Kansas-Missouri Floods of July 1951

Prepared by the WATER RESOURCES DIVISION

GEOLOGICAL SURVEY WATER-SUPPLY PAPER 1139

Records of discharge and of floods in Missouri, Nebraska, Kansas, Oklahoma and Arkansas, collected by cooperating Federal and State agencies

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PREFACE

This final of two reports on the Kansas-Missouri floods of July 1951 was prepared by the U. S. Geological Survey, Water Resources Division, under the general direction of C. G. Paulsen, chief hydraulic engineer, and J.V.B. Wells, chief, Surface Water Branch. The first, or preliminary, report was released as Geological Survey Circular 151 in October 1951.

This report would not have been possible without the aid of technical personnel of the Branch detailed to Kansas from Washington, D. C., and several district offices, who performed the difficult and tedious field surveys and office computations under pressure of emergency conditions.

Basic records of discharge in the area covered by this report are collected in cooperation with the Missouri Geological Survey and Water Resources; Nebraska Department of Roads and Irrigation; Kansas State Board of Agriculture, Division of Water Resources; Oklahoma Planning and Resources Board; Arkansas Resources and Development Commission; Corps of Engineers, Department of the Army; and U. S. Bureau of Reclamation. The basic records are supplemented by the detailed records of the flood contained in this report.

ABSTRACT

Above-normal precipitation in Kansas during May and June 1951 caused some major overflows and established conditions favorable for maximum runoff from subsequent precipitation. During the period July 9-13, 1951, heavy precipitation occurred over eastern and and central Kansas with local amounts of 16 inches or more at several points near the divide of the Kansas and Neosho basins and south of Manhattan, Kans. The resulting floods in the Kansas, Neosho, and Marais des Cygnes basins were the greatest of record although higher stages probably occurred in 1844. The July 1951 flood on the Missouri River below the Kansas River exceeded any that has occurred since 1844.

The Kansas River at Bonner Springs, Kans., discharged 5,400,000 acre-ft during the period July 10-20, attaining a peak rate of discharge of 510,000 cfs on July 13. The Neosho River near Parsons, Kans., discharged 2,360,000 acre-ft, and the Marais des Cygnes River near Ottawa, Kans., discharged 721,000 acre-ft during the same period. Notable peak discharges observed from small drainage areas in Kansas were:

Stream	Location	Discharge area in sq mi	Discharge in cfs per sq mi
Rock Creek	Burlington	8.8	1,090
Mill Creek	Alta Vista	18.7	1,060
Neosho River	Council Grove	250	484
Lyons Creek	Woodbine	231	403
Salt Creek	Lyndon	111	328

The initial retention during the storm as computed by the U. S. Geological Survey had an average value of about 2 in., the remaining precipitation becoming runoff.

The July flood in Kansas-Missouri caused the greatest flood damage of record. Damages compiled by the Corps of Engineers total $870,243,000 for the Kansas River basin, the Missouri River from Rulo, Nebr., to its mouth, and the Marais des Cygnes-Osage River basin. Statistics compiled by the American Red Cross show that 19 people were killed, either directly or indirectly, by the floods in Kansas and Missouri. The Red Cross spent nearly $13,000,000 for relief and rehabilitation assistance.

INTRODUCTION

The July 1951 floods in Kansas and Missouri were caused by a storm of almost unprecedented intensity and areal coverage for the Great Plains, falling on ground that was saturated by previous rains. During the months of May and June 1951, rain was reported each day from some observation station in Kansas. The Kansas state average precipitation for May was 6.43 in., 2.66 in. above normal, and for June it was 9.55 in., 5.58 in. above normal. State average precipitation in Missouri for May was below normal and for June it was 4.05 in. above normal. Light to moderate rains continued falling over Kansas and Missouri during the period July 1-8. During the

period July 9-13, very heavy precipitation occurred in three separate bursts in the afternoon or evening of each day, on July 10, 11, and 12, over eastern and central Kansas.

Streamflow in Kansas during May and June was above normal as a result of the heavy rainfall. Notable local floods occurred on Bear Creek and the upper Arkansas during the middle of May; at Hays, Kans., on May 22; in the upper Big Blue River basin in Nebraska during the first week in June; and on the Delaware River in Kansas, June 21. Near record flows occurred on the Kansas, Big Blue, and Smoky Hill Rivers during June. The mainstem Kansas River, the Marais des Cygnes River, and the Neosho River had average monthly flows during June 1951 of 78,870 cfs, 9,441 cfs, and 11,050 cfs at the respective gaging stations Bonner Springs, Trading Post, and Parsons. The average June flows at the same stations as computed from the available records prior to 1949 are 15,160 cfs, 3,363 cfs, and 5,249 cfs respectively. The high antecedent flows of the major streams draining the areas flooded during July indicate that conditions favorable to a high percentage of rainfall being converted into runoff existed on July 8. Ground-water levels were high, absorptive capacity of the soil mantle was a minimum, and bank storage was probably near maximum when the July storm occurred over the flood area. The storm of July 9-13, 1951, a frontal disturbance associated with convergence of warm, moist tropical Gulf air and continental polar air, centered near the common divide of the Kansas and Neosho River basins south of Manhattan. Heavy precipitation began during the afternoon of July 9, nearly stopped by noon of July 10, began again the evening of July 10 and continued through July 12, with heavy showers during late afternoon and night of each day and very little or no rain from noon to 6 p. m. of each day. By midnight July 13, almost unprecedented total amounts of rain had fallen since the beginning of the storm. Three centers of storm rainfall, one about 27 miles southwest of Manhattan, one about 36 miles south-southwest of Manhattan, and one 15 miles south of Emporia, had total storm amounts of more than 16 in. Figure 1. an isohyetal map of the July 9-13 storm, prepared by the U. S. Weather Bureau, shows the total amount and areal coverage of precipitation.

Conditions being favorable for a high percentage of precipitation to become runoff, the small streams in the flooded area began rising the evening of July 9 and the rise on the Kansas, Marais des Cygnes, and Neosho Rivers soon followed. Runoff from the smaller tributaries reflected the pattern of the precipitation; the hydrographs had three separate peaks. The major flooded streams, Kansas, Marais des Cygnes, and Neosho, went out of bank late on July 10 or July 11, and flooding of all cultural works in the flood plains began. Figure 2 shows the locations of the areas of intense flooding. The occurrence of flood crests was al-

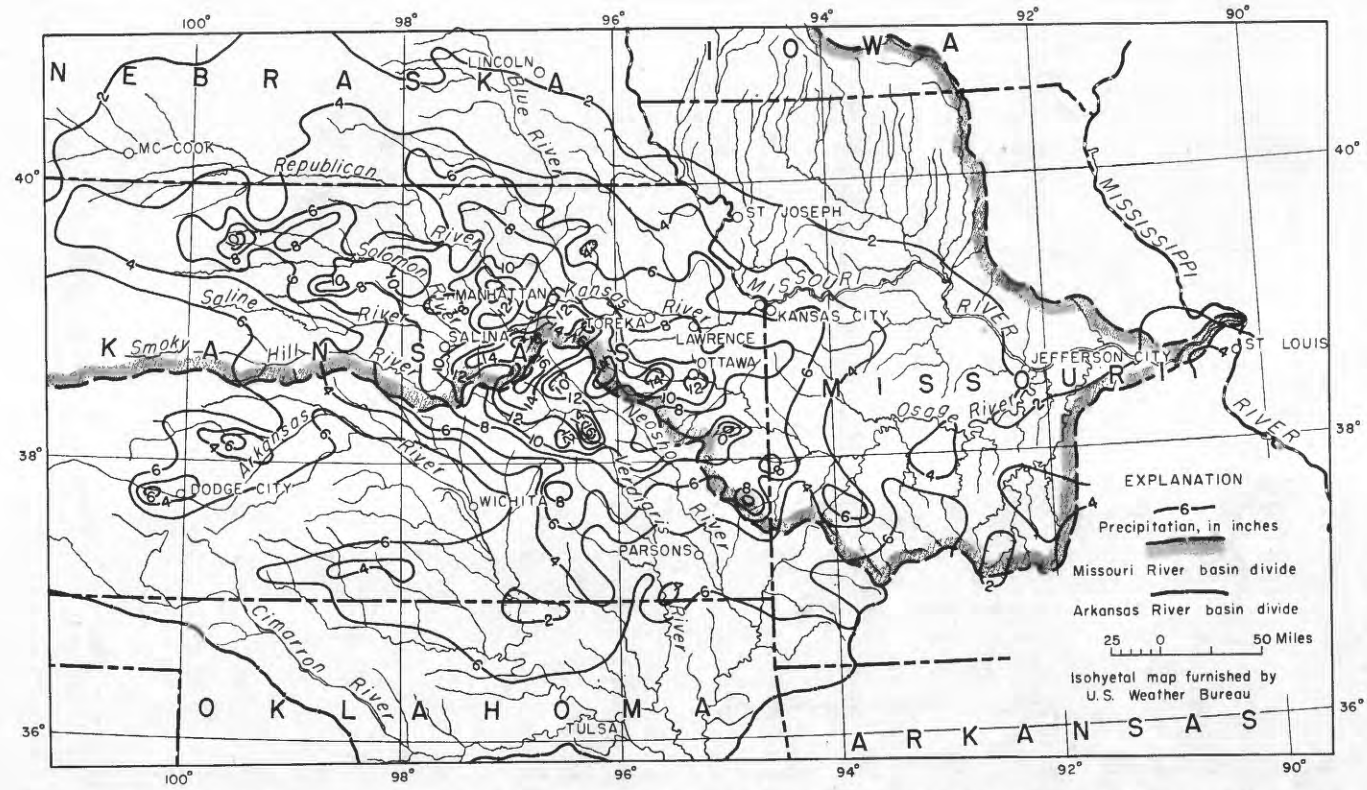

Figure 1. --Isohyetal map showing precipitation during storm of July 9-13, 1951, in Kansas-Missouri.

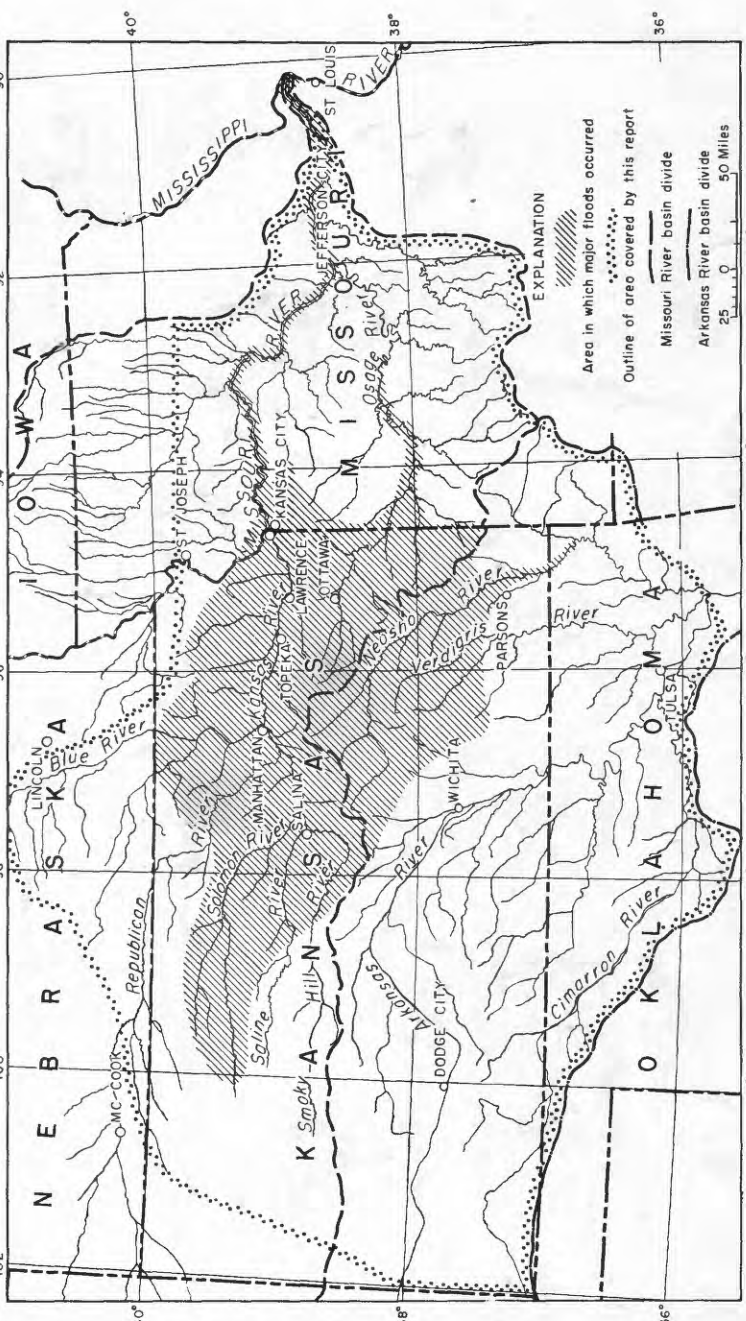

Figure 2.--Map showing areas flooded during July 1951 in Kansas-Missouri.

most simultaneous along the Kansas River from just below Junction City to Topeka due to the addition of intense runoff from the intervening drainage area; the crest passed Ogden at 10 p.m. on July 12 and Topeka at 6 a.m. on July 13. The crest passed Kansas City, Mo., at 1 p. m. on July 14 and reached Hermann, Mo., on July 19. Most of the flood water had passed from Kansas by July 20.

The July flood reached such high stages and velocities and stopped all travel on so many highways that it was found impossible to carry on the normal stream-gaging program of the Geological Survey in the flooded area in Kansas. Soon after the recession of the flood, operations were started to determine the peak discharges at regular gaging stations by indirect methods. About twenty Geological Survey employees from other districts were detailed to Kansas for the surveying work in the field, for computation of peak discharges based on field-survey data, and for computation of gaging-station records. A preliminary flood report was released as Geological Survey Circular 151 in October 1951 to meet the demand for early information on flood stages and discharges. A second staff of employees detailed to Kansas commenced work on this final report during November. Additional surveys were made in the field, the computations made for the preliminary report were thoroughly reviewed, and the final gaging-station data in the Kansas, Marais des Cygnes, and and Neosho basins were given a thorough check for consistency by the Muskingum method of flood-routing. The computation of data for this report was completed on April 2, 1952. This report on the July floods in Kansas and Missouri supplements the regular annual surface-water reports for the stations in the flooded area with more detailed information on stages and discharges during the July flood period.

The Corps of Engineers, Department of the Army, immediately after recession began to collect the following data related to the flood: Flood profiles, along main streams and major tributaries; "bucket survey" information on storm precipitation; information on flood damages; determination of peak discharge from ungaged streams; and planning information for rehabilitation of flood control structures. The Corps of Engineers published an Interim report on storms and floods in the Kansas City District May-July 1951 in October 1951. That report contains a summary of much of the field data collected by the Corps. A tabulation of over 1,000 unofficial rainfall reports collected by the Corps of Engineers for the July storm is available at the district office, Kansas City.

The U. S. Weather Bureau published two reports on the July storm and flood. These are: Some aspects of the heavy rains over eastern Kansas, July 10-13, 1951, Monthly Weather Review, July 1951; and Technical Paper No. 17, Kansas-Missouri floods of June-July 1951. The former report contains information on

the meteorology of the storm, the latter report containd meteorologic and hydrologic data plus discussions of the storm and flood. The Kansas Climatological Data for July 1951 was released by the Weather Bureau early in August. Verne Alexander, Area Hydrologic Engineer, U. S. Weather Bureau, Kansas City, published an informative article on the storm and flood in the November issue of Civil Engineering (Alexander, 1951, p. 34).

This final report of the Geological Survey on the Kansas-Missouri floods of July 1951 presents all essential stream-flow records collected by the Survey and other organizations in the states of Kansas, Missouri, Nebraska, Oklahoma, and Arkansas. Stream-flow data are given in detail sufficient for all hydrologic studies. A section on meteorology prepared by the U. S. Weather Bureau, usually included in Geological Survey flood reports, has been omitted because of the excellent discussions previously published by the Weather Bureau. Information on flood damages furnished by many agencies has been included. Many data collected and furnished by the Corps of Engineers on flood profiles, maps of flooded areas, channel changes, and determinations of peak flow for ungaged streams are included. Sections on the special hydrologic studies made in connection with the consistency of computed flood records and on flood frequency have been prepared by R. W. Carter and Tate Dalrymple, respectively, of the Surface Water Branch, U. S. Geological Survey. A discussion of previous floods in the area is included. A discussion of concurrent groundwater changes has been contributed by V. C. Fishel, Ground Water Branch, U. S. Geological Survey

ADMINISTRATION AND PERSONNEL

This report was prepared by the U. S. Geological Survey, Water Resources Division, under the general direction of C. G. Paulsen, chief hydraulic engineer, and J. V. B. Wells, chief, Surface Water Branch. Most of the field and office work in connection with the collection and computation of discharge records in the State of Kansas presented in this report was done by a staff of engineers from the Surface Water Branch detailed to Kansas. The basic records of discharge, which are supplemented by the detailed records of the flood contained in this report, are collected by the Geological Survey under the supervision of the district engineers, as follows: in Kansas, J. B. Spiegel; in Nebraska, D. D. Lewis; in Missouri, H. C. Bolon; in Oklahoma, S. K. Jackson; and in Arkansas, J. L. Saunders. This report was assembled and the text prepared by the staff of the special reports office in Lincoln, Nebr., R. E. Oltman, engineer in charge.

ACKNOWLEDGMENTS

The collection of field data and compilation of records presented in this report were made possible through a special appropriation by the 82d Congress.

Acknowledgment is made to the following agencies for services rendered: the Corps of Engineers, Department of the Army, and the U. S. Bureau of Reclamation, for field surveying parties; the U. S. Weather Bureau, Topeka office, R. H. Garrett, section chief, for office space furnished to the engineers detailed to work on the report; and to the Kansas State Board of Agriculture, Water Resources Division, R. V. Smrha, chief engineer, for engineers assigned to assist in surveying and computing.

Acknowledgment for material furnished by individuals or agencies is made at appropriate places in the text.

GENERAL DESCRIPTION OF FLOODS

The great flood of July 1951 in Kansas and Missouri was caused by an intense frontal storm, associated with convergence, that centered near the divide of the Kansas and Neosho basins just south of Manhattan, Kansas, during the period July 9-13. Antecedent conditions were optimum for high yield of runoff from the storm. During every day of May and June one or more weather stations in Kansas reported rainfall, and the monthly state averages for May and June far exceeded the normals. Distribution of May-June precipitation was not uniform over Kansas. Figure 3, an isohyetal map of June precipitation in Kansas and western Missouri, prepared from official Weather Bureau records, shows that there was one center of 16 in. total precipitation and several centers of 14 in., and that about 40 percent of Kansas received more than 10 in. of rain during June. The highest stages of record occurred along the Arkansas River between Syracuse and Garden City following an intense storm on May 15. A storm of cloudburst type at Hays, Kans., on May 22 caused Big Creek to flood about 44 blocks in Hays, where 3 people were drowned. Floods on the Kansas River and tributaries during June were the highest that have occurred in many years. The June 21 flood on the Delaware River exceeded any previously known. Near record flows occurred on the Nebraska headwaters of the Big Blue River during June. Manhattan and Lawrence were partially flooded by the Kansas River during June and farm-crops in the Kansas flood plain were severely damaged. The small towns of Solomon, Culver, Tescott, Shady Bend, and Beverly were damaged from overflows during June.

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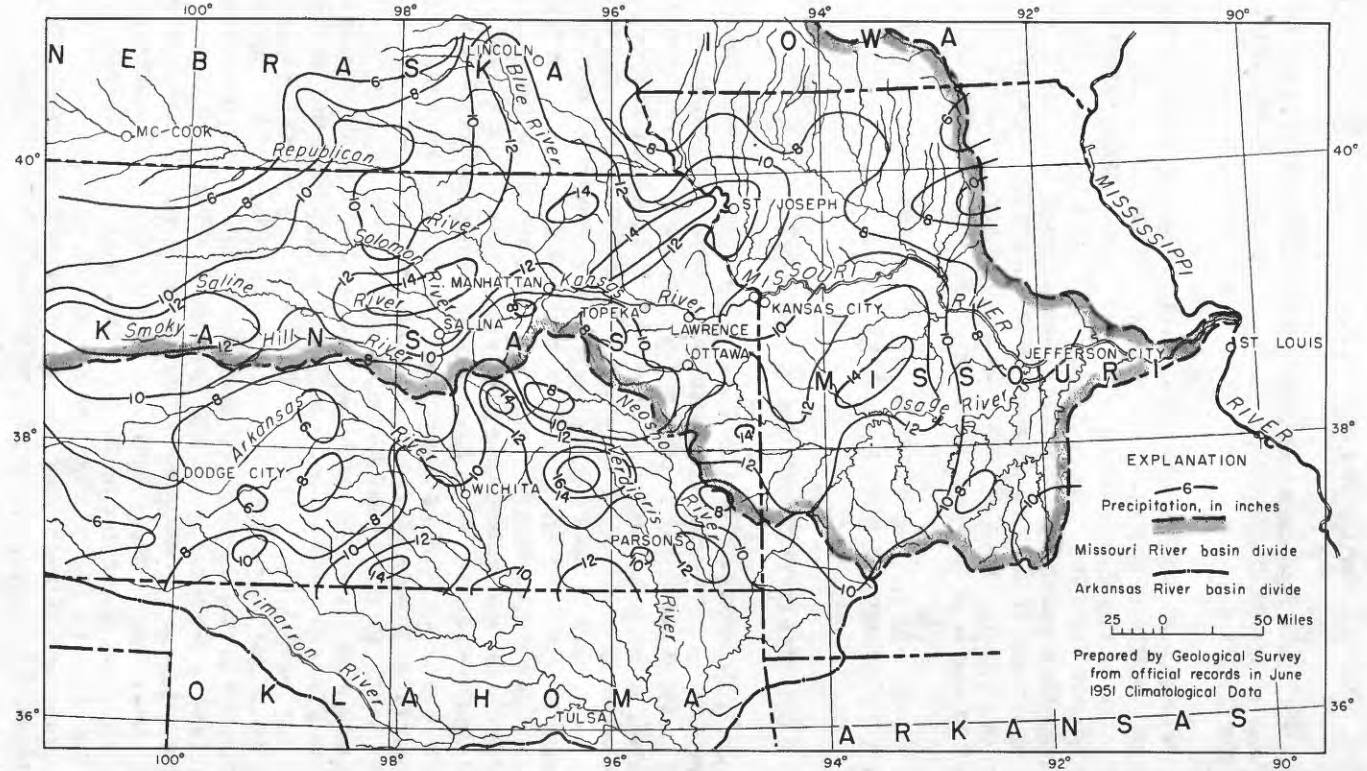


Figure 3. --Isohyetal map showing precipitation during June 1951 in Kansas and western Missouri.

The great storm of July 9-13 that caused the record July floods in Kansas and Missouri has been thoroughly described in publications of the U. S. Weather Bureau. A discussion of the meteorology of the storm is contained in Monthly Weather Review (Carr, 1951, p. 147) and a complete discussion of the storm and flood is contained in a special publication (U. S. Weather Bureau, 1952). Figure 1 shows the total precipitation for the period July 9-13, 1951 over Kansas and western Missouri. Figure 4, prepared from records published in the July 1951 Climatological Data for Kansas, shows the hourly distribution of storm precipitation. The peculiar distribution in three distinct bursts of storm precipitation is readily apparent. In the area of greatest total precipitation the second-day burst (July 11) gave nearly one-half of the total storm precipitation. The greatest amount of precipitation reported from official weather stations for the period July 9-13 was 14.64 in., observed at Alta Vista, but unofficial records show that about 17.5 in. fell in the Neosho River headwaters during the same period.

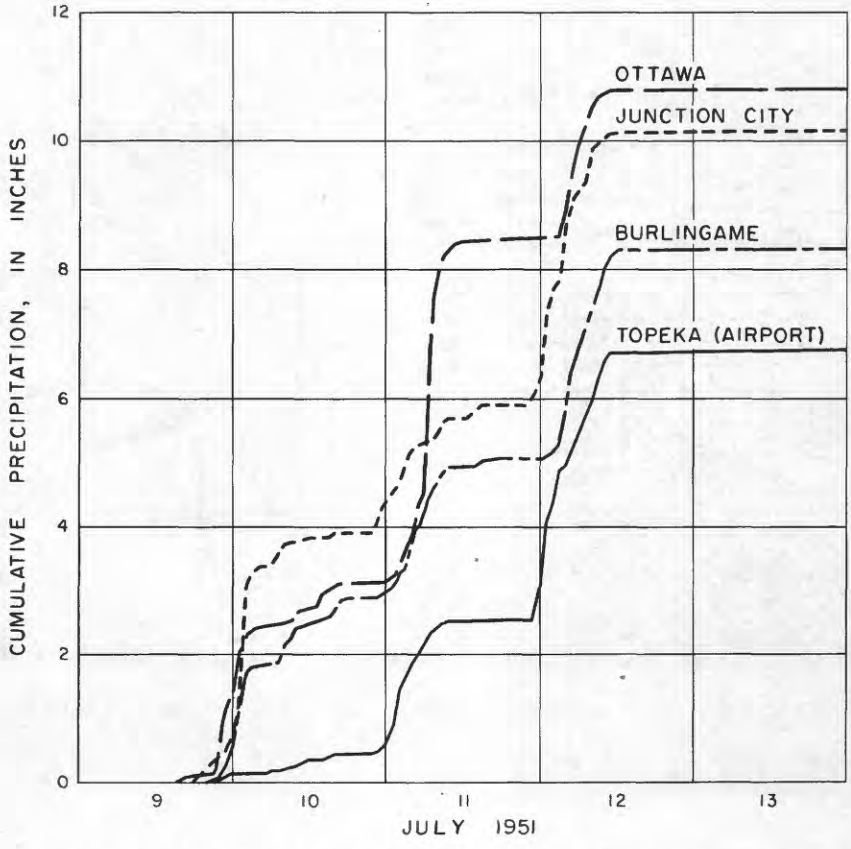


Figure 4. --Mass rainfall curves at four Kansas stations, July 9-13, 1951.

Because the conditions affecting runoff were such that maximum yield obtained from the great storm, record-breaking floods occurred on all streams draining from the areas of heavy precipitation. The Kansas River began overflowing on July 11 and was soon spread out from bluff to bluff along the entire valley. Fort Riley and Manhattan were the first urban areas to be flooded by the Kansas River. Some of the barracks at Fort Riley were smashed or carried away by the flood. At Manhattan the main business district and about 1,600 homes were flooded; depths of flooding in the main business section ranged from 6 to 8 ft. Figure 5 shows the area flooded during July at Manhattan. Swift currents, through the parts of Manhattan located nearest the Kansas River, demolished some homes and two large industrial buildings.

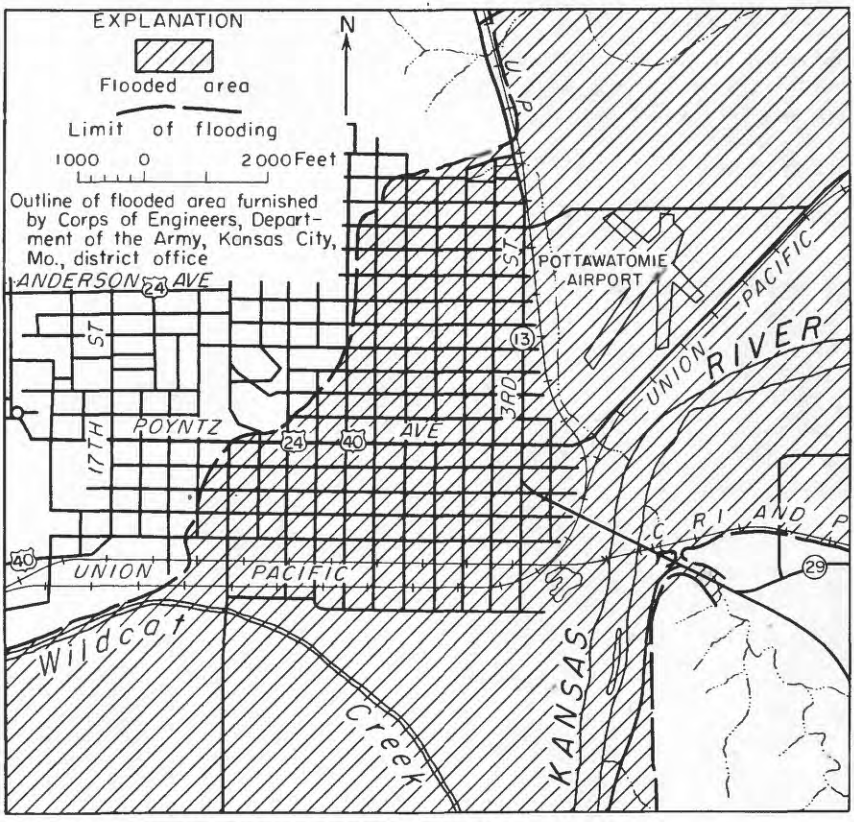


Figure 5. --Map of area flooded during July 1951 at Manhattan, Kans.

At Topeka, Kans., located at the junction of Soldier Creek and the Kansas River, there was a levee system along the river and creek. General failure of the levees protecting North Topeka occurred early on the morning of July 12 at a stage of about 31 ft, and that section of the city was flood-swept and deserted; the levees along the right bank of the river were overtopped soon after. Figure 6 shows the extent of flooding in Topeka. The residential areas in North Topeka received the worst damage; many homes were carried away and were partially smashed by swift currents or floating debris. About 24,000 people were evacuated from the flooded sections of Topeka. The industrial districts and railroad yards along the right bank of the Kansas River at Topeka were severely damaged (fig. 7). After the recession of the flood, removal of 1-3 ft of sediment was necessary before highways and railroads could be repaired or returned to service.

At Lawrence, Kans., levees had failed during the June flood, and the residential area and railroad yard on the left bank of the Kansas River were severly damaged in July. The major part of Lawrence is on high ground to the right of the river and this section was not flooded. About 1,700 people were evacuated from North Lawrence during the July flood. Figure 8 shows the extent of flooding at Lawrence.

The cities of Kansas City, Kans., and Kansas City, Mo., on the right and left banks of the Kansas River at the mouth, were damaged the most severely of any communities in the flood area. Figure 9 shows the extent of flooding in the twin-city area. The dikes protecting the Argentine district located on the right bank of the Kansas River were overtopped about midnight July 12 and over 800 people were forced to flee the area; many were forced out without salvaging more than the clothing they were wearing. At Armourdale, located on the left bank of the Kansas River, 9,100 people were evacuated during the night of July 12 although the levee was not overtopped until early morning of July 13. The concrete floodwalls around the central industrial district were overtopped at 10:30 a. m. July 13. The district had been evacuated prior to flooding but two men engaged in flood work were drowned in the rushing waters. A derelict 6,000 gal oil storage tank floated into high-tension wires and started a fire that gutted the Phillips and Socony Vacuum oil storage yards and nearby installations. Firemen fought the fire from boats but, due to partial failure of water pressure, an estimated loss of $10,000,000 (according to the Kansas City Star, July 22, 1951) occurred from this incident alone. As shown in figure 10, travel by land in the Kansas valley, at Kansas City, was impossible. One elevated viaduct spanning the valley remained open to traffic. The central industrial district contains a concentration of stock yards, packing plants, warehouses (fig. 11), and manufacturing plants and the estimated total flood damage was understandably high, about $140,000,000. Figure 12 shows the extensive flooding in the area. The Turkey

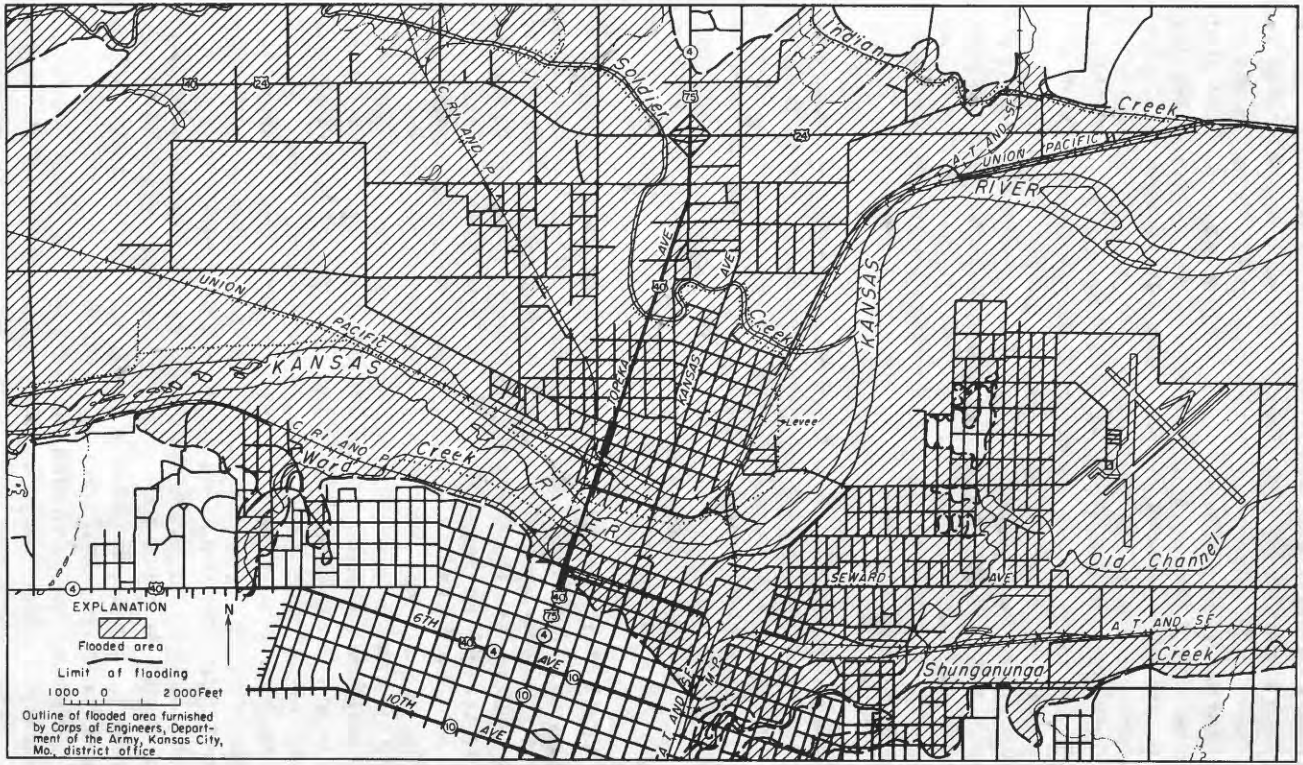


Figure 6. --Map of area flooded during July 1951 at Topeka, Kans.

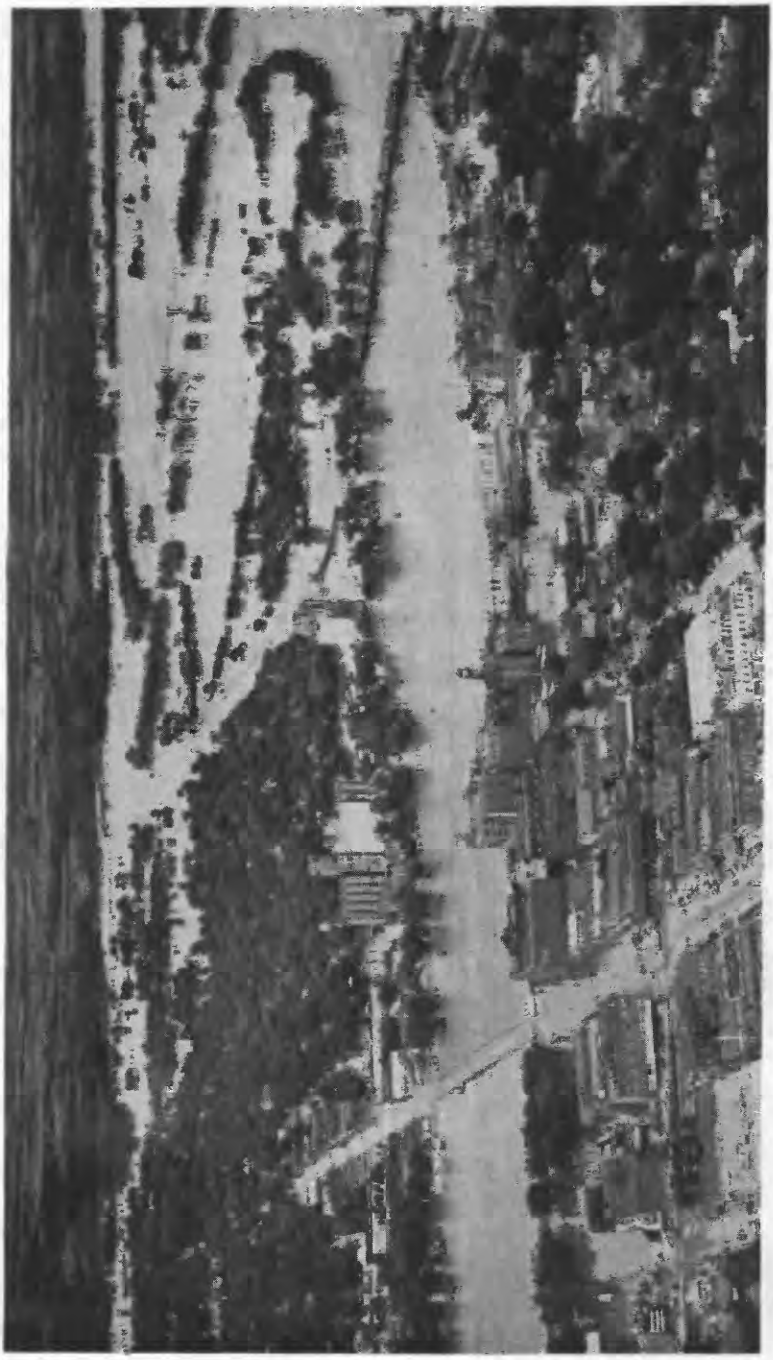


Figure 7.--Aerial view of flooded Topeka, Kans.

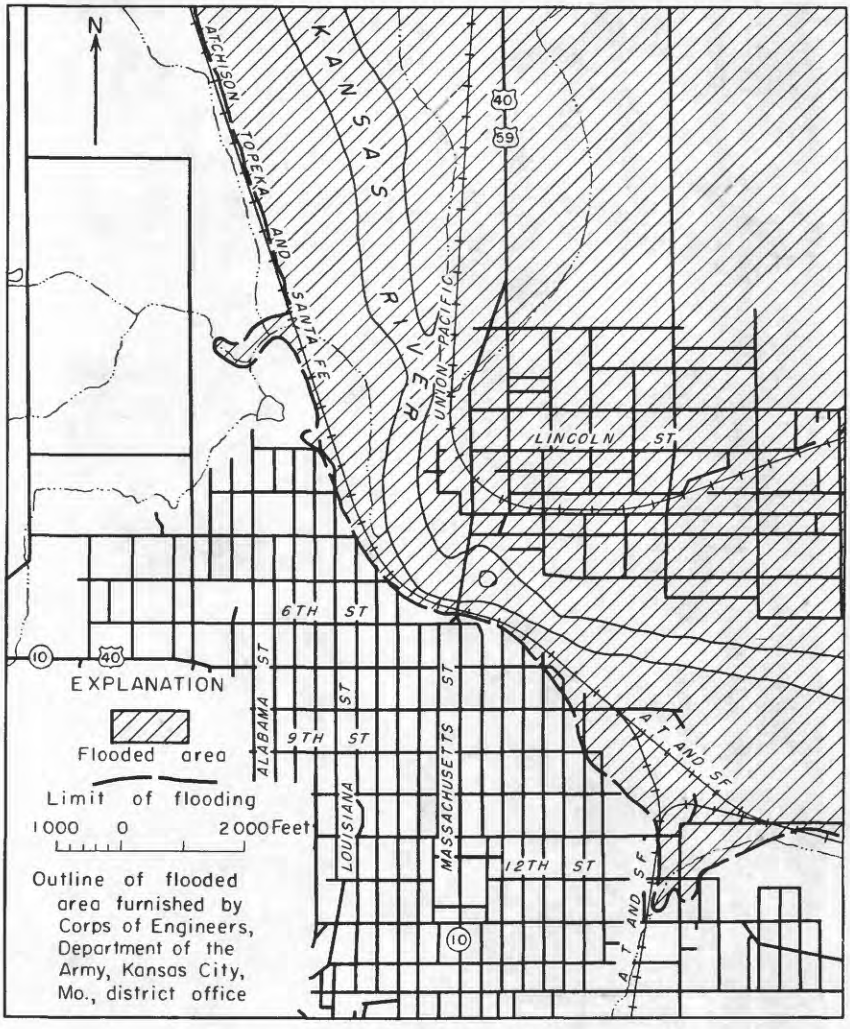


Figure 8. --Map of area flooded during July 1951 at Lawrence, Kans.

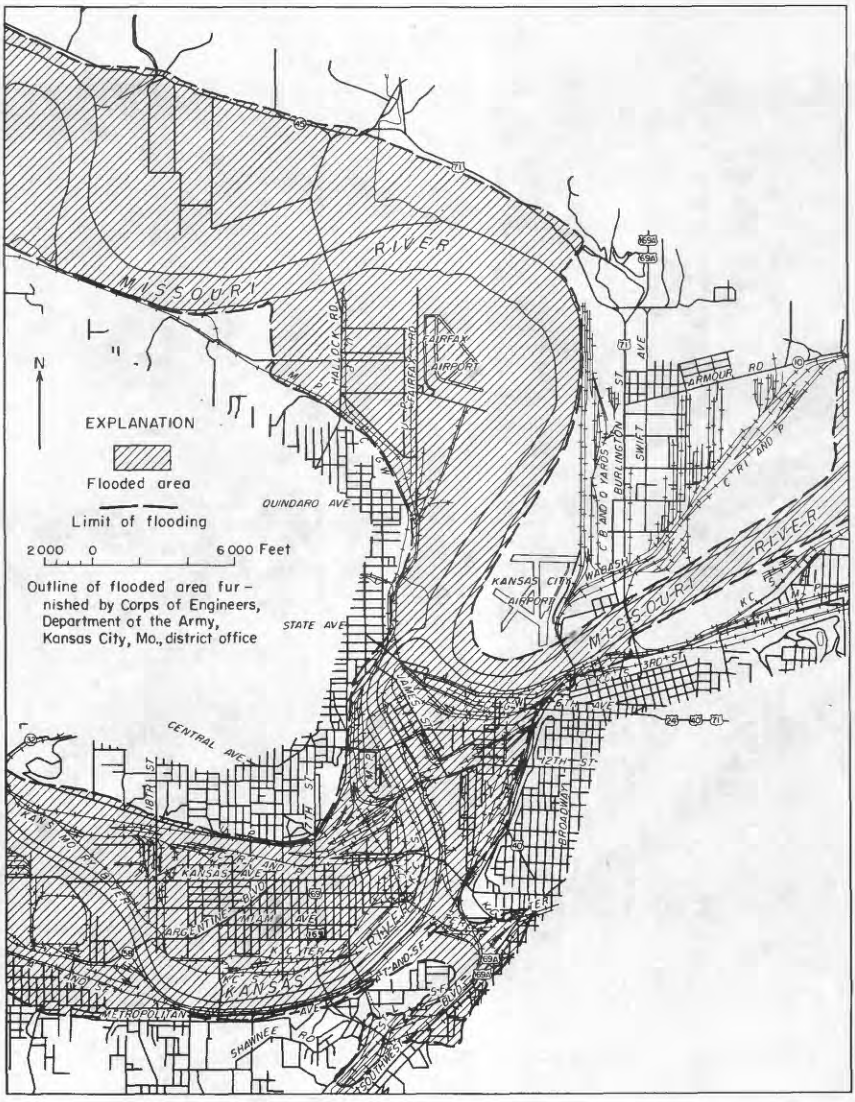


Figure 9.--Map of area flooded during July 1951 at Kansas City, Kans., and Kansas City, Mo.

Figure 10. --Inter-City viaduct is only bridge in use across Kansas River at Kansas City during flood.

Creek pumping station of Kansas City, Mo., was flooded and it became necessary to restrict water use because of low pressure. The Fairfax - Jersey Creek district, located along the right bank of the Missouri River just above the mouth of the Kansas River, was flooded when the Jersey Creek sewer failed on the landward side of the protecting levee. The Fairfax Airport, airplanes, an automobile assembly plant, and other establishments were damaged by inundation, although there was no destruction from high velocities. The Municipal Airport at Kansas City was protected from flooding by levees but all traffic was transferred to Grandview Airport south of Kansas City, Mo., during the flood. The flood crested at the mouth of Kansas River about noon on July 14.

Figure 11.--Kansas City warehouses stand idle during flood.

Figure 12.--Aerial view of flooded Kansas City industrial district

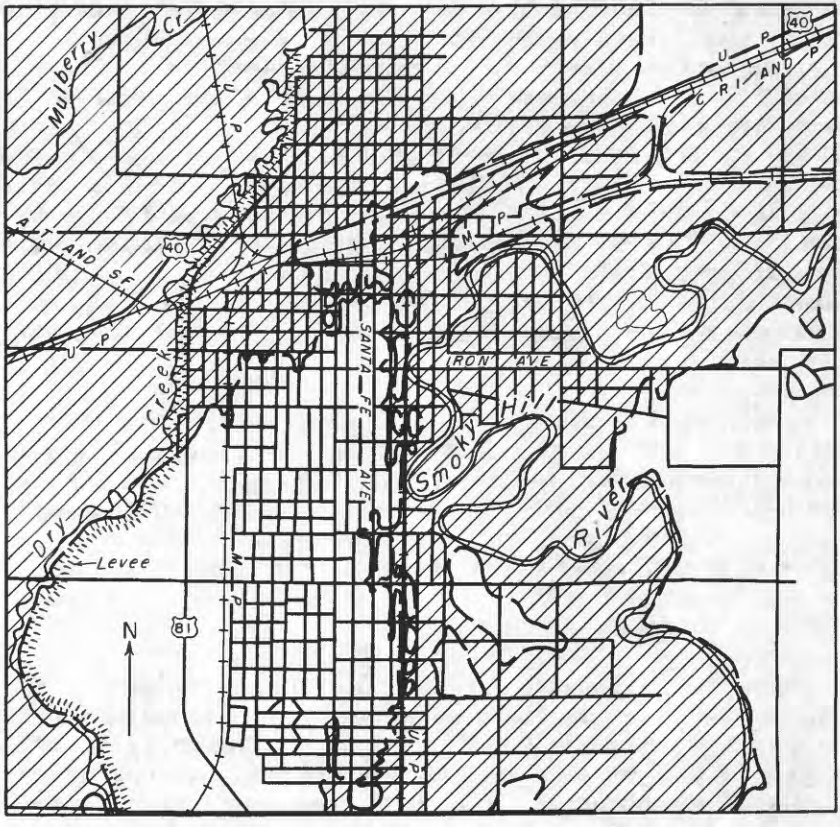
Floods on the major Kansas River tributaries above Junction City crested later than the flood crest on the Kansas River at Topeka because the peak of the storm and its runoff came later upstream. The Solomon and Saline Rivers discharged most of the total flow passing the gage on Smoky Hill River at Enterprise. The crest on the Solomon River at Niles came on July 14 as did the crest on the Smoky Hill River at Enterprise. Every city and town in the flood plains of the Saline and Solomon Rivers was damaged. Flooding on the section of the Smoky Hill River below Kanopolis Reservoir and above Salina was confined to agricultural lands. Salina was flooded by local inflow along the Smoky Hill River and by Dry Creek. Figure 13 shows the extent of flooding in Salina.

In the Neosho River Basin severe flooding occurred at Marion, Florence, and Strong City along the Cottonwood River, and at Council Grove, Dunlap, Strawn, Burlington, Neosho Falls, and Iola along the Neosho River. Figure 14 shows the extent of flooding along the Neosho River and tributaries. Lake O'the Cherokees on Neosho River stored 247,000 acre-ft of the flood waters during the period July 10-17 and materially reduced flood damage below the reservoir.

Ottawa and Osawatomie were the only cities in the Marais des Cygnes basin to be flooded. Damage to Ottawa was estimated by the Corps of Engineers to be $5,437,000. At Ottawa, 12 of the 14 business blocks were flooded (fig. 15) and nearly half of the city population was forced to move. At Osawatomie, 1,500 of a total population of 4,500 were forced to move. Figure 16 shows the extent of flooding at Ottawa.

Flooding from Kansas City, Mo., downstream along the Missouri River was mostly confined to small communities and agricultural lands although Jefferson City (fig. 17), St. Charles, Washington, and Boonville received some damage. The town of Wakenda, Mo., was completely inundated. Between Kansas City and the river mouth, 973,000 acres of agricultural land was inundated. Railroad tracks were damaged in many places by washouts (fig. 18). Crops, farm machinery, and farm buildings were damaged severely. The Mississippi River at St. Louis rose to near record stage and discharge when the flood waters from the Missouri reached it. Plate 1 shows the areal extent of flooding on the Mississippi River in the vicinity of St. Louis. Many small communities along the Mississippi River had extensive flooding along the waterfront (fig. 19).

The flood came so suddenly and covered such large areas that emergency operations of the Army, Coast Guard, Red Cross, and other organizations were overtaxed. The total flood-caused loss of life in Kansas and Missouri, according to statistics compiled by the American Red Cross was nineteen--a remarkably low figure when the hazards present during the flood are considered. Table 1 shows the statistics, by counties in Kansas and Missouri, of

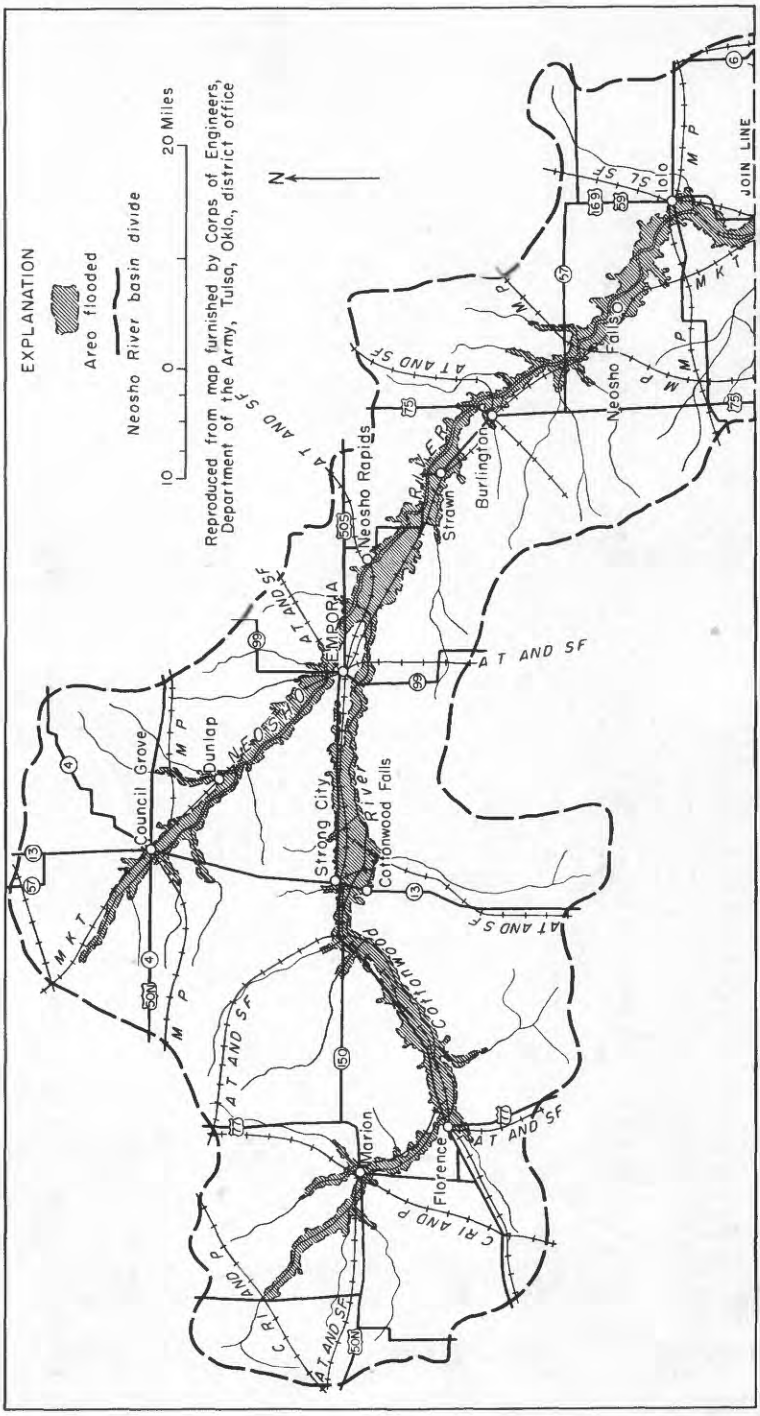


Outline of flooded area furnished by Corps of Engineers, Department of the Army, Kansas City, Mo., district office

Figure 13. --Map of area flooded during July 1951 at Salina, Kans.

Table 1.--Services rendered by the American Red Cross in the Kansas-Missouri flood of July 1951

State and County	No. of families affected	Number killed	Number injured	Total destroyed or damaged: Dwellings	Farm buildings	other buildings	No. of families assisted	Expenditures as of Nov. 30, 1951
Kansas:								
Wyandotte	12,500	3	300	3,725	189	4,627	8,007	$ 7,747,994.94
Douglas	1,200	-	12	1,085	1,385	865	646	373,148.36
Shawnee	8,000	4	5	7,300	95	5,000	3,703	3,225,604.04
Franklin	1,000	-	50	1,045	365	185	522	211,443.84
Riley	2,251	1	364	1,848	292	684	1,503	202,128.28
Geary	600	1	1	355	203	297	294	62,238.17
Salina	3,500	-	30	2,883	200	250	920	60,513.80
Cherokee	80	-	-	28	240	27	22	3,641.46
Labette	150	-	-	60	225	-	20	3,574.53
Neosho	610	1	22	435	1,000	30	284	62,976.46
Allen	1,216	2	30	1,216	1,136	206	435	114,573.12
Woodson	161	1	9	123	96	67	145	59,361.85
Coffey	94	-	-	54	59	2	83	21,375.50
Miami	1,200	-	6	550	700	1,100	177	46,908.36
Lyon	200	-	10	71	60	-	22	3,780.46
Chase	700	-	10	235	350	71	215	40,741.01
Marion	1,500	1	70	730	220	640	751	84,953.50
Dickinson	1,533	-	1	1,162	60	280	217	18,407.26
Morris	500	-	3	477	80	5	157	4,303.06
Waubaunsee	180	-	1	180	180	12	89	18,665.40
Leavenworth	125	-	-	120	-	-	30	25,000.00
Jefferson	710	1	6	682	946	45	403	17,468.10
Pottawatomie	250	-	-	250	315	4	34	8,431.78
Marshall	60	-	-	39	10	-	34	-
Cloud	100	-	-	85	15	4	49	2,702.47
Ottawa	750	-	-	670	612	60	53	5,409.58
Mitchell	325	-	7	300	22	8	72	6,563.38
Lincoln	120	-	-	110	2	4	33	1,768.58
Sedgwick	250	-	2	100	-	-	65	3,357.32
Johnson	160	-	2	91	114	27	102	50,123.49
Wilson	100	-	-	100	100	-	57	1,427.09
Linn	40	-	-	45	130	165	6	1,186.66
Osborne	8	-	-	-	23	-	2	297.04
Osage	16	-	-	8	-	12	4	959.42
Total in Kansas	40,189	15	941	26,162	9,424	14,677	19,156	12,491,028.31
Missouri:								
Platte	75	-	-	40	75	-	30	6,904.60
Jackson	1,500	2	125	267	75	48	3,166	145,862.75
Clay	800	-	1	110	210	185	633	17,415.24
Ray	1,000	-	5	47	760	810	209	27,250.16
Lafayette	100	-	-	100	135	137	22	3,041.48
Carroll	500	1	1	510	1,250	22	149	32,818.99
Saline	150	-	-	94	130	-	32	4,719.52
W. Charlton	35	-	-	35	37	41	8	735.47
Salisbury	25	-	-	30	36	35	5	304.83
Howard	144	-	-	110	13	16	47	3,701.60
Cooper	40	-	-	40	-	-	21	1,244.91
Boone	50	-	-	40	30	-	18	1,818.60
Moniteau	40	-	-	22	4	-	11	695.95
Cole	150	-	-	81	1	-	44	2,183.21
Callaway	210	1	-	310	50	40	83	10,792.08
Osage	50	-	-	37	24	8	1	227.35
Gasconade	100	-	-	28	23	27	14	1,943.39
Montgomery	77	-	-	77	150	-	55	867.69
Warren	150	-	-	66	130	1	11	857.80
Franklin	125	-	-	80	111	1	9	1,069.96
St. Charles	788	-	-	546	646	-	36	9,216.17
St. Louis	400	-	-	408	55	210	238	91.23
Jefferson	75	-	-	70	10	-	8	976.71
Ste. Genevieve	300	-	1	195	25	15	59	5,693.69
Perry	130	-	-	55	28	13	23	1,135.75
Cape Girardeau	100	-	-	45	10	-	38	687.37
Vernon	50	-	-	12	-	-	21	1,993.83
Bates	60	-	-	21	10	-	43	7,268.71
St. Clair	375	-	-	75	30	30	18	1,482.76
Mississippi	30	-	-	10	10	-	12	260.00
Benton	28	-	-	23	-	-	6	600.60
Cass	50	-	1	35	-	10	39	865.87
Total in Missouri	7,807	4	134	3,619	4,068	1,649	5,049	294,728.67


EXPLANATION
Area flooded
Neosho River basin divide
10 0 20 Miles
Reproduced from map furnished by Corps of Engineers, Department of the Army, Tulsa, Okla., district office
N
JOIN LINE
Neosho Falls
Burlington
Strawn
Neosho Rapids
EMPORIA
Strong City
Cottonwood Falls
Council Grove
Dunlap
Marion
Florence
Coldwater Creek
NEOSHO RIVER
MKT
MP
AT AND SF
CRI AND P

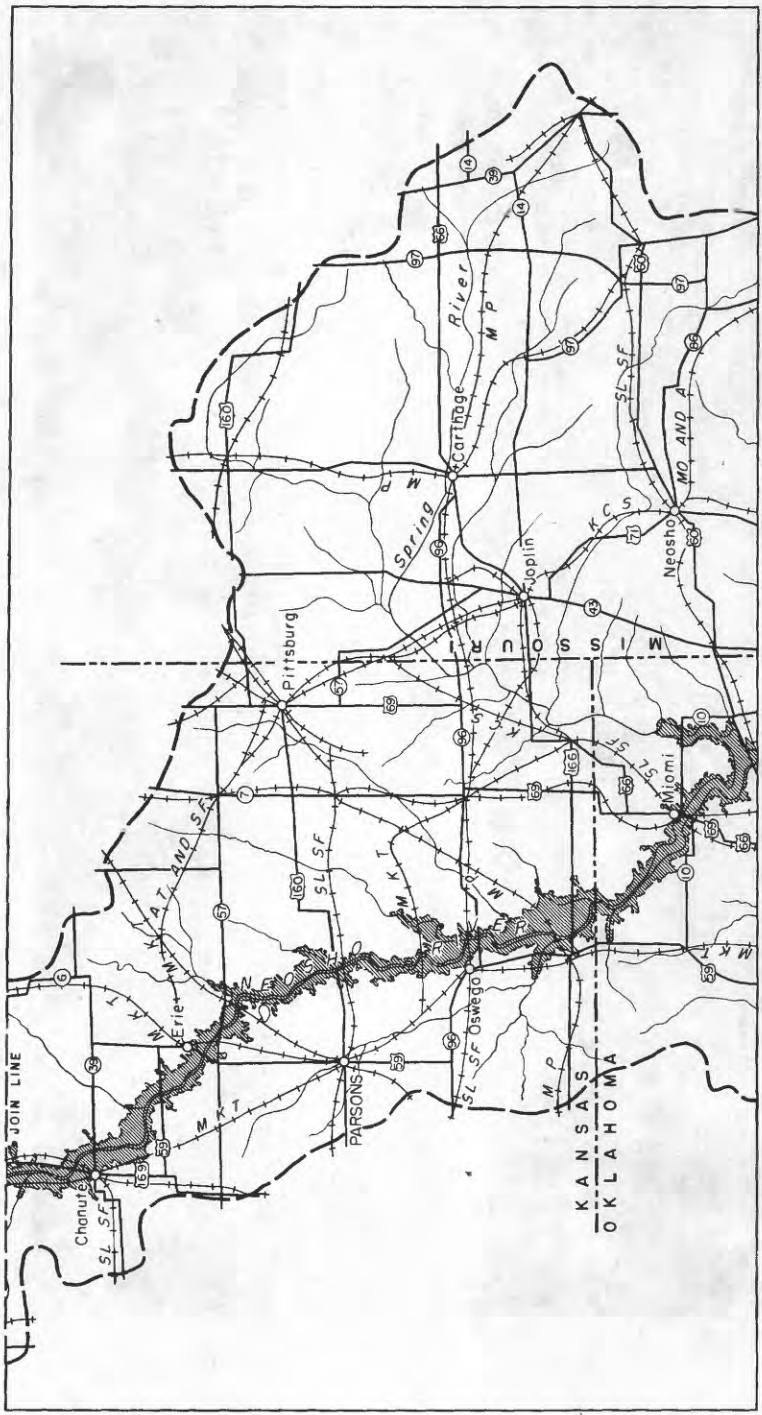


Figure 14.--Map of area flooded during July 1951 along Neosho River and tributaries in Kansas.

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Figure 15.--Business district of Ottawa flooded July 12, 1951, by Marais des Cygnes River.

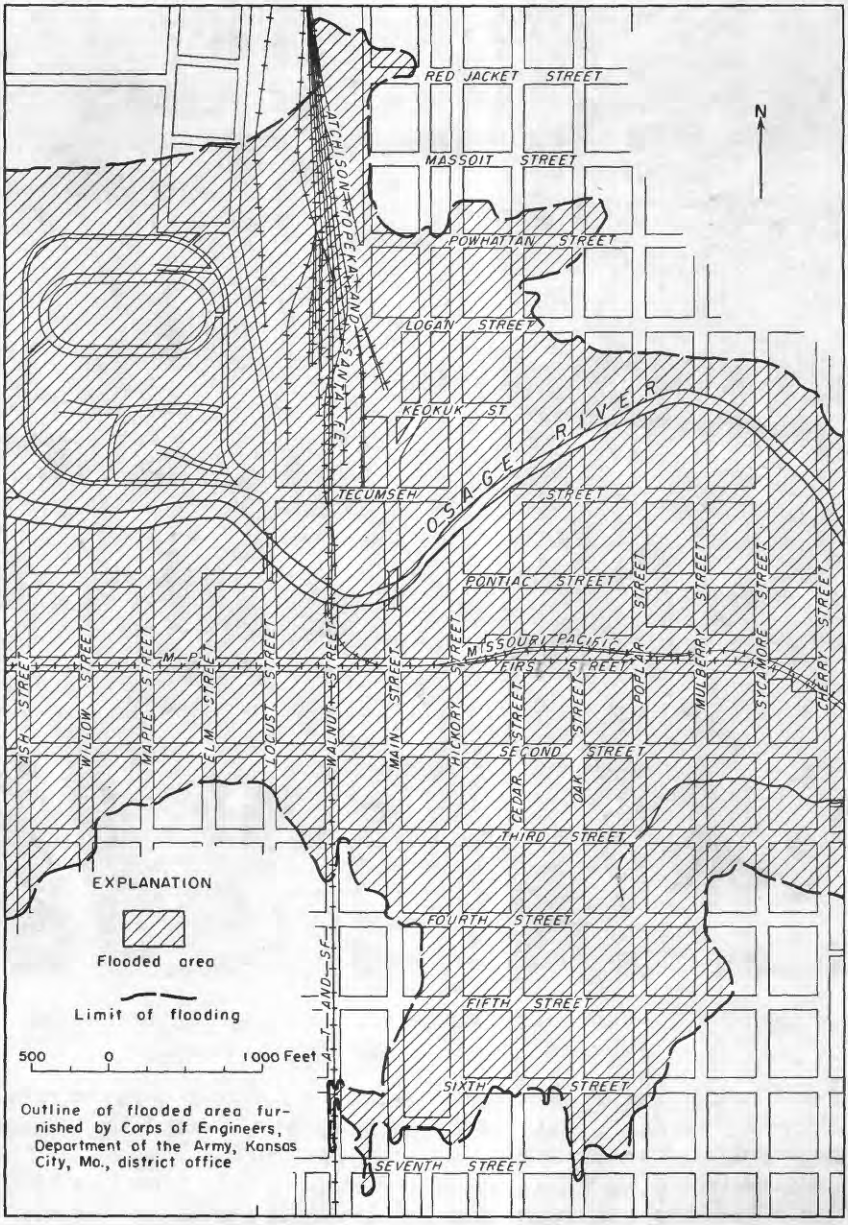

Figure 16. --Map of area flooded during July 1951 at Ottawa, Kans.

Figure 17. --View from Jefferson City during Missouri River flood crest is over lake-like body of water.

families affected by the flood, families receiving aid, number injured, number killed, buildings destroyed, and dollars spent in rescue and rehabilitation by the American Red Cross. The cooperating of Mr. Eichman of Disaster Relief Headquarters, American Red Cross, in furnishing the tabulation is gratefully acknowledged.

It is the responsibility of the U. S. Weather Bureau to issue forecasts of flood stages. Copies of the flood forecast issued for the July flood along the Kansas-Missouri, Osage, and Neosho Rivers may be consulted at the Weather Bureau office, 812 Federal Office Bldg., Kansas City, Mo.

Figure 18.--Washout of M. K. T. track north of St. Charles permitted Missouri flood waters to enter Mississippi River above Alton, Ill.

Figure 19.--Flood scene at Cape Girardeau, Mo., 1951 flood.

Damage to municipal water supplies and sewage treatment works was extensive throughout the flooded areas of Kansas. According to a paper on the emergency operation of municipal utilities (Metzler, 1952, p. 364), 33 water-supply and 4 distribution systems for Kansas communities were put out of operation by the July 1951 flood. At Topeka the water works was operated continuously, behind a sand-bag floodwall, by the strenuous labor of crews that kept shoring up the pumps to prevent settling into the semifluid foundation strata. The battle to maintain the temporary floodwall and stop sand boils as they occurred at the water plant was carried on by as many as 5,000 men at a time.

At cities where water systems were flooded, the Kansas State Board of Health placed emergency water purifiers in service from stocks kept available in storage, supplemented by units obtained from the U. S. Public Health Service and the Corps of Engineers. Purified water was distributed by tank trucks--citizens placed cans, pails, or other containers on the curb to receive the water. The State Board of Health furnished supervisory technicians for the rehabilitation of damaged plants and distribution systems in the flooded areas of Kansas. Sterilization of broken mains was necessary after repair of the break. The State Board of Health required that water samples pass bacteriological examination before municipal supplies could be used.

The statistics on damaged city water facilities presented in table 2 were furnished by Dwight F. Metzler, Chief Engineer and Director of the Sanitation Division, Kansas State Board of Health. The water systems in many other towns were damaged or put out of working order by the flood.

Many sewage disposal systems were inoperative for weeks after the flood because of destruction by cave-ins caused by the penetration and flow of saturated fill material through joints and pipes during the flood. The heavy concentration of silt carried by the flood waters plugged many sewer mains. Some sewage-pumping stations were destroyed by the flood.

In the flooded area transportation by land ceased or was severely hampered for several days in July. Six streamliners of the Santa Fe were stranded near Emporia with all passengers aboard for about four days. The highway system of Kansas was closed for many days during and after the flood. Table 3 shows the State and Federal routes of Kansas that were closed by the July flood. The data for table 3 were furnished by the Kansas Highway Department.

The data contained in table 3 do not show all of the points of closure on major highways but do represent the travel difficulties during and after the July flood. Along many routes embankments were washed out, bridges were damaged, or sediment covered the

Table 2. --Water-supply systems made inoperative by the July 1951 flood in Kansas

City	Population	No. of days 1/	Reason for failure
Kansas River basin			
Glen Elder	582	15	Flooded wells.
Simpson	241	16	Do.
Delphos	674	17	Flooded wells, broken main.
Barnard	263	19	Flooded wells.
Tescott	427	20	Do.
Manhattan	14, 500	9	Flooded wells (pressure in mains maintained with treated floodwater)
Chapman	750	15	System and one well flooded.
North Topeka	15, 500	13	System flooded.
North Lawrence	1, 500	27	Do.
Kansas City	37, 000	7	Pipe failures.
Alma	755	1	Power failure.
Rossville	572	14	Do.
Silver Lake	405	14	Do.
Valley Falls	1, 135	8	River crossing washed out.
Perry	413	9	Power failure, town flooded.
Eudora	929	12	Power failure, clear well flooded.
DeSoto	532	13	Power failure, plant wells flooded.
Bonner Springs	2, 241	13	Wells and plant destroyed.
Lenexa	816	14	Failure of supply.
Missouri Township	30, 000	17	Do.
Neosho River basin			
Marion	2, 233	13	Power failure.
Florence	1, 055	15	Plant flooded.
Cottonwood Falls	1, 026	13	Wells flooded.
Strong City	721	15	Well and plant flooded.
Council Grove	2, 814	8	Filters flooded.
Burlington	2, 292	13	Filters and settling basins flooded.
Colony	429	-	Pumps flooded on July 10, plant damaged by lightning on July 18.
Iola	7, 062	9	Water and power plant flooded.
Gas City	281	9	Supply from Iola failed.
LaHarpe	493	9	Do.
Humboldt	2, 259	14	Pumps and clear well flooded.
Chanute	10, 651	15	Plant flooded.
Altoona	550	15	Basins flooded.
St. Paul	799	5	Low lift pumps flooded.
Oswego	2, 524	13	Pumps flooded.
Marais des Cygnes River basin			
Osawatomie	4, 417	1	Low lift station flooded.
Ottawa	9, 903	14	Water and power plants flooded.

1/ Computed from the time system became inoperative to the time wate was in satisfactory bacteriological condition.

Table 3. --State and Federal highways closed by the July 1951 flood in Kansas

Highway Route	Location	Dates closed
U S 50 S	at Florence	July 11-14
U S 75	north of Netawaka	July 12
K 10	northeast of Alta Vista	July 10-13
K 13	north of El Dorado	July 7-18
K 99	south of Alma	July 10-20
U S 54	at Augusta	July 14
U S 160	at Oak Valley	July 10-13
K 13	at Strong City	July 10-20
K 15	east of Udall	July 14-16
K 68	east and west of Pamona	July 12-16
K 99	south of Emporia	July 10-16
K 130	north of Hartford	July 14
K 96	northwest part of Wichita	July 14-16
U S 160	southeast of Harper	July 13
U S 281	south of Smith Center	July 14
K 45	at Larned	July 12-19
U S 183	north and south if Kinsley	July 12-16
U S 281	south of Great Bend	July 14-19
K 4	at Gypsum	July 14
K 14	north of Ellsworth	July 11-17
K 18	west of Lincoln	July 11-17
U S 40	west of Salina	July 11
U S 50 N	in Marion	July 10-13
U S 77	north of Woodbine	July 10-16
U S 24, 40	east of Manhattan	June 22-July 20
U S 81	north of Salina	July 12-14
K 43	at Enterprise	June 22-July 20
U S 40	at Chapman	June 22-July 20
U S 40	at Solomon	July 11-20
K 9	at Waterville	July 11-14
K 9	at Monrovia	July 12-13
K 15 W	south of Washington	July 11-14
K 9	Clyde to Clifton	July 10-16
K 16	east of Holton	July 11
K 13	southwest of Frankfort	July 12
K 99	at Frankfort	July 11
K 115	at Palmer	July 10-14
U S 24	west of Simpson	July 12-16
U S 24	east and west of Topeka	July 11-20
U S 24	east of Hoxie	July 14

Table 3. --State and Federal highways closed by the July 1951 flood in Kansas--Continued

Highway Route	Location	Dates closed
U S 77	north of Junction City	July 12-16
K 18	east of Bennington	July 11-17
K 28	at Jamestown	July 11
K 29	east of Manhattan	July 11-23
K 9	west of Clyde	July 11-25
K 14	south of Lincoln	July 11-17
K 15, 9	south of Linn	July 11-14
K 15	south of Abilene	July 12-28
U S 24	at Perry	July 13-18
U S 40	at Fort Riley	July 11-18
U S 59	north of Lawrence	July 14-28
K 7	south of Bonner Springs	July 13-24
K 132	at Turner	July 12-28
U S 24	west of Glasco	July 11-16
K 14	Beloit - Lincoln	July 11-17
K 47	west of Altonna	July 11-16
K 42	at Isabel	July 11-28
K 68	east and west of US 169	July 10-16
K 16	at Randolph	July 10-17
K 35	east of La Cygne	July 13-20
K 13	at Barrett	July 12
K 13	south of Manhattan	July 11-17
U S 54	east of Uniontown	July 10
K 3	south of Uniongown	July 10-14
K 31	west of Fulton	July 10-14
K 31	west of Mapleton	July 10-16
K 65	north of Xenia	July 10-16
U S 40	Manhattan - Fort Riley	July 11-18
U S 50 S	at Strong City	July 11-14
K 57	east of Madison	July 11-16
K 99	north of Madison	July 10-14
U S 54	east of Iola	July 10-14
U S 59	north of Garnett	July 12-13
U S 75	at Altonna	July 12-14
U S 160	east of Independence	July 13
U S 166	east of Coffeyville	July 14
K 57	at LeRoy	July 12-20
K 4	15 miles southwest of Eskridge	July 10-12
K 31	west of Burlingame	July 10-12
U S 50 N	east of Burlingame	July 10-12

Table 3. --State and Federal highways closed by the July 1951 flood in Kansas--Continued.

