	1,310	.799	.89
July	2,260	1,010	1,270	.774	.89
August	1,160	875	976	.595	.69
September	1,670	778	944	.576	.64
The year	17,000	778	2,320	1.41	19.13

CURRENT RIVER AT 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, and 2 miles above Briar Creek.

DRAINAGE AREA.—2,030 square miles (measured on United States soil survey maps).

RECORDS AVAILABLE.—June 14, 1921, to September 30, 1922. The United States Engineer Office, Memphis, Tenn., has records of stage since August 1, 1918.

GAGE.—Chain gage bolted to upstream side of highway bridge; read by T. B. Swindel. Prior to May 10, 1922, a painted staff gage on bridge pier, and an auxiliary staff gage on right bank graduated from 0 to 4 feet, were used.

DISCHARGE MEASUREMENTS.—Made from downstream side of bridge.

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

EXTREMES OF DISCHARGE.—Maximum stage recorded during the year, 11.50 feet at 7 p. m. April 1 (discharge, 22,000 second-feet); minimum stage, 0.58 foot at 8 a. m. September 29 (discharge, 1,310 second-feet).

1921–1922: Maximum and minimum stages same as given above.

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

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

REGULATION.—Natural regulation through numerous large 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 changed during the high water on November 21; not affected by ice. Rating curve used before the change, fairly well defined below 8,000 second-feet; curve used after the change well defined below 8,000 second-feet; extended above that point. Gage read to hundredths twice daily after May 10; to tenths once daily prior to May 10. Daily discharge ascertained by applying mean daily gage height to rating table. Records fair.

COOPERATION.—Gage-height record prior to March 1, 1922, furnished by United States Engineer office at Memphis, Tenn.

Discharge measurements of Current River at Doniphan, Mo., during the year ending September 30, 1922

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Nov. 15	Reginald Waldo	0.86	1,460	Mar. 21	E. L. Williams	4.68	6,880
23	do	3.80	5,340	May 10	Reginald Waldo	2.88	3,870
Dec. 31	do	1.86	2,660	June 11	do	1.39	2,170
Mar. 20	E. L. Williams	4.33	6,240	Sept. 29	Denison and Austin	.60	1,330

Daily discharge, in second-feet, of Current River at Doniphan, Mo., for the year ending September 30, 1922

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept
1	2,090	1,550	3,800	2,370	2,370	3,660	22,000	7,050	2,370	2,030	1,620	1,620
2	1,790	1,540	3,520	2,370	3,660	3,380	20,800	6,540	2,370	2,140	1,620	1,620
3	1,790	1,530	3,240	2,250	4,370	3,380	11,300	5,720	2,370	2,730	1,620	1,520
4	1,880	1,520	4,520	2,250	4,080	2,980	9,300	5,120	2,250	2,850	1,620	1,520
5	1,980	1,510	4,970	2,140	3,800	2,980	8,500	5,120	2,250	2,370	1,620	1,520
6	1,880	1,500	4,670	2,030	3,800	2,980	8,120	4,670	2,250	2,250	1,520	2,030
7	1,790	1,490	4,080	2,030	3,520	2,980	8,700	4,520	2,140	2,030	1,520	1,920
8	1,790	1,480	3,800	2,030	3,240	3,800	7,580	4,370	2,140	2,250	1,520	1,620
9	1,790	1,470	4,220	2,250	2,980	3,800	7,580	3,800	2,140	1,920	1,520	1,520
10	1,790	1,460	3,520	2,250	2,730	5,420	7,400	3,660	2,370	1,920	1,520	1,520
11	1,790	1,450	3,240	2,370	2,610	7,580	7,580	3,800	2,140	1,820	1,520	1,520
12	1,790	1,450	3,110	2,250	2,370	6,880	11,100	3,520	2,030	1,920	1,520	1,520
13	1,790	1,450	2,730	2,140	2,250	6,040	9,700	3,380	2,030	1,920	1,520	1,420
14	1,700	1,450	2,490	2,140	2,140	5,270	7,580	3,380	2,030	1,820	1,520	1,420
15	1,700	1,450	2,490	2,140	2,140	5,270	7,220	3,240	2,030	1,820	1,520	1,420
16	1,700	1,620	2,250	2,030	2,140	7,580	6,710	3,110	1,920	1,820	1,520	1,420
17	1,700	1,790	2,250	2,030	2,140	6,710	6,370	3,110	1,920	1,720	1,620	1,420
18	1,700	2,200	2,250	2,030	2,030	5,800	8,700	2,980	1,920	1,720	1,620	1,420
19	1,620	10,300	2,140	2,030	2,030	5,720	13,100	2,980	1,920	1,720	1,620	1,420
20	1,620	17,600	2,140	2,140	2,140	5,720	7,050	2,850	2,030	1,720	1,620	1,420
21	1,620	21,000	2,370	2,140	2,140	6,710	6,710	2,850	1,920	1,720	1,620	1,420
22	1,620	7,220	2,370	2,140	2,250	6,370	5,720	2,730	1,820	1,720	1,620	1,420
23	1,620	5,720	2,370	2,140	2,250	5,720	5,270	2,850	1,820	1,620	1,720	1,420
24	1,620	5,420	2,490	2,030	4,220	5,270	4,820	2,850	1,820	1,620	1,720	1,330
25	1,620	5,570	4,080	2,030	6,880	5,120	4,670	2,730	1,820	1,920	1,620	1,330
26	1,610	7,050	3,800	2,030	5,270	4,970	4,370	2,730	1,920	2,250	1,520	1,330
27	1,600	5,570	3,520	2,030	4,820	5,720	4,970	2,610	1,820	2,140	1,520	1,330
28	1,590	5,270	3,110	2,030	4,220	8,900	5,880	2,490	1,820	1,920	1,520	1,330
29	1,580	4,970	2,730	2,030	-------	8,700	9,500	2,490	1,920	1,820	1,520	1,330
30	1,570	4,370	2,610	2,030	-------	8,900	7,580	2,370	1,920	1,620	1,520	1,330
31	1,560	-------	2,370	2,030	-------	12,400	-------	2,370	-------	1,620	1,620	-------

NOTE.—Discharge, Oct. 21 to Nov. 15, estimated from discharge measurement and by comparison with records of discharge at the Van Buren station; gage not read below 1.1 feet during this period.

Monthly discharge of Current River at Doniphan, Mo., for the year ending September 30, 1922

[Drainage area, 2,030 square miles]

Month	Discharge in second-feet				Run-off in inches
	Maximum	Minimum	Mean	Per square mile	
October	2,090	1,560	1,720	0.847	0.98
November	21,000	1,450	4,270	2.10	2.34
December	4,970	2,140	3,140	1.55	1.79
January	2,370	2,030	2,130	1.05	1.21
February	6,880	2,030	3,160	1.56	1.62
March	12,400	2,980	5,700	2.81	3.24
April	22,000	4,370	8,530	4.20	4.69
May	7,050	2,370	3,610	1.78	2.05
June	2,370	1,820	2,040	1.00	1.12
July	2,850	1,620	1,950	.961	1.11
August	1,720	1,520	1,570	.773	.89
September	2,030	1,330	1,480	.729	.81
The year	22,000	1,330	3,270	1.61	21.85

JACKS FORK AT EMINENCE, MO.

LOCATION.—In W. ½ sec. 26, T. 29 N., R. 4 W., at highway bridge half a mile north of Eminence, Shannon County, 1 mile below Mahan's Creek, and 8 miles above mouth.

DRAINAGE AREA.—376 square miles (measured on United States soil survey maps); somewhat indefinite because of large tributary springs.

RECORDS AVAILABLE.—October 18, 1921, to September 30, 1922.

GAGE.—Chain gage bolted to upstream side of bridge; read by E. J. Ward.

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

CHANNEL AND CONTROL.—Bed composed of sand, gravel, and boulders. Control is a coarse gravel bar 300 feet below gage; fairly permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during the period of record 7.65 feet at 5.15 p. m. November 19 (discharge, 7,240 second-feet); minimum stage, 1.23 feet September 27–30 (discharge, 135 second-feet).

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

REGULATION.—Natural regulation through flow from several large springs.

DIVERSIONS.—None.

ACCURACY.—Stage-discharge relation changed during high water November 19; not affected by ice. Rating curve used October 18 to November 18 fairly well defined; curve used November 19 to September 30 well defined below 900 second-feet and extended above that point. Gage read to hundredths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table. Records good except those above 1,000 second-feet which are fair.

Discharge measurements of Jacks Fork at Eminence, Mo., during the year ending September 30, 1922

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Oct. 18	Waldo and Williams	1.54	163	May 16	Reginald Waldo	1.95	397
Mar. 23	E. L. Williams	2.78	777	Sept. 25	Denison and Austin	1.23	133
25	do	2.57	660				

Daily discharge, in second-feet, of Jacks Fork at Eminence, Mo., for the year ending September 30, 1922

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1		161	540	343	468	565	3,770	950	285	250	180	180
2		155	1,160	325	880	515	2,180	815	285	590	177	167
3		155	1,160	325	725	490	1,580	755	268	515	174	155
4		158	1,090	325	615	490	1,320	695	268	405	170	167
5		155	880	343	540	565	1,240	668	268	325	167	325
6		149	725	343	490	695	1,580	640	250	268	167	268
7		149	640	343	425	815	1,240	590	250	250	164	218
8		155	565	365	385	725	1,090	540	250	234	161	192
9		155	515	365	365	695	1,020	490	250	234	161	177
10		155	490	385	365	1,240	1,670	468	250	218	158	174
11		161	445	385	365	1,400	3,770	445	250	218	158	167
12		155	425	365	343	1,090	1,960	425	250	234	155	164
13		155	425	343	325	880	1,400	405	234	234	155	161
14		155	405	325	305	1,020	1,160	405	234	218	155	158
15		152	385	325	285	1,580	1,090	405	218	212	158	152
16		155	365	285	285	1,160	950	385	218	208	170	149
17		176	343	285	285	950	880	385	218	212	167	146
18	167	335	365	305	285	815	815	385	215	205	167	143
19	162	5,940	343	285	285	880	725	365	212	199	167	143
20	158	1,760	325	285	305	1,400	668	343	218	199	170	149
21	161	1,090	325	285	468	1,160	590	343	212	192	174	149
22	158	815	325	268	590	950	565	343	212	186	180	143
23	155	640	343	250	1,020	815	565	343	205	183	180	143
24	158	950	425	250	1,760	725	540	325	205	212	170	143
25	155	1,860	540	250	1,090	668	565	325	205	285	164	140
26	161	1,090	515	250	815	880	565	325	215	250	158	138
27	161	815	468	250	725	2,660	725	305	234	234	155	135
28	161	668	445	250	640	1,760	2,180	305	234	212	152	138
29	173	590	405	250	-------	1,490	1,580	285	268	199	149	135
30	173	540	385	250	-------	2,660	1,240	285	285	186	149	138
31	173	-------	365	250	-------	5,760	-------	285	-------	183	192	-------

NOTE.—Gage not read Oct. 19; discharge interpolated.

Monthly discharge of Jacks Fork at Eminence, Mo., for the year ending September 30, 1922

[Drainage area, 376 square miles]

Month.	Discharge in second-feet.				Run-off in inches.
	Maximum.	Minimum.	Mean.	Per square mile.	
October 18–31	173	155	163	0.434	0.22
November	5,940	152	658	1.75	1.95
December	1,160	325	520	1.38	1.59
January	385	250	305	.811	.94
February	1,760	285	551	1.47	1.53
March	5,760	490	1,210	3.22	3.71
April	3,770	540	1,310	3.48	3.88
May	950	285	453	1.20	1.38
June	285	205	239	.636	.71
July	590	183	250	.665	.77
August	192	149	165	.439	.51
September	325	135	165	.439	.49

BIG SPRING NEAR CHICOPEE, MO.

LOCATION.—In sec. 6, T. 26 N., R. 1 E., 1,000 feet above mouth of Spring Creek, 4,000 feet below St. Louis-San Francisco Railway bridge over Current River, and 3½ miles southeast of Chicopee, Carter County.

RECORDS AVAILABLE.—January 8 to June 30, 1922.

GAGE.—Vertical staff bolted to face of large rock on right bank of spring branch, 150 feet below outlet of spring.

DISCHARGE MEASUREMENTS.—Made from temporary wagon bridge 500 feet below gage or by wading.

CHANNEL AND CONTROL.—Bed composed of heavy gravel and boulders; practically permanent; moss and weeds grow in bed of stream. Gravel ford across branch 400 feet below gage controls low flow to some extent. Stage-discharge relation is affected part of time by backwater from Current River.

EXTREMES OF DISCHARGE.—Maximum discharge during period of records, 589 second-feet (measured with current meter) May 13; minimum discharge, 341 second-feet (measured with current meter) September 27, 1922.

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

REGULATION.—Entire flow from the naturally regulated spring.

ACCURACY.—Stage-discharge relation probably permanent except for backwater from Current River whenever the river was above gage height 2.8 feet, at Van Buren. Rating curve fairly well defined; constructed by subtracting from gage heights for discharge measurements the amount that Current River at Van Buren was above 2.8 feet. Gage read to hundredths once daily. Daily discharge ascertained by applying to rating table daily gage height corrected for backwater by amount that Current River at Van Buren was above 2.8 feet, whenever that occurred. Records fair.

Discharge measurements of Big Spring near Chicopee, Mo., during the years ending September 30, 1921 and 1922

Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*
1921 Aug. 5	Reginald Waldo		367
1922 May 13	do	[a] 1.86	589
Sept. 27	Denison and Austin	.76	341

[a] Backwater from Current River when measurement was made.

Daily discharge, in second-feet, of Big Spring near Chicopee, Mo., for the year ending September 30, 1922

Day	Jan.	Feb.	Mar.	Apr.	May	June	Day	Jan.	Feb.	Mar.	Apr.	May	June
1	------	446	472	473	472	446	16	358	358	446	446	534	404
2	------	446	446	488	446	446	17	358	358	446	446	534	404
3	------	446	424	500	446	446	18	358	358	472	459	534	404
4	------	500	424	500	446	424	19	358	358	424	472	500	404
5	------	446	424	424	446	424	20	358	358	446	472	500	404
6	------	424	472	446	472	424	21	358	388	472	446	500	404
7	------	404	500	446	472	424	22	358	404	472	446	472	404
8	372	404	472	404	500	424	23	358	500	472	472	472	404
9	372	388	500	446	500	424	24	358	473	500	472	472	404
10	372	388	446	424	500	424	25	358	446	578	446	472	404
11	372	388	424	472	534	404	26	344	472	578	472	472	404
12	372	372	446	503	534	404	27	344	472	539	446	472	404
13	372	372	446	534	578	404	28	344	500	500	446	446	404
14	358	365	472	472	578	404	29	344	------	472	446	446	404
15	358	358	446	446	534	404	30	344	------	446	446	446	404
							31	344	------	458	------	446	------

NOTE.—Stage-discharge relation affected by backwater from Current River Feb. 2, 3, 24–27, and Mar. 8 to May 12. Daily discharge interpolated Feb. 14, Mar. 27, and Apr. 1, 2, 12, 18, 28, and 29.

Monthly discharge of Big Spring near Chicopee, Mo., for the year ending September 30, 1922

Month	Discharge in second-feet		
	Maximum	Minimum	Mean
January 8-31	372	344	358
February	500	358	414
March	578	424	469
April	534	404	460
May	578	446	490
June	446	404	413

ELEVEN POINT RIVER NEAR BARDLEY, MO.

LOCATION.—In NW. ¼ sec. 20, T. 23 N., R. 2 W., at highway bridge on Alton-Doniphan road at Johnson's ferry, 7 miles southwest of Bardley, Oregon County, 7 miles above Frederick's Creek, and 12 miles above Arkansas State line.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—October 22, 1921, to September 30, 1922.

GAGE.—Chain gage bolted to upstream side of bridge; read by J. S. Johnson.

DISCHARGE MEASUREMENTS.—Made from downstream side of bridge.

CHANNEL AND CONTROL.—Bed composed of sand and gravel; some outcropping rock. Low-water control is contracted section 300 feet below gage where flow is swift and broken; fairly permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during the period, 10.05 feet at 5 p. m. March 31 (discharge, 7,560 second-feet); minimum stage, 1.65 feet September 28 (discharge, 411 second-feet, by current-meter measurement).

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

REGULATION.—Natural regulation due to flow from numerous large springs, among which Greer Spring is the largest.

ACCURACY.—Stage-discharge relation not permanent; not affected by ice. Rating curve fairly well defined up to 2,000 second-feet used January 1 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 October 22 to December 31. Records fair.

Discharge measurements of Eleven Point River near Bardley, Mo., during the period September 14, 1921, to September 30, 1922.

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
1921		*Feet*	*Sec.-ft.*	1922		*Feet*	*Sec.-ft.*
Sept. 14	E. L. Williams	3.79	1,440	Mar. 20	E. L. Williams	4.30	1,800
Oct. 22	Reginald Waldo	1.88	383	May 9	Reginald Waldo	3.22	1,160
1922				Sept. 28	Austin and Denison	1.65	411
Jan. 1	do	2.26	620				

Daily discharge, in second-feet, of Eleven Point River near Bardley, Mo., for the year ending September 30, 1922

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1		400	745	640	690	910	5,130	1,310	800	690	515	480
2		400	910	590	1,020	910	2,930	1,250	855	690	515	450
3		400	910	590	910	855	2,450	1,250	800	965	515	450
4		400	910	640	855	855	2,150	1,310	800	800	515	450
5		400	910	590	800	855	2,080	1,250	800	745	515	450
6		400	855	590	745	855	2,080	1,250	745	690	515	450
7		400	800	590	690	910	1,870	1,250	745	690	515	450
8		400	800	590	640	910	1,800	1,080	745	640	515	450
9		400	745	590	640	965	1,940	1,130	745	640	515	450
10		400	690	590	640	1,550	1,870	1,130	745	640	515	450
11		400	690	590	640	1,490	2,450	1,080	745	590	480	450
12		380	745	590	590	1,370	2,370	1,080	690	640	480	450
13		400	690	590	590	1,250	2,010	1,020	690	640	480	450
14		400	640	590	590	1,310	1,800	1,020	690	640	480	450
15		400	690	590	550	1,370	1,670	1,020	690	640	480	450
16		400	640	550	550	1,310	1,610	1,020	690	590	550	425
17		425	690	550	550	1,310	2,010	965	690	590	515	425
18		1,020	640	550	550	1,310	1,940	965	690	590	515	425
19		550	640	550	550	1,490	1,670	965	640	590	480	425
20		2,770	640	550	550	1,730	1,610	965	640	590	480	425
21		1,610	590	515	640	1,610	1,490	910	640	590	480	425
22	380	1,310	590	515	690	1,420	1,490	910	640	550	480	425
23	380	1,130	590	515	800	1,370	1,370	910	640	550	480	425
24	400	1,020	690	515	965	1,250	1,370	910	640	550	480	425
25	400	1,370	690	515	965	1,190	1,370	910	640	590	480	425
26	400	1,250	745	515	965	1,310	1,310	855	640	590	480	425
27	400	1,080	690	515	965	1,870	1,310	855	640	590	480	425
28	400	965	690	515	965	1,870	1,370	855	640	550	450	425
29	400	910	690	480	-------	1,670	1,370	855	640	550	450	425
30	400	855	640	480	-------	2,010	1,370	800	640	550	450	425
31	400	-------	640	480	-------	5,820	-------	800	-------	550	450	-------

Monthly discharge of Eleven Point River near Bardley, Mo., for the year ending September 30, 1922

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October 22-31	400	380	396	7,850
November	2,770	400	755	44,900
December	910	590	717	44,100
January	640	480	557	34,200
February	1,020	550	725	40,300
March	5,820	855	1,450	89,200
April	5,130	1,310	1,910	114,000
May	1,310	800	1,030	63,300
June	855	640	701	41,700
July	965	550	629	38,700
August	550	450	492	30,300
September	480	425	438	26,100

GREER SPRING AT GREER, MO.