Highway Route	Location	Dates closed
U S 75	north and south of Lyndon	July 10-12
U S 40	Abilene - Junction City	July 10
U S 50 N	at Council Grove	July 10-13
U S 50 S	at Ottawa	July 10-16
U S 50 N	near Miller	July 11-12
U S 50 S	south of Baldwin Junction	July 11-12
U S 50 S	east and west of Emporia	July 11-14
U S 50	southwest of Olathe	July 11
U S 75	at Wakarusa	July 11-12
K 70	Reading - Osage City	July 11-14
K 99	south of Wamego	July 11-28
K 99	north of Admire	July 11, 12
U S 36	south of Haddam	July 11
U S 36	south of Morrowville	July 11
U S 50 N	at Lost Springs	July 11-13
U S 81	south of Salina	July 12
U S 77	north of Florence	July 11-12, 14-16
K 9	east of Barnes	July 11-14
K 13	south of Cottonwood Falls	July 11-14
K 15	south of Durham	July 11-12
K 57	southeast of Junction City	July 11-14
K 18	Waldo - Luray	July 11-14
K 59	south of Ottawa	July 11-16
U S 169	south Paola	July 11
K 4	at Bushton	July 11-13
U S 75	in Topeka	July 12-19
U S 159	south of Monrovia	July 12-13
U S 59	south of Lawrence	July 12-14
U S 77	south of Marysville	July 12
K 32	east of Bonner Springs	July 12
K 10	east of Lawrence	July 12-16
K 92	McLowth - Leavenworth	July 12
K 192	at Winchester	July 12-13
U S 81	at Bennington	July 12-17
K 18	north of Bogue	July 12-14
U S 83	at Halford	July 12-13
U S 183	south of Stockton	July 12-14
U S 183	south of Plainville	July 12, 13
U S 75	north and south of Burlington	July 12-14
U S 169	north and south of Osawatomie	July 12-14

Table 3. --State and Federal highways closed by the July 1951 flood in Kansas--Continued.

Highway Route	Location	Dates closed
K 7	north of Harding	July 12-16
K 7	north of Mapleton	July 12-16
K 39	at Bendict	July 12
K 7	at Farlington	July 12-13
K 31	west of Garnett	July 12-13
K 99	south of Eureka	July 12-13
U S 183	south of Rozel	July 12
U S 283 D	south of Jetmore	July 12
K 10	at Paxico	July 13-14
K 10	west of Topeka	July 13-14
K 10	at DeSoto	July 13-14
K 16	at Denison	July 13-28
K 15	south of Clay Center	July 13-18
U S 383	southwest of Norton	July 13-14
U S 59	Iola - Chanute	July 13-28
U S 59	south of Erie	July 13-23
U S 69	at Trading Post	July 13-17
U S 169	south of Chanute	July 13-14, 17
K 57	at St. Paul	July 13-16
K 14, 96	south of Lyons	July 13-18
K 17	at Modora	July 13-14
K 89	north of Halstead	July 13-17
U S 50 S	at Halstead	July 13-16
K 4	at Marquette	July 14
U S 166	east of Chetopa	July 14, 16, 19, 20
K 96	east of Oswego	July 14-16
U S 50 S	Elmdale - Florence	July 16-19
U S 59	Oswego - Chetopa	July 16
K 68	north of Quenemo	July 16
K 33	east of Ottawa	July 16
K 42	east of Zenda	July 16
U S 77	at Oklahoma - Kansas line	July 16

highway. Added to the damage to highways during May-June 1951, the July damage severely tested the resources and equipment of the Kansas Highway Department. A comprehensive listing of highway closures (from all causes) is available for consultation at the Topeka office of the Kansas Highway Department.

The destruction of, or damage to, major bridges by the July flood made travel almost impossible during the flood period and immediately afterward. As an example of the destruction, the high-

way crossings over the Kansas River from Junction City and the mouth have been listed in table 4, which shows the location of bridges and how they were affected by the flood.

As shown in table 4 it was impossible for a few days during July 1951 to cross the Kansas River valley at any place except on the Intercity Viaduct as Kansas City. Transportation by means other than boat was made difficult or impossible. The Topeka Airport was under about 2 ft of water during the flood crest. Almost all railroad main lines in Kansas were affected by the flood: some were out of operation for weeks following; others could be used as soon as the floods had receded. Plate 2 shows the area submerged by the flood along the Kansas River from Junction City to the mouth. The submergence of important highways and railroads all along the valley is clearly shown by these maps furnished by the Corps of Engineers. Disruption of wire communications and power service was almost complete in much of the flooded area.

Much of the damage to farm lands and buildings in the flood plains resulted from the heavy silt load deposited in slack-water areas. At some places along the Kansas River after the flood one could observe large "drifts" on sand lying in proximity to a large scoured hole. Deposition of sediment in the urban areas was particularly troublesome; much of the cost of rehabilitation of houses and business places in the flood area came from silt removal. In North Topeka and other cities, many floors failed from the weight of as much as 3 ft of silt imposed on timbers weakened by wetting. Glass store-fronts were smashed in by the high velocity currents in many cities. The high local velocities around corners of buildings caused deep holes to scour; at Manhattan, such an occurrence caused sewer failure and partial destruction of many buildings. Debris, some of it large cottonwood trees carried by the flood, struck obstructions with great momentum--houses or buildings located where velocities were high were thus severely damaged or carried away.

Apart from the damage to farm lands caused by sediment and scour, agricultural losses in crops were high, as high velocity currents washed out many crops. According to information collected by the Corps of Engineers on flooding of farm lands, 892,000 acres were flooded in the Kansas River basin, 160,000 acres in the Osage River basin, and 973,000 acres in the Missouri Valley from Kansas City to the mouth. Plate 3 shows the extent of flooding in the Missouri Valley from Kansas City to the mouth, and plate 4 shows the extent of flooding in the Marais des Cygnes-Osage River basin.

Table 4. --Status of highway bridges across the Kansas River from Junction City to the mouth during and after July flood.

Location	Damage	Status after flood
Junction City, K 57	Washout at approach of overflow span	Open on July 14, 1951.
Fort Riley-Marshall Field	One span destroyed	Temporary pontoon bridge still in use March 1952.
Ogden	Bridge bypassed by channel cut-off	Remains closed as of March 1952.
5 miles upstream from Manhattan	Almost completely destroyed	No replacement as of March 1952.
Manhattan, K 13	None	Open for traffic.
St. George	Almost completely destroyed	No replacement as of March 1952.
Wamego, K 99	Overflow bridges destroyed	Detour around overflow bridges in use since July 28, 1951.
One mile above Belvue	Destroyed	No replacement as of March 1952.
Two bridges near St. Marys	Destroyed	No replacement as of March 1952.
Rossville to Maplehill	Partially destroyed	In service since September 1951.
Willard	Destroyed	No replacement as of March 1952.
Valencia	---do---	Do.
Brickyard, US 40 (Topeka)	---do---	No replacement as of March 1952 (plans under way for replacement).
Topeka Ave., U S 75 (Topeka)	Not damaged	In service as soon as silt could be plowed from approach highway (July 20).

Table 4. --Status of highway bridges across the Kansas River from Junction City to the mouth during and after July flood--Continued.

Location	Damage	Status after flood
Kansas Ave. (Topeka)	Upstream rail damaged	Open for traffic as soon as flood receded.
Sardon (Topeka)	Destroyed	No replacement as of March 1952.
Perry-Lecompton	One pier moved downstream during June flood, one span destroyed in July.	Do.
Lawrence, U S 59, 40	Flooded approach	Open as soon as flood receded.
Eudora	Damaged	In operation as of March 1952.
De Soto	---do----	Do.
Bonner Springs, K 7	Not damaged	Open after flood recession.
Turner (just above Kansas City, Kans.)	Partially destroyed	No replacement as of March 1952.
Argentine Blvd. (Kansas City, Kans.)	Damaged	Not open as of March 1952.
12 St. (Kansas City, Kans.)	Minor damage	Open after recession.
U S 69 (Kansas City, Kans.)	-----do-----	Do.
5 St. (Kansas City, Kans.)	-----do-----	Do.
James Ave. (Kansas City, Kans.)	No damage, flooded approach	Do.
Intercity Viaduct	Not closed during flood	---

FLOOD DAMAGES

The July 1951 floods in Kansas and Missouri caused record damages. Immediately following the floods of May-July, 1951, personnel of the Corps of Engineers began collecting data on flood damages. A summary of the detailed damage-survey data has been published by the Corps of Engineers in the Interim Report on Storms and Floods in the Kansas City District May-July 1951. Table 5, a copy of that summary tabulation, shows a basis for comparison of the total damages in the several subbasins. Additional detailed statistics on the number of buildings destroyed, people evacuated, and acres of farm land flooded, by major river basins, are available in the above mentioned Interim Report. Although the data in table 5 are for the period May-July, a large percentage of the total damages occurred during the July flood.

The following information on damages to state highway systems during the July flood was furnished by Clifford Shoemaker, division engineer, Bureau of Public Roads, Kansas City, Mo.:

In Kansas the state's highway loss in the flood was estimated at $22,429,000 based upon the total cost of reconstruction on state, county, and township roads and bridges. This cost is estimated to be broken down as follows:

State Highway system	$6,232,000
Federal Aid Secondary system	7,868,000
County and Township system	8,329,000
Total	$22,429,000

The report on the state highway system showed the loss of four major bridges, fourteen medium sized bridges and many small bridges, road fills, bridge berms, roadbeds and surfaces. Under the operating procedure of the Emergency Relief Program, Federal-Aid Highway projects were initiated and submitted on the State Highway System in the amount of $5,141,015. The federal share available is 50 percent of the cost or $2,570,507.50 and is matched by state funds in the same amount. All the work has not yet been placed under contract. As of December 31, 1951 work had been completed in the amount of $516,085 on the State Highway System.

On the Federal Aid Secondary System and local systems, roads and bridges in 75 of the 105 counties were affected by the abnormal rainfall and floods. On the Federal Aid Secondary System 48 bridges were lost and 163 bridges damaged. As of December 31, 1951 on the Federal Aid Secondary System and local roads there were 286 new bridges constructed and 421 miles of surfacing replaced, 1,257 culverts installed and 1,137

Table 5. --Summary of damages [Compiled by Corps of Engineers]

Stream basins	Estimated flood damages in dollars, May-July 1951								
	Urban			Rural			Total		
	Direct	Indirect	Total	Direct	Indirect	Total	Direct	Indirect	Total
Kansas River basin									
Main stem	278, 943, 000	200, 130, 000	479, 073, 000	46, 229, 000	4, 592, 000	50, 821, 000	325, 172, 000	204, 722, 000	529, 894, 000
Minor tributaries	170, 000	74, 000	244, 000	9, 149, 000	252, 000	9, 401, 000	9, 319, 000	326, 000	9, 645, 000
Smoky Hill River	6, 243, 000	886, 000	7, 129, 000	12, 269, 000	1, 552, 000	13, 821, 000	18, 512, 000	2, 438, 000	20, 950, 000
Saline River	417, 000	138, 000	555, 000	6, 323, 000	961, 000	7, 284, 000	6, 740, 000	1, 099, 000	7, 839, 000
Solomon River	1, 485, 000	258, 000	1, 743, 000	13, 852, 000	882, 000	14, 734, 000	15, 337, 000	1, 140, 000	16, 477, 000
Republican River	7, 000	-	7, 000	9, 898, 000	522, 000	10, 420, 000	9, 905, 000	522, 000	10, 427, 000
Big Blue River	674, 000	684, 000	1, 358, 000	14, 465, 000	1, 567, 000	16, 032, 000	15, 139, 000	2, 251, 000	17, 390, 000
(1)	-	-	-	-	-	-	-	112, 444, 000	112, 444, 000
Total Kansas River basin	287, 939, 000	202, 170, 000	490, 109, 000	112, 185, 000	10, 328, 000	122, 513, 000	400, 124, 000	324, 942, 000	725, 066, 000
Marais des Cygnes-Osage River basin									
Main stem	5, 264, 000	637, 000	5, 901, 000	12, 740, 000	2, 202, 000	14, 942, 000	18, 004, 000	2, 839, 000	20, 843, 000
Tributaries	52, 000	11, 000	63, 000	8, 221, 000	589, 000	8, 810, 000	8, 273, 000	600, 000	8, 873, 000
(1)	-	-	-	-	-	-	-	3, 046, 000	3, 046, 000
Total Osage River basin	5, 316, 000	648, 000	5, 964, 000	20, 961, 000	2, 791, 000	23, 752, 000	26, 277, 000	6, 485, 000	32, 762, 000
Missouri River basin (Rulo to mouth)									
Main stem (Rulo to Kansas City)	406, 000	130, 000	536, 000	2, 682, 000	278, 000	2, 960, 000	3, 088, 000	408, 000	3, 496, 000
Main stem (Kansas City to mouth)	1, 226, 000	568, 000	1, 794, 000	68, 843, 000	7, 120, 000	75, 963, 000	70, 069, 000	7, 688, 000	77, 757, 000
Tributaries (Rulo to mouth)	339, 000	166, 000	505, 000	22, 919, 000	1, 463, 000	6, 382, 000	23, 258, 000	1, 629, 000	24, 887, 000
(1)	-	-	-	-	-	-	-	6, 275, 000	6, 275, 000
Total Missouri River basin (Rulo to mouth)	1, 971, 000	864, 000	2, 835, 000	94, 444, 000	8, 861, 000	103, 305, 000	96, 415, 000	16, 000, 000	112, 415, 000
Grand Total Kansas City District	295, 226, 000	203, 682, 000	498, 908, 000	227, 590, 000	21, 980, 000	249, 570, 000	522, 816, 000	347, 427, 000	870, 243, 000

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Table 5. --Summary of damages [Compiled by Corps of Engineers]--Continued

Stream basins	Estimated flood damages in dollars, May-July 1951								
	Urban			Rural			Total		
	Direct	Indirect	Total	Direct	Indirect	Total	Direct	Indirect	Total
Arkansas River basin									
Arkansas River, Great Bend to Kansas-Oklahoma State line	-	-	-	-	-	-	927,000	66,000	993,000
Little Arkansas River	-	-	-	-	-	-	151,000	182,000	333,000
Walnut River	-	-	-	-	-	-	1,179,000	12,000	1,191,000
Cow Creek	-	-	-	-	-	-	204,000	0	204,000
Chikaskia River above Kansas-Oklahoma State line	-	-	-	-	-	-	7,000	0	7,000
Total Arkansas, main stem in Kans.	-	-	-	-	-	-	2,601,000	267,000	2,868,000
Verdigris River basin, Kansas									
Verdigris River above Kansas-Oklahoma State line	-	-	-	-	-	-	2,737,000	126,000	2,863,000
Fall River below Fall River Dam to mouth	-	-	-	-	-	-	25,000	0	25,000
Elk River	-	-	-	-	-	-	620,000	12,000	632,000
Caney Creek above Kansas-Oklahoma State line	-	-	-	-	-	-	181,000	1,000	182,000
Total Verdigris River basin	-	-	-	-	-	-	3,563,000	139,000	3,702,000
Neosho River basin, Kansas									
Neosho River above Kansas-Oklahoma State line	-	-	-	-	-	-	17,658,000	1,475,000	19,133,000
Cottonwood River	-	-	-	-	-	-	7,622,000	772,000	8,394,000
Labette, Lightning, and Flat Rock Creeks	-	-	-	-	-	-	173,000	1,000	174,000
Total Neosho River basin	-	-	-	-	-	-	25,453,000	2,248,000	27,701,000
Grand Total Arkansas basin in Kansas	-	-	-	-	-	-	31,617,000	2,654,000	34,271,000

(1) Includes cost of emergency aid and relief, together with loss of business income outside flooded areas.

bridges repaired together with 79 miles of fills and approaches replaced. For the work performed and remaining to be done $1,671,564 of federal funds have been committed.

A total of $4,165,650 of Federal Emergency Relief funds has been allocated to Kansas for the reconstruction of roadway and bridges destroyed by the floods on the Federal Aid Primary and Federal Aid Secondary Systems. This has to be matched by an equal amount of state or county funds.

In Missouri the replacement of roads and bridges in the Federal Aid Primary System in Missouri was estimated to be $300,000.

The State estimated that the damage done to roads and bridges on the Federal Aid Secondary System amounted to $200,000. One bridge was washed out, estimated to cost $65,000 to replace.

As of December 31, 1951 the total expenditures by the State were $314,541.27 of which $154,455.96 was spent on the Federal Aid Primary System, $97,880.98 was spent on the Federal Aid-Secondary System and $62,204.33 spent on the State Supplementary System.

On the Primary System there was a total of 26.7 miles of surface and shoulder repairs, 17.2 miles of cleaning and restoring ditches and the replacing of 0.5 miles of roadway, also removing of drift from around bridges, and the handling of traffic and detours.

On the Federal Aid Secondary System there was a total of 38.5 miles of surface and shoulder repairs; 42.5 miles of cleaning and restoring ditches and the replacing of 0.3 miles of roadway.

On the State Supplementary System there were surface and shoulder repairs on 43.3 miles of roadway, 59.0 miles of cleaning and restoring ditches and the replacing of 3.4 miles of roadway.

Of the amounts shown above on the Primary System $91,068,40 was spent in St. Louis County and $57.689.12 in Saline County.

The Emergency Relief program in Missouri contained 4 projects covering the repair or reconstruction of 8.24 miles of roadway and bridges at a total cost of $174,292 with federal emergency relief funds requested in the amount of $87,146 to be matched with an equal amount of State funds.

The cost of flood damage in Kansas and Missouri was not completely confined to the flood area; shippers in states far from Kansas lost merchandise, livestock, and machinery in the Kansas

City freight yards. All surface travel through Kansas and Missouri had to be rerouted through adjoining states for several days during and following the floods. At Kansas City, one of the largest rail terminals of the United States, normal rail traffic was disrupted for about a week; all the major railways in the United States were affected by the stoppage. The effects of the flood will be felt for a long time; because it has been difficult for a homeowner, whose house was flooded, to obtain a loan for rehabilitation, many of the damaged homes will be repaired very slowly. Many business places have not been reoccupied since the flood owing to either discouragement or poor business prospects.

The following information on flood damage appraisals and progress of rehabilitation at Kansas City, Kans., was abstracted from an article published in the Kansas City Star on Feb. 24, 1952.

Ellsworth Green, executive manager of the Kansas City, Kans., Chamber of Commerce, announced that recomputed figures on flood damage at Kansas City, Kans., are as follows:

Total loss $209,403,433, distributed among:

Manufacturing and processing	$78,203,415
Retail and service establishments	21,000,000
Utilities-gas, water, light & telephone	2,636,531
City streets, sewers, public buildings	6,500,000
Residential properties	26,534,000
Personal properties	22,846,200
Schools and churches	1,546,690
Railroads and miscellaneous	50,000,000
County roads and bridges	316,596

Of 656 retail and service businesses in the flood area, only 119 have applied for licenses to reopen, and only 111 are actually back in business. Of 4,725 homes that were damaged, only 1,595 have been reoccupied or are now being repaired. Of the 167 industries flooded, 8 have moved to other cities. Cudahy Packing Co. and six smaller packing plants have not reopened. Nine firms that have not begun business again or have moved from Kansas City, Kans., as a result of the 1951 flood, had a total annual payroll of nearly $10,000,000.

The foregoing shows the lasting effects of a great flood on a city. Immediate damage and loss of revenues are high but the depressing effect on business lasts a long time after the flood.

MEASUREMENT OF FLOOD DISCHARGES

Travel during and immediately following the period July 10-16 was nearly impossible in the flooded area and had it been possible to reach a gage, the structures from which current-meter measurements are normally made would have been, at time of flood crest, under water or bypassed by such wide, swift, overbank flows as to render impossible the measurement of discharge by usual procedures. Because of these difficulties, few current-meter measurements were made for definition of station-ratings. (The technique of "rating" a gaging station with current-meter measurements is fully described in Water-Supply Paper 888). In addition to the lack of current-meter measurements, many records of peak stage were missing because of submerged, destroyed, or otherwise inoperative recording gages or because it was impossible for observers to reach manual gages. Measurements of peak stages and discharges at inaccessible gaging stations or at important points on ungaged streams were made by indirect methods such as the slope-area and contracted-opening. Detailed information about these methods as applied by the Geological Survey is given in Water-Supply Papers 773-E, 796-G, 798, 799, 800, 816, 843, and 888.

Most of the slope-area reaches used for computation of peak discharge at gaging stations on main stem Kansas, Marais des Cygnes, and Neosho Rivers were greater in length and breadth than any surveyed previously by the Geological Survey. The overflow areas had such a variety of crops, natural cover, and topography that frequent subdivisions of cross sections were necessary to account for changes in Manning's "n" and depth of flow. Although the lengths and cross-sectional areas of many of the reaches surveyed for computation of peak discharges exceeded those previously surveyed by the Geological Survey, the compufed results are believed to be reliable. The results obtained at Bonner Springs on the Kansas River prove the reliability of the method: the peak discharge obtained by slope-area determination was 510,000 cfs; just 20 miles downstream at Kansas City, the peak discharge was measured with current meters and computed as 503,000 cfs.

The major difficulties met in the surveying work to obtain data for computations of peak discharge were:

a. Rains, subsequent to the flood and prior to survey, washed away many of the excellent floodmarks, making definition of the high-water profiles difficult.

b. Knowledge as to time of occurrence of changes in the main channel relative to the time of peak discharge was difficult to obtain.

These difficulties were met by:

a. Careful study and classification as to degree of reliability of available high-water marks. High-water profiles were drawn on the basis of the most reliable floodmarks (in almost every surveyed reach there were a few excellent floodmarks left on the inside or outside walls of buildings.)

b. Reaches in which channel changes had occurred were avoided. Where scour of channel during the flood peak and subsequent filling occurred, the maximum cross-section was recovered by prodding through the layers of fill.

The field notes and computations of peak discharges from indirect methods made by the Geological Survey are on file at the Geological Survey district office, 305 Federal Building, Topeka, Kans. Slope-area determinations of peak discharge on miscellaneous ungaged tributaries surveyed by Corps of Engineers personnel may be consulted at the District Office, Corps of Engineers, Kansas City, Mo.

STAGES AND DISCHARGES AT STREAM-GAGING STATIONS

At each regular stream-gaging station operated by the Geological Survey, the following basic data are systematically collected: Measurements of discharge, usually by current-meter but occasionally by indirect determination of extraordinary peak flows by auxiliary methods; records of stage, either by periodic direct readings on a nonrecording gage, or by a water-stage recorder which provides a continuous graph of stage; and general information useful in computing the daily flow from the records of discharge measurements and gage heights. Typical stream-gaging stations in the flood area in Kansas are usually located at a highway or railroad bridge from which discharge measurements are made. Rating tables showing the discharges for indicated stages are prepared from the results of discharge measurements. At a few river stations auxiliary devices are used in the determination of discharge, such as turbines, or discharge gates so calibrated as to indicate rates of discharge.

The data tabulated on the following pages for each stream-gaging station show a station description, a table showing the daily discharge throughout the three-month period May to July 1951, and a table showing the stage and discharge at selected intervals during each day of the period of major flood flow, generally July 8-25, in sufficient detail to permit reliable definition of the flood hydrograph. At some gaging stations sufficient definition of the hydrograph is furnished by a tabulation of daily discharges only.

The station description gives information on the type, location, and datum of the gage, the drainage area above the gage, and information about stages and discharges during the flood. Information about stages and discharges includes the following: The method used in determining the stage; the method used to define the rating curve applicable during the flood period; the maximum stage and discharge during the period May to July 1951; for the indicated period of station records, historical stages, when available; and remarks on miscellaneous items.

Daily discharges for the months May to July 1951 are tabulated below the station description. This period covers the floods throughout the area and gives adequate definition of antecedent conditions and of the recession. Runoff volumes are expressed in depth in inches over the drainage area and in acre-ft. Figure 20 shows hydrographs of mean daily discharge at 6 selected stream-gaging stations for the period May to July 1951. Figure 21 shows the flood characteristics of several smaller tributaries in the Kansas, Marais des Cygnes, and Neosho River basins during the period July 10-20.

A table following the tabulation of mean daily discharge gives the stages and discharges at selected times of day for each station. The interval for presentation of momentary stage and discharge information was selected so as to offer exact hydrograph definition without the inclusion of unnecessary data. Standard time is the basis throughout. Data for each station are listed from July 8 until the recession had proceeded to the point where sufficient definition is furnished by the table of mean daily discharges.

Automatic gage recordings are given if available. When they are not, graphs have been constructed on the basis of manual gage readings, high-water marks, and other pertinent evidence, and the indicated stages have been scaled from the graph. Departures from this general procedure are noted in the description under gage-height record.

Records are presented in the new downstream order to be used in the annual surface-water reports starting with 1951. Gaging stations on a stream are presented in downstream order from headwater to mouth, with stations on tributaries to the stream inserted in corresponding order, and in the order in which the tributaries enter the stream. The first record is that for the Mississippi River at Alton, Ill., followed by the most upstream station included in the report for the Missouri River: St. Joseph, Mo. The next station is on the tributary coming into the Missouri River below the St. Joseph gage, that of Platte River near Agency, Mo. The last station reported on in the Kansas-Missouri basin would then be for the Mississippi River main stem gaging station at Thebes, Ill. Only records for streams on which floods occurred and for those streams on the fringe of the flooded area are included.

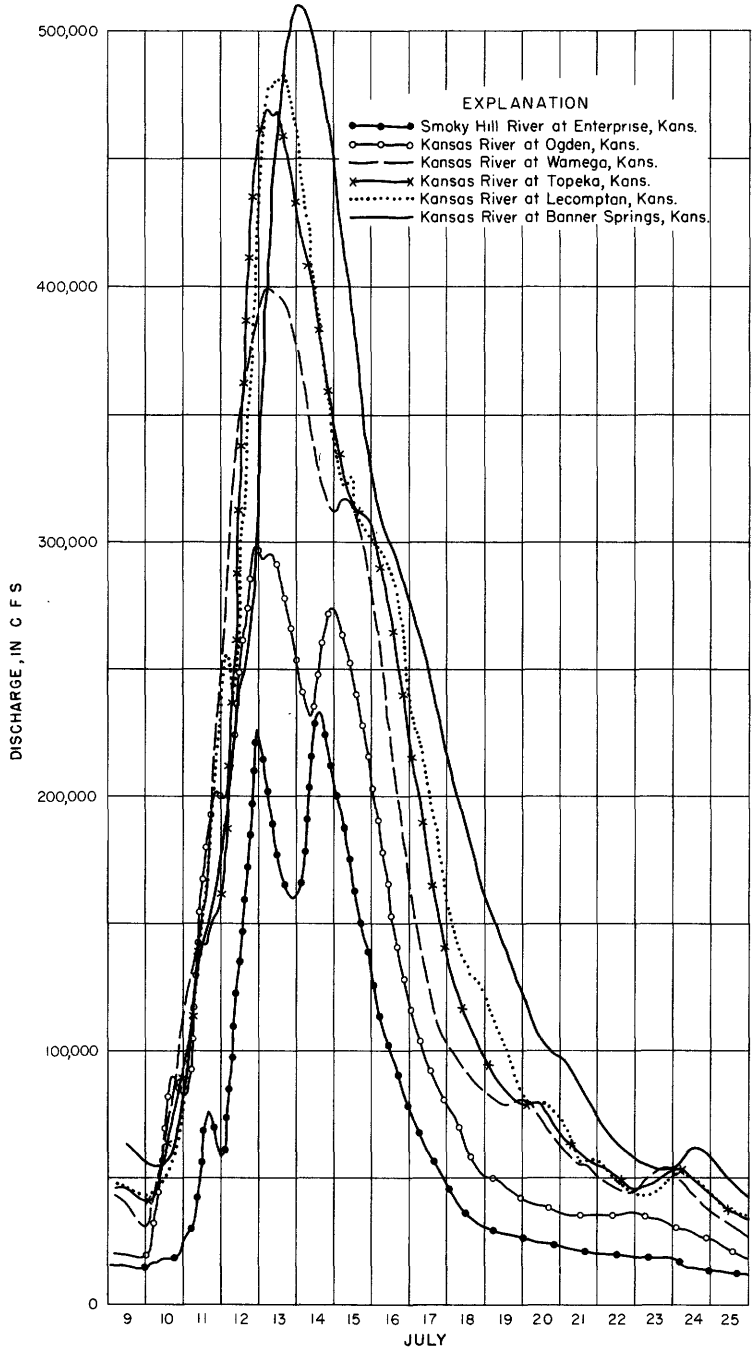

Figure 20. --Hydrographs of daily discharge at selected gaging stations in Kansas during May-July 1951.

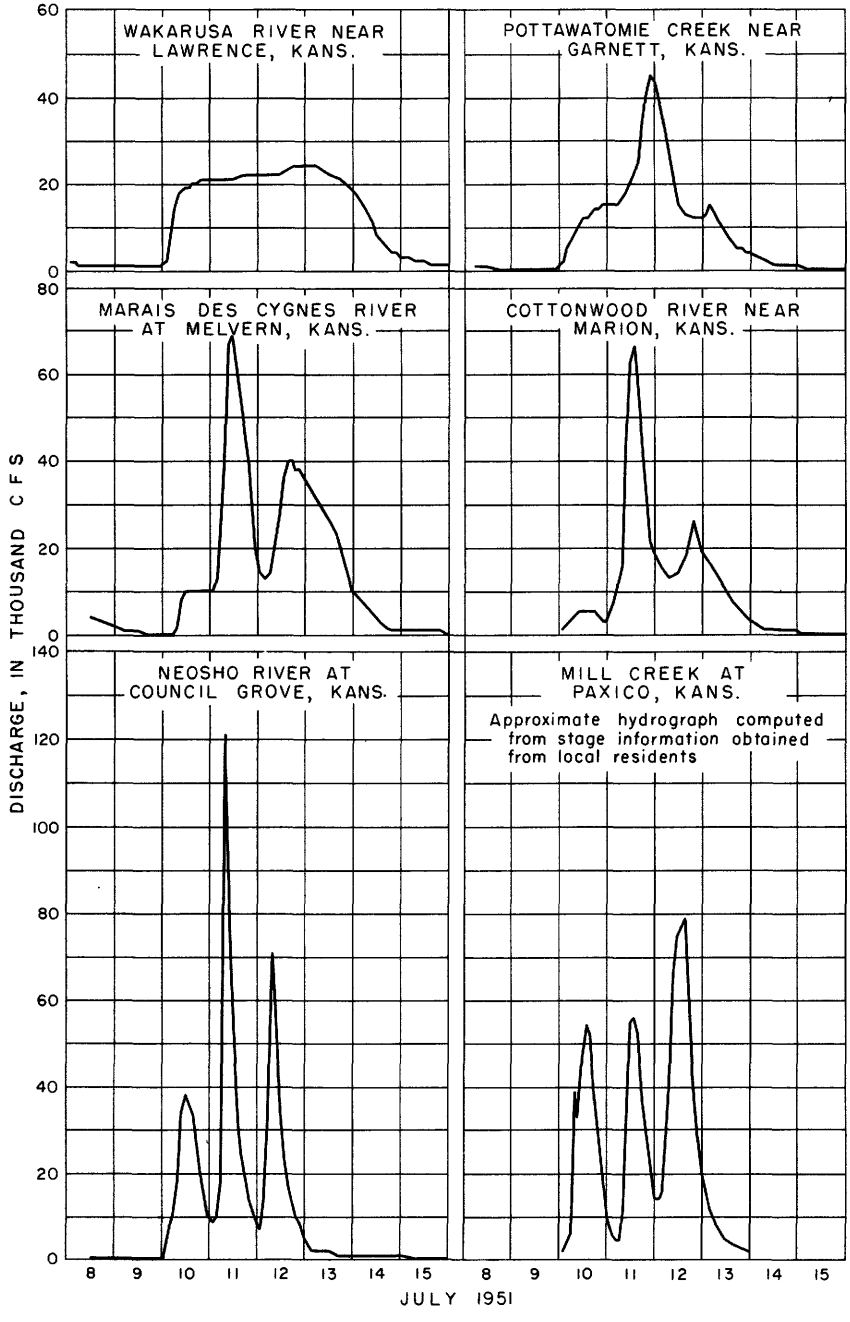

Figure 21. --Hydrographs of flood-flow on small tributaries in Kansas during July 1951.

Mississippi River main stem

Mississippi River at Alton, Ill.

Location. —Lat 38°53'06", long. 90°10'51", in sec. 14, T. 5 N., R. 10 W., tailwater gage for lock and dam No. 26, 7.7 miles upstream from Missouri River. Auxiliary gage, lat 38°49'43", long. 90°06'27", at Hartford, Ill., 5.9 miles downstream from Alton gage. Datum of gages is mean sea level, datum of 1929 (levels by Corps of Engineers).

Drainage area. —171,500 square miles, approximately.

Gage-height record. —Water-stage recorder graphs from base and auxiliary gages except for periods May 6-9, 12-17 at auxiliary gage for which graph was drawn based on twice-daily staff gage readings and comparison with record at base gage.

Discharge record. —Computed by unit-fall method. Stage-fall discharge relations defined by current-meter measurements. Shifting-control method used throughout.

Maxima. —May-July 1951: Discharge, 333,000 cfs 5 p.m. May 10; gage height, 429.47 ft 4-7 p.m. July 21.

1933-38, 1939 to April 1951: Discharge, 437,000 cfs May 24, 1943 (gage height, 429.91 ft). Flood of June 1844 reached a stage of 432.42 ft, present datum.

Remarks. —Flow partly regulated by many reservoirs and navigation dams on upper Mississippi River, and by diversion through Chicago Sanitary and Ship Canal from Lake Michigan into Illinois River.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	317,000	178,000	171,000	11	328,000	179,000	223,000	21	244,000	115,000	301,000
2	315,000	162,000	163,000	12	322,000	184,000	227,000	22	225,000	112,000	301,000
3	313,000	151,000	158,000	13	317,000	187,000	230,000	23	205,000	125,000	300,000
4	310,000	145,000	153,000	14	312,000	189,000	244,000	24	190,000	134,000	315,000
5	312,000	137,000	166,000	15	314,000	181,000	254,000	25	177,000	153,000	322,000
6	315,000	145,000	185,000	16	319,000	173,000	259,000	26	171,000	156,000	325,000
7	321,000	158,000	210,000	17	326,000	164,000	264,000	27	166,000	169,000	310,000
8	320,000	166,000	220,000	18	305,000	146,000	269,000	28	162,000	175,000	287,000
9	326,000	169,000	225,000	19	283,000	129,000	280,000	29	170,000	181,000	263,000
10	330,000	175,000	220,000	20	263,000	133,000	292,000	30	180,000	178,000	243,000
								31	182,000	-	217,000
Monthly mean discharge, in second-feet									269,000	158,200	245,100
Runoff, in thousand acre-feet									16,540	9,416	15,070
Runoff, in inches									1.80	1.03	1.65

Missouri River basin

Missouri River at St. Joseph, Mo.

Location.—Lat 39°45'10", long. 94°51' 28", in sec. 17, T. 57 N., R. 35 W., at St. Joseph and Grand Island Railroad bridge in St. Joseph. Datum of gage is 788.19 ft above mean sea level, datum of 1929.

Drainage area.—424,300 square miles.

Gage-height record.—Water-stage recorder graph.

Discharge record.—Stage-discharge relation defined by current-meter measurements. Shifting-control method used.

Maxima.—May-July 1951: Discharge, 198,000 cfs 6 a.m. May 3 (gage height, 19.9 ft).

1928 to April 1951: Discharge, 196,000 cfs June 4, 1929; maximum gage height, 21.35 ft Mar. 7, 1949 (ice jam).

1881 to 1927: Discharge known, about 370,000 cfs Apr. 29, 1881 (gage height, 27.2 ft), computed by Corps of Engineers.

Remarks.—Drainage basin above station contains many reservoirs with total usable capacity in excess of 27,175,000 acre-feet.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	147,000	73,800	103,000	11	80,200	97,300	98,100	21	69,400	148,000	60,800
2	181,000	138,000	91,400	12	70,500	101,000	101,000	22	74,400	149,000	65,600
3	189,000	161,000	104,000	13	63,000	97,300	85,600	23	75,600	138,000	71,400
4	129,000	177,000	138,000	14	61,000	88,200	74,600	24	70,500	108,000	68,500
5	96,000	143,000	128,000	15	63,600	88,800	69,900	25	66,700	90,000	60,800
6	84,400	109,000	142,000	16	72,200	111,000	68,100	26	81,400	101,000	57,000
7	75,600	123,000	159,000	17	77,900	86,300	68,000	27	77,900	113,000	56,600
8	70,000	131,000	124,000	18	67,200	74,400	77,900	28	64,600	120,000	56,100
9	65,700	116,000	90,300	19	71,600	94,000	84,600	29	61,500	121,000	56,600
10	73,300	98,000	77,400	20	75,600	108,000	64,600	30	58,000	114,000	55,200
								31	59,000	-	52,800
Monthly mean discharge, in second-feet									82,990	113,900	84,220
Runoff, in thousand acre-feet									5,103	6,780	5,179
Runoff, in inches									0.23	0.30	0.23

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge
	July 8		July 9		July 10		July 11		July 12		July 13	
2												
4												
6	17.96	138,000	15.00	94,500	13.74	79,200	13.86	81,200	15.86	108,000	14.21	86,400
8												
10												
N	16.86	120,000	14.68	90,300	13.55	77,100	15.29	99,400	15.36	101,000	14.24	86,800
2												
4												
6	16.00	108,000	14.28	85,300	13.36	74,900	16.50	117,000	14.88	94,500	14.06	84,500
8												
10												
12	15.46	100,000	14.00	81,900	13.34	74,600	16.38	115,000	14.49	89,400	13.69	80,100
	July 14		July 15		July 16		July 17		July 18		July 19	
2												
4												
6	13.36	76,700	12.79	70,700	12.55	68,400	12.53	68,600	12.11	64,600	14.42	92,000
8												
10												
N	13.13	74,100	12.68	69,500	12.52	68,100	12.62	69,600	12.86	72,700	13.91	85,500
2												
4												
6	12.94	71,900	12.66	69,300	12.48	67,700	12.43	67,600	14.57	93,400	13.26	77,800
8												
10												
12	12.86	71,000	12.64	69,100	12.43	67,100	12.24	65,600	14.77	96,100	12.59	70,200
	July 20		July 21		July 22		July 23		July 24		July 25	
2												
4												
6	12.21	66,500	11.68	61,400	11.46	59,500	12.72	73,300	12.41	70,300	11.62	62,300
8												
10												
N	11.95	63,800	11.63	60,900	11.49	59,800	12.33	69,000	12.31	69,200	11.42	60,300
2												
4												
6	11.78	62,000	11.55	60,100	12.76	73,300	12.26	68,200	12.14	67,400	11.30	59,100
8												
10												
12	11.76	61,800	11.51	59,700	13.36	80,200	12.37	69,400	11.86	64,400	11.23	58,400

Platte River near Agency, Mo.

Location. – Lat 39°41'20", long. 94°42'15", in NE¼NW¼ sec. 10, T. 56 N., R. 34 W., at bridge on U. S. Highway 169, 1½ miles downstream from Third Fork and 3½ miles northeast of Agency. Datum of gage is 807.38 ft above mean sea level, datum of 1929.

Drainage area. – 1,760 square miles.

Gage-height record. – Wire-weight gage read once daily below 7 ft and twice daily above. Graph drawn for days of changing stage.

Discharge record. – Stage-discharge relation defined by current-meter measurements.

Maxima. – May-July 1951: Discharge, 18,800 cfs 11:30 a.m. May 3 (gage height, 23.50 ft).
1924-30, 1932 to April 1951: Discharge, 50,000 cfs June 23, 1947 (gage height, 30.46 ft).

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	13,000	935	1,890	11	8,800	1,140	5,890	21	1,710	12,000	519
2	16,400	4,400	1,300	12	8,600	1,250	6,420	22	1,200	14,800	443
3	18,200	4,480	985	13	5,360	1,080	4,580	23	1,200	15,400	1,730
4	15,200	6,080	885	14	1,950	660	2,600	24	1,770	13,200	1,300
5	6,460	4,180	4,940	15	1,200	2,080	1,530	25	885	7,570	475
6	1,950	1,420	9,240	16	935	6,170	1,110	26	2,440	7,020	353
7	1,360	1,080	17,000	17	1,140	3,800	1,540	27	7,620	11,000	298
8	1,040	1,950	14,800	18	1,830	1,710	2,580	28	6,850	12,200	273
9	1,250	3,800	10,700	19	1,710	1,040	1,100	29	3,450	10,900	238
10	4,070	2,440	3,450	20	2,640	2,760	705	30	1,080	4,620	216
								31	840	-	205
Monthly mean discharge, in second-feet									4,580	5,370	3,203
Runoff, in acre-feet									281,900	319,700	196,900
Runoff, in inches									3.00	3.42	2.10

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge
	July 4		July 5		July 6		July 7		July 8		July 9	
2												
4			8.40	1,950	12.70	4,960						
6							22.75	17,000	22.08	15,600	20.20	12,400
8			12.10	4,480	14.00	6,000						
10												
N	6.50	885	15.10	6,940	16.20	7,880	22.95	17,500	21.68	14,800	19.20	11,000
2												
4			15.20	7,020	19.00	10,800						
6							22.75	17,000	21.28	14,100	17.70	9,320
8			14.40	6,340	21.90	15,200						
10												
12	6.50	885	12.70	4,960	22.45	16,200	22.52	16,400	20.88	13,400	15.10	6,940
	July 10		July 11		July 12		July 13		July 14		July 15	
2												
4			10.50	3,300								
6	11.80	4,250			14.32	6,260	13.10	5,280				
8			13.10	5,280								
10												
N	9.90	2,900	15.30	7,100	15.00	6,850	13.00	5,200	9.20	2,700	7.65	1,470
2												
4			15.70	7,440								
6	8.70	2,130			14.40	6,340	11.10	3,720				
8			15.76	7,530								
10												
12	8.70	2,130	15.50	7,280	12.90	5,120	10.20	3,090	8.30	1,890	7.15	1,250
	July 16		July 17		July 18		July 19		July 20		July 21	
2												
4												
6			6.70	985	10.50	3,300						
8												
10												
N	6.90	1,080	6.70	985	9.30	2,500	6.80	1,040	6.14	705	5.65	510
2												
4												
6			8.30	1,890	8.40	1,950						
8												
10												
12	6.75	1,040	10.90	3,580	7.70	1,530	6.30	795	5.84	582	5.48	475

Republican River near Orleans, Nebr.

Location.—Lat 40°07'50", long. 99°29'50", in NE¼NE¼ sec. 19, T. 2 N., R. 19 W., on right bank, 45 ft upstream from bridge on State Highway 89, 100 ft downstream from Chicago, Burlington & Quincy Railroad bridge, 2 miles west of Orleans, 2-3/4 miles upstream from Sappa Creek, and 23 miles upstream from Harlan County Dam. Datum of gage is 1,972.57 ft above mean sea level, datum of 1929.

Gage-height record.—Water-stage recorder graph except May 16, 21-31, June 9-11, 13-16, 21, 22, when graph was drawn on basis of outside gage readings. The graph also was estimated on parts of several other days, due to sluggish intake action, based on outside gage readings when available.

Discharge record.—Stage-discharge relation defined by current-meter measurements. Shifting-control method used.

Maxima.—May-July 1951: Discharge, 11,600 cfs 9:30 p.m. May 21 (gage height, 11.65 ft).
1947 to April 1951: Discharge, 40,600 cfs June 22, 1948 (gage height, 11.25 ft), from rating curve extended above 29,000 cfs.

Remarks.—Natural flow affected by irrigation development above station, and by storage in Bonny, Enders, and Medicine Creek Reservoirs.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	484	1,010	912	11	210	1,920	3,500	21	8,700	1,330	1,170
2	417	1,240	810	12	202	3,200	2,840	22	5,450	1,220	962
3	391	1,120	750	13	210	2,180	3,070	23	2,990	3,100	1,020
4	347	962	695	14	202	1,680	2,260	24	2,110	2,750	1,660
5	307	918	630	15	1,150	1,550	1,570	25	2,220	2,260	1,160
6	275	864	600	16	4,020	1,300	1,300	26	1,900	1,860	912
7	254	772	572	17	3,080	1,180	1,150	27	1,390	1,490	750
8	245	1,450	548	18	2,270	1,280	1,330	28	1,190	1,220	670
9	229	3,260	515	19	1,950	3,320	2,870	29	799	1,180	630
10	215	2,150	594	20	1,720	1,730	1,710	30	1,340	1,050	630
								31	1,090	-	446
Monthly mean discharge, in second-feet									1,528	1,685	1,233
Runoff, in acre-feet									93,930	100,300	75,840
Runoff, in inches									-	-	-

Sappa Creek near Oberlin, Kans.

Location.—Lat 39°50', long. 100°30', in NE¼ sec. 6, T. 3 S., R. 28 W., 150 ft upstream from bridge on U. S. Highway 36, 1 mile upstream from dam in Sappa-Oberlin State Park, 1½ miles east of Oberlin, and 7 miles downstream from confluence of North and South Forks. Datum of gage is 2,522.50 ft above mean sea level, datum of 1929.

Drainage area.—1,050 square miles.

Gage-height record.—Water-stage recorder graph except for periods July 10-14, 22, for which a graph was drawn based on once-daily wire-weight gage or float gage readings and recorded range in stage, and July 18-21, 23, for which a graph was estimated.

Discharge record.—Stage-discharge relation defined by current-meter measurements below 3,100 cfs and extended to 8,000 cfs by computation of flow over dam at gage height 15.04 ft, made by the Kansas State Board of Agriculture. Shifting-control method used May 1-18.

Maxima.—May-July 1951: Discharge, 6,010 cfs 12 p.m. July 12 (gage height, 14.6 ft).
1929-32, 1944 to April 1951: Discharge, 8,000 cfs July 16, 1944 (gage height, 15.04 ft), from rating curve extended above 3,100 cfs on basis of computation of peak flow over dam.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	2.1	11	122	11	2.0	107	158	21	264	37	70
2	2.0	10	64	12	2.0	492	3,380	22	291	610	54
3	2.1	10	50	13	2.1	344	4,560	23	432	1,060	50
4	2.1	10	40	14	2.0	226	2,140	24	288	1,080	48
5	2.1	10	36	15	3.6	194	1,340	25	135	1,120	47
6	2.1	10	53	16	2.5	191	593	26	47	586	155
7	2.1	10	29	17	3.6	157	196	27	28	224	99
8	2.0	10	25	18	6.9	64	145	28	20	140	61
9	2.1	14	23	19	17	38	115	29	16	93	47
10	2.1	14	42	20	15	31	90	30	14	106	39
								31	12	-	32
Monthly mean discharge, in second-feet									52.4	234	448
Runoff, in acre-feet									3,220	13,900	27,580
Runoff, in inches									0.06	0.25	0.49

Sappa Creek near Beaver City, Nebr.

Location. – Lat 40°02'15", long. 99°53'45", in SW¼SW¼ sec. 14, T. 1 N., R. 23 W., 200 ft downstream from bridge on U. S. Highway 283, and 7 miles southwest of Beaver City. Datum of gage is 2,154.63 ft above mean sea level, datum of 1929.

Drainage area. – 1,500 square miles.

Gage-height record. – Water-stage recorder graph except for periods July 11-14, 29-31, for which a graph was drawn based on three or more daily wire-weight gage readings.

Discharge record. – Stage-discharge relation defined by current-meter measurements. Shifting-control method used May 1-20.

Maxima. – May-July 1951: Discharge, 2,170 cfs 5 p.m. July 16 (gage height, 17.36 ft).
1937 to April 1951: Discharge, 5,500 cfs July 17, 1944 (gage height, 18.70 ft, site and datum then in use; about 21.3 ft, present site and datum).

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	9.8	36	160	11	7.4	88	168	21	240	95	252
2	8.4	26	130	12	7.8	74	603	22	32	449	220
3	7.8	23	135	13	7.6	46	640	23	46	514	203
4	8.4	18	139	14	7.8	168	792	24	286	569	212
5	8.8	17	103	15	12	379	1,670	25	289	544	161
6	9.2	22	86	16	11	268	2,000	26	370	608	148
7	8.8	18	76	17	14	231	1,690	27	288	674	139
8	9.2	482	70	18	11	189	1,310	28	167	733	138
9	8.0	176	74	19	10	187	596	29	102	461	190
10	7.4	86	62	20	53	148	311	30	64	224	156
								31	46	-	134
Monthly mean discharge, in second-feet									69.6	252	412
Runoff, in acre-feet									4,280	14,980	25,320
Runoff, in inches									0.05	0.19	0.32

Beaver Creek at Ludell, Kans.

Location. – Lat 39°51', long. 100°58', in SE¼ sec. 25, T. 2S., R. 33 W., on highway bridge just west of Ludell, and 6 miles downstream from Little Beaver Creek.

Drainage area. – 1,460 square miles.

Gage-height record. – Water-stage recorder graph, except for periods May 16, May 20 to June 2, 12, July 26-31, for which graph was drawn on basis of once or twice-daily staff gage readings. Record July 18-22 doubtful. No record July 23-25.

Discharge record. – Stage-discharge relation defined by current-meter measurements below 1,600 cfs and extended to peak stage on basis of logarithmic plotting.

Maxima. – May-July 1951: Discharge, 2,140 cfs 5 p.m. July 13 (maximum gage height, 14.15 ft 7:30 p.m. July 13).
1929-32, 1945 to April 1951: Maximum gage height, 15.0 ft Sept. 8, 1930, datum then in use, (discharge not determined).

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	8.8	17	72	11	7.6	82	159	21	288	122	156
2	7.8	16	62	12	7.6	503	1,170	22	231	449	114
3	7.8	15	57	13	7.6	1,520	2,000	23	90	1,580	90
4	8.0	14	52	14	8.0	925	1,320	24	65	1,500	900
5	7.8	14	49	15	11	484	706	25	59	1,010	1,000
6	7.8	15	48	16	201	269	359	26	48	462	347
7	7.3	16	43	17	154	154	214	27	37	242	182
8	7.6	13	39	18	48	94	145	28	30	143	104
9	7.8	13	36	19	66	226	208	29	25	98	72
10	7.6	14	34	20	82	238	120	30	22	80	57
								31	19	-	50
Monthly mean discharge, in second-feet									51.1	344	321
Runoff, in acre-feet									3,140	20,490	19,760
Runoff, in inches									0.04	0.26	0.25

Beaver Creek at Cedar Bluffs, Kans.

Location. —Lat 39°59', long. 100°35', in NE¼ sec. 10, T. 1 S., R. 29 W., 100 ft downstream from bridge on U. S. Highway 83, a quarter of a mile north of Cedar Bluffs, and 1¼ miles south of Kansas-Nebraska State line.
Drainage area. —1,710 square miles.
Gage-height record. —Water-stage recorder graph.
Discharge record. —Stage-discharge relation defined by current-meter measurements below 300 cfs and extended to peak stage. Shifting-control method used May 1-17, May 25 to June 13.
Maxima. —May-July 1951: Discharge, 990 cfs 5 a.m. July 14 (gage height, 17.89 ft).
1946 to April 1951: Discharge, 955 cfs Oct. 8, 1946 (gage height, 16.58 ft), from rating curve extended above 300 cfs.
Remarks. —Records unreliable for discharges in excess of 300 cfs.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	10	26	112	11	8.4	19	129	21	183	285	223
2	10	24	99	12	8.3	17	316	22	301	387	242
3	9.6	22	87	13	8.6	170	428	23	272	485	178
4	9.5	20	75	14	8.6	281	947	24	165	494	133
5	9.6	20	71	15	9.5	359	890	25	66	809	280
6	9.1	29	62	16	14	424	739	26	54	799	454
7	9.2	42	55	17	15	415	527	27	51	601	479
8	9.1	34	52	18	195	297	387	28	46	385	315
9	9.0	34	49	19	108	240	236	29	37	186	187
10	8.5	20	47	20	49	128	270	30	32	139	138
								31	29	-	111
Monthly mean discharge, in second-feet									56.6	240	268
Runoff, in acre-feet									3,480	14,260	16,500
Runoff, in inches									0.04	0.16	0.18

Beaver Creek near Beaver City, Nebr.

Location. —Lat 40°07'30", long. 99°53'45", in W½SW¼ sec. 23, T. 2 N., R. 23 W., at bridge on U. S. Highway 283, 3½ miles west of Beaver City. Datum of gage is 2,164.96 ft above mean sea level, datum of 1929.
Drainage area. —2,060 square miles.
Gage-height record. —Water-stage recorder graph except for periods May 21, June 8, 16-19, June 22 to July 16, for which graph was drawn based on one or more daily wire-weight gage readings.
Discharge record. —Stage-discharge relation defined by current-meter measurements. Shifting-control method used May 1-20, June 9-16.
Maxima. —May-July 1951: Discharge, 2,430 cfs 1 a.m. July 17 (gage height, 12.60 ft).
1937 to April 1951: Discharge, 3,800 cfs July 19, 1944 (gage height, 13.8 ft, from floodmark).

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	13	43	549	11	13	91	221	21	447	289	563
2	13	36	305	12	13	75	440	22	182	298	352
3	13	31	192	13	12	68	482	23	164	292	356
4	13	27	157	14	12	46	512	24	152	348	383
5	13	25	136	15	14	27	587	25	229	342	386
6	13	24	120	16	14	123	665	26	232	346	218
7	12	23	108	17	14	240	2,050	27	154	356	196
8	12	653	101	18	12	262	1,510	28	80	368	275
9	13	418	90	19	12	277	1,080	29	63	412	347
10	13	127	93	20	52	280	802	30	57	498	388
								31	50	-	300
Monthly mean discharge, in second-feet									67.9	215	450
Runoff, in acre-feet									4,180	12,780	27,700
Runoff, in inches									0.04	0.12	0.25

Sappa Creek near Stamford, Nebr.

Location. —Lat 40°08'00", long. 99°33'15", in NW¼NW¼ sec. 23, T. 2 N., R. 20 W., on left bank 40 ft south of Chicago, Burlington & Quincy Railroad track, 500 ft downstream from county highway bridge, 2 miles east of Stamford, 5½ miles upstream from mouth, and 8½ miles downstream from Beaver Creek. Datum of gage is 1,981.31 ft above mean sea level, datum of 1929.

Drainage area. —3,840 square miles, of which 3,560 square miles contribute directly to surface runoff.

Gage-height record. —Water-stage recorder graph except May 1, when there was no gage-height record, May 2, when one daily wire-weight gage reading was used, and May 3, 21, 22, July 12, 15, when graph was estimated for part of each day.

Discharge record. —Stage-discharge relation defined by current-meter measurements. Shifting-control method used May 2-19. Discharge interpolated on May 1.

Maxima. —May-July 1951: Discharge, 4,260 cfs 6 a.m. July 19 (gage height, 17.10 ft).
1945 to April 1951: Discharge, 7,430 cfs June 22, 1947 (gage height, 20.10 ft), from rating curve extended above 4,800 cfs.

Remarks. —Natural flow affected by irrigation development above station.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	31	103	616	11	26	232	302	21	557	359	1,330
2	31	98	622	12	25	222	895	22	818	381	1,130
3	29	72	440	13	25	156	1,280	23	244	854	723
4	26	62	273	14	24	135	1,290	24	180	849	593
5	25	57	261	15	25	122	1,160	25	255	858	603
6	25	56	219	16	25	347	1,370	26	384	856	552
7	25	52	191	17	26	348	1,780	27	478	895	355
8	27	467	172	18	31	351	3,010	28	369	948	520
9	26	1,190	159	19	37	363	3,800	29	246	1,010	425
10	26	811	149	20	65	355	2,430	30	169	890	464
								31	125	-	510
Monthly mean discharge, in second-feet									142	450	891
Runoff, in acre-feet									8,740	26,760	54,790
Runoff, in inches									0.04	0.13	0.27

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge
	July 8		July 9		July 10		July 11		July 12		July 13	
2							8.19	261	8.71	328		
4							8.28	272	9.36	424	12.81	1,160
6							8.18	260	11.03	727		
8							8.16	257	12.15	974	13.07	1,240
10							8.18	260	12.62	1,110		
N							8.40	287	12.61	1,100	13.30	1,310
2							8.67	323	12.48	1,060		
4							8.82	344	12.44	1,050	13.44	1,350
6							8.94	361	12.46	1,060		
8							8.98	366	12.51	1,070	13.52	1,380
10							8.98	366	12.60	1,100		
12							8.92	358	12.65	1,120	13.54	1,380
	July 14		July 15		July 16		July 17		July 18		July 19	
2							13.82	1,490	15.54	2,500	17.01	4,140
4	13.54	1,380	12.62	1,110	13.29	1,310	13.87	1,510	15.68	2,630	17.05	4,200
6							13.92	1,530	15.74	2,690	17.10	4,260
8	13.51	1,370	12.65	1,120	13.41	1,340	14.00	1,560	15.84	2,790	17.01	4,140
10							14.10	1,600	15.93	2,880	16.87	3,960
N	13.37	1,330	12.75	1,140	13.51	1,370	14.25	1,660	15.96	2,910	16.72	3,770
2							14.44	1,760	16.07	3,020	16.65	3,690
4	13.13	1,260	12.86	1,180	13.59	1,400	14.74	1,910	16.13	3,080	16.57	3,590
6							14.95	2,040	16.25	3,220	16.51	3,520
8	12.83	1,170	13.03	1,230	13.69	1,440	15.07	2,120	16.46	3,460	16.42	3,410
10							15.23	2,230	16.71	3,760	16.34	3,320
12	12.70	1,130	13.14	1,260	13.78	1,470	15.36	2,340	16.86	3,950	16.30	3,270
	July 20		July 21		July 22		July 23		July 24		July 25	
2	16.13	3,080										
4	16.04	2,990										
6	15.91	2,860										
8	15.80	2,750										
10	15.72	2,670										
N	15.51	2,470										
2	15.32	2,310										
4	15.10	2,140										
6	14.81	1,960										
8	14.52	1,800										
10	14.26	1,670										
12	14.04	1,580										

Prairie Dog Creek at Norton, Kans.

Location. – Lat 39°50', long. 99°53', on line between secs. 2 and 3, T. 3 S., R. 23 W., at bridge on U. S. Highway 283, half a mile south of Norton. Datum of gage is 2,217.91 ft above mean sea level, datum of 1929.

Drainage area. – 721 square miles.

Gage-height record. – Water-stage recorder graph except for periods May 22-31, June 5-8, 10-17, 20-22, July 17-31, for which graph was drawn based on once-daily, or more frequent, wire-weight gage readings, and June 18, 19, when there was no record.

Discharge record. – Stage-discharge relation defined by current-meter measurements. Shifting-control method used May 1-5, June 26 to July 10, July 16-31. Discharge for days of no gage-height record estimated on basis of trend of flow.

Maxima. – May-July 1951: Discharge, 14,400 cfs 8 p.m. July 12 (gage height, 23.65 ft in gage well, 24.20 ft from outside gage).

1944 to April 1951: Discharge, 8,080 cfs June 22, 1947 (gage height, 22.38 ft in gage well).

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	11	65	82	11	10	199	1,390	21	197	83	123
2	11	56	89	12	8.2	463	6,710	22	724	2,230	351
3	10	46	71	13	8.2	305	4,050	23	822	3,290	257
4	10	39	58	14	8.2	318	2,800	24	282	1,420	106
5	10	40	50	15	8.6	286	1,730	25	527	840	74
6	10	58	44	16	29	246	729	26	455	439	67
7	10	40	40	17	17	155	318	27	158	208	62
8	10	121	36	18	12	75	222	28	131	148	58
9	16	82	31	19	15	50	173	29	97	115	55
10	24	95	60	20	13	42	145	30	81	92	54
								31	74	-	54
Monthly mean discharge, in second-feet									123	388	648
Runoff, in acre-feet									7,540	23,100	39,850
Runoff, in inches									0.20	0.60	1.04

Prairie Dog Creek near Woodruff, Kans.

Location. – Lat 40°00'30", long. 99°20'50", in SE¼NE¼ sec. 33, T. 1 N., R. 18 W., at bridge on county road, 0.6 mile north of Kansas-Nebraska State line, 4½ miles northeast of Woodruff, 6 miles south of Alma, Nebr., and 12 miles upstream from mouth. Prior to May 8, 1951, at site 2-3/4 miles upstream at different datum.

Drainage area. – 1,050 square miles.

Gage-height record. – Water-stage recorder graph May 1-7, and graph based on wire-weight gage readings thereafter.

Discharge record. – Stage-discharge relation defined by current-meter measurements below 6,500 cfs and extended to peak stage. Shifting-control method used May 1-7, July 19-28.

Maxima. – May-July 1951: Discharge, 8,560 cfs 9:30 a.m. July 14 (gage height, 19.25 ft, from flood-marks).

1929-32, 1945 to April 1951: Maximum gage height, 21.04 ft June 23, 1947, site and datum then in use (discharge not determined).

Remarks. – Natural flow affected by irrigation development above station.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	14	62	166	11	12	477	1,060	21	873	103	253
2	14	66	140	12	11	770	2,570	22	926	480	850
3	13	48	132	13	22	206	4,650	23	582	1,310	890
4	13	42	137	14	27	350	7,830	24	789	1,750	499
5	11	38	122	15	21	287	4,450	25	459	2,120	286
6	11	40	111	16	25	283	2,800	26	292	1,310	204
7	10	131	102	17	27	243	1,610	27	592	548	166
8	11	1,060	93	18	21	186	568	28	287	247	1,460
9	11	1,660	89	19	20	154	415	29	208	307	274
10	12	392	87	20	68	108	327	30	158	276	340
								31	81	-	481
Monthly mean discharge, in second-feet									181	502	1,070
Runoff, in acre-feet									11,150	29,860	65,780
Runoff, in inches									0.20	0.53	1.17

Prairie Dog Creek near Woodruff, Kans.—Continued

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge
	July 8		July 9		July 10		July 11		July 12		July 13	
2							4.70	128	16.40	1,800	17.85	3,790
4							5.80	206	16.55	1,880	17.90	3,920
6							8.00	415	16.75	2,020	18.00	4,190
8							11.20	825	16.90	2,140	18.05	4,340
10							13.50	1,200	17.10	2,370	18.05	4,340
N							14.30	1,340	17.20	2,510	17.95	4,060
2							14.80	1,430	17.35	2,740	17.95	4,060
4							15.10	1,490	17.45	2,910	18.00	4,190
6							15.40	1,540	17.55	3,100	18.20	4,780
8							15.70	1,600	17.65	3,310	18.50	5,740
10							15.90	1,640	17.70	3,420	18.80	6,790
12							16.20	1,700	17.80	3,660	19.00	7,540
	July 14		July 15		July 16		July 17		July 18		July 19	
2	19.15	8,140	18.50	5,740	17.65	3,310	17.05	2,100	11.70	802		
4	19.25	8,560	18.40	5,410	17.60	3,200	17.00	2,020	11.10	718		
6	19.25	8,560	18.30	5,090	17.60	3,200	16.95	1,980	10.50	638		
8	19.25	8,560	18.20	4,780	17.55	3,100	16.90	1,920	10.00	572		
10	19.25	8,560	18.10	4,480	17.50	2,910	16.70	1,780	9.70	536		
N	19.20	8,350	18.00	4,190	17.45	2,820	16.50	1,670	9.50	512		
2	19.10	7,940	17.95	4,060	17.40	2,660	16.00	1,530	9.40	500		
4	19.00	7,540	17.90	3,920	17.35	2,580	15.30	1,400	9.25	482		
6	18.95	7,350	17.85	3,790	17.30	2,510	14.60	1,280	9.15	470		
8	18.85	6,980	17.80	3,660	17.20	2,310	13.80	1,140	9.05	459		
10	18.75	6,610	17.75	3,540	17.15	2,200	13.10	1,020	8.95	448		
12	18.60	6,080	17.70	3,420	17.10	2,140	12.40	910	8.90	442		
	July 20		July 21		July 22		July 23		July 24		July 25	
2					7.20	270	12.90	990	10.40	624		
4					9.00	454	13.00	1,010	10.20	598		
6					12.00	848	13.10	1,020	10.00	572		
8					13.70	1,120	13.00	1,010	9.80	548		
10					13.75	1,130	12.85	982	9.60	524		
N					13.20	1,040	12.50	926	9.40	500		
2					12.70	958	12.10	862	9.15	470		
4					12.60	942	11.80	818	8.90	442		
6					12.55	934	11.60	788	8.70	420		
8					12.60	942	11.30	746	8.55	404		
10					12.70	958	11.00	704	8.30	377		
12					12.80	974	10.70	664	8.10	357		

Turkey Creek at Naponee, Nebr.

Location.—Lat 40°04'30", long. 99°08'20", in SW¼SW¼ sec. 4, T. 1 N., R. 16 W., at bridge on State Highway 3 at Naponee, three-quarters of a mile upstream from mouth.

Drainage area.—160 square miles.

Gage-height record.—Wire-weight gage read twice daily. Gage heights computed from graphs based on gage readings May 16, 20-23, June 22, July 10-14.

Discharge record.—Stage-discharge relation defined by current-meter measurements below 1,200 cfs and extended to peak stage. Shifting-control method used.

Maxima.—May-July 1951: Discharge, 635 cfs 8 a.m. July 11 (gage height, 6.14 ft).
April 1948 to April 1951: Discharge, 1,920 cfs Sept. 20, 1950 (gage height, 9.50 ft, from gage reading at crest).

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	18	17	14	11	14	16	349	21	179	17	14
2	16	20	13	12	14	16	396	22	92	23	15
3	15	16	13	13	15	16	142	23	30	21	13
4	15	15	13	14	16	16	33	24	24	19	13
5	14	15	12	15	16	16	22	25	23	17	13
6	14	23	12	16	16	16	20	26	21	17	13
7	14	24	12	17	35	16	19	27	18	16	13
8	14	20	12	18	27	16	17	28	17	15	13
9	14	18	12	19	19	16	16	29	23	15	13
10	14	16	15	20	19	16	15	30	22	14	12
								31	18	-	11
Monthly mean discharge, in second-feet									26.0	17.3	41.9
Runoff, in acre-feet									1,600	1,030	2,580
Runoff, in inches									0.19	0.12	0.30

Republican River near Bloomington, Nebr.

Location. —Lat 40°04'00", long. 99°02'10" (revised), in NW¼SE¼ sec. 8, T. 1 N., R. 15 W., on right bank 600 ft downstream from county highway bridge, 2 miles south of Bloomington, 2½ miles downstream from Cottonwood Creek, and 13¼ miles downstream from Harlan County Dam. Datum of gage is 1,824.15 ft above mean sea level, datum of 1929.

Drainage area. —20,800 square miles, of which only 15,100 square miles contribute directly to surface runoff.

Gage-height record. —Water-stage recorder graph except period 7 a.m. June 20 to 8 a.m. June 29, when there was no gage-height record. The graph was estimated on parts of several other days.

Discharge record. —Stage-discharge relation defined by current-meter measurements. Shifting-control method used.

Maxima. —May-July 1951: Discharge, 11,500 cfs 9 a.m. May 22 (gage height, 7.14 ft).
1929 to April 1951: Discharge, 260,000 cfs June 1, 1935 (gage height, 20.4 ft, from floodmarks, site then in use), by slope-area method.

Remarks. —Natural flow affected by irrigation development above station, and by storage in Bonny, Enders, and Medicine Creek Reservoirs.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	738	1,330	2,080	11	290	2,670	4,090	21	7,670	3,500	3,590
2	582	1,510	1,770	12	278	3,360	8,660	22	10,000	2,500	2,640
3	496	1,360	1,660	13	278	3,190	7,110	23	5,090	4,000	2,120
4	452	1,190	1,390	14	318	2,320	7,570	24	3,780	4,500	2,520
5	405	1,050	1,220	15	318	1,980	6,570	25	3,440	4,000	2,700
6	367	1,240	1,140	16	3,980	1,830	5,520	26	3,660	3,700	2,240
7	336	1,280	1,050	17	4,920	1,750	4,960	27	2,410	3,500	1,880
8	314	1,360	978	18	2,500	1,560	3,720	28	2,110	2,800	1,850
9	310	4,290	922	19	2,000	3,390	5,540	29	1,740	2,550	2,560
10	302	3,880	908	20	2,000	2,970	5,070	30	1,560	2,520	1,840
								31	1,570	-	1,880
Monthly mean discharge, in second-feet									2,071	2,569	3,153
Runoff, in acre-feet									127,400	152,900	193,900
Runoff, in inches									0.11	0.14	0.17

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	July 8		July 9		July 10		July 11		July 12		July 13	
2							2.84	1,130	6.05	8,640		
4							2.97	1,320	6.12	8,810		
6							3.03	1,410	6.16	8,900	5.75	6,550
8							3.17	1,580	6.18	8,950		
10							3.50	2,000	6.18	8,950		
N							4.98	4,400	6.17	8,930	6.00	7,070
2							5.20	5,120	6.12	8,810		
4							5.40	5,860	6.05	8,640		
6							5.57	6,590	6.01	8,540	6.39	7,920
8							5.71	7,200	5.88	8,240		
10							5.85	7,830	5.82	8,100		
12							5.96	8,310	5.89	8,260	6.22	7,540
	July 14		July 15		July 16		July 17		July 18		July 19	
2									4.99	3,860	5.05	3,950
4									4.88	3,700	5.09	4,010
6	6.12	6,690	6.63	6,820	6.16	5,880	5.68	4,990	4.81	3,590	5.14	4,090
8									4.81	3,590	5.77	5,160
10									4.83	3,620	6.33	6,210
N	6.31	7,090	6.49	6,520	5.91	5,410	5.64	4,920	4.85	3,650	6.45	6,450
2									4.86	3,660	6.46	6,470
4									4.87	3,680	6.41	6,370
6	6.98	8,590	6.38	6,310	5.81	5,230	5.72	5,070	4.91	3,740	6.37	6,290
8									4.92	3,760	6.35	6,250
10									4.98	3,840	6.33	6,210
12	6.81	8,190	6.29	6,130	5.74	5,100	5.17	4,140	5.02	3,900	6.24	6,030
	July 20		July 21		July 22		July 23		July 24		July 25	
2	6.09	5,750	5.25	4,250	4.42	3,000						
4	6.00	5,580	5.20	4,170	4.40	2,980						
6	5.90	5,390	5.12	4,050	4.36	2,920						
8	5.79	5,190	5.01	3,880	4.36	2,920						
10	5.73	5,080	4.87	3,660	4.36	2,920						
N	5.68	4,990	4.77	3,520	4.37	2,940						
2	5.65	4,940	4.69	3,400	4.34	2,900						
4	5.59	4,840	4.60	3,280	4.31	2,860						
6	5.52	4,720	4.54	3,190	3.95	2,410						
8	5.47	4,630	4.47	3,090	3.51	1,930						
10	5.41	4,530	4.41	3,020	3.22	1,650						
12	5.34	4,410	4.36	2,950	3.17	1,600						

Center Creek at Franklin, Nebr.

Location.—Lat 40°05'30", long. 98°57'50", in SE¼SW¼ sec. 36, T. 2 N., R. 15 W., at bridge on State Highway 3 at Franklin, 1½ miles upstream from mouth. Datum of gage is 1,828.07 ft above mean sea level, datum of 1929.
Drainage area.—111 square miles.
Gage-height record.—Staff gages read twice daily. Gage heights for period July 11-17 obtained from graph based on gage readings.
Discharge record.—Stage-discharge relation defined by current-meter measurements below 420 cfs an and by slope-area determination at gage height 6.8 ft. Shifting-control method used.
Maxima.—May-July 1951: Discharge, 815 cfs 9 a.m. July 11 (gage height, 3.00 ft).
1948 to April 1951: Discharge, 3,150 cfs Sept. 20, 1950 (gage height, 6.8 ft, from floodmarks), by slope-area method.
Remarks.—Natural flow affected by irrigation development.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	7.8	6.4	3.4	11	7.5	8.3	475	21	12	3.1	7.1
2	7.3	6.2	3.2	12	7.5	6.0	376	22	8.0	3.5	7.1
3	7.3	5.8	3.2	13	7.5	5.4	224	23	4.1	3.2	5.8
4	7.3	5.8	3.4	14	7.8	5.4	108	24	4.2	3.2	5.4
5	7.5	6.7	3.4	15	7.8	4.1	58	25	4.4	3.2	4.7
6	6.4	8.0	3.4	16	9.9	3.2	23	26	4.4	3.2	4.4
7	6.4	7.8	3.4	17	13	2.8	14	27	4.7	3.5	4.2
8	7.1	6.7	3.4	18	13	2.9	8.0	28	5.2	3.5	4.1
9	7.5	7.3	3.5	19	12	2.8	7.1	29	5.2	3.5	4.0
10	7.3	7.3	3.6	20	12	3.0	7.1	30	5.2	3.4	4.0
								31	5.6	-	3.8
Monthly mean discharge, in second-feet									7.51	4.84	44.8
Runoff, in acre-feet									462	288	2,750
Runoff, in inches									0.08	0.05	0.47

Thompson Creek at Riverton, Nebr.

Location.—Lat 40°05'25", long. 98°45'45", in NW¼ sec. 2, T. 1 N., R. 13 W., on left bank, at bridge on State Highway 3 at west edge of Riverton, 200 ft upstream from Chicago, Burlington & Quincy Railroad bridge, and half a mile upstream from mouth. Datum of gage is 1,753.38 ft above mean sea level, datum of 1929.
Drainage area.—295 square miles.
Gage-height record.—Water-stage recorder graph. The graph was estimated during parts of several days.
Discharge record.—Stage-discharge relation defined by current-meter measurements below 2,000 cfs and by slope-area determination of peak discharge.
Maxima.—May-July 1951: Discharge, 2,530 cfs 8 a.m. July 11 (gage height, 6.83 ft).
1948 to April 1951: Discharge, 12,200 cfs July 9, 1950 (gage height, 11.90 ft), by slope-area method.
Remarks.—Natural flow affected by irrigation development above station.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	26	36	40	11	24	86	1,510	21	70	79	35
2	25	72	36	12	24	84	967	22	67	105	37
3	24	50	32	13	25	83	344	23	36	78	34
4	24	47	27	14	25	83	77	24	22	70	32
5	25	46	24	15	24	84	57	25	23	63	30
6	24	184	24	16	24	82	46	26	22	69	28
7	23	377	23	17	313	81	42	27	22	82	27
8	26	138	22	18	150	81	47	28	24	60	26
9	24	103	22	19	84	78	41	29	24	51	25
10	23	91	419	20	64	77	36	30	23	44	23
								31	23	-	22
Monthly mean discharge, in second-feet									43.8	88.8	134
Runoff, in acre-feet									2,690	5,280	8,240
Runoff, in inches									0.17	0.34	0.52

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge
	July 8		July 9		July 10		July 11		July 12		July 13	
2					3.16	22	5.91	1,480	4.32	580		
4					3.17	22	6.29	1,800	4.44	640	4.49	590
6					3.31	31	6.77	2,440	4.73	792		
8					3.68	55	6.83	2,530	5.00	940	4.28	415
10					4.93	530	6.68	2,350	5.37	1,160		
N					4.53	343	6.38	2,030	5.65	1,330	4.11	278
2					4.58	365	5.72	1,480	5.70	1,360		
4					5.18	731	5.12	1,040	5.61	1,310	3.89	153
6					5.13	705	4.72	786	5.35	1,150		
8					5.00	640	4.42	630	5.08	988	3.92	162
10					4.84	560	4.18	510	4.82	841		
12					6.08	1,590	3.98	415	4.71	780	3.90	156

Elm Creek at Amboy, Nebr.

Location.—Lat 40°05', long. 98°26', in SE¼SW¼ sec. 34, T. 2 N., R. 10 W., at bridge on State Highway 3, at east edge of Amboy, 200 ft east of Chicago, Burlington & Quincy Railroad track, 2½ miles upstream from mouth, and 4½ miles east of Red Cloud. Datum of gage is 1,666.33 ft above mean sea level, datum of 1929.

Drainage area.—54 square miles.

Gage-height record.—Wire-weight gage read daily most days. Gage heights computed from graphs based on gage readings May 21, 22, June 1-8, 22-26, July 10-14, 22, 23.

Discharge record.—Stage-discharge relation defined by current-meter measurements below 2,200 cfs and extended to peak stage. Shifting-control method used.

Maxima.—May-July 1951: Discharge, 1,950 cfs 1 a.m. July 11 (gage height, 7.00 ft).
1948 to April 1951: Discharge, 3,860 cfs Sept. 20, 1950 (gage height, 8.45 ft).

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	16	25	18	11	14	16	1,040	21	30	20	19
2	15	569	18	12	14	14	192	22	31	79	31
3	15	98	18	13	14	14	105	23	20	42	28
4	14	56	18	14	15	20	38	24	17	28	23
5	14	50	18	15	15	28	25	25	17	23	22
6	14	70	18	16	15	16	20	26	17	63	21
7	14	150	17	17	20	16	20	27	16	26	20
8	15	25	17	18	18	16	21	28	17	23	21
9	15	18	17	19	16	16	20	29	17	22	20
10	15	16	878	20	15	17	20	30	17	20	19
								31	17	-	19
Monthly mean discharge, in second-feet									16.7	53.2	89.7
Runoff, in acre-feet									1,030	3,170	5,520
Runoff, in inches									0.36	1.10	1.92

Republican River near Guide Rock, Nebr.

Location.—Lat 40°03'50", long. 98°22'40", in SE¼NE¼ sec. 7, T. 1 N., R. 9 W., 300 ft upstream from Willow Creek, a quarter of a mile downstream from Courtland diversion dam, and 2 miles southwest of Guide Rock. Datum of gage is 1,629.13 ft above mean sea level, datum of 1929.

Gage-height record.—Water-stage recorder graph.

Discharge record.—Stage-discharge relation defined by current-meter measurements below 14,000 cfs. Shifting-control method used.

Maxima.—May-July 1951: Discharge, 14,300 cfs 2 p.m. May 22 (gage height, 9.82 ft).
August 1950 to April 1951: Discharge, 10,300 cfs Sept. 20, 1950 (gage height, 8.47 ft).

Remarks.—Natural flow affected by irrigation development above station, and by storage in Bonny, Enders and Medicine Creek Reservoirs.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	1,100	2,510	2,670	11	395	4,460	12,000	21	4,880	2,460	5,510
2	842	8,540	2,240	12	372	3,260	12,100	22	12,600	3,730	5,130
3	669	2,360	1,990	13	351	4,890	8,310	23	5,880	2,600	3,110
4	588	1,890	1,800	14	390	3,330	7,900	24	3,940	5,550	2,840
5	549	1,660	1,510	15	404	3,220	8,750	25	3,730	5,150	3,210
6	506	2,240	1,380	16	706	2,380	6,640	26	3,550	5,080	2,980
7	461	7,140	1,260	17	3,680	2,050	6,000	27	3,400	4,600	2,650
8	428	2,480	1,100	18	3,080	1,840	5,490	28	2,600	4,280	2,210
9	413	3,670	1,010	19	2,130	1,580	4,850	29	2,250	2,960	2,350
10	413	6,430	3,930	20	1,800	3,440	7,330	30	1,770	2,800	2,960
								31	1,590	-	2,040
Monthly mean discharge, in second-feet									2,112	3,619	4,298
Runoff, in acre-feet									129,900	215,400	264,300
Runoff, in inches									--	-	-

Republican River near Guide Rock, Nebr.–Continued

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	July 8		July 9		July 10		July 11		July 12		July 13	
2					3.03	983	7.77	9,280	7.87	10,500	8.43	10,200
4					3.03	983	8.20	10,900	8.06	10,800	8.25	9,720
6					3.07	1,010	8.57	12,600	8.33	11,000	8.04	9,200
8					3.92	1,830	8.84	14,000	8.68	11,400	7.83	8,680
10					4.79	3,000	8.81	14,200	9.07	12,300	7.65	8,250
N					5.78	4,500	8.65	14,000	9.50	13,300	7.49	7,880
2					6.25	5,340	8.38	13,800	9.70	13,900	7.35	7,560
4					6.73	6,260	8.02	13,000	9.62	13,700	7.22	7,270
6					6.81	6,420	7.64	11,600	9.48	13,200	7.17	7,170
8					6.67	6,140	7.51	10,900	9.28	12,600	7.19	7,210
10					6.80	6,400	7.64	10,700	9.01	11,800	7.26	7,360
12					7.26	7,580	7.74	10,400	8.69	10,900	7.34	7,540
	July 14		July 15		July 16		July 17		July 18		July 19	
2											5.74	4,430
4			7.87	8,780							5.72	4,390
6	7.57	8,060			7.04	6,890	6.63	6,060	6.56	5,920	5.73	4,410
8			8.01	9,120							5.74	4,430
10											5.76	4,460
N	7.63	8,200	8.08	9,300	6.90	6,600	6.62	6,040	6.57	5,940	5.78	4,500
2											5.80	4,530
4			8.04	9,200							5.82	4,560
6	7.40	7,670			6.76	6,320	6.76	5,940	6.57	4,970	5.87	4,650
8			7.67	8,300							6.13	5,200
10											6.82	6,640
12	7.59	8,110	7.30	7,450	6.66	6,120	6.52	5,850	5.76	4,460	7.25	7,600
	July 20		July 21		July 22		July 23		July 24		July 25	
2												
4	7.44	8,080										
6			6.42	5,920								
8	7.38	7,950										
10												
N	7.19	7,520	6.23	5,560								
2												
4	6.94	6,980										
6			6.00	5,130								
8	6.73	6,540										
10												
12	6.57	6,220	5.72	4,630								

Republican River near Hardy, Nebr.

Location.–Lat 40°00', long. 97°56', in sec. 6, T. 1 S., R. 5 W., 1½ miles southwest of Hardy. Datum of gage is 1,501.46 ft above mean sea level, datum of 1929.

Drainage area.–22,400 square miles, of which 5,700 square miles are largely non-contributing.

Gage-height record.–Water-stage recorder graph except for periods May 1-16, 20, May 28 to June 1, June 4-6, 9, 16-20, June 28 to July 19, July 23-31, for which a graph was drawn based on twice-daily wire-weight gage readings.

Discharge record.–Stage-discharge relation defined by current-meter measurements. Shifting-control method used June 2 to July 31.

Maxima.–May-July 1951: Discharge, 18,600 cfs 11:45 a.m. June 2 (gage height, 12.59 ft). 1932 to April 1951: Discharge, 225,000 cfs June 2, 1935 (gage height, 19.4 ft), by slope-area method.

Remarks.–Some regulation at low flow by power plant 8 miles above. Many diversions above station for irrigation.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	1,080	1,480	3,210	11	457	5,600	16,300	21	3,150	4,460	5,760
2	1,310	13,300	2,940	12	420	3,770	14,600	22	12,000	5,900	5,460
3	820	4,330	2,570	13	396	4,150	11,400	23	7,370	5,300	4,560
4	670	2,020	2,440	14	432	4,750	6,180	24	3,840	4,970	2,640
5	576	1,570	2,350	15	478	4,170	7,880	25	2,970	6,640	3,100
6	541	1,940	2,110	16	499	3,210	6,810	26	2,810	6,000	3,210
7	506	12,300	2,070	17	2,260	2,730	5,120	27	2,910	6,360	3,770
8	464	4,200	1,880	18	4,090	2,460	5,140	28	2,000	4,220	3,940
9	414	2,300	1,780	19	2,760	2,270	4,080	29	2,070	3,580	2,370
10	464	6,220	6,240	20	2,110	3,050	6,010	30	1,560	3,180	2,730
								31	1,310	–	2,760
Monthly mean discharge, in second-feet									2,024	4,548	4,884
Runoff, in acre-feet									124,400	270,600	300,300
Runoff, in inches									0.10	0.23	0.25

White Rock Creek at Lovewell, Kans.

Location.—Lat 39°53', long. 97°59', in SW¼ sec. 15, T. 2 S., R. 6 W., on county bridge half a mile northwest of Lovewell, Kans.

Drainage area.—358 square miles.

Gage-height record.—Graph drawn on basis of wire-weight gage readings made generally three times daily, more frequently during high stages.

Discharge record.—Stage-discharge relation defined by current-meter measurements below 5,200 cfs and extended to peak stage on basis of logarithmic plotting and current-meter measurements made in 1950 about 7 miles upstream at State Highway 14 bridge. Shifting-control method used July 24, 25.

Maxima.—May-July 1951: Discharge, 9,800 cfs 7:30 p.m. June 7 (gage height, 20.6 ft).
1946 to April 1951: Discharge, 23,300 cfs July 10, 1950 (gage height, 22.8 ft, present site and datum).

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	538	94	116	11	44	261	2,410	21	452	1,270	146
2	287	1,500	109	12	43	234	5,040	22	441	1,810	202
3	106	2,060	97	13	41	355	4,220	23	438	1,580	340
4	73	693	87	14	44	382	1,510	24	176	715	434
5	60	158	80	15	60	333	320	25	105	220	142
6	54	152	79	16	52	170	224	26	77	182	98
7	49	5,310	76	17	76	118	176	27	62	159	125
8	47	5,380	72	18	170	111	172	28	54	139	1,070
9	47	1,390	66	19	147	96	179	29	89	123	330
10	45	461	574	20	91	94	186	30	179	122	148
								31	172	-	96
Monthly mean discharge, in second-feet									139	856	610
Runoff, in acre-feet									8,570	50,920	37,540
Runoff, in inches									0.45	2.67	1.97

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge
	July 8		July 9		July 10		July 11		July 12		July 13	
2					4.64	64	16.00	2,010	17.23	2,390		
4					4.64	64	16.59	2,150	17.29	2,420		
6					4.65	64	16.93	2,260	17.52	2,550	19.33	4,890
8					4.77	70	17.18	2,360	18.18	3,030		
10					5.50	118	17.35	2,450	18.90	3,780		
N	4.81	73	4.69	66	6.80	238	17.52	2,550	19.35	4,950	18.84	3,700
2					8.12	405	17.63	2,630	19.72	6,280		
4					9.75	667	17.68	2,670	20.00	7,400		
6					11.75	1,050	17.68	2,670	20.12	7,880	18.51	3,320
8					13.80	1,490	17.55	2,580	20.08	7,720		
10					14.65	1,690	17.40	2,480	20.00	7,400		
12	4.76	70	4.64	64	15.40	1,870	17.28	2,410	19.88	6,920	18.21	3,060
	July 14		July 15		July 16		July 17		July 18		July 19	
2	18.06	2,940										
4	17.80	2,750										
6	17.45	2,510	7.65	340			6.10	168			6.00	159
8	16.50	2,130										
10	14.00	1,530										
N	12.10	1,120	7.38	307	6.66	223	6.13	171	6.13	171	6.19	176
2	11.05	910										
4	10.25	757										
6	9.65	649	7.18	283			6.21	178			6.39	195
8	9.20	572										
10	8.75	500										
12	8.35	440	6.98	259	6.37	193	6.25	182	6.05	164	6.50	206
	July 20		July 21		July 22		July 23		July 24		July 25	
2							6.83	241	10.00	712		
4					5.68	132	6.64	220	9.55	631		
6	6.46	202					6.50	206	9.06	550	6.02	157
8					5.91	151	6.37	193	8.77	503		
10							6.33	189	8.69	490		
N	6.29	185	5.84	145	6.41	197	6.37	193	8.63	482	5.83	140
2							6.90	249	8.30	432		
4					6.87	246	7.70	347	7.20	285		
6	6.17	174					8.50	462	6.84	242	5.63	122
8					7.22	287	9.27	583	6.61	217		
10							9.90	694	6.46	201		
12	6.06	164	5.65	130	7.03	265	10.10	730	6.31	185	5.50	111

Republican River at Scandia, Kans.

Location.—Lat 39°48', long. 97°47', in NE¼ sec. 17, T. 3 S., R. 4 W., at bridge on U. S. Highway 36 at Scandia, 4 miles downstream from Dry Creek, and 4 miles upstream from School Creek. Datum of gage is 1,422.91 ft above mean sea level (1929 general adjustment, levels by Corps of Engineers).

Drainage area.—22,930 square miles, of which 5,700 square miles is largely non-contributing.

Gage-height record.—Graph drawn on basis of wire-weight gage readings made once daily at low stages, more frequently at high stages.

Discharge record.—Stage-discharge relation defined by current-meter measurements below 27,000 cfs and extended to peak stage on basis of shape of previous rating curve.

Maxima.—May-July 1951: Discharge, 38,100 cfs 8 a.m. July 11 (gage height, 11.60 ft).
1919-25, 1928-44, November 1950 to April 1951: Discharge, 215,000 cfs June 2, 1935 (gage height, 17.8 ft, from floodmarks).
Stage known prior to flood of June 2, 1935, 14.2 ft June 20, 1915.

Remarks.—Gage-height record collected in cooperation with U. S. Weather Bureau.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	2,100	2,110	3,300	11	599	6,920	27,400	21	3,600	5,800	6,760
2	1,910	14,000	3,160	12	564	4,560	20,600	22	11,200	7,120	6,000
3	1,250	7,980	2,700	13	501	4,100	19,600	23	9,110	8,180	4,640
4	886	4,420	2,400	14	494	6,200	11,900	24	5,500	5,340	3,250
5	795	2,520	2,260	15	550	3,750	10,500	25	4,230	8,020	3,090
6	711	3,080	1,970	16	585	3,780	8,850	26	3,970	6,440	3,160
7	683	13,500	1,800	17	648	2,870	6,680	27	3,280	7,480	3,270
8	648	10,400	1,630	18	3,720	2,500	6,040	28	3,970	5,180	4,700
9	641	7,040	1,470	19	3,270	2,380	5,360	29	2,840	4,180	3,460
10	536	6,520	2,390	20	2,400	2,340	6,700	30	2,700	3,460	2,710
								31	2,350	-	3,140
Monthly mean discharge, in second-feet									2,459	5,739	6,158
Runoff, in acre-feet									151,200	341,500	378,600
Runoff, in inches									0.12	0.28	0.31

Republican River at Concordia, Kans.

Location.—Lat 39°35'40", long. 97°38'55", in sec. 27, T. 5 S., R. 3 W., at bridge on U. S. Highway 81, half a mile north of Concordia and 7 miles downstream from Buffalo Creek. Datum of gage is 1,333.68 ft above mean sea level, adjustment of 1929.

Drainage area.—23,540 square miles, of which 5,700 square miles are largely non-contributing.

Gage-height record.—Water-stage recorder graph except for periods May 6, 8-12, 17, 18, 20, May 30 to June 1, June 5, 6, 17-20, June 30 to July 10, July 25-31, for which a graph was drawn based on once-daily wire-weight gage readings. No gage-height record May 29.

Discharge record.—Stage-discharge relation defined by current-meter measurements. Shifting-control method used July 8-31. Discharge for day of no gage-height record computed on basis of records for station at Clay Center.

Maxima.—May-July 1951: Discharge, 33,600 cfs 2 p.m. July 13 (gage height, 11.23 ft).
1946 to April 1951: Discharge, 75,000 cfs June 25, 1947 (gage height, 14.90 ft).

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	1,580	2,800	3,410	11	735	8,940	19,300	21	3,920	10,000	6,250
2	2,300	10,500	3,350	12	772	5,960	24,200	22	9,810	13,200	6,520
3	1,980	8,090	3,280	13	682	4,220	30,400	23	12,800	16,400	6,140
4	1,370	5,780	3,020	14	668	6,290	19,200	24	6,620	9,980	4,620
5	1,110	3,350	2,690	15	712	4,800	11,600	25	4,740	9,080	4,010
6	966	2,840	2,440	16	772	4,400	10,400	26	4,140	7,420	3,590
7	914	10,800	2,220	17	840	3,720	7,050	27	3,740	8,120	3,590
8	872	12,000	1,920	18	2,990	2,620	6,220	28	3,820	6,980	3,950
9	840	10,000	1,790	19	4,440	2,460	5,640	29	2,900	5,560	4,120
10	795	6,600	1,930	20	3,320	3,460	4,880	30	2,860	4,200	3,170
								31	2,660	-	3,200
Monthly mean discharge, in second-feet									2,796	7,019	6,906
Runoff, in acre-feet									171,900	417,700	424,700
Runoff, in inches									0.14	0.33	0.34

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge
	July 8		July 9		July 10		July 11		July 12		July 13	
2					3.74	1,760	5.85	4,500	9.65	17,900	10.67	28,000
4					3.74	1,760	8.50	11,100	9.75	18,800	10.77	29,000
6	3.92	1,970	3.78	1,800	3.73	1,750	9.65	17,900	9.97	21,000	10.87	30,000
8					3.73	1,750	10.25	23,800	10.20	23,300	10.98	31,100
10					3.73	1,750	10.52	26,500	10.70	28,300	11.07	32,000
N	3.87	1,910	3.76	1,780	3.73	1,750	10.47	26,000	10.90	30,300	11.20	33,300
2					3.73	1,750	10.33	24,600	10.72	28,500	11.23	33,600
4					3.73	1,750	10.27	24,000	10.46	25,900	11.15	32,800
6	3.83	1,860	3.75	1,770	3.80	1,830	10.16	22,900	10.34	24,700	10.97	31,000
8					4.00	2,080	10.00	21,300	10.31	24,400	10.80	29,300
10					4.40	2,600	9.75	18,800	10.42	25,500	10.70	28,300
12	3.80	1,830	3.74	1,760	5.10	3,500	9.65	17,900	10.55	26,800	10.55	26,800
	July 14		July 15		July 16		July 17		July 18		July 19	
2	10.35	24,800	9.28	15,200	8.75	12,200	7.40	7,850	6.50	6,200	6.30	5,900
4	10.25	23,800	9.15	14,400	8.85	12,800	7.27	7,610	6.53	6,260	6.30	5,900
6	10.12	22,500	8.93	13,200	8.85	12,800	7.20	7,420	6.58	6,380	6.30	5,900
8	9.95	20,800	8.71	12,000	8.74	12,200	7.13	7,380	6.62	6,480	6.30	5,900
10	9.80	19,300	8.44	10,900	8.56	11,300	7.06	7,200	6.61	6,450	6.27	5,840
N	9.68	18,100	8.25	10,100	8.36	10,500	6.95	7,050	6.56	6,320	6.21	5,820
2	9.55	17,100	8.12	9,780	8.12	9,780	6.87	6,850	6.49	6,180	6.10	5,700
4	9.42	16,100	8.06	9,540	7.89	9,120	6.80	6,800	6.43	6,160	5.97	5,540
6	9.40	16,000	8.10	9,700	7.73	8,560	6.72	6,600	6.41	6,120	5.84	5,380
8	9.35	15,600	8.23	10,000	7.68	8,300	6.65	6,420	6.38	6,060	5.72	5,240
10	9.35	15,600	8.40	10,700	7.53	8,090	6.57	6,350	6.34	5,980	5.58	5,060
12	9.33	15,500	8.58	11,400	7.43	7,940	6.54	6,280	6.32	5,940	5.47	4,940
	July 20		July 21		July 22		July 23		July 24		July 25	
2	5.40	4,900	6.65	6,420	5.98	5,560	6.40	6,100	5.82	5,340		
4	5.36	4,820	6.77	6,720	6.01	5,620	6.40	6,100	5.67	5,240	4.59	3,780
6	5.32	4,740	6.80	6,800	6.16	5,820	6.47	6,180	5.51	5,020		
8	5.30	4,700	6.78	6,750	6.57	6,350	6.52	6,240	5.41	4,920	4.50	3,650
10	5.30	4,700	6.73	6,620	6.91	6,950	6.53	6,260	5.30	4,700		
N	5.29	4,680	6.63	6,380	7.13	7,380	6.56	6,320	5.19	4,580	4.97	4,240
2	5.29	4,680	6.50	6,200	7.18	7,500	6.55	6,300	5.08	4,460		
4	5.30	4,700	6.38	6,060	7.15	7,420	6.52	6,240	4.98	4,260	4.94	4,180
6	5.34	4,780	6.24	5,880	7.00	7,050	6.45	6,160	4.88	4,160		
8	5.46	4,920	6.12	5,740	6.77	6,720	6.34	5,980	4.81	4,040	4.93	4,160
10	5.87	5,440	6.02	5,840	6.61	6,450	6.18	5,860	4.74	3,940		
12	6.37	6,040	5.97	5,540	6.47	6,240	5.99	5,580	4.69	3,900	4.93	4,160

Supplemental records.—July 11, 3 p.m., 10.38 ft, 25,100 cfs; July 11, 5 p.m., 10.10 ft, 22,300 cfs; July 13, 1 a.m., 10.52 ft, 26,500 cfs; July 18, 3 a.m., 6.49 ft, 6,180 cfs.

Republican River at Clay Center, Kans.

Location.—Lat 39°21', long. 97°08', in SW¼ sec. 17, T. 8 S., R. 3 E., at bridge on State Highway 15, 1 mile south of Clay Center, and 4 miles downstream from Five Creeks. Datum of gage is 1,159.32 ft above mean sea level, datum of 1929.

Drainage area.—24,570 square miles, of which 5,700 square miles are largely non-contributing.

Gage-height record.—Water-stage recorder graph except for periods June 19 to 12 m. June 20, July 2 to 2 a.m. July 10, July 22 to July 31, for which graph was drawn based on daily wire-weight gage readings.

Discharge record.—Stage-discharge relation defined by current-meter measurements.

Maxima.—May-July 1951: Discharge, 51,500 cfs 6 p.m. July 12 (gage height, 22.20 ft).
1917 to April 1951: Maximum stage, 25.74 ft June 3, 1935, from floodmarks.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	5,120	2,810	5,240	11	1,000	7,990	37,400	21	4,000	17,500	6,330
2	3,960	4,990	4,390	12	940	9,230	46,000	22	4,580	29,300	8,870
3	2,830	15,200	3,920	13	933	6,290	44,400	23	12,300	27,600	9,520
4	2,340	8,690	3,510	14	884	7,650	36,000	24	9,410	18,700	7,400
5	1,810	5,880	3,200	15	870	9,330	26,400	25	6,430	11,000	6,490
6	1,490	4,550	3,050	16	1,010	5,730	15,300	26	5,140	11,500	5,970
7	1,320	8,690	4,420	17	1,060	5,000	12,000	27	4,220	11,000	4,710
8	1,200	18,700	2,330	18	1,250	3,650	9,960	28	3,740	14,200	3,840
9	1,140	17,600	2,240	19	2,410	3,140	10,100	29	3,840	11,300	3,680
10	1,070	9,950	16,500	20	4,480	3,340	7,110	30	3,000	7,690	4,220
								31	3,110	-	3,340
Monthly mean discharge, in second-feet									3,125	10,610	11,540
Runoff, in acre-feet									192,200	631,100	709,800
Runoff, in inches									0.15	0.48	0.54

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	July 8		July 9		July 10		July 11		July 12		July 13	
2					11.42	4,000	19.93	29,500	21.17	40,400	22.01	49,100
4					12.37	5,530	20.31	32,500	21.22	40,900	21.93	48,200
6	10.15	2,360	9.90	2,100	13.47	7,590	20.50	34,200	21.17	40,400	21.82	47,000
8					14.86	10,600	20.74	36,400	21.33	42,000	21.90	47,900
10					16.55	14,800	21.07	39,400	21.50	43,700	21.81	46,900
N	10.05	2,260	9.91	2,110	17.73	18,300	21.25	41,200	21.77	46,500	21.64	45,100
2					18.55	21,500	21.18	40,500	21.97	48,700	21.51	43,800
4					18.95	23,400	21.17	40,400	22.10	50,200	21.31	41,800
6	9.98	2,180	10.01	2,210	19.15	24,400	21.12	39,900	22.20	51,500	21.18	40,500
8					19.29	25,200	21.22	40,900	22.17	51,100	21.08	39,500
10					19.58	27,100	21.14	40,100	22.13	50,600	20.98	38,500
12	9.92	2,120	10.65	2,950	19.74	28,200	21.18	40,500	22.16	51,000	20.90	37,800
	July 14		July 15		July 16		July 17		July 18		July 19	
2	20.83	37,200									15.48	12,100
4	20.78	36,700	20.18	31,400	17.25	16,800			14.38	9,410	15.40	11,900
6	20.73	36,300					16.02	13,400			15.29	11,600
8	20.68	35,800	19.86	29,000	16.67	15,100			14.28	9,210	15.10	11,200
10	20.67	35,700									14.86	10,600
N	20.68	35,800	19.46	26,300	16.41	14,400	15.37	11,800	14.32	9,290	14.62	9,950
2	20.69	35,900									14.38	9,410
4	20.73	36,300	18.98	23,500	16.36	14,300			14.60	9,900	14.18	9,010
6	20.63	35,400					14.95	10,800			14.05	8,750
8	20.62	35,300	18.48	21,200	16.41	14,400			15.08	11,100	13.94	8,530
10	20.57	34,800									13.85	8,350
12	20.56	34,700	17.94	19,100	16.34	14,200	14.58	9,850	15.40	11,900	13.78	8,210
	July 20		July 21		July 22		July 23		July 24		July 25	
2			12.62	5,970								
4			12.58	5,890	13.78	8,210	14.84	10,500				
6	13.56	7,770	12.56	5,860					13.48	7,610	12.98	6,610
8			12.54	5,820	13.85	8,350	14.78	10,400				
10			12.53	5,800								
N	13.21	7,070	12.53	5,800	13.74	8,130	14.44	9,530	13.36	7,370	12.90	6,470
2			12.59	5,910								
4			12.77	6,240	14.27	9,190	14.15	8,950				
6	12.90	6,470	13.07	6,790					13.23	7,110	12.83	6,340
8			13.32	7,290	14.73	10,200	13.90	8,450				
10			13.49	7,630								
12	12.66	6,040	13.62	7,890	14.82	10,400	13.74	8,130	13.10	6,850	12.78	6,250

Supplemental records.—July 11, 3 p.m., 21.25 ft, 41,200 cfs, 5 p.m., 21.07 ft, 39,400 cfs; July 12, 1 a.m., 21.22 ft, 40,900 cfs, 9 p.m., 22.06 ft, 49,700 cfs.

Republican River at Milford, Kans.

Location.—Lat. 39°10', long. 96°55', in SW¼ sec. 19, T. 10 S., R. 5 E., at bridge on State Highway 82 on southwest boundary of Milford city limits.
Drainage area.—24,900 square miles, of which 5,700 square miles is largely non-contributing.
Gage-height record.—Graph based on one or more daily wire-weight gage readings.
Discharge record.—Stage-discharge relation defined by current-meter measurements below 39,000 cfs and extended to peak stage on basis of velocity-area study. Shifting-control method used July 8 to 12 m. July 12.
Maxima.—May-July 1951: Discharge, 62,900 cfs 12 m. July 12 (gage height, 19.70 ft).
Nov. 1950 to April 1951: Continuous low flow.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	4,890	2,950	4,950	11	1,210	7,250	48,200	21	4,870	22,100	6,310
2	4,970	4,530	3,740	12	1,200	10,200	57,000	22	4,380	33,900	8,060
3	2,780	14,800	3,280	13	1,170	6,740	52,200	23	9,430	31,200	8,140
4	2,300	9,920	2,820	14	1,140	5,990	42,500	24	10,800	20,600	7,780
5	2,020	6,080	2,410	15	1,120	11,300	36,400	25	6,740	11,700	5,920
6	1,670	5,000	2,450	16	4,030	6,420	21,000	26	5,140	10,100	5,720
7	1,500	9,880	2,320	17	3,260	4,910	14,300	27	4,400	11,400	4,450
8	1,370	19,100	1,930	18	1,520	3,770	12,400	28	3,820	16,700	3,780
9	1,330	18,200	3,340	19	3,740	3,300	12,100	29	3,240	13,000	3,720
10	1,270	11,200	29,900	20	4,860	3,530	7,900	30	3,460	7,280	5,180
								31	2,900	-	4,480
Monthly mean discharge, in second-feet									3,436	11,440	13,700
Runoff, in acre-feet									211,300	680,400	842,300
Runoff, in inches									0.16	0.51	0.63

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	July 8		July 9		July 10		July 11		July 12		July 13	
2			6.80	1,800	12.75	14,600			18.62	50,700		
4			6.77	1,770	13.95	19,400	18.17	46,200	18.82	52,700		
6			6.75	1,750	14.93	23,600			19.07	55,900	18.70	54,100
8			6.74	1,740	15.80	28,000	18.40	48,500	19.40	59,200		
10			6.73	1,730	16.63	33,000			19.68	62,200		
N	6.92	1,920	6.74	1,740	16.75	33,700	18.51	49,800	19.70	62,900	18.55	52,900
2			6.95	1,960	16.60	32,800			19.55	61,400		
4			7.75	2,900	16.60	32,800	18.48	49,500	19.29	59,100		
6			8.62	4,180	16.80	34,300			19.03	56,800	18.25	50,500
8			9.55	5,860	17.25	38,200	18.38	48,700	18.91	55,800		
10			10.55	8,220	17.63	41,400			18.84	55,200		
12	6.81	1,810	11.60	11,000	17.85	43,200	18.49	49,600	18.79	54,800	17.85	47,400
	July 14		July 15		July 16		July 17		July 18		July 19	
2									10.50	11,000		
4	17.55	45,400	16.75	40,000	13.92	24,100			10.39	10,700		
6							11.95	15,800	10.30	10,400	11.21	13,100
8	17.26	43,300	16.65	39,400	13.45	21,800			10.30	10,400		
10									10.50	11,000		
N	17.02	41,600	16.42	38,000	13.09	20,400	11.55	14,200	10.92	12,300	10.90	12,200
2									11.32	13,500		
4	16.86	40,700	15.96	35,300	12.80	19,200			11.54	14,200		
6							11.10	12,800	11.60	14,400	10.52	11,100
8	16.80	40,300	15.35	31,600	12.54	18,200			11.57	14,300		
10									11.53	14,100		
12	16.79	40,200	14.65	27,800	12.30	17,200	10.62	11,400	11.46	13,900	10.10	9,850
	July 20		July 21		July 22		July 23		July 24		July 25	
2												
4			8.53	6,030							8.65	6,290
6	9.63	8,800			9.34	7,950	9.45	8,220	9.38	8,050		
8			8.48	5,930							8.42	5,800
10												
N	9.28	7,800	8.53	6,030	9.43	8,180	9.41	8,120	9.35	7,980	8.35	5,660
2												
4			8.66	6,310							8.36	5,680
6	8.92	6,910			9.48	8,300	9.37	8,020	9.20	7,600		
8			8.87	6,790							8.39	5,740
10												
12	8.65	6,290	9.08	7,300	9.48	8,300	9.39	8,080	8.90	6,860	8.42	5,800

Rose Creek near Wallace, Kans.

Location.—Lat. 38°53', long. 101°38', in NE¼ sec. 34, T. 13 S., R. 39 W., 1 mile upstream from mouth and 2½ miles southwest of Wallace.
Drainage area.—28.5 square miles.
Gage-height record.—Water-stage recorder graph.
Discharge record.—Stage-discharge relation subject to large and erratic shifts, not well defined by current-meter measurements.
Maxima.—May-July 1951: Discharge, 81 cfs 5 a.m. June 30 (gage height, 4.66 ft).
1946 to April 1951: Discharge, 3,870 cfs (revised) Aug. 31, 1949 (gage height, 11.00 ft), from rating curve extended above 150 cfs on basis of slope-area determination of peak flow.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	5	3	28	11	6	9	7	21	5	20	6
2	5	3	11	12	6	7	7	22	5	36	8
3	4	3	9	13	6	5	7	23	5	23	7
4	3	3	8	14	6	5	7	24	4	10	6
5	2	2	8	15	12	5	6	25	4	9	6
6	3	2	7	16	8	5	6	26	4	8	6
7	4	2	6	17	6	5	11	27	3	8	6
8	4	2	6	18	6	5	8	28	3	7	6
9	3	2	6	19	8	5	6	29	3	51	5
10	4	5	6	20	6	6	6	30	3	61	5
								31	3	-	5
Monthly mean discharge, in second-feet									4.8	10.6	7.5
Runoff, in acre-feet									296	629	460
Runoff, in inches									0.19	0.41	0.30

North Fork Smoky Hill River near McAllaster, Kans.

Location.—Lat 39°01', long. 101°22', in NW¼ sec. 18, T. 12 S., R. 36 W., at bridge on U. S. Highway 40, about 300 ft downstream from Union Pacific Railroad, and 1¼ miles northeast of McAllaster.
Drainage area.—670 square miles.
Gage-height record.—Water-stage recorder graph. Due to drawdown, stages in gage well will at times differ materially from stages in river.
Discharge record.—Stage-discharge relation defined by current-meter measurements below 500 cfs and contracted-opening determination of peak discharge. Shifting-control method used May 1-21.
Maxima.—May-July 1951: Discharge, 12,200 cfs at 12:30 a.m. June 6 (gage height, 10.95 ft in gage well, 11.8 ft outside of gage well, from floodmarks).
1946 to April 1951: Discharge, 4,110 cfs June 5, 1949 (gage height, 8.63 ft in gage well), from rating extended above 500 cfs.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	0.4	20	39	11	0.4	922	26	21	140	65	24
2	.6	19	31	12	.5	729	27	22	123	378	1,690
3	.6	18	26	13	.4	689	26	23	47	78	436
4	.6	17	24	14	.6	317	50	24	90	56	1,270
5	.7	349	22	15	36	136	32	25	122	423	294
6	.6	1,720	20	16	3.8	86	27	26	37	257	155
7	.9	48	20	17	2.0	88	22	27	31	161	104
8	1.0	24	18	18	2.1	256	18	28	26	84	72
9	.7	629	16	19	1.4	51	17	29	23	62	51
10	.5	1,070	17	20	.9	37	15	30	22	48	41
								31	20	-	34
Monthly mean discharge, in second-feet									23.7	295	150
Runoff, in acre-feet									1,460	17,530	9,250
Runoff, in inches									0.04	0.49	0.26

North Fork Smoky Hill River near McAllaster, Kans.—Continued

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	June 5		June 6		June 7		June 8		June 9		June 10	
2	3.75	16	9.70	7,000					5.85	455	8.30	3,300
4	3.77	17	8.50	3,700					5.46	281	7.90	2,570
6	3.78	17	7.10	1,450	4.33	58			5.32	236	7.20	1,570
8	3.78	17	6.30	730					5.20	205	6.54	916
10	3.78	17	5.82	440					4.98	157	6.05	570
N	3.78	17	5.47	284	4.17	43	3.88	22	4.80	124	5.70	380
2	3.78	17	5.23	212					4.63	96	5.47	284
4	3.78	17	5.04	169					4.50	78	5.30	230
6	3.77	17	4.90	142	4.06	34			4.40	66	5.15	194
8	3.76	16	4.77	119					6.10	600	5.00	161
10	3.75	16	4.66	101					8.20	3,110	5.35	245
12	10.00	8,000	4.57	88	4.00	30	3.90	23	8.75	4,260	6.25	695
	June 11		June 12		June 13		June 14		June 15		June 16	
2	7.10	1,450	6.45	840	6.90	1,240						
4	7.05	1,400	6.03	558	6.77	1,120	6.10	600				
6	6.75	1,100	6.38	786	6.60	970						
8	6.25	695	6.34	758	6.40	800	5.63	348				
10	5.91	486	6.26	702	6.23	681						
N	5.72	390	6.16	636	6.08	588	5.40	260	4.85	133	4.55	85
2	5.52	303	6.04	564	5.95	510						
4	5.34	242	5.93	498	5.85	455	5.25	218				
6	5.16	196	5.88	470	5.76	410						
8	5.75	405	6.00	540	5.68	371	5.14	191				
10	8.25	3,200	6.60	970	5.63	348						
12	7.30	1,690	6.82	1,170	5.72	390	5.07	176	4.68	104	4.44	71

Supplemental record.—June 6, 12:30 a.m., 10.95 ft, 12,200 cfs.

Ladder Creek below Chalk Creek near Scott City, Kans.

Location.—Lat 38°47', long. 100°52', in SW¼ sec. 34, T. 14 S., R. 32 W., at county road bridge, about 1¼ miles upstream from mouth, about 5 miles downstream from Chalk and Butte Creeks, and 23 miles northeast of Scott City.

Drainage area.—1,460 square miles.

Gage-height record.—Graph drawn on basis of once-daily wire-weight gage readings.

Discharge record.—Stage-discharge relation defined by current-meter measurements and contracted-opening determination above 900 cfs; not defined below 900 cfs.

Maxima.—May-July 1951: Discharge, 8,650 cfs 8:30 a.m. June 11 (gage height, 12.32 ft).
November 1950 to April 1951: Continuous low flow.
Maximum stage known, 16.1 ft 4 a.m. Aug. 6, 1933, caused by dam failure at Scott City.

Mean daily gage height, in feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	2.4	4.0	7.4	11	2.2	11.4	3.1	21	4.4	6.8	2.7
2	2.4	6.4	6.6	12	2.2	9.4	3.0	22	4.4	8.3	3.2
3	2.4	4.8	5.1	13	2.3	8.9	2.9	23	4.0	7.6	3.2
4	2.3	3.9	4.1	14	2.6	7.4	2.9	24	3.6	6.7	2.9
5	2.2	3.3	3.7	15	7.0	5.4	2.8	25	3.3	5.4	2.8
6	2.2	5.2	3.3	16	6.6	4.4	2.8	26	3.1	4.6	2.6
7	2.2	3.6	3.2	17	6.1	3.9	2.8	27	2.8	3.9	2.7
8	2.2	4.6	3.1	18	6.2	3.8	2.7	28	2.8	3.7	2.7
9	2.2	5.0	3.1	19	5.3	3.5	2.7	29	2.7	7.4	2.6
10	2.1	9.5	3.0	20	4.7	3.6	2.7	30	2.7	8.4	2.6
								31	2.6	-	2.5

Mean discharge, in second-feet, 1951

Date	Discharge
June 10	3,000
June 11	6,200
June 12	2,660
June 13	2,050
June 14	980

Smoky Hill River at Elkader, Kans.

Location.—Lat 38°48', long. 100°51', in sec. 34, T. 14 S., R. 32 W., at bridge on U. S. Highway 83 at Elkader, 0.1 mile downstream from Ladder Creek, and 24 miles north of Scott City. Datum of gage is 2,624.62 ft above mean sea level, datum of 1929.

Drainage area.—3,555 square miles.

Gage-height record.—Water-stage recorder graph except for periods May 1-13, 27-30, June 3-5, July 6-21, 29, for which graph was drawn based on once-daily wire-weight gage readings, and July 30-31, when no record was obtained.

Discharge record.—Stage-discharge relation defined by current-meter measurements below 16,000 cfs. Shifting-control method used June 6-10, July 25-29. Discharge for days of no gage-height record estimated on basis of estimated stage graph.

Maxima.—May-July 1951: Discharge, 19,700 cfs 5 a.m. June 11 (gage height, 8.79 ft).
1939 to April 1951: Discharge, 9,440 cfs Oct. 7, 1946 (gage height, 7.55 ft), from rating curve extended above 2,300 cfs.
Maximum stage known, 13.2 ft May 30, 1938, from floodmark.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	26	188	2,110	11	17	13,700	169	21	387	4,990	126
2	26	472	1,060	12	17	7,560	156	22	600	4,090	1,090
3	23	201	788	13	22	4,560	151	23	430	2,580	1,970
4	18	169	609	14	1,090	2,030	149	24	318	1,600	1,320
5	16	160	460	15	1,210	1,100	145	25	252	990	896
6	16	4,030	366	16	673	738	145	26	223	980	645
7	16	1,350	287	17	459	574	136	27	188	766	546
8	18	869	234	18	543	530	136	28	149	658	425
9	17	664	174	19	656	568	134	29	138	3,140	319
10	17	8,300	151	20	418	554	132	30	128	4,200	280
								31	118	-	270
Monthly mean discharge, in second-feet									265	2,410	503
Runoff, in acre-feet									16,320	143,400	30,900
Runoff, in inches									0.09	0.76	0.16

Hackberry Creek at Gove, Kans.
(Formerly published as near Gove, Kans.)

Location.—Lat 38°57', long. 100°29', in sec. 1, T. 13 S., R. 29 W., at bridge on State Highway 23, half a mile south of Gove. Datum of gage is 2,592.72 ft above mean sea level, datum of 1929.

Drainage area.—421 square miles.

Gage-height record.—Water-stage recorder graph except for periods May 1-12, June 3-5, 8, 9, 13-16, 23, 26, June 29 to July 10, July 13-22, 24, 25, for which graph was drawn based on once-daily wire-weight gage readings. No record obtained June 17-20, July 11, 12, 26-31.

Discharge record.—Stage-discharge relation defined by current-meter measurements below 5,200 cfs and by slope-area determination of peak discharge.

Maxima.—May-July 1951: Discharge, 18,200 cfs 2 a.m. June 7 (gage height, 19.0 ft).
1946 to April 1951: Discharge, 2,110 cfs May 20, 1949 (gage height, 10.27 ft).

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	1.9	15	95	11	1.4	3,640	800	21	84	887	84
2	1.9	13	87	12	2.6	2,130	260	22	62	2,760	153
3	1.7	4.8	86	13	18	735	81	23	601	1,300	991
4	1.4	2.7	78	14	255	236	62	24	123	337	344
5	1.3	4.4	57	15	882	174	66	25	52	137	174
6	.9	1,060	51	16	513	132	65	26	38	114	145
7	.9	6,300	50	17	122	110	66	27	60	757	135
8	2.4	808	42	18	85	350	76	28	29	519	135
9	5.2	589	40	19	1,180	155	81	29	22	170	130
10	1.7	1,110	40	20	187	95	80	30	17	110	130
								31	15	-	125
Monthly mean discharge, in second-feet									141	825	155
Runoff, in acre-feet									8,660	49,100	9,540
Runoff, in inches									0.39	2.19	0.42

Smoky Hill River near Ransom, Kans.

Location.—Lat 38°47', long. 99°54', in SW¼ sec. 33, T. 14 S., R. 23 W., at bridge on U. S. Highway 283, at headwaters of Cedar Bluff Reservoir, and 11 miles north of Ransom. Datum of gage is 2,139.5 ft above mean sea level (from stages in Cedar Bluff Reservoir).

Drainage area.—5,370 square miles.

Gage-height record.—Water-stage recorder graph until June 11; graph based on frequent wire-weight gage readings June 12-25; no record thereafter.

Discharge record.—Stage-discharge relation defined by current-meter measurements. Discharge June 22-25 from backwater study and four discharge measurements, June 26 to July 23 from records for river station near Ellis and for Cedar Bluff Reservoir near Ellis, and July 24-31 from records at station near Arnold, 7 miles upstream.

Maxima.—May-July 1951: Discharge, 23,800 cfs 9 p.m. June 11 (gage height, 12.57 ft). Gage height, 15.41 ft July 2, backwater from Cedar Bluff Reservoir.
1950 to April 1951: Discharge, 12,800 cfs July 31, 1950 (gage height, 10.15 ft).

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	41	579	3,800	11	57	13,700	1,300	21	1,230	9,370	600
2	37	2,710	2,300	12	44	14,200	1,000	22	4,720	10,400	2,100
3	41	789	1,300	13	42	8,500	900	23	1,440	8,300	1,200
4	36	503	1,100	14	53	5,040	800	24	1,050	3,800	2,020
5	34	318	1,000	15	614	3,080	500	25	919	2,800	2,340
6	33	4,810	900	16	1,480	2,050	400	26	478	1,400	1,040
7	31	7,140	700	17	1,290	1,430	300	27	340	1,800	612
8	29	6,620	600	18	988	1,230	250	28	295	2,900	482
9	270	2,340	500	19	1,480	1,020	212	29	262	3,300	404
10	95	3,470	380	20	1,350	936	210	30	226	5,400	345
								31	222	-	315
Monthly mean discharge, in second-feet									620	4,331	965
Runoff, in acre-feet									38,140	257,700	59,330
Runoff, in inches									0.13	0.90	0.21

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	June 5		June 6		June 7		June 8		June 9		June 10	
2			5.90	1,790	8.45	7,040	9.48	10,300			5.78	1,660
4			8.38	6,840	9.00	8,700	9.50	10,400			5.80	1,680
6	4.46	334	8.86	8,270	9.25	9,520	9.17	9,250	6.52	2,580	5.76	1,640
8			8.75	7,920	9.42	10,100	8.84	8,200			5.90	1,790
10			8.09	6,040	9.25	9,520	8.45	7,040			6.20	2,130
N	4.41	302	7.56	4,670	9.00	8,700	8.14	6,180	6.32	2,290	6.48	2,520
2			7.48	4,480	8.48	7,120					6.64	2,780
4			7.25	3,970	7.92	5,580	7.64	4,870			6.60	2,710
6	4.38	284	6.84	3,140	7.56	4,670			6.06	1,970	7.00	3,450
8			6.88	3,210	7.32	4,120	7.26	3,990			7.90	5,530
10	4.36	273	7.48	4,480	7.25	3,970					8.95	8,540
12	4.65	478	7.81	5,300	8.75	7,920	6.92	3,290	5.85	1,740	10.14	12,700
	June 11		June 12		June 13		June 14		June 15		June 16	
2	10.32	13,400			9.50	10,400						
4	9.90	11,800	11.32	17,700	9.52	10,500	7.81	5,720				
6	9.42	10,100			9.17	9,250			6.43	3,420		
8	9.25	9,520	10.73	15,100	8.69	7,880	7.55	5,200				
10	9.48	10,300			8.58	7,600						
N	9.44	10,200	10.30	13,300	8.69	7,880	7.50	5,100	6.14	3,020	5.39	2,030
2	9.58	10,700										
4	9.78	11,400	9.98	12,100	8.88	8,350	7.20	4,550				
6	10.65	14,700							5.92	2,710		
8	12.00	20,900	9.72	11,200	8.69	7,880	6.97	4,200				
10	12.45	23,200										
12	12.22	22,000	9.43	10,100	8.37	7,080	6.75	3,880	5.75	2,480	5.09	1,670
	June 20		June 21		June 22		June 23		June 24		June 25	
2			6.50	3,520	9.20	9,350						
4			7.65	5,400	10.25	13,100	10.59	9,100	12.00	4,700	12.55	2,400
6	4.40	920	8.40	7,150	10.30	13,300						
8			9.25	9,520	10.22	13,000	11.05	9,500	12.00	4,100	12.60	3,100
10			9.90	11,800	10.55	12,000						
N	4.47	990	9.86	11,700	10.24	11,000	11.20	9,800	12.17	3,600	12.72	3,000
2			9.75	11,300	10.09	10,000						
4			9.86	11,700	9.92	9,000	11.40	8,300	12.25	3,200		2,800
6	4.40	920	9.92	11,900	9.82	8,400						
8			9.86	11,700	9.80	8,000	11.57	6,200	12.38	2,900		2,500
10			9.70	11,100	9.90	8,000						
12	4.35	870	9.50	10,400	10.08	8,400	11.78	5,400	12.42	2,800		2,100

Supplemental record. - June 11, 9 p.m., 12.57 ft, 23,800 cfs.

Cedar Bluff Reservoir near Ellis, Kans.

Location.—Lat 38°47', long. 99°43', sec. 36, T. 14 S., R. 22 W., 18 miles southwest of Ellis.
Gage-height record.—Frequent staff-gage readings June 10 to July 31.
Maximum.—May-July 1951: Contents, 269,400 acre-feet 12:00 p.m. July 2 (elevation, 2,154.90 ft).
Remarks.—Reservoir is formed by earth-fill dam; dam completed in 1951. Capacity, 376,950 acre-feet at flood control pool, elevation 2,166 ft. Storage capacity of 191,860 acre-feet is provided for flood control. Elevations and contents furnished by Bureau of Reclamation.

Elevation, in feet, and contents, in acre-feet, at 12 p.m. of indicated day

Day	June		July	
	Elevation	Contents	Elevation	Contents
1			2,154.80	268,530
2			2,154.90	269,400
3			2,154.80	268,530
4			2,154.60	266,810
5			2,154.45	265,520
6			2,154.20	263,380
7			2,153.90	260,820
8			2,153.65	258,705
9			2,153.33	256,010
10	2,126.00	88,480	2,152.95	252,835
11	2,132.20	115,670	2,152.90	252,420
12	2,137.50	143,880	2,152.75	251,175
13	2,140.10	159,530	2,152.60	249,930
14	2,141.35	167,460	2,152.45	248,695
15	2,141.95	171,350	2,152.30	247,460
16	2,142.22	173,120	2,152.10	245,820
17	2,142.35	173,980	2,151.90	244,190
18	2,142.50	174,970	2,151.70	242,560
19	2,142.75	176,630	2,151.50	240,950
20	2,143.05	178,635	2,151.30	239,330
21	2,146.05	199,480	2,151.20	238,530
22	2,149.30	223,600	2,151.30	239,330
23	2,151.15	238,130	2,151.35	239,735
24	2,151.85	243,785	2,151.68	242,400
25	2,152.30	247,460	2,151.90	244,190
26	2,152.35	247,870	2,151.95	244,595
27	2,152.45	249,195	2,151.87	243,945
28	2,152.90	252,420	2,151.75	242,970
29	2,153.35	256,180	2,151.55	241,350
30	2,154.30	264,230	2,151.35	239,735
31	-	-	2,151.20	238,530

Smoky Hill River near Ellis, Kans.

Location.—Lat 38°46', long. 99°34', between secs. 4 and 5, T. 15 S., R. 20 W., at bridge 11½ miles south of Ellis.
Drainage area.—5,630 square miles.
Gage-height record.—Water-stage recorder graph.
Discharge record.—Stage-discharge relation defined by current-meter measurements. Shifting-control method used July 5-17.
Maxima.—May-July 1951: Discharge, 9,290 cfs 12 p.m. May 21 (gage height, 9.83 ft).
1941 to April 1951: Discharge, 9,860 cfs Oct. 5, 1946 (gage height, 10.45 ft).

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	37	794	1,810	11	89	1,010	1,540	21	922	1,140	904
2	36	1,310	1,920	12	86	763	1,500	22	2,740	2,210	1,220
3	35	651	1,920	13	74	630	1,430	23	737	855	960
4	35	625	1,880	14	89	684	1,370	24	678	1,050	975
5	35	628	1,840	15	87	646	1,310	25	651	1,180	1,050
6	33	2,950	1,800	16	311	635	1,170	26	610	1,220	1,120
7	32	1,420	1,740	17	474	620	1,100	27	590	1,360	1,130
8	30	838	1,690	18	494	541	1,040	28	586	1,340	1,090
9	45	752	1,630	19	499	283	990	29	576	1,490	1,070
10	68	841	1,580	20	504	87	939	30	563	1,620	1,040
								31	568	-	1,000
Monthly mean discharge, in second-feet									397	1,006	1,347
Runoff, in acre-feet									24,420	59,850	82,830
Runoff, in inches									0.08	0.20	0.28

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	June 5		June 6		June 7		June 8		June 9		June 10	
2			7.00	3,640	6.50	2,940						
4			8.87	7,050	5.82	2,080						
6	4.16	620	8.29	5,860	5.37	1,580					4.54	848
8			7.19	3,930	5.07	1,260						
10			6.08	2,400	4.92	1,130						
N	4.15	615	5.27	1,470	4.85	1,080	4.54	848	4.40	755	4.66	932
2			4.99	1,190	4.77	1,010						
4			4.80	1,040	4.69	953						
6	4.15	615	4.74	990	4.66	932					4.51	827
8			5.55	1,780	4.61	897						
10			7.13	3,840	4.59	883						
12	4.32	707	7.09	3,780	4.58	876	4.44	781	4.34	719	4.46	794
	June 11		June 12						June 18		June 19	
2												
4	4.82	1,050							4.16	620	3.63	385
6			4.49	814								
8	4.96	1,170							4.15	615	3.62	382
10												
N	4.82	1,050	4.46	794					4.15	615	3.61	378
2												
4	4.72	975							4.04	563	3.03	196
6			4.26	673								
8	4.67	939							3.51	342	2.71	122
10												
12	4.65	925	4.15	615					3.59	370	2.59	98
	June 20		June 21		June 22		June 23		June 24		June 25	
2			4.00	545	4.07	576						
4			5.04	1,870	6.39	2,800						
6			5.94	2,230	7.43	4,320	4.47	800				
8			5.88	2,160	7.94	5,190						
10			5.36	1,570	7.32	4,140						
N	2.48	79	4.81	1,040	6.21	2,560	4.50	820	4.82	1,050	4.99	1,190
2			4.47	800	5.46	1,680						
4			4.41	762	5.18	1,370						
6			4.43	774	4.96	1,170	4.59	883				
8			4.46	794	4.80	1,040						
10			4.37	737	4.70	960						
12	2.55	91	4.18	630	4.57	869	4.71	968	4.91	1,120	5.00	1,200

Big Creek near Hays, Kans.

Location.—Lat 38°51', long. 99°19', in SW¼ sec. 10, T. 14 S., R. 18 W., at highway bridge half a mile above concrete dam, 3 miles southeast of Hays, and 25 miles upstream from mouth.
Drainage area.—594 square miles.
Gage-height record.—Water-stage recorder graph except July 30, for which a graph was drawn based on one wire-weight gage reading, and July 31, when there was no gage-height record.
Discharge record.—Stage-discharge relation defined by current-meter measurements below 7,400 cfs and extended to peak stage on basis of logarithmic plotting of main-channel flow and slope-area determination of the overflow.
Maxima.—May-July 1951: Discharge, 19,900 cfs 4 a.m. May 22 (gage height, 21.46 ft).
1946 to April 1951: Discharge observed, 4,000 cfs Oct. 6, 1946 (gage height, 19.65 ft)

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	11	90	563	11	23	474	332	21	190	1,800	114
2	14	1,590	401	12	17	626	495	22	7,380	5,550	1,740
3	13	205	328	13	11	1,130	470	23	1,610	7,920	1,060
4	13	183	295	14	45	3,480	359	24	1,130	5,700	337
5	11	103	229	15	31	1,080	240	25	414	1,330	240
6	10	1,350	291	16	17	346	198	26	219	592	247
7	9.0	1,660	242	17	15	236	171	27	146	2,660	167
8	9.0	1,770	205	18	15	207	150	28	114	4,420	139
9	15	2,920	179	19	15	162	137	29	94	4,460	125
10	14	647	164	20	31	207	122	30	78	1,250	103
								31	69	-	85
Monthly mean discharge, in second-feet									380	1,805	320
Runoff, in acre-feet									23,370	107,400	19,690
Runoff, in inches									0.74	3.39	0.62

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 21		May 22		May 23		May 24		May 25		May 26	
2			14.20	2,060	16.65	2,960	10.40	1,120				
4	5.61	92	21.46	19,900	15.83	2,630	11.53	1,370				
6			21.06	15,800	14.90	2,300	12.25	1,540	7.38	476	6.38	258
8	6.47	277	20.53	11,400	13.93	1,980	12.38	1,570				
10			20.00	8,350	12.90	1,700	12.10	1,500				
N	6.40	262	19.65	6,600	11.80	1,430	11.53	1,370	7.02	398	6.25	229
2			19.40	5,620	10.60	1,160	10.72	1,190				
4	5.94	162	19.17	4,950	9.45	910	9.85	997				
6			18.90	4,420	8.66	744	9.05	826	6.75	339	5.92	158
8	5.65	101	18.50	3,990	8.36	681	8.55	720				
10			18.00	3,600	8.45	700	8.18	643				
12	7.00	394	17.38	3,270	9.30	878	7.93	590	6.54	293	5.97	169
	June 20		June 21		June 22		June 23		June 24		June 25	
2			7.50	501								
4			8.75	762	16.17	2,770	20.11	8,960				
6	6.07	190	9.55	931					19.88	7,730	12.40	1,580
8			10.60	1,160	18.00	3,600	19.95	8,090				
10			12.20	1,530								
N	6.00	175	13.75	1,930	19.42	5,690	19.80	7,330	19.46	5,840	10.70	1,180
2			14.83	2,280								
4			15.42	2,490	19.82	7,430	19.73	6,980				
6	6.24	227	15.90	2,660					18.15	3,700	9.65	953
8			16.30	2,820	19.93	7,990	19.83	7,480				
10			16.52	2,910								
12	6.65	317	16.50	2,900	20.08	8,790	20.05	8,620	15.25	2,430	8.73	758
	June 26		June 27		June 28		June 29		June 30		July 1	
2			7.58	517								
4			8.50	710								
6			10.00	1,030	18.15	3,700	19.47	5,870	12.10	1,500	8.02	609
8			12.20	1,530								
10			15.00	2,340								
N	7.82	567	17.20	3,180	18.08	3,660	19.02	4,620	10.60	1,160	7.71	544
2			18.15	3,700								
4			18.62	4,100								
6			18.80	4,290	19.30	5,300	17.20	3,180	9.47	914	7.48	497
8			18.76	4,250								
10			18.57	4,050								
12	7.39	478	18.34	3,850	19.55	6,180	14.38	2,120	8.67	748	7.30	459

Smoky Hill River near Russell, Kans.

Location.—Lat 38°47', long. 98°51', in NW¼ sec. 2, T. 15 S., R. 14 W., a quarter of a mile upstream from Landon Creek and 7.7 miles south of Russell. Datum of gage is 1,689.74 ft above mean sea level, datum of 1929.

Drainage area.—6,965 square miles.

Gage-height record.—Water-stage recorder graph, except for period 4 p.m. May 22 to 7 a.m. May 23, for which graph was drawn based on gage readings around peak.

Discharge record.—Stage-discharge relation defined by current-meter measurements.

Maxima.—May-July 1951: Discharge, 39,500 cfs 6:30 p.m. May 23 (gage height, 23.26 ft).
1939 to April 1951: Discharge, 22,300 cfs June 18, 1942 (gage height, 18.70 ft).
The flood of May 30, 1938 reached a stage of 30.3 ft (discharge not determined) from information by nearby resident.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	205	701	3,660	11	91	2,230	2,440	21	971	1,540	1,360
2	139	2,870	2,830	12	91	3,210	5,670	22	15,900	9,080	1,450
3	111	4,560	2,470	13	93	2,070	4,690	23	14,700	15,700	3,040
4	105	2,430	2,330	14	105	5,280	2,710	24	4,710	10,300	2,610
5	101	1,280	2,240	15	744	6,430	2,090	25	2,520	6,900	1,740
6	93	4,650	2,140	16	635	2,700	1,820	26	1,720	3,260	1,580
7	88	10,800	2,070	17	435	1,520	1,680	27	1,240	2,490	1,590
8	86	5,740	2,040	18	560	1,260	1,580	28	1,010	4,480	1,500
9	88	3,330	1,940	19	635	1,130	1,500	29	881	6,110	1,440
10	100	3,810	1,880	20	641	845	1,430	30	809	5,730	1,400
								31	743	-	1,730
Monthly mean discharge, in second-feet									1,624	4,415	2,215
Runoff, in acre-feet									99,870	262,700	136,200
Runoff, in inches									0.27	0.71	0.37

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	July 8		July 9		July 10		July 11		July 12		July 13	
2							6.43	1,840	10.94	5,230	12.11	6,350
4	6.93	2,080	6.68	1,960	6.57	1,900	6.44	1,840	10.94	5,230	11.74	5,980
6							6.45	1,840	10.66	4,970	11.23	5,490
8	6.93	2,080	6.66	1,950	6.56	1,900	6.47	1,860	10.56	4,880	10.71	5,020
10							6.50	1,870	10.90	5,190	10.27	4,630
N	6.86	2,050	6.66	1,950	6.54	1,890	6.70	1,970	11.21	5,470	9.96	4,370
2							7.08	2,160	11.54	5,780	9.72	4,160
4	6.77	2,000	6.63	1,940	6.43	1,840	7.36	2,330	11.69	5,930	9.55	4,020
6							7.81	2,630	12.04	6,280	9.41	3,900
8	6.73	1,980	6.59	1,920	6.46	1,850	8.87	3,460	12.41	6,650	9.23	3,750
10							9.76	4,200	12.42	6,660	9.10	3,640
12	6.69	1,960	6.58	1,910	6.44	1,840	10.50	4,830	12.28	6,520	8.93	3,500
	July 14		July 15		July 16		July 17		July 18		July 19	
2												
4	8.56	3,210	7.06	2,150	6.54	1,890	6.18	1,710	5.97	1,600		
6												
8	8.20	2,920	7.08	2,160	6.48	1,860	6.18	1,710	5.94	1,590	5.79	1,520
10												
N	7.83	2,640	7.04	2,140	6.42	1,830	6.14	1,690	5.93	1,590		
2												
4	7.51	2,420	6.90	2,070	6.34	1,790	6.09	1,660	5.91	1,580	5.73	1,480
6												
8	7.26	2,270	6.76	2,000	6.26	1,750	6.04	1,640	5.88	1,560		
10												
12	7.06	2,150	6.63	1,940	6.20	1,720	6.00	1,620	5.81	1,520	5.69	1,460
	July 20		July 21		July 22		July 23		July 24		July 25	
2							6.46	1,850	8.81	3,410		
4					5.49	1,360	6.93	2,080	8.56	3,210	6.49	1,860
6							7.44	2,380	8.31	3,010		
8					5.53	1,380	7.84	2,650	8.07	2,820	6.32	1,780
10							8.19	2,910	7.85	2,660		
N	5.65	1,440	5.48	1,360	5.58	1,410	8.58	3,220	7.67	2,530	6.19	1,720
2							8.97	3,540	7.45	2,380		
4					5.70	1,470	9.24	3,750	7.27	2,270	6.07	1,660
6							9.32	3,820	7.08	2,160		
8					5.90	1,570	9.37	3,860	6.93	2,080	5.99	1,620
10							9.24	3,750	6.81	2,020		
12	5.52	1,380	5.40	1,320	6.21	1,720	9.07	3,620	6.70	1,970	5.97	1,600

Supplemental records.—July 12, 3 a.m., 11.00 ft, 5,280 cfs; July 12, 9 p.m., 12.47 ft, 6,720 cfs.

Smoky Hill River at Ellsworth, Kans.

Location.—Lat 38°44', long. 98°14', in SE¼ sec. 20, T. 15 S., R. 8 W., at bridge on State Highway 14 in Ellsworth, 2 miles downstream from Turkey Creek.
Drainage area.—7,580 square miles.
Gage-height record.—Water-stage recorder graph.
Discharge record.—Stage-discharge relation defined by current-meter measurements.
Maxima.—May-July 1951: Discharge, 30,000 cfs 9:15 p.m. May 23 (gage height, 24.12 ft).
1895-1905, 1918-25, 1928 to April 1951: Discharge, 61,000 cfs June 1, 1938 (gage height, 27.2 ft).

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	666	996	5,720	11	390	3,780	7,400	21	3,010	9,930	1,540
2	410	4,450	3,870	12	206	2,860	11,600	22	4,740	6,980	1,490
3	285	4,740	3,380	13	154	3,400	11,100	23	15,600	11,800	1,780
4	194	4,500	2,950	14	152	3,610	5,330	24	18,100	19,200	3,480
5	154	2,270	2,680	15	595	7,470	3,110	25	4,440	12,500	2,460
6	138	4,820	2,540	16	1,180	6,030	2,500	26	2,800	7,060	1,820
7	124	18,300	2,400	17	1,390	2,630	2,090	27	1,900	4,180	1,690
8	115	13,500	2,330	18	924	1,790	1,870	28	1,480	4,190	1,660
9	165	5,930	2,240	19	762	1,520	1,740	29	1,260	7,230	1,540
10	833	3,980	2,130	20	728	1,320	1,630	30	1,140	7,320	1,480
								31	1,070	-	2,050
Monthly mean discharge, in second-feet									2,100	6,270	3,213
Runoff, in acre-feet									129,100	373,100	197,600
Runoff, in inches									0.32	0.92	0.49

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge
	July 8		July 9		July 10		July 11		July 12		July 13	
2							7.73	2,580	17.21	9,990		
4			7.12	2,270			8.30	2,910	17.01	9,810	18.94	12,400
6					6.94	2,180	9.77	3,830	16.76	9,580		
8			7.06	2,240			12.45	5,760	16.90	9,710	18.55	11,600
10							14.13	7,220	17.30	10,100		
N	7.25	2,340	6.99	2,200	6.82	2,120	15.13	8,120	18.00	10,700	18.17	10,900
2							16.52	9,370	18.78	12,100		
4			7.07	2,240			18.13	10,800	19.40	13,300	17.90	10,600
6					6.75	2,080	18.18	10,900	19.83	14,300		
8			7.07	2,240			17.85	10,600	19.80	14,200	17.38	10,100
10							17.67	10,400	19.70	14,000		
12	7.18	2,300	7.00	2,210	6.78	2,100	17.43	10,200	19.48	13,500	16.05	8,940
	July 14		July 15		July 16		July 17		July 18		July 19	
2												
4	13.76	6,880										
6			9.00	3,330	7.87	2,650	6.97	2,200	6.48	1,950		
8	12.00	5,400										
10												
N	11.22	4,820	8.46	3,010	7.55	2,480	6.77	2,100	6.39	1,900	6.06	1,740
2												
4	10.68	4,440										
6			8.17	2,830	7.31	2,360	6.65	2,040	6.27	1,840		
8	10.14	4,070										
10												
12	9.68	3,770	8.07	2,770	7.11	2,260	6.08	1,750	6.20	1,810	5.92	1,670
	July 20		July 21		July 22		July 23		July 24		July 25	
2	5.90	1,660					5.67	1,560	8.18	2,840		
4	5.88	1,660					5.72	1,580	8.64	3,110	8.19	2,840
6	5.86	1,650					5.75	1,600	9.11	3,400		
8	5.83	1,630					5.78	1,610	9.50	3,660	7.75	2,580
10	5.81	1,620					5.82	1,630	9.73	3,800		
N	5.78	1,610	5.62	1,540	5.48	1,480	5.87	1,650	9.85	3,880	7.37	2,400
2	5.85	1,640					5.95	1,690	9.87	3,900		
4	5.80	1,620					6.10	1,760	9.75	3,820	7.05	2,240
6	5.78	1,610					6.31	1,860	9.57	3,700		
8	5.77	1,610					6.65	2,040	9.28	3,510	6.82	2,120
10	5.75	1,600					7.16	2,290	9.00	3,330		
12	5.73	1,590	5.48	1,480	5.58	1,520	7.68	2,550	8.72	3,160	6.62	2,020

Supplemental records.—July 11, 5 p.m., 18.32 ft, 11,100 cfs; July 12, 7 p.m., 19.87 ft, 14,400 cfs; July 20, 1 p.m., 5.77 ft, 1,610 cfs.

Kanopolis Reservoir near Kanopolis, Kans.

Location.—Lat 38°37', long. 97°58', in NE¼ sec. 3, T. 17 S., R. 6 W., in shaft of control tower at dam on Smoky Hill River, 12 miles southeast of Kanopolis, 25 miles southwest of Salina, 207.8 miles above the mouth of the Smoky Hill River. Datum of gage is at mean sea level, adjustment of 1929.

Drainage area.—7,857 square miles.

Gage-height record.—Water-stage recorder graph.

Maxima.—May-July 1951: Contents, 434,000 acre-feet July 14 (elevation, 1,506.90 ft).
1948 to April 1951: Contents, 248,400 acre-feet Sept. 1, 2, 1950 (elevation, 1,491.03 ft).

Remarks.—Reservoir is formed by earth-fill dam; dam completed in 1948. Capacity, 450,000 acre-feet between elevation 1415 (sill of outlet gate) and 1508 ft. Crest of uncontrolled spillway is at elevation 1507 ft. Storage capacity of 397,000 acre-feet above elevation 1459 ft is provided for flood control. Storage capacity of 53,000 acre-feet below elevation 1459 ft is provided for conservation and recreation. Elevations and contents furnished by Corps of Engineers.

Elevation, in feet, and contents, in acre-feet, at 12 p.m. of indicated day

Day	May		June		July	
	Elevation	Contents	Elevation	Contents	Elevation	Contents
1	1,459.34	54,280	1,474.32	124,000	1,503.10	381,400
2	1,459.57	55,140	1,474.12	128,600	1,502.99	380,000
3	1,459.70	55,630	1,476.14	135,100	1,502.95	379,500
4	1,459.78	55,930	1,477.24	142,200	1,502.69	376,000
5	1,459.83	56,120	1,477.65	144,800	1,502.51	373,700
6	1,459.86	56,240	1,478.89	152,800	1,502.04	367,500
7	1,459.84	56,160	1,483.73	187,100	1,501.67	362,700
8	1,459.60	55,260	1,486.90	212,400	1,501.31	358,000
9	1,459.73	55,740	1,488.32	224,400	1,500.91	352,700
10	1,460.75	59,600	1,488.90	229,200	1,500.55	348,000
11	1,460.87	60,040	1,489.54	234,600	1,502.74	376,700
12	1,460.72	59,490	1,489.86	237,300	1,505.55	414,300
13	1,460.53	58,760	1,490.64	244,600	1,506.87	433,500
14	1,460.45	58,460	1,491.06	248,700	1,506.90	434,000
15	1,460.34	58,040	1,492.20	259,600	1,506.60	429,600
16	1,460.63	59,140	1,493.30	270,200	1,506.22	424,000
17	1,461.78	63,500	1,493.58	272,900	1,505.73	416,900
18	1,462.15	64,910	1,493.50	272,100	1,505.18	408,900
19	1,462.27	65,370	1,493.07	268,000	1,504.92	405,200
20	1,462.35	65,670	1,492.58	263,300	1,504.65	401,700
21	1,463.40	69,770	1,494.25	279,300	1,504.59	400,900
22	1,465.50	78,720	1,495.84	295,600	1,504.54	400,300
23	1,470.05	100,100	1,497.45	313,100	1,504.53	400,100
24	1,475.50	131,000	1,499.75	338,100	1,504.70	402,400
25	1,476.95	140,300	1,501.37	358,800	1,504.86	404,500
26	1,477.01	140,700	1,501.90	365,700	1,504.77	403,300
27	1,476.85	139,700	1,501.86	365,200	1,504.57	400,700
28	1,476.40	136,800	1,501.95	366,400	1,504.35	397,800
29	1,475.75	132,600	1,502.43	372,600	1,504.11	394,600
30	1,475.00	127,800	1,502.87	378,400	1,503.85	391,200
31	1,474.68	126,000	-	-	1,503.64	388,500

Smoky Hill River near Langley, Kans.

Location.—Lat 38°37', long. 97°57', in SE¼ sec. 35, T. 16 S., R. 6 W., half a mile below Kanopolis Dam, 1½ miles west of Ellsworth-McPherson county line, 3 miles downstream from Bluff Creek, and 5 miles north of Langley.
Drainage area.—7,857 square miles.
Gage-height record.—Water-stage recorder graph.
Discharge record.—Stage-discharge relation defined by current-meter measurements.
Maxima.—May-July 1951: Discharge, 5,570 cfs 8 a.m. July 15 (gage height, 15.29 ft).
1941 to April 1951: Discharge, 17,200 cfs Oct. 20, 1941 (gage height, 23.47 ft).
Remarks.—Flow regulated by Kanopolis Reservoir (see page 75).

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	153	1,860	4,560	11	434	980	1,970	21	515	2,100	1,790
2	65	1,360	4,550	12	431	984	2,240	22	371	1,140	1,720
3	65	866	4,050	13	427	987	3,210	23	302	1,040	1,670
4	66	872	4,550	14	420	1,000	5,250	24	717	2,500	1,660
5	67	875	4,620	15	416	1,000	5,550	25	1,340	3,900	1,650
6	68	890	4,610	16	420	1,010	5,530	26	2,390	4,120	2,100
7	166	990	4,590	17	494	1,010	5,370	27	2,400	4,120	2,960
8	407	956	4,620	18	484	1,760	4,810	28	2,690	4,130	2,970
9	405	971	4,600	19	489	3,500	4,790	29	3,280	4,170	3,030
10	429	977	4,590	20	491	3,480	3,540	30	3,250	4,360	3,020
								31	2,700	-	3,290
Monthly mean discharge, in second-feet									850	1,930	3,660
Runoff, in acre-feet									52,270	114,900	225,000
Runoff, in inches									0.12	0.27	0.54

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge
	July 8		July 9		July 10		July 11		July 12		July 13	
2							9.63	2,770	6.30	1,330	6.43	1,380
4	13.14	4,600					6.45	1,380	6.55	1,420	6.39	1,360
6			13.15	4,610	13.11	4,590	6.32	1,340	6.65	1,450	6.37	1,350
8	13.21	4,630					6.85	1,520	7.75	1,890	6.35	1,350
10							7.60	1,820	9.35	2,620	10.08	3,010
N	13.19	4,630	13.13	4,600	13.10	4,580	7.95	1,980	10.50	3,240	11.53	3,830
2							8.72	2,320	11.79	3,970	11.68	3,910
4	13.18	4,620					8.34	2,150	10.88	3,450	13.58	4,800
6			13.12	4,590	13.10	4,580	7.48	1,770	9.43	2,660	13.83	4,910
8	13.18	4,620					6.85	1,720	7.95	1,980	13.87	4,930
10							6.50	1,400	6.98	1,570	13.87	4,930
12	13.18	4,620	13.11	4,590	13.14	4,600	6.34	1,340	6.57	1,420	13.88	4,940
	July 14		July 15		July 16		July 17		July 18		July 19	
2	13.88	4,940					15.18	5,520				
4	13.88	4,940	15.17	5,520			15.17	5,520				
6	13.87	4,930			15.23	5,540	15.16	5,510	13.60	4,810	13.57	4,800
8	13.86	4,930	15.29	5,570			15.16	5,510				
10	13.85	4,920					15.15	5,510				
N	15.08	5,480	15.25	5,550	15.20	5,530	15.12	5,490	13.60	4,810	13.55	4,790
2	15.18	5,520					15.10	5,480				
4	15.21	5,530	15.24	5,550			15.08	5,480				
6	15.22	5,540			15.18	5,520	15.07	5,470	13.58	4,800	13.54	4,780
8	15.21	5,530	15.25	5,550			13.90	4,940				
10	15.20	5,530					13.73	4,870				
12	15.19	5,530	15.25	5,550	15.18	5,520	13.67	4,840	13.58	4,800	13.53	4,780
	July 20		July 21		July 22		July 23		July 24		July 25	
2	13.53	4,780										
4	13.53	4,780										
6	13.53	4,780	7.55	1,800	7.46	1,760	7.25	1,680				
8	13.52	4,770										
10	13.51	4,770										
N	13.50	4,760	7.52	1,790	7.30	1,700	7.23	1,670	7.19	1,660	7.17	1,650
2	9.40	2,650										
4	7.78	1,900										
6	7.60	1,820	7.48	1,770	7.25	1,680	7.21	1,660				
8	7.57	1,810										
10	7.57	1,810										
12	7.56	1,800	7.47	1,770	7.25	1,680	7.20	1,660	7.17	1,650	7.15	1,640

Supplemental records.—July 8, 6 a.m., 13.20 ft, 4,630 cfs; July 11, 1 a.m., 13.15 ft, 4,610 cfs; July 12, 3 a.m., 6.30 ft, 1,330 cfs; July 12, 5 a.m., 6.53 ft, 1,410 cfs; July 13, 9 a.m., 6.35 ft, 1,350 cfs; July 15, 5 a.m., 15.28 ft, 5,570 cfs; July 20, 1 p.m., 13.50 ft, 4,760 cfs; July 22, 10 a.m., 7.45 ft, 1,760 cfs; July 22, 11 a.m., 7.14 ft, 1,640 cfs.