LOCATION.—In SE. ¼ SW. ¼ sec. 36, T. 25 N., R. 4. W., 250 feet below Greer Spring Milling Co.'s dam, 500 feet below second spring, 850 feet below first spring at mouth of cave, 1 mile north of Greer, Oregon County, 1¼ miles above Eleven Point River.

RECORDS AVAILABLE.—August 10 to December 30, 1904, and November 18, 1921, to September 30, 1922.

GAGE.—Vertical staff fastened to large elm tree on right bank at same location as gage used in 1904. Gages not set to the same datum.

DISCHARGE MEASUREMENTS.—Made by wading.

CHANNEL AND CONTROL.—Bed composed of coarse gravel and boulders. Control is a section of boulders and rocks below the gage; fairly permanent. Stage at gage is never affected by backwater from Eleven Point River.

EXTREMES OF DISCHARGE.—Maximum stage recorded during the year, 1.68 feet at 10.15 a. m. April 11 (discharge, 835 second-feet); minimum stage, 0.94 foot February 15–19 (discharge, 237 second-feet).

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

REGULATION.—Dam 250 feet above gage does not utilize the entire flow and the effect is not noticeable.

ACCURACY.—Stage-discharge relation permanent. Rating curve poorly defined. Gage read to hundredths once daily. Daily discharge ascertained by applying daily gage height to rating table. Records poor.

Discharge measurements of Greer Spring at Greer, Mo., during the year ending September 30, 1922

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Oct. 21	Waldo and Williams	-------	279	May 9	Reginald Waldo	1.35	525
Nov. 18	Reginald Waldo	0.99	317	Sept. 28	Denison and Austin	1.00	271

Daily discharge, in second-feet, of Greer Spring at Greer, Mo., for the year ending September 30, 1922

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	-------	-------	400	306	270	344	708	624	448	432	330	306
2	-------	-------	416	294	259	344	660	624	448	432	330	306
3	-------	-------	432	294	259	358	660	624	432	464	330	306
4	-------	-------	432	306	259	358	660	624	432	464	318	294
5	-------	-------	416	306	259	358	708	624	432	464	318	294
6	-------	-------	400	294	259	372	708	624	432	448	318	294
7	-------	-------	386	294	259	372	708	606	432	448	318	294
8	-------	-------	372	294	248	372	708	606	416	448	318	282
9	-------	-------	372	294	248	386	755	588	416	432	318	282
10	-------	-------	358	294	248	400	755	588	416	432	318	282
11	-------	-------	358	306	248	386	835	588	416	400	318	306
12	-------	-------	358	306	248	386	755	570	416	400	306	294
13	-------	-------	344	294	248	400	755	570	400	386	306	294
14	-------	-------	344	294	248	448	708	552	400	386	306	294
15	-------	-------	330	294	237	448	708	534	400	372	306	294
16	-------	-------	330	282	237	448	660	498	400	372	318	282
17	-------	-------	344	282	237	432	708	498	400	358	318	282
18	-------	282	344	294	237	416	660	480	400	358	318	282
19	-------	498	344	282	237	448	660	480	400	358	306	282
20	-------	516	330	282	294	498	660	480	400	358	306	282
21	279	516	330	282	282	498	642	464	400	358	306	282
22	-------	498	330	282	282	498	624	464	386	344	318	282
23	-------	480	330	282	344	480	624	464	386	344	318	282
24	-------	498	344	270	344	480	624	480	386	358	306	282
25	-------	480	344	270	330	480	624	480	386	372	306	270
26	-------	480	330	270	358	498	624	480	400	358	306	270
27	-------	464	330	259	358	534	624	480	400	358	306	270
28	-------	448	318	259	344	552	642	480	400	358	306	270
29	-------	448	318	248	-------	624	642	464	416	344	294	270
30	-------	416	306	248	-------	708	624	464	416	344	318	270
31	-------	-------	306	248	-------	755	-------	464	-------	344	318	-------

18569°—25†—WSP 547——4

Monthly discharge of Greer Spring at Greer, Mo., for the year ending September 30, 1922

Month	Discharge in second-feet		
	Maximum	Minimum	Mean
November 18–30	516	282	463
December	432	306	355
January	396	248	284
February	358	237	274
March	755	344	454
April	835	624	681
May	624	464	534
June	448	386	410
July	464	344	390
August	330	294	314
September	306	270	286

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, 1922.

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 1912.

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, 1.46 feet on May 28 and 30 (discharge, 409 second-feet); minimum discharge occurred during winter.

1911–1922: Maximum stage recorded, 2.03 feet at 8.30 a. m. June 15, 1921 (discharge, 794 second-feet); minimum discharge measured 5.4 second-feet on 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.—Diurnal fluctuation during spring from alternate melting and freezing of mountain snow. No artificial regulation.

ACCURACY.—Stage-discharge relation shifted slightly. Rating curve well defined. Gage read to hundredths twice daily. Daily discharge ascertained by applying mean daily gage-height to rating table except periods October 1 to May 15 and September 1 to 30, when shifting-control method was used. Records fair.

Discharge measurements of East Fork of Arkansas River near Leadville, Colo., during the year ending September 30, 1922

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Oct. 20	J. B. Spiegel	0.28	10.9	May 25	Robert Follansbee	0.88	124
Jan. 27	T. J. Watkins	[a]1.00	12.9	June 16	do	.90	132
Mar. 17	do	[a].90	9.3	Sept. 12	M. B. Arthur	.33	17.3
Apr. 30	Robert Follansbee	.25	16.6				

[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 September 30, 1922

Day	Oct.	Nov.	May	June	July	Aug.	Sept.
1	16		19	352	88	53	30
2	16		20	255	73	100	37
3	13		23	266	82	53	32
4	12		27	255	82	44	73
5	13		35	272	66	35	34
6	12		51	282	57	28	28
7	13		64	299	49	44	30
8	13		75	310	55	35	28
9	13		66	328	75	22	28
10	12		51	310	80	22	25
11	12		44	255	57	22	22
12	12		35	260	48	32	21
13	12		32	191	40	21	21
14	12		26	174	31	27	20
15	10		28	166	30	37	13
		15					
16	9		25	118	34	62	15
17	9		46	109	37	82	13
18	9		68	134	30	31	9
19	12		68	109	28	31	15
20	13		75	134	37	37	10
21	16		57	115	22	31	9
22	16		60	124	26	32	9
23	16		68	121	23	37	11
24	16		75	124	26	112	9
25	16		95	100	22	49	11
26	16		88	98	23	26	12
27	16		92	98	22	26	9
28	16		402	80	28	23	9
29	15		364	95	64	31	9
30	16		402	103	46	31	10
31	16	-------	370	-------	53	27	-------

Monthly discharge of East Fork of Arkansas River near Leadville, Colo., for the year ending September 30, 1922

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	16	9	13.5	830
November	-------	-------	15	893
May	402	19	95.2	5,850
June	352	80	188	11,200
July	88	22	46.1	2,830
August	100	22	40.1	2,470
September	37	9	18.2	1,080

NOTE.—Mean discharge for November is estimated.

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.—431 square miles (revised measurement on topographic map).

RECORDS AVAILABLE.—May 1, 1897, to September 10, 1899; April 6, 1910, to September 30, 1922.

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, 3.77 feet at 3 a. m., July 14 (discharge, 1,680 second-feet); minimum discharge, 72 second-feet on January 11 and 21.

1910–1922: 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.

Discharge measurements of Arkansas River at Granite, Colo., during the year ending September 30, 1922

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Feb. 1	H. D. Amsley	[a] 1.62	95	July 8	Thomas Curtis	2.74	816
Mar. 9	Thomas Curtis	1.27	118	27	do	1.87	328
Apr. 4	do	1.28	153	Aug. 8	do	2.53	694
May 21	do	2.88	918	29	do	2.67	784
June 13	do	3.63	1,560	Sept. 18	do	1.28	138

[a] Stage-discharge relation affected by ice.

Daily discharge, in second-feet, of Arkansas River at Granite, Colo., for the year ending September 30, 1922

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	149	144	149	113	90	84	106	426	751	952	517	779
2	152	160	144	116	98	84	106	421	897	921	533	684
3	141	163	141	100	110	84	131	435	1,020	874	481	627
4	136	163	136	76	110	84	148	450	1,140	874	371	389
5	136	155	139	76	78	106	148	465	1,210	890	528	232
6	136	155	158	75	84	84	148	539	1,290	952	697	219
7	149	149	141	87	89	84	124	596	1,380	914	697	225
8	158	152	147	87	110	84	124	614	1,490	800	677	209
9	136	134	147	87	110	84	124	744	1,580	807	671	203
10	136	139	141	84	105	84	124	837	1,530	929	664	200
11	136	144	147	72	105	84	124	723	1,450	852	717	180
12	129	139	155	86	78	106	124	620	1,460	786	730	171
13	119	147	155	75	81	106	102	596	1,540	765	270	171
14	114	147	163	98	73	106	102	556	1,530	800	308	171
15	117	141	158	69	98	131	124	517	1,470	852	297	156
16	129	136	158	85	92	131	124	495	1,440	830	304	146
17	141	122	158	100	89	131	124	480	1,210	751	353	138
18	195	110	173	88	110	106	124	506	1,260	677	293	146
19	262	124	163	88	98	106	124	639	1,280	677	252	141
20	262	136	158	77	94	106	124	807	1,330	684	235	134
21	238	149	139	72	106	106	148	897	1,420	639	222	124
22	228	139	144	82	106	156	148	905	1,290	384	281	124
23	228	136	144	88	84	156	148	983	1,130	337	289	131
24	228	129	144	88	84	156	174	1,060	1,100	324	324	171
25	238	134	144	86	84	131	174	1,160	991	324	677	209
26	245	139	144	100	106	131	235	1,280	944	329	874	206
27	245	141	136	107	84	131	206	1,330	882	333	807	203
28	231	141	134	115	84	131	242	1,260	867	367	793	203
29	136	144	134	90	------	106	293	1,230	867	440	786	166
30	136	149	139	104	------	106	384	1,250	952	398	793	129
31	136	------	136	93	------	106	------	1,110	------	412	800	------

Monthly discharge of Arkansas River at Granite, Colo., for the year ending September 30, 1922

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	262	114	172	10,600
November	163	110	142	8,450
December	173	134	147	9,040
January	116	72	89	5,470
February	110	73	94.3	5,240
March	156	84	109	6,700
April	384	102	154	9,160
May	1,330	421	772	47,500
June	1,580	751	1,220	72,600
July	952	324	673	41,400
August	874	222	522	32,100
September	779	124	233	13,900
The year	1,580	72	362	262,000

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, nearest important tributary.

DRAINAGE AREA.—1,210 square miles (revised measurement on map of Colorado, scale 1:500,000).

RECORDS AVAILABLE.—April 11, 1895, to October 31, 1903; November 3, 1909, to September 30, 1922.

GAGE.—Bristol water-stage recorder on right bank in City Park 400 feet below highway bridge; inspected by water commissioner. Datum lowered 1.0 foot January 1, 1922.

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, 5.42 feet at 8 a. m. June 14 (discharge, 2,870 second-feet); minimum stage, 1.40 feet on March 29 and 30 (discharge, 217 second-feet).

1909–1922: Maximum stage, 6.2 feet (old datum) 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.

Discharge measurements of Arkansas River at Salida, Colo., during the year ending September 30, 1922

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Feb. 2	H. D. Amsley	0.45	218	July 6	Thomas Curtis	4.33	1,700
Mar. 10	Thomas Curtis	.45	242	28	do	2.37	543
Apr. 10	do	1.68	294	Aug. 9	do	2.92	865
May 10	do	3.38	1,240	30	do	3.22	1,010
22	do	3.68	1,470	Sept. 19	do	1.81	344
June 12	do	5.09	2,610				

Daily discharge, in second-feet, of Arkansas River at Salida, Colo., for the year ending September 30, 1922

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	350	501	378	301	263	233	222	492	1,550	2,050	822	955
2	374	416	378	307	260	230	227	519	1,710	2,030	1,010	927
3	362	420	378	311	263	263	249	534	1,790	1,980	913	850
4	342	442	358	295	274	283	283	640	2,040	1,940	796	732
5	342	442	358	271	274	254	295	640	2,150	1,940	708	457
6	346	442	350	271	243	246	274	738	2,290	1,960	1,040	393
7	354	442	346	265	249	225	298	892	2,380	1,970	970	382
8	346	442	338	277	254	265	298	1,010	2,540	1,850	913	382
9	320	420	338	277	277	243	295	1,060	2,630	1,770	871	382
10	302	399	358	277	274	246	292	1,250	2,560	1,900	843	364
11	309	420	378	274	271	254	274	1,150	2,500	1,860	809	353
12	309	420	370	257	271	251	289	1,070	2,510	1,770	920	340
13	309	420	350	271	243	246	277	1,000	2,550	1,650	557	333
14	309	420	346	260	246	251	268	948	2,660	1,660	424	340
15	309	399	346	283	238	265	268	850	2,490	1,610	515	343
16	313	399	346	254	263	271	277	763	2,350	1,630	470	347
17	362	412	302	265	257	271	265	738	2,130	1,570	640	343
18	412	399	338	280	254	274	240	829	2,170	1,530	696	343
19	534	370	358	268	274	257	263	913	2,170	1,520	770	350
20	558	399	358	268	263	235	280	1,260	2,200	1,460	738	347
21	524	416	358	257	263	240	292	1,470	2,270	1,390	645	347
22	515	399	350	257	268	240	304	1,510	2,270	1,360	608	343
23	492	399	358	257	251	254	314	1,640	2,170	543	562	336
24	515	399	338	263	249	271	333	1,630	2,150	528	533	323
25	524	399	338	263	249	254	340	1,830	2,120	496	553	367
26	524	378	366	271	254	240	360	2,040	2,080	501	1,090	382
27	534	378	358	271	257	240	371	2,250	2,030	519	1,040	382
28	553	370	358	277	251	225	397	2,320	2,010	528	970	382
29	529	358	338	286	------	217	428	2,270	1,970	668	941	379
30	492	370	346	260	------	217	440	2,300	2,060	720	978	333
31	501	------	358	274	------	220	------	2,190	------	696	1,000	------

Monthly discharge of Arkansas River at Salida, Colo., for the year ending September 30, 1922

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	558	302	415	25,500
November	501	358	410	24,400
December	378	302	353	21,700
January	311	254	273	16,800
February	277	238	259	14,400
March	283	217	248	15,200
April	440	222	300	17,900
May	2,320	492	1,250	76,900
June	2,660	1,550	2,220	132,000
July	2,050	496	1,410	86,700
August	1,090	424	785	48,300
September	955	323	428	25,500
The year	2,660	217	697	505,000

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.—3,090 square miles (revised measurement on map of Colorado, scale 1:500,000).

RECORDS AVAILABLE.—May 1, 1888, to September 30, 1922.

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, 3.35 feet at 4 p. m., June 14 (discharge, 3,180 second-feet); minimum stage, 0.52 foot at midnight March 31 (discharge, 237 second-feet).

1888–1922: Maximum stage recorded, 10.7 feet at 8 p. m., August 2, 1921 (discharge, 19,000 second-feet); minimum discharge, 108 second-feet on 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.

Discharge measurements of Arkansas River at Canon City, Colo., during the year ending September 30, 1922

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Feb. 2	H. D. Amsley	[a]0.83	286	June 8	Thomas Curtis	3.18	2,920
Mar. 7	Thomas Curtis	.65	321	July 8	do	2.18	1,560
27	do	.73	361	29	Curtis and Baily	1.11	496
Apr. 19	do	.79	371	Aug. 10	Curtis and Jones, jr	1.50	880
28	do	.95	524	31	do	1.65	1,010
May 10	do	1.68	1,160	Sept. 14	Curtis and Burgess	.68	279
25	do	2.25	1,710	20	do	.64	312

[a] Stage-discharge relation affected by ice.

Daily discharge, in second-feet, of Arkansas River at Canon City, Colo., for the year ending September 30, 1922

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	416	520	448	472	333	253	269	519	2,250	1,870	811	1,020
2	448	501	432	472	342	319	296	561	1,540	1,850	956	974
3	432	458	458	472	309	395	307	561	1,760	1,820	920	938
4	406	458	406	347	344	427	319	604	2,010	1,690	827	869
5	406	458	406	291	406	407	330	686	2,160	1,680	869	678
6	406	458	458	291	429	335	341	747	2,380	1,690	1,020	477
7	398	448	448	291	437	319	330	852	2,550	1,750	1,120	452
8	406	416	416	314	378	324	330	974	2,690	1,640	992	414
9	398	406	442	337	428	341	291	1,020	2,880	1,480	956	401
10	366	406	416	315	450	324	291	1,140	2,900	1,510	903	371
11	398	416	432	357	359	341	274	1,180	2,790	1,660	869	341
12	406	432	432	294	319	335	296	1,070	2,700	1,470	912	313
13	386	448	432	317	298	335	330	956	2,740	1,310	938	296
14	386	416	432	324	300	335	324	920	2,940	1,250	568	296
15	398	458	406	337	315	359	307	835	2,740	1,250	604	383
16	374	432	416	332	372	383	353	819	2,560	1,240	568	519
17	374	448	386	357	374	401	377	787	2,460	1,270	634	341
18	508	508	394	352	302	420	371	787	2,240	1,140	787	324
19	489	448	448	329	377	377	365	803	2,310	1,110	920	313
20	625	470	432	427	377	359	395	1,090	2,250	1,020	852	330
21	588	534	458	402	365	365	377	1,250	2,180	1,000	827	341
22	588	520	458	345	347	395	389	1,420	2,340	894	732	335
23	588	520	458	392	335	433	407	1,500	2,190	626	663	324
24	574	554	406	421	330	472	452	1,600	2,070	634	611	324
25	588	520	432	436	347	459	485	1,750	2,050	533	590	319
26	588	534	442	411	319	407	517	1,990	1,960	477	920	383
27	588	458	458	406	319	341	540	2,210	1,900	499	1,060	401
28	588	458	458	414	313	330	492	2,450	1,810	485	992	407
29	588	448	432	310	-------	274	446	2,480	1,740	619	992	389
30	534	470	432	391	-------	269	477	2,480	1,810	1,050	1,010	371
31	520	-------	416	420	-------	258	-------	2,450	-------	920	1,040	-------

Monthly discharge of Arkansas River at Canon City, Colo., for the year ending September 30, 1922

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	625	366	476	29,300
November	554	406	467	27,800
December	458	386	432	26,600
January	472	291	367	22,600
February	450	298	354	19,700
March	472	253	358	22,000
April	540	269	369	22,000
May	2,480	519	1,240	76,200
June	2,940	1,540	2,300	137,000
July	1,870	477	1,210	74,400
August	1,120	568	854	52,500
September	1,020	296	455	27,100
The year	2,940	253	741	537,000

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.—4,820 square miles (revised measurement on map of Colorado, scale 1:500,000).

RECORDS AVAILABLE.—May 1, 1885, to September 30, 1886; September 19, 1894, to September 30, 1922. 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 during year from water-stage recorder 7.95 feet at 6 p. m., August 6 (discharge, 8,850 second-feet); minimum discharge, 129 second-feet on April 13.

1894–1922: Maximum stage from high-water mark, 24.66 feet at midnight, June 3, 1921 (discharge estimated at 100,000 second-feet); 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 September 30, 1922

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	299	442	551	600	442	354	268	265	2,120	1,890	717	781
2	304	519	532	515	375	335	256	446	1,270	2,470	736	787
3	308	519	532	483	386	481	233	507	1,390	1,820	900	893
4	336	551	488	483	375	452	256	522	1,490	1,720	822	871
5	277	532	471	407	402	390	262	547	1,780	1,600	781	761
6	248	551	500	396	386	311	271	629	2,030	1,530	1,170	411
7	248	513	513	480	350	287	256	717	2,270	1,520	1,010	336
8	290	500	513	422	402	253	242	828	2,410	1,480	978	291
9	282	442	506	446	316	287	242	923	2,650	1,360	1,070	265
10	261	471	500	480	463	284	231	1,070	2,710	1,310	856	248
11	313	442	519	478	445	304	218	1,150	2,560	1,500	815	265
12	313	431	519	475	415	304	151	1,080	2,460	1,460	842	274
13	346	442	500	470	415	291	129	629	2,310	1,350	878	220
14	352	471	532	465	445	297	239	842	2,440	1,330	669	215
15	336	500	513	460	370	291	236	835	2,540	1,220	497	220
16	336	500	500	460	354	314	265	736	2,490	1,320	522	568
17	336	471	532	455	360	332	271	693	2,310	1,160	455	336
18	336	538	471	450	370	328	284	693	1,990	1,110	522	281
19	420	506	578	445	364	328	300	863	2,030	1,030	781	262
20	483	500	649	440	360	300	284	930	1,820	1,050	652	256
21	564	613	649	430	386	242	265	1,070	1,790	946	675	253
22	578	649	649	400	380	218	297	1,220	1,910	938	634	242
23	578	634	672	400	375	181	294	1,320	1,880	669	579	223
24	585	620	672	430	370	261	253	1,460	1,710	507	532	194
25	599	620	578	480	365	256	262	1,530	1,630	512	474	187
26	620	634	564	490	375	287	294	1,660	1,500	366	411	196
27	649	578	634	408	391	297	284	2,500	1,430	356	705	233
28	599	532	657	413	350	294	223	2,540	1,510	356	749	248
29	564	532	672	415	-------	265	201	2,440	1,370	532	856	226
30	471	532	657	414	-------	262	223	2,490	1,490	606	962	205
31	471	-------	649	335	-------	256	-------	2,340	-------	705	822	-------

Monthly discharge of Arkansas River at Pueblo, Colo., for the year ending September 30, 1922

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	649	248	410	25,200
November	649	471	526	31,300
December	672	471	564	34,700
January	600	335	449	27,600
February	463	316	385	21,400
March	481	181	299	18,400
April	300	129	250	14,900
May	2,540	265	1,140	70,100
June	2,710	1,270	1,980	118,000
July	2,470	356	1,150	70,700
August	1,170	411	744	45,700
September	893	187	358	21,300
The year	2,710	129	690	499,000

ARKANSAS RIVER AT HOLLY, COLO.

LOCATION.—Between secs. 14 and 15, T. 23 S., R. 42 W., at highway bridge half a mile south of Holly, Prowers County. Nearest tributary, Wildhorse Creek, an intermittent stream, enters 1 mile upstream.

DRAINAGE AREA.—About 25,000 square miles.

RECORDS AVAILABLE.—October 15, 1907, to September 30, 1922.

GAGE.—Bristol float-type water-stage recorder on upstream side of bridge.

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

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

EXTREMES OF DISCHARGE.—Maximum mean daily stage during year, 3.37 feet April 29 (discharge, 1,730 second-feet); minimum discharge, 3 second-feet on several days during July and September.

1907–1922: Maximum stage recorded, 11 feet at noon, October 20, 1908 (discharge determined from slope measurements, 136,000 second-feet); no flow during periods in June and July, 1910.

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

COOPERATION.—Complete records furnished by the State engineer.

Discharge measurements of Arkansas River at Holly, Colo., during the year ending September 30, 1922

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Jan. 10	H. D. Amsley	2.01	249	June 9	L. T. Burgess	1.91	26.5
Feb. 9	do	2.75	659	27	Amsley and Burgess	1.52	4.2
Mar. 12	Amsley and Burgess	2.26	291	July 20	do	1.55	5.2
Apr. 2	L. T. Burgess	2.00	114	Aug. 25	do	1.85	26.6
May 1	do	2.51	391	Sept. 29	do	1.58	3.0
13	Amsley and Burgess	2.08	96.4				

Daily discharge, in second-feet, of Arkansas River at Holly, Colo., for the years ending September 30, 1914–1922

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1913–14												
1	24	13	40	285	144	114	38	7,030	1,910	160	1,680	20
2	24	13	40	220	129	135	38	18,000	3,240	165	1,500	22
3	24	13	40	220	113	144	38	11,200	5,340	156	1,400	27
4	24	13	40	240	106	129	38	8,600	6,650	152	1,900	34
5	13	13	263	280	92	125	38	3,540	5,580	134	5,400	27
6	13	13	118	170	92	158	38	2,600	5,110	1,500	3,330	24
7	13	13	125	170	92	106	38	1,600	4,000	500	2,280	29
8	13	13	125	170	144	56	38	1,210	3,320	300	1,520	20
9	13	24	125	224	205	56	38	900	1,310	175	1,440	18
10	13	24	125	224	198	78	38	750	1,000	75	1,360	22
11	13	24	180	237	182	84	38	570	890	75	1,150	24
12	13	24	125	243	144	56	38	430	730	50	790	22
13	13	24	125	243	144	56	38	282	490	50	865	82
14	13	24	200	256	163	60	38	233	600	30	524	74
15	13	24	325	249	205	38	38	225	4,920	30	400	66
16	13	24	300	256	224	38	38	176	1,060	25	1,200	77
17	13	24	350	237	243	45	38	136	9,100	25	145	66
18	13	24	250	224	224	38	38	84	6,240	25	122	30
19	13	24	250	224	192	38	38	300	5,240	5,000	154	9
20	13	24	225	224	224	38	38	1,000	4,450	5,500	120	8
21	13	24	150	243	198	38	38	440	3,960	5,000	116	6
22	13	24	150	249	110	38	38	1,530	3,270	3,100	90	8
23	13	24	175	263	106	38	38	6,650	3,000	5,000	85	6
24	13	24	150	271	133	38	38	3,210	1,940	6,800	79	6
25	13	24	150	256	187	38	38	2,610	910	5,500	58	6
26	13	24	250	243	182	38	38	1,810	566	4,000	44	6
27	13	24	175	237	144	38	38	1,200	384	3,000	44	8
28	13	24	175	192	125	38	38	1,790	258	2,150	28	12
29	13	24	200	192	-------	38	38	3,180	238	2,370	18	6
30	13	40	200	168	-------	38	125	2,820	192	1,490	14	7
31	13	-------	200	144	-------	38	-------	2,800	-------	1,570	16	-------
1914–15												
1	6	64	-------	250	230	240	138	985	4,300	1,220	460	360
2	8	64	-------	250	240	285	105	1,180	4,850	560	1,300	330
3	5	55	-------	250	220	283	90	985	6,450	360	1,160	340
4	6	51	-------	250	220	280	80	900	8,850	690	750	550
5	4	57	-------	240	290	240	80	700	7,500	280	560	490
6	4	79	-------	220	350	290	70	900	6,100	420	310	420
7	5	58	-------	220	490	310	90	1,070	5,450	300	160	320
8	3	43	-------	220	415	375	80	1,180	4,850	320	165	340
9	4	23	-------	220	345	370	90	900	3,820	175	170	300
10	5	18	-------	220	200	300	370	640	3,370	158	160	275
11	2	18	-------	220	200	355	340	450	2,120	95	140	200
12	2	20	-------	175	230	380	310	280	1,790	72	150	200
13	2	22	-------	175	185	490	225	178	1,520	65	165	200
14	4	71	-------	175	150	435	310	120	1,790	65	210	200
15	2	172	-------	175	155	330	590	90	1,520	110	1,020	155
16	2	124	-------	175	150	325	985	70	760	110	1,860	85
17	2	136	-------	175	135	385	1,280	20	450	95	950	225
18	4	188	-------	175	105	460	3,370	138	370	80	560	178
19	6	212	-------	175	100	340	1,960	200	200	72	1,780	138
20	4	180	-------	175	100	410	2,480	830	70	125	2,850	120
21	4	160	-------	175	100	120	1,960	900	40	1,060	1,380	120
22	18	112	-------	175	100	155	1,070	1,180	25	340	1,630	102
23	77	104	-------	200	95	120	985	1,180	25	220	1,590	85
24	200	90	-------	240	130	120	1,280	700	60	198	2,250	102
25	588	79	-------	240	125	90	1,790	450	450	260	13,300	102
26	370	74	-------	290	140	90	3,600	450	1,280	920	5,150	102
27	260	74	-------	265	155	80	4,850	2,300	900	600	4,300	120
28	180	69	-------	240	270	70	3,370	8,200	450	310	2,250	102
29	192	61	-------	290	-------	90	2,120	4,300	540	690	1,310	120
30	128	61	-------	290	-------	120	1,180	3,140	3,600	1,030	960	138
31	87	-------	-------	290	-------	120	-------	4,850	-------	850	650	-------

Daily discharge, in second feet, of Arkansas River at Holly, Colo., for the years ending September 30, 1914-1922—Continued

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1915–16												
1	138	110	175	160	225	120	68	30	2	68	5	900
2	120	125	195	375	250	120	55	30	2	22	5	570
3	120	125	175	275	230	80	55	30	3	8	5	460
4	120	125	195	300	225	220	55	30	3	8	5	370
5	120	98	175	300	270	160	55	22	22	15	5	270
6	85	90	240	325	300	140	55	22	190	8	5	208
7	120	65	218	300	300	100	80	22	100	5	5	170
8	120	50	155	275	300	100	120	15	68	5	5	170
9	120	50	138	300	300	80	100	8	55	8	5	150
10	120	60	175	350	550	80	120	5	30	15	5	150
11	120	120	155	850	750	100	120	5	80	15	5	120
12	120	90	70	500	850	80	100	5	570	15	5	120
13	52	105	155	500	850	80	80	5	220	22	5	120
14	70	70	155	200	1,600	80	80	5	160	15	5	105
15	50	95	155	150	800	100	100	3	140	15	8	105
16	50	220	218	150	1,100	80	80	2	140	15	120	65
17	50	260	155	150	1,050	80	80	3	120	15	220	40
18	50	190	206	125	750	80	80	5	100	15	140	32
19	50	195	140	150	700	80	100	5	80	15	140	40
20	100	155	165	150	500	80	80	5	570	15	120	40
21	110	70	200	175	500	68	80	5	220	8	2,460	40
22	98	50	225	200	350	80	80	3	80	15	8,560	40
23	110	95	225	200	280	80	68	5	68	8	7,360	40
24	125	120	225	300	315	80	55	3	100	8	2,160	40
25	125	108	210	375	280	80	30	2	68	5	695	40
26	110	120	225	500	220	68	15	2	42	5	315	40
27	70	155	225	450	160	68	15	2	30	5	248	40
28	70	138	250	350	55	55	30	3	15	5	170	25
29	110	155	275	225	120	68	30	3	120	5	170	40
30	110	195	275	225	------	68	30	2	190	5	460	40
31	125	------	300	225	------	68	------	2	------	5	900	------
1916–17												
1	40	65	------	219	158	148	52	------	------	12	11	44
2	40	65	------	219	133	148	52	------	------	12	12	44
3	40	65	------	219	208	122	51	------	------	12	12	46
4	25	65	------	219	153	120	49	------	------	12	12	41
5	40	48	------	219	178	120	49	------	------	31	14	38
6	25	40	------	219	205	120	47	------	------	205	15	38
7	25	48	------	244	202	117	------	------	------	106	15	40
8	25	48	------	188	200	141	------	------	56	56	13	40
9	40	40	------	242	197	93	------	------	58	56	12	40
10	65	48	------	242	197	93	------	------	60	31	11	41
11	65	48	------	242	225	93	------	73	61	106	93	41
12	65	48	------	183	222	90	------	73	63	56	172	42
13	32	75	------	180	222	113	------	71	19	63	65	35
14	40	150	------	84	191	110	------	51	19	63	585	42
15	40	150	------	84	165	86	------	51	19	26	136	44
16	65	150	------	177	219	86	------	51	19	32	136	44
17	90	225	------	175	162	108	------	51	19	32	106	104
18	65	250	------	342	188	84	------	13	19	32	88	108
19	65	275	------	403	186	82	------	13	19	32	80	88
20	65	250	------	371	186	82	------	13	19	34	82	63
21	65	225	------	371	113	82	------	------	19	34	76	82
22	65	150	------	400	110	80	------	------	19	34	65	78
23	65	190	------	400	108	80	------	------	19	22	65	78
24	120	150	------	397	129	78	------	------	84	14	60	80
25	120	225	------	397	153	78	------	------	106	12	56	78
26	120	315	------	365	150	78	------	------	56	14	58	93
27	120	315	------	426	126	97	------	------	31	11	51	205
28	90	270	------	422	124	76	------	------	19	11	47	219
29	90	225	------	387	------	73	------	------	19	10	42	165
30	65	170	------	158	------	54	------	------	19	11	44	117
31	65	------	------	155	------	52	------	------	------	14	44	------

Daily discharge, in second-feet, of Arkansas River at Holly, Colo, for the years ending September 30, 1914-1922—Continued

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1917–18												
1	113	60	7	21	60	141	42	19	333	101	49	17
2	108	51	6	133	60	150	28	19	194	61	32	17
3	110	51	6	131	60	126	28	19	54	61	32	17
4	117	49	6	131	60	150	42	19	56	46	32	40
5	117	49	5	108	60	202	60	19	56	46	32	56
6	84	41	6	108	60	175	60	19	56	46	32	56
7	54	41	4	65	60	150	60	20	58	46	32	56
8	54	34	4	63	60	126	60	20	58	47	32	55
9	54	34	30	63	60	124	60	20	27	47	32	55
10	52	27	47	63	60	101	18	20	28	47	32	54
11	36	21	56	19	60	60	18	20	28	108	32	54
12	16	21	80	18	60	60	18	20	30	76	32	397
13	11	13	113	100	60	60	28	20	30	480	31	394
14	14	13	168	100	60	80	42	21	31	387	31	216
15	14	12	191	100	60	101	42	21	31	211	31	177
16	14	12	178	100	50	80	42	13	20	275	19	139
17	24	12	170	100	60	60	60	13	8	339	19	136
18	30	10	170	100	60	60	61	13	8	110	18	136
19	30	12	129	172	60	60	31	13	8	75	18	133
20	24	12	104	172	60	42	18	1.0	8	99	18	110
21	24	13	93	150	60	42	18	1.0	22	183	18	88
22	36	15	93	150	131	60	18	1.0	14	183	18	110
23	35	15	82	150	208	11	18	1.0	120	239	18	97
24	42	15	61	100	208	60	18	22	225	170	18	86
25	42	14	42	150	153	11	18	22	464	110	101	86
26	42	14	51	150	84	11	18	24	306	110	256	86
27	35	17	82	150	129	7	18	24	183	88	124	86
28	35	7	28	150	129	7	31	24	166	67	51	86
29	30	7	34	60	-------	28	19	24	148	58	41	86
30	30	7	21	60	-------	51	19	25	124	54	41	65
31	60	-------	21	60	-------	60	-------	333	-------	49	17	-------
1918–19												
1	47	86	131	-------	-------	108	365	2,300	48	13	180	14
2	47	86	131	-------	-------	108	495	1,900	48	14	3,760	10
3	47	86	131	-------	-------	365	605	1,640	54	14	2,440	10
4	47	86	131	-------	-------	365	1,070	1,170	68	58	810	12
5	47	86	139	-------	-------	365	1,000	1,075	134	48	410	12
6	47	86	147	-------	-------	365	930	980	240	320	280	14
7	32	86	155	-------	-------	365	795	660	82	180	134	14
8	32	86	163	-------	-------	445	930	660	68	48	96	14
9	32	86	171	-------	-------	365	930	810	68	32	96	10
10	32	86	180	-------	-------	365	930	810	48	17	240	10
11	32	86	180	-------	-------	365	930	660	58	14	980	12
12	32	86	168	-------	-------	365	930	410	58	12	735	12
13	32	86	155	-------	-------	365	1,000	210	68	10	410	12
14	40	86	131	-------	-------	365	1,220	180	68	14	180	14
15	47	65	131	-------	-------	365	1,465	180	48	26	134	14
16	47	65	108	-------	-------	365	1,465	134	32	980	96	115
17	47	65	108	-------	-------	300	1,220	134	20	735	96	240
18	47	65	108	-------	-------	245	930	96	20	365	68	134
19	47	65	108	-------	-------	164	1,000	48	32	240	48	240
20	47	65	108	-------	-------	245	930	48	26	320	48	240
21	47	65	155	-------	-------	222	930	48	48	320	48	134
22	47	65	155	-------	-------	272	862	48	48	240	48	96
23	47	86	155	-------	-------	405	665	48	26	134	48	68
24	47	108	155	-------	-------	545	665	48	20	134	32	180
25	47	108	155	-------	-------	545	1,720	48	13	96	20	134
26	56	108	155	-------	-------	365	2,440	48	26	96	32	96
27	60	108	155	-------	-------	445	1,900	68	32	48	32	96
28	65	108	155	-------	-------	445	4,340	68	12	40	26	68
29	65	131	125	-------	-------	365	5,400	68	10	32	14	68
30	65	131	125	-------	-------	365	2,740	58	10	20	14	68
31	86	-------	125	-------	-------	365	-------	48	-------	32	14	-------

Daily discharge, in second-feet, of Arkansas River at Holly, Colo., for the years ending September 30, 1914-1922—Continued

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1919–20												
1	58	68	410		295	40	20	73	23	17	760	23
2	48	96	389		242	56	32	73	23	17	2,200	23
3	40	96	368		295	73	40	56	23	17	2,200	40
4	48	134	347		190	96	56	56	32	15	4,000	295
5	68	134	326		120	120	120	40	155	13	2,660	120
6	48	134	305		120	120	155	73	242	17	1,990	73
7	68	134	284		155	295	96	73	295	15	1,570	672
8	96	134	263		190	155	56	56	155	760	1,460	855
9	96	96	242		242	73	40	40	73	2,990	760	1,570
10	68	96	221		295	120	32	155	40	1,050	585	874
11	48	180	200		190	155	120	295	32	362	506	970
12	32	675	200		190	190	32	190	20	190	428	708
13	96	690	200		190	120	73	96	20	428	1,150	322
14	134	458	200		190	73	73	96	20	73	2,200	554
15	134	482	200		242	40	242	242	20	56	950	274
16	134	383	200		190	40	295	362	17	40	585	348
17	134	392	200		190	32	242	155	18	56	190	836
18	134	401	232		242	40	155	96	22	585	96	672
19	134	248	264		295	40	73	73	22	950	96	760
20	134	256	296		242	40	40	56	32	585	23	779
21	180	256	328		155	32	40	73	32	428	96	444
22	115	296	360		96	23	40	40	20	242	96	264
23	82	338	392		40	40	40	56	18	120	96	169
24	82	296	424		40	32	96	40	20	73	120	176
25	68	256	456		96	40	120	40	20	56	18	111
26	96	166	488		73	32	73	40	22	428	17	183
27	134	256	520		73	40	73	40	20	1,990	18	183
28	96	338	552		73	20	56	40	16	1,150	32	295
29	68	338	585		23	20	40	40	18	585	23	40
30	68	338	360			23	56	40	20	950	56	308
31	68		360			20		23		428	23	
1920–21												
1	308	183	253	220	205	200	116	36	26	2,110	2,830	389
2	459	176	253	225	200	238	116	36	36	1,960	2,830	254
3	82	169	253	225	215	238	116	19	26	1,750	7,920	196
4	87	101	308	220	215	332	62	19	15	1,620	10,100	232
5	50	242	375	225	225	284	38	20	44,800	1,670	4,740	97
6	148	232	253	230	220	238	34	20	59,500	1,860	3,240	145
7	148	284	253	220	190	238	32	41	35,000	2,110	2,280	232
8	242	232	308	230	180	200	43	41	15,600	1,780	1,940	122
9	96	183	253	210	200	344	43	32	11,800	1,700	1,460	132
10	101	242	253	210	200	344	41	32	10,000	1,320	1,620	87
11	162	155	200	205	190	284	41	25	7,300	1,180	1,460	75
12	63	362	253	212	220	284	32	36	7,300	1,050	1,050	41
13	63	362	162	215	200	238	46	15	7,100	930	820	38
14	56	375	253	225	215	284	36	15	7,220	1,600	1,780	64
15	242	375	33	215	180	168	41	26	7,200	2,290	1,460	64
16	1,550	253	60	225	200	116	36	48	8,700	2,280	6,350	82
17	1,010	253	162	240	200	200	168	48	8,590	3,460	6,350	68
18	475	375	375	225	200	116	78	26	8,590	2,930	3,460	41
19	620	253	308	225	180	116	78	26	7,920	7,380	2,200	38
20	446	200	422	210	205	116	62	48	7,340	10,200	1,460	64
21	428	162	101	220	195	140	26	62	6,640	5,350	1,180	92
22	950	162	50	210	180	200	26	48	6,720	2,830	990	82
23	742	127	308	290	160	238	26	48	5,230	2,640	930	46
24	401	162	375	290	160	168	22	48	3,870	2,550	820	41
25	106	253	422	275	190	168	22	48	3,680	2,640	820	41
26	60	200	253	300	230	168	26	36	3,280	2,460	667	50
27	56	200	308	260	230	238	19	26	3,220	2,110	524	33
28	92	253	162	230	230	200	36	26	3,240	2,020	532	41
29	111	253	162	210		168	36	15	2,500	1,700	346	53
30	63	162	375	195		140	36	15	2,350	1,460	346	64
31	190		375	195		116		15		4,450	268	