Smoky Hill River at Lindsborg, Kans.

Location. —Lat 38°34', long. 97°40', in SE¼ sec. 17, T. 17 S., R. 3 W., at bridge 300 ft downstream from mill dam in Lindsborg. Datum of gage is 1,297.19 ft above mean sea level, datum of 1929.
Drainage area. —8,110 square miles.
Gage-height record. —Water-stage recorder graph.
Discharge record. —Stage-discharge relation defined by current-meter measurements. Shifting-control method used May 1-9, July 20-31.
Maxima. —May-July, 1951: Discharge, 14,200 cfs 4 p.m. July 12 (gage height, 29.32 ft).
1930 to April 1951: Discharge, 26,000 cfs June 3, 1938 (gage height, 32.55 ft).
Flood of May 1903 reached a stage of 33.9 ft, from floodmarks (discharge, 32,000 cfs, from rating curve extended above 26,000 cfs).
Remarks. —Flow partially regulated by Kanopolis Reservoir (see page 75).

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	908	1,930	4,560	11	685	1,230	8,020	21	1,270	3,460	2,810
2	376	2,240	4,500	12	579	1,220	12,900	22	1,180	2,310	1,960
3	175	1,180	4,660	13	561	1,220	11,000	23	886	1,740	1,840
4	137	1,100	4,390	14	549	1,660	5,200	24	587	1,420	1,760
5	119	1,080	4,450	15	545	1,410	5,360	25	985	3,210	1,680
6	107	1,210	4,520	16	698	1,260	5,800	26	1,890	3,810	1,630
7	97	3,630	4,510	17	2,760	1,240	5,880	27	2,350	3,980	2,380
8	192	1,400	4,500	18	1,450	1,240	5,810	28	2,370	4,060	2,790
9	758	1,360	4,540	19	1,160	2,610	5,250	29	2,900	5,180	2,820
10	1,510	1,240	4,530	20	752	3,360	4,940	30	3,150	5,140	2,840
								31	3,170	-	2,840
Monthly mean discharge, in second-feet									1,124	2,238	4,538
Runoff, in acre-feet									69,140	133,200	279,000
Runoff, in inches									0.16	0.31	0.65

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	July 8		July 9		July 10		July 11		July 12		July 13	
2					19.90	4,520	20.32	4,730	27.70	10,800	29.20	13,900
4	19.87	4,510			19.90	4,520	20.97	5,060	27.79	10,900	29.11	13,700
6			19.95	4,550	19.89	4,520	22.25	5,830	28.07	11,400	28.97	13,300
8	19.80	4,480			19.90	4,520	23.49	6,660	28.40	12,100	28.77	12,800
10					19.91	4,530	24.70	7,580	28.77	12,800	28.49	12,300
N	19.85	4,500	19.93	4,540	19.89	4,520	25.84	8,640	29.10	13,600	28.14	11,600
2					19.89	4,520	26.55	9,350	29.27	14,100	27.58	10,600
4	19.85	4,500			19.88	4,520	26.98	9,780	29.32	14,200	26.94	9,740
6			19.91	4,530	19.88	4,520	27.22	10,100	29.29	14,100	26.04	8,840
8	19.87	4,510			19.88	4,520	27.38	10,300	29.28	14,100	25.04	7,850
10					19.92	4,530	27.54	10,500	29.27	14,100	23.90	6,950
12	19.90	4,520	19.90	4,520	20.08	4,610	27.64	10,700	29.24	14,000	22.78	6,180
	July 14		July 15		July 16		July 17		July 18		July 19	
2	21.95	5,640										
4	21.40	5,310										
6	21.10	5,130	21.27	5,230	22.12	5,750			22.31	5,870	21.55	5,400
8	20.96	5,050										
10	20.93	5,040										
N	20.94	5,040	21.46	5,350	22.23	5,820	22.33	5,880	22.29	5,860	21.23	5,210
2	20.98	5,060										
4	21.03	5,090										
6	21.06	5,110	21.69	5,480	22.29	5,860			22.15	5,770	21.00	5,070
8	21.09	5,120										
10	21.13	5,150										
12	21.15	5,160	21.94	5,630	22.32	5,880	22.31	5,870	21.90	5,610	20.85	5,000
	July 20		July 21		July 22		July 23		July 24		July 25	
2			20.13	4,600								
4			19.21	4,100								
6	20.78	4,960	17.85	3,320								
8			16.90	2,760								
10			16.40	2,470								
N	20.73	4,940	16.09	2,310	15.28	1,950	15.03	1,840	14.81	1,750	14.64	1,680
2			15.90	2,230								
4			15.77	2,170								
6	20.71	4,920	15.67	2,120								
8			15.65	2,110								
10			15.58	2,080								
12	20.56	4,840	15.52	2,060	15.18	1,900	14.92	1,800	14.73	1,720	14.58	1,650

Smoky Hill River near Mentor, Kans.

Location.—Lat 38°48', long. 97°35', on line between secs. 30 and 31, T. 14 S., R. 2 W., at county road bridge, 1 mile south of Salina, and 4 miles north of Mentor. Datum of gage is 1,211.74 ft above mean sea level (levels by Corps of Engineers).

Drainage area.—8,230 square miles.

Gage-height record.—Water-stage recorder graph except for periods May 10, 16-18, May 22 to June 1, June 7, 20-22, 26-30, July 22-28, for which a graph was drawn based on one to three times daily wire-weight gage readings.

Discharge record.—Stage-discharge relation defined by current-meter measurements below 4,500 cfs and by slope-area determination of peak discharge. Backwater from return flow from overbank storage 12 m. July 13 to 12 p.m. July 17, discharge computed on basis of records for station at Lindsborg.

Maxima.—May-July 1951: Discharge, 20,000 cfs 10 a.m. July 13 (gage height, 24.93 ft).
1923-32, 1947 to April 1951: Discharge, 7,450 cfs Aug. 17, 1927 (gage height, 25.8 ft, site and datum then in use).

Remarks.—Flow partially regulated by Kanopolis Reservoir (see page 75).

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	1,570	2,860	5,680	11	1,420	1,170	8,460	21	900	3,200	5,060
2	961	1,760	4,690	12	630	1,150	18,100	22	1,380	3,280	2,900
3	420	1,860	4,450	13	544	1,140	18,500	23	1,440	2,580	2,420
4	227	1,050	4,600	14	518	1,250	9,600	24	820	1,540	2,320
5	189	996	4,280	15	502	1,740	6,200	25	662	1,680	2,240
6	172	1,170	4,200	16	947	1,270	5,800	26	1,250	3,170	2,200
7	161	3,240	4,220	17	1,510	1,170	5,700	27	2,170	3,480	2,280
8	155	3,390	4,180	18	3,140	1,150	6,620	28	2,350	3,630	2,960
9	245	1,420	4,170	19	1,410	1,210	6,620	29	2,430	4,020	3,080
10	1,360	1,270	4,280	20	1,150	2,760	5,900	30	2,960	5,460	3,100
								31	3,060	-	3,110
Monthly mean discharge, in second-feet									1,182	2,169	5,417
Runoff, in acre-feet									72,700	129,100	333,100
Runoff, in inches									0.17	0.29	0.76

Smoky Hill River at Salina, Kans.

Location.—Lat 38°51', long. 97°36', in NW¼ sec. 13, T. 14 S., R. 3 W., on downstream railing of Iron Ave. Bridge in Salina. Datum of gage is 1,199.95 ft above mean sea level.

Drainage area.—8,243 square miles.

Gage-height record.—Wire-weight gage readings once daily, more frequently during flood periods.

Maxima.—May-July 1951: Gage-height, 24.10 ft 11:30 a.m. July 13.
1929 to April 1951: Gage-height 24.25 ft Oct. 21, 1941.
Stage of 24.6 ft occurred May 30, 1903.

Remarks.—Records furnished by U. S. Weather Bureau.

Daily stage, in feet, 1951

Day	June	July	Day	June	July	Day	June	July
1	15.9	20.0	11	13.8	20.2	21	15.9	20.4
2	14.0	19.6	12	13.7	23.3	22	16.9	16.4
3	13.9	19.1	13	13.8	24.1	23	15.7	15.1
4	13.6	19.1	14	13.9	23.4	24	14.3	15.0
5	13.4	18.8	15	14.5	22.8	25	13.9	14.8
6	13.4	18.6	16	14.0	21.8	26	16.2	14.8
7	15.3	18.6	17	13.8	21.0	27	17.0	14.8
8	18.9	18.5	18	13.7	20.9	28	17.5	15.6
9	14.0	18.5	19	13.7	21.0	29	17.7	16.2
10	13.9	18.6	20	-	20.9	30	19.3	16.2
						31	-	16.2

Supplemental records.—July 1, 6 p.m., 20.00 ft; July 10, 6:30 p.m., 18.60 ft; July 11, 8:30 p.m., 20.70 ft; July 13, 11:30 a.m., 24.10 ft, 8:30 p.m., 23.70 ft; July 18, 6:30 p.m., 21.00 ft; July 30, 4 p.m., 16.20 ft.

Saline River near Russell, Kans.

Location.—Lat 38°58', long. 98°51', between secs. 34 and 35, T. 12 S., R. 14 W., 2 miles downstream from Salt Creek and 5 miles north of Russell.
Drainage area.—1,502 square miles.
Gage-height record.—Water-stage recorder graph except for period July 30, 31, for which graph was drawn based on daily wire-weight gage readings.
Discharge record.—Stage-discharge relation defined by current-meter measurements.
Maxima.—May-July 1951: Discharge, 17,000 cfs 9 p.m. June 28 (gage height, 19.12 ft).
1946 to April 1951: Discharge, 14,300 cfs July 26, 1950 (gage height, 18.40 ft).

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	247	272	1,870	11	65	804	5,270	21	672	4,100	498
2	108	971	1,330	12	61	1,360	4,940	22	4,850	10,400	1,510
3	85	1,050	1,450	13	56	2,350	3,890	23	6,130	10,600	1,890
4	75	408	1,200	14	67	1,580	2,360	24	3,350	9,140	1,670
5	69	293	872	15	165	1,700	1,510	25	1,280	4,580	1,990
6	67	756	717	16	107	1,810	1,020	26	747	2,270	1,700
7	64	1,350	627	17	110	651	781	27	531	2,760	903
8	63	1,760	568	18	252	493	668	28	428	9,830	672
9	63	4,350	531	19	373	421	595	29	394	9,080	553
10	65	1,080	531	20	244	389	537	30	357	3,710	508
								31	295	-	472
Monthly mean discharge, in second-feet									692	3,011	1,408
Runoff, in acre-feet									42,530	179,100	86,540
Runoff, in inches									0.53	2.24	1.08

Paradise Creek near Paradise, Kans.

Location.—Lat 39°04', long. 98°51', in NW¼ sec. 26, T. 14 S., R. 14 W., at bridge on U. S. Highway 281, 4½ miles southeast of Paradise.
Drainage area.—212 square miles.
Gage-height record.—Water-stage recorder graph except for periods May 1-15, 18-23, May 25 to June 7, June 10-20, July 1-10, 27-31, for which graph was drawn based on one or more daily wire-weight gage readings.
Discharge record.—Stage-discharge relation defined by current-meter measurements below 9,300 cfs and slope-area determination of peak discharge. Shifting-control method used May 1 to June 2.
Maxima.—May-July 1951: Discharge, 14,800 cfs 4 a.m. July 11 (gage height, 23.10 ft).
1946 to April 1951: Discharge, 4,160 cfs July 16, 1950 (gage height, 17.47 ft).

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	83	56	113	11	12	61	8,350	21	517	2,240	120
2	31	299	94	12	10	63	3,990	22	1,290	3,160	781
3	25	480	120	13	10	54	2,310	23	1,010	1,980	620
4	21	108	77	14	58	90	915	24	240	612	188
5	19	61	62	15	73	53	448	25	129	196	136
6	19	433	61	16	52	38	302	26	88	158	118
7	17	1,220	53	17	62	30	226	27	67	535	106
8	12	560	44	18	50	23	190	28	59	810	93
9	12	167	43	19	37	19	163	29	66	262	84
10	12	86	394	20	41	33	141	30	103	152	198
								31	58	-	87
Monthly mean discharge, in second-feet									138	468	665
Runoff, in acre-feet									8,500	27,850	40,910
Runoff, in inches									0.75	2.46	3.62

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	July 8		July 9		July 10		July 11		July 12		July 13	
2					4.95	42	18.49	5,520				
4					4.94	42	23.10	14,800	17.63	4,360		
6					4.92	40	22.19	12,500			16.27	2,870
8					4.90	39	20.84	9,680	17.25	3,900		
10					4.88	38	20.52	9,040				
N	4.96	43	4.96	43	4.87	37	20.59	9,180	17.03	3,640	15.23	2,040
2					4.86	36	20.13	8,330				
4					4.86	36	19.67	7,510	16.95	3,550		
6					5.19	59	19.30	6,840			14.05	1,730
8					6.40	183	19.02	6,370	17.27	3,920		
10					15.62	2,300	18.75	5,940				
12	4.95	42	4.96	43	17.09	3,710	18.40	5,380	17.09	3,710	12.95	1,490
	July 14		July 15		July 16		July 17		July 18		July 19	
2												
4												
6	11:55	1,190										
8												
10												
N	9.67	796	7.95	434	7.30	300	6.90	223	6.70	190	6.52	163
2												
4												
6	8.95	644										
8												
10												
12	8.61	573	7.56	353	7.08	256	6.78	203	6.61	176	6.42	150
	July 20		July 21		July 22		July 23		July 24		July 25	
2			6.23	128	6.82	209						
4			6.22	126	7.67	376						
6			6.21	125	8.65	582	10.00	865				
8			6.18	122	9.60	781						
10			6.17	120	10.25	918						
N	6.35	142	6.16	119	10.75	1,020	9.33	724	6.64	181	6.29	135
2			6.13	116	10.94	1,060						
4			6.12	114	10.99	1,070						
6			6.11	113	10.75	1,020	7.50	340				
8			6.09	111	10.38	945						
10			6.08	110	10.09	884						
12	6.25	130	6.35	142	9.98	861	7.01	242	6.41	149	6.22	126

Saline River near Wilson, Kans.

Location. —Lat 38°56', long. 98°32', in SW¼ sec. 11, T. 13 S., R. 11 W., just upstream from highway bridge, three-quarters of a mile upstream from Hell Creek, and 8 miles northwest of Wilson.

Drainage area. —1,900 square miles.

Gage-height record. —Water-stage recorder graph except for periods June 26, 28, July 1-8, 11, 14-23, for which a graph was drawn based on bi-daily or oftener wire-weight gage readings and shape of recorder graph. No gage-height record June 3, 4.

Discharge record. —Stage-discharge relation defined by current-meter measurements below 13,000 cfs and by slope-area determination at gage-height, 22.06 ft. Shifting-control method used June 10-21, 23. For period of no gage-height record discharge computed on basis of records for stations near Russell and at Tescott.

Maxima. —May-July 1951: Discharge, 19,300 cfs 9 a.m. June 23 (gage height, 22.06 ft).

1929 to April 1951: Discharge, 21,900 cfs June 2, 1935 (gage height, 24.79 ft), from rating curve extended above 10,000 cfs.

Flood of July 1928 reached a stage of about 26.8 ft, from floodmarks (discharge, 25,700 cfs, from rating extended above 10,000 cfs).

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	224	468	2,700	11	88	1,340	6,270	21	449	4,070	918
2	297	904	1,930	12	86	1,300	14,000	22	4,960	7,680	1,070
3	168	1,400	2,130	13	80	2,400	7,530	23	5,890	15,900	3,080
4	134	1,100	2,020	14	90	2,880	4,560	24	5,910	13,200	2,080
5	114	743	1,410	15	137	1,810	2,610	25	2,500	7,380	1,940
6	103	2,390	1,150	16	267	2,740	1,840	26	1,410	3,250	2,340
7	98	6,560	1,020	17	207	1,300	1,440	27	1,020	3,480	1,360
8	90	2,720	910	18	217	942	1,220	28	804	5,380	1,060
9	88	3,790	852	19	365	750	1,090	29	673	13,800	898
10	90	3,130	803	20	392	688	997	30	646	6,270	803
								31	577	-	1,050
Monthly mean discharge, in second-feet									909	3,992	2,357
Runoff, in acre-feet									55,880	237,600	145,000
Runoff, in inches									0.55	2.34	1.43

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	July 8		July 9		July 10		July 11		July 12		July 13	
2							6.84	790	21.70	17,300	18.78	8,260
4							6.87	800	21.52	16,400	18.58	7,920
6	7.25	934	7.06	866	6.86	796	6.98	837	21.25	15,200	18.51	7,820
8							7.53	1,040	20.98	14,100	18.53	7,840
10							10.43	2,210	21.08	14,500	18.55	7,880
N	7.17	905	7.03	855	6.86	796	15.63	5,220	21.15	14,800	18.57	7,900
2							18.03	7,130	21.07	14,500	18.57	7,900
4							18.78	8,260	20.85	13,600	18.35	7,580
6	7.11	884	6.99	841	6.91	813	19.30	9,300	20.53	12,600	17.93	7,030
8							20.70	13,100	20.10	11,300	17.48	6,580
10							21.70	17,300	19.60	10,000	17.03	6,220
12	7.07	869	6.93	820	6.86	796	21.80	17,800	19.13	8,960	16.64	5,930
	July 14		July 15		July 16		July 17		July 18		July 19	
2												
4	16.18	5,610	11.97	2,960								
6					9.86	1,960	8.76	1,510	8.13	1,260		
8	15.55	5,160	11.58	2,770								
10												
N	14.60	4,540	11.20	2,580	9.53	1,820	8.56	1,430	8.02	1,220	7.69	1,090
2												
4	13.68	3,950	10.85	2,400								
6					9.28	1,720	8.39	1,370	7.92	1,180		
8	13.01	3,550	10.52	2,250								
10											-	
12	12.46	3,230	10.24	2,130	9.02	1,620	8.25	1,310	7.83	1,150	7.55	1,040
	July 20		July 21		July 22		July 23		July 24		July 25	
2							11.35	2,660	11.40	2,680	10.11	2,070
4					7.07	869	12.17	3,070	10.85	2,400	10.13	2,080
6							12.85	3,450	10.27	2,140	10.01	2,020
8					7.06	866	13.20	3,660	9.85	1,950	9.79	1,930
10							12.75	3,390	9.61	1,850	9.50	1,810
N	7.42	995	7.20	916	7.15	898	12.20	3,090	9.64	1,870	9.26	1,710
2							11.85	2,900	9.72	1,900	9.17	1,680
4					7.36	974	11.72	2,840	9.75	1,910	9.31	1,730
6							12.15	3,060	9.76	1,910	9.65	1,870
8					8.18	1,280	12.35	3,170	9.79	1,930	10.05	2,040
10							12.25	3,120	9.86	1,960	10.41	2,200
12	7.32	959	7.10	880	10.42	2,210	12.00	2,980	9.99	2,020	10.74	2,350

Wolf Creek near Sylvan Grove, Kans.

Location. —Lat 39°01', long. 98°28', on line between secs. 7 and 18, T. 12 S., R. 10 W., 3 miles upstream from mouth and 4½ miles west of Sylvan Grove. Datum of gage is 1,419.60 ft above mean sea level (levels by U. S. Bureau of Reclamation).

Drainage area. —261 square miles.

Gage-height record. —Water-stage recorder graph.

Discharge record. —Stage-discharge relation defined by current-meter measurements below 3,700 cfs and by contracted-opening and slope-area determinations of peak discharge. Shifting-control method used June 8 to July 11. Discharge, 12 p.m. July 11 to 2 a.m. July 14 computed from backwater studies.

Maxima. —May to July 1951: Discharge, 29,300 cfs 11 a.m. July 11 (gage height, 30.96 ft).
1945 to April 1951: Discharge, 3,850 cfs July 16, 1950 (gage height, 24.99 ft).

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	28	16	524	11	8.4	168	10,500	21	86	2,570	129
2	27	346	296	12	8.2	131	5,920	22	773	5,140	543
3	16	240	444	13	7.8	154	4,270	23	1,030	5,080	753
4	11	67	306	14	8.2	846	1,080	24	1,010	2,030	208
5	9 9	23	231	15	29	414	516	25	527	1,350	137
6	9.0	2,410	206	16	42	361	316	26	60	710	173
7	8.6	7,070	206	17	31	169	232	27	25	670	102
8	8.4	2.720	264	18	69	75	193	28	19	1,380	88
9	8.4	675	223	19	36	63	170	29	17	1,770	82
10	9.3	607	219	20	27	57	149	30	16	1,250	76
								31	15	-	404
Monthly mean discharge, in second-feet									128	1,285	934
Runoff, in acre-feet									7,890	76,490	57,440
Runoff, in inches									0.57	5.50	4.13

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	July 8		July 9		July 10		July 11		July 12		July 13	
2					6.37	179	16.60	1,430	29.29	6,600	29.00	6,400
4					6.36	178	19.75	2,090	29.25	6,140	28.87	6,000
6	6.51	189	7.19	247	6.35	178	24.15	3,500	29.26	5,740	28.70	5,600
8					6.35	178	28.95	6,650	29.30	5,480	28.46	5,200
10					6.33	176	30.90	26,400	29.34	5,300	28.09	4,700
N	6.44	184	6.71	205	6.32	175	30.85	24,400	29.35	5,200	27.36	4,240
2					6.30	174	30.59	16,700	29.26	5,220	26.36	3,780
4					6.28	173	30.30	12,300	29.21	5,420	25.17	3,360
6	9.13	422	6.47	186	6.27	172	30.05	10,200	29.21	5,800	23.87	2,940
8					6.62	198	29.84	8,900	29.23	6,360	22.54	2,540
10					8.30	343	29.61	7,980	29.19	6,840	20.85	2,180
12	8.12	327	6.38	180	12.80	826	29.41	7,200	29.11	6,700	19.77	1,860
	July 14		July 15		July 16		July 17		July 18		July 19	
2	18.38	1,560										
4	17.36	1,420										
6	16.59	1,270	13.07	581								
8	16.08	1,170										
10	15.63	1,080										
N	15.27	1,000	12.62	509	10.96	306	10.06	229	9.59	192	9.26	169
2	14.97	944										
4	14.68	886										
6	14.41	832	12.16	442								
8	14.13	776										
10	13.87	724										
12	13.65	680	11.74	389	10.48	263	9.78	206	9.44	182	9.13	160
	July 20		July 21		July 22		July 23		July 24		July 25	
2			8.78	139	8.61	129	17.55	1,460				
4			8.74	136	8.63	130	16.92	1,330			8.89	145
6			8.70	134	8.72	135	16.00	1,150	10.40	256		
8			8.66	132	9.00	152	14.90	930			8.89	145
10			8.62	129	9.30	172	13.90	730				
N	8.93	148	8.58	127	9.64	196	13.10	586	9.62	194	8.81	141
2			8.56	126	11.00	310	12.48	487				
4			8.54	124	13.45	642	12.00	420			8.63	130
6			8.52	123	15.50	1,050	11.63	376	9.12	159		
8			8.50	122	16.83	1,320	11.33	343			8.51	123
10			8.48	121	17.57	1,460	11.10	320				
12	8.82	141	8.57	126	17.80	1,510	10.89	300	8.93	148	8.58	127

Supplemental record. — July 11, 11 a.m., 30.96 ft, 29,300 cfs.

Saline River at Tescott, Kans.

Location. — Lat 39°00', long. 97°53', in SE¼ sec. 16, T. 12 S., R. 5 W., at highway bridge, half a mile south of Tescott and half a mile upstream from Dry Creek.

Drainage area. — 2,820 square miles.

Gage-height record. — Water-stage recorder graph, except for periods May 1, 2, June 2, 14, July 7-10, July 21 to 4 p.m. July 24, July 30, 31, for which a graph was drawn based on once-daily wire-weight gage readings.

Discharge record. — Stage-discharge relation defined by current-meter measurements below 12,000 cfs and by slope-area determination of peak discharge.

Maxima. — May-July 1951: Discharge, 61,400 cfs 4 a.m. July 13 (gage height, 30.06 ft).
1919 to April 1951: Discharge, 6,850 cfs June 3, 1935 (gage height, 29.57 ft, from graph based on gage readings).

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	307	797	7,000	11	341	7,400	10,200	21	1,140	4,480	1,660
2	464	2,120	8,000	12	176	6,480	24,800	22	3,150	6,440	1,460
3	345	3,590	6,650	13	142	4,270	47,600	23	4,100	7,000	1,460
4	397	2,370	6,220	14	142	2,830	21,500	24	3,960	16,200	1,810
5	272	2,180	4,730	15	150	3,840	10,300	25	4,290	22,500	2,910
6	206	2,180	3,340	16	198	4,490	5,940	26	5,070	17,000	3,300
7	176	6,500	2,710	17	952	4,570	5,410	27	5,560	13,900	2,870
8	159	9,200	2,480	18	1,360	4,190	4,720	28	3,980	11,000	2,800
9	152	10,400	2,130	19	595	2,680	3,080	29	1,240	6,900	2,370
10	362	9,000	2,060	20	483	1,720	2,070	30	963	6,450	1,500
								31	828	-	1,190
Monthly mean discharge, in second-feet									1,344	6,756	6,589
Runoff, in acre-feet									82,630	402,000	405,200
Runoff, in inches									0.55	2.67	2.69

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	July 8		July 9		July 10		July 11		July 12		July 13	
2					16.82	2,000	22.80	3,930	29.27	11,800	30.02	57,800
4	19.01	2,650	17.51	2,200	16.77	1,990	25.60	5,040	29.32	13,900	30.06	61,400
6					16.70	1,980	27.78	5,910	29.35	15,200	30.02	57,800
8	18.84	2,600	17.36	2,160	16.64	1,960	28.80	6,400	29.42	18,500	29.98	54,300
10					16.59	1,950	29.25	11,000	29.51	23,000	29.96	52,600
N	18.47	2,490	17.25	2,120	16.56	1,940	29.36	15,700	29.57	26,000	29.90	47,500
2					16.50	1,920	29.36	15,700	29.60	27,500	29.87	45,200
4	18.14	2,390	17.12	2,090	16.47	1,920	29.32	13,900	29.65	30,200	29.82	41,500
6					16.50	1,920	29.29	12,600	29.66	30,800	29.80	40,000
8	17.89	2,320	16.99	2,050	16.67	1,970	29.28	12,200	29.69	32,400	29.76	37,200
10					18.85	2,600	29.28	12,200	29.77	37,900	29.73	35,100
12	17.67	2,250	16.87	2,020	20.50	3,120	29.28	12,200	29.90	47,500	29.70	33,000
	July 14		July 15		July 16		July 17		July 18		July 19	
2									28.45	5,220	25.05	3,750
4	29.61	27,600	29.31	12,400	29.11	6,200	28.95	5,480	28.35	5,180	24.62	3,600
6									28.21	5,100	24.21	3,450
8	29.55	24,200	29.28	11,200	29.10	6,000	28.90	5,450	28.04	5,020	23.76	3,310
10									27.85	4,920	23.31	3,170
N	29.48	20,500	29.26	10,400	29.08	5,900	28.85	5,420	27.59	4,800	22.88	3,040
2									27.31	4,660	22.48	2,920
4	29.42	17,500	29.22	8,800	29.04	5,700	28.78	5,390	26.97	4,520	22.08	2,800
6									26.63	4,380	21.69	2,690
8	29.38	15,600	29.19	7,800	29.00	5,500	28.68	5,340	26.26	4,230	21.35	2,580
10									25.86	4,070	21.02	2,490
12	29.36	14,700	29.16	7,200	28.96	5,480	28.55	5,280	25.43	3,900	20.75	2,400
	July 20		July 21		July 22		July 23		July 24		July 25	
2											20.97	2,470
4	20.31	2,270	18.57	1,750	17.58	1,500	17.36	1,440	17.73	1,530	21.31	2,570
6											21.67	2,680
8	19.90	2,150	18.39	1,700	17.45	1,460	17.37	1,440	17.96	1,590	21.99	2,780
10											22.29	2,870
N	19.53	2,040	18.21	1,650	17.37	1,440	17.41	1,450	18.50	1,730	22.57	2,950
2											22.82	3,030
4	19.24	1,950	18.04	1,610	17.37	1,440	17.43	1,460	19.12	1,920	23.02	3,090
6											23.27	3,160
8	19.02	1,890	17.89	1,570	17.37	1,440	17.50	1,480	19.86	2,140	23.44	3,210
10											23.59	3,260
12	18.77	1,810	17.72	1,530	17.36	1,440	17.60	1,500	20.59	2,360	23.71	3,290

Bow Creek near Stockton, Kans.

Location. – Lat 39°34', long. 99°17', on line between secs. 1 and 2, T. 6 S., R. 18 W., on downstream side of bridge on U. S. Highway 183, 8.5 miles north of Stockton.
Drainage area. – 337 square miles.
Gage-height record. – Graph drawn on basis of wire-weight gage readings made generally once daily, with frequent readings during rises, prior to June 28, July 4-10; water-stage recorder graph June 28 to July 3 and after July 10.
Discharge record. – Stage-discharge relation defined by current-meter measurements below 700 cfs and by contracted-opening determination of peak discharge. Shifting-control method used May 1-21, July 15-31.
Maximum. – May-July 1951: Discharge, 12,900 cfs 7:30 a.m. July 12 (gage height, 13.60 ft, from flood-marks).

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	8.3	12	41	11	9.3	70	4,040	21	110	1,270	115
2	8.3	12	32	12	8.3	190	4,990	22	361	3,670	596
3	7.8	12	29	13	8.1	220	1,670	23	350	2,100	306
4	7.6	11	18	14	7.8	253	1,380	24	65	935	347
5	7.6	12	9.8	15	8.1	298	1,070	25	14	838	377
6	7.4	254	8.1	16	8.8	347	320	26	14	279	142
7	7.4	697	6.8	17	24	190	210	27	13	165	98
8	7.6	1,320	5.8	18	18	149	200	28	15	110	78
9	13	271	5.1	19	15	62	157	29	15	82	63
10	11	117	163	20	12	34	131	30	13	60	54
								31	13	-	51
Monthly mean discharge, in second-feet									38.3	468	539
Runoff, in acre-feet									2,360	27,850	33,150
Runoff, in inches									0.13	1.55	1.84

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge
	July 8		July 9		July 10		July 11		July 12		July 13	
2							12.20	6,700	9.47	1,520	9.89	1,890
4							12.66	8,540	11.70	5,100	9.78	1,780
6							12.45	7,700	12.85	9,320	9.69	1,690
8							11.65	4,980	13.50	12,400	9.75	1,750
10							10.85	3,230	12.65	8,500	9.80	1,800
N	2.61	5.8	2.57	5.1	2.55	4.8	10.60	2,810	11.85	5,550	9.76	1,760
2							10.25	2,300	11.56	4,750	9.70	1,700
4							10.08	2,100	10.95	3,410	9.58	1,600
6							9.85	1,850	10.48	2,630	9.48	1,520
8							9.56	1,590	10.27	2,320	9.38	1,440
10							9.35	1,420	10.12	2,140	9.31	1,390
12	2.59	5.4	2.55	4.8	11.15	3,800	9.20	1,320	10.00	2,000	9.25	1,350
	July 14		July 15		July 16		July 17		July 18		July 19	
2												
4	9.17	1,300	9.30	1,380	5.36	394			3.94	187		
6												
8	9.14	1,280	9.02	1,210	4.99	335			3.95	189		
10												
N	9.24	1,340	8.69	1,060	4.76	300	4.09	209	4.27	234	3.70	156
2												
4	9.37	1,440	8.29	962	4.57	274			4.14	216		
6												
8	9.45	1,500	7.54	798	4.38	248			3.96	190		
10												
12	9.45	1,500	5.99	503	4.26	232	3.97	192	3.84	175	3.58	141
	July 20		July 21		July 22		July 23		July 24		July 25	
2					5.49	415	4.40	252				
4					6.67	623	4.42	254	4.70	292	5.86	479
6					8.05	908	4.90	321				
8					7.96	888	5.07	347	4.83	311	5.96	497
10					7.49	785	5.03	342				
N	3.50	131	3.77	114	7.04	694	4.99	335	5.00	336	5.64	439
2					6.54	599						
4					6.41	577	4.86	316	5.19	367	4.73	297
6					6.45	583						
8					5.92	489	4.72	295	5.43	406	4.24	229
10					5.15	361						
12	3.43	121	3.65	151	4.69	290	4.67	289	5.68	447	3.96	190

Supplemental records. – July 10, 10 p.m., 2.54 ft, 4.6 cfs; July 11, 1 a.m., 12.15 ft, 6,520 cfs; 1:30 a.m., 11.96 ft, 5,880 cfs; 3 a.m., 13.16 ft, 10,700 cfs; 4:30 a.m., 12.93 ft, 9,680 cfs; July 12, 1 a.m., 9.16 ft, 1,300 cfs; 7:30 a.m., 13.60 ft, 12,900 cfs; July 18, 1 p.m., 4.34 ft, 242 cfs; July 21, 11:30 p.m., 3.31 ft, 106 cfs; July 22, 7 a.m., 8.12 ft, 925 cfs; July 23, 3 a.m., 4.35 ft, 244 cfs.

North Fork Solomon River at Kirwin, Kans.

Location.—Lat 39°40', long. 99°07', in SW¼ sec. 34, T. 4 S., R. 16 W., half a mile south of Kirwin, three-quarters of a mile downstream from Bow Creek, and 1½ miles upstream from Deer Creek. Datum of gage is 1,656.95 ft above mean sea level, datum of 1929 (levels by Bureau of Reclamation).
Drainage area.—1,290 square miles.
Gage-height record.—Water-stage recorder graph except for periods May 15-18, 26-31, June 2-8, 21, June 28 to July 5, July 7-10, 20, 21, 26-31, for which a graph was drawn based on once-daily wire-weight gage readings, and July 6, when there was no gage-height record.
Discharge record.—Stage-discharge relation defined by current-meter measurements below 10,000 cfs and by slope-area and contracted-opening determinations at gage height 22.3 ft.
Maxima.—May-July 1951: Discharge, 15,600 cfs 4:30 a.m., July 11 (gage height, 20.42 ft).
1919-25, 1928-32, 1941 to April 1951: Discharge, 24,000 cfs (revised) Sept. 18, 1919 (gage height, 22.5 ft).

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	40	551	238	11	32	281	10,800	21	565	1,390	396
2	34	288	236	12	31	255	12,000	22	2,430	8,610	1,840
3	33	155	200	13	31	518	10,700	23	1,570	8,300	1,690
4	31	106	382	14	33	902	4,960	24	778	3,660	1,380
5	31	93	198	15	125	663	3,010	25	345	2,220	1,130
6	30	823	150	16	90	886	1,140	26	199	780	580
7	30	1,940	111	17	87	1,060	674	27	201	539	418
8	29	3,240	130	18	74	431	626	28	174	385	559
9	40	1,980	124	19	94	293	526	29	138	428	408
10	37	464	431	20	72	235	438	30	112	360	305
								31	223	-	295
Monthly mean discharge, in second-feet									250	1,395	1,809
Runoff, in acre-feet									15,350	82,980	111,200
Runoff, in inches									0.22	1.21	1.62

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge
	July 8		July 9		July 10		July 11		July 12		July 13	
2					4.73	116	15.60	5,560	18.30	10,200	19.75	13,600
4					4.73	116	20.30	15,200	18.13	9,860	19.70	13,400
6	4.82	129			4.73	116	19.98	14,200	19.14	11,900	19.35	12,400
8					4.73	116	19.16	11,900	20.00	14,300	19.01	11,600
10					4.73	116	18.60	10,800	19.66	13,300	18.77	11,100
N	4.85	134	4.78	123	4.73	116	18.13	9,860	19.17	11,900	18.55	10,700
2					4.74	118	18.37	10,300	18.99	11,600	18.33	10,300
4					4.82	129	18.71	11,000	19.26	12,100	18.08	9,760
6	4.84	132			6.00	375	18.80	11,200	19.39	12,500	17.78	9,160
8					7.64	936	18.90	11,400	19.20	12,000	17.47	8,540
10					8.95	1,580	18.92	11,400	19.25	12,100	17.16	7,920
12	4.83	130	4.74	118	10.66	2,550	18.66	10,900	19.48	12,700	16.82	7,280
	July 14		July 15		July 16		July 17		July 18		July 19	
2	16.44	6,660	12.78	3,820	9.10	1,650	7.20	760	6.76	601		
4	15.82	5,820	12.54	3,670	8.65	1,420	7.15	740	6.74	594		
6	15.40	5,330	12.38	3,580	8.46	1,330	7.08	713	6.77	604	6.62	552
8	15.08	5,050	12.02	3,360	8.20	1,200	6.98	678	6.85	632		
10	14.82	4,910	11.82	3,240	8.09	1,140	6.93	660	6.90	650		
N	14.63	4,820	11.54	3,070	7.91	1,060	6.95	668	6.89	646	6.53	524
2	14.35	4,680	11.23	2,890	7.69	956	6.92	657	6.85	632		
4	14.03	4,520	10.77	2,610	7.74	976	6.90	650	6.86	636		
6	13.62	4,310	10.69	2,560	7.58	912	6.85	632	6.89	646	6.43	494
8	13.22	4,080	10.29	2,320	7.45	860	6.82	622	6.89	646		
10	12.78	3,850	10.00	2,150	7.34	816	6.80	615	6.83	626		
12	12.68	3,760	9.50	1,850	7.26	784	6.78	608	6.75	598	6.34	467
	July 20		July 21		July 22		July 23		July 24		July 25	
2					6.34	467	9.53	1,870	8.82	1,510	8.44	1,320
4					6.87	640	9.10	1,650	8.68	1,440	8.42	1,310
6	6.28	449	6.12	405	7.75	980	8.98	1,590	8.64	1,420	8.40	1,300
8					8.70	1,450	9.03	1,620	8.57	1,380	8.36	1,280
10					9.88	2,080	9.09	1,640	8.52	1,360	8.28	1,240
N	6.24	437	6.08	395	11.00	2,750	9.16	1,680	8.47	1,340	8.18	1,190
2					10.77	2,610	9.27	1,740	8.42	1,310	8.10	1,150
4					10.87	2,670	9.24	1,720	8.42	1,310	7.94	1,070
6	6.20	425	6.05	388	10.62	2,520	9.19	1,700	8.44	1,320	7.74	976
8					10.37	2,370	9.15	1,680	8.48	1,340	7.52	888
10					10.10	2,210	9.02	1,610	8.47	1,340	7.34	816
12	6.15	412	6.02	380	9.90	2,090	8.93	1,560	8.46	1,330	7.18	752

Supplemental records.—July 11, 4:30 a.m., 20.42 ft, 15,600 cfs, 1 p.m., 18.15 ft, 9,900 cfs; July 12, 3 a.m., 18.10 ft, 9,800 cfs, 7:30 a.m., 20.04 ft, 14,400 cfs; July 15, 1 a.m., 12.96 ft, 3,930 cfs; July 22, 1 p.m., 11.30 ft, 2,930 cfs.

North Fork Solomon River near Downs, Kans.

Location.—Lat 39°31', long. 98°36', at west end of line between secs. 19 and 30, T. 6 S., R. 11 W., at bridge on U. S. Highway 24, 3 miles west of Downs, 4½ miles upstream from Oak Creek, and 6½ miles upstream from mouth.

Drainage area.—2,390 square miles.

Gage-height record.—Water-stage recorder graph except for the periods May 25-28, June 4, 5, 15, 17, 18, 6 a.m. July 19 to 10 a.m. July 22, 4 p.m. July 26 to 10 a.m. July 28, for which graph was drawn based on once-daily wire-weight gage readings. Gage heights partially estimated June 11; no gage-height record May 29-31, June 16, 19, July 1-8, 10 and insufficient gage-height record June 13, 14, 20, 28-30, July 9, 30, 31.

Discharge record.—Stage-discharge relation defined by current-meter measurements below 19,000 cfs and extended to peak stage by logarithmic plotting. Discharge for periods of insufficient or no gage-height record computed on basis of records for station at Kirwin and Solomon River at Beloit.

Maxima.—May-July 1951: Discharge, 35,700 cfs 12 m. July 12 (gage height, 30.41 ft).
1945 to April 1951: Discharge, 22,700 cfs Aug. 13, 1950 (gage height, 28.23 ft).

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	118	3,690	800	11	62	841	13,000	21	4,390	4,620	708
2	148	4,980	580	12	62	1,720	32,300	22	6,790	9,050	1,080
3	108	2,670	420	13	62	1,500	25,900	23	3,530	17,200	4,240
4	95	706	600	14	82	1,100	13,800	24	1,140	11,200	1,770
5	77	498	450	15	88	902	7,510	25	648	5,800	1,270
6	67	583	350	16	132	700	3,700	26	500	1,950	1,030
7	62	6,060	290	17	177	828	1,310	27	391	980	857
8	60	7,880	310	18	138	880	1,510	28	330	1,200	1,760
9	64	9,590	380	19	148	550	977	29	280	1,500	3,550
10	63	4,660	1,400	20	132	350	817	30	250	1,300	1,500
								31	240	-	800
Monthly mean discharge, in second-feet									659	3,516	4,031
Runoff, in acre-feet									40,530	209,200	247,900
Runoff, in inches									0.32	1.64	1.94

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	July 8		July 9		July 10		July 11		July 12		July 13	
2							18.98	3,310	29.41	29,200	29.48	29,600
4							21.52	5,490	29.56	30,100	29.31	28,600
6							22.61	6,870	29.75	31,300	29.07	27,200
8							23.65	8,570	29.98	32,800	28.87	26,000
10							24.81	11,100	30.28	34,800	28.74	25,300
N							25.47	12,800	30.41	35,700	28.70	25,100
2							25.76	13,600	30.35	35,300	28.70	25,100
4							26.14	14,600	30.18	34,100	28.70	25,100
6							27.00	17,500	29.98	32,800	28.65	24,800
8							27.97	21,500	29.79	31,500	28.57	24,400
10							28.81	25,700	29.65	30,600	28.36	23,400
12							29.25	28,200	29.58	30,200	28.02	21,700
	July 14		July 15		July 16		July 17		July 18		July 19	
2	27.61	19,900	23.74	8,740	21.98	6,050	14.22	1,520	12.75	1,190		
4	27.15	18,000	23.55	8,390	21.74	5,760	13.93	1,450	14.20	1,520	12.00	1,040
6	26.65	16,200	23.37	8,080	21.41	5,370	13.65	1,380	15.86	1,970		
8	26.24	15,000	23.23	7,840	20.89	4,830	13.38	1,320	16.18	2,080	11.81	1,010
10	25.86	13,800	23.09	7,600	20.00	4,070	13.21	1,280	15.91	1,990		
N	25.52	12,900	22.95	7,380	19.00	3,320	13.14	1,270	15.26	1,790	11.59	968
2	25.21	12,100	22.84	7,210	18.05	2,800	12.99	1,240	14.50	1,590		
4	24.92	11,300	22.73	7,040	17.14	2,430	12.85	1,210	13.68	1,380	11.48	951
6	24.65	10,700	22.62	6,890	16.32	2,130	12.90	1,220	13.00	1,240		
8	24.42	10,200	22.49	6,710	15.68	1,920	12.95	1,230	12.56	1,150	11.26	916
10	24.18	9,630	22.37	6,550	15.09	1,740	12.86	1,210	12.28	1,100		
12	23.95	9,150	22.20	6,330	14.60	1,620	12.66	1,170	12.13	1,070	11.02	880
	July 20		July 21		July 22		July 23		July 24		July 25	
2					9.76	704	16.90	2,330	16.73	2,270	13.52	1,340
4	10.87	859	9.99	736	9.92	726	19.00	3,320	16.05	2,030	13.37	1,310
6					10.16	759	20.17	4,210	15.63	1,900	13.26	1,290
8	10.72	838	9.86	717	10.50	807	20.72	4,670	15.38	1,830	13.15	1,270
10					11.20	907	21.02	4,960	15.18	1,770	13.09	1,260
N	10.57	817	9.75	702	12.80	1,200	21.26	5,210	14.98	1,710	13.06	1,250
2					13.67	1,380	21.43	5,390	14.78	1,660	13.05	1,250
4	10.42	796	9.65	690	13.80	1,420	21.49	5,460	14.56	1,600	13.04	1,250
6					13.49	1,340	21.30	5,250	14.33	1,550	13.02	1,240
8	10.28	776	9.58	680	13.10	1,260	20.55	4,520	14.09	1,490	12.97	1,230
10					13.25	1,290	19.15	3,420	13.89	1,440	12.91	1,220
12	10.13	755	9.67	692	14.75	1,650	17.80	2,690	13.69	1,390	12.85	1,210

Supplemental records.—July 10, 11 p.m., 11.73 ft, 992 cfs; July 22, 3 p.m., 13.82 ft, 1,420 cfs; July 22, 9 p.m., 13.04 ft, 1,250 cfs.

South Fork Solomon River at Alton, Kans.

Location. — Lat 39°27', long. 98°57', in SW¼ sec. 12, T. 7 S., R. 15 W., 1.1 miles south of Missouri Pacific Railroad in Alton. Datum of gage is 1,598.20 ft above mean sea level, datum of 1929 (levels by Bureau of Reclamation).

Drainage area. — 1,720 square miles.

Gage-height record. — Water-stage recorder graph prior to July 12, except for periods May 24-29, June 10, 11, 16-20, July 5-7, 13-15, 18, for which graph was drawn based on one or more daily wire-weight gage readings. No gage-height record May 30, June 26, July 1-4, 16, 17, 19-31.

Discharge record. — Stage-discharge relation defined by current-meter measurements below 25,000 cfs and extended to peak stage on basis of contracted-opening and slope-area determinations. Discharge for periods of no gage-height record prior to July 12, July 19-31, when gage was destroyed, computed on basis of records for station at Osborne and North Fork Solomon River near Downs.

Maxima. — May-July 1951: Discharge, 91,900 cfs, 8 p.m. July 12 (gage height, 27.10 ft, from floodmarks).

1919-25, 1928-32, 1942 to April 1951: Discharge, 11,500 cfs June 16, 1943; gage height, 21.5 ft Sept. 19, 1919, present datum.

Maximum stage known prior to 1951, 24.5 ft Aug. 1, 1928.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	90	370	950	11	38	1,100	17,000	21	2,590	820	660
2	67	810	750	12	38	1,780	52,900	22	11,600	13,100	1,000
3	58	482	700	13	38	1,430	19,900	23	5,340	13,900	4,000
4	48	300	850	14	40	2,500	3,540	24	1,220	3,700	3,000
5	44	247	634	15	44	3,060	2,370	25	781	1,690	1,600
6	41	1,370	522	16	76	915	1,850	26	574	1,100	1,100
7	38	7,950	448	17	206	632	1,500	27	465	1,650	800
8	38	4,290	728	18	259	503	1,260	28	408	4,700	600
9	41	2,190	1,040	19	170	454	900	29	382	3,270	520
10	41	1,080	1,920	20	208	408	750	30	350	1,540	470
								31	314	-	440
Monthly mean discharge, in second-feet									827	2,578	4,023
Runoff, in acre-feet									50,870	153,400	247,300
Runoff, in inches									0.55	1.67	2.70

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	July 8		July 9		July 10		July 11		July 12		July 13	
2					5.7	756	19.8	17,100	23.8	36,400		
4					5.6	732	16.0	6,860	24.5	42,800	23.5	34,100
6	4.5	486	7.3	1,180	5.5	708	14.7	5,140	25.2	51,300		
8					5.4	685	17.0	8,680	24.1	38,900	21.3	22,700
10					5.3	662	19.3	15,300	23.6	34,800		
N	5.1	616	6.7	1,000	5.25	650	19.53	16,100	24.2	39,800	19.1	14,600
2					5.5	708	19.62	16,400	24.9	47,400		
4					6.0	830	20.25	18,700	25.7	58,900	17.3	9,280
6	6.25	892	6.2	880	7.2	1,150	21.10	21,900	26.3	70,600		
8					9.8	1,930	22.02	25,800	27.1	91,900	16.0	6,860
10					15.0	5,490	22.60	28,700	26.6	77,800		
12	8.0	1,390	5.9	805	19.7	16,700	22.80	29,700	25.7	58,900	14.8	5,250
	July 14		July 15		July 16		July 17		July 18		July 19	
2												
4												
6	13.6	4,050	11.3	2,500								
8												
10												
N	12.6	3,270	11.0	2,360	9.5	1,840	8.3	1,480	7.5	1,240		
2												
4												
6	12.0	2,880	10.7	2,240								
8												
10												
12	11.6	2,650	10.3	2,080	8.8	1,630	8.0	1,390	7.2	1,150		

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South Fork Solomon River at Osborne, Kans.

Location. – Lat 39°26', long. 98°42', on line between secs. 19 and 20, T. 7 S., R. 12 W., at bridge on U. S. Highway 281, half a mile south of Osborne, and 0.6 mile downstream from mouth of Covert Creek.

Drainage area. – 2,024 square miles.

Gage-height record. – Water-stage recorder graph except for periods May 21, 25-29, June 1-4, 6, 11, 12, 17-21, 27, July 2-4, 6-10, July 19 to 7 a.m. July 23, July 27-31, for which graph was drawn based on wire-weight gage readings made one or more times daily, and May 30, 31, June 5, July 5, when there was no gage-height record.

Discharge record. – Stage-discharge relation defined by current-meter measurements below 16,000 cfs and by contracted-opening and slope area determinations of peak discharge.

Maxima. – May-July 1951: Discharge, 81,200 cfs 2 a.m. July 13 (gage height, 27.65 ft).
1946 to April 1941: Discharge, 10,000 cfs Aug. 29, 1950 (gage height, 20.13 ft).

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	178	438	1,900	11	75	1,540	17,400	21	3,500	1,450	892
2	124	1,710	1,160	12	71	2,130	53,500	22	8,540	12,200	1,630
3	98	908	902	13	69	2,100	40,400	23	11,800	19,500	5,150
4	90	499	1,000	14	86	1,940	6,640	24	3,000	5,810	4,500
5	84	370	1,100	15	172	4,380	3,810	25	1,290	3,360	2,560
6	80	2,300	718	16	106	1,820	2,660	26	832	1,950	1,460
7	74	8,380	632	17	192	904	1,940	27	620	2,880	950
8	72	9,720	817	18	283	681	1,580	28	506	5,790	791
9	77	4,800	1,620	19	238	589	1,260	29	442	5,870	707
10	84	2,060	1,020	20	182	567	1,030	30	400	3,600	645
								31	350	-	594
Monthly mean discharge, in second-feet									1,088	3,675	5,193
Runoff, in acre-feet									66,870	218,700	319,300
Runoff, in inches									0.62	2.03	2.96

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	July 8		July 9		July 10		July 11		July 12		July 13	
2			11.70	1,480			10.80	1,240	23.40	24,300	27.65	81,200
4	8.32	708	12.27	1,640	10.19	1,100	19.00	6,900	24.52	33,100	27.46	77,400
6			12.65	1,760			22.15	17,600	25.65	46,100	26.92	66,600
8	8.47	735	12.93	1,860	9.76	1,010	22.41	18,800	26.40	57,400	26.16	53,600
10			13.07	1,900			22.85	21,000	27.00	68,200	25.33	42,000
N	8.71	782	12.92	1,850	9.42	932	23.03	22,100	27.18	71,800	24.47	32,600
2			12.66	1,760			22.95	21,600	26.91	66,400	23.59	25,400
4	8.97	834	12.35	1,660	9.27	899	22.92	21,400	26.46	58,400	22.75	20,600
6			11.96	1,550			23.03	22,100	26.16	53,600	22.00	16,800
8	9.39	926	11.55	1,430	9.60	972	23.08	22,400	26.20	54,200	21.36	14,300
10			11.17	1,330			23.04	22,100	26.65	61,700	20.82	12,400
12	10.50	1,170	10.83	1,250	10.28	1,120	23.06	22,300	27.29	74,000	20.35	10,800
	July 14		July 15		July 16		July 17		July 18		July 19	
2									13.81	1,620		
4									13.78	1,610		
6	19.27	7,580							13.73	1,590		
8									13.76	1,600		
10									13.78	1,610		
N	18.57	6,040	17.04	3,740	15.77	2,620	14.56	1,930	13.76	1,600	12.67	1,260
2									13.75	1,600		
4									13.77	1,610		
6	18.08	5,220							13.70	1,580		
8									13.55	1,520		
10									13.36	1,460		
12	17.67	4,600	16.44	3,150	15.19	2,250	13.88	1,650	13.23	1,420	12.14	1,120
	July 20		July 21		July 22		July 23		July 24		July 25	
2							15.75	2,600	16.98	3,680		
4					11.80	1,050	16.20	2,960	17.26	3,990		
6			11.15	920			17.50	4,350	17.95	5,020	16.27	3,020
8					12.86	1,310	18.81	6,520	18.40	5,700		
10							19.32	7,700	18.34	5,610		
N	11.72	1,030	10.94	881	13.65	1,560	19.19	7,380	18.12	5,280	15.58	2,490
2							18.85	6,600	17.83	4,840		
4					14.15	1,760	18.42	5,740	17.67	4,600		
6			10.73	850			18.00	5,100	17.34	4,110	14.82	2,060
8					15.44	2,400	17.63	4,540	17.14	3,840		
10							17.33	4,100	16.97	3,670		
12	11.34	958	10.89	874	15.66	2,540	17.09	3,790	16.80	3,500	14.30	1,820

Supplemental record. - July 12, 7 p.m., 26.11 ft, 52,800 cfs.

Solomon River at Beloit, Kans.

Location.—Lat 39°27', long. 98°07', in SW¼ sec. 9, T. 7 S., R. 7 W., in Beloit, 150 ft upstream from dam at city water plant and 1½ miles upstream from Leban Creek. Auxiliary wire-weight gage at bridge on State Highway 14, 450 ft downstream from recorder. Datum of both gages is 1,339.11 ft above mean sea level, datum of 1929.

Drainage area.—5,430 square miles.

Gage-height record.—Water-stage recorder graph except for periods May 1-8, 15-22, June 1, 2, 12-21, 1 p.m. July 7 to 5 p.m. July 9, 12 m. July 12 to July 31, for which a graph was drawn based on wire-weight gage readings made three times daily.

Discharge record.—Stage-discharge relation defined by current-meter measurements below 31,000 cfs and extended to peak stage on basis of study of relationship of peak discharges to drainage areas at adjacent sites.

Maxima.—May-July 1951: Discharge, 125,000 cfs 4 a.m. July 13 (gage height, 39.30 ft).
1895-97, 1929 to April 1951: Discharge, 37,800 cfs June 3, 1935 (gage height, 34.5 ft, from graph based on gage readings and floodmarks) from rating curve extended above 25,000 cfs on basis of velocity-area studies.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	775	1,500	9,740	11	200	13,400	11,200	21	1,940	2,340	3,450
2	873	3,850	6,210	12	187	7,580	72,200	22	4,630	10,400	4,050
3	562	6,700	3,010	13	204	4,630	113,000	23	7,320	25,800	4,990
4	397	8,230	2,160	14	226	4,500	67,000	24	14,000	38,200	7,210
5	308	3,570	1,890	15	318	3,910	25,400	25	12,000	27,900	8,580
6	259	1,880	2,400	16	574	4,160	12,500	26	6,450	14,200	7,380
7	231	6,020	1,820	17	824	5,140	9,160	27	2,100	9,140	5,220
8	222	13,100	1,500	18	1,160	3,040	6,920	28	1,450	7,030	3,390
9	250	22,200	1,520	19	960	2,120	5,510	29	1,180	7,110	3,620
10	222	19,300	2,500	20	782	1,530	4,410	30	1,170	9,880	5,310
								31	1,180	-	3,980
Monthly mean discharge, in second-feet									2,031	9,612	13,460
Runoff, in acre-feet									124,900	572,000	827,600
Runoff, in inches									0.43	1.97	2.86

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	July 8		July 9		July 10		July 11		July 12		July 13	
2					16.10	1,720	24.73	7,680	32.63	25,200	39.18	121,000
4			15.78	1,380	16.10	1,720	25.78	8,760	34.30	32,800	39.30	125,000
6					16.14	1,770	26.52	9,640	35.55	43,000	39.25	124,000
8			15.80	1,400	16.17	1,800	26.99	10,300	36.46	58,300	39.20	122,000
10					16.23	1,880	27.30	10,700	37.17	72,400	39.14	120,000
N	15.89	1,490	15.88	1,480	16.30	1,960	27.48	11,000	37.60	81,200	38.98	115,000
2					16.43	2,130	27.64	11,300	37.86	86,900	38.86	112,000
4			15.98	1,590	16.48	2,190	27.84	11,700	38.06	91,400	38.73	108,000
6					16.56	2,300	28.12	12,200	38.24	95,800	38.59	105,000
8			16.07	1,690	18.30	3,690	28.67	13,300	38.50	102,000	38.46	101,000
10					21.63	5,300	29.72	15,700	38.76	109,000	38.32	97,700
12	15.81	1,410	16.10	1,720	21.72	5,350	31.08	19,600	39.00	116,000	38.17	94,100
	July 14		July 15		July 16		July 17		July 18		July 19	
2	38.02	90,500									22.44	5,810
4	37.86	86,900	34.47	33,700	29.22	14,500	26.63	9,780			22.27	5,690
6	37.68	83,000							24.43	7,410	22.12	5,590
8	37.49	78,800	33.69	29,800	28.62	13,200	26.28	9,340			21.97	5,500
10	37.24	73,800									21.90	5,460
N	36.91	67,200	32.57	24,900	28.06	12,100	26.03	9,040	23.86	6,890	21.94	5,480
2	36.56	60,200									22.10	5,580
4	36.32	55,800	31.12	19,700	27.65	11,300	25.86	8,850			22.04	5,540
6	36.08	51,400							23.14	6,310	21.88	5,450
8	35.82	46,900	30.25	17,100	27.31	10,800	25.70	8,670			21.67	5,320
10	25.52	42,700									21.47	5,200
12	35.19	39,000	29.72	15,700	27.00	10,300	25.28	8,230	22.59	5,910	21.26	5,080
	July 20		July 21		July 22		July 23		July 24		July 25	
2			18.41	3,730	17.34	3,260	20.09	4,440	23.16	6,330	25.94	8,930
4			18.22	3,660	17.47	3,350	20.11	4,460	23.39	6,510	25.99	8,990
6			18.05	3,590	18.01	3,570	20.18	4,490	23.57	6,660	25.98	8,980
8			17.90	3,530	18.87	3,920	20.37	4,580	23.68	6,740	25.92	8,910
10			17.77	3,480	19.59	4,210	20.60	4,700	23.82	6,860	25.82	8,800
N	19.94	4,370	17.65	3,430	19.84	4,320	20.86	4,840	24.00	7,020	25.72	8,690
2			17.54	3,390	19.98	4,390	21.16	5,020	24.23	7,230	25.58	8,540
4			17.45	3,340	20.06	4,430	21.48	5,210	24.50	7,470	25.44	8,390
6			17.37	3,290	20.10	4,450	21.82	5,410	24.82	7,770	25.29	8,240
8			17.32	3,250	20.10	4,450	22.20	5,640	25.16	8,110	25.17	8,120
10			17.30	3,230	20.09	4,440	22.54	5,880	25.47	8,420	25.07	8,020
12	18.62	3,820	17.30	3,230	20.08	4,440	22.86	6,100	25.74	8,710	25.00	7,950

Supplemental records.—July 10, 11:30 p.m., 21.52 ft, 5,230 cfs; July 25, 5 a.m., 26.00 ft, 9,000 cfs.

Solomon River at Minneapolis, Kans.

Location. – Lat 39°07', long. 97°43', in SE¼ sec. 1, T. 11 S., R. 4 W., on upstream railing of highway bridge at southwest corner of Minneapolis. Datum of gage is 1,217.43 ft above mean sea level.
Drainage area. – 6,039 square miles.
Gage-height record. – Wire-weight gage readings made frequently during flood periods.
Maxima. – May-July 1951: Gage-height, 34.14 ft, 10 p.m., July 13.
1943 to April 1951: Gage-height, 32.17 ft, July 21, 1948.
Remarks. – Records furnished by U. S. Weather Bureau.

Daily stage, in feet, 1951

Day	June	July	Day	June	July	Day	June	July
1	-	26.9	11	31.0	26.1	21	24.4	25.3
2	-	27.1	12	31.6	33.2	22	28.5	22.6
3	-	28.6	13	31.4	33.5	23	31.3	22.8
4	-	26.7	14	30.2	33.9	24	29.3	21.4
5	20.0	18.0	15	27.1	33.0	25	31.5	21.1
6	22.2	16.0	16	22.3	32.5	26	31.8	22.7
7	25.1	-	17	18.1	32.2	27	32.2	26.8
8	22.6	-	18	-	31.9	28	31.8	26.9
9	24.6	-	19	19.0	31.2	29	31.4	24.5
10	26.7	14.7	20	16.3	28.5	30	29.6	18.3
						31	-	18.5

Supplemental records. – July 11, 12 m, 30.90 ft, 9 p.m., 33.40 ft; July 12, 10 p.m., 33.86 ft; July 13, 10 p.m., 34.14 ft; July 27, 6:30 p.m., 27.24 ft.

Solomon River at Niles, Kans.

Location. – Lat 38°58', long. 97°29', in NW¼ sec. 31, T. 12 S., R. 1 W., at county highway bridge three-quarters of a mile west of Niles and 12 miles upstream from mouth.
Drainage area. – 6,770 square miles.
Gage-height record. – Water-stage recorder graph except for periods June 16, 17, June 30 to July 2, for which a graph was drawn based on two or three wire-weight gage readings daily.
Discharge record. – Stage-discharge relation defined by current-meter measurements. Shifting-control method used June 28, 29.
Maxima. – May-July 1951: Discharge, 178,000 cfs 6 a.m. July 14 (gage height, 31.76 ft).
1897-1903, 1917 to April 1951: Discharge observed, 41,000 cfs June 3, 1903 (gage height, 33.8 ft, datum about 1½ ft lower than present) by rainfall-runoff studies.
Remarks. – Some diurnal fluctuation caused by power plants above station.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	1,570	1,580	17,900	11	512	11,700	17,400	21	2,900	19,300	12,300
2	2,210	1,900	14,100	12	489	13,600	63,800	22	4,680	16,300	8,280
3	1,780	4,010	14,000	13	472	14,900	68,200	23	6,100	15,500	6,470
4	1,350	4,640	14,600	14	459	15,200	157,000	24	5,880	15,500	5,970
5	1,080	4,950	11,500	15	462	14,300	90,500	25	5,800	16,100	5,470
6	834	5,400	5,260	16	541	12,500	49,400	26	5,450	16,400	5,250
7	694	7,680	3,240	17	711	8,040	36,400	27	6,040	19,700	5,990
8	603	9,550	3,090	18	1,500	5,330	28,400	28	7,220	29,000	7,100
9	562	10,200	2,960	19	2,460	4,600	22,500	29	8,510	28,000	7,520
10	545	10,400	3,260	20	2,310	4,200	16,800	30	5,520	23,900	6,560
								31	1,980	-	4,110
Monthly mean discharge, in second-feet									2,620	12,150	23,080
Runoff, in thousand acre-feet									161.1	722.7	1,419
Runoff, in inches									0.45	2.00	3.93

Solomon River at Niles, Kans.—Continued

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge
	July 8		July 9		July 10		July 11		July 12		July 13	
2							22.59	5,240	29.51	25,300		
4					16.65	2,760	24.42	6,220	29.65	26,800	30.87	53,400
6	17.45	3,060	17.42	3,050			25.88	7,100	29.73	27,800		
8					16.63	2,750	27.21	8,840	30.08	32,500	30.90	54,900
10							28.14	13,900	31.18	79,800		
N	17.50	3,080	17.19	2,960	17.20	2,960	29.14	21,700	31.45	118,000	30.90	54,900
2							29.59	26,200	31.41	111,000		
4					18.76	3,580	29.65	26,800	31.29	93,700	30.88	53,900
6	17.62	3,130	16.94	2,860			29.63	26,600	31.18	79,800		
8					19.44	3,860	29.57	26,000	31.08	68,800	31.25	88,600
10							29.52	25,400	31.00	61,300		
12	17.60	3,120	16.78	2,800	20.92	4,470	29.50	25,200	30.94	57,500	31.62	149,000
	July 14		July 15		July 16		July 17		July 18		July 19	
2	31.70	165,000										
4	31.74	173,000										
6	31.76	178,000										
8	31.73	171,000										
10	31.70	165,000										
N	31.67	159,000	31.24	87,300	30.75	47,900	30.31	36,400	29.76	28,100	29.23	22,500
2	31.66	157,000										
4	31.64	153,000										
6	31.61	147,000										
8	31.59	143,000										
10	31.55	136,000										
12	31.50	126,000	31.00	61,300	30.50	40,400	30.06	32,200	29.52	25,400	28.90	19,500
	July 20		July 21		July 22		July 23		July 24		July 25	
2												
4							25.53	6,890				
6					27.29	9,160			24.10	6,040	23.39	5,640
8							25.09	6,620				
10												
N	28.54	16,700	27.89	12,400	26.94	7,900	24.69	6,380	24.02	5,990	23.03	5,460
2												
4							24.40	6,210				
6					26.55	7,500			23.90	5,920	22.69	5,300
8							24.23	6,110				
10												
12	28.20	14,300	27.46	10,000	25.97	7,150	24.14	6,060	23.68	5,800	22.45	5,180

Smoky Hill River near Abilene, Kans.

Location.—Lat 38°54', long. 97°17', in SE¼ sec. 23, T. 13 S., R. 1 E., at Sand Spring pumping station on left bank 4 miles west of Abilene.
Drainage area.—18,877 square miles.
Gage-height record.—Staff gage readings made frequently during flood periods.
Maxima.—May-July 1951: Gage-height 29.40 ft, 12 m., July 14.
1904-21, 1945 to April 1951: Gage-height, 26.1 ft July 23, 1948.
Stage of 27.3 ft occurred May 29, 1903.
Remarks.—Records furnished by U. S. Weather Bureau.

Daily stage, in feet, 1951

Day	June	July	Day	June	July	Day	June	July
1	14.0	24.8	11	25.2	22.4	21	19.5	23.6
2	-	24.2	12	25.5	26.5	22	23.7	22.9
3	-	23.7	13	25.9	28.4	23	24.8	21.8
4	-	24.0	14	26.1	29.4	24	24.5	19.9
5	-	23.9	15	25.1	28.5	25	24.6	18.7
6	-	23.4	16	24.4	27.2	26	24.4	18.0
7	20.9	22.4	17	23.3	26.4	27	25.2	18.5
8	25.4	21.5	18	22.2	25.5	28	26.2	19.3
9	25.1	20.1	19	20.3	24.9	29	25.8	20.5
10	25.7	19.4	20	18.8	24.2	30	25.5	21.2
						31	-	20.4

Supplemental records.—June 9, 6:00 p.m., 25.90 ft; June 25, 2:30 p.m., 24.55 ft, June 28, 1 p.m., 26.25 ft; July 12, 12 p.m., 28.95 ft; July 13, 6 p.m., 28.20 ft, July 14, 12 m. 29.40 ft.

Smoky Hill River at Enterprise, Kans.

Location.—Lat 38°54', long. 97°07', in NE¼ sec. 20, T. 13 S., R. 3 E., in Enterprise, at Atchison, Topeka & Santa Fe Railroad bridge, and 14 miles upstream from Chapman Creek. Datum of gage is 1,098.14 ft above mean sea level, datum of 1929.
Drainage area.—19,200 square miles.
Gage-height record.—Water-stage recorder graph.
Discharge record.—Stage-discharge relation defined by current-meter measurements below 55,000 cfs and by slope-area determination of peak discharge.
Maxima.—May-July 1951: Discharge, 233,000 cfs 2 p.m. July 14 (gage height, 33.96 ft).
1934 to April 1951: Discharge, 37,800 cfs Oct. 20, 1941 (gage height, 30.20 ft).
1903-33: Discharge, 90,000 cfs in May 1903 (stage, about 32 ft) from information by Corps of Engineers.
Remarks.—Flow partially regulated by Kanopolis Reservoir (see page 75).

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	6,950	7,480	45,400	11	3,830	21,900	51,100	21	6,390	13,800	21,600
2	7,200	6,480	27,400	12	3,680	21,500	142,000	22	7,540	19,100	20,100
3	5,330	6,430	25,000	13	2,450	23,200	180,000	23	10,600	27,500	18,200
4	3,550	9,300	25,400	14	1,840	25,900	207,000	24	12,300	27,400	14,600
5	2,640	10,100	24,300	15	1,680	26,700	164,000	25	12,000	27,300	12,400
6	2,200	10,700	22,000	16	2,540	24,900	99,300	26	11,300	27,200	11,500
7	1,880	18,900	19,600	17	5,600	21,100	60,500	27	11,200	31,700	11,800
8	1,580	22,400	17,400	18	7,620	18,800	36,900	28	12,200	53,400	12,400
9	1,450	21,200	14,700	19	9,860	15,600	28,700	29	13,600	54,600	13,400
10	3,250	22,400	17,900	20	8,550	12,600	24,600	30	14,800	45,400	14,400
								31	13,400	-	13,900
Monthly mean discharge, in second-feet									6,742	22,500	45,080
Runoff, in thousand acre-feet									414.6	1,339	2,772
Runoff, in inches									0.40	1.31	2.71

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	July 8		July 9		July 10		July 11		July 12		July 13	
2	27.90	18,300	26.04	15,800	26.09	15,900	30.16	27,600	31.35	59,200	33.78	215,000
4	27.80	18,200	25.81	15,600	26.92	16,900	30.32	29,500	31.68	74,100	33.68	206,000
6	27.68	18,000	25.61	15,400	27.18	17,300	30.45	31,400	32.05	92,500	33.59	198,000
8	27.58	17,800	25.37	15,100	27.28	17,400	30.63	34,600	32.47	116,000	33.47	188,000
10	27.45	17,600	25.17	14,900	27.36	17,500	30.91	41,800	32.69	129,000	33.36	179,000
N	27.33	17,500	24.95	14,600	27.46	17,600	31.32	57,900	32.88	143,000	33.28	172,000
2	27.18	17,300	24.72	14,400	27.59	17,800	31.63	71,800	33.06	155,000	33.23	168,000
4	27.04	17,100	24.50	14,200	27.71	18,000	31.72	76,000	33.20	166,000	33.19	165,000
6	26.86	16,800	24.30	13,900	27.86	18,300	31.66	73,200	33.48	188,000	33.15	162,000
8	26.66	16,600	24.16	13,800	27.96	18,400	31.53	67,400	33.76	213,000	33.13	160,000
10	26.47	16,400	24.21	13,800	28.97	20,400	31.40	61,500	33.89	226,000	33.12	160,000
12	26.26	16,100	24.82	14,500	29.72	23,700	31.33	58,400	33.84	221,000	33.12	160,000
	July 14		July 15		July 16		July 17		July 18		July 19	
2	33.16	163,000	33.59	198,000	32.55	121,000						
4	33.26	171,000	33.53	193,000	32.47	116,000	31.61	71,000				
6	33.48	188,000	33.44	185,000	32.38	111,000						
8	33.69	207,000	33.36	179,000	32.30	106,000	31.48	65,100	30.80	38,500	30.31	29,300
10	33.86	223,000	33.27	172,000	32.24	102,000						
N	33.95	232,000	33.18	164,000	32.16	98,000	31.37	60,200				
2	33.96	233,000	33.08	157,000	32.09	94,500						
4	33.94	231,000	32.99	150,000	32.03	91,500	31.25	55,000	30.60	34,000	30.16	27,600
6	33.88	225,000	32.89	143,000	31.94	87,000						
8	33.79	216,000	32.83	139,000	31.86	83,000	31.14	50,600				
10	33.73	211,000	32.72	131,000	31.79	79,500						
12	33.61	200,000	32.63	126,000	31.75	77,500	31.00	45,000	30.45	31,400	30.08	26,800
	July 20		July 21		July 22		July 23		July 24		July 25	
2												
4												
6			29.47	22,000			28.21	18,900	25.74	15,500	23.18	12,700
8												
10												
N	29.83	24,500	29.36	21,500	28.85	20,200	27.93	18,400	24.80	14,500	22.88	12,400
2												
4												
6			29.27	21,200			27.44	17,600	24.06	13,700	22.60	12,100
8												
10												
12	29.58	22,700	29.13	20,800	28.43	19,300	26.76	16,700	23.57	13,100	22.34	11,800

Supplemental record.—July 9, 9 p.m., 24.08 ft, 13,700 cfs.

Kansas River at Ogden, Kans.

Location.—Lat 39°06'15", long. 96°41'55", in SE¼ SW¼ sec. 7, T. 11 S., R. 7 E., on downstream end of first pier from right bank of highway bridge three-quarters of a mile south of Ogden and 10 miles downstream from confluence of Smoky Hill and Republican Rivers. Datum of gage is 1,020.83 ft above mean sea level (levels by Corps of Engineers).