Daily discharge, in second-feet, of Arkansas River at Holly, Colo., for the years ending September 30, 1914-1922—Continued

Day.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1921–22												
1	64	132	43	150	385	170	110	472	91	6	380	10
2	28	122	41	150	375	180	102	279	60	7	196	10
3	33	122	41	150	365	240	116	252	42	18	650	10
4	30	97	64	150	330	290	116	218	34	39	461	9
5	46	82	239	225	320	340	116	224	37	20	472	9
6	46	82	307	210	340	450	110	196	28	17	800	7
7	53	75	338	200	315	400	86	246	28	16	406	6
8	57	71	330	160	340	300	86	207	22	13	1,130	6
9	68	57	268	170	350	300	86	182	21	12	596	4
10	53	92	338	180	360	300	89	147	19	16	259	7
11	46	107	335	224	350	300	74	123	19	15	187	7
12	71	107	300	230	350	306	218	102	18	20	143	5
13	82	117	300	200	550	235	246	99	14	21	119	6
14	117	107	275	210	500	173	210	96	16	16	94	6
15	97	122	240	250	450	164	110	126	14	13	88	6
16	92	102	250	300	465	150	101	105	16	11	88	6
17	107	57	250	254	350	143	101	88	29	11	76	6
18	92	46	200	254	350	147	107	81	20	10	71	6
19	102	71	140	200	305	173	104	76	18	9	56	5
20	92	68	140	165	290	286	103	64	25	7	47	5
21	97	50	130	160	290	266	110	76	15	5	42	5
22	122	82	130	180	270	235	116	62	11	4	34	4
23	87	92	130	262	265	191	110	58	10	4	32	3
24	102	60	135	248	250	155	110	54	10	3	30	3
25	132	57	135	275	200	140	105	47	8	3	29	3
26	107	71	140	300	230	136	105	47	8	3	38	3
27	112	82	150	300	240	123	224	51	4	3	30	3
28	97	71	150	325	200	102	623	42	4	3	25	3
29	151	53	150	350	-------	105	1,730	37	5	4	19	4
30	196	46	145	350	-------	136	770	49	5	6	18	4
31	132	-------	135	415	-------	150	-------	56	-------	9	12	-------

Monthly discharge of Arkansas River at Holly, Colo., for the years ending September 30, 1914–1922

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1913–14				
October	24	13	14.4	885
November	40	13	22.4	1,330
December	350	40	172	10,600
January	285	144	228	14,000
February	243	92	158	8,780
March	158	38	64.8	3,980
April	125	38	40.9	2,430
May	18,000	84	2,700	166,000
June	10,600	192	3,180	189,000
July	6,800	25	1,580	97,200
August	5,400	14	891	54,800
September	82	6	25.7	1,530
The year	18,000	6	769	551,000
1914–15				
October	588	2	64.0	3,940
November	212	18	84.6	5,030
January	290	175	220	13,500
February	490	95	201	11,200
March	490	70	262	16,100
April	4,850	70	1,170	69,600
May	8,200	70	1,290	79,300
June	8,850	25	2,450	14,600
July	1,220	65	382	23,500
August	13,300	140	1,600	98,400
September	550	85	217	12,900

Monthly discharge of Arkansas River at Holly, Colo., for the years ending September 30, 1914-1922—Continued

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1915–16				
October	138	50	990	6,090
November	260	50	120	7,140
December	300	70	195	12,000
January	850	125	294	18,100
February	1,600	55	489	28,100
March	220	55	91.1	5,600
April	120	15	69.9	4,160
May	30	2	9.3	572
June	570	2	120	7,140
July	68	5	12.7	781
August	8,560	5	784	48,200
September	900	32	153	9,100
The year	8,560	2	278	147,000
1916–17				
October	120	25	62.6	3,850
November	15	40	146	8,690
January	426	84	269	16,500
February	225	108	172	9,550
March	148	52	96.2	5,920
April			[a] 50.0	595
May			[a] 46.0	912
June			[a] 36.6	1,670
July	205	10	38.6	2,370
August	585	11	73.5	4,520
September	219	35	73.9	4,400
1917–18				
October	117	11	48.0	2,950
November	60	7	23.3	1,390
December	191	4	67.4	4,140
January	172	18	103	6,330
February	208	50	81.9	4,550
March	202	7	79.2	4,870
April	60	18	33.8	2,010
May	333	1	27.4	1,680
June	464	8	96.5	5,740
July	480	46	130	7,990
August	256	17	41.6	2,560
September	397	17	106	6,310
The year	480	1	68.9	50,500
1918–19				
October	86	32	47.1	2,900
November	131	65	87.1	5,180
December	180	108	142	8,730
March	545	108	345	21,200
April	5,400	365	1,360	80,900
May	2,300	48	474	29,100
June	240	10	51.4	3,060
July	980	10	150	9,220
August	3,760	14	373	22,900
September	240	10	72.0	4,280
1919–20				
October	180	32	90.6	5,570
November	690	68	272	16,200
December	585	200	328	20,200
January			[a] 300	18,400
February	295	23	172	9,890
March	295	20	72.3	4,450
April	295	20	87.5	5,210
May	362	23	91.2	5,610
June	295	16	49.7	2,960
July	2,990	13	474	29,100
August	4,000	23	807	49,600
September	1,570	23	431	25,600
The year	4,000		266	193,000

[a] Estimated.

Monthly discharge of Arkansas River at Holly, Colo, for the years ending September 30, 1913–1922—Continued

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1920–21				
October	1,550	50	310	19,100
November	375	101	231	13,700
December	422	33	254	15,600
January			[a] 229	14,100
February			[a] 201	11,200
March	344	116	210	12,900
April	168	19	51.1	8,040
May	62	15	32.1	1,970
June	59,500	15	9,830	585,000
July	10,200	930	2,620	161,000
August	10,100	268	2,340	144,000
September	389	33	100	5,950
The year	59,500		1,360	988,000
1921–22				
October	196	28	87.4	5,370
November	132	46	83.3	4,960
December	338	41	193	11,900
January	415	150	232	14,300
February	550	200	335	18,600
March	450	102	219	13,500
April	1,730	74	213	12,700
May	472	37	128	7,870
June	91	4	21.7	1,290
July	39	3	11.1	683
August	1,130	12	214	13,200
September	10	3	5.7	339
The year	1,730	3	144	105,000

[a] Estimated.

ARKANSAS RIVER AT SYRACUSE, KANS.

LOCATION.—In NW. ¼ sec. 18, T. 24 S., R. 40 W., at highway bridge half a mile south of Syracuse, Hamilton County.

DRAINAGE AREA.—25,500 square miles (measured by State irrigation commissioner).

RECORDS AVAILABLE.—August 21, 1902, to November 30, 1905; April 1 to July 31, 1906; June 20, 1921, to September 30, 1922.

GAGE.—Gurley water-stage recorder on downstream side of bridge pier near center of channel. From 1902 to 1906 a vertical staff gage fastened to downstream pile of one of the bents of the bridge was used; not referred to same datum.

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

CHANNEL AND CONTROL.—Bed composed of loose, clean sand. No definite control; stage-discharge relation subject to frequent changes.

EXTREMES OF DISCHARGE.—Maximum stage recorded during the period, 5.50 feet July 20, 1921 (discharge, 13,400 second-feet); minimum stage, 1.16 feet in October and November (discharge, 71 second-feet).

1902–1906: Maximum stage recorded, 7.5 feet, July 11, 1903 (discharge, 28,300 second-feet); minimum discharge, 3 second-feet during January, 1905.

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

DIVERSIONS.—Nearly all low-water flow during year is diverted for irrigation in eastern Colorado and western Kansas.

18569°—25†—WSP 547——5

ACCURACY.—Rating curve fairly well-defined between 75 and 12,000 second-feet. Operation of water-stage recorder satisfactory. Daily discharge ascertained by applying hourly gage heights to rating curve. Records fair.

COOPERATION.—Complete records furnished by the Kansas Board of Agriculture through George S. Knapp, State irrigation commissioner.

Discharge measurements of Arkansas River at Syracuse, Kans., for the period June 1, 1921, to September 30, 1922

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
1921		*Feet*	*Sec.-ft.*	1921		*Feet*	*Sec.-ft.*
June 10	Bruce H. Cummings	5.22	12,013	Nov. 15	H. D. Amsley	1.53	79.1
22	Knapp and Cummings	4.13	6,305	Dec. 21	George S. Knapp	1.64	128
28	Bruce H. Cummings	3.53	4,051				
July 5	do	2.96	2,021	1922			
12	do	2.68	1,244	Feb. 7	George S. Knapp	2.04	329
Aug. 2	do	2.45	1,418	Apr. 12	do	1.77	191
9	do	2.73	1,862	May 14	H. D. Amsley	1.47	88.0
23	do	2.22	774	17	George S. Knapp	1.52	93.8
30	do	1.82	426	June 16	do	1.07	6.6
Sept. 13	do	1.32	134	20	Williams and Kinnison	1.09	6.1
20	do	1.20	105	July 20	H. D. Amsley	1.12	10.2
27	do	1.17	72.1	Aug. 25	do	1.00	9.8
Oct. 4	do	1.17	63.9	Sept. 13	George S. Knapp	.94	4.3
Nov. 1	do	1.79	209	30	H. D. Amsley	.94	5.3
8	do	1.59	103				

Daily discharge, in second-feet, of Arkansas River at Syracuse, Kans., for the period June 1, 1921, to September 30, 1922

Day	June	July	Aug.	Sept.	Day	June	July	Aug.	Sept.
1921					1921				
1	22	2,630	1,200	334	16	8,000	2,590	4,920	130
2	22	2,490	1,160	304	17	7,500	4,780	7,300	130
3	22	2,190	5,640	268	18	7,300	3,990	4,560	130
4	22	2,010	8,000	238	19	7,000	4,520	2,820	130
5	22	2,080	7,600	210	20	6,990	13,450	1,940	98
6	45,000	2,630	4,920	195	21	7,070	7,500	1,370	91
7	30,000	2,660	2,980	292	22	6,740	4,720	990	84
8	25,000	2,350	2,220	316	23	5,480	3,370	856	84
9	15,000	2,080	2,050	215	24	4,630	2,980	798	81
10	12,013	1,700	1,970	190	25	4,030	3,690	660	78
11	11,000	1,350	1,790	180	26	3,590	3,690	586	74
12	10,000	1,250	1,620	160	27	3,590	2,820	530	78
13	9,500	890	1,430	140	28	4,100	2,600	538	74
14	9,000	760	1,370	135	29	3,170	1,840	506	71
15	8,500	650	1,340	135	30	2,690	2,020	418	71
					31		1,640	370	

Daily discharge, in second-feet, of Arkansas River at Syracuse, Kans., for the period June 1, 1921, to September 30, 1922—Continued

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1921–22												
1	78	204	110	315			117	453	82	5	41	4
2	81	192	95	305			99	341	96	7	258	4
3	78	170	186	341			82	284	103	6	191	4
4	74	155	261	331		284	85	224	65	6	430	4
5	71	145	324	326		289	82	196	62	13	224	4
6	71	135	394	274	326	326	82	181	53	24	458	4
7	71	135	457	200	331	406	41	234	38	16	305	4
8	74	110	515	154	390	441	41	234	24	10	384	5
9	78	100	537	177	470	336	43	177	17	6	501	5
10	81	100	537	215	507	284	75	150	14	9	248	5
11	81	90	545	205	476	263	103	146	14	41	154	5
12	81	80	568	117	470	215	191	121	14	158	117	5
13	81	80	485	106		191	248	99	10	68	89	5
14	81	68	429	121		133	269	89	8	43	59	5
15	81	72	471	146		103	258	113	7	36	36	5
16	81	80	478			113	196	125	7	24	21	5
17	81	85	282			85	200	89	6	21	12	5
18	81	90	289		341	71	167	68	6	20	8	5
19	90	120	275		341	92	167	53	6	16	6	5
20	85	150	165		305	200	137	43	7	12	5	5
21	80	125	120	401		229	137	43	8	10	4	5
22	76	100	130			196	99	68	6	8	4	5
23	80	85	155			167	113	59	6	8	4	5
24	85	105	180			117	125	50	6	7	4	5
25	125	105	186		150	110	125	43	6	7	3	5
26	120	115	234		289	78	177	38	6	6	3	4
27	145	120	275			78	274	43	6	6	3	4
28	162	115	284			68	295	38	6	6	3	4
29	155	130	373			68	632	34	6	6	3	4
30	162	125	380			92	641	121	5	16	3	4
31	192		387			142		82		7	4	

NOTE.—Discharge estimated from June 1–19, 1921, except on June 10. No gage-height record for days when no discharge is given in January, February, and March, 1922.

Monthly discharge of Arkansas River at Syracuse, Kans., for the period June 1, 1921, to September 30, 1922

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1921				
June	45,000	22	8,570	510,000
July	13,400	650	3,040	187,000
August	8,000	370	2,410	148,000
September	334	71	157	9,360
The period				854,000
1922				
October	192	71	96	5,890
November	204	68	116	6,920
December	568	95	326	20,100
January	401	106	233	14,400
February	507	150	368	20,300
March	441	68	185	11,400
April	641	41	177	10,500
May	453	34	120	8,010
June	103	5	23.3	1,390
July	158	5	20.3	1,240
August	501	3	115	7,140
September	5	4	4.6	274
The year	641	3		108,000

NOTE.—Discharge estimated for days of no record in January, February, and March, 1922.

ARKANSAS RIVER AT GARDEN CITY, KANS.

LOCATION.—In NW. ¼ sec. 18, T. 24 S., R. 32 W., at highway bridge half a mile south of Garden City, Finney County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—June 21 to September 30, 1922.

GAGE.—Stevens water-stage recorder in wooden shelter and well on downstream side of cylindrical bridge pier near center of channel; inspected by Ben Allen, county engineer. Gage records height of underground water after surface flow ceases.

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

CHANNEL AND CONTROL.—Bed of stream composed of loose sand and gravel. No definite control; stage-discharge relation subject to frequent changes. Surface flow ceases at gage height of 2.60 feet.

EXTREMES OF DISCHARGE.—Maximum stage from water-stage recorder, during period, 3.04 feet at 2 a. m. August 7 (discharge, 38 second-feet); minimum stage, 1.47 feet September 25, 26, and 30 (no flow).

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

No discharge measurements were made at this station during the period. There was no flow past the gage during the period of records except on July 13 (5 second-feet), August 7 (11 second-feet), and August 9 (5 second-feet), equivalent to a total run-off of 42 acre-feet.

ARKANSAS RIVER AT LARNED, KANS.

LOCATION.—In NE. ¼ sec. 5, T. 22 S., R. 16 W., at highway bridge half a mile above Pawnee River and half a mile south of Larned, Pawnee County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—June 22 to September 30, 1922.

GAGE.—Stevens water-stage recorder in wooden well and shelter located on downstream side of cylindrical bridge pier near center of channel. Gage records height of underground water after surface flow ceases.

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

CHANNEL AND CONTROL.—Bed of the stream composed of loose sand and gravel. No definite control; stage-discharge relation subject to frequent changes. Surface flow ceases at gage height of 2.7 feet.

EXTREMES OF DISCHARGE.—Maximum stage from water-stage recorder during period, 3.66 feet at 7 a. m. July 15 (discharge, 142 second-feet); minimum stage, 1.13 feet at 1 a. m. September 25 (no discharge).

ACCURACY.—Stage-discharge relation not permanent. Rating curve, fairly well defined. Daily discharge ascertained by shifting-control method. Records fair.

Discharge measurements of Arkansas River at Larned, Kans., during the year ending September 30, 1922

Date	Made by—	Gage height	Discharge
June 22	W. R. Denison	3.18	16.6
July 26	Reginald Waldo	2.73	0

Daily discharge, in second-feet, of Arkansas River at Larned, Kans. for the period June 23 to September 30, 1922

Day	June	July	Aug.	Sept.	Day	June	July	Aug.	Sept.	Day	June	July	Aug.	Sept.
1		43			11		48	0.3		21		21		
2		45			12		80			22		16		
3		31			13		111			23	16	14		
4		15			14		114			24	13	12		
5		6.0			15		111			25	12	6.8		
6		1.5			16		68			26	36	2.0		
7		15	41		17		46			27	39			
8		10	29		18		45			28	31			
9		1.8	15		19		34			29	26			
10		64	8.4		20		31			30	52			

NOTE.—No surface flow July 27 to Aug. 6 and Aug. 12 to Sept. 30.

Monthly discharge of Arkansas River at Larned, Kans., for the period June 23 to September 30, 1922

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
June 23–30	52	12	28.1	446
July	114	0	32.0	1,970
August	41	0	3.02	186
September	0	0	0	0
The period				2,600

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 mouth of Little Arkansas River and 2 miles northwest of Wichita, Sedgwick County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—June 11, 1921, to September 30, 1922.

GAGE.—Gurley water-stage recorder in wooden shelter fastened to downstream side of bridge pier. Prior to January 13, 1922, chain gage on upstream handrail of highway bridge; read by P. L. Brockway, city engineer.

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

CHANNEL AND CONTROL.—Wide, flat bed of shifting, loose, clean sand. No definite control; stage-discharge relation subject to continuous change.

EXTREMES OF DISCHARGE.—Maximum stage during year from water-stage recorder, 14.56 feet at 9 a. m. April 28 (discharge, 5,390 second-feet); no flow September 22–26.

1921–1922: Maximum stage recorded, 16.52 feet at 8.30 p. m. June 16, 1921 (discharge, 7,510 second-feet); no flow September 22–26, 1922.

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

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

ACCURACY.—Stage-discharge relation not permanent; slightly affected by ice. Rating curve fairly well defined below 3,000 second-feet. Operation of water-stage recorder satisfactory. Daily discharge ascertained by indirect method for shifting control. Records fair.

Discharge measurements of Arkansas River at Wichita, Kans., during the year ending September 30, 1922

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Nov. 2	H. B. Kinnison	10.22	57.0	June 9	W. R. Denison	10.96	457
Mar. 9	do	11.10	423	July 19	Reginald Waldo	11.20	614
Apr. 28	W. R. Denison	14.40	5,370	Aug. 7	do	10.51	167

Daily discharge, in second-feet, of Arkansas River at Wichita, Kans., for the year ending September 30, 1922

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	164	66	78	115	276	325	685	2,850	765	330	216	33
2	164	64	70	160	224	390	650	2,560	810	330	208	31
3	157	52	115	182	200	450	685	2,160	855	330	204	30
4	145	56	54	204	168	480	720	1,990	720	330	188	27
5	139	60	94	236	192	510	810	1,770	650	325	172	23
6	139	52	74	139	180	450	765	1,650	545	310	164	19
7	118	52	86	212	160	420	855	1,590	545	295	168	16
8	106	56	98	221	168	450	1,240	1,770	480	310	164	15
9	106	56	109	230	172	480	3,000	3,300	450	300	151	14
10	106	52	98	238	220	580	1,650	2,700	450	330	145	22
11	96	48	98	247	220	510	1,190	2,290	450	480	142	18
12	92	48	96	256	244	450	990	2,030	420	580	139	16
13	87	38	94	264	295	480	855	2,030	420	1,040	160	15
14	83	48	112	264	276	1,650	810	1,240	390	1,470	180	13
15	78	48	136	256	650	3,760	765	1,140	360	1,090	168	10
16	74	52	160	228	580	3,600	685	1,040	330	765	154	10
17	70	52	168	220	510	3,150	650	945	320	615	142	7
18	66	50	168	224	390	2,850	615	855	310	580	133	4
19	62	52	168	224	300	2,420	580	810	310	615	112	2
20	50	56	160	200	330	1,990	580	765	295	615	103	2
21	70	54	145	196	420	1,530	545	720	295	685	96	1
22	68	52	140	180	480	1,300	545	720	295	765	84	0
23	65	58	135	176	545	1,140	580	765	276	615	72	0
24	62	54	130	180	510	1,140	685	810	305	545	68	0
25	60	74	130	180	450	945	1,240	855	310	510	64	0
26	52	70	106	192	390	900	3,450	945	300	420	64	0
27	58	62	106	216	390	855	4,880	990	290	360	62	10
28	56	58	142	224	372	810	5,220	945	420	310	56	10
29	62	58	148	212	-------	765	4,080	855	450	285	48	9
30	66	62	184	212	-------	720	3,300	765	360	252	42	8
31	70	-------	184	228	-------	685	-------	685	-------	228	36	-------

NOTE.—Discharge interpolated or estimated Oct. 12–14, 16–18, 23, 24, 30, Nov. 4, 21, Dec. 12, 15, 22, 23, Jan. 3, 8–12, and Sept. 24–28; gage not read. Stage-discharge relation affected by ice Dec. 21, Jan. 18–20, and Feb. 28; discharge estimated by study of gage-height graph and temperature and precipitation records.

Monthly discharge of Arkansas River near Wichita, Kans., for the year ending September 30, 1922

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	164	50	90.0	5,530
November	74	38	55.3	3,290
December	184	54	122	7,500
January	264	115	210	12,900
February	650	160	333	18,500
March	3,760	325	1,170	71,900
April	5,220	545	1,440	85,700
May	3,300	685	1,440	88,500
June	855	276	439	26,100
July	1,470	228	517	31,800
August	216	36	126	7,750
September	33	0	12.2	726
The year	5,220	0	497	360,000

ARKANSAS RIVER AT ARKANSAS CITY, KANS.

LOCATION.—In NW. ¼ sec. 25, T. 34 S., R. 3 E., at Chestnut Avenue highway bridge, half a mile west of Arkansas City, Cowley County, 2 miles below diversion dam for Kansas Gas & Electric Co.'s canal, 5 miles above Walnut River and 8 miles below Ninnescah River.

DRAINAGE AREA.—Not determined.

RECORDS AVAILABLE.—September 23, 1902, to July 31, 1906; September 10, 1921, to September 30, 1922.

GAGE.—Chain gage on upstream handrail of highway bridge; read by F. O. Burn tt. Staff gage fastened to downstream pile of bridge was used 1902–1906. Gages not referred to same datum.

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

CHANNEL AND CONTROL.—Bed composed of clean sand. Control is contracted section and sand bar below gage; shifting.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 19.1 feet at 7.45 a. m. July 14 (discharge, 24,900 second-feet); minimum stage, 4.93 feet at 5.04 p. m. October 9 (discharge, 1 second-foot).

1902–1906: Maximum stage recorded, 15.2 feet, July 10, 1904 (discharge, 40,300 second-feet); minimum stage, 2.65 feet, December 30 and 31, 1902 (discharge, 33 second-feet).

REGULATION AND DIVERSION.—Canal of Kansas Gas & Electric Co. with diversion dam across river 2 miles upstream, diverts about 600 second-feet during high water and practically entire flow at low stages. Diversion in western Kansas and eastern Colorado for irrigation takes large part of low-water flow.

ACCURACY.—Stage-discharge relation not permanent; not affected by ice. Rating curve used September 10 to November 3, 1921, fairly well defined; curve used November 4, 1921, to September 30, 1922, fairly well defined below 8,000 second-feet and extended above that point. Gage read to hundredths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table; shifting-control method used October 1, 1921, to August 8. Records fair.

Discharge measurements of Arkansas River at Arkansas City, Kans., during the period September 10, 1921, to September 30, 1922

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
1921		*Feet*	*Sec.-ft.*	1922		*Feet*	*Sec.-ft.*
Sept. 23	E. C. Curtis	6.01	161	Mar. 10	H. B. Kinnison	6.77	536
27	do	6.94	512	Apr. 29	W. R. Denison	11.70	5,760
Nov. 3	H. B. Kinnison	5.03	6.3	June 11	do	7.92	1,020
				Aug. 8	Reginald Waldo	7.45	930

Daily discharge, in second-feet, of Arkansas River at Arkansas City, Kans., for the period September 10, 1921, to September 30, 1922

Day	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	------	69	6.4	13	11	55	215	1,000	3,950	1,790	1,120	1,060	343
2	------	250	5.7	14	230	46	98	945	3,810	1,700	1,240	1,060	324
3	------	37	6.4	16	32	92	215	945	5,650	1,620	1,390	1,000	324
4	------	30	6.4	15	32	102	287	1,000	3,810	1,620	1,530	1,000	306
5	------	23	6.4	17	39	59	358	1,390	3,450	1,460	1,240	945	290
6	------	18	5.5	13	58	59	122	1,320	2,990	1,460	1,120	885	273
7	------	13	5.6	14	31	55	249	1,700	2,640	1,320	1,000	885	256
8	------	11	5.8	15	27	118	574	5,450	4,760	1,240	885	885	256
9	------	5.7	5.9	14	336	45	483	9,200	4,080	1,240	825	945	273
10	141	9.2	6.1	12	33	38	505	12,000	6,110	1,120	765	1,120	825
11	405	9.2	4.2	19	39	45	461	19,300	7,450	1,060	8,330	945	483
12	138	9.2	7.1	22	53	57	483	7,800	5,180	1,000	11,600	825	398
13	156	8.5	8.0	24	62	35	461	4,620	4,220	945	22,900	825	324
14	134	7.1	7.5	18	62	57	1,180	3,220	3,330	945	24,900	765	306
15	120	7.1	6.8	13	76	400	4,490	2,640	2,760	885	15,100	765	306
16	111	7.8	7.0	13	277	38	10,300	2,240	2,440	825	6,110	735	290
17	99	6.4	8.6	12	63	39	13,900	2,040	2,240	885	4,080	653	290
18	190	6.4	8.8	19	55	35	7,980	1,870	2,040	765	7,800	601	273
19	161	6.4	9.0	16	144	46	4,760	1,700	1,870	825	11,800	601	273
20	176	5.0	9.1	17	91	166	3,330	1,530	1,790	765	8,150	575	290
21	104	7.1	11	20	123	127	2,440	1,460	1,700	679	5,490	527	306
22	129	7.1	7.9	39	134	213	1,960	1,390	7,450	705	3,680	505	290
23	158	4.0	11	48	124	244	1,700	1,390	7,450	679	2,870	483	273
24	190	6.4	11	28	103	315	1,530	1,390	6,580	653	2,240	439	264
25	320	7.1	11	20	94	669	1,620	2,140	4,080	735	2,040	417	256
26	655	7.1	11	17	66	644	2,140	1,960	2,760	1,000	1,790	461	240
27	525	5.0	12	15	42	431	2,040	3,810	2,240	885	1,620	417	256
28	450	6.4	13	15	44	336	1,530	5,490	2,340	885	1,390	398	240
29	235	5.7	12	15	42	------	1,240	5,800	2,240	1,180	1,320	380	256
30	118	5.7	12	15	40	------	1,120	4,620	2,100	1,120	1,180	362	240
31	------	6.4	------	15	43	------	1,060	--------	1,960	------	1,120	362	------

NOTE.—Gage not read Apr. 8, May 30, and Sept. 24; discharge interpolated.

Monthly discharge of Arkansas River at Arkansas City, Kans., for the period September 10, 1921, to September 30, 1922

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1921				
September 10–30	655	99	225	9,370
1921–22				
October	250	4.0	19.6	1,210
November	13	4.2	8.27	492
December	48	12	18.2	1,120
January	336	11	84.1	5,170
February	669	35	163	9,050
March	13,900	98	2,220	136,000
April	19,300	945	3,710	221,000
May	7,450	1,700	3,720	229,000
June	1,790	653	1,070	63,700
July	24,900	765	5,050	311,000
August	1,120	362	704	43,300
September	825	240	311	18,500
The year	24,900	4.0	1,440	1,040,000

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, 1922.

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 forest ranger during winter. Relation between present gage and gages used in 1890 and 1903 not known.

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

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

EXTREMES OF DISCHARGE.—Maximum stage recorded, 1.56 feet at 10 a. m. May 30 (discharge, 300 second-feet); minimum discharge occurred during winter.

1911–1922: Maximum stage recorded, 2.3 feet at 8.30 a. m., June 14, 1921 (discharge, 395 second-feet); 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, 1,590 acre-feet were diverted.

ACCURACY.—Stage-discharge relation not permanent; affected by ice during the winter. Rating curve fairly well defined. Gage read to quarter-tenths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table; shifting-control method used April 30 to June 10. Records fair.

Discharge measurements of Tennessee Fork near Leadville, Colo., during the year ending September 30, 1922

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Oct. 20	J. B. Spiegel	0.35	8.8	May 25	Robert Follansbee	1.21	191
Jan. 27	T. J. Watkins	.40	10.0	June 16	do	.98	100
Mar. 17	do	[a].50	10.8	Sept. 12	M. B. Arthur	.35	7.5
Apr. 30	Robert Follansbee	1.09	111				

[a] Stage-discharge relation affected by ice.

Daily discharge, in second-feet, of Tennessee Fork near Leadville, Colo., for the year ending September 30, 1922

Day	Oct.	Nov.	Apr.	May	June	July	Aug.	Sept.
1	8	9		159	241	65	36	17
2	6	9		144	224	54	52	17
3	6	10		162	204	52	52	14
4	6	9		165	172	49	29	20
5	7	9		150	153	42	24	17
6	6	10		169	141	35	29	14
7	6	9		188	150	28	29	12
8	7	9		172	159	27	19	11
9	6	11		159	169	70	11	17
10	6	10		132	162	103	11	17
11	5	10		101	129	52	22	16
12	5	10		94	132	52	18	11
13	5	10		85	132	56	17	10
14	4	10		82	132	32	23	7
15	4	10		87	129	24	20	5
16	4	10		80	101	28	30	5
17	5	10		110	89	19	42	6
18	4	10		129	92	19	32	5
19	7	11		106	101	19	27	5
20	9	10		138	80	12	30	4
21	10	10		147	87	12	35	4
22	9	10		138	96	12	29	4
23	10	10		129	89	13	26	3
24	9	10		175	94	11	49	3
25	10	10		188	78	13	28	3
26	10	10		238	76	10	17	2
27	10	10		268	78	11	13	2
28	9	10		251	56	19	17	2
29	8	10		265	63	29	20	2
30	10	10	111	279	59	29	17	2
31	9			244		36	14	

NOTE.—Stage-discharge relation affected by ice Nov. 22-30; discharge estimated.

Monthly discharge of Tennessee Fork near Leadville, Colo., for the year ending September 30, 1922

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	10	4	7.1	437
November	11	9	9.9	589
December			9	553
January			9	553
February			9	500
March			10	615
April	111		18	1,070
May	279	80	159	9,780
June	241	56	122	7,260
July	103	10	33.3	2,050
August	52	11	26.4	1,620
September	20	2	8.6	512
The year	279	2	35.3	25,500

NOTE.—Mean discharge for December, January, February, March, and April based on temperature record, two discharge measurements, and observer's notes.

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

LOCATION.—In sec. 22, T. 14 S., R. 79 W., at private bridge, 6 miles west of Buena Vista, Chaffee County.

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

RECORDS AVAILABLE.—April 7, 1911, to September 30, 1922. From September 23, 1910, to September 13, 1911, station maintained in sec. 21, 1 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, 1.75 feet at 6 a. m. June 10 and 11 (discharge, 328 second-feet); minimum stage, 0.25 foot on several days during April (discharge, 18 second-feet);

1911–1922: Maximum discharge recorded, 495 second-feet June 12, 1921; minimum discharge, 10 second-feet April 9 and 19, 1914.

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 permanent; not affected by ice. Rating curve 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 Cottonwood Creek below Hot Springs, near Buena Vista, Colo., during the year ending September 30, 1922

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Jan. 29	T. J. Watkins	0.38	20.3	May 23	Robert Follansbee	1.06	115
May 2	Robert Follansbee	.43	22.4	June 15	do	1.46	213

Daily discharge, in second-feet, of Cottonwood Creek below Hot Springs, near Buena Vista, Colo., for the year ending September 30, 1922

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	34	28	26	24	21	20	20	25	131	148	57	43
2	38	27	26	23	21	20	20	28	153	131	53	44
3	35	27	26	24	21	20	20	28	168	121	52	48
4	34	26	24	22	21	20	21	32	159	114	48	47
5	34	26	23	21	21	20	21	48	202	112	44	44
6	33	25	24	21	21	20	20	67	228	103	44	41
7	37	25	23	22	21	20	20	78	252	99	44	40
8	35	24	23	24	21	20	20	71	269	92	41	38
9	35	23	24	24	21	20	20	65	282	82	38	36
10	34	23	25	23	21	20	21	52	296	114	38	35
11	34	22	25	23	21	20	20	38	305	94	37	33
12	34	22	25	22	21	20	21	32	269	88	35	33
13	34	22	25	22	21	20	20	34	260	73	40	32
14	33	23	25	22	21	20	19	35	260	68	49	32
15	32	26	25	22	21	20	20	41	228	62	61	31
16	32	26	24	22	21	20	19	35	202	60	65	31
17	32	26	22	23	21	20	19	37	191	54	81	31
18	32	22	25	22	21	20	19	62	191	58	81	29
19	31	22	26	22	21	20	19	71	184	57	88	28
20	31	23	25	21	21	21	19	94	188	53	81	28
21	31	26	25	21	21	21	20	94	178	55	68	28
22	30	26	24	21	20	21	20	94	178	52	68	27
23	30	26	26	21	20	21	21	103	159	52	61	27
24	30	26	23	21	20	21	22	117	159	48	61	26
25	30	27	25	21	20	21	22	131	159	46	57	26
26	28	26	25	21	20	21	22	159	153	43	54	26
27	26	25	24	22	20	21	22	191	148	42	53	25
28	27	25	24	21	20	21	22	228	137	44	49	26
29	26	26	24	21	-------	21	22	191	129	48	48	26
30	24	26	25	21	-------	20	22	220	148	46	47	26
31	28	-------	24	21	-------	20	-------	168	-------	52	47	-------

Monthly discharge of Cottonwood Creek below Hot Springs, near Buena Vista, Colo., for the year ending September 30, 1922

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	38	24	31.7	1,950
November	28	22	24.9	1,480
December	26	22	24.5	1,510
January	24	21	22.0	1,350
February	21	20	20.8	1,160
March	21	20	20.3	1,250
April	22	19	20.4	1,210
May	228	25	86.1	5,290
June	305	129	199.0	11,800
July	148	42	74.5	4,580
August	88	35	54.5	3,350
September	48	25	32.9	1,960
The year	305	19	51.0	36,900

WEST BEAVER CREEK NEAR VICTOR, COLO.

LOCATION.—In sec. 30, T. 16 S., R. 68 W., at Skaguay power station of Southern Colorado Power Co., 7 miles southeast of Victor, Fremont County.

DRAINAGE AREA.—66 square miles (revised measurement on topographic map).

RECORDS AVAILABLE.—January 1, 1905, to September 30, 1922.

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 1922, 3,070 acre-feet were diverted through St. John tunnel. 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 Southern Colorado Power Co.

Monthly discharge of West Beaver Creek near Victor, Colo., for the year ending September 30, 1922

Month	Mean discharge in second-feet	Run-off in acre-feet
October	14.3	879
November	11.8	702
December	6.29	387
January	5.02	309
February	5.57	309
March	9.50	584
April	14.7	875
May	14.3	879
June	12.0	714
July	12.3	756
August	16.0	984
September	11.2	666
The year	11.1	8,040

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, 1922.

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 stage is measured by steel scale. Discharge is computed by Francis formula.

REGULATION.—Flow regulated by series of three reservoirs having an aggregating 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 is 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 September 30, 1922

[Drainage area, 7.2 square miles]

Month	Discharge in second-feet				Run-off	
	Maximum	Minimum	Mean	Per square mile	Inches	Acre-feet
October	6.62	3.20	3.80	0.528	0.61	234
November	3.81	1.95	2.82	.392	.44	168
December	1.82	1.58	1.81	.251	.29	111
January	1.35	1.35	1.35	.188	.22	83.0
February	8.21	.92	1.44	.200	.21	80.0
March	8.21	.73	3.23	.449	.52	199
April	.92	.73	.83	.115	.13	49.4
May	8.21	3.81	6.60	.917	1.06	406
June	4.47	2.61	3.31	.460	.51	197
July	15.6	2.61	7.06	.981	1.13	434
August	16.6	3.20	10.0	1.39	1.60	615
September	14.6	1.58	4.65	.646	.72	277
The year	16.6	.73	3.94	.547	7.44	2,850

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, 1922.

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 September 30, 1922

[Drainage area, 1.0 square miles]

Month	Discharge in second-feet				Run-off	
	Maximum	Minimum	Mean	Per square mile	Inches	Acre-feet
October	0.72	0.45	0.55	0.55	0.63	34
November	.63	.16	.41	.41	.46	24
December	.16	.16	.16	.16	.18	9.8
January	.16	.05	.10	.10	.12	6.1
February	.01	.01	.01	.01	.01	.6
March	.01	.01	.01	.01	.01	.6
April	.02	.02	.02	.02	.02	1.2
May	.45	.05	.26	.26	.30	16
June	1.04	.45	.80	.80	.89	48
July	.82	.54	.72	.72	.83	44
August	.82	.54	.66	.66	.76	41
September	.54	.36	.47	.47	.52	28
The year	1.04	.01	.364	.364	4.73	253

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, 1922.

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 September 30, 1922

[Drainage area, 0.65 square miles]

Month	Discharge in second-feet				Run-off	
	Maximum	Minimum	Mean	Per square mile	Inches	Acre-feet
October	0.63	0.16	0.37	0.569	0.66	23
November	.16	.05	.097	.149	.17	5.8
December	0	0	0	0	0	0
January	0	0	0	0	0	0
February	0	0	0	0	0	0
March	0	0	0	0	0	0
April	.10	0	.033	.051	.06	2.0
May	.63	.10	.33	.508	.59	20
June	.63	.29	.43	.662	.74	26
July	.45	.18	.36	.554	.64	22
August	.54	.29	.38	.585	.67	23
September	.29	.16	.25	.385	.43	15
The year	.63	0	.170	.262	3.96	137

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, 1922.

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 September 30, 1922

[Drainage area, 2.00 square miles]

Month	Discharge in second-feet				Run-off	
	Maximum	Minimum	Mean	Per square mile	Inches	Acre-feet
October	2.40	1.60	1.92	0.960	1.11	118
November	1.60	1.10	1.40	.700	.78	83.3
December	1.30	1.03	1.13	.565	.65	69.5
January	.97	.67	.77	.385	.44	47.3
February	.85	.67	.73	.365	.38	40.5
March	.85	.56	.69	.345	.40	42.4
April	1.10	.73	.89	.445	.50	53.0
May	1.17	.67	.86	.430	.50	52.9
June	1.10	.56	.76	.380	.42	45.2
July	.91	.46	.65	.325	.37	40.0
August	2.75	.73	1.59	.795	.92	97.8
September	1.90	1.60	1.68	.840	.94	100.0
The year	2.75	.46	1.09	.545	7.41	790

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, 1922.