Drainage area.—45,240 square miles.

Gage-height record.—Water-stage recorder graph except for periods May 1-5, 7-9, 11, 12, 14, 16-19, 21, July 18-25, for which graph was drawn based on once or twice-daily wire-weight gage readings, and May 6, 10, 13, 15, 20, 10 a.m. July 13 to July 17, July 26, 27, when there was no gage-height record.

Discharge record.—Stage-discharge relation defined by current-meter measurements below 60,000 cfs and by slope-area determination of peak discharge. Discharge for periods of no gage-height record computed on basis of records for stations upstream and downstream, and computed inflow from ungaged tributaries.

Maxima.—May-July 1951: Discharge, 298,000 cfs 10 p.m. July 12 (gage height, 30.53 ft).
1917 to April 1951: Discharge, 170,000 cfs June 3, 1935 (gage height, 28.03 ft), from rating curve extended above 30,000 cfs on basis of velocity-area studies.
Flood in May 1903 reached a stage of about 28.5 ft, from information by Corps of Engineers.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	21,400	16,100	58,300	11	6,260	30,800	153,000	21	16,500	27,100	36,100
2	16,800	11,600	44,200	12	6,410	30,800	251,000	22	14,200	45,200	36,000
3	11,900	15,900	36,700	13	5,200	29,600	283,000	23	16,200	62,300	34,100
4	9,380	20,200	33,100	14	4,480	27,800	252,000	24	23,800	76,500	28,700
5	7,430	16,800	31,200	15	4,000	33,200	243,000	25	20,000	56,000	22,000
6	6,200	16,400	29,400	16	9,940	33,500	156,000	26	19,000	44,200	19,500
7	5,240	31,600	27,000	17	12,900	32,900	95,600	27	16,700	45,100	19,000
8	4,540	37,800	23,100	18	13,400	30,200	63,600	28	16,000	54,500	17,400
9	4,140	43,900	19,500	19	20,500	25,600	45,900	29	16,800	94,600	17,400
10	5,100	37,100	61,700	20	18,000	21,200	39,000	30	18,000	78,200	19,100
								31	17,700	-	19,900
Monthly mean discharge, in second-feet									12,520	37,560	71,480
Runoff, in thousand acre-feet									769.8	2,235	4,395
Runoff, in inches									0.32	0.93	1.82

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge
	July 8		July 9		July 10		July 11		July 12		July 13	
2					13.95	21,000	21.75	83,200	27.29	199,000	30.38	293,000
4			13.84	20,600	15.64	28,200	22.03	87,400	27.51	206,000	30.41	294,000
6					17.24	36,900	22.59	95,800	27.82	215,000	30.43	295,000
8			13.68	19,900	18.45	44,600	24.55	134,000	28.20	226,000	30.43	295,000
10					19.54	54,400	25.71	158,000	28.75	243,000	30.37	292,000
N	14.48	23,100	13.50	19,200	21.05	72,800	26.18	170,000	29.23	257,000		292,000
2					21.89	85,400	26.57	179,000	29.51	266,000		283,000
4			13.39	18,800	22.22	90,300	27.02	191,000	29.59	268,000		278,000
6					22.14	89,100	27.32	200,000	30.26	289,000		272,000
8			13.30	18,400	21.88	85,200	27.40	202,000	30.49	297,000		265,000
10					21.71	82,600	27.35	201,000	30.53	298,000		259,000
12	14.00	21,200	13.33	18,600	21.65	81,800	27.27	199,000	30.50	297,000		252,000
	July 14		July 15		July 16		July 17		July 18		July 19	
2												
4		238,000		266,000		185,000		109,000				
6									19.90	72,800	17.13	47,900
8		231,000		257,000		168,000		101,000				
10												
N		246,000		246,000		153,000		93,500	18.90	62,000	16.77	45,600
2												
4		263,000		233,000		139,000		89,000				
6									18.10	54,800	16.44	43,600
8		274,000		217,000		128,000		83,000				
10												
12		274,000		202,000		118,000		78,000	17.60	51,200	16.14	41,800
	July 20		July 21		July 22		July 23		July 24		July 25	
2												
4												
6	15.82	39,900	15.25	36,500	15.08	35,500	15.07	35,400	14.16	30,100	12.98	23,900
8												
10												
N	15.60	38,600	15.17	36,000	15.08	35,500	14.92	34,500	13.91	28,700	12.65	22,200
2												
4												
6	15.50	38,000	15.10	35,600	15.12	36,700	14.60	32,600	13.65	27,300	12.15	19,900
8												
10												
12	15.38	37,300	15.09	35,500	15.12	36,700	14.40	31,400	13.34	25,700	11.80	18,300

Supplemental records.—July 14, about 10 p.m., 274,000 cfs (gage height, 28.3 ft, from high water mark).

Kansas River at Manhattan, Kans.

Location. – Lat 39°10'30", long. 96°33'15", in SW¼ sec. 17, T. 10 S., R. 8 E., on downstream railing of highway bridge on State Highways 13 and 29 at south edge of Manhattan. Datum of gage is 986.62 ft above mean sea level.
Drainage area. – 45,464 square miles.
Gage-height record. – Wire-weight gage read once daily, more frequently during flood periods.
Maxima. – May-July 1951: Gage-height, 33.40 ft, 3 a.m., July 13.
1904-14, 1921 to April 1951: Gage height, 28.0 ft, June 4, 1945.
Stage of about 40 ft occurred June 1844.
Remarks. – Records furnished by U. S. Weather Bureau.

Daily stage, in feet, 1951

Day	June	July	Day	June	July	Day	June	July
1	14.4	24.4	11	18.9	26.4	21	16.1	20.3
2	12.2	22.2	12	18.0	30.5	22	23.2	19.2
3	12.6	20.6	13	18.6	32.0	23	24.8	19.2
4	17.7	19.6	14	17.8	29.9	24	25.1	18.5
5	16.4	19.1	15	19.0	29.8	25	24.3	16.9
6	16.6	18.9	16	21.0	27.9	26	22.3	15.1
7	19.0	19.0	17	21.3	25.4	27	22.8	15.5
8	21.5	18.3	18	19.5	23.9	28	23.7	14.6
9	22.9	17.1	19	17.9	22.5	29	26.2	14.4
10	21.5	21.2	20	16.5	21.5	30	25.9	14.6
						31	-	15.0

Supplemental records. – June 9, 12 m, 23.00 ft; June 24, 1 p.m., 25.22 ft; June 29, 6 p.m., 26.80 ft; July 9, 5 p.m., 16.10 ft; July 11, 4:30 p.m., 29.00 ft; July 13, 3 a.m., 33.40 ft; July 14, 7 p.m., 29.50 ft; July 15, 7:30 a.m., 29.84 ft.

Big Blue River near Crete, Nebr.

Location. – Lat 40°35'40", long. 96°57'35", in S½ sec. 3, T. 7 N., R. 4 E., at bridge on State Highway 82, 1.8 miles south from Missouri Pacific Railroad station in Crete, 3.3 miles downstream from Walnut Creek, 3.6 miles upstream from Squaw Creek. Datum of gage is 1,311.5 ft above mean sea level, datum of 1929.
Drainage area. – 2,680 square miles.
Gage-height record. – Wire-weight gage read twice daily. Gage heights above 12 ft obtained from graph based on gage readings.
Discharge record. – Stage-discharge relation defined by current-meter measurements. Stage-discharge relation below about 12 ft affected by backwater from power dam downstream; discharge computed only for stages above 12 ft.
Maxima. – May-July 1951: Discharge, 25,500 cfs 4 a.m. June 3 (gage height, 28.3 ft).
1945 to April 1951: Discharge, 27,600 cfs July 10, 1950 (gage height, 28.74 ft).

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1				11				21		2,370	
2		13,500		12				22		2,580	
3		20,800		13				23		1,400	
4		11,800		14		1,870		24			
5		7,710		15				25		1,520	
6		4,860		16				26		1,740	
7		3,130		17				27			
8		1,990		18		3,830		28			
9				19		6,850		29			
10				20		3,390		30			
								31			
Monthly mean discharge, in second-feet									-	-	-
Runoff, in acre-feet									-	-	-
Runoff, in inches									-	-	-

Big Blue River at Barneston, Nebr.

Location. – Lat 40°03', long. 96°35', in NE¼SW¼ sec. 13, T. 1 N., R. 7 E., in tailwater of power plant, three-quarters of a mile northwest of Barneston, 2 miles upstream from Plum Creek, and 5 miles upstream from Nebraska-Kansas State line.

Drainage area. – 4,420 square miles.

Gage-height record. – Water-stage recorder graph except period July 25-31, for which a graph was drawn based on intermittent recorder record and occasional power plant tail-gage readings.

Discharge record. – Stage-discharge relation defined by current-meter measurements. Shifting-control method used May 4 to June 2, July 15-31.

Maxima. – May-July 1951: Discharge, 26,000 cfs 12 p.m. June 4 (gage height, 27.48 ft).
1932 to April 1951: Discharge, 57,700 cfs June 9, 1941 (gage height, 34.3 ft).

Remarks. – Low flow regulated by power plant at gage, which has pondage of about 1,500 acre-feet. High flow occasionally affected for short periods by operation of trash gates.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	15,200	738	3,210	11	638	3,820	13,700	21	1,010	10,100	1,010
2	7,910	11,600	2,680	12	521	4,990	18,200	22	2,160	12,900	1,360
3	2,180	20,100	2,020	13	448	2,800	15,100	23	994	14,100	998
4	1,100	22,700	1,670	14	519	8,310	6,330	24	696	10,100	699
5	842	24,000	1,370	15	573	19,000	3,980	25	1,130	4,400	554
6	565	19,400	10,200	16	648	12,000	2,470	26	2,040	15,900	518
7	616	19,900	17,400	17	998	3,350	1,990	27	1,080	17,600	515
8	596	12,500	5,750	18	923	2,400	8,130	28	1,070	11,200	518
9	596	5,710	1,530	19	1,500	6,100	2,440	29	970	4,740	440
10	624	3,210	1,740	20	1,130	6,850	1,360	30	954	3,390	410
								31	811	–	419
Monthly mean discharge, in second-feet									1,647	10,460	4,152
Runoff, in acre-feet									101,200	622,600	255,300
Runoff, in inches									0.43	2.64	1.08

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge
	July 8		July 9		July 10		July 11		July 12		July 13	
2	19.36	10,700	8.77	2,110	7.84	1,620	12.17	3,870	24.44	18,700	24.15	18,100
4	18.10	9,220	8.64	2,030	7.76	1,580	18.10	9,220	24.36	18,500	24.05	17,900
6	16.60	7,840	8.51	1,960	7.64	1,520	19.05	10,300	24.32	18,400	23.90	17,600
8	15.28	6,720	8.44	1,920	7.60	1,500	20.70	12,600	24.14	18,100	23.66	17,200
10	14.10	5,780	5.75	738	7.68	1,540	21.85	14,300	24.04	17,900	23.34	16,600
N	13.08	4,960	5.74	734	7.42	1,410	22.65	15,500	24.04	17,900	22.92	15,900
2	12.19	4,330	5.74	734	7.68	1,540	23.25	16,500	24.08	18,000	22.42	15,100
4	11.25	3,680	7.10	1,250	7.80	1,600	23.71	17,300	24.14	18,100	21.76	14,100
6	10.40	3,090	7.52	1,460	7.94	1,670	23.99	17,800	24.18	18,200	20.91	12,900
8	9.74	2,690	8.17	1,780	8.28	1,840	24.18	18,200	24.20	18,200	19.90	11,400
10	9.28	2,420	7.98	1,690	9.31	2,440	24.34	18,500	24.22	18,300	18.95	10,200
12	8.98	2,240	7.91	1,660	10.95	3,460	24.42	18,600	24.20	18,200	18.10	9,220
	July 14		July 15		July 16		July 17		July 18		July 19	
2	17.22	8,400	12.76	4,710	10.84	3,170	9.73	2,410	8.25	1,520	12.65	4,620
4	16.42	7,680	12.54	4,530	10.76	3,110	9.60	2,320	10.00	2,600	11.88	4,000
6	15.72	7,080	12.35	4,380	10.63	3,020	9.45	2,210	14.60	6,180	11.12	3,400
8	15.14	6,610	12.16	4,230	10.56	2,980	9.30	2,120	19.61	11,000	10.46	2,910
10	14.65	6,220	11.96	4,070	9.50	2,250	9.16	2,030	20.65	12,500	10.00	2,600
N	14.28	5,920	11.79	3,930	5.93	545	9.07	1,970	20.93	12,900	9.64	2,330
2	14.02	5,720	11.65	3,820	8.40	1,600	8.94	1,900	20.56	12,300	9.40	2,180
4	13.80	5,540	11.48	3,680	9.60	2,320	8.80	1,820	19.60	11,000	7.83	1,300
6	13.61	5,390	11.32	3,560	10.00	2,590	8.71	1,770	18.40	9,540	5.94	548
8	13.42	5,240	11.16	3,420	10.00	2,590	8.60	1,710	16.75	7,980	5.92	542
10	13.20	5,060	11.06	3,350	9.98	2,570	8.47	1,640	15.05	6,540	7.95	1,360
12	12.98	4,890	10.96	3,260	9.82	2,470	8.33	1,560	13.62	5,400	8.38	1,600

Big Blue River at Marysville, Kans.

Location.—Lat 39°50', long. 96°39', at common corner of secs. 28, 29, 32, 33, T. 2 S., R. 7 E., at downstream rail of highway bridge on U. S. Highway 36 at Marysville. Datum of gage is 1,110.10 ft above mean sea level.
Drainage area.—4,688 square miles.
Gage-height record.—Wire-weight gage read frequently during flood periods.
Maxima.—May-July 1951: Gage-height, 40.20 ft, 6 p.m. June 15.
October 1950 to April 1951: Continuous low flow.
Stage of 45.39 ft occurred June 9, 1941.
Remarks.—Records furnished by U. S. Weather Bureau.

Daily stage, in feet, 1951

Day	June	July	Day	June	July	Day	June	July
1	-	-	11	-	37.2	21	33.2	-
2	19.2	-	12	-	38.3	22	35.3	-
3	36.2	-	13	-	37.8	23	37.2	-
4	37.4	-	14	-	32.0	24	36.5	-
5	39.0	-	15	38.4	-	25	-	-
6	39.0	-	16	38.8	-	26	36.2	-
7	39.1	35.7	17	-	-	27	38.6	-
8	38.7	35.8	18	-	-	28	37.0	-
9	29.3	-	19	-	-	29	28.7	-
10	-	-	20	-	-	30	-	-
						31	-	-

Supplemental records.—June 5, 3 p.m., 39.50 ft; June 15, 6 p.m., 40.20 ft; June 22, 8 p.m., 37.70 ft; June 26, 5 p.m., 39.30 ft; July 6, 6 p.m., 32.70 ft; July 7, 9 p.m., 36.87 ft; July 10, 6 p.m., 26.25 ft; July 11, 12 m, 38.10 ft; July 12, 4 p.m., 39.35 ft.

Little Blue River at Angus, Nebr.

Location.—Lat 40°16'25", long. 97°58'20", in NW¼ sec. 35, T. 4 N., R. 6 W., at bridge on county road a quarter of a mile downstream from Ox Bow Creek, and half a mile southeast of Angus.
Gage-height record.—Wire-weight gage read twice daily and more frequently during rises. Gage heights computed from graphs based on gage readings June 1-8, 13-24, June 26 to July 2, July 10-18, 22.
Discharge record.—Stage-discharge relation defined by current-meter measurements below 6,000 cfs and extended to peak stage. Shifting-control method used June 26 to July 10, July 16-31.
Maxima.—May-July 1951: Discharge, 18,500 cfs 3 p.m. June 26 (gage height, 13.4 ft).
September 1950 to April 1951: Discharge, 11,800 cfs Sept. 21, 1950 (gage height, 12.1 ft, from floodmark).

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	201	1,800	506	11	99	169	4,490	21	264	243	186
2	165	7,630	354	12	95	142	6,120	22	414	1,060	401
3	137	2,130	284	13	93	474	4,660	23	264	820	222
4	124	613	231	14	102	823	2,720	24	198	577	166
5	115	318	207	15	100	810	1,850	25	153	317	151
6	108	247	188	16	97	679	743	26	196	10,800	145
7	102	720	174	17	118	280	350	27	214	14,800	133
8	99	495	167	18	119	1,370	293	28	139	7,440	126
9	97	356	154	19	330	862	252	29	130	3,040	126
10	126	247	1,910	20	256	352	214	30	126	996	121
								31	118	-	115
Monthly mean discharge, in second-feet									158	2,020	895
Runoff, in acre-feet									9,720	120,200	55,060
Runoff, in inches									-	-	-

Little Blue River at Angus, Nebr.—Continued

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	July 8		July 9		July 10		July 11		July 12		July 13	
2					2.00	158						
4					2.90	297	8.45	2,360	10.45	6,890		
6					4.25	627						
8					5.74	1,120	9.00	2,740	10.35	6,560	9.85	4,920
10					7.25	1,760						
N					8.70	2,490	9.70	4,440	10.20	6,060		
2					9.60	4,120						
4					9.55	3,960	10.20	6,060	10.10	5,730	9.78	4,700
6					8.90	2,630						
8					8.40	2,330	10.40	6,720	10.00	5,400		
10					8.25	2,260						
12			1.95	152	8.20	2,230	10.50	7,060	9.90	5,080	9.45	3,650
	July 14		July 15		July 16		July 17		July 18		July 19	
2												
4												
6			7.90	2,080	5.15	868	3.85	457				
8	8.98	2,720										
10												
N			7.70	1,980	4.55	670	3.45	358				
2												
4	8.70	2,490										
6			7.00	1,630	4.22	571	2.85	233				
8												
10												
12	8.20	2,230	6.05	1,220	4.00	509	2.60	191				

Little Blue River near Endicott, Nebr.

Location.—Lat 40°05'10", long. 97°08'10", in sec. 6, T. 1 N., R. 3 E., 300 feet downstream from county highway bridge, 1½ miles upstream from Chicago, Burlington and Quincy Railroad bridge, and 2 miles northwest of Endicott.

Drainage area.—2,340 square miles.

Gage-height record.—Water-stage recorder graph except period July 10-12.

Discharge record.—Stage-discharge relation defined by current-meter measurements. Shifting-control method used for stages below about 9 ft; for stages above 9 ft discharge computed by using rate of change in stage as a factor. Discharge for July 10-12 computed from graph based on gage readings obtained at bridge on State Highway 15 about 4 miles upstream.

Maxima.—May-July 1951: Discharge, 36,800 cfs 8 p.m. June 27; gage height, 16.82 ft 12 p.m. June 27.

1908-15, 1929 to April 1951: Discharge, 31,000 cfs June 9, 1941 (gage height, 16.23 ft), from rating curve extended above 20,000 cfs.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	797	303	2,410	11	270	1,160	11,000	21	946	1,370	641
2	961	3,590	1,320	12	270	1,160	20,000	22	1,060	2,880	700
3	634	7,060	1,010	13	248	703	13,000	23	862	4,220	775
4	453	10,000	804	14	254	1,100	8,080	24	586	2,660	862
5	371	2,640	675	15	262	1,660	4,670	25	470	1,340	562
6	348	1,500	641	16	295	1,370	3,040	26	547	16,300	472
7	324	1,370	782	17	351	1,140	1,540	27	464	28,900	431
8	303	2,260	512	18	358	900	1,480	28	433	22,500	405
9	290	1,960	453	19	348	1,360	926	29	418	12,000	402
10	279	1,120	920	20	297	1,720	750	30	420	5,810	400
								31	344	-	371
Monthly mean discharge, in second-feet									460	4,735	2,582
Runoff, in acre-feet									28,290	281,800	158,700
Runoff, in inches									0.23	2.26	1.27

Little Blue River at Waterville, Kans.

Location. – Lat 39°42', long. 96°45', in SE¼ sec. 16, T. 4 S., R. 6 E., half a mile north of Waterville, 1 mile downstream from Corn Creek, and 4 miles upstream from mouth. Datum of gage is 1,111.06 ft above mean sea level, datum of 1929.

Drainage area. – 3,440 square miles.

Gage-height record. – Graph drawn on basis of wire-weight gage readings made generally once daily, twice daily at high stages.

Discharge record. – Stage-discharge relation defined by current-meter measurements below 25,000 cfs and extended to peak stage by logarithmic plotting. Shifting-control method used July 16-31.

Maxima. – May-July 1951: Discharge, 38,200 cfs 2 a.m., July 13 (gage height, 24.65 ft).
1922-25, 1928 to April 1951: Discharge, 50,400 cfs June 10, 1941 (gage height, 26.20 ft, from floodmarks), by velocity-area studies.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	7,790	605	8,210	11	601	2,130	25,200	21	970	20,800	1,980
2	4,910	2,930	5,150	12	560	2,130	30,700	22	1,710	16,400	4,240
3	3,430	7,800	4,240	13	545	1,720	33,800	23	1,330	11,200	4,510
4	2,370	9,000	3,710	14	513	3,230	23,700	24	1,120	10,700	2,090
5	1,410	9,760	3,520	15	520	6,350	12,700	25	1,210	5,880	1,500
6	1,060	5,680	3,200	16	766	4,500	8,080	26	851	14,300	1,400
7	916	6,550	3,030	17	816	2,630	5,950	27	707	22,900	1,330
8	761	4,870	2,860	18	834	1,950	4,430	28	601	30,200	1,280
9	702	5,390	2,550	19	1,710	1,400	3,990	29	567	26,000	1,310
10	633	3,710	11,200	20	940	3,920	3,160	30	610	19,000	1,300
								31	633	-	1,200
Monthly mean discharge, in second-feet									1,358	8,788	7,146
Runoff, in acre-feet									83,500	522,900	439,400
Runoff, in inches									0.46	2.85	2.39

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	July 8		July 9		July 10		July 11		July 12		July 13	
2					8.20	2,610						
4					9.42	3,590						
6					11.10	5,100	22.17	26,700	22.22	26,900	24.56	37,800
8					13.10	7,110						
10					14.80	8,980						
N	8.52	2,870	8.08	2,510	16.18	10,600	21.88	25,500	22.94	29,800	23.80	34,000
2					17.43	12,200						
4					18.45	13,900						
6					19.38	16,600	21.60	24,400	23.91	34,600	23.02	30,100
8					20.24	19,300						
10					20.95	21,800						
12	8.27	2,670	8.07	2,510	21.42	23,700	21.75	25,000	24.61	38,000	22.59	28,400
	July 14		July 15		July 16		July 17		July 18		July 19	
2												
4												
6	22.18	26,700										
8												
10												
N	21.65	24,600	17.26	12,000	13.92	7,900	12.42	6,020	11.10	4,300	10.90	4,050
2												
4												
6	20.70	21,000										
8												
10												
12	19.48	16,900	15.50	9,800	13.00	6,700	11.70	5,050	10.92	4,070	10.68	3,780
	July 20		July 21		July 22		July 23		July 24		July 25	
2												
4					8.91	1,750						
6							12.32	5,870				
8					9.08	1,880						
10												
N	10.19	3,190	9.05	1,860	11.32	4,570	10.95	4,150	9.19	2,010	8.44	1,490
2												
4					12.72	6,370						
6							10.30	3,300				
8					12.98	6,680						
10												
12	9.60	2,460	8.90	1,740	12.94	6,640	9.84	2,770	8.70	1,580	8.27	1,440

Supplemental record. – July 13, 2 a.m., 24.65 ft, 38,200 cfs.

Big Blue River at Blue Rapids, Kans.

Location. – Lat 39°41', long. 96°40', in NE¼ sec. 20, T. 4 S., R. 7 E., at downstream railing of highway bridge (formerly U. S. Highway 77) at north edge of Blue Rapids. Datum of gage is 1,080.51 ft above mean sea level.
Drainage area. – 8,342 square miles.
Gage-height record. – Wire-weight gage readings once daily, more frequently during flood periods.
Maxima. – May-July 1951: Gage-height, 35.60 ft, 5 a.m. July 13.
1904 to April 1951: Gage-height, 39.5 ft, June 10, 1941.
Remarks. – Records furnished by U. S. Weather Bureau.

Daily stage, in feet, 1951

Day	June	July	Day	June	July	Day	June	July
1	9.7	19.7	11	13.8	30.8	21	28.0	12.8
2	10.0	16.1	12	15.4	32.2	22	24.4	14.7
3	23.9	14.4	13	14.7	35.5	23	28.4	17.0
4	26.2	13.4	14	15.4	32.4	24	26.4	12.7
5	27.1	13.0	15	22.8	25.6	25	21.7	11.9
6	26.9	12.0	16	28.1	18.9	26	23.1	11.3
7	27.2	20.1	17	20.4	16.2	27	31.6	11.1
8	28.1	22.3	18	13.7	14.4	28	34.3	11.4
9	22.6	14.2	19	13.5	20.6	29	31.8	10.9
10	16.8	11.5	20	15.8	13.8	30	26.3	11.2
						31	-	10.6

Supplemental records. – June 5, 10 p.m., 28.20 ft; June 7, 11 p.m., 28.60 ft; June 16, 6:30 a.m., 28.08 ft; June 21, 4 p.m., 29.55 ft; June 22, 1 a.m., 29.35 ft; June 28, 12 m, 34.53 ft; July 10, 6 p.m., 23.10 ft; July 11, 6 p.m., 32.61 ft; July 13, 5 a.m., 35.60 ft.

Big Blue River at Randolph, Kans.

Location. —Lat 39°27', long. 96°43', in SE¼ sec. 12, T. 7 S., R. 6 E., at bridge on State Highway 13, half a mile upstream from Fancy Creek and three-quarters of a mile east of Randolph. Datum of gage is 1,034.73 ft above mean sea level, datum of 1929.

Drainage area. —9,100 square miles.

Gage-height record. —Water-stage recorder graph except for period July 29-31, for which a graph was drawn based on once-daily wire-weight gage readings.

Discharge record. —Stage-discharge relation defined by current-meter measurements below 53,000 cfs and extended to peak stage on basis of velocity-area studies.

Maxima. —May-July 1951: Discharge, 77,800 cfs 2 p.m., July 13 (gage height, 28.88 ft).

1918 to April 1951: Discharge, 98,000 cfs June 10, 1941 (gage height, 30.81 ft), by velocity-area studies.

Flood of 1903 reached a stage of 30.6 ft, from floodmarks.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	26,900	1,740	17,400	11	1,840	6,500	44,300	21	3,700	47,900	4,770
2	35,300	3,270	10,200	12	1,790	7,490	74,300	22	3,050	54,100	6,830
3	18,200	17,900	7,530	13	1,580	7,290	75,000	23	3,990	43,600	12,300
4	5,600	24,200	6,430	14	1,440	7,700	63,600	24	2,770	34,000	5,620
5	3,690	26,800	6,720	15	1,420	21,700	35,100	25	2,210	22,400	4,150
6	2,980	31,200	7,950	16	4,510	37,300	15,200	26	2,530	25,300	4,410
7	2,240	39,000	14,500	17	5,680	25,000	9,840	27	3,210	51,200	3,240
8	2,140	44,000	17,600	18	3,450	6,490	7,670	28	2,050	68,100	3,310
9	1,960	29,500	8,530	19	6,740	5,740	14,500	29	1,880	61,900	2,830
10	1,900	10,900	13,300	20	6,390	9,970	7,290	30	2,030	38,700	2,940
								31	2,040	-	2,880
Monthly mean discharge, in second-feet									5,329	27,030	16,460
Runoff, in thousand acre-feet									327.7	1,608	1,012
Runoff, in inches									0.68	3.31	2.09

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	July 8		July 9		July 10		July 11		July 12		July 13	
2	18.26	17,000			10.61	4,890			27.87	67,700	28.77	69,700
4	18.45	17,400	15.57	12,100	12.01	5,130	26.84	31,300	28.06	69,600	28.75	71,500
6	18.61	17,700			14.90	6,680			28.36	72,600	28.76	72,600
8	18.76	18,000	13.87	9,500	16.97	8,160	27.47	36,200	28.55	74,500	28.80	74,000
10	18.85	18,200			20.29	9,380			28.70	76,000	28.85	75,500
N	18.91	18,300	12.55	7,570	23.45	13,200	27.76	43,700	28.80	77,000	28.87	76,700
2	18.92	18,300			24.32	13,700			28.82	77,200	28.88	77,800
4	18.87	18,200	11.59	6,310	24.89	15,200	27.77	51,100	28.80	77,000	28.87	77,700
6	18.75	18,000			25.30	20,100			28.80	77,000	28.82	77,200
8	18.47	17,400	10.94	5,530	25.67	22,600	27.78	57,900	28.73	76,300	28.76	76,600
10	17.98	16,500			25.90	24,700			28.75	76,500	28.67	75,700
12	17.32	15,300	10.50	5,000	26.18	26,700	27.80	64,000	28.74	76,400	28.54	74,400
	July 14		July 15		July 16		July 17		July 18		July 19	
2									13.25	8,020	14.89	10,800
4	28.24	71,400	25.52	45,200	18.72	17,900			13.09	7,780	15.97	12,600
6							14.82	10,700	13.02	7,670	16.95	14,500
8	27.89	67,900	24.90	39,700	17.67	15,800			12.92	7,510	17.68	15,900
10									12.90	7,490	18.20	16,900
N	27.50	64,000	24.22	34,400	17.04	14,600	14.17	9,540	12.84	7,390	18.44	17,300
2									12.78	7,300	18.36	17,200
4	27.10	60,000	23.34	29,800	16.50	13,600			12.76	7,280	18.04	16,500
6							13.86	9,020	12.82	7,360	17.53	15,600
8	26.66	55,800	22.12	25,500	16.00	12,700			12.92	7,510	16.81	14,200
10									13.20	7,950	16.00	12,700
12	26.12	50,600	20.34	21,200	15.52	11,900	13.42	8,290	13.96	9,190	15.24	11,400
	July 20		July 21		July 22		July 23		July 24		July 25	
2					10.25	3,930	17.28	15,200				
4	13.96	9,190	11.36	5,340	10.17	3,850	17.27	15,200	12.00	6,800	9.98	4,380
6					10.10	3,760	17.14	15,000				
8	13.05	7,710	11.19	5,110	10.04	3,700	16.80	14,300	11.27	5,920	9.89	4,290
10					9.99	3,650	16.36	13,500				
N	12.43	6,760	11.00	4,840	10.10	3,760	15.84	12,600	10.75	5,300	9.77	4,170
2					11.19	5,110	15.28	11,700				
4	11.90	6,060	10.65	4,390	13.07	7,750	14.74	10,900	10.40	4,880	9.64	4,040
6					14.75	10,600	14.23	10,100				
8	11.55	5,590	10.49	4,210	15.88	12,500	13.73	9,300	10.15	4,580	9.50	3,900
10					16.60	13,900	13.28	8,620				
12	11.46	5,460	10.34	4,030	17.08	14,800	12.86	8,000	10.04	4,450	9.34	3,740

Big Blue River near Manhattan, Kans.

Location. —Lat 39°14'19", long. 96°35'15", in SW¼ sec. 30, T. 9 S., R. 8 E., just above Kansas Power and Light Company power-plant dam, 4½ miles north of Manhattan, and 8 miles upstream from mouth. Datum of gage is 997.03 ft above mean sea level, datum of 1929, Kansas City supplementary adjustment of 1943.

Drainage area. — 9,540 square miles.

Gage-height record. —Graph drawn on basis of twice-daily wire-weight gage readings and frequent readings of power-plant staff gage.

Discharge record. —Stage-discharge relation defined by current-meter measurements below 37,000 cfs and by slope-area determination of peak discharge. Occasional flow through tainter gate and turbine during May and June computed from power-plant records.

Maxima. —May-July 1951: Discharge, 93,400 cfs 10 p.m. July 12 (gage height, 29.9 ft, from floodmark).
1895-1905, Dec. 8, 1950 to April 1951: Discharge, 98,000 cfs May 31, 1903 (gage height, 36.5 ft, site 1 mile downstream, datum then in use) from rating curve extended above 35,000 cfs.
Flood of June 11, 1941 reached a stage of 30.9 ft, present site and datum (from Corps of Engineers floodmark in power plant). Flood of June 1908 reached about same stage as flood of 1903 at 1903 gage site.

Remarks. —Some regulation by power-plant operation.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	23,400	2,500	25,900	11	1,970	7,620	64,400	21	5,970	30,900	6,140
2	33,900	4,000	12,300	12	2,340	7,390	85,100	22	3,710	58,500	5,920
3	28,100	16,700	8,560	13	2,210	9,370	86,400	23	5,140	50,600	15,500
4	7,910	23,900	6,090	14	1,790	8,100	70,400	24	3,990	42,000	7,300
5	4,450	26,700	5,360	15	1,910	19,800	46,200	25	3,090	30,100	4,380
6	3,220	30,100	7,040	16	5,640	31,500	22,500	26	3,150	28,400	4,900
7	2,570	35,200	15,100	17	7,680	34,100	13,000	27	4,210	45,200	3,790
8	2,310	37,600	19,000	18	5,280	9,770	9,480	28	3,200	60,400	3,040
9	2,810	37,000	13,200	19	8,400	5,530	15,600	29	2,850	67,700	2,950
10	2,210	14,400	27,900	20	9,310	11,000	10,800	30	2,770	48,400	2,780
								31	2,960	-	2,780
Monthly mean discharge, in second-feet									6,402	27,820	20,120
Runoff, in thousand acre-feet									393.6	1,655	1,237
Runoff, in inches									0.77	3.25	2.43

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	July 8		July 9		July 10		July 11		July 12		July 13	
2			20.32	19,800	18.72	11,400						
4			20.14	18,800	18.61	10,900	27.50	55,000				
6	20.04	18,200	19.83	17,100	18.72	11,400			29.17	78,100	29.60	86,800
8			19.52	15,400	19.50	15,300	28.17	62,400				
10			19.20	13,800	20.75	22,100						
N	20.21	19,200	18.86	12,100	21.85	28,700	28.50	67,000	29.59	86,600	29.54	85,500
2			18.56	10,700	23.40	36,000						
4			18.30	9,500	24.15	38,300	28.70	70,000				
6	20.32	19,800	18.07	8,480	24.60	39,900			29.86	92,500	29.51	84,800
8			17.95	8,000	25.70	44,200	28.80	71,600				
10			18.03	8,320	26.18	46,300						
12	20.36	20,000	18.80	11,800	26.62	48,500	28.86	72,600	29.89	93,200	29.47	84,000
	July 14		July 15		July 16		July 17		July 18		July 19	
2												
4	29.33	81,200			22.43	32,000						
6			26.89	50,100			19.23	14,000	18.45	10,200	18.75	11,600
8	29.00	75,000			20.95	23,300						
10												
N	28.71	70,200	26.12	46,000	20.31	19,700	19.02	12,900	18.27	9,360	19.95	17,700
2												
4	28.42	65,900			19.91	17,500						
6			25.20	42,200			18.83	12,000	18.13	8,740	20.42	20,300
8	28.01	60,500			19.68	16,200						
10												
12	27.56	55,600	23.87	37,400	19.49	15,200	18.64	11,000	18.00	8,200	19.90	17,400
	July 20		July 21		July 22		July 23		July 24		July 25	
2							19.48	15,200				
4					17.20	5,160	19.71	16,400				
6	19.10	13,300					19.85	17,200	18.15	8,820	16.97	4,460
8					17.13	4,940	19.91	17,500				
10							19.92	17,600				
N	18.36	9,770	17.46	6,090	17.06	4,720	19.85	17,200	17.66	6,850	16.92	4,320
2							19.73	16,500				
4					17.00	4,540	19.56	15,600				
6	17.92	7,880					19.38	14,700	17.27	5,400	16.92	4,320
8					17.65	6,810	19.16	13,600				
10							18.94	12,500				
12	17.71	7,040	17.26	5,360	19.10	13,300	18.74	11,500	17.07	4,750	16.85	4,130

Supplemental record. — July 12, 10 p.m., 29.9 ft, 93,400 cfs.

Kansas River at Wamego, Kans.

Location.—Lat 39°12', long. 96°18', in SE¼ sec. 9, T. 10 S., R. 10 E., on downstream end of pier of bridge on State Highway 99 at Wamego, 3 miles downstream from Antelope Creek. Datum of gage is 953.51 ft above mean sea level, datum of 1929.

Drainage area.—55,240 square miles.

Gage-height record.—Water-stage recorder graph except for period May 4, 7-10, May 12 to 3 p.m. May 16, for which a graph was drawn based on daily wire-weight gage readings.

Discharge record.—Stage-discharge relation defined by current-meter measurements below 170,000 cfs and by slope-area determination of peak discharge, records of nearby stations, and computation of runoff from ungaged area. Shifting-control method used from 4 a.m. July 11 to 10 a.m. July 12.

Maxima.—May-July 1951: Discharge, 400,000 cfs 5:30 a.m. July 13 (gage height, 27.56 ft).
1919 to April 1951: Discharge, 177,000 cfs June 4, 1935 (gage height, 23.79 ft, from graph based on gage readings).
Flood in May 1903 reached a stage of 26.3 ft, determined by U. S. Weather Bureau from floodmarks.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	42,300	17,600	104,000	11	9,550	45,100	170,000	21	20,100	43,600	55,700
2	52,900	13,600	67,100	12	7,610	39,100	342,000	22	17,600	94,900	46,100
3	48,300	20,000	51,200	13	7,100	41,700	393,000	23	17,000	119,000	51,500
4	20,600	44,400	43,300	14	6,230	36,700	337,000	24	25,300	115,000	44,100
5	11,600	43,300	41,100	15	5,480	46,700	305,000	25	22,800	105,000	32,200
6	8,930	45,300	42,400	16	7,320	61,900	219,000	26	21,000	79,500	26,400
7	7,450	56,200	44,800	17	15,100	68,700	127,000	27	18,900	87,900	26,700
8	6,270	71 300	44,800	18	19,100	51,600	92,000	28	17,100	107,000	22,100
9	6,230	81,800	37,900	19	25,400	36,400	80,200	29	16,500	132,000	21,200
10	7,280	65,900	66,200	20	24,200	32,400	72,000	30	17,500	135,000	21,500
								31	18,300	-	23,500
Monthly mean discharge, in second-feet									17,780	64,620	98,400
Runoff, in thousand acre-feet									1,093	3,845	6,052
Runoff, in inches									0.37	1.31	2.05

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	July 8		July 9		July 10		July 11		July 12		July 13	
2					12.03	35,200	21.64	121,000	25.12	272,000		
4			13.35	43,100	13.03	41,200	21.98	127,000	25.41	302,000	27.55	399,000
6					13.88	46,300	22.20	136,000	25.63	325,000		
8			13.09	41,500	14.46	49,800	22.37	141,000	25.82	332,000	27.52	398,000
10					15.23	54,400	22.53	145,000	26.10	344,000		
N	13.65	44,900	12.63	38,800	16.23	60,600	22.65	150,000	26.24	350,000	27.47	396,000
2					17.18	67,900	22.80	160,000	26.39	356,000		
4			12.03	35,200	18.12	76,200	23.02	190,000	26.60	363,000	27.42	395,000
6					19.12	86,900	23.40	214,000	26.82	372,000		
8			11.45	31,700	20.00	97,500	23.84	230,000	27.03	379,000	27.20	386,000
10					20.66	106,000	24.31	240,000	27.15	384,000		
12	13.51	44,100	11.22	30,300	21.20	114,000	24.70	252,000	27.30	390,000	26.94	376,000
	July 14		July 15		July 16		July 17		July 18		July 19	
2												
4	26.58	362,000	25.37	317,000							17.96	81,700
6					23.85	250,000	21.21	142,000				
8	26.17	347,000	25.38	317,000							17.65	79,600
10												
N	25.80	333,000	25.25	312,000	23.16	217,000	20.62	124,000	19.07	90,600	17.45	78,200
2												
4	25.52	322,000	25.00	302,000							17.58	79,100
6					22.46	188,000	20.14	109,000				
8	25.30	314,000	24.72	289,000							17.75	80,200
10												
12	25.26	312,000	24.40	275,000	21.82	164,000	19.90	103,000	18.24	83,900	17.82	80,700
	July 20		July 21		July 22		July 23		July 24		July 25	
2												
4	17.63	79,400	14.70	59,000	12.96	48,300	12.89	47,900				
6									12.92	48,000	10.50	34,400
8	17.15	76,000	14.35	56,800	12.69	46,700	13.45	51,200				
10												
N	16.63	72,400	14.14	55,400	12.44	45,300	13.82	53,400	12.22	44,000	10.10	32,300
2												
4	16.06	68,400	14.02	54,600	12.31	44,500	13.92	54,000				
6									11.50	39,900	9.62	29,900
8	15.56	64,900	13.65	52,400	12.30	44,400	13.86	53,700				
10												
12	15.10	61,700	13.26	50,100	12.42	45,100	13.56	51,900	10.94	36,800	9.12	27,400

Supplemental records.—July 13, 5:30 a.m., 27.56 ft, 400,000 cfs; July 23, 6 p.m., 13.94 ft, 54,100 cfs.

Mill Creek at Paxico, Kans.

Location. —Lat 39°04', long. 96°10', sec. 27, T. 11 S., R. 11 E., at Paxico, 12 miles southeast of Wamego.
Drainage area. —316 square miles.
Gage-height record. —From graph based on information from local residents who noticed when flood water reached various levels on their property. Level of Paxico Post Office floor taken as 10 ft.
Discharge record. — Stage-discharge relation estimated on basis of contracted-opening determination of crest, elevation of bank-full stage, and elevation of zero flow.
Maximum. —July 1951: Discharge, 79,000 cfs 4 p. m. July 12.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1				11			26,400	21			
2				12			45,600	22			
3				13			7,000	23			
4				14				24			
5				15				25			
6				16				26			
7				17				27			
8				18				28			
9			200	19				29			
10			26,800	20				30			
								31			
Monthly mean discharge, in second-feet									-	-	-
Runoff, in acre-feet									-	-	-
Runoff, in inches									-	-	-

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge
	July 8		July 9		July 10		July 11		July 12		July 13	
2						1,500	2.8	6,600	5.0	14,000		
4						3,500	2.0	5,000	5.4	16,000	4.6	12,400
6					2.5	6,000	2.0	5,000	7.3	27,900		
8					8.5	39,000	4.6	12,400	9.0	44,000	3.0	7,000
10					7.9	33,100	7.6	30,400	10.7	66,500		
N					9.2	46,400	9.9	54,800	11.2	75,000	1.5	4,800
2					9.8	53,600	10.0	56,000	11.3	77,000		
4					9.7	52,400	9.7	52,400	11.37	79,000		
6					8.4	38,000	8.3	37,000	10.5	63,500		3,200
8					7.1	26,300	7.1	26,300	8.5	39,000		
10					5.6	17,000	6.0	19,000	7.3	27,900		
12				200	4.1	10,400	5.1	14,500	6.3	20,800		2,000

Kansas River at Topeka, Kans.

Location. —Lat 39°03'45", long. 95°40'30", in SE¼ sec. 30, R. 16 E., T. 11 S. on downstream end of first pier from right bank at Topeka Avenue Bridge in Topeka, 2 miles upstream from Soldier Creek. Datum of gage is 854.08 ft above mean sea level, datum of 1929.

Drainage area. —56,710 square miles.

Gage-height record. —Water-stage recorder graph except for periods May 6 to 1 p. m. May 18, May 28 to June 3, for which a graph was drawn based on once-daily wire-weight gage readings.

Discharge record. —Stage-discharge relation defined by current-meter measurements. Shifting-control method used 1 a. m. to 5 a. m. July 12; adjustments based on record of levee breaks. Loop curve used 2 p. m. July 13 to 12 p. m. July 14.

Maxima. —May-July 1951: Discharge, 469,000 cfs 6:30 a. m. July 13 (gage height, 36.34 ft).

1917 to April 1951: Maximum discharge, 154,000 cfs June 5, 1935 (gage height, 26.65 ft, site and datum then in use).

Flood of May 30, 1903 reached a stage of 32.7 ft, from floodmarks, referred to U. S. Weather Bureau gage and datum 0.5 mile downstream. Flood in spring of 1844 is believed to have been higher, according to data of Corps of Engineers.

Remarks. —Dikes at Topeka first broke at 1:05 a. m. July 12, 1951, followed by general failure of dikes at 3 a. m. Soldier Creek discharge not included in tabulation of flow of Kansas River, although the two streams merged on July 12. The combined flow reached a peak of 478,000 cfs at 6:30 a. m. July 13.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	50,000	20,600	118,000	11	11,500	51,100	136,000	21	25,900	46,000	60,000
2	70,500	18,400	79,400	12	12,200	40,400	328,000	22	22,600	97,200	50,200
3	51,900	15,400	59,900	13	9,390	41,300	458,000	23	20,400	121,000	48,900
4	35,700	35,300	49,700	14	9,050	39,200	389,000	24	23,100	116,000	49,800
5	18,600	42,800	53,200	15	7,740	46,800	319,000	25	29,200	105,000	38,600
6	13,500	42,600	59,500	16	7,280	58,600	268,000	26	23,600	106,000	30,100
7	11,100	51,100	56,400	17	14,500	60,700	177,000	27	22,700	98,800	30,100
8	9,220	63,400	47,900	18	22,000	58,600	114,000	28	20,900	96,900	25,800
9	8,910	70,800	44,500	19	30,800	42,400	86,000	29	18,800	116,000	22,700
10	13,400	69,300	60,300	20	34,800	34,500	76,400	30	19,400	134,000	21,700
								31	20,600	-	23,300
Monthly mean discharge, in second-feet									22,240	64,670	110,000
Runoff, in thousand acre-feet									1,367	3,848	6,762
Runoff, in inches									0.45	1.27	2.24

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge
	July 8		July 9		July 10		July 11		July 12		July 13	
2					15.91	40,500	25.97	106,000	31.04	170,000	36.23	463,000
4			17.18	46,200	15.94	40,600	26.85	114,000	31.40	226,000	36.29	466,000
6					16.35	42,500	27.90	126,000	31.71	238,000	36.33	469,000
8			17.08	45,800	17.27	46,600	28.79	136,000	32.49	270,000	36.32	468,000
10					18.40	51,900	29.29	142,000	33.30	310,000	36.28	467,000
N	17.55	47,900	16.95	45,200	19.53	57,200	29.14	141,000	33.93	344,000	36.28	468,000
2					20.60	62,400	29.13	141,000	34.46	376,000	36.19	463,000
4			16.70	44,000	21.58	67,300	29.44	144,000	34.85	398,000	36.22	457,000
6					22.57	74,100	29.93	150,000	35.17	415,000	36.12	451,000
8			16.33	42,400	23.50	82,500	30.16	153,000	35.55	433,000	36.04	445,000
10					24.27	89,400	30.32	155,000	35.85	446,000	35.90	438,000
12	17.25	46,600	15.94	40,600	25.00	96,000	30.36	156,000	36.08	457,000	35.77	430,000
	July 14		July 15		July 16		July 17		July 18		July 19	
2	35.70	423,000										
4	35.58	417,000	33.60	335,000	32.90	297,000	30.45	206,000	26.75	127,000	23.81	92,300
6	35.45	410,000										
8	35.36	405,000	33.30	319,000	32.60	284,000	29.89	190,000	26.27	120,000	23.42	88,900
10	35.25	399,000										
N	35.12	390,000	33.20	313,000	32.31	271,000	29.27	175,000	25.74	113,000	22.96	85,200
2	34.92	382,000										
4	34.75	374,000	33.18	312,000	31.90	253,000	28.71	162,000	25.20	106,000	22.60	82,300
6	34.52	365,000										
8	34.34	358,000	33.16	311,000	31.44	237,000	28.03	148,000	24.75	101,000	22.27	79,700
10	34.14	352,000										
12	33.91	345,000	33.10	307,000	30.95	221,000	27.35	136,000	24.28	96,500	22.20	79,100
	July 20		July 21		July 22		July 23		July 24		July 25	
2									18.00	53,300		
4	22.24	79,400			18.10	53,800	16.58	46,500	17.98	53,200		
6			19.84	62,700					17.90	52,800	15.42	40,900
8	22.30	79,900			17.62	51,500	16.65	46,800	17.77	52,200		
10									17.59	51,300		
N	22.14	78,600	19.16	59,100	17.24	49,700	16.89	48,000	17.40	50,400	14.88	38,300
2									17.20	49,500		
4	21.77	75,700			16.99	48,500	17.38	50,300	16.97	48,400		
6			18.69	56,800					16.72	47,200	14.43	36,200
8	21.24	71,700			16.72	47,200	17.77	52,200	16.48	46,000		
10									16.22	44,800		
12	20.63	67,400	18.35	55,000	16.59	46,500	17.98	53,200	15.99	43,700	14.00	34,100

Supplemental records. — July 12, 1 a.m., 30.72 ft, 160,000 cfs, 3 a.m., 31.31 ft, 221,000 cfs, 5 a.m., 31.50 ft, 230,000 cfs; July 13, 6:30 a.m., 36.34 ft, 469,000 cfs.

Soldier Creek near Topeka, Kans.

Location. —Lat 39°06', long. 95°43', in NW¼ sec. 14, T. 11 S., R. 15 E., at steel highway bridge, 1½ miles upstream from Halfday Creek, 4 miles northwest of Topeka, and 7 miles upstream from mouth. Datum of gage is 866.75 ft (revised) above mean sea level, datum of 1929.

Drainage area. —268 square miles.

Gage-height record. —Graph drawn on basis of wire-weight gage readings made generally once daily, with frequent readings during periods of high stages, May 1, June 21-24, 26-30, July 5, 6, 10-12.

Discharge record. —Stage-discharge relation defined by current-meter measurements. Discharge for period of backwater from Kansas River, July 11-19, computed on basis of previous recessions.

Maxima. —May-July 1951: Discharge, 11,400 cfs 3 p.m., June 22 (gage height, 28.15 ft).
1929 to April 1951: Discharge, 9,910 cfs April 23, 1944 (gage height, 28.2 ft, from graph based on gage readings).

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	5,340	84	1,760	11	412	115	7,450	21	724	2,950	362
2	5,650	75	980	12	250	101	9,850	22	302	10,500	288
3	830	136	2,300	13	169	111	8,260	23	196	8,160	266
4	353	89	1,190	14	137	89	3,090	24	152	5,420	242
5	265	61	4,320	15	122	1,010	1,120	25	134	1,740	193
6	220	61	5,210	16	119	728	798	26	120	6,670	173
7	185	175	1,790	17	305	226	605	27	104	7,490	186
8	165	508	679	18	197	313	478	28	91	3,680	154
9	159	690	404	19	1,010	564	500	29	90	5,010	129
10	367	674	2,110	20	1,680	149	442	30	95	2,370	119
								31	92	-	116
Monthly mean discharge, in second-feet									646	1,998	1,792
Runoff, in acre-feet									39,740	118,900	110,200
Runoff, in inches									2.78	8.32	7.71

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	July 8		July 9		July 10		July 11		July 12		July 13	
2					5.50	537	18.99	4,960	26.28	8,750		
4	7.18	890	4.91	427	6.60	766	20.76	5,400	27.05	9,400	28.99	9,550
6					8.12	1,100	22.40	5,850	27.55	9,750		
8	6.54	753	4.80	407	10.00	1,540	24.38	7,450	27.87	9,900	28.80	9,150
10					11.73	2,010	25.20	8,100	28.15	9,900		
N	6.01	642	4.73	394	12.91	2,380	25.46	8,550	28.40	10,000	28.51	8,450
2					13.68	2,650	25.58	8,550	28.60	10,200		
4	5.56	549	4.69	387	14.22	2,850	25.68	8,550	28.76	10,300	28.08	7,700
6					14.47	2,950	25.76	8,500	28.88	10,400		
8	5.22	484	4.68	386	14.18	2,830	25.83	8,550	28.97	10,300	27.53	6,800
10					15.70	3,440	25.98	8,550	29.02	10,100		
12	5.04	450	4.71	391	17.25	4,110	26.07	8,600	29.06	9,900	26.86	5,900
	July 14		July 15		July 16		July 17		July 18		July 19	
2	26.50	5,430										
4	26.03	4,900	21.97	1,300	19.65	870			11.24	500	8.13	480
6	25.56	4,400										
8	25.02	3,750	21.68	1,180	19.38	830			10.55	485	7.91	500
10	24.45	3,140										
N	23.80	2,500	21.35	1,090	19.17	790	15.40	600	9.73	470	7.70	520
2	23.20	2,200										
4	22.78	2,000	20.93	1,020	18.98	760			9.12	460	7.53	520
6	22.52	1,800										
8	22.37	1,680	20.48	960	18.72	730			8.72	460	7.37	500
10	22.28	1,580										
12	22.21	1,480	20.00	910	18.19	700	11.99	520	8.42	470	7.23	490
	July 20		July 21		July 22		July 23		July 24		July 25	
2												
4					5.87	314	5.50	257	5.56	266	5.11	202
6												
8					5.78	300	5.52	260	5.49	256	5.07	197
10												
N	6.90	440	6.28	360	5.69	286	5.56	266	5.40	243	5.02	190
2												
4					5.61	274	5.60	272	5.32	232	5.00	187
6												
8					5.55	264	5.62	275	5.21	216	4.98	184
10												
12	6.61	400	5.95	328	5.51	258	5.60	272	5.17	211	4.97	183

Supplemental record. — July 10, 7 p.m., 14.12 ft, 2,810 cfs.

Delaware River at Valley Falls, Kans.

Location.—Lat 39°21', long. 95°27', in SW¼ sec. 18, T. 8 S., R. 18 E., at county highway bridge, 200 ft downstream from Walnut Creek, 300 ft upstream from Atchison, Topeka, & Santa Fe Railway bridge, and a quarter of a mile north of Valley Falls. Datum of gage is 884.55 ft above mean sea level, datum of 1929.

Drainage area.—922 square miles.

Gage-height record.—Graph drawn on basis of two or more daily wire-weight gage readings except May 4 and July 29, when gage was not read.

Discharge record.—Stage-discharge relation defined by current-meter measurements below 46,000 cfs and by contracted-opening determination of peak discharge. Discharge for days of no gage-height record computed on basis of records for stations on nearby streams.

Maxima.—May-July 1951: Discharge, 94,600 cfs 9:30 p.m. June 21 (gage height, 32.08 ft, from floodmarks).

1922 to April 1951: Discharge, 45,900 cfs June 16, 1945 (gage height, 27.85 ft, from floodmark).

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	18,100	274	1,040	11	962	251	20,300	21	810	42,400	621
2	1,490	337	788	12	574	294	30,700	22	673	55,200	478
3	962	390	2,060	13	422	316	17,400	23	508	14,600	457
4	650	241	1,320	14	354	222	1,960	24	408	3,470	377
5	630	212	4,950	15	325	1,270	1,160	25	368	1,180	338
6	615	218	15,900	16	1,800	1,220	924	26	358	14,600	303
7	493	1,040	12,400	17	1,040	394	728	27	312	13,300	273
8	450	1,640	1,280	18	533	241	5,920	28	264	16,200	249
9	479	716	833	19	7,330	284	2,560	29	264	13,000	235
10	865	386	1,520	20	1,980	488	794	30	270	1,690	221
								31	284	-	205
Monthly mean discharge, in second-feet									1,438	6,202	4,139
Runoff, in acre-feet									88,410	369,100	254,000
Runoff, in inches									1.80	7.51	5.18

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge
	July 8		July 9		July 10		July 11		July 12		July 13	
2	5.66	1,850			4.35	862	15.08	8,830	24.89	29,400	24.55	27,800
4	5.41	1,630	4.37	876	4.42	908	18.24	12,500	24.91	29,600	24.22	26,100
6	5.19	1,440			4.49	954	20.62	16,400	24.93	29,700	23.77	24,300
8	5.03	1,320	4.30	830	4.59	1,020	21.49	18,100	24.95	29,800	23.18	22,200
10	4.90	1,230			4.73	1,110	22.15	19,500	25.00	30,100	22.30	19,800
N	4.83	1,180	4.26	806	4.90	1,230	22.84	21,200	25.18	31,200	21.20	17,500
2	4.75	1,120			5.10	1,370	23.37	22,800	25.39	32,400	20.00	15,300
4	4.68	1,080	4.24	794	5.32	1,550	23.85	24,600	25.45	32,800	18.68	13,200
6	4.63	1,040			5.55	1,760	24.25	26,200	25.36	32,300	17.16	11,100
8	4.56	999	4.26	806	6.00	2,130	24.55	27,800	25.21	31,400	15.24	8,990
10	4.50	960			6.67	2,620	24.71	28,600	25.03	30,300	11.95	6,060
12	4.46	934	4.31	836	10.02	4,710	24.82	29,100	24.82	29,100	7.98	3,490
	July 14		July 15		July 16		July 17		July 18		July 19	
2	6.96	2,820							4.09	704	10.60	5,070
4	6.40	2,430							4.22	782	9.62	4,470
6	6.02	2,150	4.90	1,230	4.51	966	4.21	776	4.45	928	8.68	3,910
8	5.80	1,970							6.25	2,320	7.85	3,410
10	5.69	1,880							15.20	8,950	6.96	2,820
N	5.60	1,800	4.75	1,120	4.45	928	4.11	716	17.25	11,200	6.16	2,260
2	5.54	1,750							16.57	10,400	5.36	1,580
4	5.47	1,680							15.77	9,550	4.84	1,190
6	5.40	1,620	4.66	1,060	4.38	882	4.04	674	14.84	8,590	4.54	986
8	5.30	1,530							13.78	7,600	4.36	869
10	5.22	1,470							12.75	6,700	4.31	836
12	5.16	1,420	4.58	1,010	4.30	830	4.02	662	11.70	5,860	4.30	830
	July 20		July 21		July 22		July 23		July 24		July 25	
2												
4									3.56	405		
6	4.30	830			3.63	496	3.67	464				
8									3.50	375		
10												
N	4.28	818	3.95	620	3.68	469	3.67	464	3.46	357	3.41	334
2												
4									3.47	362		
6	4.18	758			3.65	452	3.65	452				
8									3.48	366		
10												
12	4.10	710	3.80	535	3.66	458	3.62	436	3.47	362	3.38	321

Kansas River at Lecompton, Kans.

Location.—Lat 39°03'00", long. 95°23'30", in NE¼SE¼ sec. 34, T. 11 S., R. 18 E., on downstream side of highway bridge at Lecompton, half a mile downstream from Delaware River. Datum of gage is 821.26 ft above mean sea level, datum of 1929.

Drainage area.—58,420 square miles.

Gage-height record.—Graph drawn on basis of one to eight daily readings of gage, with the more frequent readings at high stages. Wire-weight gage used except for periods June 23 to 12 p.m. June 24, July 13 to 8 a.m. July 17, when an improvised staff gage was used.

Discharge record.—Stage-discharge relation defined by current-meter measurements below 120,000 cfs and by slope-area determination of peak discharge.

Maxima.—May-July 1951: Discharge, 483,000 cfs 4 p.m. July 13 (gage height, 30.23 ft).
1899-1905, 1936 to April 1951: Flood of May 31, 1903 reached a stage of 27.9 ft, (revised), from floodmark.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	65,600	22,200	162,000	11	14,600	56,800	162,000	21	29,400	52,200	60,700
2	105,000	20,700	104,000	12	14,500	42,600	308,000	22	26,000	140,000	49,500
3	66,100	17,200	66,500	13	11,400	41,500	472,000	23	22,500	197,000	45,100
4	52,000	28,000	54,200	14	10,400	39,600	398,000	24	22,100	177,000	48,900
5	22,400	44,000	59,400	15	9,350	50,500	316,000	25	26,400	136,000	37,800
6	16,700	43,400	81,800	16	8,570	68,300	279,000	26	26,200	153,000	30,200
7	13,700	52,400	79,100	17	12,900	66,500	199,000	27	24,300	152,000	29,000
8	11,600	70,900	58,500	18	21,500	65,900	135,000	28	22,000	135,000	26,600
9	10,700	82,700	46,200	19	32,900	45,100	102,000	29	20,800	155,000	23,100
10	14,800	82,700	53,200	20	45,000	36,600	78,600	30	20,600	172,000	22,200
								31	21,900	-	22,600
Monthly mean discharge, in second-feet									26,510	81,560	116,500
Runoff, in thousand acre-feet									1,630	4,853	7,161
Runoff, in inches									0.52	1.56	2.30

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	July 8		July 9		July 10		July 11		July 12		July 13	
2							18.90	90,800	25.85	255,000	29.78	453,000
4					13.30	43,200	20.35	110,000	25.86	255,000	30.00	467,000
6			13.98	47,700			21.38	126,000	25.50	240,000	30.11	475,000
8					13.68	45,700	22.10	140,000	25.60	244,000	30.12	475,000
10							22.65	152,000	25.85	255,000	30.18	480,000
N	15.42	58,000	13.66	45,600	14.30	49,900	23.22	166,000	26.75	293,000	30.19	480,000
2							23.60	176,000	27.20	313,000	30.21	482,000
4					15.15	55,900	23.95	186,000	27.60	331,000	30.23	483,000
6			13.47	44,400			24.32	198,000	28.20	360,000	30.19	480,000
8					16.20	63,900	24.70	211,000	28.74	389,000	30.10	474,000
10							25.12	225,000	29.18	416,000	29.99	466,000
12	14.38	50,500	13.32	43,400	17.75	77,900	25.55	242,000	29.52	436,000	29.86	458,000
	July 14		July 15		July 16		July 17		July 18		July 19	
2	29.68	446,000	27.57	330,000	26.85	297,000			22.54	149,000		
4	29.53	437,000	27.46	325,000	26.83	297,000	25.10	225,000	22.30	144,000		
6	29.40	429,000	27.40	322,000	26.80	295,000			22.08	140,000	20.46	111,000
8	29.35	426,000	27.43	323,000	26.76	293,000	24.83	215,000	21.93	137,000		
10	29.08	410,000	27.46	325,000	26.68	290,000			21.90	136,000		
N	28.92	400,000	27.28	317,000	26.61	287,000	24.45	202,000	21.84	135,000	19.80	102,000
2	28.66	385,000	27.16	311,000	26.48	281,000			21.67	131,000		
4	28.54	378,000	27.10	308,000	26.34	275,000	23.98	187,000	21.58	130,000		
6	28.40	370,000	27.05	306,000	26.18	269,000			21.50	128,000	18.98	91,800
8	28.08	354,000	26.98	303,000	25.85	255,000	23.38	170,000	21.39	126,000		
10	27.88	344,000	26.92	300,000	25.56	243,000			21.22	124,000		
12	27.70	336,000	26.88	299,000	25.37	235,000	22.80	155,000	21.04	121,000	18.12	81,800
	July 20		July 21		July 22		July 23		July 24		July 25	
2	18.00	80,500	17.03	71,000			13.28	43,100	14.58	51,900		
4	17.98	80,300	16.78	68,700	14.95	54,400	13.27	43,100	14.62	52,100		
6	17.99	80,400	16.46	66,000			13.29	43,200	14.59	51,900		
8	17.99	80,400	15.94	61,800	14.47	51,100	13.33	43,400	14.44	50,900		
10	17.96	80,100	15.40	57,800			13.37	43,700	14.38	50,500		
N	17.88	79,200	15.14	55,800	14.16	48,900	13.43	44,100	14.28	49,800	12.25	37,200
2	17.82	78,600	15.12	55,700			13.52	44,700	14.16	48,900		
4	17.77	78,100	15.18	56,200	13.89	47,100	13.60	45,200	14.00	47,800		
6	17.70	77,400	15.24	56,600			13.74	46,100	13.82	46,600		
8	17.56	76,000	15.28	56,900	13.62	45,300	13.99	47,700	13.62	45,300		
10	17.40	74,400	15.27	56,800			14.21	49,300	13.44	44,200		
12	17.22	72,700	15.22	56,400	13.36	43,600	14.49	51,200	13.28	43,100	11.58	33,500

Kansas River at Lawrence, Kans.

Location. – Lat 38°58', long. 95°14', in SW¼ sec. 30, T. 12 S., R. 20 E., on downstream end of right abutment of concrete arch bridge in Lawrence. Datum of gage is 799.12 ft above mean sea level.
Drainage area. – 58,504 square miles.
Gage-height record. – Staff gage read frequently during flood periods.
Maxima. – May-July 1951: Gage-height, 30.40 ft, 8 a.m.-11 p.m. July 13.
1927 to April 1951: Gage-height, 23.9 ft, June 18, 1943.
Stage of 28.5 ft occurred May 31, 1903.
Remarks. – Records furnished by U. S. Weather Bureau.

Daily stage, in feet, 1951

Day	June	July	Day	June	July	Day	June	July
1	-	24.5	11	16.8	21.0	21	13.8	17.2
2	-	22.2	12	14.9	26.3	22	19.0	16.0
3	-	17.7	13	14.2	30.4	23	25.2	15.0
4	-	16.7	14	14.6	29.8	24	25.4	15.7
5	15.0	15.3	15	14.2	28.3	25	22.9	14.6
6	14.8	18.7	16	17.4	27.3	26	22.0	-
7	15.2	18.9	17	16.8	25.5	27	23.7	-
8	17.1	17.3	18	17.2	22.9	28	23.0	-
9	18.1	15.4	19	15.3	20.8	29	22.7	-
10	18.4	15.1	20	14.1	18.4	30	24.5	-
						31	-	-

Supplemental records. – June 10, 6 a.m.-9p.m., 18.40 ft; June 23, 12 p.m., 25.60 ft; June 26, 12 p.m., 23.80 ft; June 30, 12 p.m., 24.50 ft; July 7, 6 a.m., 19.00 ft; July 12, 3 a.m., 26.50 ft; July 13, 8 a.m.-11 p.m., 30.40 ft.

Wakarusa River near Lawrence, Kans.

Location.—Lat 38°55', long. 95°16', in NW¼ sec. 24, T. 13 S., R. 19 E., at downstream side of bridge on U. S. Highway 59, 4 miles southwest of Lawrence, and 11 miles upstream from mouth. Datum of gage is 799.24 ft above mean sea level, datum of 1929.

Drainage area.—458 square miles.

Gage-height record.—Graph drawn on basis of two or more daily wire-weight gage readings.

Discharge record.—Stage-discharge relation defined by current-meter measurements below 15,000 cfs and extended to peak stage by logarithmic plotting.

Maxima.—May-July 1951: Discharge, 24,200 cfs 12 p.m. July 12 (gage height, 31.59 ft, from flood-mark).

1929 to April 1951: Discharge, 18,500 cfs April 23, 1944 (gage height, 30.00 ft, from graph based on gage readings).

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	2,850	78	1,630	11	718	329	21,300	21	196	121	380
2	3,660	62	790	12	396	311	22,600	22	347	672	200
3	746	40	1,300	13	266	253	22,100	23	516	1,510	194
4	463	30	1,350	14	202	174	9,790	24	275	3,760	246
5	331	28	1,480	15	163	256	1,850	25	168	1,220	198
6	256	226	2,350	16	158	526	929	26	132	8,120	149
7	217	3,560	4,160	17	241	217	594	27	108	13,300	127
8	190	3,130	1,240	18	214	141	396	28	91	6,490	131
9	178	2,720	678	19	182	244	322	29	82	3,730	106
10	907	670	15,700	20	157	172	309	30	79	3,820	93
								31	81	-	87
Monthly mean discharge, in second-feet									470	1,864	3,638
Runoff, in acre-feet									28,900	110,900	223,700
Runoff, in inches									1.18	4.54	9.16

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge
	July 8		July 9		July 10		July 11		July 12		July 13	
2	16.20	2,370	9.88	706	16.48	2,470						
4	14.69	1,860	9.78	686	24.00	6,150			31.07	21,800		
6	13.31	1,460	9.71	672	29.07	14,200	30.88	21,000			31.46	23,600
8	12.20	1,200	9.64	659	29.80	16,800			31.10	22,000		
10	11.49	1,040	9.58	647	30.18	18,200						
N	11.11	959	9.55	642	30.38	19,000	30.97	21,400	31.17	22,300	31.21	22,400
2	10.82	897	9.53	638	30.48	19,400						
4	10.60	851	9.51	634	30.59	19,900			31.29	22,800		
6	10.40	810	9.50	632	30.69	20,300	31.02	21,600			30.89	21,100
8	10.26	782	9.50	632	30.77	20,600			31.50	23,800		
10	10.11	752	9.55	642	30.81	20,700						
12	9.99	728	12.00	1,160	30.85	20,900	31.04	21,700	31.59	24,200	30.27	18,600
	July 14		July 15		July 16		July 17		July 18		July 19	
2	30.01	17,500										
4	29.69	16,400	16.65	2,530			10.43	726	9.02	429		
6	29.27	14,900			11.57	1,000						
8	28.80	13,400	15.18	2,020			10.17	667	9.03	431		
10	28.00	11,200										
N	26.28	7,920	14.12	1,690	11.23	918	9.86	601	8.95	415	8.50	327
2	24.75	6,640										
4	23.25	5,700	13.24	1,440			9.43	511	8.77	379		
6	21.88	4,930			10.94	846						
8	20.64	4,270	12.53	1,250			9.15	455	8.59	343		
10	19.49	3,700										
12	18.43	3,220	12.08	1,130	10.64	774	9.05	435	8.51	329	8.38	306
	July 20		July 21		July 22		July 23		July 24		July 25	
2												
4	8.32	295	8.78	381								
6					7.72	202	7.54	177	8.06	253		
8	8.27	287	8.87	399								
10												
N	8.31	294	8.89	403	7.53	176	7.63	189	8.08	256	7.69	198
2												
4	8.41	311	8.85	395								
6					7.57	181	7.75	206	8.01	245		
8	8.54	334	8.71	367								
10												
12	8.68	361	8.40	309	7.53	176	7.91	230	7.91	230	7.47	168

Stranger Creek near Tonganoxie, Kans.

Location. —Lat 39°06', long. 95°01', in NE¼ sec. 13, T. 11 S., R. 21 E., at highway bridge 1 mile upstream from Tonganoxie Creek, 4 miles east of Tonganoxie, and 9 miles upstream from mouth. Datum of gage is 796.95 ft above sea level (levels by Corps of Engineers).

Drainage area. —406 square miles.

Gage-height record. —Water-stage recorder graph except for periods May 23, 24, 26, 27, 29-31, June 2, 3, 7, 9, 10, 12, for which a graph was drawn based on once daily wire-weight gage readings, May 25, 28, June 1, 4-6, 8, 11, when there was no gage-height record.

Discharge record. —Stage-discharge relation defined by current-meter measurements below 16,000 cfs and by contracted-opening determination of peak discharge. Discharge for periods of no gage-height record computed on basis of recorded range in stage and records for stations on nearby streams.

Maxima. —May-July 1951: Discharge, 33,100 cfs 12 p.m. July 12 (gage height, 28.94 ft).
1929 to April 1951: Discharge, 15,500 cfs Dec. 5, 1944 (gage height, 27.40 ft).

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	2,380	95	2,640	11	773	220	3,370	21	135	811	246
2	3,220	73	468	12	406	155	14,200	22	141	2,620	196
3	3,100	67	656	13	254	88	19,400	23	119	7,300	190
4	512	65	892	14	198	78	10,200	24	104	9,960	190
5	323	70	2,760	15	168	108	2,580	25	105	4,110	165
6	261	150	3,430	16	172	438	567	26	108	3,150	148
7	222	104	3,950	17	218	329	346	27	106	3,820	134
8	201	450	6,170	18	186	131	278	28	84	8,290	124
9	224	365	2,600	19	164	119	870	29	74	3,810	116
10	1,060	307	1,120	20	144	470	679	30	81	8,160	111
								31	96	-	114
Monthly mean discharge, in second-feet									495	1,864	2,545
Runoff, in acre-feet									30,420	110,900	156,500
Runoff, in inches									1.41	5.12	7.23

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	July 8		July 9		July 10		July 11		July 12		July 13	
2	25.70	6,960	24.50	3,700	17.20	1,300	16.84	1,230	24.90	3,940		
4	25.72	7,060	23.93	3,390	16.89	1,240	20.32	2,150	25.03	4,070	28.54	27,900
6	25.74	7,150	23.33	3,130	16.58	1,180	22.91	2,970	25.25	4,820		
8	25.75	7,200	22.87	2,950	16.21	1,100	24.01	3,420	25.59	6,430	27.99	21,800
10	25.73	7,100	22.45	2,810	15.82	1,020	24.60	3,760	26.02	8,500		
N	25.68	6,860	21.89	2,620	15.63	986	24.94	3,960	26.51	11,100	27.45	17,000
2	25.61	6,530	21.23	2,420	15.65	990	25.07	4,170	27.15	15,000		
4	25.50	6,000	20.55	2,220	15.87	1,030	25.08	4,190	27.62	18,500	27.02	14,100
6	25.37	5,380	19.79	1,990	16.13	1,090	25.04	4,100	28.32	25,400		
8	25.20	4,600	19.03	1,760	16.30	1,120	25.00	4,000	28.14	23,400	26.80	12,800
10	25.00	4,000	18.25	1,560	16.37	1,130	24.94	3,960	28.61	28,800		
12	24.78	3,870	17.58	1,400	16.38	1,140	24.86	3,920	28.94	33,100	26.78	12,700
	July 14		July 15		July 16		July 17		July 18		July 19	
2			25.12	4,310							10.49	260
4	26.80	12,800	24.84	3,900	13.75	658	11.66	379			10.49	260
6			24.47	3,680					10.78	287	10.84	293
8	26.70	12,200	24.01	3,420	13.41	607	11.50	361			12.46	476
10			23.26	3,100							14.22	730
N	26.44	10,700	22.15	2,700	13.19	577	11.31	340	10.67	276	15.63	986
2			20.39	2,170							16.46	1,150
4	26.13	9,080	18.46	1,620	12.84	528	11.16	325			17.09	1,280
6			16.78	1,220					10.56	266	17.47	1,370
8	25.76	7,250	15.55	970	12.30	455	11.03	312			17.65	1,410
10			14.76	822							17.64	1,410
12	25.35	5,280	14.26	737	12.00	418	10.94	303	10.50	261	17.42	1,360
	July 20		July 21		July 22		July 23		July 24		July 25	
2	16.96	1,250										
4	16.32	1,120					9.50	178				
6	15.59	978	10.51	262					9.66	191		
8	14.73	816					9.57	184				
10	13.91	682										
N	13.14	570	10.28	241	9.72	196	9.68	192	9.71	195	9.33	164
2	12.47	477										
4	11.96	413					9.78	200				
6	11.56	368	10.11	227					9.61	187		
8	11.26	335					9.75	198				
10	11.01	310										
12	10.86	295	9.96	215	9.51	179	9.70	194	9.48	176	9.20	155

Supplemental record —July 12, 7 p.m., 28.55 ft, 28,000 cfs.

Kansas River at Bonner Springs, Kans.

Location. —Lat 39°03'20", long. 94°52'45", in NE¼ sec. 32, T. 11 S., R. 23 E., on downstream end of pier of bridge on State Highway 7 at Bonner Springs, half a mile downstream from Wolf Creek. Datum of gage is 747.01 ft above mean sea level, datum of 1929.

Drainage area. —59,890 square miles.

Gage-height record. —Water-stage recorder graph except for periods May 6-18, 23, 24, May 27 to June 4, 7 a.m. July 13 to 5 p.m. July 17, for which a graph was drawn based on a floodmark, generally twice-daily wire-weight gage readings, and frequent staff-gage readings July 13, 14.

Discharge record. —Stage-discharge relation defined by current-meter measurements below 230,000 cfs and by slope-area determination of peak discharge.

Maxima. —May-July 1951: Discharge, 510,000 cfs 12 p.m. July 13 (gage height, 38.58 ft).
1917 to April 1951: Discharge, 147,000 cfs June 18, 1943 (gage height, 25.23 ft).

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	41,800	22,000	170,000	11	21,400	68,200	136,000	21	32,800	37,700	84,400
2	97,900	21,200	146,000	12	16,400	47,700	241,000	22	28,400	88,500	63,800
3	82,800	19,200	96,700	13	14,700	39,900	441,000	23	24,700	142,000	54,300
4	53,800	19,600	74,300	14	12,300	41,600	486,000	24	22,600	172,000	59,400
5	31,200	41,300	70,900	15	11,400	39,900	382,000	25	27,500	157,000	49,300
6	21,200	42,100	101,000	16	10,100	69,200	299,000	26	28,500	144,000	37,900
7	16,800	50,200	106,000	17	9,630	67,800	247,000	27	24,800	156,000	32,500
8	14,200	70,400	85,600	18	19,000	70,400	185,000	28	23,100	160,000	32,900
9	13,400	80,600	62,000	19	26,400	55,400	141,000	29	21,600	154,000	27,800
10	20,100	83,000	58,600	20	46,300	41,000	106,000	30	20,200	164,000	25,800
								31	21,300	-	25,300
Monthly mean discharge, in second-feet									27,620	78,870	133,200
Runoff, in thousand acre-feet									1,699	4,693	8,189
Runoff, in inches									0.53	1.47	2.56

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	July 8		July 9		July 10		July 11		July 12		July 13	
2												
4					13.72	54,600	18.97	103,000	26.68	198,000	34.37	371,000
6	18.30	96,500										
8					13.63	53,800	21.33	128,000	28.20	225,000	35.94	418,000
10												
N	17.23	86,200	14.64	62,300	13.65	54,000	22.64	142,000	29.30	246,000	37.13	458,000
2												
4					13.97	56,600	23.62	153,000	29.81	256,000	37.84	483,000
6	15.99	74,400										
8					14.97	65,200	24.26	161,000	30.61	273,000	38.36	502,000
10												
12	15.21	67,400	13.90	56,000	16.47	79,000	25.20	174,000	32.56	321,000	38.58	510,000
	July 14		July 15		July 16		July 17		July 18		July 19	
2												
4	38.53	508,000										
6			35.78	413,000	32.09	308,000	30.22	265,000	26.41	199,000	22.25	149,000
8	38.37	502,000										
10												
N	38.08	492,000	34.76	382,000	31.67	298,000	29.37	247,000	25.26	185,000	21.57	141,000
2												
4	37.69	477,000										
6			33.60	349,000	31.27	288,000	28.47	230,000	24.08	171,000	20.80	132,000
8	37.23	461,000										
10												
12	36.71	443,000	32.69	324,000	30.82	278,000	27.47	214,000	23.08	159,000	19.89	122,000
	July 20		July 21		July 22		July 23		July 24		July 25	
2												
4												
6	18.86	110,000	17.12	92,200	14.56	67,000	13.19	55,000	13.70	59,300	12.96	53,200
8												
10												
N	18.24	104,000	16.33	84,300	14.20	63,800	13.00	53,500	13.97	61,700	12.42	48,900
2												
4												
6	17.86	99,600	15.60	77,000	13.83	60,500	12.99	53,400	13.88	60,900	11.93	45,000
8												
10												
12	17.66	97,600	15.00	71,000	13.41	56,800	13.07	54,100	13.50	57,500	11.57	42,500

Missouri River at Kansas City, Mo.

Location.—Lat 39°06'43", long. 94°35'16", in sec. 32, T. 50 N., R. 33 W., at Chicago, Burlington, & Quincy Railroad bridge at Kansas City, 1 mile downstream from Kansas River. Datum of gage is 715.79 ft above mean sea level, datum of 1929.

Drainage area.—489,200 square miles.

Gage-height record.—Water-stage recorder graph.

Discharge record.—Stage-discharge relation defined by current-meter measurements. Shifting-control method used. July 8-25 computed from loop curves.

Maxima.—May-July 1951: Discharge, 573,000 cfs 1 p.m. July 14; gage height, 36.2 ft 5-7 a.m. July 14.

1905-6, 1928 to April 1951: Discharge, 336,000 cfs June 18, 1943; gage height, 29.10 ft June 19, 1943.

1844 to 1927: Discharge known, about 625,000 cfs June 16, 1844 (gage height, 38.0 ft), computed by Corps of Engineers.

Flood of June 2, 1903 reached a stage of 34.95 ft.

Remarks.—Drainage basin above station contains many reservoirs with total usable capacity in excess of 27,640,000 acre-feet.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	154,000	77,200	268,000	11	104,000	171,000	245,000	21	114,000	171,000	152,000
2	241,000	131,000	247,000	12	99,200	155,000	340,000	22	103,000	231,000	130,000
3	257,000	176,000	195,000	13	89,000	141,000	427,000	23	106,000	277,000	130,000
4	241,000	179,000	202,000	14	80,600	134,000	558,000	24	101,000	281,000	128,000
5	170,000	200,000	210,000	15	76,200	122,000	495,000	25	96,600	263,000	120,000
6	134,000	174,000	237,000	16	78,400	162,000	398,000	26	102,000	245,000	99,800
7	110,000	162,000	255,000	17	82,400	164,000	328,000	27	115,000	260,000	87,800
8	89,600	190,000	260,000	18	90,200	141,000	261,000	28	102,000	270,000	86,000
9	80,600	200,000	222,000	19	91,400	132,000	226,000	29	90,800	268,000	81,200
10	86,000	186,000	184,000	20	121,000	143,000	182,000	30	84,200	269,000	79,400
								31	76,700	-	76,700
Monthly mean discharge, in second-feet									115,100	189,200	222,900
Runoff, in thousand acre-feet									7,075	11,260	13,710
Runoff, in inches									0.27	0.43	0.53

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	July 8		July 9		July 10		July 11		July 12		July 13	
2												
4												
6	25.75	268,000	24.12	236,000	21.13	188,000	22.86	216,000	28.40	313,000	31.54	383,000
8												
10												
N	25.68	263,000	23.06	218,000	20.63	182,000	25.32	256,000	29.94	347,000	32.50	406,000
2												
4												
6	25.30	256,000	22.29	206,000	20.37	178,000	26.30	274,000	30.88	368,000	34.40	469,000
8												
10												
12	24.88	248,000	21.66	197,000	20.55	181,000	27.10	288,000	31.12	373,000	35.75	528,000
	July 14		July 15		July 16		July 17		July 18		July 19	
2												
4												
6	36.20	565,000	34.55	516,000	31.66	420,000	29.73	340,000	27.63	271,000	25.37	232,000
8												
10												
N	36.14	572,000	34.10	500,000	30.92	393,000	29.40	327,000	26.91	257,000	25.14	228,000
2												
4												
6	35.90	565,000	33.33	476,000	30.48	375,000	29.13	317,000	26.24	246,000	24.54	220,000
8												
10												
12	34.95	531,000	32.40	446,000	30.22	362,000	28.47	293,000	25.64	236,000	23.60	208,000
	July 20		July 21		July 22		July 23		July 24		July 25	
2												
4												
6	22.26	192,000	19.23	158,000	16.90	134,000	16.53	128,000	16.10	126,000	16.29	128,000
8												
10												
N	21.21	180,000	18.75	153,000	16.49	128,000	16.93	134,000	16.29	128,000	15.51	120,000
2												
4												
6	20.34	169,000	18.12	146,000	16.19	127,000	16.66	131,000	16.57	130,000	14.92	115,000
8												
10												
12	19.68	162,000	17.50	140,000	16.00	125,000	16.30	128,000	16.57	130,000	14.31	108,000

Blue River near Kansas City, Mo.

Location.—Lat 38°57'25", long. 94°33'32", in SE¼NE¼ sec. 28, T. 48 N., R. 33 W., at bridge on County Highway 8-S, 0.4 mile downstream from Indian Creek and 1.7 miles southeast of Kansas City. Datum of gage is 753.73 ft above mean sea level (levels by Corps of Engineers).
Drainage area.—188 square miles.
Gage-height record.—Water-stage recorder graph.
Discharge record.—Artificial concrete control. Stage-discharge relation defined by current-meter measurements. Shifting control method used May 12 to June 21, July 18-31.
Maxima.—May-July 1951: Discharge, 31,100 cfs 3:45 p.m. July 11 (gage height, 38.30 ft).
1939 to April 1951: Discharge, 26,400 cfs Apr. 23, 1944 (gage height, 35.88 ft).
Maximum stage known about 39 ft Nov. 17, 1928, from information by city of Kansas City.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	515	76	470	11	381	109	16,500	21	234	182	99
2	346	53	320	12	229	148	15,000	22	204	898	82
3	220	53	712	13	167	94	2,680	23	217	948	348
4	114	49	352	14	135	87	679	24	138	453	116
5	99	46	1,870	15	111	117	418	25	116	300	81
6	87	87	3,620	16	324	727	275	26	289	4,500	72
7	78	927	1,610	17	412	151	318	27	104	971	58
8	76	236	448	18	157	106	176	28	87	3,270	51
9	130	398	655	19	418	101	145	29	80	3,920	46
10	1,330	135	2,590	20	163	742	122	30	78	1,500	42
								31	111	-	38
Monthly mean discharge, in second-feet									231	713	1,613
Runoff, in acre-feet									14,180	42,410	99,160
Runoff, in inches									1.41	4.23	9.89

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge
	July 4		July 5		July 6		July 7		July 8		July 9	
2			5.02	250	8.30	1,320	14.80	4,030			7.69	1,110
4			5.01	246	6.90	864	12.90	3,150			8.55	1,430
6	5.36	385	4.99	238	6.32	682	10.60	2,190			7.49	1,050
8			4.97	229	6.02	594	8.95	1,570			6.53	757
10			4.99	238	6.30	682	7.90	1,180			5.99	594
N	5.20	324	5.60	470	17.00	5,100	7.30	988	5.49	432	5.71	502
2			10.60	2,190	21.00	7,240	6.95	895			5.56	453
4			15.30	4,270	21.90	7,740	6.64	772			5.46	422
6	5.12	288	16.15	4,700	19.00	6,150	6.48	742			5.39	396
8			16.00	4,600	16.70	4,950	6.20	652			5.36	385
10			14.00	3,660	16.17	4,700	5.96	579			5.33	373
12	5.04	259	11.00	2,350	15.80	4,500	5.80	534	5.39	396	5.36	385
	July 10		July 11		July 12		July 13		July 14		July 15	
2	5.55	453	9.80	1,870	27.00	11,400						
4	7.00	895	19.40	6,360	25.10	9,660	16.40	4,800				
6	10.25	2,030	23.70	8,800	27.10	11,500			6.50	742		
8	12.90	3,150	26.10	10,500	29.50	14,500	11.55	2,590				
10	14.10	3,700	28.50	13,200	32.00	18,400						
N	14.00	3,660	31.80	18,100	33.20	20,700	8.95	1,570	6.30	682	5.46	422
2	13.80	3,570	36.40	27,100	33.30	20,900						
4	13.80	3,570	38.20	30,800	32.60	19,500	7.85	1,150				
6	13.30	3,340	37.30	28,900	31.00	16,700			6.00	594		
8	12.70	3,070	35.20	24,700	29.10	13,900	7.48	1,050				
10	11.35	2,510	32.60	19,500	26.80	11,200						
12	10.10	1,990	29.90	15,100	23.90	8,920	6.95	895	5.70	502	5.20	324
	July 16		July 17		July 18		July 19		July 20		July 21	
2												
4			4.92	204								
6												
8			5.46	418								
10												
N	5.09	276	5.72	502	4.82	167	4.76	144	4.68	122	4.59	99
2												
4			5.19	316								
6												
8			5.03	250								
10												
12	4.97	225	4.93	208	4.80	160	4.72	132	4.63	109	4.55	90

Little Blue River near Lake City, Mo.

Location.—Lat 39°06'00", long. 94°18'00", in SW¼SE¼ sec. 35, T. 50 N., R. 31 W., at bridge on State Highway 78, 3 miles southwest of Lake City and 10½ miles upstream from mouth. Datum of gage is 719.15 ft above mean sea level, datum of 1929.

Drainage area.—184 square miles.

Gage-height record.—Wire-weight gage read once daily below 11 ft and twice daily above except for May 4, 25, July 20 when gage was not read. Graph drawn for days of changing stage.

Discharge record.—Stage-discharge relation defined by current-meter measurements. Shifting-control method used May 1 to June 25, July 14-31. Discharge for days of no gage-height record interpolated.

Maxima.—May-July 1951: Discharge, 6,400 cfs 12 m. to 5 p.m. July 12 (gage height, 26.1 ft, from floodmark).

1948 to April 1951: Discharge, 6,000 cfs Mar. 20, 1948 (gage height, 24.97 ft, from floodmark).

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	168	49	423	11	502	55	4,120	21	98	92	98
2	195	32	222	12	213	90	6,210	22	110	55	77
3	116	25	213	13	137	77	4,990	23	137	424	252
4	87	27	295	14	104	49	2,280	24	87	679	152
5	72	21	220	15	82	45	533	25	67	222	87
6	58	24	1,450	16	146	356	231	26	55	1,040	72
7	51	159	1,690	17	390	163	310	27	47	1,360	62
8	49	110	429	18	152	67	250	28	39	1,080	55
9	51	152	2,010	19	110	51	160	29	37	1,560	47
10	340	87	1,640	20	116	72	120	30	35	1,540	41
								31	47	-	37
Monthly mean discharge, in second-feet									126	325	928
Runoff, in acre-feet									7,730	19,360	57,080
Runoff, in inches									0.79	1.97	5.82

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge
	July 4		July 5		July 6		July 7		July 8		July 9	
2												
4			8.46	195	12.80	672	19.33	2,030	11.00	445	18.80	1,890
6	10.40	380										
8			8.40	186	15.40	1,100	19.10	1,970	9.90	330	20.70	2,460
10												
N	9.50	290	8.30	177	17.80	1,680	18.90	1,910	9.50	290	20.70	2,460
2												
4			8.37	186	19.10	1,970	17.70	1,610	9.50	290	20.20	2,290
6	8.80	222										
8			9.30	270	19.40	2,060	15.80	1,180	10.80	423	18.70	1,860
10												
12	8.60	204	10.70	412	19.40	2,060	13.60	790	13.70	805	16.70	1,370
	July 10		July 11		July 12		July 13		July 14		July 15	
2												
4	16.60	1,350	21.70	2,860	25.66	6,000	25.60	5,900				
6									21.70	2,780	13.30	658
8	17.00	1,440	23.30	3,760	25.98	6,300	25.20	5,500				
10												
N	18.10	1,710	24.00	4,350	26.10	6,400	24.80	5,100	20.30	2,260	11.50	423
2												
4	18.40	1,780	24.50	4,800	26.10	6,400	24.30	4,620				
6									18.60	1,760	10.70	330
8	18.70	1,860	24.90	5,200	26.04	6,300	23.60	4,000				
10												
12	19.10	1,970	25.20	5,500	25.86	6,200	22.90	3,490	16.10	1,160	10.30	280
	July 16		July 17									
2												
4												
6												
8												
10												
N	9.70	222	11.00	360								
2												
4												
6												
8												
10												
12	9.40	195	10.60	320								

East Fork Fishing River at Excelsior Springs, Mo.

Location.—Lat 39°20'20", long. 94°12'45", in SE¼SE¼ sec. 1, T. 52 N., R. 30 W., at Golf Hill Bridge in Excelsior Springs, three-quarters of a mile upstream from Dry Fork Fishing River, and 6-3/4 miles upstream from mouth.

Drainage area.—19.8 square miles.

Gage-height record.—Water-stage recorder graph.

Discharge record.—Stage-discharge relation defined by current-meter measurements below 1,700 cfs and by slope-area determination of peak discharge. Shifting-control method used May 9 to June 21.

Maxima.—May-July 1951: Discharge, 23,100 cfs 5:30 a.m. July 6 (gage height, 15.33 ft in gage well).
February to April 1951: Discharge, 464 cfs April 6, 1951 (gage height, 5.32 ft).
At point 200 ft upstream from gage flood of June 22, 1947 reached a stage 3.7 ft higher than that of July 6, 1951, from floodmarks.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	5.5	2.4	20	11	16	1.5	334	21	12	178	5.8
2	5.2	1.9	12	12	11	1.3	334	22	10	32	5.0
3	4.5	1.5	12	13	8.1	1.1	56	23	8.1	92	6.1
4	3.2	1.3	8.8	14	6.5	.9	29	24	6.5	110	5.2
5	2.2	1.3	477	15	5.2	40	20	25	5.2	25	4.2
6	1.9	1.7	3,890	16	7.2	56	17	26	5.0	313	3.5
7	1.9	6.5	94	17	8.5	10	17	27	3.5	217	3.0
8	1.5	5.0	199	18	5.5	5.8	12	28	2.8	618	2.4
9	4.7	4.2	114	19	36	4.5	9.5	29	2.8	94	2.0
10	38	2.2	41	20	14	3.5	7.6	30	2.6	42	1.8
								31	3.2	-	1.4
Monthly mean discharge, in second-feet									8.01	62.5	185
Runoff, in acre-feet									492	3,720	11,390
Runoff, in inches									0.47	3.52	10.79

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge
	July 4		July 5		July 6		July 7		July 8		July 9	
1			2.29	5.2	4.36	250			5.08	51		
2			2.28	5.0	4.36	250			5.08	51	6.40	262
3			2.28	5.0	9.30	2,920			5.07	51		
4			2.27	4.8	11.20	7,060			5.07	51	5.88	159
5			2.27	4.8	14.00	17,400			5.06	50		
6			2.27	4.8	14.40	18,900			5.06	50	5.63	120
7			2.27	4.8	11.50	7,460			5.05	49		
8			2.33	6.5	10.60	4,680			5.05	49	5.47	98
9			2.44	10	10.90	5,560			5.04	48		
10			3.10	61	11.50	7,460			5.04	48	5.35	82
11			6.13	710	12.50	11,000			5.03	47		
N	2.40	8.8	6.10	695	10.80	5,260	5.40	88	5.02	47	5.27	71
1			5.67	562	9.30	1,990			5.01	46		
2			8.05	1,630	7.70	700			4.99	44	5.19	62
3			8.65	2,160	7.10	462			4.98	43		
4			7.97	1,550	6.80	370			4.97	43	5.13	56
5			7.20	1,120	6.52	293			4.96	42		
6			6.30	760	6.37	255			4.95	41	5.07	51
7			5.68	576	6.22	220			4.94	40		
8			5.34	478	6.10	196			5.70	131	5.03	47
9			5.00	390	6.00	178			8.50	1,140		
10			4.65	311	5.93	167			8.82	1,400	5.00	45
11			4.40	259	5.87	157			8.10	895		
12	2.30	5.5	4.37	250	5.82	149	5.10	53	7.47	590	4.98	43
	July 10		July 11		July 12		July 13					
2			4.97	43	5.33	79						
4			6.05	187	5.31	76						
6	4.93	39	8.36	1,040	6.20	216	5.22	65				
8			7.92	790	7.80	745						
10			7.87	768	8.20	950						
N	4.92	39	6.95	415	7.90	790	5.10	53				
2			6.30	238	6.95	415						
4			5.87	158	6.32	243						
6	5.00	45	5.66	125	5.96	172	4.97	43				
8			5.48	99	5.70	131						
10			5.37	84	5.53	106						
12	4.94	40	5.30	75	5.42	91	4.87	35				

Supplemental records.—July 5, 2:45 p.m., 8.71 ft, 2,210 cfs; July 6, 5:30 a.m., 15.1 ft, 23,100 cfs; 11 a.m., 12.5 ft, 11,000 cfs; July 8, 10 p.m., 9.00 ft, 1,620 cfs; July 11, 6:30 a.m., 8.40 ft, 1,080 cfs; July 12, 11 a.m., 8.23 ft, 980 cfs.

Crooked River near Richmond, Mo.

Location. – Lat 39°20', long. 93°59', in NW¼ sec. 7, T. 52 N., R. 27 W., at bridge on State Highway 13, 4 miles north of Richmond, 8½ miles upstream from West Fork Crooked River, and 24½ miles upstream from mouth. Datum of gage is 706.34 ft above mean sea level, datum of 1929.
Drainage area. – 159 square miles.
Gage-height record. – Wire-weight gage read once daily below 10 ft and twice daily above. Graph drawn for days of changing stage. No gage-height record May 14.
Discharge record. – Stage-discharge relation defined by current-meter measurements. Shifting-control method used May 21 to June 20, July 14-31. Discharge for day of no gage-height record interpolated.
Maxima. – May-July 1951: Discharge, 27,000 cfs 1 p.m. July 6 (gage height, 28.8 ft, from floodmark).
1948 to April 1951: Discharge, 3,300 cfs June 2, 1949 (gage height, 21.8 ft).

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	44	11	161	11	133	13	2,320	21	46	824	53
2	76	13	108	12	92	11	3,490	22	39	1,550	30
3	61	12	97	13	56	8	2,700	23	48	755	30
4	44	10	88	14	46	8	424	24	28	1,300	28
5	37	9	1,580	15	37	7	157	25	23	413	28
6	30	8	17,900	16	30	63	133	26	18	1,130	28
7	25	13	10,700	17	41	19	108	27	17	1,790	26
8	24	20	1,170	18	34	18	120	28	16	2,270	24
9	34	25	1,400	19	63	12	80	29	10	2,420	18
10	120	18	668	20	66	13	58	30	10	409	17
								31	9	-	13
Monthly mean discharge, in second-feet									43	439	1,412
Runoff, in acre-feet									2,690	26,130	86,790
Runoff, in inches									0.32	3.08	10.23

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	July 4		July 5		July 6		July 7		July 8		July 9	
2			7.80	154	24.90	5,950						
4			8.80	237	25.90	8,110	27.70	17,100	19.00	2,060	16.70	1,400
6			10.30	401	26.80	11,200						
8			11.70	576	27.70	17,100	27.20	13,400	15.00	1,070	18.10	1,760
10			13.60	845	28.30	22,200						
N	6.55	80	15.30	1,120	28.70	26,000	26.40	9,600	11.50	550	18.20	1,790
2			17.10	1,490	28.70	26,000						
4			19.00	2,060	28.50	24,000	25.40	6,830	10.80	461	17.40	1,560
6			20.30	2,600	28.20	21,300						
8			21.60	3,200	28.00	19,500	24.30	5,140	11.10	498	15.40	1,140
10			22.80	3,880	28.20	21,300						
12	7.00	102	23.90	4,710	28.10	20,400	22.90	3,940	13.20	785	13.00	755
	July 10		July 11		July 12		July 13		July 14		July 15	
2												
4			17.20	1,510			21.80	3,300	12.70	671		
6	11.10	498			21.90	3,350						
8			19.00	2,060			21.50	3,150	11.00	449		
10												
N	11.00	485	20.00	2,460	22.30	3,580	21.30	3,050	10.10	341	8.10	147
2												
4			20.60	2,730			20.90	2,860	9.50	275		
6	12.70	713			22.50	3,700						
8			21.10	2,960			17.50	1,590	9.00	228		
10												
12	15.70	1,200	21.50	3,150	22.20	3,520	14.30	953	8.70	201	7.90	133

Missouri River at Waverly, Mo.

Location. —Lat 39°12'51", long. 93°30'57", in sec. 14, T. 51 N., R. 24 W., at bridge on U. S. Highway 65 at Waverly. Datum of gage is 645.49 ft above mean sea level, datum of 1929.
Drainage area. —491,200 square miles.
Gage-height record. —Water-stage recorder graph.
Discharge record. —Stage-discharge relation defined by current-meter measurements. Shifting-control method used. July 11-25 computed from loop curves.
Maxima. —May-July 1951: Discharge, 549,000 cfs 8 to 11 a.m. July 16; gage height, 28.20 ft 6 a.m. to 1 p.m. July 14.
1929 to April 1951: Discharge, 347,000 cfs Apr. 24, 1944; gage height, 25.14 ft June 24, 1947.
Remarks. —Drainage basin above station contains reservoirs with total usable capacity in excess of 27,640,000 acre-feet.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	124,000	75,900	287,000	11	101,000	184,000	219,000	21	127,000	159,000	222,000
2	198,000	93,700	266,000	12	107,000	172,000	265,000	22	105,000	197,000	168,000
3	230,000	166,000	235,000	13	93,700	160,000	344,000	23	102,000	229,000	143,000
4	240,000	170,000	214,000	14	83,700	150,000	401,000	24	102,000	256,000	134,000
5	208,000	184,000	225,000	15	77,700	139,000	502,000	25	95,000	281,000	127,000
6	160,000	187,000	248,000	16	74,100	153,000	538,000	26	97,600	275,000	117,000
7	130,000	164,000	281,000	17	83,700	181,000	460,000	27	109,000	266,000	104,000
8	105,000	176,000	302,000	18	91,800	157,000	383,000	28	109,000	275,000	97,600
9	86,700	199,000	276,000	19	95,000	142,000	314,000	29	93,700	298,000	93,000
10	84,300	199,000	234,000	20	106,000	147,000	271,000	30	85,500	290,000	86,700
								31	80,100	-	82,500
Monthly mean discharge, in second-feet									115,700	190,900	246,400
Runoff, in thousand acre-feet									7,112	11,360	15,150
Runoff, in inches									0.27	0.43	0.58

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	July 8		July 9		July 10		July 11		July 12		July 13	
2												
4												
6	27.18	305,000	26.82	286,000	25.85	240,000	24.36	214,000	25.79	247,000	27.57	325,000
8												
10												
N	27.00	306,000	26.80	278,000	25.44	234,000	24.50	216,000	26.33	260,000	27.77	342,000
2												
4												
6	26.89	299,000	26.64	268,000	24.99	226,000	24.81	222,000	26.87	285,000	28.03	362,000
8												
10												
12	26.82	294,000	26.29	254,000	24.60	220,000	25.28	231,000	27.32	308,000	28.18	376,000
	July 14		July 15		July 16		July 17		July 18		July 19	
2												
4												
6	28.20	385,000	27.84	480,000	27.51	547,000	26.64	480,000	25.65	400,000	24.60	327,000
8												
10												
N	28.20	395,000	27.70	505,000	27.40	548,000	26.41	460,000	25.41	388,000	24.34	312,000
2												
4												
6	28.15	410,000	27.62	525,000	27.15	532,000	26.13	437,000	25.14	365,000	24.14	302,000
8												
10												
12	27.90	455,000	27.55	540,000	26.90	506,000	25.90	419,000	24.82	342,000	23.95	287,000
	July 20		July 21		July 22		July 23		July 24		July 25	
2												
4												
6	23.76	282,000	22.65	238,000	21.10	178,000	19.82	143,000	19.52	137,000	19.16	129,000
8												
10												
N	23.54	273,000	22.29	220,000	20.74	168,000	19.74	142,000	19.33	133,000	19.09	128,000
2												
4												
6	23.30	262,000	21.90	206,000	20.31	156,000	19.75	142,000	19.23	132,000	18.90	125,000
8												
10												
12	23.02	250,000	21.53	197,000	19.96	147,000	19.67	141,000	19.18	130,000	18.63	123,000

Wakenda Creek at Carrollton, Mo.

Location.—Lat 39°21', long. 93°30', in NE¼SE¼ sec. 5, T. 52 N., R. 23 W., at bridge on U. S. Highway 65 in Carrollton, half a mile downstream from Brush Creek and 14 miles upstream from mouth. Datum of gage is 641.17 ft above mean sea level, datum of 1929.

Drainage area.—248 square miles.

Gage-height record.—Wire-weight gage read once daily below 10 ft and twice daily above. Graph drawn for days of changing stage.

Discharge record.—Stage-discharge relation defined by current-meter measurements. Shifting-control method used May 1-12, July 26-31, Stage-discharge relation affected by backwater and/or overflow from Missouri River July 1-4, 14-25; discharge computed on basis of discharge measurements and records for adjacent stations. Overflow from Missouri River excluded.

Maxima.—May-July 1951: Discharge, 6,640 cfs 6 a.m. July 7 (gage height, 22.40 ft); gage height, 23.4 ft 8:30 a.m. July 17, from graph based on gage readings (backwater and overflow from Missouri River).

1948 to April 1951: Discharge, 7,000 cfs Mar. 20, 1948 (gage height, 22.64 ft, from floodmark).

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	62	9	350	11	52	3.6	3,240	21	35	2,460	80
2	76	8	200	12	69	3.7	5,020	22	18	3,540	60
3	69	6	150	13	58	4.1	4,320	23	16	1,290	500
4	49	4.2	100	14	36	3.2	2,000	24	12	1,390	1,500
5	37	4.0	1,800	15	31	32	700	25	10	309	1,000
6	30	3.6	5,170	16	25	40	350	26	9	2,040	604
7	25	13	5,630	17	26	8	350	27	5	3,720	265
8	25	23	2,670	18	26	7	200	28	4.1	3,500	151
9	24	26	1,680	19	35	41	130	29	4.1	4,730	80
10	43	17	1,530	20	37	225	100	30	4.0	1,600	27
								31	10	-	15
Monthly mean discharge, in second-feet									31.0	835	1,289
Runoff, in acre-feet									1,908	49,710	79,280
Runoff, in inches									0.14	3.76	5.99

Grand River near Sumner, Mo.

Location.—Lat 39°38'25", long. 93°16'25", in NE¼ sec. 29, T. 56 N., R. 21 W., at Chicago, Burlington & Quincy Railroad bridge, 2 miles southwest of Sumner and 2½ miles downstream from Locust Creek. Datum of gage is 630.87 ft above mean sea level, datum of 1929. Auxiliary staff gage 3¼ miles downstream. Datum of auxiliary gage is 631.00 ft above mean sea level, datum of 1929.

Drainage area.—6,880 square miles.

Gage-height record.—Base gage: Water-stage recorder graph. Auxiliary gage: Graph based on twice-daily staff gage readings.

Discharge record.—Stage-discharge relation defined by current-meter measurements. Discharge computed using fall, as determined from auxiliary gage, as a factor May 5-7, 14, 15, June 5, June 23 to July 4, July 9-16.

Maxima.—May-July 1951: Discharge, 60,000 cfs 8 a.m. July 9; gage height, 32.36 ft 4 a.m. June 30.
1924 to April 1951: Discharge, 180,000 cfs June 7, 8, 1947 (gage height, 39.5 ft, from floodmark). Flood of July 9, 1909 reached a stage of 36.7 ft, from floodmark.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	18,800	2,460	26,700	11	22,600	5,000	20,600	21	2,720	10,600	3,000
2	26,000	3,070	12,000	12	27,300	3,000	17,700	22	3,500	28,200	3,840
3	36,700	15,300	6,420	13	24,600	2,860	15,700	23	2,720	41,400	17,000
4	44,200	16,000	4,990	14	11,900	3,430	12,100	24	2,390	51,800	16,000
5	31,300	10,000	7,480	15	6,340	2,790	4,700	25	2,390	45,600	12,300
6	11,500	5,350	21,900	16	4,180	2,580	3,790	26	2,200	36,300	7,420
7	5,520	3,430	38,200	17	3,430	6,160	8,720	27	7,500	36,700	3,500
8	4,030	2,650	54,000	18	2,930	4,500	10,600	28	11,000	44,600	2,200
9	3,210	4,660	58,000	19	2,790	2,390	8,020	29	6,160	54,000	1,780
10	5,570	7,120	42,000	20	2,650	1,960	4,500	30	3,360	51,500	1,460
								31	2,460	-	1,280
Monthly mean discharge, in second-feet									11,030	16,850	14,450
Runoff, in thousand acre-feet									678.2	1,002	888.4
Runoff, in inches									1.85	2.73	2.42

Yellow Creek near Rothville, Mo.

Location.—Lat 39°38', long. 93°05', on line between NW¼ sec. 31, T. 56 N., R. 19 W., and NE¼ sec. 36, T. 56 N., R. 20 W., at bridge on State Highway 11, 2½ miles southwest of Rothville and 3 miles downstream from East Yellow Creek. Datum of gage is 664.37 ft above mean sea level, datum of 1929.

Drainage area.—405 square miles.

Gage-height record.—Wire-weight gage read twice daily during high rises; otherwise once daily. Graph drawn for days of changing stage. Doubtful gage-height record July 14, 16.

Discharge record.—Stage-discharge relation defined by current-meter measurements. Shifting-control method used May 14 to June 20, July 2-31. Discharge for days of doubtful gage-height record computed on basis of discharge measurement on July 15 and weather records.

Maxima.—May-July 1951: Discharge, 8,200 cfs 6 a.m. to 1 p.m. June 29 (gage height, 21.26 ft).
1929-32, 1948 to April 1951: Discharge, 9,000 cfs June 17, 1950 (gage height, 21.40 ft).
Maximum stage known, 23.1 ft in June 1947, from floodmark, from information by Corps of Engineers and local residents.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	160	104	1,640	11	1,300	21	742	21	66	1,920	29
2	337	136	468	12	1,160	17	842	22	225	2,900	22
3	491	160	215	13	723	15	370	23	86	3,640	22
4	381	97	168	14	265	15	200	24	40	4,400	733
5	205	152	160	15	144	13	97	25	32	2,380	1,040
6	112	104	557	16	97	14	70	26	32	1,510	249
7	74	59	326	17	74	27	168	27	50	2,450	120
8	59	37	128	18	59	21	144	28	26	4,400	120
9	50	25	168	19	44	20	90	29	23	7,400	112
10	440	24	97	20	40	168	62	30	31	4,400	235
								31	152	-	160
Monthly mean discharge, in second-feet									225	1,221	308
Runoff, in acre-feet									13,840	72,650	18,950
Runoff, in inches									0.64	3.36	0.88

Chariton River near Keytesville, Mo.

Location.—Lat 39°26'55", long. 92°52'10", in SE¼SE¼ sec. 25, T. 54 N., R. 18 W., at county highway bridge 4½ miles northeast of Keytesville and 5¼ miles upstream from Puzzle Creek. Datum of gage is 616.37 ft above mean sea level, datum of 1929.

Drainage area.—1,950 square miles.

Gage-height record.—Wire-weight gage read once daily below 12 ft and twice daily above. Graph drawn for days of changing stage. Doubtful gage reading May 27.

Discharge record.—Stage-discharge relation defined by current-meter measurements. Shifting-control method used May 18 to June 22, June 27. Stage-discharge relation affected by backwater from Missouri River July 7-22; discharge computed on basis of discharge measurement, records for station at Novinger, and Missouri River stages at Glasgow. Discharge for May 27 computed on assumption gage was read 1 ft low.

Maxima.—May-July 1951: Discharge, 10,400 cfs 6 p.m. June 27 to 2 p.m. June 28; gage height, 21.87 ft, from floodmark 10 a.m. to 2 p.m. June 28.
1929 to April 1951: Discharge, 25,600 cfs June 8, 9, 1947 (gage height, 25.3 ft, from floodmarks).

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	1,550	948	4,260	11	1,900	1,550	750	21	706	1,140	300
2	1,420	860	3,420	12	4,420	1,340	600	22	1,220	3,540	400
3	2,300	2,090	2,620	13	4,420	1,060	470	23	948	4,800	6,110
4	3,040	911	1,920	14	3,600	772	350	24	554	7,700	6,470
5	2,750	674	1,440	15	3,860	706	350	25	497	6,150	5,860
6	2,360	1,180	1,510	16	4,140	911	300	26	860	7,740	3,300
7	1,810	1,060	1,500	17	3,600	840	270	27	525	10,200	1,440
8	1,340	739	1,200	18	1,850	554	270	28	469	10,000	846
9	1,060	525	1,000	19	911	497	300	29	365	7,850	818
10	840	1,020	900	20	875	466	300	30	643	5,480	790
								31	1,220	-	494
Monthly mean discharge, in second-feet									1,808	2,777	1,631
Runoff, in acre-feet									111,200	165,200	100,300
Runoff, in inches									1.07	1.59	0.96

Mussel Fork near Musselfork, Mo.

Location.—Lat 39°31', long. 92°57', in SW¼SE¼ sec. 32, T. 55 N., R. 18 W., at bridge on State Highway 5, 1½ miles upstream from Long Branch and 4½ miles southwest of Musselfork.
Drainage area.—267 square miles.
Gage-height record.—Wire-weight gage read once daily below 5 feet and twice daily above. Graph drawn for days of changing stage.
Discharge record.—Stage-discharge relation defined by current-meter measurements.
Maxima.—May-July 1951: Discharge, 4,380 cfs 8 a.m. June 20 (gage height, 18.96 ft).
1948 to April 1951: Discharge, 2,650 cfs June 17. 18, 1950 (gage height, 18.7 ft, from graph based on gage readings).
Maximum stage known, 20.7 ft in June 1947, from information by local resident.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	84	96	707	11	592	21	387	21	31	501	26
2	203	352	185	12	553	18	1,240	22	95	619	24
3	169	1,290	122	13	278	90	333	23	78	2,220	24
4	185	185	137	14	122	57	145	24	78	2,150	867
5	108	96	161	15	78	20	84	25	45	1,560	1,320
6	67	78	462	16	54	17	62	26	35	979	323
7	48	57	239	17	43	25	48	27	29	2,000	90
8	41	50	108	18	37	20	39	28	21	2,590	62
9	37	35	173	19	35	62	33	29	18	3,910	110
10	239	26	118	20	50	142	29	30	15	2,290	153
								31	91	-	62
Monthly mean discharge, in second-feet									115	719	254
Runoff, in acre-feet									7,060	42,760	15,620
Runoff, in inches									0.50	3.00	1.10

Lamine River at Clifton City, Mo.

Location.—Lat 38°45'20", long. 93°01'10", in NW¼ sec. 16, T. 46 N., R. 19 W., at county highway bridge, 300 ft upstream from Missouri-Kansas-Texas Railroad bridge, three-quarters of a mile east of Clifton City, and 8 miles downstream from Otter Creek. Datum of gage is 621.91 ft above mean sea level, datum of 1929.
Drainage area.—598 square miles.
Gage-height record.—Wire-weight gage read once daily below 10 ft and twice daily above. Graph drawn for days of changing stage.
Discharge record.—Stage-discharge relation defined by discharge measurements below 30,000 cfs and extended to peak stage.
Maxima.—May-July 1951: Discharge, 65,500 cfs 5 a.m. June 29 (gage height, 32.50 ft).
1922 to April 1951: Discharge, 60,000 cfs May 18, 1943 (gage height, 32.0 ft), from rating curve extended above 30,000 cfs.
Maximum stage known, 35.3 ft Sept. 18, 1905, from floodmark.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	239	57	5,850	11	537	350	4,460	21	264	824	177
2	620	61	1,060	12	337	4,690	7,130	22	1,000	350	150
3	592	65	1,630	13	177	7,280	11,500	23	883	1,940	337
4	311	47	7,400	14	177	1,100	2,780	24	376	7,440	239
5	196	43	7,550	15	142	3,240	824	25	217	9,840	118
6	186	39	17,600	16	110	1,820	537	26	150	2,980	95
7	150	43	26,300	17	95	2,240	376	27	95	5,780	76
8	126	800	9,650	18	83	592	298	28	75	14,500	72
9	118	5,780	2,170	19	65	376	274	29	68	47,200	66
10	510	1,900	2,080	20	62	402	217	30	59	13,800	58
								31	56	-	50
Monthly mean discharge, in second-feet									261	4,519	3,585
Runoff, in acre-feet									16,020	268,900	220,400
Runoff, in inches									0.50	8.43	6.91

Blackwater River at Blue Lick, Mo.

Location.—Lat 38°59'30", long. 93°12'15", on line between secs. 27 and 34, T. 49 N., R. 21 W., at bridge on U. S. Highway 65, three-quarters of a mile downstream from Finney Creek and 1 mile south of Blue Lick. Datum of gage is 593.79 ft above mean sea level, datum of 1929.

Drainage area.—1,120 square miles.

Gage-height record.—Wire-weight gage read twice daily except May 6, 13, 20, 27, 30, June 3, 10, 17, 24, July 1, 4, 15, 22, 29 when gage was not read. Graph drawn for days of changing stage.

Discharge record.—Stage-discharge relation defined by current-meter measurements. Shifting-control method used June 10 to July 3, July 20-31. Discharge for days of no gage-height record computed on basis of weather records and records for adjacent stations.

Maxima.—May-July 1951: Discharge, 23,900 cfs 3 to 8 a.m. July 14 (gage height, 35.06 ft, from graph based on gage readings).

1922-33, 1938 to April 1951: Discharge, 54,000 cfs Nov. 18, 1928 (gage height, 41.25 ft, from floodmarks), from rating curve extended above 32,000 cfs by logarithmic plotting.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	386	47	17,000	11	3,180	262	15,900	21	93	2,810	370
2	1,400	671	15,900	12	2,500	178	19,600	22	85	3,630	250
3	999	750	10,800	13	900	501	22,300	23	93	3,180	410
4	393	144	9,000	14	312	312	23,100	24	102	3,800	2,380
5	250	93	6,880	15	212	206	18,500	25	85	4,560	1,250
6	200	60	9,240	16	178	355	12,600	26	70	6,530	262
7	148	124	13,800	17	138	900	8,320	27	55	7,060	198
8	129	1,770	20,000	18	129	899	6,360	28	41	11,400	168
9	255	1,140	18,200	19	116	198	4,960	29	28	13,800	140
10	2,360	500	15,300	20	105	1,560	1,580	30	28	15,600	111
								31	28	-	98
Monthly mean discharge, in second-feet									484	2,768	8,870
Runoff, in acre-feet									29,750	164,700	545,400
Runoff, in inches									0.50	2.76	9.13

Missouri River at Boonville, Mo.

Location.—Lat 38°58'40", long. 92°45'15", in sec. 35, T. 49 N., R. 17 W., at Missouri-Kansas-Texas Railroad bridge at Boonville. Datum of gage is 565.02 ft above mean sea level, datum of 1929.

Drainage area.—505,700 square miles.

Gage-height record.—Water-stage recorder graph.

Discharge record.—Stage-discharge relation defined by current-meter measurements. Shifting-control method used.

Maxima.—May-July 1951: Discharge, 550,000 cfs at 2 p.m. July 17 (gage height, 32.82 ft 11 p.m.).

1925 to April 1951: Discharge, 504,000 cfs Apr. 27, 1944; gage height, 32.02 ft June 27, 1947.

1844 to 1924: Discharge known, about 710,000 cfs June 21, 1844 (gage height, 32.7 ft) computed by Corps of Engineers.

The flood of June 6, 1903 reached 30.5 ft.

Remarks.—Drainage basin above station contains many reservoirs with total usable capacity in excess of 27,640,000 acre-feet.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	118,000	89,600	369,000	11	108,000	194,000	329,000	21	117,000	167,000	340,000
2	178,000	90,200	355,000	12	135,000	180,000	323,000	22	121,000	203,000	295,000
3	223,000	132,000	336,000	13	133,000	171,000	321,000	23	108,000	241,000	261,000
4	240,000	183,000	312,000	14	120,000	164,000	343,000	24	106,000	271,000	228,000
5	248,000	192,000	284,000	15	105,000	157,000	370,000	25	104,000	291,000	198,000
6	227,000	197,000	275,000	16	93,600	155,000	429,000	26	98,300	316,000	170,000
7	168,000	191,000	284,000	17	89,600	179,000	534,000	27	99,500	328,000	140,000
8	132,000	177,000	313,000	18	93,600	184,000	527,000	28	118,000	330,000	116,000
9	107,000	190,000	335,000	19	98,900	161,000	475,000	29	112,000	339,000	104,000
10	100,000	200,000	329,000	20	100,000	155,000	404,000	30	98,300	369,000	98,900
								31	93,000	-	93,600
Monthly mean discharge, in second-feet									128,800	206,600	299,700
Runoff, in thousand acre-feet									7,920	12,290	18,430
Runoff, in inches									0.29	0.46	0.68

Missouri River at Boonville, Mo.—Continued

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	July 8		July 9		July 10		July 11		July 12		July 13	
2												
4												
6	27.48	304,000	28.26	334,000	28.40	331,000	28.25	324,000	28.38	328,000	27.82	318,000
8												
10												
N	27.73	312,000	28.36	339,000	28.39	328,000	28.55	334,000	28.20	322,000	27.79	318,000
2												
4												
6	27.99	322,000	28.38	336,000	28.34	326,000	28.48	331,000	28.02	319,000	27.86	323,000
8												
10												
12	28.16	329,000	28.41	335,000	28.32	326,000	28.44	330,000	27.89	318,000	27.93	329,000
	July 14		July 15		July 16		July 17		July 18		July 19	
2												
4												
6	28.09	336,000	28.59	364,000	29.36	406,000	32.00	528,000	32.62	536,000	32.02	492,000
8												
10												
N	28.24	343,000	28.70	370,000	29.72	425,000	32.50	548,000	32.57	529,000	31.77	476,000
2												
4												
6	28.35	350,000	28.78	376,000	30.35	451,000	32.70	548,000	32.40	517,000	31.46	458,000
8												
10												
12	28.45	354,000	29.01	388,000	30.99	479,000	32.75	547,000	32.19	503,000	31.21	442,000
	July 20		July 21		July 22		July 23		July 24		July 25	
2												
4												
6	30.85	422,000	29.39	353,000	28.10	304,000	26.72	268,000	25.25	235,000	23.78	204,000
8												
10												
N	30.54	405,000	29.08	339,000	27.77	295,000	26.41	261,000	24.91	228,000	23.41	197,000
2												
4												
6	30.08	383,000	28.76	327,000	27.42	286,000	26.06	253,000	24.56	221,000	23.06	191,000
8												
10												
12	29.77	369,000	28.44	315,000	27.10	278,000	25.67	244,000	24.23	214,000	22.70	184,000

Moniteau Creek near Fayette, Mo.

Location.—Lat 39°07'15", long. 92°33'40", in SE¼SE¼ sec. 14, T. 50 N., R. 15 W., at county highway bridge, 1 mile downstream from Hungry Mother Creek, 7½ miles east of Fayette, and 15 miles upstream from mouth.

Drainage area.—81 square miles.

Gage-height record.—Wire-weight gage read once daily below 11 ft and twice daily above except for May 6, 19, 20 when gage was not read. Gage reading doubtful May 14.

Discharge record.—Stage-discharge relation defined by current-meter measurements. Shifting-control method used May 11 to June 23, July 29-31. Discharge for days of no gage-height record computed on basis of weather records. Discharge for day of doubtful gage-height record interpolated.

Maxima.—May-July 1951: Discharge, 2,450 cfs 9-10 p.m. July 11 (gage height, 18.0 ft, from floodmark).

1948 to April 1951: Discharge, 2,760 cfs Dec. 22, 1949 (gage height, 18.48 ft, from floodmark). Maximum stage known, 22.9 ft, probably in April 1944, from information by local resident.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	11	31	49	11	49	2.1	796	21	11	31	7
2	18	11	29	12	25	1.7	462	22	8	71	6
3	14	6	25	13	16	1.4	74	23	10	99	65
4	14	3.7	20	14	12	1.1	39	24	9	605	34
5	6	2.7	16	15	9	11	24	25	6	116	11
6	6	2.6	166	16	8	83	18	26	6	782	7
7	7	2.9	62	17	7	29	14	27	7	236	12
8	7	3.8	26	18	7	11	11	28	3.4	244	49
9	6	3.5	17	19	6	5	9	29	2.6	143	5
10	67	2.7	14	20	6	101	8	30	2.2	83	3.5
								31	32	-	3.0
Monthly mean discharge, in second-feet									13.5	90.9	67.1
Runoff, in acre-feet									829	5,410	4,130
Runoff, in inches									0.19	1.25	0.96

Petite Saline Creek near Boonville, Mo.

Location.—Lat 38°55'00", long. 92°39'20", in SW¼SE¼ sec. 15, T. 48 N., R. 16 W., at bridge on county road, half a mile downstream from Clarks Fork Creek, 7 miles southeast of Boonville, and 14½ miles upstream from mouth. Datum of gage is 573.40 ft above mean sea level, datum of 1929.

Drainage area.—182 square miles.

Gage-height record.—Wire-weight gage read once daily below 9 ft and twice daily above. Graph drawn for days of changing stage.

Discharge relation.—Stage-discharge relation defined by current-meter measurements. Shifting-control method used July 21, 22, 26-31.

Maxima.—May-July 1951: Discharge, 5,520 cfs 8 a.m. June 29 (gage height, 22.80 ft, from graph based on gage readings).

1948 to April 1951: Discharge, 6,120 cfs Oct. 21, 1949 (gage height, 23.50 ft).

Maximum stage known prior to that of Oct. 21, 1949, 23.2 ft in June 1921, from information by local resident.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	61	10	865	11	1,240	35	1,450	21	44	12	47
2	182	10	339	12	329	14	2,740	22	31	12	31
3	101	10	134	13	80	13	1,050	23	32	467	390
4	51	10	84	14	61	13	245	24	25	1,660	394
5	54	8	667	15	47	27	152	25	22	1,840	76
6	44	7	2,600	16	47	60	124	26	17	1,320	32
7	38	10	3,170	17	38	72	110	27	15	990	31
8	35	10	678	18	30	25	236	28	12	2,240	25
9	284	31	425	19	215	13	159	29	11	4,470	20
10	1,440	44	456	20	160	10	84	30	10	2,390	19
								31	14	-	19
Monthly mean discharge, in second-feet									154	528	544
Runoff, in acre-feet									9,460	31,400	33,430
Runoff, in inches									0.97	3.24	3.44

Moreau River near Jefferson City, Mo.

Location.—Lat 38°30'25", long. 92°15'20", in N½ sec. 4, T. 43 N., R. 12 W., at bridge on U. S. Highway 54, 5 miles southwest of Jefferson City and 5-3/4 miles downstream from confluence of North and South Moreau Creeks. Datum of gage is 562.73 ft above mean sea level, datum of 1929.

Drainage area.—531 square miles.

Gage-height record.—Wire-weight gage read once daily below 8 ft and twice daily or more frequently above. Graph drawn for days of changing stage.

Discharge record.—Stage-discharge relation defined by current-meter measurements. Shifting-control method used July 15-31.

Maxima.—May-July 1951: Discharge, 16,500 cfs 8 a.m. July 7 (gage height, 23.75 ft).

1947 to April 1951: Discharge, 23,000 cfs June 23, 1948 (gage height, 27.0 ft, from floodmark).

Flood in 1905 reached a stage of 38.20 ft, flood in 1943 reached a stage of 35.11 ft, and flood in 1929 reached a stage of 32.91 ft, from floodmarks and information by local residents.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	72	46	3,670	11	260	196	1,890	21	719	283	150
2	249	42	832	12	217	876	5,360	22	459	238	133
3	206	38	683	13	217	3,980	11,400	23	783	1,130	110
4	176	62	3,800	14	206	389	4,260	24	329	6,710	95
5	150	43	2,460	15	167	176	794	25	167	2,430	88
6	125	31	13,400	16	158	141	459	26	110	832	81
7	102	30	14,600	17	150	94	329	27	94	1,890	74
8	92	48	2,110	18	125	63	260	28	67	3,210	70
9	73	186	908	19	125	75	206	29	53	7,300	167
10	141	158	581	20	683	59	176	30	38	5,860	125
								31	48	-	73
Monthly mean discharge, in second-feet									212	1,221	2,237
Runoff, in acre-feet									13,010	72,630	137,500
Runoff, in inches									0.46	2.56	4.86

Marais des Cygnes River at Melvern, Kans.

Location.—Lat 38°31', long. 95°38', in SW¼ sec. 3, T. 18 S., R. 16 E., half a mile north of Melvern and 1½ miles upstream from Long Creek.
Drainage area.—363 square miles.
Gage-height record.—From graph based on once-daily wire-weight gage readings, and graphic comparison with gage-height records for stations on nearby streams.
Discharge record.—Stage-discharge relation defined by current-meter measurements below 19,000 cfs and by slope-area measurement of peak discharge.
Maxima.—May-July 1951: Discharge, 68,500 cfs 12 m. July 11 (gage height, 30.8 ft, from floodmarks). 1939 to April 1951: Discharge, 29,000 cfs April 23, 1944 (gage height, 26.7 ft).

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	4,670	56	935	11	96	528	39,400	21	140	64	240
2	2,780	47	360	12	93	320	27,700	22	289	103	180
3	885	39	915	13	91	204	25,100	23	860	2,950	2,180
4	390	34	1,270	14	91	214	4,610	24	415	2,100	1,110
5	125	31	710	15	91	300	718	25	200	480	275
6	110	35	3,230	16	88	230	643	26	180	380	220
7	103	1,920	6,920	17	110	190	716	27	125	370	260
8	96	3,740	3,940	18	83	125	412	28	96	455	220
9	958	3,220	797	19	82	90	305	29	70	615	180
10	650	1,180	6,310	20	132	76	270	30	62	1,470	150
								31	60	-	125
Monthly mean discharge, in second-feet									459	719	4,206
Runoff, in acre-feet									28,210	42,780	258,600
Runoff, in inches									1.46	2.21	13.36

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	July 8		July 9		July 10		July 11		July 12		July 13	
2					5.00	58	24.45	10,500	25.2	14,300		
4					5.05	64	25.0	12,900	25.0	12,900	27.25	33,000
6			10.25	1,260	7.10	450	26.5	25,600	25.2	14,300		
8					13.3	2,050	27.9	39,500	25.6	17,500	26.9	29,500
10					20.5	7,650	30.6	66,500	26.3	23,800		
N	15.80	3,930	7.70	630	23.5	9,500	30.8	68,500	27.0	30,500	26.6	26,500
2					24.0	10,000	30.5	65,500	27.6	36,500		
4					24.2	10,200	29.6	56,500	28.0	40,500	26.2	22,900
6			6.70	360	24.2	10,200	28.7	47,500	27.9	39,500		
8					24.2	10,200	27.8	38,500	27.8	38,500	25.4	15,900
10					24.2	10,200	26.6	26,500	27.7	37,500		
12	12.50	1,810	5.05	64	24.3	10,300	25.7	18,400	27.5	35,500	23.7	9,700
	July 14		July 15		July 16		July 17		July 18		July 19	
2												
4	21.5	8,300										
6			8.6	860	7.2	480						
8	18.7	6,370										
10												
N	15.9	4,030	7.8	660	7.25	500	8.1	735	6.9	400	6.4	300
2					7.45	560						
4	13.5	2,110			8.25	772						
6			7.4	540	8.8	910						
8	11.0	1,410			9.0	960						
10					8.8	910						
12	9.7	1,140	7.2	480	8.7	885	7.3	510	6.6	340	6.3	280
	July 20		July 21		July 22		July 23		July 24		July 25	
2							5.5	125				
4							5.5	125	12.9	1,930		
6							5.6	140				
8							6.6	340	11.0	1,410		
10							9.0	960				
N	6.25	270	6.1	240	5.8	180	11.6	1,560	9.2	1,010	6.3	280
2							16.0	4,130				
4							16.9	4,930	7.3	510		
6							16.7	4,770				
8							16.1	4,230	6.4	300		
10							15.3	3,430				
12	6.2	260	6.0	220	5.6	140	14.6	2,750	6.3	280	6.2	260

Salt Creek near Lyndon, Kans.

Location.—Lat 38°37', long. 95°38', in SW¼ sec. 34, T. 16 S., R. 16 E., on downstream side of county highway bridge, 2½ miles east of Lyndon.

Drainage area.—111 square miles.

Gage-height record.—Graph based on usually once-daily readings of wire-weight gage, except May 3, 18, 20, 24, June 7, 10, July 14, 21, 27, 30, when there was no gage-height record, and June 8, when there was insufficient gage-height record.

Discharge record.—Stage-discharge relation defined by current-meter measurements below 6,000 cfs and by slope-area measurement of peak discharge. Discharge for days of no gage-height record computed on basis of records for stations on streams nearby.

Maxima.—May-July 1951: Discharge, 36,400 cfs 10 a.m. July 11 (gage height, 17.00 ft, from flood marks).

1939 to April 1951: Discharge, 17,900 cfs (revised) Apr. 22, 1944 and Apr. 16, 1945 (gage height, 16.0 ft, from floodmark).

Flood of 1935 reached a stage of 20.3 ft, from floodmarks.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	2,700	12	158	11	88	62	17,600	21	36	10	70
2	434	8.5	95	12	73	53	7,760	22	249	22	129
3	120	7.0	58	13	50	66	1,540	23	291	205	603
4	73	7.0	45	14	30	148	750	24	65	924	226
5	49	16	48	15	30	123	218	25	40	117	90
6	41	1,370	1,270	16	127	30	182	26	29	683	62
7	30	1,700	993	17	88	20	428	27	23	120	270
8	30	900	158	18	45	15	185	28	18	652	135
9	854	414	71	19	36	13	127	29	12	1,060	69
10	137	120	4,600	20	40	11	98	30	9.0	1,360	45
								31	11	-	39
Monthly mean discharge, in second-feet									189	342	1,230
Runoff, in acre-feet									11,620	20,330	75,610
Runoff, in inches									1.96	3.43	12.77

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	July 8		July 9		July 10		July 11		July 12		July 13	
2					2.89	44	15.15	10,000	15.76	15,000		
4					2.90	45	15.78	15,200	15.46	12,100	9.37	2,700
6					3.00	58	16.28	22,100	15.03	9,520		
8					5.20	550	16.71	30,000	14.57	8,560	8.20	1,920
10					11.69	4,800	17.00	36,400	14.10	7,850		
N	3.57	151	3.06	67	13.60	7,100	16.72	30,200	13.63	7,140	7.08	1,250
2					13.91	7,560	16.12	19,600	13.13	6,470		
4					13.98	7,670	15.50	12,400	12.64	5,840	6.18	790
6					14.00	7,700	14.94	9,220	12.13	5,280		
8					14.01	7,720	14.54	8,510	11.62	4,720	5.60	540
10					14.06	7,790	14.35	8,220	11.08	4,190		
12	3.30	105	2.90	45	14.38	8,270	14.95	9,250	10.51	3,680	5.23	392
	July 14		July 15		July 16		July 17		July 18		July 19	
2												
4												
6					4.62	186	6.25	825				
8												
10												
N			4.73	219	4.53	162	5.20	380	4.61	183	4.38	126
2												
4												
6					4.49	152	4.90	270				
8												
10												
12			4.69	207	4.82	246	4.75	225	4.48	150	4.28	106
	July 20		July 21		July 22		July 23		July 24		July 25	
2												
4							5.75	600				
6					3.98	53						
8							6.02	710				
10												
N	4.25	100			4.13	77	5.98	692	4.58	175	4.21	92
2												
4							5.84	636				
6					4.53	162						
8							5.63	552				
10												
12	4.18	86			5.25	400	5.38	452	4.25	100	4.11	74

Hundred and Ten Mile Creek near Quenemo, Kans.

Location.—Lat 38°39', long. 95°34', in SE¼ sec. 18, T. 16 S., R. 17 E., 1¼ miles downstream from Dragoon Creek, 5½ miles northwest of Quenemo, and 6.6 miles above mouth. Datum of gage is 921.98 ft above mean sea level (levels by Kansas State Board of Agriculture).

Drainage area.—321 square miles.

Gage-height record.—Water-stage recorder graph.

Discharge record.—Stage-discharge relation defined by current-meter measurements below 20,000 cfs and by slope-area measurement of peak discharge. At stages between 3 and 28 ft, discharge computed using rate of change in stage as a factor. Discharge for period of backwater from Marais des Cygnes River 8 p.m. July 12 to 12 m. July 15, estimated on basis of normal recession curve and comparison with stations nearby.

Maxima.—May-July 1951: Discharge, 38,600 cfs 9 a.m. July 11 (gage height, 28.47 ft), by slope-area method.

1939 to April 1951: Discharge, 34,700 cfs Apr. 22, 1944 (gage height, 27.34 ft).

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	5,220	51	1,010	11	333	222	27,700	21	204	56	118
2	3,330	41	238	12	180	186	27,600	22	479	316	93
3	525	39	250	13	136	152	11,000	23	576	596	143
4	266	34	244	14	106	120	1,740	24	200	2,700	137
5	206	32	373	15	88	140	464	25	130	371	104
6	168	106	1,150	16	137	220	429	26	98	4,760	89
7	140	3,500	5,060	17	188	124	481	27	75	2,580	361
8	124	4,840	1,310	18	162	82	199	28	59	656	112
9	650	2,490	266	19	118	68	178	29	55	2,000	68
10	1,170	345	14,800	20	124	58	150	30	51	2,430	54
								31	60	-	48
Monthly mean discharge, in second-feet									495	977	3,096
Runoff, in acre-feet									30,460	58,150	190,400
Runoff, in inches									1.78	3.40	11.12

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	July 8		July 9		July 10		July 11		July 12		July 13	
2	13.75	2,230	4.17	289	12.20	3,920			25.70	19,500	27.12	18,000
4	12.20	1,960	4.10	277	20.80	10,500	26.73	29,000	25.62	21,100	26.91	17,000
6	11.00	1,800	4.05	267	24.80	16,400			26.82	30,400	26.54	16,000
8	9.88	1,630	4.00	257	24.90	16,100	28.34	37,500	27.48	32,000	26.11	14,500
10	8.95	1,440	3.98	256	25.00	16,600			27.98	34,900	25.64	13,000
N	8.12	1,280	3.95	248	24.99	16,200	27.92	34,100	28.16	36,100	25.21	12,000
2	7.50	1,140	3.92	242	25.00	16,600			27.95	34,600	24.86	10,000
4	6.88	970	3.89	236	25.13	17,300	26.75	24,100	27.49	30,800	24.50	7,500
6	6.25	764	3.86	230	25.23	17,800			27.03	26,200	23.98	5,500
8	5.58	576	3.83	226	25.27	18,000	26.08	21,300	26.71	24,000	23.00	4,000
10	4.95	443	3.81	222	25.30	18,100			26.67	22,200	21.40	3,500
12	4.45	342	5.05	777	25.41	19,000	25.78	20,000	26.95	20,000	19.60	3,000
	July 14		July 15		July 16		July 17		July 18		July 19	
2	17.65	2,700			4.17	295						
4	15.88	2,500	7.04	620	4.14	290	6.45	807				
6	14.55	2,300			4.12	285			3.73	206		
8	13.26	2,000	5.74	500	4.09	278	4.85	421				
10	12.00	1,800			4.07	274						
N	10.95	1,650	4.74	410	4.05	270	4.21	296	3.67	194	3.60	180
2	10.31	1,500			4.03	263						
4	9.80	1,300	4.41	351	3.99	255	4.02	259				
6	9.38	1,200			3.96	249			3.65	190		
8	8.98	1,080	4.30	327	3.93	246	3.90	238				
10	8.56	940			6.70	1,530						
12	8.12	820	4.22	307	8.07	1,510	3.82	222	3.65	190	3.52	164
	July 20		July 21		July 22		July 23		July 24		July 25	
2												
4							3.19	98				
6									3.42	144		
8							3.37	134				
10												
N	3.46	152	3.29	118	3.16	92	3.52	162	3.39	138	3.22	104
2												
4							3.59	178				
6									3.34	128		
8							3.53	166				
10												
12	3.37	134	3.22	104	3.12	84	3.46	152	3.33	126	3.12	84

Supplemental records.—July 9, 11 p.m., 3.83 ft, 269 cfs; July 10, 1 p.m., 24.96 ft, 16,200 cfs; July 11, 9 a.m., 28.47 ft, 38,600 cfs; July 12, 9 p.m., 26.65 ft, 23,000 cfs.

Marais des Cygnes River near Quenemo, Kans.

Location.—Lat 38°15', long. 95°28', in NW¼ sec. 12, T. 17 S., R. 17 E., on upstream railing of county highway bridge, 3 miles east of Quenemo. Datum of gage is 890.62 ft above mean sea level.
Drainage area.—1,030 square miles.
Gage-height record.—Wire-weight gage readings made frequently during flood periods.
Maxima.—May-July 1951: Gage-height, 40.35 ft, 2:30 p.m., July 11.
1922 to April 1951: Gage-height, 38.4 ft, Nov. 17, 1928.
Remarks.—Records furnished by U. S. Weather Bureau.

Daily stage, in feet, 1951

Day	June	July	Day	June	July	Day	June	July
1	-	30.8	11	9.5	38.3	21	-	-
2	-	22.0	12	-	39.0	22	-	-
3	-	8.7	13	-	38.2	23	-	-
4	-	-	14	-	35.3	24	21.1	22.2
5	-	-	15	-	31.0	25	25.6	13.1
6	-	-	16	-	14.9	26	15.7	7.3
7	10.0	23.7	17	8.6	16.8	27	28.2	-
8	27.0	32.1	18	-	16.8	28	16.1	8.5
9	30.3	23.5	19	-	8.7	29	21.6	-
10	27.5	25.2	20	-	-	30	27.3	-
						31	-	-

Supplemental records.— June 9, 10 a.m., 30.49 ft; June 24, 9 p.m., 26.90 ft; June 27, 8 a.m., 28.30 ft; July 1, 3 a.m., 30.90 ft; July 8, 2 a.m., 32.30 ft; July 11, 2:30 p.m., 40.35 ft; July 12, 4 p.m., 39.85 ft; July 15, 6 p.m., 24.50 ft.

Marais des Cygnes River at Ottawa, Kans.

Location.—Lat 38°37', long. 95°16', in NW¼ sec. 36, T. 16 S., R. 19 E., at downstream railing of Main St. Bridge in Ottawa. Datum of gage is 863.26 ft above mean sea level.
Drainage area.—1,240 square miles.
Gage-height record.—Wire-weight gage readings once daily, more frequently during flood periods.
Maxima.—May-July 1951: Gage-height, 42.10 ft, 1:30 a.m., July 12.
1902-5, 1911-14, 1920 to April 1951: Gage-height, 37.6 ft, Nov. 17, 1928.
Remarks.—Records furnished by U. S. Weather Bureau.

Daily stage, in feet, 1951

Day	June	July	Day	June	July	Day	June	July
1	2.0	21.7	11	7.4	29.5	21	2.1	3.5
2	1.9	19.9	12	3.5	41.8	22	2.1	3.2
3	1.8	5.8	13	3.8	40.6	23	3.7	9.0
4	1.7	4.9	14	2.8	35.3	24	11.7	13.2
5	1.6	3.8	15	2.5	31.0	25	19.6	10.1
6	1.6	6.6	16	3.6	27.0	26	12.6	3.4
7	8.5	13.2	17	5.0	12.8	27	23.8	3.0
8	16.3	20.6	18	2.6	11.7	28	16.9	4.7
9	24.2	21.0	19	2.2	5.0	29	18.3	2.7
10	22.0	19.5	20	2.8	3.9	30	21.5	2.5
						31	-	2.2

Supplemental records.— June 9, 12 N, 24.80 ft; July 8, 6 p.m., 22.00 ft; July 10, 12 m, 23.70 ft, 7 p.m., 26.40 ft; July 11, 1 p.m., 36.90 ft, 7:30 p.m., 40.50 ft, 12 p.m., 41.30 ft; July 12, 1:30 a.m., 42.10 ft; July 16, 6 p.m., 18.60 ft.

Marais des Cygnes River near Ottawa, Kans.

Location.—Lat 38°37', long. 95°15', in NW¼ sec 6, T. 17 S., R. 20 E., three-quarters of a mile downstream from Skunk Creek and 1⅝ miles southeast of Ottawa. Datum of gage is 858.08 ft above mean sea level (levels by Corps of Engineers).

Drainage area.—1,260 square miles.

Gage-height record.—Water-stage recorder graph except for periods May 1-6, for which graph was drawn based on once-daily readings of U. S. Geological Survey wire-weight gage, and 9 p.m. July 12 to 5 p.m. July 16, for which graph was drawn based on once-daily readings of U. S. Weather Bureau gage, 1½ miles upstream, which were converted by a gage-relation curve.

Discharge record.—Stage-discharge relation defined by current-meter measurements below 44,000 cfs and by slope-area determination of peak discharge.

Maxima.—May-July 1951: Discharge, 142,000 cfs 12 p.m. July 11 to 2 a.m. July 12 (gage height, 42.50 ft), by slope-area measurement.

1902-5, 1918 to April 1951: Discharge, 75,000 cfs Nov. 17, 1928 (gage height, 38.65 ft).

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	4,860	224	9,570	11	6,070	2,080	59,000	21	788	256	665
2	9,180	198	7,170	12	1,330	796	134,000	22	748	461	536
3	8,950	163	1,740	13	786	759	90,900	23	1,800	983	2,460
4	3,480	143	1,140	14	585	527	39,100	24	1,740	4,410	3,560
5	856	128	1,360	15	464	449	12,700	25	794	6,540	2,030
6	646	140	1,860	16	434	1,080	8,990	26	516	7,120	713
7	519	3,290	5,140	17	753	1,030	3,800	27	383	10,600	886
8	440	6,940	8,790	18	845	464	2,900	28	326	7,730	945
9	723	11,200	7,810	19	740	323	1,110	29	286	8,530	478
10	8,040	8,780	10,200	20	635	440	822	30	241	9,750	385
								31	230	-	305
Monthly mean discharge, in second-feet									1,887	3,184	13,580
Runoff, in acre-feet									115,400	189,500	835,200
Runoff, in inches									1.72	2.82	12.43

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	July 8		July 9		July 10		July 11		July 12		July 13	
2					15.83	5,230	29.33	13,400	42.50	142,000		
4	20.78	8,090	23.02	9,430	18.33	6,620	29.77	13,700	42.44	140,000	41.5	113,000
6					20.73	8,060	30.31	14,100	42.46	140,000		
8	21.53	8,540	22.48	9,110	22.95	9,390	31.43	15,500	42.35	136,000	41.0	103,000
10					24.63	10,400	32.58	20,600	42.35	136,000		
N	22.18	8,930	21.30	8,400	25.77	11,100	34.98	41,800	42.20	130,000	40.1	89,700
2					26.60	11,600	37.63	67,300	42.20	130,000		
4	22.67	9,220	19.28	7,190	27.43	12,100	39.53	86,800	42.24	132,000	39.2	79,200
6					28.08	12,600	40.73	103,000	42.27	133,000		
8	23.02	9,430	16.65	5,680	28.48	12,800	41.63	119,000	42.25	132,000	38.3	70,000
10					28.81	13,100	42.25	135,000	42.0	124,000		
12	23.15	9,510	14.67	4,590	29.06	13,200	42.50	142,000	41.8	119,000	37.5	62,000
	July 14		July 15		July 16		July 17		July 18		July 19	
2												
4	36.6	53,000	32.1	14,000	28.1	10,500	15.85	4,060	14.26	3,440	7.27	1,300
6												
8	35.8	45,200	31.3	12,600	27.5	10,100	14.95	3,700	13.85	3,300	6.65	1,150
10												
N	35.1	38,900	30.7	12,100	26.6	9,560	14.67	3,590	13.23	3,080	6.28	1,050
2												
4	34.3	31,700	30.0	11,600	25.3	8,780	14.65	3,580	12.41	2,790	6.03	988
6												
8	33.6	25,400	29.4	11,200	22.28	7,040	14.65	3,580	10.73	2,250	5.87	945
10												
12	32.8	18,900	28.8	10,900	18.11	5,020	14.59	3,560	8.27	1,540	5.75	912
	July 20		July 21		July 22		July 23		July 24		July 25	
2							4.63	603				
4							7.23	1,290			13.11	3,040
6	5.59	869					10.23	2,100	14.23	3,430		
8							12.10	2,680			11.53	2,490
10							13.08	3,030				
N	5.41	821	4.85	666	4.41	539	13.26	3,090	15.03	3,730	9.49	1,880
2							13.16	3,060				
4							13.03	3,010			7.73	1,410
6	5.25	778					12.94	2,980	15.24	3,820		
8							12.87	2,950			6.57	1,130
10							12.92	2,970				
12	5.08	732	4.61	597	4.18	472	13.18	3,060	14.37	3,480	5.83	934

Supplemental record.—July 23, 1 a.m., 4.18 ft, 472 cfs.

Marais des Cygnes River at Osawatomie, Kans.

Location. – Lat 38°30', long. 94°58', in NE¼ sec. 10, T. 18 S., R. 22 E., on downstream side of pumping plant building of City Water Plant at Osawatomie. Datum of gage is 816.15 ft above mean sea level.
Drainage area. – 1,627 square miles.
Gage-height record. – Staff gage read once or more daily during flood periods.
Maxima. - May-July 1951: Gage-height, 50.30 ft, 9:30 p.m., July 12.
1944 to April 1951: Gage-height, 42.1 ft, April 17, 1945.
Stage of 44.32 ft occurred Nov. 18, 1928.
Remarks. - Records furnished by U. S. Weather Bureau.

Daily stage, in feet, 1951

Day	June	July	Day	June	July	Day	June	July
1	-	34.2	11	28.0	33.6	21	-	-
2	-	34.3	12	-	47.9	22	-	-
3	-	31.5	13	-	50.0	23	-	-
4	-	-	14	-	45.7	24	22.0	24.0
5	-	-	15	-	41.4	25	26.3	-
6	-	20.0	16	-	37.5	26	30.0	-
7	-	21.1	17	-	35.7	27	32.3	-
8	-	24.8	18	-	30.9	28	33.2	-
9	28.8	26.1	19	-	-	29	32.1	-
10	30.7	29.2	20	-	-	30	33.8	-
						31	-	-

Supplemental records. – June 28, 11 a.m., 33.40 ft; July 1, 11 p.m. 34.40 ft; July 9, 11 a.m., 26.20 ft, 7 p.m., 25.90 ft; July 11, 7 p.m., 37.90 ft; July 12, 7 p.m., 50.20 ft, 9:30 p.m., 50.30 ft; July 13, 7 p.m., 48.40 ft.