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 September 30, 1923

[Drainage area, 0.73 square miles]

Month	Discharge in second-feet				Run-off	
	Maximum	Minimum	Mean	Per square mile	Inches	Acre-feet
October	0.97	0.56	0.75	1.03	1.19	46
November	.56	.36	.46	.630	.70	27
December	.46	.27	.34	.466	.54	21
January	.46	.10	.19	.260	.30	12
February	.13	.05	.056	.077	.08	3.1
March	.20	.05	.090	.123	.14	5.5
April	.36	.13	.24	.329	.37	14
May	.46	.27	.35	.479	.55	22
June	.67	.23	.35	.479	.53	21
July	.46	.20	.31	.425	.49	19
August	2.49	.46	1.22	1.67	1.92	75
September	1.03	.51	.69	.945	1.05	41
The year	2.49	.05	.422	.577	7.86	307

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, 1922.

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 half way 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 the basin. During high water, excess passing intake and recorded at the 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.

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Monthly discharge of South Ruxton Creek at Halfway, Colo., for the year ending September. 30, 1922

[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	2.28	0.577	0.67	140
November	1.90	1.52	1.73	.438	.49	103
December	1.75	1.30	1.42	.359	.41	87.3
January	1.30	.91	1.04	.263	.30	64.0
February	1.03	.67	.90	.228	.24	50.0
March	.97	.10	.76	.192	.22	46.7
April	1.24	.91	1.07	.271	.30	63.7
May	1.60	1.17	1.34	.339	.39	82.4
June	2.57	1.38	1.60	.405	.45	95.2
July	2.57	1.75	2.12	.537	.62	130
August	7.04	2.07	5.37	1.36	1.57	330
September	4.73	2.10	2.97	.752	.84	177
The year	7.04	.10	1.89	.478	6.50	1,370

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 of a 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, 1922.

DETERMINATION OF DISCHARGE.—Flow measured by two sharp-crested weirs with complete end contraction. Discharge computed by Francis formula. The main weir is about one-third of a mile above mouth of creek and just above hydroelectric intake. The 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. During high water, record from lower weir is discarded 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 September 30, 1922

[Drainage area, 2.4 square miles]

Month	Discharge in second-feet				Run-off	
	Maximum	Minimum	Mean	Per square mile	Inches	Acre-feet
October	2.57	1.45	1.93	0.804	0.93	119
November	1.38	.97	1.15	.479	.53	68.4
December	1.03	.73	.84	.350	.40	52
January	.73	.36	.49	.204	.24	30
February	.20	.07	.14	.058	.06	7.8
March	.97	.05	.35	.146	.17	22
April	1.30	.56	.81	.338	.38	48
May	1.45	1.10	1.22	.508	.59	75.0
June	2.23	.91	1.45	.604	.67	86.3
July	2.23	.85	1.28	.533	.61	78.7
August	8.31	1.90	3.91	1.63	1.88	240
September	3.80	1.60	2.38	.992	1.11	142
The year	8.31	.05	1.34	.558	7.57	969

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, 1922.

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 Sutherland Creek near Manitou, Colo., for the year ending September 30, 1922

[Drainage area, 4.4 square miles]

Month	Discharge in second-feet				Run-off	
	Maximum	Minimum	Mean	Per square mile	Inches	Acre-feet
October	0.79	0.79	0.79	0.180	0.21	49
November	.56	.56	.56	.127	.14	33
December	.56	.56	.56	.127	.15	34
January	.56	.56	.56	.127	.15	34
February	.67	.36	.59	.134	.14	33
March	.56	.46	.50	.114	.13	31
April	1.10	.56	.75	.170	.19	45
May	1.10	.79	1.00	.227	.26	61
June	1.03	.46	.82	.186	.21	49
July	.67	.27	.49	.111	.13	30
August	2.23	1.03	1.44	.327	.38	89
September	1.03	.67	.78	.177	.20	46
The year	2.23	.36	.738	.168	2.29	534

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, 1922.

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 September 30, 1922

[Drainage area, 6.9 square miles]

Month	Discharge in second-feet				Run-off	
	Maximum	Minimum	Mean	Per square mile	Inches	Acre-feet
October	2.40	1.90	2.17	0.314	0.36	133
November	2.10	1.63	1.82	.264	.29	108
December	1.75	1.30	1.58	.229	.26	97.2
January	1.45	1.03	1.21	.175	.20	74.4
February	1.10	.79	.98	.142	.15	54.4
March	1.17	.79	.98	.142	.16	60.3
April	1.90	.85	1.20	.174	.19	71.4
May	2.10	.79	1.16	.168	.19	71.3
June	3.80	.61	1.27	.184	.21	75.6
July	2.57	.56	.98	.142	.16	60.3
August	10.1	1.98	3.31	.480	.55	204
September	1.90	1.03	1.37	.199	.22	81.5
The year	10.1	.61	1.51	.219	2.94	1,090

AMAZON CANAL NEAR HARTLAND, KANS.

LOCATION.—In SW. ¼ sec. 8, T. 25 S., R. 37 W., 1 mile below head gates and 2 miles west of Hartland, Kearny County.

RECORDS AVAILABLE.—Irrigation seasons of 1921 and 1922.

GAGE.—Gurley water-stage recorder on north bank of canal 50 feet below highway bridge across canal.

DISCHARGE MEASUREMENTS.—Made from highway bridge.

CHANNEL AND CONTROL.—Drifted sand in bottom of canal. Banks and control permanent.

ACCURACY.—Stage-discharge relation permanent; rating curve well-defined. Daily discharge ascertained by applying hourly gage height to rating table. Records good.

COOPERATION.—Complete records furnished by the Kansas State Board of Agriculture through George S. Knapp, State irrigation commissioner.

Water for the Amazon canal is diverted from the north bank of Arkansas River in NW. ¼ sec. 7, T. 25 S., R. 37 W., for irrigation. Waste gate is 1 mile below gage; used only in case of flood.

Discharge measurements of the Amazon canal near Hartland, Kans., for the period March 2, 1921, to September 30, 1922

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
1921		*Feet*	*Sec.-ft.*	1921		*Feet*	*Sec.-ft.*
Mar. 2	Knapp and Cummings	3.88	162	Sept. 27	Bruce H. Cummings	2.27	37.4
Aug. 2	Bruce H. Cummings	4.65	246	Oct. 4	do	2.30	38.6
9	do	4.60	227	11	do	1.88	18.8
22	do	4.40	223	31	do	3.51	141
29	do	2.60	61.1	Nov. 7	do	3.10	95.9
Sept. 20	do	2.72	69.6				

Daily discharge, in second-feet, of the Amazon canal near Hartland, Kans., for the period March 2, 1921, to September 30, 1922

Day	1921						1922				
	Mar.	July	Aug.	Sept.	Oct.	Nov.	Mar.	Apr.	June	July	Aug.
1			221		33	172					
2	167		222		36	160					76
3	30		248		36	146			95		163
4			256		36	127			75		193
5			241		37	116			59		240
6			240		38	102			50		59
7			245		20	99			38		
8			242		15	98			21		
9			238		20	94					82
10			244		20						36
11			225		19						
12			168		30					92	
13			126		28					153	
14			123		34					54	
15			158		29			225		28	
16			192		44			231		15	
17			262	16	44			225			
18			251	27	44			216			
19			218	58	47		81	210			
20			211	67	48		90	211			
21			210	54	50		103	169			
22			207	39	43		103	157			
23		8	196	34	48		116	65			
24		164	162	34	50		115				
25		177	134	27	62		100				
26		143	112	32	62		110				
27		154	91	36	42		121				
28		182	75	35	54		111				
29		204	60	31	72		105				
30		227	48	32	104		29				
31		240			128		12				

NOTE.—No flow during periods for which no discharge is given.

Monthly discharge of Amazon canal near Hartland, Kans., for the period March 2, 1921, to September 30, 1922

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1921				
March 2-3	167	30	98	391
July 23-31	240	8	166	2,970
August 1-30	262	48	187	11,200
September 17-30	67	16	37	1,030
October	128	15	44	2,720
November 1-9	172	94	124	2,210
1922				
March 19-31	121	12	92.1	2,370
April 15-23	231	65	190	3,390
June 3-8	95	21	56.3	670
July 12-16	153	15	68.4	678
August 2-6, 9-10	240	36	121	1,680

SOUTH SIDE DITCH NEAR HARTLAND, KANS.

LOCATION.—In SW. ¼ sec. 15, T. 25 S., R. 37 W., half a mile south of Hartland, Kearny County, and 1 mile below head gates.

RECORDS AVAILABLE.—Irrigation seasons of 1921 and 1922.

GAGE.—Gurley water-stage recorder on south bank 100 feet above highway bridge across canal.

DISCHARGE MEASUREMENTS.—Made from highway bridge.

CHANNEL AND CONTROL.—Bed composed of loose sand. Banks and control fairly permanent.

ACCURACY.—Stage-discharge relation changes slightly. Rating curve fairly well-defined. Daily discharge ascertained by applying hourly gage height to rating curve. Records good.

COOPERATION.—Complete records furnished by the Kansas State Board of Agriculture through George S. Knapp, State irrigation commissioner.

Water for the South Side ditch is diverted from the south bank of Arkansas River in SW. ¼ sec. 16, T. 25 S., R. 37 W., for irrigation. A waste gate 200 feet below gage was built in 1922.

Discharge measurements of South Side ditch near Hartland, Kans., during the period March 2, 1921, to September 30, 1922

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Sept. 5	Bruce H. Cummings	2.25	120	Nov. 22	Bruce H. Cummings	1.13	8.8
12	do	1.94	67.4	29	Knapp and Cummings	2.22	105
Nov. 15	Amsley and Cummings	1.98	88.5				

Daily discharge, in second-feet, of South Side ditch near Hartland, Kans., for the period March 2, 1921, to September 30, 1922

Day	1921			1922		
	Mar.	Sept.	Nov.	Apr.	May	Aug.
1					132	
2	17	30			123	
3	111	117			40	
4	208	120			36	
5	247	112			31	88
6	247	120			28	116
7	248	170			24	196
8	167	198				111
9	65	173				132
10	135	140	28			107
11		117	73			112
12		75	75			152
13		72	85			100
14		72	83			50
15		70	80			34
16		71	80			27
17		50	81			23
18			81			18
19			39			14
20						11
21			32			9
22			20	11		6
23			21	57		
24				146		
25			56	146		
26			118	146		
27			122	146		
28			118	150		
29			116	147		
30			120	73		
31						

NOTE.—No flow during periods for which discharge is not given.

Monthly discharge of South Side ditch near Hartland, Kans., for the period March 2, 1921, to September 30, 1922

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1921				
March 2–10	248	17	161	2,870
September 2–17	198	30	106	3,390
November 10–19, 21–23, 25–30	120	20	75.0	2,830
1922				
April 22–30	150	11	114	2,030
May 1–7	132	24	59.1	821
August 5–22	196	6	72.5	2,590

GREAT EASTERN CANAL NEAR HARTLAND, KANS.

LOCATION.—In NW. ¼ sec. 15, T. 25 S., R. 37 W., half a mile south of Hartland, Kearny County, and 1 mile below head gate.

RECORDS AVAILABLE.—Irrigation seasons of 1921 and 1922.

GAGE.—Gurley water-stage recorder on south bank 150 feet above highway bridge crossing canal.

DISCHARGE MEASUREMENTS.—Made from highway bridge.

CHANNEL AND CONTROL.—Bed of canal sand; banks permanent; control shifting.

ACCURACY.—Stage-discharge relation not permanent. Rating curve poorly defined. Daily discharge ascertained by applying hourly gage heights to rating curve. Records poor.

COOPERATION.—Complete records furnished by the Kansas State Board of Agriculture through George S. Knapp, State irrigation commissioner.

Water for the Great Eastern canal is diverted from the north bank of Arkansas River in NW. ¼ sec. 16, T. 25 S., R. 37 W., for irrigation. A spillway is 1 mile below gage but is seldom used during irrigation season.

Discharge measurements of Great Eastern canal near Hartland, Kans., for the period March 3, 1921, to September 30, 1922

[Made by Bruce H. Cummings]

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
1921		*Feet*	*Sec.-ft.*	1921		*Feet*	*Sec.-ft.*
Apr. 18		1.81	87.1	May 16		0.58	1.34
25		1.13	28.5	Nov. 22		2.14	110
May 9		.59	1.44				

Daily discharge, in second-feet, of Great Eastern canal near Hartland, Kans., for the period March 3, 1921, to September 30, 1922

Day	1921				1922			
	Mar.	Apr.	May	Nov.	Mar.	Apr.	May	Aug.
1		53	20				189	
2		48	14				183	
3	25	22	10				189	
4	20	21					156	
5		20	11				70	
6		18	14				98	
7		18	28		120		157	241
8			14		98		187	159
9			10		70		183	265
10					36		158	174
11					57		132	
12					180		115	
13					180		129	
14					113		111	
15		92			44		105	
16	34	66			33			
17	58	74			106			
18	56	82			132			
19	67	92		17	89			
20	56	79		95	95			
21	50	67		84	144			
22	66	57		80	151			
23	101	49		105	128			
24	97	37		118	91			
25	90	31		55	63	17		
26	93	28		22	43	24		
27	72	22		17	22	67		
28	74	21				128		
29	68	23				158		
30	62	25				187		
31	60							

NOTE.—No flow on days for which discharge is not given during irrigation season, March to November. In addition to water diverted during irrigation season, about 20,000 acre-feet were diverted during each winter for storage in Lake McKinney.

Monthly discharge of Great Eastern canal near Hartland, Kans., for the period March 3, 1921, to September 30, 1922

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1921				
March 3-4, 16-31	101	20	64	2,280
April 1-7, 15-30	92	18	45	2,070
May 1-3, 5-9	28	10	15	240
November 19-27	118	17	66.0	1,180
1922				
March 7-27	180	22	95.0	3,960
April 25-30	187	17	96.8	1,150
May 1-15	189	70	144	4,290
August 7-10	265	159	210	1,660

FARMERS DITCH NEAR GARDEN CITY, KANS.

LOCATION.—In NW. ¼ sec. 5, T. 24 S., R. 34 W., 1½ miles below head gates and 11 miles west of Garden City, Finney County.

RECORDS AVAILABLE.—Irrigation season of 1921 and 1922.

GAGE.—Gurley water-stage recorder on north bank at downstream side of highway bridge.

DISCHARGE MEASUREMENTS.—Made from highway bridge.

CHANNEL AND CONTROL.—Slightly sandy bed; permanent banks and control.

ACCURACY.—Stage-discharge relation permanent, rating curve well-defined. Daily discharge ascertained by applying hourly gage heights to rating curve. Records good.

COOPERATION.—Complete records furnished by the Kansas State Board of Agriculture through George S. Knapp, State irrigation commissioner.

Water for the Farmers ditch is diverted from the north bank of Arkansas River in SE. ¼ sec. 12, T. 24 S., R. 35 W., for irrigation. An unused waste gate is half a mile below the gage.

Discharge measurements of Farmers ditch near Garden City, Kans., for the period March 11, 1921, to September 30, 1922

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
1921		*Feet*	*Sec.-ft.*	1921		*Feet*	*Sec.-ft.*
June 15	Knapp and Cummings	1.61	53.3	Oct. 4	Bruce H. Cummings	1.16	24.6
20	do	1.90	65.9	11	do	1.28	30.7
27	Bruce H. Cummings	1.45	38.9	Nov. 15	Amsley and Cummings	.97	14.8
July 4	do	1.07	19.2				
Aug. 1	do	2.08	84.8	1922			
16	do	2.92	150	Apr. 14	George S. Knapp	3.12	172
30	do	2.32	93.9	May 18	do	2.32	113
Sept. 20	do	1.65	53.5				
27	do	1.30	34.1				

Daily discharge, in second-feet, of Farmers ditch near Garden City, Kans., for the period March 11, 1921, to September 30, 1922

Day	Oct.	Nov.	Mar.	Apr.	May	June	July	Aug.	Sept.
1921									
1				11			22	65	131
2				20			13	44	141
3				18			15	30	83
4				30			19	26	67
5				43			21	49	61
6				24			29	74	57
7				24			28	73	111
8				25				95	152
9				26				99	133
10				23				110	54
11			110	17				118	48
12			136	17				120	57
13			159	42		36		119	67
14			158			42		108	60
15			179			47		112	51
16			179			44		128	47
17			115			48		60	77
18			112			66		88	79
19			100			68		108	107
20			60			67	16	124	65
21			61			65	33	129	44
22			67			47	40	109	43
23			52			38	47	112	42
24			28			36	52	99	42
25			22			35		98	35
26			21			34		90	32
27			19			38	29	107	28
28			22			52	39	114	23
29			21			56	42	114	19
30						41	45	72	22
31							56	43	
1921–22									
1	25	18		110	36	83			
2	25	17		129	72	34			
3	25	19		126	68	12			
4	26	18		119	88				
5	25	17		110	117				
6	23	16		103	58				
7	21	16		94	38			31	
8	25	15		89	34			30	
9	31	16		72	47			51	
10	31	16		67	29			145	
11	30	16		61	24			45	
12	33	15		96	23			12	
13	25	15		124	26				
14	22	14		170	24				
15	24	14		121	29				
16	22	14		49	77				
17	21	13		42	121				
18	19	13	19	39	102				
19	19	13	10		94				
20	19	14	37		91				
21	19	15	29		83				
22	19	20	26		110				
23	18		26	13	88				
24	18		25	16	84				
25	18	12	23	29	70				
26	16	17	23	34	57				
27	16	16	18	39	44				
28	12	15	38	42					
29	23			31	43				
30	35			19	63				
31	24		82		72				

NOTE.—No flow on days for which discharge is not given.

Monthly discharge of Farmers ditch near Garden City, Kans., for the period March 11, 1921, to September 30, 1922

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1921				
March 11–29	179	19	85.3	3,210
April 1–13	43	11	24.6	635
June 13–30	68	34	47.7	1,710
July 1–7, 20–24, 27–31	56	13	33.8	1,080
August	129	26	91.5	5,620
September	152	19	63.8	3,920
October	35	12	22.8	1,400
November 1–22, 25–28	19	12	15.8	801
1922				
March 18–28, 31	37	10	28.9	631
April 1–18, 23–30	170	13	74.6	3,850
May 1–27, 29–31	121	23	63.0	3,880
June 1–3	83	12	43.0	256
August 7–12	145	12	52.3	623

GARDEN CITY CANAL NEAR GARDEN CITY, KANS.

LOCATION.—In NW. ¼ sec. 4, T. 24 S., R. 34 W., half a mile below head gates and 10 miles west of Garden City, Finney County.

RECORDS AVAILABLE.—Irrigation seasons of 1921 and 1922.

GAGE.—Gurley water-stage recorder on south bank of canal 40 feet downstream from highway bridge.

DISCHARGE MEASUREMENTS.—Made from footbridge at gage.

CHANNEL AND CONTROL.—Bed is loose, clean sand. Control shifting. Banks, permanent.

ACCURACY.—Stage-discharge relation affected by shifting sand in bottom of canal. Rating curve fairly well defined throughout. Daily discharge ascertained by applying hourly gage heights to rating curve. Records fair.

COOPERATION.—Complete records furnished by the Kansas State Board of Agriculture through George S. Knapp, State irrigation commissioner.

Water for the Garden City canal is diverted from the north bank of Arkansas River in SE. ¼ sec. 5, T. 24 S., R. 34 W., for irrigation. No waste gate is provided.