Pottawatomie Creek near Garnett, Kans.

Location.—Lat 38°20', long. 95°15', in SW¼ sec. 6, T. 20 S., R. 20 E., at bridge on U. S. Highway 59, a quarter of a mile downstream from confluence of North Pottawatomie and Cedar Creeks, a quarter of a mile upstream from Atchison, Topeka & Santa Fe Railway bridge, and 4 miles north of Garnett. Datum of gage is 873.2 ft above mean sea level, datum of 1929, Kansas City supplementary adjustment of 1943.

Drainage area.—334 square miles.

Gage-height record.—Graph drawn on basis of wire-weight gage readings made generally once daily, more frequently during high stages.

Discharge record.—Stage-discharge relation defined by current-meter measurements below 14,000 cfs and extended to peak stage on basis of contracted-opening determination. For stages between 7 and 30 ft, discharge computed using rate of change in stage as a factor.

Maxima.—May-July 1951: Discharge, 45,300 cfs 10 p.m. July 11 (gage height, 32.30 ft).
1939 to April 1951: Discharge, 23,600 cfs Apr. 23, 1944 (gage height, 30.6 ft, from graph based on gage readings), from rating curve extended above 14,000 cfs on basis of velocity-area studies.
Flood of Nov. 16, 1928 reached a stage of approximately 32.2 ft (discharge, 49,000 cfs).

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	6,020	46	3,510	11	494	230	24,400	21	200	235	110
2	1,820	42	435	12	210	656	21,300	22	634	261	98
3	326	30	230	13	144	365	8,950	23	1,150	4,550	4,350
4	188	15	238	14	110	130	1,650	24	280	7,350	2,230
5	140	16	260	15	85	97	379	25	155	1,960	181
6	110	23	317	16	173	871	216	26	110	2,390	250
7	84	496	3,060	17	768	278	3,040	27	85	1,960	110
8	74	934	632	18	233	125	677	28	56	2,490	85
9	158	1,110	250	19	187	1,900	196	29	58	4,570	67
10	1,930	132	10,100	20	282	431	137	30	44	10,800	52
								31	46	-	35
Monthly mean discharge, in second-feet									528	1,483	2,824
Runoff, in acre-feet									32,440	88,250	173,600
Runoff, in inches									1.82	4.95	9.74

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge
	July 8		July 9		July 10		July 11		July 12		July 13	
2			5.52	288	12.00	1,960	29.22	14,700			28.52	13,100
4			5.36	271	18.90	4,580	29.20	14,600	31.50	34,900	29.00	15,000
6	9.68	693	5.22	257	23.32	7,420	29.20	14,900			29.16	14,100
8			5.10	245	24.80	8,580	29.34	16,400	30.60	24,000	28.80	11,400
10			5.00	235	26.20	10,300	29.66	17,600			28.27	9,830
N	7.55	547	4.91	226	27.10	11,600	30.18	20,100	29.68	15,300	27.63	8,610
2			4.85	220	27.72	12,400	30.46	22,500			26.92	7,230
4			4.80	215	28.24	13,200	30.70	25,100	29.11	13,300	26.10	6,120
6	6.43	424	4.77	212	28.62	13,800	31.32	32,600			25.23	5,330
8			4.76	211	28.92	14,300	31.88	39,800	28.79	12,500	24.35	4,700
10			4.77	212	29.12	14,900	32.30	45,300			23.40	4,130
12	5.70	315	6.95	502	29.24	14,900	32.18	43,700	28.57	12,100	22.42	3,700
	July 14		July 15		July 16		July 17		July 18		July 19	
2							6.85	439	16.90	1,680		
4	20.30	2,800					12.00	1,910	14.25	1,160		
6			6.82	435			16.70	3,650	11.45	800		
8	17.65	2,060					19.10	4,610	9.25	586		
10							20.16	4,100	8.01	498		
N	14.35	1,380	6.35	369	5.07	208	19.75	2,680	7.25	480	4.89	189
2							17.80	2,180	6.72	421		
4	11.28	920					17.22	3,430	6.32	365		
6			5.96	315			19.34	4,720	6.02	323		
8	9.03	629					20.80	4,610	5.80	296		
10							20.34	2,930	5.62	274		
12	7.65	513	5.65	278	4.70	170	18.80	2,240	5.47	254	4.51	151
	July 20		July 21		July 22		July 23		July 24		July 25	
2					3.87	94	9.25	1,190	23.70	4,680		
4					3.85	92	12.10	1,990	22.95	3,860		
6					3.85	92	14.45	2,790	21.65	3,270	4.58	158
8					3.85	92	16.60	3,590	20.40	2,830		
10					3.85	92	18.30	4,230	19.15	2,480		
N	4.36	136	4.04	109	3.85	92	19.85	4,840	17.87	2,130	4.54	154
2					3.86	93	21.20	5,540	16.37	1,760		
4					3.87	94	22.38	6,180	14.70	1,340		
6					3.87	94	23.27	6,270	12.20	864	4.88	188
8					3.88	95	23.90	6,510	6.55	397		
10					3.90	97	24.19	6,090	5.25	230		
12	4.24	126	3.87	94	5.10	212	24.12	5,610	4.89	189	5.47	256

Big Bull Creek near Hillsdale, Kans.

Location.—Lat 38°38', long. 94°53', in NE¼ sec. 29, T. 16 S., R. 23 E., at county highway bridge, one-half mile upstream from Ten Mile Creek, and 4 miles southwest of Hillsdale. Datum of gage is 848.22 ft above mean sea level (levels by Kansas State Board of Agriculture).

Drainage area.—147 square miles.

Gage-height record.—From graph based on once-daily readings of wire-weight gage, except June 26 and July 5, when there was insufficient record to construct the graph. Due to faulty intake, the water-stage recorder record was used only as a guide to graph.

Discharge record.—Stage-discharge relation defined by current-meter measurements below 290 cfs, peak discharge from slope-area determination.

Maxima.—May-July 1951: Discharge, 45,200 cfs 12:30 p.m. July 11 (gage height, 25.82 ft).
1948 to April 1951: Gage height, 22.50 ft, 12 m. May 21, 1949, from graph based on gage readings.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1		34	286	11		85		21		154	47
2		25	133	12	159	67		22	214		45
3	170	22		13	106	67		23	222		
4	108	21		14	79	54		24	106		97
5	73	19	90	15	76		187	25	79	139	82
6	64	67		16			131	26	61		52
7	55			17		166		27	48		39
8	48			18	117	82	105	28	38		36
9				19			79	29	35		33
10		146		20	137		60	30	34		28
								31	41		26
Monthly mean discharge, in second-feet									-	-	-
Runoff, in acre-feet									-	-	-
Runoff, in inches									-	-	-

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge
	July 8		July 9		July 10		July 11		July 12		July 13	
2			3.10	154	13.10		10.80		21.27		20.50	
4			3.08	150	15.70		11.00		20.62		19.35	
6	3.40	227	3.06	146	18.00		16.00		20.59		17.00	
8			3.03	139	18.87		21.30		20.94		13.50	
10			3.01	135	18.97		23.00		21.22		10.00	
N	3.27	194	3.00	133	18.93		25.72		21.46		7.75	
2			2.97	128	18.97		25.32		21.72		6.50	
4			2.95	124	18.90		24.27		21.82		5.92	
6	3.19	175	3.00	133	18.35		23.37		21.77		5.42	
8			3.05	144	17.13		22.72		21.67		4.92	
10			2.92	119	15.08		22.26		21.49		4.56	
12	3.12	159	6.20		12.80		21.82		21.12		4.30	
	July 14		July 15		July 16		July 17		July 18		July 19	
2					3.05	144	5.40					
4					3.03	139	6.55					
6	3.90				3.01	135	5.83					
8					2.98	129	4.60		2.84	105		
10					2.95	124	3.88					
N	3.65		3.22	182	2.94	122	3.70				2.67	78
2					2.92	119	3.50	255				
4					2.90	115	3.40	227	2.76	92		
6	3.52	261			2.88	112	3.30	202				
8					2.86	108	3.22	182				
10					2.92	119	3.13	161				
12	3.43	235	3.07	148	3.50	255	3.07	148	2.74	88	2.63	73
	July 20		July 21		July 22		July 23		July 24		July 25	
2							3.20	177				
4							6.70					
6							10.40					
8							13.00					
10							16.10					
N	2.51	58	2.38	44	2.38	44	14.40		2.80	98	2.52	59
2							11.00					
4							7.80					
6							4.60					
8							3.00	133				
10							2.90	115				
12	2.46	53	2.41	47	2.40	46	2.90	115	2.65	76	2.47	54

Supplemental records.—July 11, 3 a.m., 9.95 ft; 12:30 p.m., 25.82 ft, 45,200 cfs.

Marais des Cygnes River at La Cygne, Kans.

Location. —Lat 38°21', long. 94°46', in sec. 32, T. 19 S., R. 24 E., at downstream end of second concrete pier from right bank of bridge on State Highway 35 at La Cygne. Datum of gage is 776.01 ft above mean sea level (levels by Kansas Highway Commission).
Drainage area. —2,731 square miles.
Gage-height record. —Staff gage readings once daily during flood periods.
Maxima. —May-July 1951: Gage-height, 36.2 ft, July 13.
1928 to April 1951: Stage 33.2 ft, Nov. 18, 1928.
Remarks. —Records furnished by U. S. Weather Bureau.

Daily stage, in feet, 1951

Day	June	July	Day	June	July	Day	June	July
1	-	30.7	11	27.6	29.2	21	16.3	14.0
2	-	30.3	12	25.3	32.8	22	-	-
3	-	30.2	13	-	36.2	23	-	-
4	-	30.1	14	-	35.0	24	23.7	22.0
5	-	26.6	15	-	32.7	25	25.1	22.5
6	-	24.8	16	-	31.8	26	26.9	18.7
7	-	25.9	17	20.2	31.1	27	29.0	-
8	17.6	24.2	18	-	30.4	28	29.8	-
9	24.5	24.6	19	-	29.7	29	30.4	-
10	27.3	26.4	20	-	25.6	30	31.0	-
						31	-	-

Supplemental records. — June 30, 12 m, 31.10 ft; July 3, 5 p.m., 30.30 ft; July 7, 8 a.m., 36.19 ft; July 9, 6 p.m., 24.20 ft; July 12, 6 p.m., 33.40 ft; July 14, 6 p.m., 34.00 ft; July 15, 6 p.m., 32.40 ft; July 19, 6 p.m., 29.20 ft.

Marais des Cygnes River at Trading Post, Kans.

Location. – Lat 38°15', long. 94°41', in SE¼ sec. 5, T. 21 S., R. 25 E., at bridge on U. S. Highway 69 at Trading Post, 1 mile upstream from Big Sugar Creek. Datum of gage is 761.16 ft above mean sea level, datum of 1929.

Drainage area. – 2,910 square miles.

Gage-height record. – Water-stage recorder graph except for period 6 a.m. July 13 to 12 p.m. July 14, for which a graph was drawn based on floodmark and shape of graph on adjacent days, and July 15-22, for which a graph was drawn based on twice-daily wire-weight gage readings.

Discharge record. – Stage-discharge relation defined by current-meter measurements below 110,000 cfs and extended to peak stage on basis of area-velocity studies.

Maxima. – May-July 1951: Discharge, 148,000 cfs 2 to 4 a.m. July 14 (gage height, 38.12 ft, from floodmark in gage house).

1921-23, 1928 to April 1951: Discharge, 120,000 cfs Nov. 18, 1928 (gage height, 34.45 ft), from rating curve extended above 74,000 cfs.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	2,050	892	51,700	11	7,620	14,200	25,400	21	2,500	7,600	10,100
2	8,730	703	39,600	12	10,100	13,900	58,200	22	3,430	3,670	3,790
3	12,100	586	32,500	13	7,940	7,620	126,000	23	3,550	4,880	2,560
4	13,300	508	32,800	14	2,900	2,590	141,000	24	4,240	13,100	8,090
5	13,000	446	26,800	15	1,490	1,560	106,000	25	4,260	15,800	9,560
6	6,970	430	16,800	16	1,220	4,540	71,400	26	2,500	16,900	8,430
7	1,810	2,670	15,500	17	2,740	8,830	52,400	27	1,450	20,800	3,600
8	1,240	7,280	14,000	18	3,220	5,860	39,400	28	1,050	23,200	1,600
9	1,050	11,400	12,000	19	2,580	2,110	30,200	29	868	29,700	1,810
10	2,320	13,600	12,700	20	2,570	3,650	19,800	30	798	44,200	1,660
								31	738	-	876
Monthly mean discharge, in second-feet									4,204	9,441	31,490
Runoff, in thousand acre-feet									258.5	561.8	1,936
Runoff, in inches									1.67	3.62	12.48

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	July 8		July 9		July 10		July 11		July 12		July 13	
2												
4	26.14	14,700					26.57	16,600	28.84	39,400	34.96	107,000
6			25.04	12,400	24.65	11,800						
8	25.99	14,300					26.98	19,500	29.40	45,000	35.97	119,000
10												
N	25.83	14,000	24.79	12,000	25.14	12,600	27.50	25,700	30.26	53,900	36.78	129,000
2												
4	25.65	13,600					27.93	31,100	31.54	67,900	37.39	137,000
6			24.52	11,600	25.51	13,300						
8	25.47	13,200					28.20	33,600	32.49	78,400	37.83	144,000
10												
12	25.30	12,900	24.30	11,200	26.18	14,800	28.52	36,500	33.81	92,900	38.07	147,000
	July 14		July 15		July 16		July 17		July 18		July 19	
2	38.12	148,000										
4	38.12	148,000										
6			35.73	116,000	32.48	78,300	30.48	56,300	29.13	42,300	28.12	32,900
8	38.01	146,000										
10												
N	37.76	143,000	34.87	105,000	31.78	70,600	30.14	52,500	28.81	39,100	27.84	30,100
2												
4	37.43	138,000										
6			34.03	95,400	31.18	64,000	29.74	48,400	28.51	36,400	27.64	27,700
8	37.02	132,000										
10												
12	36.56	126,000	33.23	86,500	30.75	59,200	29.43	45,300	28.29	34,400	27.48	25,400
	July 20		July 21		July 22		July 23		July 24		July 25	
2					17.90	6,000	4.32	1,850	13.42	6,310	19.11	9,430
4	27.37	23,900	25.24	12,800	16.80	5,450	4.14	1,740	14.43	6,820	19.20	9,490
6					15.63	4,950	4.07	1,690	15.36	7,280	19.26	9,530
8	27.23	22,200	24.36	11,300	14.33	4,470	4.02	1,650	16.21	7,700	19.32	9,570
10					12.83	3,940	4.02	1,650	16.89	8,040	19.36	9,600
N	27.03	20,000	23.28	9,960	11.24	3,450	4.11	1,720	17.44	8,360	19.40	9,630
2					9.63	3,040	4.40	1,920	17.98	8,690	19.41	9,640
4	26.75	17,600	22.00	8,700	8.33	2,780	5.25	2,400	18.30	8,880	19.41	9,640
6					7.14	2,550	6.93	3,170	18.53	9,020	19.40	9,630
8	26.38	15,600	20.50	7,550	6.15	2,370	8.92	4,060	18.71	9,150	19.36	9,600
10					5.30	2,190	10.82	5,010	18.87	9,260	19.30	9,560
12	25.89	14,100	18.89	6,530	4.68	2,000	12.25	5,720	19.00	9,350	19.21	9,500

Supplemental record. – July 10, 1 a.m., 24.26 ft, 11,200 cfs.

Big Sugar Creek at Farlinville, Kans.

Location.—Lat 38°14'25", long. 94°51'05", in NW¼ sec. 11, T. 21 S., R. 23 E., at bridge on State Highway 7, at Farlinville. Datum of gage is 783.92 ft above mean sea level (levels by Kansas State Board of Agriculture).

Drainage area.—198 square miles.

Gage-height record.—Graph drawn on basis of once-daily wire-weight gage readings, with more frequent readings made during periods of high stage. Readings of June 9, July 23-28, are doubtful and were not used.

Discharge record.—Stage-discharge relation defined by current-meter measurements below 4,000 cfs and by contracted-opening determination at 24,000 cfs. Discharge for days of doubtful gage-height record estimated on basis of records for stations on streams nearby.

Maxima.—May-July 1951: Discharge, 22,500 cfs 10 p.m. July 11 (gage height, 29.1 ft).
1929-32, 1948 to April 1951: Discharge, 7,550 cfs (revised) July 7, 1949 (gage height, 24.96 ft). Flood of November 1928 reached a stage of 31.9 ft, datum in use February 1929 to June 1932.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	719	50	1,770	11	312	72	15,200	21	530	513	367
2	885	41	695	12	276	103	12,500	22	373	513	122
3	245	36	534	13	264	71	7,970	23	224	2,740	1,600
4	150	35	1,220	14	264	61	1,730	24	108	3,470	800
5	123	32	512	15	260	65	518	25	80	1,100	500
6	116	35	550	16	258	583	399	26	77	2,070	540
7	105	591	1,240	17	466	298	1,150	27	67	1,580	140
8	95	349	482	18	232	206	742	28	67	1,210	110
9	67	300	332	19	206	110	556	29	60	2,540	84
10	371	113	7,300	20	204	1,400	489	30	56	11,300	66
								31	53	-	39
Monthly mean discharge, in second-feet									236	1,053	1,944
Runoff, in acre-feet									14,510	62,650	119,500
Runoff, in inches									1.37	5.93	11.32

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	July 8		July 9		July 10		July 11		July 12		July 13	
2					7.0	534	27.7	12,700	28.2	14,500	26.2	9,320
4					9.0	740	27.7	12,700	27.7	12,700	26.2	9,320
6	7.2	554	5.2	336	11.5	1,030	27.7	12,700	27.5	12,100	26.3	9,480
8					16.2	1,910	27.8	13,000	27.6	12,400	26.7	10,200
10					21.0	3,860	27.85	13,200	27.7	12,700	26.8	10,400
N	6.2	446	5.1	324	26.8	10,400	27.9	13,400	27.8	13,000	26.5	9,800
2					27.2	11,300	28.0	13,700	27.75	12,800	25.5	8,300
4					27.6	12,400	28.4	15,500	27.7	12,700	24.5	7,000
6	5.7	391	5.0	312	27.8	13,000	28.7	17,600	27.5	12,100	23.6	6,040
8					27.8	13,000	28.9	19,800	27.1	11,000	22.6	5,070
10					27.75	12,800	29.1	22,500	26.7	10,200	21.6	4,270
12	5.3	347	5.5	369	27.75	12,800	28.8	18,600	26.2	9,320	20.6	3,620
	July 14		July 15		July 16		July 17		July 18		July 19	
2							6.0	424				
4							8.5	685	10.5	910		
6	17.8	2,390					12.0	1,090			7.5	584
8							13.9	1,380	9.2	762		
10							14.3	1,460				
N	14.3	1,460	6.7	501	5.7	391	14.4	1,480	8.4	674	7.2	554
2							14.2	1,440				
4							13.8	1,360	8.1	644		
6	10.7	934					13.5	1,320			7.0	534
8							13.2	1,270	7.8	614		
10							12.7	1,200				
12	7.9	624	6.2	446	5.5	369	12.1	1,100	7.6	594	6.8	512
	July 20		July 21		July 22		July 23		July 24		July 25	
2												
4												
6	6.7	501	5.83	408	3.80	180						
8												
10												
N	6.6	490	5.45	368	3.13	97						
2												
4												
6	6.5	479	5.08	329	2.76	53						
8												
10												
12	6.3	457	4.57	270	2.69	45						

Little Osage River at Fulton, Kans.

Location. — Lat 38°01'20", long. 94°42'50", on line between sec. 25, T. 23 S., R. 24 E., and sec. 30, T. 23 S., R. 25 E., on U. S. Highway 69 and three-quarters of a mile north of Fulton.
Drainage area. — 295 square miles.
Gage-height record. — Graph drawn on basis of once-daily readings of wire-weight gage, except for July 11-13, 15, 26-31.
Discharge record. — Stage-discharge relation defined by current-meter measurements below 13,000 cfs and extended to peak stage by logarithmic plotting. Discharge for periods of no gage-height record estimated on basis of weather records and records for stations nearby.
Maxima. — May-July 1951: Discharge, 15,400 cfs 4:30 p.m. July 12 (gage height, 28.75 ft).
Flood of June 30 reached approximately same stage and discharge.
1948 to April 1951: Discharge, 16,400 cfs July 19, 1950 (gage height, 29.3 ft, from graph based on gage readings), from rating curve extended above 13,000 cfs by logarithmic plotting.
Remarks. — Records poor.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	20	134	5,610	11	366	30	13,500	21	330	878	142
2	30	105	1,620	12	210	109	13,800	22	308	2,170	204
3	45	45	●420	13	312	40	10,100	23	299	3,000	147
4	33	31	3,500	14	267	57	2,830	24	299	4,590	62
5	30	43	4,240	15	230	143	615	25	282	2,140	56
6	78	622	1,150	16	170	160	354	26	204	665	53
7	76	1,220	224	17	140	158	708	27	267	1,430	50
8	76	508	182	18	172	55	570	28	211	5,210	47
9	75	428	174	19	88	66	398	29	160	7,490	45
10	653	193	4,790	20	147	440	290	30	146	12,900	41
								31	142	-	37
Monthly mean discharge, in second-feet									189	1,502	2,128
Runoff, in acre-feet									11,640	89,380	130,800
Runoff, in inches									0.74	5.68	8.32

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	July 8		July 9		July 10		July 11		July 12		July 13	
2					5.6	275	27.0	12,400	27.3	12,900		
4					6.5	490	27.0	12,400	27.2	12,700	27.5	13,200
6					8.0	890	27.0	12,400	27.1	12,600		
8					10.0	1,600	27.2	12,700	27.2	12,700	26.6	11,800
10					12.0	2,400	27.4	13,000	27.3	12,900		
N	5.11	182	5.10	180	15.0	3,200	27.7	13,500	27.6	13,400	25.3	10,200
2					18.8	4,500	28.2	14,400	28.2	14,400		
4					21.7	6,460	28.6	15,100	28.75	15,400	24.0	8,600
6					24.0	8,600	28.5	14,900	28.7	15,300		
8					25.8	10,800	28.3	14,500	28.5	14,900	22.1	6,790
10					26.7	12,000	28.0	14,000	28.3	14,500		
12	5.05	172	5.00	164	27.0	12,400	27.5	13,200	28.1	14,200	20.4	5,480
	July 14		July 15		July 16		July 17		July 18		July 19	
2	19.98	5,190										
4	18.68	4,440										
6	17.36	3,840			6.10	390	7.31	692			6.17	408
8	16.02	3,410										
10	14.71	3,140										
N	13.52	2,860			5.93	349	7.73	809	6.79	562	6.14	400
2	12.13	2,440										
4	10.81	1,920										
6	9.46	1,380			5.76	310	7.66	788			6.09	388
8	8.59	1,070										
10	8.23	959										
12	7.95	875	6.35	452	5.64	284	7.45	728	6.26	430	5.97	359
	July 20		July 21		July 22		July 23		July 24		July 25	
2					4.70	121						
4					4.71	122						
6			4.93	154	4.73	125	5.20	197				
8					4.76	129						
10					4.76	129						
N	5.69	295	4.76	129	4.96	158	4.81	136	4.27	59	4.23	55
2					5.79	317						
4					5.76	310						
6			4.69	120	5.70	297	4.51	96				
8					5.63	282						
10					5.56	267						
12	5.29	213	4.69	120	5.48	250	4.38	71	4.26	58	4.22	54

Marmaton River near Fort Scott, Kans.

Location.—Lat 37°52', long. 94°40', in NW¼ sec. 21, T. 25 S., R. 25 E., at old military highway bridge, 2 miles northeast of Fort Scott, 2½ miles downstream from Mill Creek, and 2½ miles west of Kansas-Missouri State line.

Drainage area.—411 square miles.

Gage-height record.—Water-stage recorder graph except for periods July 6 to 4 p.m. July 9, 10 a.m. July 19 to July 23, 25, 27, 28, for which graph was drawn based on once-daily wire-weight gage readings, and May 30 to June 1, July 24, 26, 29, 30, when there was no record. Record for period June 2-5 doubtful due to poor intake action.

Discharge record.—Stage-discharge relation defined by current-meter measurements. Discharge between 400 cfs and 9,000 cfs computed by using rate of change of stage as a factor. Discharge for days of no gage-height record estimated on basis of trend of flow.

Maxima.—May-July 1951: Discharge, 27,800 cfs 1:30 p.m., June 30 (gage height, 35.96 ft). 1921-25, 1929 to April 1951: Discharge, 34,200 cfs May 18, 1943 (gage height, 36.90 ft). Maximum stage known, 42.34 ft in 1915.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	95	80	16,300	11	360	152	20,300	21	182	3,090	146
2	338	78	2,540	12	168	347	12,600	22	8,280	3,000	106
3	214	78	1,120	13	113	448	5,360	23	5,300	6,530	93
4	120	80	7,510	14	91	154	1,730	24	1,270	13,900	86
5	97	81	4,670	15	79	109	750	25	476	8,380	82
6	87	115	1,240	16	114	498	463	26	278	3,010	77
7	83	218	542	17	281	145	1,540	27	192	999	71
8	70	331	314	18	131	87	833	28	144	487	59
9	64	687	585	19	90	688	329	29	116	5,990	48
10	444	288	10,900	20	80	2,970	202	30	95	24,500	40
								31	85	-	30
Monthly mean discharge, in second-feet									630	2,584	2,925
Runoff, in acre-feet									38,750	153,800	179,800
Runoff, in inches									1.77	7.01	8.20

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	July 8		July 9		July 10		July 11		July 12		July 13	
2			5.01	245	17.80	3,320						
4			4.97	240	24.56	6,120	34.63	20,200				
6			4.92	234	27.17	7,450			33.66	15,600	29.37	6,600
8			4.87	227	28.66	8,400	34.74	20,700				
10			4.82	221	29.86	9,320						
N	5.45	305	4.78	217	31.38	9,380	34.80	21,000	32.70	12,100	28.09	5,350
2			4.73	211	32.52	11,600						
4			4.67	203	33.25	14,000	34.82	21,100				
6			6.80	582	33.67	15,700			31.43	9,440	26.52	3,940
8			10.80	1,420	33.97	16,900	34.65	20,200				
10			13.06	1,910	34.20	18,000						
12	5.07	253	14.84	2,370	34.35	18,800	34.30	18,500	30.31	8,110	24.30	2,980
	July 14		July 15		July 16		July 17		July 18		July 19	
2							6.80	577				
4	22.28	2,380					8.95	1,040				
6			10.89	788	6.80	510	11.78	1,620	10.59	1,060		
8	20.10	1,930					13.34	1,980				
10							14.12	1,970				
N	17.97	1,590	9.26	775	6.45	456	14.19	1,900	8.65	771	5.50	312
2							14.08	1,830				
4	16.33	1,370					13.90	1,780				
6			8.08	662	6.14	411	13.67	1,690	7.27	564		
8	14.69	1,150					13.34	1,630				
10							13.01	1,530				
12	13.09	969	7.31	583	6.02	392	12.57	1,420	6.43	453	4.96	239
	July 20		July 21		July 22		July 23		July 24		July 25	
2												
4												
6												
8												
10												
N	4.63	199	4.15	147	3.66	104	3.50	93			3.32	82
2												
4												
6												
8												
10												
12	4.37	170	3.86	120	3.57	98	3.43	89	3.34	86	3.30	81

Supplemental records.—July 11, 3 p.m., 34.84 ft, 21,200 cfs; July 16, 11 p.m., 5.90 ft, 373 cfs.

Cedar Creek near Pleasant View, Mo.

Location.—Lat 37°50'03", long. 93°52'30", in NE¼ sec. 2, T. 35 N., R. 27 W., at bridge on County Highway D, 1½ miles north of Pleasant View, 1-3/4 miles downstream from Alder Creek, and 5-3/4 miles upstream from mouth. Datum of gage is about 739.5 ft above mean sea level, datum of 1929.
Drainage area.—420 square miles.
Gage-height record.—Wire-weight gage read once daily below 3 ft and twice daily above except for May 6-9 when gage was not read. Graph drawn for days of changing stage.
Discharge record.—Stage-discharge relation defined by current-meter measurements. Discharge for period of no gage-height record interpolated.
Maxima.—May-July 1951: Discharge, 24,300 cfs 3 p.m. July 4 (gage height, 25.56 ft).
1923-26, 1948 to April 1951: Discharge, 16,000 cfs July 12, 1924 (gage height, 24.0 ft).
Maximum stage known, 27.7 ft July 20, 1909, from floodmark.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	254	236	8,520	11	185	570	5,720	21	60	227	177
2	310	98	4,880	12	193	1,880	3,450	22	1,370	1,650	139
3	236	86	2,060	13	169	254	956	23	1,280	3,620	132
4	210	66	13,000	14	162	154	620	24	668	2,620	111
5	193	59	8,750	15	125	162	470	25	450	987	98
6	192	45	4,220	16	92	692	390	26	236	2,120	75
7	190	56	1,360	17	68	592	254	27	210	836	62
8	188	341	532	18	65	154	201	28	177	430	52
9	186	668	460	19	61	236	139	29	132	1,150	43
10	185	254	4,020	20	60	236	139	30	92	5,490	39
								31	254	-	35
Monthly mean discharge, in second-feet									266	866	1,971
Runoff, in acre-feet									16,370	51,510	121,200
Runoff, in inches									0.73	2.30	5.41

Sac River near Stockton, Mo.

Location.—Lat 37°42'30", long. 93°45'20", in W½ sec. 11, T. 34 N., R. 26 W., at bridge on State Highway 64, three-quarters of a mile upstream from Bear Creek and 2 miles east of Stockton. Datum of gage is 764.02 ft above mean sea level, datum of 1929.
Drainage area.—1,160 square miles.
Gage-height record.—Wire-weight gage read once daily below 8 ft and twice daily above. Graph drawn for days of changing stage.
Discharge record.—Stage-discharge relation defined by current-meter measurements. Stage-discharge relation affected by backwater from Bear Creek May 22, June 12; discharge computed on basis of record for gage 1½ miles upstream and from weather records.
Maxima.—May-July 1951: Discharge, 50,100 cfs 10 p.m. July 4 (gage height, 25.35 ft).
1921 to April 1951: Discharge, 120,000 cfs May 19, 1943 (gage height, 31.8 ft).
Maximum stage known prior to 1943, 29.3 ft in July 1909.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	862	904	21,600	11	904	820	9,180	21	455	2,030	1,480
2	1,080	697	11,900	12	779	1,100	4,480	22	1,300	3,970	1,260
3	1,120	575	6,300	13	697	904	3,420	23	1,390	5,640	1,120
4	990	515	29,100	14	615	656	2,830	24	1,160	2,680	990
5	862	495	32,600	15	575	575	2,350	25	862	2,030	904
6	862	455	11,000	16	515	1,160	2,030	26	738	2,780	862
7	779	820	5,120	17	495	1,660	1,750	27	615	2,130	779
8	697	1,080	3,540	18	455	1,120	1,570	28	535	1,620	738
9	656	1,160	2,830	19	435	904	3,850	29	475	2,040	656
10	697	1,080	6,690	20	415	1,160	2,070	30	1,260	13,200	615
								31	2,210	-	575
Monthly mean discharge, in second-feet									822	1,865	5,619
Runoff, in acre-feet									50,560	111,000	345,500
Runoff, in inches									0.82	1.79	5.58

Osage River at Osceola, Mo.

Location.—Lat 38°03'44", long. 93°41'37", in NE¼NE¼ sec. 17, T. 38 N., R. 25 W., half a mile downstream from Gallinipper Creek, 1 mile downstream from hydroelectric plant of West Missouri Power Co., and 1 mile northeast of Osceola. Datum of gage is 678.91 ft above mean sea level, datum of 1929.

Drainage area.—8,220 square miles.

Gage-height record.—Water-stage recorder graph.

Discharge record.—Stage-discharge relation defined by current-meter measurements.

Maxima.—May-July 1951: Discharge, 98,300 cfs 2 to 7 p.m. July 6 (gage height, 35.87 ft in gage well, 36.04 ft from outside gage).

1921-28, 1930 to April 1951: Discharge, 146,000 cfs May 21, 1943 (gage height, 41.48 ft in gage well, 41.7 ft from outside gage).

Maximum stage known prior to 1943, about 40.3 ft in June 1844, from profile based on floodmarks in vicinity and furnished by Union Electric Company of Missouri (discharge, 135,000 cfs, from rating curve defined by discharge measurements since 1931).

Remarks.—Low and medium flow regulated by power plant 1 mile upstream.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	4,190	3,680	53,800	11	5,040	16,300	67,800	21	5,210	9,370	84,700
2	5,210	2,620	60,500	12	9,550	18,400	65,800	22	8,830	18,200	77,600
3	10,300	2,230	65,800	13	12,100	19,900	61,400	23	14,300	25,800	69,900
4	13,700	1,930	64,800	14	12,700	17,400	56,800	24	14,100	32,700	62,400
5	14,700	1,650	74,200	15	9,190	14,100	57,400	25	13,300	27,000	55,400
6	15,300	1,350	96,100	16	4,700	9,550	65,500	26	13,100	28,800	49,500
7	14,700	2,050	90,900	17	3,280	11,600	78,600	27	12,000	30,600	42,800
8	9,190	6,740	74,900	18	3,760	13,900	88,300	28	8,110	30,600	35,500
9	4,360	14,100	64,000	19	5,380	12,300	91,600	29	4,280	33,400	28,300
10	3,760	15,700	67,100	20	5,210	8,470	90,600	30	2,830	44,800	20,100
								31	3,120	-	7,760
Monthly mean discharge, in second-feet									8,565	15,840	63,540
Runoff, in thousand acre-feet									526.6	942.6	3,907
Runoff, in inches									1.20	2.15	8.91

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	July 8		July 9		July 10		July 11		July 12		July 13	
2												
4												
6	33.03	77,900	30.92	65,800	30.64	64,300	31.44	68,400	30.95	66,000	30.36	63,300
8												
10												
N	32.47	74,800	30.47	63,800	31.43	68,400	31.28	67,900	30.88	65,800	29.97	61,400
2												
4												
6	31.92	71,200	30.10	61,900	31.76	70,600	31.12	66,800	30.83	65,300	29.57	59,600
8												
10												
12	31.37	68,400	29.78	60,500	31.63	69,500	31.03	66,500	30.67	64,800	29.20	57,800
	July 14		July 15		July 16		July 17		July 18		July 19	
2												
4												
6	29.04	57,100	28.90	56,500	30.23	62,400	32.59	75,400	34.30	86,600	34.95	91,200
8												
10												
N	28.90	56,500	29.05	57,100	30.77	65,300	33.16	79,200	34.56	88,700	34.98	91,500
2												
4												
6	28.86	56,300	29.30	58,200	31.37	68,400	33.59	81,800	34.77	90,200	35.05	92,000
8												
10												
12	28.85	56,000	29.70	60,000	31.99	71,800	34.02	84,500	34.90	90,900	35.07	92,300
	July 20		July 21		July 22		July 23		July 24		July 25	
2												
4												
6	35.05	92,000	34.33	86,600	33.25	79,200	31.99	71,800	30.57	64,300	29.02	56,900
8												
10												
N	34.90	90,900	34.03	84,500	32.96	77,900	31.65	69,500	30.22	62,400	28.59	55,200
2												
4												
6	34.70	89,400	33.77	83,200	32.65	75,400	31.30	67,900	29.82	60,500	28.19	53,800
8												
10												
12	34.47	88,000	33.49	81,200	32.35	74,200	30.96	66,300	29.45	58,700	27.75	52,600

Pomme de Terre River at Hermitage, Mo.

Location.—Lat 37°56'45", long. 93°18'35", in SE¼NE¼ sec. 23, T. 37 N., R. 22 W., at bridge on U. S. Highway 54, a quarter of a mile east of Hermitage and 1½ miles downstream from Mill (Crane) Creek. Datum of gage is 726.83 ft above mean sea level, datum of 1929.
Drainage area.—655 square miles.
Gage-height record.—Water-stage recorder graph.
Discharge record.—Stage-discharge relation defined by current-meter measurements.
Maxima.—May-July 1951: Discharge, 29,000 cfs 7 a.m. July 1 (gage height, 26.40 ft).
1921 to April 1951: Discharge, 70,000 cfs Aug. 8, 1927 (gage height, 36.45 ft, from floodmark), from rating curve extended above 41,000 cfs.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	383	113	23,200	11	471	322	10,500	21	224	1,020	363
2	769	101	3,460	12	411	1,570	2,660	22	218	1,740	308
3	921	90	1,670	13	325	1,560	1,840	23	921	7,670	275
4	600	95	5,990	14	281	1,350	1,400	24	600	3,050	243
5	453	113	4,920	15	249	2,660	960	25	346	1,180	221
6	380	126	2,180	16	218	940	731	26	271	2,170	204
7	335	148	2,800	17	198	1,090	600	27	218	1,620	189
8	305	582	1,360	18	186	637	508	28	183	788	172
9	279	674	940	19	169	432	422	29	156	674	169
10	373	544	9,460	20	167	422	436	30	137	10,300	150
								31	129	-	137
Monthly mean discharge, in second-feet									351	1,459	2,531
Runoff, in acre-feet									21,570	86,840	155,600
Runoff, in inches									0.62	2.49	4.46

South Grand River near Brownington, Mo.

Location.—Lat 38°15'45", long. 93°42'50", in NW¼ sec. 17, T. 40 N., R. 25 W., at county highway bridge, 150 ft downstream from St. Louis-San Francisco Railway bridge, 200 ft downstream from Deepwater Creek, and 1 mile north of Brownington. Datum of gage is 675.86 ft above mean sea level, datum of 1929.
Drainage area.—1,660 square miles.
Gage-height record.—Wire-weight gage read once daily below 10 ft and twice daily above. Graph drawn for days of changing stage.
Discharge record.—Stage-discharge relation defined by current-meter measurements.
Maxima.—May-July 1951: Discharge, 42,400 cfs 1 a.m. July 15 (gage height, 35.5 ft, from floodmarks).
1921 to April 1951: Discharge, 63,900 cfs Nov. 19, 1928 (gage height, 39.9 ft, from floodmarks).

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	470	687	31,600	11	1,700	8,320	12,500	21	1,130	2,030	2,990
2	642	598	28,600	12	1,640	7,340	15,800	22	1,290	1,520	642
3	598	260	21,800	13	1,130	4,670	26,500	23	1,580	3,280	449
4	598	165	16,600	14	687	2,600	38,800	24	1,080	8,250	733
5	428	118	14,800	15	428	1,750	40,400	25	687	10,300	2,080
6	294	98	14,800	16	294	1,240	32,000	26	449	13,100	1,460
7	230	1,410	15,600	17	230	3,130	22,000	27	927	14,200	780
8	202	3,380	15,900	18	202	3,530	15,300	28	780	16,400	428
9	177	5,840	14,100	19	918	4,340	11,400	29	294	20,200	312
10	368	6,740	12,800	20	1,700	4,620	8,040	30	388	27,700	230
								31	260	-	189
Monthly mean discharge, in second-feet									703	5,927	13,540
Runoff, in acre-feet									43,240	352,700	832,300
Runoff, in inches									0.49	3.98	9.40

Niangua River near Decaturville, Mo.

Location.—Lat 37°56'20", long. 92°50'30", in NW¼NE¼ sec. 19, T. 37 N., R. 17 W., 0.3 mile downstream from hydroelectric plant of Sho-Me Power Cooperative, Inc. and 8 miles northwest of Decaturville. Datum of gage is about 665.9 ft above mean sea level, datum of 1929.
Drainage area.—627 square miles.
Gage-height record.—Water-stage recorder graph.
Discharge record.—Stage-discharge relation defined by current-meter measurements. Discharge determined by integration on days of power plant regulation.
Maxima.—May-July 1951: Discharge, 16,700 cfs 2:30 a.m. July 2 (gage height, 16.06 ft).
1930 to April 1951: Discharge, 33,400 cfs May 19, 1943 (gage height, 21.84 ft).
Maximum stage known, about 28.0 ft during 1914.
Remarks.—Medium and low flow regulated by power plant upstream.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	614	625	9,700	11	598	670	5,100	21	892	678	860
2	950	472	10,300	12	641	565	3,020	22	1,120	718	775
3	998	712	2,300	13	531	414	2,840	23	1,850	1,710	672
4	1,110	664	1,800	14	656	1,240	2,040	24	1,970	3,340	634
5	940	654	4,760	15	508	1,450	1,640	25	1,350	1,590	575
6	786	498	3,280	16	492	1,570	1,300	26	1,050	1,310	590
7	820	523	2,130	17	460	1,170	1,170	27	825	1,560	515
8	608	872	1,800	18	445	985	1,040	28	904	1,220	512
9	627	888	1,520	19	426	965	920	29	641	1,000	540
10	640	868	4,180	20	607	942	950	30	585	4,380	518
								31	378	-	458
Monthly mean discharge, in second-feet									807	1,142	2,208
Runoff, in acre-feet									49,630	67,940	135,700
Runoff, in inches									1.48	2.03	4.06

Lake of the Ozarks near Bagnell, Mo.

Location.—Lat 38°12', long. 92°37', in SE¼ sec. 19, T. 40 N., R. 15 W., at Bagnell Dam on Osage River, 2 miles southwest of Bagnell. Datum of gage is at mean sea level, adjustment of 1912, or 1.18 ft below mean sea level, datum of 1929, determined by Union Electric Company of Missouri. Elevations given herein are referred to adjustment of 1912.
Drainage area.—14,000 square miles.
Gage-height record.—Water-stage recorder graph.
Maxima.—May-July 1951: Contents, 1,482,000 acre-feet 12 m. to 10 p.m. July 7 (elevation, 664.41 ft).
1931 to April 1951: Contents, 1,527,000 acre-feet May 22, 1943 (elevation, 665.45 ft).
Remarks.—Reservoir is formed by concrete gravity dam. Spillway is equipped with 12 taintor gates 34 ft wide by 22 ft high. Storage began in 1931. Usable capacity, 1,235,000 acre-feet between elevations 630.00 ft (maximum draw-down) and 660.00 ft (top of gates) above mean sea level. Dead storage, 774,000 acre-feet. Figures given herein are of usable contents. Water is used for generating electricity. Records collected and prepared in cooperation with the Union Electric Company of Missouri.

Lake of the Ozarks near Bagnell, Mo.—Continued

Elevation in feet, and contents, in acre-feet, at 12 p.m. of indicated day

Day	May		June		July	
	Elevation	Contents	Elevation	Contents	Elevation	Contents
1	651.53	804,300	655.38	998,800	662.75	1,393,000
2	651.55	805,300	655.48	998,800	663.08	1,410,000
3	651.63	809,100	655.65	1,008,000	663.08	1,410,000
4	651.86	820,100	655.45	997,300	663.14	1,414,000
5	652.58	854,300	655.21	984,900	663.64	1,440,000
6	653.30	889,400	654.95	971,500	664.37	1,480,000
7	653.70	909,200	654.77	962,300	664.40	1,481,000
8	653.90	919,200	654.58	952,900	664.20	1,471,000
9	653.86	917,200	654.95	971,500	663.79	1,449,000
10	653.68	908,300	655.13	980,800	663.74	1,446,000
11	653.44	896,400	655.31	990,100	663.74	1,446,000
12	653.55	901,800	655.74	1,012,000	663.56	1,436,000
13	654.00	924,100	656.15	1,034,000	663.62	1,439,000
14	654.04	926,100	656.34	1,044,000	663.12	1,413,000
15	654.07	927,600	656.67	1,062,000	662.59	1,385,000
16	653.89	918,700	657.35	1,098,000	662.11	1,359,000
17	653.57	902,800	657.90	1,128,000	661.81	1,343,000
18	653.24	886,400	658.17	1,143,000	661.76	1,340,000
19	653.38	893,400	658.31	1,151,000	661.84	1,344,000
20	654.30	939,000	658.31	1,151,000	661.95	1,350,000
21	654.64	955,900	658.09	1,138,000	661.93	1,349,000
22	655.26	987,500	658.09	1,138,000	661.76	1,340,000
23	655.37	993,200	658.72	1,173,000	661.48	1,325,000
24	655.43	996,200	659.82	1,235,000	661.15	1,308,000
25	655.44	996,800	660.17	1,255,000	660.87	1,292,000
26	655.75	1,013,000	660.29	1,261,000	660.63	1,280,000
27	656.24	1,038,000	660.29	1,261,000	660.39	1,267,000
28	656.22	1,037,000	660.73	1,285,000	660.15	1,254,000
29	656.07	1,030,000	661.48	1,325,000	660.09	1,251,000
30	656.12	1,032,000	662.52	1,381,000	660.08	1,250,000
31	655.81	1,016,000	-	-	659.79	1,233,000

Osage River near Bagnell, Mo.

Location.—Lat 38°12'26", long 92°35'23", in N½SE¼ sec. 21, T. 40 N., R. 15 W., 1½ miles upstream from Bagnell and 3 miles downstream from hydroelectric plant of Union Electric Co. of Missouri. Datum of gage is 548.57 ft above mean sea level, datum of 1929.

Drainage area.—14,000 square miles.

Gage-height record.—Water-stage recorder graph except for May 1, June 26 to July 1, when there was no recorder record.

Discharge record.—Stage-discharge relation defined by current-meter measurements. Discharge determined by integration on days of power plant regulation. Discharge during periods of no gage-height record obtained from power plant operating data.

Maxima.—May-July 1951: Discharge, 126,000 cfs 5 to 8 a.m. July 8 (gage height, 38.26 ft).
1925 to April 1951: Discharge, 220,000 cfs May 19, 1943 (gage height, 48.8 ft).
Maximum stage known prior to 1943, 43.1 ft in June 1844 (discharge, 164,000 cfs).

Remarks.—Flow regulated by Lake of the Ozarks (see preceding page).

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	9,400	12,800	93,800	11	13,600	20,800	118,000	21	8,760	21,200	102,000
2	9,360	4,620	96,900	12	8,940	21,100	117,000	22	16,200	21,400	102,000
3	9,620	1,570	100,000	13	3,270	21,100	119,000	23	20,500	23,900	97,800
4	9,910	9,040	102,000	14	13,100	20,800	117,000	24	20,800	34,600	93,000
5	834	9,130	104,000	15	13,500	19,200	115,000	25	19,600	50,900	85,500
6	500	9,220	116,000	16	13,200	9,460	112,000	26	8,060	57,600	77,700
7	8,640	12,100	125,000	17	13,600	1,870	109,000	27	2,840	59,600	68,800
8	9,140	20,000	125,000	18	12,800	12,400	105,000	28	13,100	61,400	57,200
9	9,750	21,100	122,000	19	4,400	15,700	104,000	29	13,100	71,400	40,500
10	12,300	20,300	119,000	20	1,380	21,100	102,000	30	5,090	84,900	29,300
								31	13,700	-	25,000
Monthly mean discharge, in second-feet									10,290	25,680	96,790
Runoff, in thousand acre-feet									632.7	1,528	5,951
Runoff, in inches									0.85	2.05	7.97

Osage River near St. Thomas, Mo.

Location. – Lat 38°20'25", long. 92°13'25", in SE¼SW¼ sec. 35, T. 42 N., R. 12 W., 0.5 mile downstream from Sugar Creek and 2½ miles south of St. Thomas. Datum of gage is 528.06 ft above mean sea level, datum of 1929.
Drainage area. – 14,500 square miles.
Gage-height record. – Water-stage recorder graph except for periods May 3, 4, 13, 15-21, July 10-17, 20-23, for which graph was drawn based on daily gage readings and recorded range line.
Discharge record. – Stage-discharge relation defined by current-meter measurements.
Maxima. – May-July 1951: Discharge, 130,000 cfs about 7 to 11 p.m. July 13 (gage height, 35.20 ft).
1931 to April 1951: Discharge, 216,000 cfs May 20, 1943 (gage height, 43.8 ft).
Maximum stage known prior to 1943, about 39.4 ft in June 1844.
Remarks. – Flow regulated by Lake of the Ozarks (see page 140).

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	9,410	12,900	94,300	11	14,000	21,600	124,000	21	5,640	21,000	109,000
2	9,940	10,800	97,400	12	11,600	21,900	124,000	22	17,200	21,300	108,000
3	9,940	3,780	102,000	13	6,000	21,300	128,000	23	24,100	23,800	107,000
4	10,200	3,700	105,000	14	7,100	21,300	128,000	24	21,600	33,400	103,000
5	8,630	9,410	107,000	15	13,500	20,100	124,000	25	20,400	49,800	96,900
6	2,620	10,200	114,000	16	13,200	14,300	121,000	26	14,000	60,600	89,800
7	2,740	9,940	122,000	17	13,200	6,850	118,000	27	6,600	62,300	81,000
8	9,150	19,800	128,000	18	12,900	4,240	114,000	28	5,640	63,200	69,000
9	9,150	24,800	128,000	19	10,500	13,800	113,000	29	13,500	68,100	52,600
10	11,000	21,600	126,000	20	2,920	20,100	111,000	30	9,410	82,900	33,400
								31	6,360	-	27,400
Monthly mean discharge, in second-feet									10,710	25,960	103,400
Runoff, in thousand acre-feet									658.8	1,545	6,359
Runoff, in inches									0.85	2.00	8.22

Maries River at Westphalia, Mo.

Location. – Lat 38°25'55", long. 91°59'20", in NE¼ sec. 35, T. 43 N., R. 10 W., at bridge on U. S. Highway 63, three-quarters of a mile southeast of Westphalia and 1¼ miles downstream from Little Maries River. Datum of gage is 542.37 ft above mean sea level, datum of 1929.
Drainage area. – 257 square miles.
Gage-height record. – Wire-weight gage read once daily below 10 ft and twice daily above until June 6; water-stage recorder graph thereafter. Graph drawn for days of changing stage.
Discharge record. – Stage-discharge relation defined by current-meter measurements. Shifting-control method used July 14-31. Stage-discharge relation affected by backwater from Osage and Missouri Rivers July 17-21; discharge computed on basis of discharge measurement and weather records.
Maxima. – May-July 1951: Discharge, 10,300 cfs 10 p.m. June 30 (gage height, 13.22 ft).
1947 to April 1951: Discharge, 15,600 cfs Jan. 4, 1950 (gage height, 16.0 ft, from graph based on gage readings).
Flood of June 8, 1937 reached a stage of 22.8 ft, from information furnished by local residents.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	93	56	1,950	11	136	193	636	21	582	81	95
2	123	44	532	12	142	758	1,060	22	4,460	72	89
3	250	66	382	13	110	329	6,510	23	1,170	875	82
4	172	102	598	14	84	184	1,470	24	364	2,450	78
5	140	61	2,250	15	68	132	556	25	222	1,020	63
6	114	45	4,080	16	60	112	364	26	150	1,970	54
7	92	40	1,370	17	51	509	250	27	117	756	78
8	81	735	508	18	49	250	160	28	93	329	73
9	70	2,160	312	19	50	142	130	29	73	1,620	51
10	74	280	608	20	650	105	110	30	64	5,970	45
								31	84	-	40
Monthly mean discharge, in second-feet									322	715	793
Runoff, in acre-feet									19,810	42,540	48,760
Runoff, in inches									1.46	3.10	3.56

Gasconade River near Rich Fountain, Mo.

Location. —Lat 38°23'20", long. 91°49'15", in SE¼ sec. 16, T. 42 N., R. 8 W., at bridge on State Highway 89, 800 ft upstream from Swan Creek and 4 miles east of village of Rich Fountain. Datum of gage is 553.70 ft above mean sea level, datum of 1929.
Drainage area. —3,180 square miles.
Gage-height record. —Water-stage recorder graph.
Discharge record. —Stage-discharge relation defined by current-meter measurements.
Maxima. —May-July 1951: Discharge, 38,700 cfs 6 to 8 a.m. July 3 (gage height, 20.50 ft).
1921 to April 1951: Discharge, 96,400 cfs Apr. 16, 1945 (gage height, 29.13 ft).

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	2,870	2,350	30,500	11	2,760	2,870	16,300	21	12,000	2,870	4,080
2	2,870	2,150	35,400	12	2,550	3,960	24,700	22	20,800	3,100	3,700
3	2,870	2,150	37,600	13	2,600	3,330	23,900	23	15,300	3,820	3,450
4	3,210	2,010	32,500	14	2,760	3,100	21,000	24	10,700	6,980	3,820
5	3,960	1,910	14,200	15	2,550	3,820	18,800	25	7,460	7,800	3,450
6	3,700	1,820	14,400	16	2,350	3,450	10,700	26	5,460	7,800	3,100
7	3,330	1,820	17,700	17	2,200	3,330	7,460	27	4,340	5,600	3,330
8	2,980	3,530	14,200	18	2,060	3,450	6,060	28	3,700	4,620	3,330
9	2,660	2,660	9,490	19	1,960	3,330	5,170	29	3,210	5,760	3,210
10	2,660	2,450	8,300	20	2,660	2,870	4,620	30	2,870	18,300	3,820
								31	2,550	-	3,330
Monthly mean discharge, in second-feet									4,644	4,100	12,630
Runoff, in acre-feet									285,500	244,000	776,800
Runoff, in inches									1.68	1.44	4.58

Loutre River at Mineola, Mo.

Location. —Lat 38°53'20", long. 91°34'30", in SE¼NW¼ sec. 34, T. 48 N., R. 6 W., at bridge on U. S. Highway 40 in Mineola, 0.2 mile upstream from Sallee Branch. Datum of gage is 539.86 ft above mean sea level, datum of 1929.
Drainage area. —202 square miles.
Gage-height record. —Wire-weight gage read once daily below 10 ft and twice daily above except for May 9 and July 18 when gage was not read. Graph drawn for days of changing stage.
Discharge record. —Stage-discharge relation defined by current-meter measurements. Shifting-control method used June 27 to July 31. Discharge for days of no gage-height record computed on basis of weather records.
Maxima. —May-July 1951: Discharge, 4,480 cfs 1 p.m. June 26 (gage height, 14.0 ft, from graph based on gage readings).
1947 to April 1951: Discharge, 11,500 cfs Sept. 13, 1949 (gage height, 19.98 ft).
Flood of June 20, 1928 reached a stage of about 28.9 ft, from information by local resident.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	39	15	302	11	151	8	280	21	18	132	13
2	43	11	172	12	86	15	293	22	16	52	13
3	39	11	107	13	51	286	86	23	14	709	385
4	36	10	83	14	38	57	46	24	13	1,750	308
5	32	8	63	15	29	24	33	25	11	814	33
6	29	7	80	16	25	30	26	26	10	2,760	24
7	25	6	65	17	22	151	21	27	9	588	20
8	24	6	46	18	19	47	19	28	8	1,530	14
9	24	6	42	19	18	647	17	29	6	673	11
10	128	8	68	20	16	1,380	15	30	6	445	10
								31	9	-	9
Monthly mean discharge, in second-feet									32.1	406	87.2
Runoff, in acre-feet									1,970	24,170	5,360
Runoff, in inches									0.18	2.24	0.50

Missouri River at Hermann, Mo.

Location. – Lat 38°42'36", long. 91°26'21", in SW¼ sec. 25, T. 46 N., R. 5 W., at bridge on State Highway 19 at Hermann. Datum of gage is 481.40 ft above mean sea level, datum of 1929.

Drainage area. – 528,200 square miles.

Gage-height record. – Water-stage recorder graph.

Discharge record. – Stage-discharge relation defined by current-meter measurements. Shifting-control method used.

Maxima. – May-July 1951: Discharge, 618,000 cfs 8 a.m. to 12 m. July 19 (gage height, 33.33 ft).

1928 to April 1951: Discharge, 577,000 cfs Apr. 28, 1944; gage height, 31.20 ft May 21, 1943, June 29, 1947.

1844 to 1927: Discharge known, about 892,000 cfs June 1844 (gage height, 35.5 ft), computed by Corps of Engineers.

Remarks. – Drainage basin above station contains many reservoirs with total usable capacity in excess of 28,875,000 acre-feet.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	130,000	106,000	470,000	11	117,000	231,000	503,000	21	122,000	179,000	557,000
2	147,000	104,000	505,000	12	132,000	237,000	502,000	22	156,000	201,000	500,000
3	215,000	103,000	500,000	13	152,000	223,000	513,000	23	170,000	244,000	445,000
4	246,000	159,000	508,000	14	145,000	203,000	509,000	24	157,000	290,000	392,000
5	249,000	203,000	508,000	15	136,000	187,000	503,000	25	147,000	313,000	345,000
6	248,000	204,000	491,000	16	122,000	178,000	502,000	26	137,000	344,000	307,000
7	225,000	213,000	479,000	17	109,000	174,000	514,000	27	123,000	372,000	270,000
8	172,000	204,000	471,000	18	107,000	192,000	584,000	28	120,000	387,000	234,000
9	137,000	226,000	477,000	19	112,000	191,000	615,000	29	139,000	410,000	196,000
10	119,000	228,000	494,000	20	119,000	178,000	602,000	30	132,000	439,000	164,000
								31	111,000	-	142,000
Monthly mean discharge, in second-feet									150,100	230,800	445,200
Runoff, in thousand acre-feet									9,229	13,730	27,380
Runoff, in inches									0.33	0.49	0.97

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	July 8		July 9		July 10		July 11		July 12		July 13	
2												
4												
6	30.35	470,000	30.38	476,000	30.38	481,000	30.90	503,000	30.91	498,000	31.29	510,000
8												
10												
N	30.35	471,000	30.38	477,000	30.80	502,000	30.92	503,000	31.03	503,000	31.38	515,000
2												
4												
6	30.35	472,000	30.38	478,000	30.84	503,000	30.90	502,000	31.13	505,000	31.41	517,000
8												
10												
12	30.35	473,000	30.38	479,000	30.90	504,000	30.98	502,000	31.15	506,000	31.39	516,000
	July 14		July 15		July 16		July 17		July 18		July 19	
2												
4												
6	31.32	512,000	31.20	505,000	31.13	501,000	31.15	502,000	32.37	565,000	33.28	616,000
8												
10												
N	31.27	509,000	31.15	503,000	31.14	502,000	31.32	510,000	32.81	589,000	33.33	618,000
2												
4												
6	31.23	507,000	31.13	502,000	31.14	502,000	31.59	524,000	33.09	605,000	33.23	613,000
8												
10												
12	31.16	504,000	31.14	502,000	31.14	502,000	31.94	542,000	33.20	611,000	33.21	612,000
	July 20		July 21		July 22		July 23		July 24		July 25	
2												
4												
6	33.21	609,000	32.54	570,000	31.46	510,000	30.36	457,000	29.43	403,000	28.40	355,000
8												
10												
N	33.08	602,000	32.33	558,000	31.26	501,000	30.14	446,000	29.26	393,000	28.13	344,000
2												
4												
6	33.00	598,000	32.05	543,000	30.99	488,000	29.90	431,000	28.95	378,000	27.88	334,000
8												
10												
12	32.75	584,000	31.79	529,000	30.72	475,000	29.69	417,000	28.67	366,000	27.63	325,000

Mississippi River main stem

Mississippi River at St. Louis, Mo.

Location. —Lat 38°37'44", long. 90°10'54", at foot of Washington Avenue, just downstream from west pier of Eads Bridge, St. Louis, 15 miles downstream from Missouri River and 180 miles upstream from Ohio River. Datum of gage is 379.94 ft above mean sea level, datum of 1929, and 379.80 ft above mean Gulf level.

Drainage area. —701,000 square miles, approximately.

Gage-height record. —Water-stage recorder graph except for periods May 8-14 and June 5 for which graph was drawn based on twice-daily readings at Market Street gage.

Discharge record. —Stage-discharge relation defined by current-meter measurements. Shifting-control method used throughout.

Maxima. —May-July 1951: Discharge, 782,000 cfs 1 a.m. to 12 m. July 21; gage height, 40.28 ft 2:30 a.m. July 22.

1933 to April 1951: Discharge, 844,000 cfs April 30, 1944; gage height, 40.26 ft July 2, 1947. Flood of June 27, 1844, reached a stage of 41.32 ft from floodmarks, (discharge, 1,300,000 cfs, computed by Corps of Engineers). Flood of April 1785 may have reached a stage of 42.0 ft.

Remarks. —Flow partly regulated by many reservoirs and navigation dams on upper Mississippi River, by diversion through Chicago Sanitary and Ship Canal from Lake Michigan into Illinois River, and by many reservoirs in Missouri River Basin.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	443,000	287,000	572,000	11	482,000	339,000	648,000	21	361,000	299,000	779,000
2	446,000	267,000	576,000	12	465,000	408,000	659,000	22	348,000	290,000	765,000
3	461,000	251,000	592,000	13	468,000	422,000	671,000	23	357,000	323,000	754,000
4	513,000	240,000	604,000	14	475,000	410,000	683,000	24	355,000	394,000	736,000
5	539,000	282,000	617,000	15	468,000	387,000	694,000	25	330,000	441,000	710,000
6	552,000	338,000	622,000	16	456,000	361,000	704,000	26	313,000	465,000	680,000
7	560,000	357,000	632,000	17	439,000	342,000	715,000	27	299,000	492,000	645,000
8	549,000	367,000	639,000	18	417,000	323,000	725,000	28	278,000	518,000	602,000
9	523,000	367,000	645,000	19	396,000	321,000	744,000	29	276,000	542,000	544,000
10	499,000	390,000	645,000	20	378,000	332,000	772,000	30	302,000	556,000	472,000
								31	306,000	-	406,000
Monthly mean discharge, in second-feet									421,100	372,400	653,300
Runoff, in thousand acre-feet									25,890	22,160	40,170
Runoff, in inches									0.69	0.59	1.07

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge
	July 8		July 9		July 10		July 11		July 12		July 13	
2												
4												
6	35.37	637,000	35.63	645,000	35.60	645,000	35.64	645,000	36.10	657,000	36.44	666,000
8												
10												
N	35.42	639,000	35.63	645,000	35.58	644,000	35.70	646,000	36.18	658,000	36.59	671,000
2												
4												
6	35.45	640,000	35.62	645,000	35.60	645,000	35.87	652,000	36.29	662,000	36.78	675,000
8												
10												
12	35.48	641,000	35.67	646,000	35.62	645,000	35.99	654,000	36.36	664,000	36.91	679,000
	July 14		July 15		July 16		July 17		July 18		July 19	
2												
4												
6	37.03	681,000	37.51	690,000	38.05	701,000	38.37	712,000	38.52	721,000	38.72	737,000
8												
10												
N	37.11	683,000	37.68	694,000	38.17	704,000	38.43	715,000	38.56	724,000	38.83	743,000
2												
4												
6	37.24	686,000	37.81	697,000	38.23	707,000	38.47	718,000	38.61	728,000	39.01	750,000
8												
10												
12	37.39	688,000	37.95	700,000	38.30	709,000	38.51	720,000	38.57	733,000	39.22	758,000
	July 20		July 21		July 22		July 23		July 24		July 25	
2												
4												
6	39.46	766,000	40.16	782,000	40.23	770,000	39.92	755,000	39.49	742,000	38.70	717,000
8												
10												
N	39.63	773,000	40.23	780,000	40.13	762,000	39.92	755,000	39.30	736,000	38.47	709,000
2												
4												
6	39.89	779,000	40.25	778,000	40.09	761,000	39.85	752,000	39.14	730,000	38.27	704,000
8												
10												
12	40.05	780,000	40.26	774,000	40.05	760,000	39.69	748,000	38.94	724,000	38.01	695,000

Mississippi River at Chester, Ill.

Location. —Lat 37°54'00", long. 89°49'50", in SW¼ sec. 24, T. 7 S., R. 7 W., 3rd principal meridian, 0.4 mile downstream from highway bridge at Chester, 8.3 miles downstream from Kaskaskia River, and 109.5 miles upstream from Ohio River. Datum of gage is 341.05 ft above mean sea level, datum of 1929 (levels by Corps of Engineers).

Drainage area. —712,600 square miles (authority, Mississippi River Commission).

Gage-height record. —Graph based on twice-daily readings and recorder graphs for stations upstream and downstream.

Discharge record. —Stage-discharge relation defined by current-meter measurements. Shifting-control method used throughout.

Maxima. —May-July 1951: Discharge, 795,000 cfs 11:30 p.m. July 22; gage height, 39.28 ft 6 a.m. July 23.

1942 to April 1951: Discharge, 886,000 cfs July 3, 1947; (discharge, including unmeasured overflow, was greater May 24, 1943).

1891 to April 1951: Maximum gage height, 38.17 ft July 4, 1947.

Flood of about June 30, 1844 reached a stage of 39.8 ft (discharge, 1,350,000 cfs, computed by Corps of Engineers).

Remarks. —Flow partly regulated by many reservoirs and navigation dams on upper Mississippi River, by diversion through Chicago Sanitary and Ship Canal from Lake Michigan into Illinois River, and by many reservoirs in Missouri River Basin.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	444,000	307,000	541,000	11	500,000	399,000	652,000	21	393,000	333,000	786,000
2	442,000	288,000	556,000	12	479,000	414,000	664,000	22	374,000	302,000	795,000
3	447,000	270,000	573,000	13	469,000	422,000	690,000	23	357,000	305,000	790,000
4	465,000	258,000	589,000	14	472,000	425,000	708,000	24	366,000	357,000	786,000
5	500,000	258 000	604,000	15	476,000	405,000	720,000	25	359,000	410,000	767,000
6	526,000	307,000	615,000	16	476,000	384,000	741,000	26	341,000	447,000	736,000
7	543,000	351,000	626,000	17	467,000	363,000	758,000	27	319,000	469,000	697,000
8	548,000	368,000	634,000	18	451,000	343,000	772,000	28	300,000	486,000	652,000
9	543,000	378,000	640,000	19	427,000	329,000	772,000	29	286,000	504,000	618,000
10	524,000	382,000	646,000	20	405,000	337,000	776,000	30	296,000	524,000	571,000
								31	315,000	-	507,000
Monthly mean discharge, in second-feet									429,400	370,800	676,800
Runoff, in thousand acre-feet									26,400	22,070	41,620
Runoff, in inches									0.69	0.58	1.10

Mississippi River at Thebes, Ill.

Location. —Lat 37°13'00", long. 89°27'50", in NW¼ sec. 17, T. 15 S., R. 3 W., on railroad bridge at Thebes, 43.7 miles upstream from Ohio River. Datum of gage is mean sea level, datum of 1929 (levels by Corps of Engineers). Auxiliary gage, lat 37°18'06", long. 89°31'05", at Cape Girardeau, Mo., 51.9 miles upstream from Ohio River. Datum of gage is 304.65 ft above mean sea level, datum of 1929 (levels by Corps of Enginners).

Drainage area. —717,200 square miles, approximately.

Gage-height record. —Water-stage recorder graphs from base and auxiliary gages except for periods June 17, 19 at base gage, and June 8-12, 16-19, 25, 26, and July 10-31 at auxiliary gage for which graphs were drawn based on once-daily readings of outside gage and recorder record for other gage when available.

Discharge record. —Computed by unit-fall method. Stage-fall-discharge relations defined by current-meter measurements. Shifting-control method used throughout.

Maxima. —May-July 1951: Discharge, 805,000 cfs 4 a.m. July 24 (gage height, 339.91 ft 8 a.m.)

1941 to April 1951: Discharge, 893,000 cfs May 27, 1943 (gage height, 340.33 ft, present datum).

1879 to April 1951: At Grays Point, 2.6 miles upstream, gage height, 342.39 ft above mean sea level, datum of 1929, May 27, 28, 1943.

Flood of July 4, 1844 at Grays Point reached a stage of 345.14 ft above mean sea level, datum of 1929, from floodmarks (discharge, 1,350,000 cfs, computed by Corps of Engineers).

Remarks. —Flow partly regulated by many reservoirs and navigation dams on upper Mississippi River, by diversion through Chicago Sanitary and Ship Canal from Lake Michigan into Illinois River, and by many reservoirs in Missouri River Basin.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	458,000	320,000	549,000	11	515,000	383,000	673,000	21	396,000	345,000	757,000
2	456,000	303,000	568,000	12	490,000	396,000	667,000	22	378,000	321,000	783,000
3	455,000	286,000	589,000	13	470,000	411,000	680,000	23	370,000	307,000	799,000
4	461,000	272,000	604,000	14	461,000	420,000	695,000	24	370,000	339,000	801,000
5	487,000	260,000	613,000	15	466,000	415,000	703,000	25	373,000	384,000	797,000
6	520,000	285,000	621,000	16	471,000	396,000	711,000	26	354,000	427,000	787,000
7	539,000	336,000	623,000	17	466,000	377,000	721,000	27	335,000	460,000	763,000
8	549,000	360,000	629,000	18	455,000	357,000	739,000	28	319,000	481,000	732,000
9	554,000	373,000	642,000	19	437,000	342,000	743,000	29	301,000	501,000	687,000
10	540 000	372,000	669,000	20	415,000	344,000	750,000	30	294,000	526,000	633,000
								31	310,000	-	591,000
Monthly mean discharge, in second-feet									434,400	370,000	687,700
Runoff, in thousand acre-feet									26,710	22,010	42,290
Runoff, in inches									0.70	0.58	1.11

Arkansas River basin

Arkansas River near Coolidge, Kans.

Location.—Lat 38°01', long. 102°00', in sec. 26, T. 23 S., R. 43 W., on right bank 1,560 ft upstream from county highway bridge, 1 mile south of Coolidge and about 1½ miles downstream from Colorado-Kansas State line. Datum of gage is 3,333.84 ft above mean sea level, datum of 1929.

Drainage area.—25,309 square miles.

Gage-height record.—Water-stage recorder graph.

Discharge record.—Stage-discharge relation defined by current-meter measurements below 11,000 cfs and extended to peak stage by logarithmic plotting. Shifting-control method used May 1 to June 20, June 23 to July 31.

Maxima.—May-July 1951: Discharge, 60,000 cfs, 11 a.m. May 15 (gage height, 10.67 ft).
1893-94, 1901-2, 1907 to April 1951: Discharge, 136,000 cfs Oct. 20, 1908, by slope-area method, at Holly, Colo., 6 miles upstream.

Remarks.—Diversions above station for irrigation. Flow partly regulated by John Martin Reservoir (capacity, 701,000 acre-feet).

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	90	252	341	11	360	1,530	207	21	748	2,770	83
2	80	230	267	12	323	948	222	22	530	1,220	252
3	86	214	230	13	304	570	500	23	390	800	1,290
4	111	214	207	14	450	400	276	24	332	600	370
5	207	585	214	15	28,900	252	207	25	390	660	160
6	237	192	187	16	10,500	214	170	26	295	660	106
7	252	143	192	17	2,510	181	111	27	295	580	80
8	276	138	192	18	1,130	285	98	28	260	2,990	73
9	260	143	214	19	590	200	80	29	222	1,150	63
10	332	276	192	20	400	1,280	73	30	222	610	165
								31	260	-	304
Monthly mean discharge, in second-feet									1,656	676	230
Runoff, in acre-feet									101,800	40,240	14,130
Runoff, in inches									0.08	0.03	0.01

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 13		May 14		May 15		May 16		May 17		May 18	
2					4.65	2,220	7.40	11,500				
4					6.25	6,250	7.92	13,900				
6					8.93	26,700	8.03	15,400	4.65	3,200		
8					9.21	38,600	8.10	15,400				
10					10.44	59,300	7.85	13,500				
N	3.10	304	3.21	390	10.41	54,500	7.35	10,800	4.15	2,360	3.28	1,100
2					9.96	45,500	7.06	9,840				
4					9.98	45,900	6.72	8,680				
6					9.33	33,400	6.30	7,200	3.78	1,830		
8					8.10	15,400	6.02	6,500				
10					7.30	10,600	5.70	5,550				
12	3.21	410	4.19	1,460	7.18	10,100	5.43	5,040	3.54	1,490	3.04	840
	May 19		May 20		May 21		May 22		May 23		May 24	
2												
4					2.67	370	2.90	580				
6												
8					2.95	650	2.79	470				
10												
N	2.84	580	2.68	380	3.70	1,490	2.77	450	2.67	360	2.59	295
2												
4					3.15	840	2.84	520				
6												
8					2.87	550	2.87	550				
10												
12	2.75	490	2.68	380	2.84	520	2.81	490	2.62	314	2.71	410
	May 25		May 26		May 27		May 28		May 29		May 30	
2												
4	2.90	620										
6												
8	2.72	440										
10												
N	2.62	341	2.55	286	2.54	286	2.50	260	2.45	230	2.43	222
2												
4	2.57	295										
6												
8	2.56	286										
10												
12	2.57	295	2.56	295	2.54	286	2.45	222	2.44	222	2.43	222

Supplemental records.—May 15, 11 a.m., 10.67 ft, 60,000 cfs, 3 p.m., 10.06 ft, 47,500 cfs; May 21, 10 a.m., 3.80 ft, 1,630 cfs.

Arkansas River at Syracuse, Kans.

Location.—Lat 37°58', long. 101°45', in NW¼ sec. 18, T. 24 S., R. 40 W., at bridge on U. S. Highway 270, half a mile south of Syracuse. Datum of gage is 3,212.32 ft above mean sea level, datum of 1929.

Drainage area.—25,894 square miles.

Gage-height record.—Water-stage recorder graph except for periods May 1-6, May 15 to June 19, July 7-22, 26-30, for which a graph was drawn based on once-daily wire-weight gage readings.

Discharge record.—Stage-discharge relation defined by current-meter measurements. Shifting-control method used May 1-15, May 27 to July 19.

Maxima.—May-July 1951: Discharge, 54,300 cfs 7 p.m. May 15 (gage height, 12.63 ft).
1902-6, 1921 to April 1951: Gage height, about 11.75 ft June 6, 1921 (discharge not determined).

Remarks.—Diversions above station for irrigation. Flow regulated by John Martin Reservoir (capacity, 701,000 acre-feet).