Discharge measurements of Garden City canal near Garden City, Kans., during the period April 14, 1921, to September 30, 1922

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
1921		*Feet*	*Sec.-ft.*	1921		*Feet*	*Sec.-ft.*
Apr. 18	Bruce H. Cummings	1.97	14.9	Aug. 23	Bruce H. Cummings	2.34	21.4
25	do	1.60	10.2	Sept. 19	do	1.42	3.2
May 2	do	1.62	10.5	Oct. 4	do	1.32	2.0
9	do	1.57	9.8				
16	do	1.60	10.3	1922			
23	Knapp and Cummings	1.54	9.0	May 19	George S. Knapp	1.66	7.4
July 11	Bruce H. Cummings	1.35	5.4	June 16	do	1.75	7.4
18	do	1.83	16.9	20	Williams and Kinnison	1.72	7.5
Aug. 1	do	1.84	13.6	24	George S. Knapp	1.50	2.6
15	do	2.29	23.9				

Daily discharge, in second-feet, of Garden City canal near Garden City, Kans., for the period April 14, 1921, to September 30, 1922

Day	1921					1922				
	Apr.	May	July	Aug.	Sept.	Apr.	May	June	July	Aug.
1		9		12	20		16	36	5	5
2		9		13	22		27	35	14	
3		9		24	9		27	35	6	
4		10		27				24		
5		10		35				16		
6		12		25				18	7	13
7		21		26				18	5	11
8		11		25				20		6
9		9		25				16		10
10		6		25				12		13
11		6		25				13	9	6
12		5		25				13	27	4
13				25				13	34	
14	20	6		25				11	12	
15	18	8		23				9		
16	5	8		23			4	7		
17		7		28			7	7		
18	12	5		24		23	7	8		
19	19	5		24		32	7	7		
20	15			24		25	7	6		
21	14	8		24		21	6	6		
22	14	9		24		22	8	6		
23	12	8		24		11	6			
24	10			21		11	6	5		
25	10			14	6	27	5	5		
26	11			14	7	45	4			
27	12			16	7	48	4			
28	12			19	7	35				
29	12			19	7	29		21		
30	12			19	6	4	9	10	24	
31			10	17			9		12	

NOTE.—No flow during periods for which no discharge is given.

Monthly discharge of Garden City canal near Garden City, Kans., for the period April 14, 1921, to September 30, 1922

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1921				
April 14–16, 18–30	20	5	13	413
May 1–12, 14–19, 21–23	21	5	8.6	359
July 31	10	10	10	20
August	35	12	22.3	1,380
September 1–3, 25–30	22	6	10.1	180
1922				
April 18–30	48	4	25.6	660
May 1–3, 16–27, 30–31	27	4	9.3	315
June 1–22, 24–25, 29–30	36	5	14.5	748
July 1–3, 6–7, 11–14, 30–31	34	5	14.1	307
August 1, 6–12	13	4	8.5	135

LITTLE ARKANSAS RIVER AT VALLEY CENTER, KANS.

LOCATION.—In SW. ¼ sec. 1, T. 26 S., R. 1 W., at highway bridge half a mile west of Goodrich station on Arkansas Valley Interurban Railroad, a mile south of Valley Center, Sedgwick County, and 14 miles above junction with Arkansas River.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—June 10 to September 30, 1922.

GAGE.—Chain gage attached to upstream handrail of highway bridge, read by Clarence Carr.

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

CHANNEL AND CONTROL.—Bed composed of sand and gravel; lodged snags and driftwood are frequent. Low-water control is sand and gravel bar under bridge; fairly permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of records, 14.1 feet at 5.40 p. m. July 11 (discharge, 5,770 second-feet); minimum discharge, 18 second-feet September 25, 26, 29, and 30.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined. Gage read to hundredths once daily except during rises when it was read twice daily. Daily discharge ascertained by shifting-control method. Records good.

Discharge measurements of Little Arkansas River at Valley Center, Kans., during the year ending September 30, 1922

Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*
June 10	W. R. Denison	1.53	57
July 19	Reginald Waldo	2.33	130
Aug. 7	do	1.71	71

Daily discharge, in second-feet, of Little Arkansas River at Valley Center, Kans., for the year ending September 30, 1922

Day	June	July	Aug.	Sept.	Day	June	July	Aug.	Sept.
1		136	50	28	16	45	386	42	21
2		120	49	25	17	44	218	40	20
3		136	47	25	18	43	160	38	24
4		115	52	24	19	43	136	36	19
5		77	52	24	20	47	130	39	20
6		59	50	24	21	43	125	39	22
7		51	68	23	22	42	115	37	22
8		51	110	22	23	38	100	36	21
9		45	72	20	24	43	82	34	19
10	57	41	54	26	25	46	72	34	18
11	58	3,710	52	23	26	90	72	36	18
12	53	4,090	48	23	27	142	68	34	20
13	50	1,960	45	23	28	100	59	33	21
14	50	1,140	42	25	29	59	59	31	18
15	57	746	43	23	30	50	54	29	18
					31		52	28	

Monthly discharge of Little Arkansas River at Valley Center, Kans., for the year ending September 30, 1922

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
June 10-30	142	38	57.1	2,380
July	4,090	41	463	28,500
August	110	28	45.2	2,780
September	28	18	22.0	1,310
The period				35,000

DIVERSION CANAL FROM ARKANSAS RIVER AT ARKANSAS CITY, KANS.

LOCATION.—In SE. ¼ sec. 25, T. 34 S., R. 3 E., in Arkansas City, Cowley County, on right bank of canal 135 feet below Chestnut Avenue canal bridge, 2 miles below diversion dam across Arkansas River, and 2 miles above power house at lower end of canal on Walnut River.

RECORDS AVAILABLE.—September 10, 1921, to September 30, 1922. Gage-height records have been obtained since July 27, 1919, by Kansas Gas & Electric Co.

GAGE.—Staff gage of 1½-inch iron pipe driven to bedrock; read by F. O. Burnett.

DISCHARGE MEASUREMENTS.—Made from upstream side of footbridge on B Street, 6,060 feet below gage, or by wading at St. Louis-San Francisco Railway Co.'s trestle 500 feet below gage.

CHANNEL AND CONTROL.—Bed composed of sand and silt; permanent. Control is gravel and earth bar held by old, sawed-off piling at trestle 500 feet below gage; permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during the period of record, 10.30 feet at 5.15 p. m. April 2 (discharge, 509 second-feet); no flow April 13 to September 30.

REGULATION.—Flow is controlled by head gates 6,600 feet above gage.

ACCURACY.—Stage-discharge relation permanent. Rating curve fairly well defined above 150 second-feet. Gage read to quarter inches twice daily. Daily discharge ascertained by applying mean daily gage height to rating table. Records good.

Water for this canal is diverted from the left bank of Arkansas River in SW. ¼ sec. 23, T. 34 S., R. 3 E., and is used for power. The canal empties into Walnut River, which flows into Arkansas River 3 miles below Arkansas City.

Discharge measurements of diversion canal from Arkansas River at Arkansas City, Kans., during the period September 10, 1921, to September 30, 1922

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
1921		*Feet*	*Sec.-ft.*	1921		*Feet*	*Sec.-ft.*
Aug. 23	H. B. Kinnison	10.10	531	Nov. 3	H. B. Kinnison	8.46	228
Sept. 23	E. C. Curtis	9.79	431	1922			
27	do	10.16	484	Mar. 10	do	10.11	485

Daily discharge, in second-feet, of diversion canal from Arkansas River at Arkansas City, Kans., for the period ending September 10, 1921, to September 30, 1922

Day	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.
1		397	220	234	277	429	109	493
2		206	220	234	292	413	136	509
3		337	220	248	292	445	193	493
4		322	206	262	352	445	234	493
5		322	220	248	429	429	307	461
6		307	220	193	445	429	445	493
7		292	206	206	352	445	493	461
8		292	206	248	292	445	477	477
9		292	206	277	17	413	493	493
10	429	248	206	292	367	397	477	493
11	154	262	206	322	248	397	493	477
12	413	292	206	307	429	397	509	167
13	413	248	206	322	429	382	493	
14	397	248	206	322	413	397	493	
15	397	234	220	307	445	160	493	
16	397	248	220	322	307	367	493	
17	397	234	220	322	382	352	493	
18	429	220	220	307	429	352	477	
19	413	220	220	322	154	397	477	
20	413	220	220	277	167	445	477	
21	397	220	220	248	193	429	461	
22	413	220	220	220	248	461	493	
23	429	206	220	206	262	477	477	
24	429	220	220	193	234	493	477	
25	461	193	206	167	206	461	493	
26	477	193	206	208	220	493	234	
27	493	206	234	248	262	493	445	
28	477	193	248	262	262	86	461	
29	445	193	220	248	277		477	
30	413	220	248	292	307		493	
31		206		277	367		493	

NOTES.—No flow Apr. 13 to Sept. 30. Gage not read, Dec. 26 and Apr. 8; discharge interpolated.

Monthly discharge of diversion canal from Arkansas River at Arkansas City, Kans., for the period September 10, 1921, to September 30, 1922

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
1921				
September 10-30	493	154	414	17,200
1921-22				
October	397	193	249	15,300
November	248	206	217	12,900
December	322	167	263	16,200
January	445	17	302	18,600
February	493	86	405	22,500
March	509	109	428	26,300
April	509	0	184	10,900
The year				123,000

NOTE.—No flow Apr. 13 to Sept. 30, 1922.

WALNUT RIVER AT WINFIELD, KANS.

LOCATION.—In NE. ¼ sec. 33, T. 32 S., R. 4 E., at concrete highway bridge 1 mile south of Winfield, Cowley County, 1 mile above Black Creek, and 3 miles below Timber Creek.

DRAINAGE AREA.—1,860 square miles.

RECORDS AVAILABLE.—November 14, 1921, to September 30, 1922.

GAGE.—Chain gage on upstream handrail of highway bridge; read by William Mason.

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

CHANNEL AND CONTROL.—Bed composed of silt, sand, and rock; permanent. Control is gravel and rock bar 500 feet below gage; slightly shifting.

EXTREMES OF DISCHARGE.—Maximum stage recorded during period of record, 31.63 feet at 7 a. m. July 13 (discharge, 21,400 second-feet); minimum stage, 3.02 feet at 8 a. m. February 2 (discharge, 2.8 second-feet).

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

ACCURACY.—Stage-discharge relation not permanent; not affected by ice. Rating curve fairly well defined below 20,000 second-feet. Gage read to hundredths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table; shifting-control method used May 5 to July 19. Records good.

Discharge measurements of Walnut River at Winfield, Kans., during the year ending September 30, 1922

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Mar. 9	H. B. Kinnison	3.55	58	July 20	Reginald Waldo	6.22	1,150
Apr. 29	W. R. Denison	4.93	504	Aug. 8	do	4.11	207
June 11	do	4.36	324				

Daily discharge, in second-feet, of Walnut River at Winfield, Kans., for the year ending September 30, 1922.

Day	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1		13	12	27	39	54	648	1,690	556	170	46
2		14	10	22	26	33	1,490	840	840	211	63
3		12	16	22	28	135	7,070	648	792	350	46
4		12	16	30	32	648	4,860	579	648	276	32
5		12	16	9.0	28	1,640	2,390	491	534	204	43
6		11	16	19	28	1,640	1,040	449	331	164	43
7		31	18	22	26	1,390	792	428	240	187	35
8		36	11	18	24	6,370	5,810	449	187	222	39
9		21	19	19	31	16,600	9,330	388	140	196	47
10		22	26	16	46	18,600	2,990	350	161	276	98
11		28	26	23	44	18,500	1,540	331	18,500	276	240
12		11	14	8.4	9.0	2,790	1,540	312	18,800	211	233
13		11	19	14	88	1,040	840	276	15,600	135	103
14	7.2	8.4	20	14	696	890	696	258	5,600	118	70
15	5.6	11	11	14	3,390	840	648	222	1,490	146	70
16	6.6	10	23	18	3,720	840	602	222	990	93	70
17	6.6	11	19	14	1,040	648	579	294	792	84	42
18	7.2	11	16	19	369	602	512	388	7,570	135	39
19	15	11	18	13	276	556	449	331	4,160	135	64
20	15	14	21	13	194	470	428	233	1,340	388	37
21	8.4	12	23	22	152	408	744	208	792	222	39
22	6.0	16	9.6	37	132	369	8,290	187	602	118	40
23	7.2	16	28	35	72	369	4,160	180	512	100	78
24	6.0	21	10	16	113	792	4,980	170	428	93	52
25	6.0	16	21	26	1,440	1,940	2,340	170	408	108	43
26	6.6	14	21	19	428	1,640	1,390	180	388	78	50
27	7.8	31	23	35	240	648	940	229	350	43	46
28	11	13	26	72	164	648	744	792	312	78	40
29	13	16	11		146	534	2,140	696	276	46	40
30	12	21	14		126	648	2,940	276	240	78	36
31		21	26		93		3,990		258	43	

Monthly discharge of Walnut River at Winfield, Kans., for the year ending September 30, 1922

[Drainage area, 1,860 square miles.]

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
November 14-30	15	5.6	8.66	292
December	36	8.4	16.4	1,010
January	28	9.6	18.1	1,110
February	72	8.4	22.0	1,220
March	3,720	9.0	427	26,300
April	18,600	33	2,740	163,000
May	9,330	428	2,480	152,000
June	1,690	170	409	24,300
July	18,800	140	2,700	166,000
August	388	43	161	9,900
September	240	32	64.1	3,810
The period				559,000

VERDIGRIS RIVER AT INDEPENDENCE, KANS.

LOCATION.—In NE. ¼ sec. 31, T. 32 S., R. 16 E., at highway bridge half a mile east of Independence, Montgomery County, 2½ miles below Elk River and 4½ miles above Drum Creek.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—November 14, 1921, to September 30, 1922. Intermittent records of stage were obtained April 24 to September 24, 1904.

GAGE.—Chain gage fastened to upstream side of highway bridge; read by Ben Wainscott. Chain gage at same site but independent datum was used in 1904.

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

CHANNEL AND CONTROL.—Bed composed of silt and rock. Control is rock riffle just below gage; fairly permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during year, 44.41 feet at 4.45 p. m. April 10 (discharge, 44,300 second-feet); minimum stage, 0.74 foot at 12.40 p. m. November 15 (discharge, 5.4 second-feet).

1904: Maximum stage, 46.7 feet on July 8, referred to present datum.

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

ACCURACY.—Stage-discharge relation permanent. Rating curve fairly well defined below 30,000 second-feet. Gage read to hundredths once daily; more frequently during high water. Daily discharge ascertained by applying mean daily gage height to rating table. Records fair.

Discharge measurements of Verdigris River at Independence, Kans., during the period November 14, 1921, to September 30, 1922

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Nov. 8	H. B. Kinnison	0.98	9.7	June 12	W. R. Denison	3.06	388
Mar. 26	do	18.04	10,200	July 4	Reginald Waldo	25.97	14,000
27	do	16.08	7,700	5	do	21.05	10,300
Apr. 12	W. R. Denison	34.74	25,500	Aug. 9	do	3.43	577
May 11	Kinnison and Denison	7.20	2,030				

18569°—25†—WSP 547——7

Daily discharge, in second-feet, of Verdigris River at Independence, Kans., for the year ending September 30, 1922

Day	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1		10	13	13	41	1,690	2,900	4,160	2,330	267	44
2		11	15	13	44	1,120	2,210	1,790	14,300	225	41
3		11	14	13	55	2,630	4,650	1,290	16,900	267	31
4		11	14	14	61	11,500	7,870	1,080	15,500	647	27
5		11	12	14	61	18,100	8,430	921	11,300	393	26
6		11	19	26	75	16,200	4,510	801	1,590	463	47
7		11	15	26	77	9,550	3,040	761	921	533	31
8		12	14	26	69	24,800	1,840	685	685	571	21
9		11	16	31	99	37,500	2,450	571	515	552	23
10		11	16	41	461	44,100	4,930	515	497	685	39
11		12	15	34	393	38,500	1,940	444	4,230	393	186
12		12	14	34	252	28,900	1,370	393	20,400	282	609
13		12	13	29	313	16,200	1,330	345	31,200	207	377
14	5.8	11	13	29	21,100	3,600	1,120	313	34,200	181	197
15	5.4	13	12	23	20,400	5,210	921	267	24,700	167	123
16	5.8	14	12	23	7,730	3,180	841	225	13,800	139	99
17	8.4	14	11	24	2,150	2,690	761	1,460	1,740	123	77
18	13	12	12	26	1,240	2,830	801	377	4,440	123	58
19	12	11	10	34	1,240	1,990	723	377	9,410	123	58
20	9.6	11	11	39	1,000	1,500	647	345	1,940	112	63
21	10	10	11	36	841	1,290	6,470	252	1,200	167	45
22	9.6	11	11	36	685	1,120	12,400	207	921	109	144
23	9.6	13	11	26	533	1,040	17,900	162	761	86	102
24	9.2	12	11	26	479	4,160	11,400	144	685	83	72
25	9.6	13	12	47	2,210	7,240	6,610	131	571	69	63
26	9.6	13	11	52	7,940	4,230	2,970	162	533	61	55
27	11	12	11	44	7,030	2,830	1,990	647	444	61	58
28	10	12	13	41	1,640	5,000	1,460	313	377	55	31
29	10	12	14	------	1,160	3,810	2,830	231	345	52	27
30	10	13	14	------	2,150	4,790	5,000	153	313	52	27
31	------	13	14	------	5,280	------	11,400	------	267	49	------

NOTE.—Gage not read Apr. 13 and Aug. 6; discharge interpolated.

Monthly discharge of Verdigris River at Independence, Kans., for the year ending September 30, 1922

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
November 14–30	13	5.4	9.33	315
December	14	10	11.8	726
January	19	10	13.0	799
February	52	13	29.3	1,630
March	21,100	41	2,800	172,000
April	44,100	1,040	10,200	607,000
May	17,900	647	4,310	265,000
June	4,160	131	651	38,700
July	34,200	267	7,000	430,000
August	685	49	235	14,400
September	609	21	93.4	5,560
The period				1,540,000

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, 1922. August 1, 1895, to November 30, 1903, at a site 4 miles upstream at city water and power dam.

GAGE.—Stevens continuous water-stage recorder on left bank, three-fourths mile above Pipe Line ford; inspected 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 a long shale riffle half a mile below gage; permanent.

EXTREMES OF DISCHARGE.—Maximum stage during year from water-stage recorder, 27.32 feet at 4 p. m. April 10 (discharge, 31,400 second-feet); minimum stage from water-stage recorder, 2.57 feet at 4 p. m. September 3 (discharge, 9.5 second-feet).

1917–1922: Maximum stage recorded, that of April 10, 1922; minimum stage, 1.9 feet on June 23, 1920 (discharge, 1 second-foot).

1895–1903: Maximum stage recorded, 22.0 feet on June 3, 1903 (discharge, 39,100 second-feet); a higher discharge of 45,600 second-feet given for May 24, 1896 (gage height, 20.1 feet); no flow on several days in September and October, 1897.

A stage of 24.0 feet on July 10, 1904, referred to datum of old gage was determined by levels from high-water marks (discharge, estimated, 74,600 second-feet).

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

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

ACCURACY.—Stage-discharge relation permanent during the year; not seriously affected by ice. Rating curve well defined. Operation of water-stage recorder satisfactory except for few short periods. Daily discharge ascertained by applying mean daily gage height to rating table. Records good.

Discharge measurements of Neosho River near Iola, Kans., during the year ending September 30, 1922

Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*
Nov. 8	H. B. Kinnison	2.65	14.3
Mar. 25	do	21.50	22,600
July 6	Reginald Waldo	5.16	1,170

Daily discharge, in second-feet, of Neosho River near Iola, Kans., for the year ending September 30, 1922

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	276	22	20	27	39	298	1,360	3,880	2,200	1,520	126	59
2	204	20	19	27	46	196	990	2,710	1,680	6,500	6,240	46
3	196	18	14	27	51	157	5,720	4,000	1,200	7,930	3,400	12
4	178	17	14	33	51	146	15,500	5,980	850	3,640	5,330	25
5	126	16	14	31	66	129	15,300	4,480	700	1,930	1,600	51
6	112	16	14	27	75	112	11,800	3,160	615	1,200	730	55
7	93	17	14	27	72	90	12,300	2,110	560	920	615	53
8	80	15	14	30	59	77	23,700	1,930	510	730	460	49
9	64	14	14	36	51	90	28,500	2,930	460	560	615	62
10	61	14	14	41	48	115	30,800	3,640	485	615	615	150
11	59	14	14	41	42	157	29,400	3,520	460	2,110	615	189
12	55	14	14	37	40	231	25,400	2,820	410	7,280	510	104
13	44	14	17	34	38	1,360	24,000	1,680	365	12,900	460	72
14	41	15	21	31	37	12,300	20,000	1,360	320	10,200	298	66
15	39	15	22	30	36	8,710	5,850	1,130	298	7,800	255	55
16	37	15	24	27	34	8,970	3,160	990	276	3,280	235	48
17	34	16	25	26	31	11,900	5,330	920	276	1,520	235	51
18	30	17	25	26	27	13,200	2,820	850	255	990	208	51
19	29	16	25	26	22	8,580	2,020	790	231	730	189	51
20	28	15	26	25	18	2,400	1,680	790	216	588	204	51
21	28	14	26	24	18	1,760	1,440	730	208	510	208	51
22	27	14	26	21	20	1,360	1,200	1,930	196	460	178	51
23	27	14	26	21	24	990	1,060	2,930	189	410	118	51
24	26	14	27	22	24	13,600	2,400	4,000	178	365	101	98
25	26	14	27	22	22	24,900	2,820	2,600	277	365	118	98
26	25	14	27	21	25	27,800	2,400	1,930	642	388	118	98
27	25	14	27	19	510	10,200	2,930	2,020	276	365	106	82
28	24	16	27	20	485	2,110	3,520	1,440	216	342	93	72
29	25	17	27	33	------	1,680	5,330	1,060	189	342	85	64
30	25	19	27	29	------	2,600	5,200	1,060	255	276	85	57
31	24	------	27	31	------	2,200	--------	2,200	-------	255	75	-------

NOTE.—Water-stage recorder not operating, Oct. 20–27, Dec. 6–8, 20–23, 25–30, and Feb. 12–15; discharge interpolated.

Monthly discharge of Neosho River near Iola, Kans., for the year ending September 30, 1922

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October	276	24	67.7	4,160
November	22	14	15.7	934
December	27	14	21.2	1,300
January	41	19	28.1	1,730
February	510	18	71.8	3,990
March	27,800	77	5,110	314,000
April	30,800	990	9,800	583,000
May	5,980	730	2,310	142,000
June	2,200	178	500	29,800
July	12,900	255	2,480	152,000
August	6,240	75	781	48,000
September	189	12	67.4	4,010
The year	30,800	12	1,780	1,280,000

NEOSHO RIVER NEAR PARSONS, KANS.

LOCATION.—In NW. ¼ sec. 22, T. 31 S., R. 21 E., at bridge on Parsons-Pittsburg highway 500 feet above St. Louis-San Francisco Railway bridge, 800 feet below Hickory Creek, and 10 miles east of Parsons, Labette County.

DRAINAGE AREA.—Not measured.

RECORDS AVAILABLE.—October 18, 1921, to September 30, 1922.

GAGE.—Chain gage bolted to upstream side of bridge; read by Mrs. W. C. Slane.

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

CHANNEL AND CONTROL.—Bed, flat, solid, outcropping shale rock. Control not well defined. Bank-full stage, gage height 24 feet.

EXTREMES OF DISCHARGE.—Maximum stage recorded during the year, 24.90 feet at 5.50 p. m. April 13 and 7 a. m. April 14 (discharge, 28,400 second-feet); minimum stage, 1.12 feet at 5.10 p. m., December 3 (discharge, 18 second-feet).

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

REGULATION.—Flow apparently not affected by dams upstream.

ACCURACY.—Stage-discharge relation practically permanent; not affected by ice during the year. Gage read to hundredths twice daily. Rating curve well defined. Daily discharge ascertained by applying mean daily gage heights to rating table. Records good.

Discharge measurements of Neosho River near Parsons, Kans., during the year ending September 30, 1922

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Nov. 8	H. B. Kinnison	1.25	29.7	Apr. 12	W. R. Denison	24.42	27,500
Mar. 25	do	15.85	13,100	May 11	Kinnison and Denison	7.53	3,670
26	do	20.19	19,500	July 3	Reginald Waldo	18.65	14,700
27	do	22.21	22,100	Aug. 9	do	3.65	943

Daily discharge, in second-feet, of Neosho River near Parsons, Kans., for the year ending September 30, 1922

Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1		33	22	31	36	250	4,080	5,430	2,300	1,020	338	99
2		29	23	30	33	338	2,300	4,350	2,540	9,110	338	97
3		28	18	34	32	218	3,180	3,260	2,020	16,300	4,530	95
4		28	24	43	33	146	11,700	3,900	1,380	12,500	3,740	84
5		28	27	30	34	122	20,500	7,490	1,140	5,340	4,530	74
6		28	25	41	35	122	23,000	6,490	908	2,620	2,780	66
7		28	22	44	36	139	22,300	3,660	740	1,700	1,570	51
8		28	25	44	39	133	25,600	2,540	740	1,260	908	44
9		26	26	44	50	116	28,000	2,380	603	1,080	908	44
10		26	26	40	56	128	27,800	2,860	449	1,200	908	92
11		25	29	36	54	177	27,200	3,580	472	5,250	1,260	93
12		22	28	36	37	218	27,800	3,500	497	14,300	1,140	118
13		22	26	33	36	908	28,400	3,180	472	21,700	630	64
14		28	25	39	36	17,000	28,400	1,950	422	19,600	447	161
15		28	24	42	35	23,800	27,800	1,570	359	15,800	338	126
16		28	22	39	36	23,400	26,600	1,320	338	9,960	284	69
17		24	25	33	35	14,100	17,800	1,200	338	4,350	250	70
18	36	25	26	37	33	11,300	9,350	1,080	740	3,100	234	81
19	36	25	24	32	35	13,800	4,710	964	380	1,760	218	75
20	36	23	25	33	30	11,100	2,940	964	250	1,260	218	75
21	36	20	26	34	27	3,580	2,300	908	218	964	191	64
22	36	21	30	33	32	2,300	1,880	1,640	234	796	218	72
23	36	19	32	32	29	1,820	1,700	4,620	218	684	202	86
24	36	21	30	30	34	1,200	3,580	4,890	202	603	191	102
25	36	19	38	28	33	10,200	7,090	4,440	202	522	158	86
26	34	25	35	29	31	19,800	4,710	4,350	234	497	116	66
27	34	24	32	29	32	23,000	3,660	3,820	603	447	101	102
28	34	23	32	30	33	24,800	5,160	2,230	449	472	122	108
29	34	22	28	32	-------	19,600	4,800	1,880	401	380	120	81
30	34	22	34	30	-------	4,800	5,520	1,380	320	380	104	77
31	34	-------	32	32	-------	4,530	-------	1,200	-------	359	101	-------

Monthly discharge of Neosho River near Parsons, Kans., for the year ending September 30, 1922

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
October 18-31	36	34	35.1	976
November	33	19	24.9	1,480
December	38	18	27.1	1,670
January	44	28	34.8	2,140
February	56	27	35.8	1,990
March	24,800	116	7,520	462,000
April	28,400	1,700	13,700	815,000
May	7,490	908	3,000	184,000
June	2,540	202	672	40,000
July	21,700	359	5,010	308,000
August	4,530	101	877	53,900
September	161	44	84.1	5,000
The period				1,880,000

COTTONWOOD RIVER AT ELMDALE, KANS.

LOCATION.—In NW. ¼ sec. 26, T. 19 S., R. 7 E., at highway bridge one-fourth mile above Middle Creek, 1 mile east of Elmdale, Chase County, and 2 miles above Diamond Creek.

DRAINAGE AREA.—1,040 square miles (measured on topographic map; scale, 1:125,000).

RECORDS AVAILABLE.—May 9 to September 30, 1922.

GAGE.—Chain gage fastened to upstream handrail of bridge; read by Miss Rowena Starkey.

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

CHANNEL AND CONTROL.—Bed composed of coarse sand, gravel, and rock. Control is long gravel and rock riffle extending 200 feet above and 100 feet below gage; permanent. Dam at Cottonwood Falls may affect the stage-discharge relation at medium and high stages. Bank-full stage, gage height 32 feet.

EXTREMES OF DISCHARGE.—Maximum stage recorded during the period of records, 12.41 feet at 5.45 p. m. May 9 (discharge, 2,520 second-feet); minimum stage recorded, 3.33 feet on September 9 and 12 (discharge, 10 second-feet).

REGULATION.—None.

ACCURACY.—Stage-discharge relation permanent. Rating curve well defined below 200 second-feet and is fairly well defined between 200 and 3,000 second-feet. Gage read to hundredths twice daily. Daily discharge ascertained by applying mean daily gage height to rating table. Records good.

Discharge measurements of Cottonwood River at Elmdale, Kans., during the year ending September 30, 1922

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
May 9	W. R. Denison	12.24	2,320	July 19	Reginald Waldo	3.90	92
10	do	7.27	846	Aug. 7	do	4.36	249
June 8	do	4.16	166				

Daily discharge, in second-feet, of Cottonwood River at Elmdale, Kans., for the year ending September 30, 1922

Day	May	June	July	Aug.	Sept.	Day	May	June	July	Aug.	Sept.
1	------	216	504	124	26	16	233	84	167	32	195
2	------	164	985	105	24	17	237	80	130	41	18
3	------	147	677	88	26	18	233	82	92	38	18
4	------	164	548	63	30	19	208	76	92	36	18
5	------	144	246	51	24	20	191	72	92	38	54
6	------	144	97	46	19	21	164	72	72	28	18
7	------	233	86	456	18	22	182	68	72	26	18
8	------	172	75	118	14	23	305	63	72	28	24
9	2,410	138	63	76	10	24	717	58	76	32	23
10	779	113	164	58	15	25	913	54	68	26	24
11	430	124	636	54	14	26	305	100	63	26	18
12	340	116	1,490	41	10	27	258	105	54	26	17
13	305	108	1,010	38	15	28	204	92	54	26	17
14	258	100	697	38	18	29	182	76	54	26	17
15	250	92	204	38	18	30	305	130	1,080	26	17
						31	305	------	592	26	------

NOTE.—Gage not read June 12–14, July 7, 8, 16, and 17; discharge interpolated.

Monthly discharge of Cottonwood River at Elmdale, Kans., for the year ending September 30, 1922

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
May 9–31	2,410	164	422	19,300
June	233	54	113	6,720
July	1,490	54	333	20,500
August	456	26	60.5	3,720
September	195	10	25.9	1,540
The period	------	------	------	51,800

RED RIVER BASIN

OUACHITA RIVER NEAR HOT SPRINGS, ARK.

LOCATION.—In SW. ¼ sec. 29, T. 3 S., R. 19 W., at Smith Ferry highway bridge, just above Fourche a Loup Creek, 1 mile above Hot Springs Creek, 3 miles above dam site of Caddo River Power & Irrigation Co., 3½ miles below Little Mazarn Creek, and 5 miles south of Hot Springs, Garland County.

DRAINAGE AREA.—1,420 square miles (measured on base map of Arkansas; scale, 1:500,000).

RECORDS AVAILABLE.—June 27 to September 30, 1922.

GAGE.—Chain gage bolted to eyebar of lower chord on downstream side of bridge; read by George E. Ficklin.

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

CHANNEL AND CONTROL.—Bed composed of solid rock and small gravel and boulders. Channel is obstructed by outcropping rock dikes on which small trees grow. Control is a series of outcropping rock dikes 400, 1,000, and 1,500 feet below gage; the upper dike forms the low-water control, and lower dike the high-water control; permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during the period of record, 6.30 feet at 9 a. m. July 3 (discharge, 375 second-feet); minimum discharge, 42 second-feet, several periods in September.

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

REGULATION.—None.

DIVERSIONS.—None.

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

The following discharge measurement was made by E. L. Williams:
June 14, 1922: Gage height, 6.78 feet; discharge, 746 second-feet.

Daily discharge, in second-feet, of Ouachita River near Hot Springs, Ark., for the year ending September 30, 1922

Day	June	July	Aug.	Sept.	Day	June	July	Aug.	Sept.
1		265	178	44	16		193	72	42
2		275	157	44	17		193	89	43
3		363	157	44	18		157	94	42
4		310	150	44	19		138	89	42
5		275	150	44	20		147	82	45
6		201	138	44	21		132	82	44
7		178	157	43	22		104	80	45
8		154	327	44	23		92	77	48
9		147	233	42	24		84	75	48
10		104	178	42	25		84	72	50
11		80	164	42	26		115	70	47
12		54	147	42	27	168	99	66	45
13		135	126	42	28	315	94	62	44
14		275	115	42	29	345	94	54	44
15		217	89	42	30	285	89	48	42
					31		84	43	

NOTE.—Gage not read Aug. 22–25; discharge interpolated. Gage not read Sept. 16–30, and readings Sept. 1–15 not reliable; discharge estimated by comparison with records of flow at Malvern, Ark.

Monthly discharge of Ouachita River near Hot Springs, Ark., for the year ending September 30, 1922

[Drainage area, 1,420 square miles]

Month	Discharge in second-feet				Run-off in inches
	Maximum	Minimum	Mean	Per square mile	
July	363	54	159	0.112	0.13
August	327	43	117	.082	.09
September	50	42	43.9	.031	.03

OUACHITA RIVER NEAR MALVERN, ARK.

LOCATION.—In NW. ¼ sec. 16, T. 4 S., R. 17 W., at Rockport highway bridge, 100 feet above an old timber crib and rock-filled dam and 1¾ miles northwest of Malvern, Hot Springs County.

DRAINAGE AREA.—1,570 square miles (measured on base map of Arkansas; scale, 1: 500,000).

RECORDS AVAILABLE.—March 3, 1903, to April 30, 1905, and June 29 to September 30, 1922.

GAGE.—Chain gage bolted to eye bar of lower chord on upstream side of highway bridge; read by C. C. Halton and Whit Halton. Gage used 1903 to 1905 was a vertical staff fastened to web between cylindrical piers of the bridge; datum 2.0 feet above that of present gage.

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

CHANNEL AND CONTROL.—Bed composed of solid rock with outcropping dikes. Small trees grow on the rocks projecting above low water. Control is a solid rock outcrop and the remains of an old timber crib and rock-filled dam, 100 feet below the gage; fairly permanent.

EXTREMES OF DISCHARGE.—Maximum stage recorded during the period of records, 3.27 feet July 14 (discharge, 525 second-feet); minimum stage 1.28 feet on several days in September (discharge, 66 second-feet).

1903–1905: Maximum stage recorded, 20.00 feet on March 11, 1903, referred to datum of old gage (discharge, 36,900 second-feet); minimum stage recorded, 0.00 foot on December 18–20, 1904 (discharge, 40 second-feet).

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

REGULATION.—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 fair.

The following discharge measurement was made by E. L. Williams:
June 14, 1922: Gage height, 4.04 feet; discharge, 936 second-feet.

Daily discharge, in second-feet, of Ouachita River near Malvern, Ark., for the year ending September 30, 1922

Day	June	July	Aug.	Sept.	Day	June	July	Aug.	Sept.
1		340	191	78	16		280	134	67
2		325	180	74	17		214	127	67
3		325	214	74	18		226	127	67
4		310	180	70	19		202	127	67
5		280	202	70	20		180	151	70
6		252	191	70	21		239	160	70
7		226	151	67	22		160	151	70
8		191	142	70	23		134	142	78
9		170	358	67	24		134	112	78
10		160	266	67	25		142	112	81
11		160	214	67	26		191	106	74
12		142	180	67	27		160	94	70
13		151	160	67	28		202	89	70
14		515	142	67	29	310	160	85	70
15		340	134	67	30	515	134	81	67
					31		127	78	

Monthly discharge of Ouachita River near Malvern, Ark., for the year ending September 30, 1922

[Drainage area, 1,570 square miles]

Month.	Discharge in second-feet				Run-off in inches
	Maximum	Minimum	Mean	Per square mile	
July	515	127	218	0.139	0.16
August	358	78	154	.098	.11
September	81	67	70.2	.045	.05

BAYOU COCODRIE NEAR MEEKER, LA.

LOCATION.—On line between secs. 4 and 5, T. 1 S., R. 1 E. at Meeker-Meridian highway bridge, three-eighths mile east of Rock Island Railroad crossing, three-fourths mile below Lake Cocodrie, 20 miles above mouth of Bayou Chicot, and 4 miles southwest of Meeker.

DRAINAGE AREA.—278 square miles.

RECORDS AVAILABLE.—May 12 to September 30, 1922.

GAGE.—Vertical staff, attached to downstream pile bent of bridge; read by Gilbert Johnson.

DISCHARGE MEASUREMENTS.—Made from bridge at gage.

CHANNEL AND CONTROL.—Channel curved at station and general course is very crooked. Bed composed of leaves, twigs, sinkers, and mud, and subject to shift. Right bank composed of clay and is not subject to overflow. Left bank clay, low, wooded, and subject to overflow above a gage height of about 12.5 feet. Control not well defined.

EXTREMES OF DISCHARGE.—Maximum discharge recorded during period of records, 656 second-feet July 20 and 21; minimum stage, 0.8 foot July 13 (discharge, 88 second-feet, partly estimated and subject to error).

ICE.—None during year.

DIVERSIONS.—None.

REGULATION.—Flow regulated by swampy areas and Lake Cocodrie, about three-fourths mile above station.

ACCURACY.—Stage-discharge relation not permanent. Rating curve well defined. Gage read to nearest tenth twice a day. Daily discharge determined by applying mean daily gage heights to rating table, using shifting-control method. Records fair.

Discharge measurements of Bayou Cocodrie near Meeker, La., during the year ending September 30, 1922

Date	Made by—	Gage height	Discharge	Date	Made by—	Gage height	Discharge
		Feet	*Sec.-ft.*			*Feet*	*Sec.-ft.*
Apr. 27	Ellsworth and Bradford	8.12	697	Aug. 25	McCashin and Joseph	3.22	183
Aug. 11	McCashin and Bradford	5.93	504	Sept. 1	Joseph and Lee	2.33	132

Daily discharge, in second-feet, of Bayou Cocodrie near Meeker, La., for the year ending September 30, 1922

Day	May	June	July	Aug.	Sept.	Day	May	June	July	Aug.	Sept.
1	------	428	103	392	137	16	519	334	204	441	103
2	------	404	106	392	127	17	506	302	245	416	110
3	------	404	106	368	118	18	480	282	441	392	103
4	------	380	106	467	110	19	506	263	614	368	100
5	------	356	106	519	103	20	545	245	656	334	94
6	------	334	103	532	110	21	572	227	656	312	100
7	------	334	103	519	106	22	572	211	642	282	106
8	------	312	103	493	100	23	572	197	614	236	106
9	------	334	100	480	94	24	572	176	586	197	106
10	------	334	97	493	114	25	545	147	558	162	106
11	------	334	94	506	106	26	519	127	532	162	103
12	586	368	90	506	100	27	519	110	506	183	103
13	558	368	88	493	94	28	519	103	480	183	103
14	532	368	90	454	92	29	493	100	480	169	103
15	532	368	137	454	97	30	467	103	428	157	100
						31	441	------	404	147	------

NOTE.—Water below gage July 12-14; discharge partly estimated. Gage not read Sept. 24; discharge interpolated.

Monthly discharge of Bayou Cocodrie near Meeker, La., for the year ending September 30, 1922

Month	Discharge in second-feet			Run-off in acre-feet
	Maximum	Minimum	Mean	
May 12-31	586	441	528	20,900
June	428	100	278	16,500
July	656	88	309	19,000
August	532	147	362	22,300
September	137	92	105	6,250
The period				85,000

MISCELLANEOUS DISCHARGE MEASUREMENTS

Miscellaneous discharge measurements in lower Mississippi River drainage basin during the year ending September 30, 1922

Date	Stream	Tributary to—	Locality	Discharge
				Sec.-ft.
Oct. 21	Eleven Point River	White River	Above Greer Spring Branch near Greer, Mo.	42.2
Sept. 25	Alley Spring	Jacks Fork	Alley, Mo	81.9

INDEX