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	75	326	671	11	315	748	244	21	888	3,800	145
2	73	290	528	12	336	940	239	22	1,090	1,670	187
3	67	285	442	13	336	825	310	23	739	1,010	709
4	60	271	387	14	390	594	304	24	600	910	564
5	90	310	347	15	29,500	480	235	25	1,030	1,030	304
6	176	358	326	16	20,700	460	202	26	546	870	218
7	199	285	271	17	4,770	347	191	27	458	825	180
8	223	244	252	18	1,730	320	155	28	422	3,180	162
9	235	218	244	19	1,190	331	162	29	403	2,140	138
10	248	299	239	20	832	734	158	30	361	1,010	162
								31	341	-	454
Monthly mean discharge, in second-feet									2,207	837	295
Runoff, in acre-feet									135,700	49,800	18,110
Runoff, in inches									0.10	0.04	0.01

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge
	May 13		May 14		May 15		May 16		May 17		May 18	
2					5.73	6,760						
4					8.00	15,800	9.50	27,600				
6					8.76	19,900			4.96	5,950	3.07	1,920
8					9.18	22,300	8.56	21,600				
10					9.40	23,700						
N	1.96	336	2.04	381	9.60	25,000	8.00	18,400	4.24	4,100	2.88	1,650
2					10.08	28,200						
4					11.45	38,900	7.73	17,000				
6					12.58	51,800			3.67	2,930	2.76	1,500
8					12.54	53,400	7.30	14,800				
10					12.02	48,200						
12	1.97	341	2.24	508	11.10	40,000	6.18	10,000	3.27	2,220	2.73	1,460
	May 19		May 20		May 21		May 22		May 23		May 24	
2												
4												
6	2.73	1,460			2.07	754	2.49	1,170				
8												
10												
N	2.48	1,160	2.16	834	2.17	843	2.47	1,150	2.02	712	1.87	594
2												
4												
6	2.29	960			2.34	1,010	2.37	1,040				
8												
10												
12	2.22	890	2.09	772	2.45	1,120	2.23	900	1.92	632	1.85	579
	May 25		May 26		May 27		May 28		May 29		May 30	
2												
4	2.45	1,120										
6			1.83	564								
8	2.70	1,420										
10												
N	2.54	1,230	1.78	528	1.68	454	1.63	416	1.62	404	1.55	358
2												
4	2.31	980										
6			1.75	508								
8	2.12	798										
10												
12	1.98	679	1.72	487	1.65	435	1.64	423	1.58	381	1.53	347

Supplemental records.—May 14, 10 p.m., 2.13 ft, 435 cfs; May 15, 1 a.m., 3.33 ft, 1,600 cfs, 3 a.m., 7.25 ft, 12,300 cfs, 7 p.m., 12.63 ft, 54,300 cfs.

Arkansas River at Garden City, Kans.

Location. —Lat 37°57', long. 100°52', in NW¼ sec. 19, T. 24 S., R. 32 W., at bridge on U. S. Highway 83, half a mile south of Garden City. Datum of gage is 2,816.45 ft above mean sea level (preliminary).

Drainage area. —27,719 square miles.

Gage-height record. —Water-stage recorder graph except for periods May 26 to June 4, July 7-20, 23-28, 30, 31, for which a graph was drawn based on once-daily wire-weight gage readings.

Discharge record. —Stage-discharge relation defined by current-meter measurements. Shifting-control method used May 23 to June 21, July 8-24.

Maxima. —May-July 1951: Discharge, 33,500 cfs 10 p.m. May 16 (gage height, 9.57 ft).
1922 to April 1951: Discharge, 31,400 cfs April 28, 1942 (gage height, 8.87 ft).

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	27	623	1,720	11	17	651	472	21	2,600	1,090	280
2	23	630	1,400	12	16	994	424	22	2,730	2,980	280
3	20	574	1,220	13	29	1,460	394	23	2,110	1,910	177
4	23	539	1,000	14	197	1,260	430	24	1,630	1,440	162
5	25	532	825	15	1,110	1,100	454	25	1,420	1,220	325
6	23	525	748	16	15,600	950	350	26	1,220	1,220	151
7	20	672	644	17	18,000	780	345	27	914	1,350	119
8	20	560	560	18	4,220	679	320	28	740	1,530	93
9	19	504	539	19	3,220	602	300	29	664	3,440	86
10	18	609	518	20	1,800	637	280	30	621	2,500	60
								31	672	-	68
Monthly mean discharge, in second-feet									1,927	1,119	476
Runoff, in acre-feet									118,500	66,570	29,240
Runoff, in inches									0.08	0.05	0.02

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 13		May 14		May 15		May 16		May 17		May 18	
2	1.98	17	2.16	43	2.97	312	7.92	9,680				
4	1.98	17	2.13	38	2.88	272	8.07	10,400	8.98	23,700		
6	1.98	17	2.12	36	2.83	252	8.16	10,800			5.64	4,880
8	1.98	17	2.11	35	2.93	294	8.19	11,000	8.67	20,600		
10	1.99	18	2.12	36	2.88	272	8.25	11,300				
N	1.99	18	2.12	36	2.82	248	8.37	12,000	8.43	18,600	5.26	3,860
2	1.99	18	2.73	212	2.82	248	8.39	12,100				
4	1.99	18	3.20	430	2.83	252	8.46	12,700	8.10	16,200		
6	1.99	18	3.26	466	2.83	252	8.70	15,200			4.93	3,070
8	2.32	75	3.22	442	3.25	460	9.40	29,600	7.21	11,000		
10	2.35	84	3.13	392	6.90	6,050	9.57	33,500				
12	2.21	51	3.06	355	7.60	8,400	9.35	28,700	6.36	7,340	4.82	2,820
	May 19		May 20		May 21		May 22		May 23		May 24	
2					4.10	1,580						
4			4.52	2,240	4.27	1,820	4.38	2,190				
6	4.75	2,680			4.72	2,620			4.44	2,180		
8			4.39	2,000	5.13	3,530	4.93	3,070				
10					5.33	4,040						
N	5.27	3,880	4.13	1,620	5.20	3,700	4.75	2,680	4.30	2,000	3.92	1,610
2					4.93	3,070						
4			4.03	1,490	4.71	2,600	4.67	2,520				
6	5.14	3,560			4.47	2,150			4.19	1,880		
8			3.95	1,380	4.38	2,190	5.09	3,440				
10					4.38	2,190						
12	4.77	2,720	4.01	1,460	4.39	2,000	4.89	2,980	4.09	1,780	3.83	1,520
	May 25		May 26		May 27		May 28		May 29		May 30	
2												
4												
6												
8												
10												
N	3.72	1,420	3.50	1,220	3.05	870	2.84	740	2.70	665	2.58	602
2												
4												
6												
8												
10												
12	3.60	1,310	3.42	1,150	2.89	764	2.80	716	2.60	609	2.72	672

Arkansas River at Dodge City, Kans.

Location.—Lat 37°45', long. 100°01', in NE¼ sec. 35, T. 26 S., R. 25 W., on Second Street Bridge in Dodge City. Datum of gage is 2,467.71 ft above mean sea level, datum of 1929.
Drainage area.—29,837 square miles.
Gage-height record.—Water-stage recorder graph except for period May 1-14, for which a graph was drawn based on once-daily wire-weight gage readings.
Discharge record.—Stage-discharge relation defined by current-meter measurements. Shifting-control method used July 23-28.
Maxima.—May-July 1951: Discharge, 19,700 cfs 4 a.m. May 18 (gage height, 12.54 ft).
1944 to April 1951: Discharge, 16,200 cfs June 8, 1949 (gage height, 13.29 ft).

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	141	716	2,310	11	121	928	2,210	21	2,790	982	386
2	137	615	1,690	12	101	883	1,950	22	4,510	1,170	380
3	133	557	1,410	13	101	1,200	1,110	23	2,720	2,500	527
4	129	480	1,240	14	352	1,490	829	24	1,990	1,880	368
5	117	473	1,060	15	648	1,280	652	25	1,600	1,590	320
6	117	473	919	16	3,600	1,090	571	26	1,340	1,350	400
7	113	494	820	17	7,840	910	529	27	1,150	1,280	368
8	109	585	740	18	16,000	740	466	28	970	1,520	304
9	169	883	638	19	5,720	660	804	29	802	1,710	260
10	173	1,240	638	20	3,200	622	419	30	712	3,450	244
								31	716	-	228
Monthly mean discharge, in second-feet									1,881	1,125	800
Runoff, in acre-feet									115,700	66,940	49,170
Runoff, in inches									0.07	0.04	0.03

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge
	May 13		May 14		May 15		May 16		May 17		May 18	
2			3.39	101	4.32	588	7.08	3,370	9.04	6,680	12.00	17,000
4			3.42	113	4.08	438	7.29	3,670	9.12	6,840	12.54	19,700
6			3.46	129	3.90	330	7.26	3,620	9.23	7,060	12.34	18,700
8			3.63	198	3.89	325	6.92	3,150	9.30	7,200	12.17	17,800
10			3.85	305	3.90	330	6.35	2,410	9.44	7,550	12.06	17,300
N	3.39	101	3.96	366	3.93	348	5.85	1,850	9.50	7,700	11.88	16,400
2			4.19	504	3.85	305	5.50	1,510	9.60	7,950	11.76	15,800
4			4.08	438	3.91	336	6.27	2,310	9.66	8,100	11.74	15,700
6			4.21	516	4.25	542	8.10	4,920	9.75	8,320	11.58	14,900
8			4.20	510	4.98	1,060	8.60	5,820	9.85	8,580	11.35	13,900
10			4.40	640	5.52	1,530	8.80	6,200	9.98	8,940	11.04	12,700
12	3.39	101	4.50	710	6.50	2,590	8.94	6,480	10.85	11,900	10.75	11,500
	May 19		May 20		May 21		May 22		May 23		May 24	
2					6.57	2,580	9.74	8,300	6.72	2,790		
4			7.20	3,460	6.52	2,520	9.02	6,640	6.75	2,830		
6	9.23	7,060			6.48	2,480	8.72	6,040	6.71	2,770	6.16	2,090
8			7.28	3,590	6.40	2,380	8.39	5,440	6.63	2,660		
10					6.35	2,320	7.85	4,500	6.59	2,610		
N	7.96	4,680	7.13	3,360	6.32	2,280	7.35	3,700	6.67	2,720	6.07	1,980
2					6.22	2,160	7.02	3,210	6.78	2,870		
4			6.87	3,000	6.17	2,100	6.79	2,890	6.82	2,930		
6	7.37	3,730			6.50	2,500	6.70	2,760	6.73	2,800	5.97	1,870
8			6.68	2,730	6.47	2,460	6.60	2,620	6.62	2,650		
10					8.00	4,740	6.57	2,580	6.49	2,490		
12	7.12	3,350	6.68	2,730	9.48	7,650	6.62	2,650	6.37	2,340	5.84	1,720
	May 25		May 26		May 27		May 28		May 29		May 30	
2												
4												
6												
8												
10												
N	5.73	1,610	5.46	1,340	5.27	1,150	5.06	964	4.87	796	4.75	700
2												
4												
6												
8												
10												
12	5.58	1,460	5.35	1,230	5.18	1,070	4.97	883	4.79	732	4.77	716

Supplemental records.—May 16, 5 a.m., 7.32 ft, 3,710 cfs, 3 p.m., 5.40 ft, 1,420 cfs; May 21, 11 p.m., 8.50 ft, 5,640 cfs; May 22, 1 a.m., 9.87 ft, 8,620 cfs.

Arkansas River near Kinsley, Kans.

Location. —Lat 37°56', long. 99°22', on line between secs. 26 and 35, T. 24 S., R. 19 W., on U. S. Highway 50 S, 2 miles east of Kinsley.
Drainage area. —30,330 square miles.
Gage-height record. —Water-stage recorder graph except for periods May 1-15, May 27 to June 20, June 26-28, July 4-10, 14-31, for which graph was drawn based on once-daily wire-weight gage readings.
Discharge record. —Stage-discharge relation defined by current-meter measurements.
Maxima. —May-July 1951: Discharge, 11,700 cfs 7 p.m. May 19 (gage height, 11.20 ft).
1944 to April 1951: Discharge, 11,300 cfs June 10, 1949 (gage height, 11.09 ft).
Remarks. —Diversions above station for irrigation. Flow regulated by John Martin Reservoir (capacity, 701,000 acre-ft).

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	259	990	5,280	11	178	1,210	2,020	21	3,910	1,400	488
2	226	934	2,530	12	180	1,310	2,890	22	6,120	1,650	444
3	211	890	1,820	13	182	1,090	2,210	23	9,420	1,690	404
4	205	790	1,580	14	296	1,200	1,560	24	3,420	2,020	372
5	205	760	1,480	15	498	1,280	1,290	25	2,220	1,760	352
6	202	760	1,200	16	1,530	1,290	969	26	1,870	1,580	428
7	196	775	1,120	17	4,870	1,260	914	27	1,620	1,280	298
8	193	785	1,060	18	6,370	908	866	28	1,540	1,220	304
9	190	812	1,040	19	9,050	890	735	29	1,460	1,600	392
10	182	860	1,060	20	8,750	955	620	30	1,240	3,230	384
								31	1,060	-	289
Monthly mean discharge, in second-feet									2,189	1,239	1,174
Runoff, in acre-feet									134,600	73,740	72,200
Runoff, in inches									0.08	0.05	0.04

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge
	May 13		May 14		May 15		May 16		May 17		May 18	
2									8.19	4,120		
4							4.62	610	8.13	4,030		
6									7.91	3,680		
8							4.67	635	7.82	3,550	9.25	6,140
10									8.12	4,010		
N	3.46	180	3.84	292	4.40	500	4.92	760	8.53	4,710		
2									8.88	5,400		
4							6.12	1,600	9.07	5,780	9.41	6,500
6									9.18	6,000		
8							7.61	3,250	9.24	6,120		
10									9.18	6,000		
12	3.50	190	4.17	408	4.57	585	8.16	4,080	9.20	6,040	9.58	6,910
	May 19		May 20		May 21		May 22		May 23		May 24	
2												
4	9.70	7,200										
6			10.96	10,800	8.06	3,920	8.36	4,410	10.53	9,440	7.94	3,720
8	9.83	7,510										
10												
N	10.16	8,410	10.76	10,100	7.93	3,710	9.40	6,480	11.04	11,100	7.60	3,240
2												
4	10.83	10,300										
6			9.23	6,100	8.08	3,950	9.86	7,580	10.76	10,100	7.20	2,700
8	11.14	11,400										
10												
12	11.15	11,500	8.40	4,480	7.88	3,630	10.15	8,380	8.96	5,560	6.98	2,440
	May 25		May 26		May 27		May 28		May 29		May 30	
2												
4												
6												
8												
10												
N	6.78	2,220	6.42	1,870	6.13	1,610	6.05	1,540	5.96	1,470	5.64	1,230
2												
4												
6												
8												
10												
12	6.58	2,020	6.25	1,720	6.06	1,550	6.02	1,520	5.85	1,380	5.49	1,120

* Supplemental record. — May 23, 1 p.m., 11.05 ft, 11,100 cfs.

Pawnee River near Larned, Kans.

Location.—Lat 38°11', long. 99°20', on line between secs. 29 and 32, T. 21 S., R. 18 W., at bridge on U. S. Highway 50 S., 1 mile west of Sanford and 13 miles west of Larned.
Drainage area.—2,576 square miles.
Gage-height record.—Water-stage recorder graph except for periods May 8-16, June 17, 18, 22, July 10, 11, 20-24, 27-31, for which a graph was drawn based on once-daily or more frequent wire-weight gage readings, and July 8, 9, when graph was estimated.
Discharge record.—Stage-discharge relation defined by current-meter measurements.
Maxima.—May-July 1951: Discharge, 9,510 cfs 6 p.m. June 23 (gage height, 27.54 ft).
1924 to April 1951: Discharge, 20,000 cfs (estimated) May 28, 1935 (gage height, 31.96 ft, site and datum then in use), includes about 11,000 cfs which overflowed above station into Saw Mill Creek and thence into Arkansas River above Larned.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	182	128	8,070	11	60	1,370	6,640	21	1,720	862	309
2	86	148	5,690	12	47	4,970	9,110	22	3,480	3,790	282
3	63	1,670	2,340	13	40	6,470	5,640	23	7,020	9,250	274
4	51	1,790	1,240	14	37	3,510	3,940	24	5,920	8,190	400
5	47	694	1,230	15	55	1,370	2,640	25	2,100	4,560	912
6	44	307	626	16	275	507	1,880	26	555	2,040	577
7	43	835	456	17	1,710	330	850	27	293	1,830	338
8	47	1,600	385	18	3,560	338	516	28	217	1,580	253
9	57	1,770	335	19	1,740	550	417	29	178	1,720	216
10	58	1,010	293	20	1,180	406	355	30	154	5,340	214
								31	141	-	279
Monthly mean discharge, in second-feet									1,005	2,298	1,829
Runoff, in acre-feet									61,800	136,700	112,500
Runoff, in inches									0.45	1.00	0.82

Arkansas River at Great Bend, Kans.

Location.—Lat 38°21', long. 98°46', in SE¼ sec. 33, T. 19 S., R. 13 W., at bridge on U. S. Highway 281, half a mile south of Great Bend, and 4½ miles upstream from Walnut Creek. Datum of gage is 1,839.82 ft above mean sea level (levels by Corps of Engineers).
Drainage area.—33,986 square miles.
Gage-height record.—Water-stage recorder graph except for periods July 8-10, 19-31, for which a graph was drawn based on once-daily wire-weight gage readings.
Discharge record.—Stage-discharge relation defined by current-meter measurements. Shifting-control method used May 24-26, July 13-17.
Maxima.—May-July 1951: Discharge, 13,900 cfs 1 a.m. May 25; maximum gage-height, 11.36 ft 6 p.m. May 24.
1941 to April 1951: Discharge, 20,200 cfs May 1, 1942 (gage height, 10.34 ft).
Remarks.—Levees began breaking at 6 p.m. May 24, 1951.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	1,510	1,420	8,100	11	322	2,480	2,410	21	9,200	1,840	1,100
2	788	1,350	10,400	12	358	3,090	7,260	22	9,730	3,570	1,100
3	482	1,330	10,200	13	482	5,770	10,800	23	9,550	6,900	1,180
4	420	2,450	8,840	14	410	7,140	12,400	24	12,200	8,720	1,290
5	386	2,810	3,820	15	382	7,160	10,800	25	12,300	10,300	1,420
6	362	1,880	2,850	16	488	3,740	8,020	26	8,280	9,970	1,700
7	358	2,070	2,000	17	2,250	2,120	4,630	27	3,700	7,180	1,400
8	342	2,850	1,650	18	5,500	1,760	2,340	28	2,380	4,610	1,090
9	334	3,310	1,480	19	6,910	1,670	1,500	29	1,910	4,490	954
10	334	3,130	1,370	20	9,160	1,690	1,190	30	1,650	5,860	892
								31	1,560	-	852
Monthly mean discharge, in second-feet									3,356	4,089	4,033
Runoff, in acre-feet									206,400	243,300	248,000
Runoff, in inches									0.11	0.13	0.14

Cow Creek near Lyons, Kans.

Location.— Lat 38°18', long. 98°11', in SW¼ sec. 15, T. 20 S., R. 8 W., 60 ft upstream from Missouri Pacific Railroad bridge, 400 ft downstream from Little Cow Creek, and 3 miles south of Lyons.
Drainage area.— 728 square miles (including 229 square miles in Cheyenne Bottoms).
Gage-height record.— Water-stage recorder graph except for June 24 for which an estimated graph was drawn based on shape of adjacent days, and July 5 for which a graph was drawn based on two staff-gage readings.
Discharge record.— Stage-discharge relation defined by current-meter measurements below 2,700 cfs and extended to peak stage by logarithmic plotting.
Maxima.— May-July 1951: Discharge, 4,890 cfs 7 a.m. July 13 (gage height, 19.05 ft).
1938 to April 1951: Discharge, 12,400 cfs Oct. 20, 1941 (gage height, 20.49 ft), from rating curve extended above 5,000 cfs.
Maximum stage known, 22.75 ft July 11, 1929, from records of Missouri Pacific Railroad.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	371	74	345	11	1,110	164	281	21	497	53	75
2	312	74	162	12	1,040	105	1,370	22	913	59	65
3	148	68	96	13	264	83	4,300	23	899	431	63
4	83	294	73	14	94	74	3,180	24	763	900	60
5	60	112	119	15	78	134	1,540	25	297	540	57
6	50	116	78	16	193	407	604	26	119	132	52
7	44	802	53	17	470	138	187	27	86	103	49
8	42	1,120	45	18	862	74	131	28	70	88	48
9	87	1,220	41	19	856	57	104	29	60	150	46
10	714	691	37	20	304	52	90	30	56	420	44
								31	59	-	42
Monthly mean discharge, in second-feet									355	291	433
Runoff, in acre-feet									21,820	17,330	26,650
Runoff, in inches									0.56	0.45	0.69

Little Arkansas River at Valley Center, Kans.

Location.—Lat 37°50', long. 97°23', in SW¼ sec. 36, T. 25 S., R. 1 W., at county highway bridge, half a mile west of Valley Center and 16 miles upstream from mouth. Datum of gage is 1,327.82 ft above mean sea level, datum of 1929.
Drainage area.—1,327 square miles.
Gage-height record.—Water-stage recorder graph May 1-17, May 19 to July 2. Graph based on one or more daily wire-weight gage readings May 17-19, July 2-31.
Discharge record.—Stage-discharge relation defined by current-meter measurements.
Maxima.—May-July 1951: Discharge, 22,400 cfs 8 p.m. May 17 (gage height, 20.50 ft, from recorded range line).
1922 to April 1951: Discharge, 32,000 cfs April 16, 1945 (gage height, 22.05 ft), on basis of slope-area determination.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	4,520	372	9,770	11	2,050	2,230	578	21	6,160	241	1,270
2	4,410	364	6,680	12	2,430	912	5,830	22	6,620	971	1,090
3	2,020	328	8,740	13	1,240	537	16,200	23	7,960	2,450	1,520
4	940	286	7,570	14	438	421	14,100	24	4,790	3,590	2,930
5	408	254	5,120	15	282	713	11,900	25	3,400	2,800	2,640
6	275	246	2,690	16	1,830	638	9,550	26	1,840	1,470	1,400
7	222	1,920	1,490	17	15,800	647	6,080	27	971	668	764
8	192	3,840	838	18	17,500	441	3,010	28	680	425	677
9	194	5,010	581	19	11,200	308	2,110	29	527	2,810	543
10	848	4,810	480	20	6,810	250	1,520	30	438	13,600	416
								31	379	-	356
Monthly mean discharge, in second-feet									3,464	1,785	4,143
Runoff, in acre-feet									213,000	106,200	254,800
Runoff, in inches									3.01	1.50	3.60

Arkansas River at Wichita, Kans.

Location.—Lat 37°41', long. 97°21', in SE¼ sec. 20, T. 27 S., R. 1 E., at Douglas Avenue Bridge in Wichita, and half a mile downstream from Little Arkansas River. Datum of gage is 1,280.98 ft above mean sea level (levels by U. S. Weather Bureau).
Drainage area.—40,182 square miles.
Gage-height record.—Water-stage recorder graph.
Discharge record.—Stage-discharge relation defined by current-meter measurements.
Maxima.—May-July 1951: Discharge, 27,600 cfs 1 a.m. July 1 (gage height, 13.38 ft).
1934 to April 1951: Discharge, 26,600 cfs April 24, 1944 (gage height, 11.70 ft).
1897-1933: Maximum stage observed by U. S. Weather Bureau, 17.3 ft July 10, 1904.
Maximum stage known, 18 ft May 13, 1877 (from published reports by U. S. Weather Bureau).

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	7,630	3,640	25,500	11	3,260	11,600	3,200	21	15,400	4,350	5,180
2	9,550	3,100	20,900	12	4,000	9,900	9,820	22	18,000	4,630	4,180
3	5,580	2,700	19,200	13	3,350	8,950	18,100	23	20,600	8,380	4,920
4	3,680	2,480	22,400	14	2,230	8,350	20,000	24	18,000	11,700	7,960
5	2,310	3,020	17,700	15	1,800	8,820	21,400	25	16,200	12,300	6,660
6	1,690	4,770	16,900	16	2,900	9,100	22,700	26	14,800	11,600	4,950
7	1,300	7,200	14,900	17	16,900	9,380	24,700	27	14,400	11,400	3,950
8	1,130	12,200	10,800	18	20,900	8,250	21,400	28	16,000	11,800	3,650
9	1,090	12,300	6,420	19	18,600	6,390	16,400	29	14,400	13,800	3,180
10	1,320	13,400	4,000	20	16,800	5,220	7,940	30	7,520	24,800	2,860
								31	4,310	-	2,520
Monthly mean discharge, in second-feet									9,215	8,851	12,080
Runoff, in acre-feet									566,600	526,700	742,600
Runoff, in inches									0.26	0.25	0.35

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 13		May 14		May 15		May 16		May 17		May 18	
2												
4							3.30	1,960			11.64	22,400
6					3.28	1,930			8.55	13,600		
8							3.34	2,020			11.32	21,400
10												
N	4.18	3,360	3.43	2,140	3.25	1,890	3.50	2,250	10.15	18,000	11.30	21,400
2												
4							3.60	2,400			11.03	20,600
6					2.97	1,510			11.10	20,800		
8							4.45	3,860			10.60	19,300
10												
12	3.77	2,670	3.31	1,970	3.18	1,790	6.35	7,990	11.77	22,700	10.00	17,600
	May 19		May 20		May 21		May 22		May 23		May 24	
2												
4	9.77	17,000			9.07	15,000			11.00	20,500		
6			9.97	17,500			10.48	19,000				
8	10.22	18,200			8.94	14,700			11.55	22,100		
10												
N	10.55	19,200	9.69	16,700	8.87	14,500	10.00	17,600	11.47	21,900	10.09	17,900
2												
4	10.65	19,500			8.95	14,700			11.15	20,900		
6			9.42	16,000			9.76	16,900				
8	10.57	19,300			9.55	16,400			10.80	19,900		
10												
12	10.36	18,600	9.15	15,200	10.30	18,500	10.20	18,200	10.50	19,000	9.80	17,000
	May 25		May 26		May 27		May 28		May 29		May 30	
2												
4												
6									9.30	15,600	6.85	9,220
8												
10												
N	9.48	16,200	9.00	14,800	8.75	14,200	9.60	16,500	9.02	14,900	5.84	6,780
2												
4												
6									8.43	13,300	5.33	5,650
8												
10												
12	9.29	15,600	8.67	13,900	9.10	15,100	9.36	15,800	7.90	11,900	5.00	4,950

North Fork Ninnescah River near Cheney, Kans.

Location.—Lat 37°40', long. 97°46', on line between secs. 28 and 33, T. 27 S., R. 4 W., at bridge on U. S. Highway 54, 2 miles north and 1 mile east of Cheney, 4 miles upstream from Spring Creek, and 22½ miles west of Wichita.
Drainage area.—947 square miles.
Gage-height record.—Water-stage recorder graph.
Discharge record.—Stage-discharge relation defined by current-meter measurements below 2,400 cfs and extended to peak stage on basis of logarithmic plotting.
Maxima.—May-July, 1951: Discharge, 9,460 cfs 10 a.m. May 23 (gage height, 13.23 ft).
August 1950 to April 1951: Continuous low flow.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	678	334	4,850	11	138	498	257	21	1,890	366	146
2	341	295	1,190	12	122	434	260	22	3,020	494	121
3	230	281	794	13	120	366	251	23	7,340	3,120	153
4	178	251	694	14	108	312	257	24	2,360	3,080	354
5	155	230	574	15	126	402	350	25	1,460	1,930	722
6	140	254	458	16	3,800	850	346	26	970	3,980	586
7	128	3,070	370	17	6,490	606	298	27	704	1,350	502
8	126	1,460	295	18	2,800	586	233	28	533	766	320
9	119	678	260	19	1,390	658	189	29	421	646	221
10	162	522	245	20	745	486	166	30	344	5,460	184
								31	350	-	176
Monthly mean discharge, in second-feet									1,209	1,126	510
Runoff, in acre-feet									74,360	66,970	31,380
Runoff, in inches									1.47	1.33	0.62

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge
	May 13		May 14		May 15		May 16		May 17		May 18	
2							6.80	950			10.38	4,420
4							7.66	1,510	11.82	6,640	9.92	3,790
6			4.66	110	4.62	103	8.48	2,200			9.46	3,220
8							9.38	3,130	12.51	8,020	9.03	2,750
10							10.05	3,960			8.71	2,430
N	4.72	122	4.66	110	4.62	103	10.75	4,980	12.12	7,240	8.48	2,200
2					4.60	99	11.13	5,540			8.43	2,160
4					4.63	104	11.17	5,600	11.59	6,240	8.37	2,100
6			4.63	104	4.68	113	11.00	5,350			8.56	2,280
8					4.79	138	10.69	4,880	11.26	5,740	8.62	2,340
10					4.88	160	10.56	4,690			8.55	2,270
12	4.67	112	4.62	103	5.75	465	10.80	5,050	10.78	5,020	8.48	2,200
	May 19		May 20		May 21		May 22		May 23		May 24	
2					6.42	754	9.84	3,680	11.18	5,620		
4					6.65	865	9.66	3,460	11.83	6,660	9.75	3,570
6	7.90	1,700			7.00	1,070	9.35	3,100	12.61	8,220		
8					7.25	1,220	8.92	2,640	13.02	9,040	8.64	2,360
10					7.48	1,390	8.48	2,200	13.23	9,460		
N	7.28	1,250	6.36	727	7.73	1,560	8.29	2,030	13.13	9,260	7.98	1,760
2					8.14	1,900	8.40	2,130	12.83	8,660		
4					8.64	2,360	8.67	2,390	12.38	7,760	7.75	1,580
6	6.96	1,050			9.06	2,780	9.13	2,850	11.93	6,860		
8					9.40	3,150	9.64	3,440	11.51	6,120	7.72	1,560
10					9.68	3,490	10.18	4,130	11.14	5,560		
12	6.70	890	6.16	637	9.80	3,630	10.68	4,870	10.72	4,930	7.88	1,680
	May 25		May 26		May 27		May 28		May 29		May 30	
2												
4	7.95	1,740										
6												
8	7.83	1,640										
10												
N	7.56	1,440	6.79	955	6.23	702	5.80	530	5.53	422	5.33	346
2												
4	7.38	1,320										
6												
8	7.25	1,220										
10												
12	7.15	1,160	6.50	810	5.98	602	5.65	470	5.40	370	5.25	316

Supplemental records.—May 18, 7 p.m., 8.67 ft, 2,390 cfs; May 21, 1 a.m., 6.15 ft, 632 cfs.

Ninnescah River near Peck, Kans.

Location. – Lat 37°28', long. 97°25', in NW¼ sec. 10, T. 30 S., R. 1 W., at county highway bridge, 3 miles southwest of Peck and 28 miles upstream from the mouth.
Drainage area. – 2,129 square miles.
Gage-height record. – Water-stage recorder graph.
Discharge record. – Stage-discharge relation defined by current-meter measurements below 18,000 cfs and extended to peak stage by logarithmic plotting.
Maxima. – May-July 1951: Discharge, 25,100 cfs 8 p.m. May 17 (gage height, 20.73 ft).
1938 to April 1951: Discharge, 24,600 cfs (revised) Apr. 23, 1944 (gage height, 20.58 ft).
Maximum stage known, 26.4 ft June 9, 1923, from floodmark.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	6,360	1,070	8,730	11	475	1,440	745	21	4,870	840	520
2	2,070	995	5,980	12	418	1,200	730	22	8,260	1,380	460
3	1,110	930	2,310	13	385	1,060	1,080	23	9,050	2,190	3,690
4	845	860	1,740	14	349	935	1,520	24	9,570	3,760	1,280
5	680	800	1,460	15	320	825	3,170	25	3,590	4,930	1,120
6	580	880	1,240	16	4,820	1,660	2,200	26	2,520	4,790	1,200
7	500	5,740	1,050	17	21,400	1,560	1,180	27	1,960	5,590	1,090
8	441	7,220	900	18	17,200	995	880	28	1,630	2,340	840
9	428	3,250	845	19	8,520	1,000	715	29	1,430	1,650	635
10	428	1,740	810	20	3,320	980	600	30	1,360	5,940	510
								31	1,140	–	450
Monthly mean discharge, in second-feet									3,743	2,485	1,603
Runoff, in acre-feet									230,100	147,900	98,540
Runoff, in inches									2.03	1.30	0.87

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 13		May 14		May 15		May 16		May 17		May 18	
2							3.09	310				
4							3.13	328	17.75	16,900		
6							3.19	356			19.55	21,600
8							4.00	750	19.45	21,200		
10							6.50	2,000				
N	3.27	392	3.19	356	3.12	324	9.85	4,520	20.05	23,000	17.85	17,100
2							12.05	6,960				
4							13.05	8,170	20.47	24,300		
6							13.55	8,880			15.85	12,900
8							13.98	9,570	20.73	25,100		
10							14.38	10,200				
12	3.20	360	3.12	324	3.09	310	15.00	11,200	20.64	24,800	14.18	9,890
	May 19		May 20		May 21		May 22		May 23		May 24	
2	13.96	9,540			7.32	2,520						
4	14.02	9,630			7.36	2,550						
6	14.14	9,820	8.85	3,630	8.15	3,100	12.29	7,250	13.17	8,340	15.30	11,800
8	14.22	9,950			9.35	4,060						
10	14.16	9,860			10.25	4,900						
N	13.89	9,420	8.20	3,140	10.72	5,390	13.30	8,520	13.40	8,660	14.55	10,500
2	13.52	8,830			11.12	5,840						
4	13.07	8,200			11.38	6,160						
6	12.43	7,420	7.71	2,800	11.54	6,350	14.03	9,650	13.86	9,380	12.88	7,960
8	11.75	6,600			11.64	6,470						
10	10.90	5,590			11.68	6,520						
12	10.20	4,850	7.36	2,550	11.71	6,550	13.44	8,720	14.82	10,900	10.46	5,110
	May 25		May 26		May 27		May 28		May 29		May 30	
2												
4												
6	8.95	3,710							5.41	1,460	5.37	1,440
8												
10												
N	8.55	3,390	7.26	2,480	6.38	1,940	5.74	1,620	5.32	1,410	5.25	1,380
2												
4												
6	8.32	3,220							5.26	1,380	5.09	1,300
8												
10												
12	7.92	2,940	6.76	2,160	6.05	1,780	5.51	1,500	5.35	1,420	4.95	1,220

Arkansas River at Arkansas City, Kans.

Location.—Lat 37°04', long. 97°03', in NW¼ sec. 25, T. 34 S., R. 3 E., at Chestnut Avenue highway bridge, half a mile west of Arkansas City and 5 miles upstream from Walnut River.

Drainage area.—43,475 square miles.

Gage-height record.—Water-stage recorder graph except for July 30, 31, for which days a graph was drawn based on once-daily wire-weight gage readings.

Discharge record.—Stage-discharge relation defined by current-meter measurements.

Maxima.—May-July 1951: Discharge, 66,000 cfs 8 a.m. May 19 (gage height, 23.50 ft).
1902-6, 1921 to April 1951: Gage height, 25.46 ft June 11, 1923, from floodmarks (discharge not determined).

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	18,100	6,600	37,400	11	2,970	15,100	7,250	21	25,500	7,900	9,080
2	22,500	5,740	43,000	12	3,840	13,300	6,770	22	27,800	11,200	6,880
3	12,800	5,120	35,500	13	4,280	10,900	18,500	23	30,800	8,360	7,230
4	6,530	4,600	25,400	14	3,940	10,000	25,900	24	29,200	23,200	13,700
5	4,390	4,300	24,500	15	3,000	9,530	28,400	25	27,300	27,000	10,900
6	3,240	5,280	20,300	16	3,570	10,000	27,700	26	20,900	24,100	8,400
7	2,700	15,200	18,100	17	18,800	11,000	26,000	27	16,800	17,800	7,060
8	2,450	20,600	15,700	18	38,500	11,000	25,700	28	16,100	16,900	5,960
9	2,300	22,900	11,900	19	60,400	9,270	23,800	29	17,200	14,800	5,400
10	3,120	17,700	10,000	20	38,600	7,710	17,400	30	15,000	21,800	4,800
								31	8,760	-	4,350
Monthly mean discharge, in second-feet									15,850	12,960	17,190
Runoff, in thousand acre-feet									974.7	771.4	1,057
Runoff, in inches									0.42	0.33	0.46

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 13		May 14		May 15		May 16		May 17		May 18	
2												
4							9.55	2,740	14.35	14,300	18.70	30,400
6												
8							9.56	2,760	15.59	18,100	19.35	33,900
10												
N	10.36	4,350	10.21	4,030	9.67	2,960	9.62	2,870	16.12	19,900	19.96	37,300
2												
4							9.85	3,300	16.41	20,900	20.56	41,000
6												
8							10.25	4,120	16.83	22,400	21.55	48,000
10												
12	10.38	4,390	9.85	3,300	9.57	2,780	12.20	8,500	17.85	26,300	22.40	55,000
	May 19		May 20		May 21		May 22		May 23		May 24	
2					18.92	31,600	17.65	25,500				
4	23.20	62,600	21.08	44,600	18.65	30,100	17.79	26,100	18.76	30,700	18.50	29,400
6					18.31	28,400	17.95	26,800				
8	23.50	66,000	20.38	39,800	18.00	27,000	17.97	26,900	18.90	31,400	18.30	28,400
10					17.60	25,300	17.93	26,700				
N	23.40	64,800	19.94	37,200	17.23	23,900	18.16	27,700	18.97	31,800	18.50	29,400
2					16.88	22,600	18.27	28,200				
4	23.04	60,900	19.61	35,400	16.67	21,800	18.30	28,400	18.87	31,300	18.57	29,700
6					16.58	21,500	18.54	29,600				
8	22.47	55,600	19.35	33,900	16.75	22,100	18.58	29,800	18.61	29,900	18.48	29,200
10					16.97	22,900	18.65	30,100				
12	21.76	49,600	19.05	32,300	17.37	24,400	18.68	30,200	18.58	29,800	18.29	28,300
	May 25		May 26		May 27		May 28		May 29		May 30	
2												
4	18.17	27,800										
6			16.88	22,600					15.28	17,200	15.15	16,700
8	18.12	27,500										
10												
N	18.09	27,400	16.19	20,100	15.18	16,800	14.87	15,900	15.31	17,300	14.80	15,700
2												
4	18.10	27,400										
6			15.81	18,900					15.31	17,300	14.15	13,700
8	17.94	26,700										
10												
12	17.73	25,800	15.53	18,000	14.84	15,800	15.15	16,700	15.23	17,000	13.25	11,200

Whitewater River at Augusta, Kans.

Location.—Lat 37°41'16", long. 96°59'40", in SE¼ sec. 21, T. 26 S., R. 4 E., on Butler County highway bridge, 3 miles above the confluence with Walnut River, and 1 mile northeast of Augusta.
Drainage area.—473 square miles.
Gage-height record.—Water-stage recorder graph except for period July 28-31, for which graph was drawn based on once-daily wire-weight gage readings.
Discharge record.—Stage-discharge relation defined by current-meter measurements. Shifting-control method used June 29 to July 2, July 7-11.
Maxima.—May-July 1951: Discharge, 11,800 cfs 12 p.m. May 1 (gage height, 25.58 ft).
Nov. 1950 to April 1951: Continuous low flow.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	9,340	134	7,820	11	328	325	2,020	21	1,380	672	179
2	10,700	121	2,810	12	204	194	6,900	22	3,310	1,330	159
3	1,630	108	2,260	13	166	152	8,230	23	3,250	5,710	3,660
4	347	103	9,040	14	141	136	7,140	24	1,510	7,550	2,620
5	252	102	4,900	15	127	546	796	25	368	1,960	488
6	222	106	577	16	1,060	567	418	26	294	405	246
7	196	1,090	412	17	4,420	175	313	27	246	231	188
8	177	1,250	314	18	3,890	120	255	28	202	201	152
9	308	733	322	19	1,280	105	220	29	179	3,940	123
10	1,060	541	231	20	682	104	196	30	159	8,440	113
								31	147	-	113
Monthly mean discharge, in second-feet									1,535	1,238	2,039
Runoff, in acre-feet									94,360	73,690	125,400
Runoff, in inches									3.72	2.92	4.97

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge
	June 20		June 21		June 22		June 23		June 24		June 25	
2							12.94	2,120				
4			4.72	120			12.86	2,100	22.94	8,840	15.41	3,040
6	4.60	100			8.24	940	12.50	2,000				
8			5.33	234			13.32	2,210	22.81	8,710	13.56	2,280
10							18.00	4,600				
N	4.62	103	7.80	830	9.18	1,180	20.40	6,420	22.45	8,350	11.65	1,790
2							21.85	7,750				
4			8.84	1,090			22.60	8,500	21.24	7,170	9.77	1,320
6	4.66	110			10.86	1,600	22.98	8,880				
8			9.06	1,140			23.20	9,120	19.37	5,600	8.21	932
10							23.25	9,180				
12	4.66	110	9.00	1,130	12.71	2,060	23.22	9,140	17.33	4,160	7.13	662
	June 26		June 27		June 28		June 29		June 30		July 1	
2							5.37	242				
4					5.09	186	6.07	407				
6	6.32	467	5.37	242			7.48	750	24.94	8,180		
8					5.03	175	11.10	1,660				
10							14.50	2,600				
N	5.90	366	5.29	226	5.03	175	18.00	4,600	25.56	8,630	25.21	7,900
2							19.53	5,720				
4					5.05	179	20.39	6,330				
6	5.70	318	5.26	220			21.00	6,720	25.78	8,860		
8					5.49	268	21.46	7,020				
10							21.85	7,300				
12	5.52	275	5.16	200	5.40	248	22.49	7,570	25.68	8,650	23.62	6,810
	July 2		July 3		July 4		July 5		July 6		July 7	
2	22.46	6,480										
4	20.83	6,120	6.87	599	21.95	7,850	23.25	9,180			6.19	428
6	18.70	5,090										
8	16.46	3,640	6.74	568	23.04	8,940	21.30	7,220			6.12	409
10	13.80	2,350										
N	11.52	1,760	9.55	1,270	23.51	9,460	17.43	4,220	6.57	527	6.18	424
2	9.75	1,320										
4	8.50	1,000	14.81	2,740	23.85	9,840	13.04	2,140			6.15	416
6	7.77	822										
8	7.42	735	18.35	4,840	24.02	10,000	9.67	1,300			6.06	392
10	7.23	688										
12	7.08	650	20.40	6,420	23.89	9,880	7.72	810	6.23	445	5.96	361

Whitewater River at Augusta, Kans.--Continued

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	July 8		July 9		July 10		July 11		July 12		July 13	
2												
4			5.76	296			5.24	174				
6	5.84	328							19.88	6,000	22.12	8,020
8			5.67	275			6.06	404				
10												
N	5.75	301	5.60	257	5.42	212	11.81	1,830	21.08	7,020	21.84	7,740
2												
4			6.10	376			15.56	3,110				
6	5.74	294							22.05	7,950	22.52	8,420
8			6.29	416			17.22	4,090				
10												
12	5.79	304	5.87	316	5.29	183	18.41	4,890	22.51	8,410	23.17	9,090
	July 14		July 15		July 16		July 17		July 18		July 19	
2												
4			8.96	1,140								
6	23.66	9,630										
8			7.48	750								
10												
N	22.84	8,740	6.98	625	6.11	416	5.67	311	5.42	252	5.26	220
2												
4			6.73	565								
6	18.16	4,710										
8			6.54	520								
10												
12	11.90	1,860	6.41	488	5.83	351	5.54	280	5.34	236	5.18	204
	July 20		July 21		July 22		July 23		July 24		July 25	
2							5.53	277				
4							8.95	1,120	17.28	4,130		
6							12.55	2,020			6.79	580
8							15.48	3,070	15.81	3,250		
10							17.29	4,130				
N	5.14	196	5.04	177	4.94	159	18.05	4,640	13.93	2,390	6.14	424
2							18.57	5,000				
4							18.97	5,280	11.70	1,800		
6							19.15	5,420			5.83	349
8							19.05	5,340	9.59	1,280		
10							18.76	5,130				
12	5.11	190	5.01	172	4.87	147	18.37	4,860	8.07	898	5.63	301

Supplemental records.- June 21, 10 p.m., 8.99 ft, 1,130 cfs; June 23, 7 a.m., 12.28 ft, 1,970 cfs; June 27, 3 p.m., 5.25 ft, 218 cfs; July 9, 2 p.m., 5.57 ft, 250 cfs, 6 p.m., 6.50 ft, 472 cfs; July 11, 7 a.m., 5.24 ft, 174 cfs; July 13, 11 a.m., 21.82 ft, 7,720 cfs; July 23, 1 a.m., 4.86 ft, 145 cfs.

Walnut River at Winfield, Kans.

Location.—Lat 37°14', long. 97°00', in NE¼ sec. 33, T. 32 S., R. 4 E., at bridge on U. S. Highway 77, 1 mile south of Winfield and 1 mile upstream from Black Crook Creek.
Drainage area.—1,840 square miles.
Gage-height record.—Water-stage recorder graph except for periods June 27-29, July 7-9, 17-22, 26-30, for which graph was drawn based on once-daily wire-weight gage readings.
Discharge record.—Stage-discharge relation defined by current-meter measurements.
Maxima.—May-July 1951: Discharge, 83,000 cfs 4 a.m. July 1 (gage height, 37.80 ft).
1921 to April 1951: Discharge, 105,000 cfs Apr. 23, 1944 (gage height, 38.1 ft in gage well, 38.30 ft from outside gage).

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	14,500	822	61,100	11	3,210	1,460	5,750	21	3,980	1,180	1,010
2	21,500	750	35,000	12	1,370	1,910	10,200	22	19,800	6,530	915
3	24,400	720	18,800	13	990	1,420	19,600	23	15,500	8,740	3,180
4	10,700	685	13,000	14	846	942	22,500	24	8,550	16,100	10,600
5	1,670	650	17,900	15	750	858	16,800	25	3,350	21,900	5,620
6	1,300	816	13,200	16	2,330	1,150	4,030	26	1,790	16,000	1,660
7	1,140	11,400	2,470	17	14,600	1,080	1,880	27	1,640	2,620	1,170
8	1,020	8,110	1,580	18	17,300	720	1,480	28	1,240	1,530	1,030
9	996	4,050	2,260	19	10,900	786	1,270	29	1,070	3,490	888
10	3,320	2,100	12,000	20	3,780	700	1,140	30	990	28,400	704
								31	918	-	638
Monthly mean discharge, in second-feet									6,305	4,921	9,335
Runoff, in acre-feet									387,700	292,800	574,000
Runoff, in inches									3.95	2.98	5.85

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	June 20		June 21		June 22		June 23		June 24		June 25	
2												
4			5.02	852	10.05	4,160						
6							15.20	8,500	20.68	14,000	26.97	21,200
8			5.11	906	11.80	5,540						
10												
N	4.70	650	5.09	894	13.50	6,950	15.26	8,560	23.05	16,600	27.70	22,100
2												
4			5.20	960	14.70	8,030						
6							15.37	8,670	25.10	18,900	28.20	22,800
8			6.30	1,620	15.30	8,600						
10												
12	4.55	545	8.60	3,150	15.34	8,640	16.55	9,850	26.27	20,300	28.26	22,800
	June 26		June 27		June 28		June 29		June 30		July 1	
2												
4							5.88	1,370	24.60	18,300	37.80	83,000
6	27.20	21,500	8.20	2,870								
8							5.92	1,390	28.55	23,200	37.48	73,400
10												
N	24.10	17,700	7.32	2,250	6.06	1,480	6.00	1,440	31.00	26,600	36.85	59,400
2												
4							7.75	2,560	32.63	30,200	36.12	51,800
6	17.50	10,800	6.94	2,000								
8							13.95	7,360	33.63	35,800	35.48	47,400
10												
12	11.00	4,900	6.60	1,800	5.88	1,370	19.00	12,300	36.90	60,200	34.90	43,400
	July 2		July 3		July 4		July 5		July 6		July 7	
2												
4			30.30	25,600					24.12	17,700		
6					18.30	11,600	23.73	17,300			8.00	2,730
8			28.85	23,600					23.12	16,600		
10												
N	33.43	34,600	26.35	20,400	20.45	13,800	24.55	18,300	21.28	14,600	7.15	2,140
2												
4			22.20	15,600					17.90	11,200		
6					21.45	14,800	24.88	18,700			6.66	1,840
8			16.75	10,000					13.90	7,310		
10												
12	31.40	27,200	14.26	7,630	22.55	16,000	24.70	18,400	10.65	4,620	6.42	1,690

Walnut River at Winfield, Kans.--Continued

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	July 8		July 9		July 10		July 11		July 12		July 13	
2												
4			6.03	1,460	18.85	12,200	15.87	9,170				
6									14.80	8,120	24.10	17,700
8			6.03	1,460	20.05	13,400	13.70	7,130				
10												
N	6.21	1,570	6.04	1,460	19.82	13,100	11.10	4,980	17.40	10,700	26.45	20,500
2												
4			6.06	1,480	19.00	12,300	8.98	3,420				
6									19.20	12,500	27.40	21,700
8			7.85	2,620	18.20	11,500	7.85	2,620				
10												
12	6.07	1,480	15.40	8,700	17.30	10,600	9.40	3,710	21.65	15,000	27.95	22,400
	July 14		July 15		July 16		July 17		July 18		July 19	
2												
4												
6	27.90	22,400	26.20	20,200	11.00	4,900						
8												
10												
N	28.04	22,600	24.10	17,700	8.60	3,150	6.67	1,840	6.05	1,470	5.70	1,260
2												
4												
6	28.13	22,700	20.70	14,000	7.73	2,540						
8												
10												
12	27.66	22,100	15.52	8,820	7.30	2,240	6.25	1,590	5.90	1,380	5.57	1,180
	July 20		July 21		July 22		July 23		July 24		July 25	
2												
4							5.06	876			15.60	8,900
6									16.87	10,200		
8							5.08	888			13.60	7,040
10												
N	5.51	1,150	5.29	1,010	5.12	912	6.30	1,620	17.85	11,200	11.44	5,250
2												
4							10.10	4,200			9.30	3,640
6									18.18	11,500		
8							13.30	6,770			7.85	2,620
10												
12	5.37	1,060	5.17	942	5.09	894	15.30	8,600	17.20	10,500	6.96	2,020

Salt Fork Arkansas River at Tonkawa, Okla.

Location.—Lat 36°40'30", long. 97°18'40", in NE¼SW¼ sec. 4, T. 25 N., R. 1 W., at bridge on U. S. Highway 177 in Tonkawa, 4 miles downstream from Thompson Creek, 7.8 miles upstream from Chikaskia River, and 33.8 miles upstream from mouth. Datum of gage is 930.22 ft above mean sea level (Corps of Engineers bench mark).
Drainage area.—4,528 square miles.
Gage-height record.—Water-stage recorder graph.
Discharge record.—Stage-discharge relation defined by current-meter measurements. Shifting-control method used May 1, 3-18, 22-31, June 25 to July 6, July 10-19, 22-25, 27-31.
Maxima.—May-July 1951: Discharge, 31,200 cfs 5:15 a.m. July 15 (gage height, 21.59 ft).
1903-5, 1936 to April 1951: Discharge, 40,800 cfs May 20, 1938 (gage height, 22.82 ft).
Maximum stage known, 26.8 ft June 10, 1923, from information by Corps of Engineers.
Remarks.—Some regulation by Great Salt Plains flood-control reservoir, 69.5 miles above station (capacity, 292,400 acre-feet).

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	3,700	3,700	21,200	11	552	2,600	6,100	21	9,970	1,540	3,500
2	1,190	3,300	21,700	12	1,140	2,800	5,360	22	14,500	2,860	2,900
3	675	3,000	15,600	13	835	3,200	12,800	23	14,700	5,840	2,600
4	560	2,500	17,800	14	466	7,860	22,100	24	9,350	9,330	2,130
5	448	2,220	17,800	15	264	3,470	28,600	25	7,440	11,300	1,820
6	381	1,950	12,100	16	216	3,250	14,100	26	6,360	13,000	1,820
7	345	1,680	9,200	17	1,320	3,500	9,200	27	5,720	9,800	1,640
8	280	1,540	8,150	18	7,580	2,310	6,100	28	5,600	8,450	1,590
9	272	2,260	7,440	19	13,000	1,910	4,880	29	5,600	7,580	1,590
10	458	3,000	6,880	20	10,800	1,590	4,000	30	4,660	13,800	1,460
								31	4,220	-	1,290
Monthly mean discharge, in second-feet									4,277	4,705	8,821
Runoff, in acre-feet									263,000	279,900	542,400
Runoff, in inches									1.09	1.16	2.25

Chikaskia River near Corbin, Kans.

Location.—Lat 37°08', long. 97°36', on line between secs. 35 and 36, T. 33 S., R. 3 W., at bridge on State Highway 49, 1 mile upstream from Prairie Creek, and 3 miles west of Corbin.
Drainage area.—794 square miles.
Gage-height record.—Water-stage recorder graph except for periods May 2-13, May 25 to June 4, June 17, 18, June 25 to July 9, July 16, for which a graph was drawn based on once-daily wire-weight gage readings.
Discharge record.—Stage-discharge relation defined by current-meter measurements. Shifting-control method used May 5-15, May 27 to June 21, July 7-13.
Maximum.—May-July 1951: Discharge, 35,100 cfs 2 p.m. May 17 (gage height, 22.50 ft).

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	3,710	394	2,420	11	210	940	352	21	2,130	2,380	424
2	1,050	359	1,340	12	172	1,020	287	22	5,940	10,200	363
3	484	356	925	13	153	646	6,160	23	3,450	2,910	334
4	362	316	641	14	139	689	9,970	24	1,620	11,100	363
5	302	283	517	15	132	632	11,800	25	1,010	2,990	337
6	269	1,480	436	16	3,800	1,630	2,810	26	760	1,110	489
7	236	8,320	371	17	25,600	655	1,190	27	630	790	424
8	212	5,380	312	18	8,920	424	790	28	550	655	294
9	254	1,580	358	19	4,150	356	608	29	661	737	256
10	358	925	828	20	1,720	356	500	30	565	2,040	242
								31	444	-	236
Monthly mean discharge, in second-feet									2,258	2,055	1,496
Runoff, in acre-feet									138,800	122,300	91,990
Runoff, in inches									3.28	2.89	2.17

Chikaskia River near Corbin, Kans.—Continued

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	May 13		May 14		May 15		May 16		May 17		May 18	
2							2.98	136	16.25	15,500		
4							3.00	140	17.62	19,000	14.37	11,400
6							3.01	142	18.95	22,800		
8							3.15	174	20.30	27,000	13.23	9,310
10							4.14	533	21.35	30,700		
N	3.06	154	2.99	138	2.95	130	7.07	2,460	22.05	33,300	12.34	7,880
2							8.88	3,800	22.50	35,100		
4							10.38	5,360	22.13	33,600	11.75	7,050
6							11.80	7,120	21.30	30,600		
8							12.91	8,760	19.80	25,400	11.42	6,600
10							13.90	10,500	18.10	20,300		
12	3.02	144	2.98	136	2.95	130	15.00	12,700	16.50	16,200	11.20	6,340
	May 19		May 20		May 21		May 22		May 23		May 24	
2					5.11	1,200						
4	11.10	6,220			5.03	1,160	12.66	8,360				
6					4.98	1,130			8.84	3,770	6.21	1,870
8	9.85	4,750			4.97	1,120	12.34	7,880				
10					4.94	1,110						
N	8.89	3,810	5.90	1,670	4.94	1,110	10.78	5,840	9.08	3,980	5.61	1,500
2					4.96	1,120						
4	8.11	3,190			5.01	1,150	9.36	4,260				
6					6.15	1,830			7.95	3,080	5.32	1,320
8	7.31	2,630			9.11	4,010	8.73	3,680				
10					11.06	6,170						
12	6.82	2,280	5.21	1,260	12.19	7,670	8.55	3,540	7.01	2,420	5.05	1,170
	May 25		May 26		May 27		May 28		May 29		May 30	
2												
4												
6									4.07	679	3.92	618
8												
10												
N	4.75	1,010	4.25	756	3.95	631	3.73	546	4.16	718	3.74	550
2												
4												
6									4.00	650	3.64	512
8												
10												
12	4.46	860	4.05	670	3.84	586	3.66	521	4.05	670	3.57	488

Arkansas River at Ralston, Okla.

Location.—Lat 36°30'10", long. 96°43'30", in NW¼ sec. 1, T. 23 N., R. 5 E., at bridge on State Highway 18 at Ralston, 2 miles downstream from Salt Creek, 2 miles upstream from Grayhorse Creek, and at mile 594.0. Datum of gage is 776.80 ft above mean sea level, datum of 1929.

Drainage area.—54,227 square miles.

Gage-height record.—Water-stage recorder graph.

Discharge record.—Stage-discharge relation defined by current-meter measurements. Shifting-control method used May 1-18, May 22 to June 28, July 27-31.

Maxima.—May-July 1951: Discharge, 135,000 cfs 3 p.m. July 3 (gage height, 21.45 ft in gage well, 22.2 ft from outside gage).

1938 to April 1951: Discharge, 179,000 cfs Apr. 25, 1944 (gage height, 22.82 ft in gage well, 23.65 ft from outside gage).

Maximum stage known, 23.8 ft June 12, 1923, referred to outside gage on basis of stages observed in 1923 and 1944 at site 1,200 ft downstream.

Remarks.—Records collected and computed by Corps of Engineers and reviewed by Geological Survey.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	25,000	18,800	64,800	11	8,260	31,400	25,500	21	88,900	22,000	29,200
2	40,200	15,200	97,700	12	11,300	26,100	25,000	22	53,400	30,800	19,700
3	52,500	13,000	129,000	13	8,550	23,500	28,200	23	70,400	33,100	16,400
4	40,800	11,600	110,000	14	7,130	21,600	64,800	24	93,300	43,000	14,100
5	30,800	10,700	84,900	15	6,460	24,000	94,400	25	72,200	67,500	22,000
6	14,700	10,400	68,400	16	5,680	20,600	112,000	26	50,800	81,900	25,000
7	9,140	11,600	58,500	17	4,830	17,600	102,000	27	37,400	88,900	17,200
8	7,410	25,000	36,200	18	19,200	18,400	59,400	28	29,800	48,200	14,100
9	6,720	49,200	28,200	19	61,200	17,200	38,800	29	26,600	30,800	13,000
10	7,410	54,200	23,500	20	93,300	15,600	33,700	30	26,100	41,600	11,300
								31	24,000	-	10,400
Monthly mean discharge, in second-feet									33,340	30,780	47,660
Runoff, in thousand acre-feet									2,050	1,832	2,930
Runoff, in inches									0.71	0.63	1.01

Cimarron River at Perkins, Okla.

Location. —Lat 35°58', long. 97°02', in SW¼SW¼ sec. 7, T. 17 N., R. 3 E., near right bank on downstream side of pier of bridge on State Highway 40, 1 mile south of Perkins, 1½ miles upstream from Dugout Creek, 4 miles downstream from Wildhorse Creek, and at mile 87.3. Datum of gage is 819.88 ft above mean sea level, datum of 1929 (levels by Corps of Engineers).
Drainage area. —17,825 square miles (revised).
Gage-height record. —Water-stage recorder graph.
Discharge record. —Stage-discharge relation defined by current-meter measurements. Shifting-control method used May 1-11, 13-17, 19-26, May 29 to June 6, June 14-21, July 1-31.
Maxima. —May-July 1951: Discharge, 50,200 cfs 9 p.m. May 20 (gage height, 13.90 ft).
1939 to April 1951: Discharge, 65,300 cfs May 19, 1949 (gage height, 15.22 ft).
Flood of Oct. 4, 5, 1926, reached a stage of 17.0 ft, from floodmarks, from information by Corps of Engineers.
Remarks. —Records collected and computed by Corps of Engineers and reviewed by Geological Survey.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	4,900	2,570	19,300	11	1,990	1,610	2,570	21	23,100	5,580	1,190
2	3,950	2,200	29,300	12	2,220	5,850	2,270	22	15,300	8,650	1,000
3	2,140	1,920	9,980	13	809	4,480	1,920	23	21,900	13,300	876
4	890	2,340	11,100	14	538	6,680	2,060	24	17,000	11,600	1,060
5	614	1,920	11,600	15	434	11,300	2,130	25	9,360	10,100	892
6	582	3,310	17,700	16	380	5,470	1,990	26	13,800	20,300	805
7	491	3,500	10,200	17	4,310	5,230	1,920	27	6,970	9,160	942
8	412	3,880	5,350	18	36,200	4,070	1,800	28	6,680	5,350	985
9	370	1,920	4,370	19	44,100	3,680	1,400	29	8,780	3,970	1,220
10	514	1,420	3,410	20	45,600	2,810	1,220	30	4,790	3,060	1,400
								31	3,140	-	1,060
Monthly mean discharge, in second-feet									9,105	5,574	4,936
Runoff, in acre-feet									559,900	331,700	303,500
Runoff, in inches									0.59	0.35	0.32

Arkansas River at Tulsa, Okla.

Location. —Lat 36°08'40", long. 96°00'10", in NW¼ sec. 11, T. 19 N., R. 12 E., at bridge on U. S. Highway 66 in Tulsa, 10.1 miles upstream from Polecat Creek, 17.1 miles downstream from Cimarron River, and at mile 523.7. Datum of gage is 618.23 ft above mean sea level, datum of 1929 (Corps of Engineers bench mark).
Drainage area. —74,350 square miles (revised).
Gage-height record. —Water-stage recorder graph except June 3, for which graph was drawn based on wire-weight gage reading.
Discharge record. —Stage-discharge relation defined by current-meter measurements. Shifting-control method used May 18-27, July 21-31.
Maxima. —May-July 1951: Discharge, 149,000 cfs 3 p.m. July 4 (gage height, 15.70 ft).
1938 to April 1951: Discharge, 173,000 cfs May 20, 1943; gage height, 17.00 ft Apr. 26, 1944.
Maximum stage known, 19.8 ft June 13, 1923, from reports of U. S. Weather Bureau.
Remarks. —Records collected and computed by Corps of Engineers and reviewed by Geological Survey.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	6,320	28,700	61,200	11	11,400	48,000	28,700	21	132,000	22,800	36,800
2	34,400	22,800	105,000	12	9,430	31,500	32,200	22	97,400	36,000	30,800
3	52,200	18,700	128,000	13	15,000	30,100	27,300	23	76,800	38,400	22,800
4	53,300	16,600	143,000	14	13,400	31,500	43,000	24	98,900	46,200	18,700
5	40,800	15,500	120,000	15	10,100	30,800	88,400	25	106,000	56,600	16,600
6	30,100	15,500	94,400	16	8,970	40,800	106,000	26	74,200	82,400	26,000
7	17,600	16,000	86,900	17	8,520	28,700	120,000	27	59,900	94,400	28,000
8	12,400	22,200	63,800	18	15,400	24,700	97,400	28	41,700	86,900	19,800
9	10,100	41,300	40,800	19	69,800	25,400	51,100	29	36,000	47,100	16,600
10	9,430	56,600	33,600	20	108,000	22,800	40,800	30	36,000	51,100	15,000
								31	32,900	-	13,400
Monthly mean discharge, in second-feet									42,850	37,670	56,650
Runoff, in thousand acre-feet									2,635	2,242	3,483
Runoff, in inches									0.66	0.57	0.88

Verdigris River near Coyville, Kans.

Location.—Lat 37°42'20", long. 95°54'20", in SW¼ sec. 8, T. 27 S., R. 14 E., on county highway bridge, 1¼ miles upstream from Meadow Creek, 1½ miles northwest of Coyville, and 2½ miles downstream from Pig Creek. Datum of gage is 845.28 ft above mean sea level (levels by Corps of Engineers).

Drainage area.—747 square miles.

Gage-height record.—Average of twice-daily wire-weight gage readings except for periods of changing or high stage for which graphs were drawn based on two or more daily wire-weight gage readings.

Discharge record.—Stage-discharge relation defined by current-meter measurements below 46,000 cfs and by slope-area determination of peak discharge. Shifting-control method used May 3-9.

Maxima.—May-July 1951: Discharge, 130,000 cfs 1 a.m. July 12 (gage height, 41.25 ft).
1939 to April 1951: Discharge observed, 67,000 cfs (revised) April 16, 1945, July 20, 1948. Gage height observed, 39.45 ft, April 16, 1945.

Remarks.—Records collected and computed by Corps of Engineers and reviewed by Geological Survey.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	6,960	206	22,800	11	1,720	856	35,300	21	2,510	1,260	276
2	11,200	178	5,610	12	564	3,890	59,400	22	3,240	4,460	226
3	2,940	169	4,340	13	405	508	32,500	23	4,860	7,280	476
4	674	160	7,800	14	322	278	12,700	24	1,240	11,600	1,870
5	482	151	1,790	15	267	2,250	2,960	25	620	7,530	513
6	417	179	867	16	510	5,140	905	26	1,560	1,650	253
7	369	2,490	1,000	17	3,130	917	644	27	1,040	725	277
8	322	1,770	684	18	1,560	369	496	28	417	550	183
9	504	1,210	2,020	19	3,200	278	405	29	311	14,100	153
10	3,130	482	15,300	20	2,460	728	337	30	267	41,300	133
								31	236	-	120
Monthly mean discharge, in second-feet									1,853	3,755	6,850
Runoff, in acre-feet									113,900	223,500	421,200
Runoff, in inches									2.86	5.61	10.57

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	July 8		July 9		July 10		July 11		July 12		July 13	
2	9.19	771	8.02	592	30.54	8,880	37.34	25,300	41.09	124,000	38.00	35,300
4	8.99	740	7.97	592	31.22	9,390	37.28	25,300	40.58	104,000	38.06	36,900
6	8.87	725	7.94	578	33.25	11,100	37.17	24,100	40.00	83,900	38.12	36,900
8	8.76	710	7.91	578	34.72	12,700	37.06	22,900	39.36	65,500	38.20	38,500
10	8.65	680	7.91	578	35.36	13,600	37.03	21,700	38.79	49,500	38.26	40,100
N	8.55	680	7.92	578	35.77	14,200	37.15	24,100	38.30	40,100	38.10	36,900
2	8.46	665	8.02	592	36.12	15,000	37.31	25,300	37.96	35,300	37.80	32,300
4	8.36	650	8.53	665	36.47	16,900	37.40	26,700	37.78	32,300	37.64	29,500
6	8.27	635	12.97	1,440	36.80	19,500	37.61	29,500	37.74	30,900	37.46	28,100
8	8.20	620	25.09	5,760	37.02	21,700	38.18	38,500	37.80	32,300	37.28	25,300
10	8.14	606	28.82	7,760	37.23	24,100	40.00	83,900	37.88	33,700	37.13	22,900
12	8.07	606	29.97	8,530	37.34	25,300	41.20	128,000	37.93	33,700	36.97	21,700
	July 14		July 15		July 16		July 17		July 18		July 19	
2	36.79	19,500	24.43	5,420	12.84	1,100	10.67	727	9.55	549	8.92	443
4	36.58	17,700	23.00	4,750	12.49	1,040	10.56	710	9.47	533	8.87	443
6	36.29	15,700	21.58	4,110	12.21	988	10.46	693	9.41	518	8.82	428
8	35.90	14,400	20.36	3,570	11.97	952	10.37	677	9.34	503	8.74	413
10	35.15	13,300	19.17	3,040	11.76	916	10.26	661	9.26	503	8.67	413
N	34.60	12,600	18.07	2,590	11.59	880	10.16	645	9.19	488	8.59	399
2	33.47	11,400	17.01	2,170	11.44	846	10.05	613	9.12	473	8.56	399
4	31.98	10,000	16.12	1,870	11.28	829	9.95	613	9.09	473	8.50	385
6	30.46	8,880	15.21	1,620	11.15	812	9.86	597	9.07	473	8.47	385
8	29.02	7,880	14.36	1,420	11.01	778	9.77	581	9.06	473	8.44	371
10	27.48	7,000	13.75	1,290	10.89	761	9.69	565	9.04	458	8.40	371
12	25.94	6,160	13.25	1,170	10.77	744	9.63	549	8.98	458	8.40	371
	July 20		July 21		July 22		July 23		July 24		July 25	
2	8.34	357	7.87	303	7.42	241	7.08	209	13.79	1,290	11.29	829
4	8.29	357	7.85	290	7.37	241	7.08	209	15.08	1,590	10.55	710
6	8.26	357	7.80	290	7.37	241	7.07	209	16.51	2,000	10.04	613
8	8.21	343	7.77	290	7.32	230	7.07	209	17.66	2,430	9.57	549
10	8.17	343	7.75	290	7.28	230	7.12	209	18.18	2,630	9.24	488
N	8.15	343	7.67	277	7.25	219	7.31	230	18.17	2,630	8.95	458
2	8.10	329	7.65	265	7.22	219	8.97	458	17.60	2,400	8.71	413
4	8.07	329	7.59	265	7.18	219	11.17	812	16.60	2,040	8.48	385
6	8.02	316	7.57	265	7.16	219	11.44	846	15.57	1,730	8.37	371
8	7.97	316	7.54	253	7.15	219	11.28	829	14.39	1,420	8.23	343
10	7.95	316	7.48	253	7.12	209	11.49	863	13.34	1,190	8.08	329
12	7.90	303	7.40	241	7.09	209	12.60	1,060	12.43	1,020	7.95	316

Verdigris River near Altoona, Kans.

Location.—Lat 37°29', long. 95°41', in SW¼ sec. 29, T. 29 S., R. 16 E., at county highway bridge 2½ miles southwest of Altoona, 2½ miles downstream from Big Cedar Creek, and 6 miles upstream from Chetopa Creek. Datum of gage is 780.18 ft above mean sea level (levels by Corps of Engineers).

Drainage area.—1,138 square miles.

Gage-height record.—Water-stage recorder graph except for periods June 15, 18-21, 28, July 9, 18-31, for which graphs were drawn based on twice-daily wire-weight gage readings, and May 13-16, June 10, 11, 14, July 7, 8, when there was no record.

Discharge record.—Stage-discharge relation defined by current-meter measurements. Shifting-control method used July 26-31. Discharge computed from backwater rating June 27, July 4-6, 16, 17, and by using rate of change in stage as a factor June 22, 24, 29, July 9, 10. Discharge for periods of no gage-height record estimated on basis of weather records and records for station at Coyville.

Maxima.—May-July 1951: Discharge, 71,000 cfs 7:30 p.m. July 12 (gage height, 31.09 ft).
1939 to April 1951: Discharge, 54,500 cfs April 17, 1945 (gage height, 29.50 ft).

Remarks.—Records collected and computed by Corps of Engineers and reviwed by Geological Survey.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	1,930	285	48,600	11	3,510	800	18,000	21	2,700	1,690	548
2	6,160	246	32,300	12	1,690	3,720	51,800	22	6,060	5,830	454
3	9,180	211	15,600	13	700	3,460	57,000	23	5,230	8,180	399
4	5,750	201	9,910	14	420	750	40,900	24	4,660	12,300	827
5	797	188	8,730	15	370	417	20,500	25	1,690	15,600	1,780
6	550	175	3,930	16	350	3,590	8,640	26	1,650	14,700	664
7	468	1,230	1,200	17	1,350	4,740	2,950	27	1,960	5,580	494
8	400	3,420	1,000	18	3,020	1,040	1,470	28	1,010	930	431
9	383	2,200	1,130	19	2,310	431	832	29	471	6,780	317
10	2,390	900	9,380	20	3,300	1,390	673	30	373	24,900	241
								31	320	-	208
Monthly mean discharge, in second-feet									2,295	4,196	11,000
Runoff, in acre-feet									141,100	249,700	676,200
Runoff, in inches									2.33	4.11	11.14

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	July 8		July 9		July 10		July 11		July 12		July 13	
2			4.81	664	11.93	3,490	24.11	11,600	27.25	31,400	30.68	66,600
4			4.80	664	12.44	4,210	24.20	11,800	27.41	33,200	30.50	64,400
6			4.78	664	16.60	6,660	24.30	12,000	27.59	35,000	30.33	62,200
8			4.78	664	20.60	8,570	24.43	12,300	27.89	37,700	30.13	60,000
10			4.77	645	22.45	9,730	24.69	13,200	28.53	43,600	29.83	56,700
N			4.77	645	23.78	11,300	25.03	14,300	29.30	51,600	29.65	54,600
2			4.78	664	24.48	12,700	25.47	16,800	30.25	61,100	29.51	53,600
4			4.87	683	24.56	12,900	26.09	21,500	30.80	67,700	29.42	52,600
6			5.17	797	24.34	12,000	26.54	25,100	31.03	69,900	29.33	51,600
8			7.60	1,730	24.19	11,800	26.82	27,800	31.08	71,000	29.26	51,600
10			11.17	3,610	24.10	11,600	26.94	28,700	31.01	69,900	29.20	50,600
12	4.81	664	11.90	3,520	24.09	11,600	27.10	30,500	30.87	68,800	29.11	49,600
	July 14		July 15		July 16		July 17		July 18		July 19	
2	29.02	48,600	26.86	28,700	24.68	12,800	14.80	3,930	9.05	2,280	5.50	930
4	28.90	47,600	26.66	26,900	24.52	11,900	12.93	3,460	8.44	2,040	5.42	892
6	28.74	45,600	26.47	25,100	24.36	11,100	11.34	3,000	7.63	1,730	5.37	873
8	28.59	44,600	26.25	22,400	24.16	10,500	10.13	2,640	7.17	1,580	5.30	854
10	28.44	42,600	26.06	21,500	23.84	9,500	10.58	2,780	6.87	1,460	5.27	835
N	28.30	41,600	25.85	18,900	23.42	8,300	10.69	2,830	6.57	1,350	5.22	816
2	28.13	39,600	25.66	18,100	22.92	7,400	10.50	2,750	6.30	1,230	5.18	816
4	27.91	37,700	25.47	16,800	22.20	6,560	10.16	2,650	6.10	1,160	5.15	797
6	27.72	35,900	25.32	15,600	21.36	5,970	10.16	2,650	5.90	1,080	5.12	778
8	27.52	34,100	25.15	15,200	20.30	5,580	10.21	2,670	5.77	1,040	5.09	778
10	27.30	32,300	24.98	14,300	18.79	5,070	9.95	2,580	5.68	1,010	5.06	759
12	27.08	30,500	24.82	13,500	16.84	4,470	9.54	2,440	5.59	968	5.02	740
	July 20		July 21		July 22		July 23		July 24		July 25	
2	4.98	740	4.62	588	4.33	494	4.13	414	4.17	428	7.69	1,770
4	4.96	721	4.59	588	4.31	475	4.12	410	4.24	453	8.13	1,920
6	4.93	721	4.57	569	4.29	471	4.11	406	4.35	494	8.50	2,080
8	4.87	683	4.54	569	4.28	468	4.09	400	4.57	569	8.60	2,120
10	4.82	664	4.51	550	4.27	464	4.08	396	4.82	664	8.50	2,080
N	4.79	664	4.49	550	4.25	456	4.07	393	5.04	759	8.35	2,040
2	4.78	664	4.47	531	4.22	445	4.06	390	5.32	854	8.02	1,880
4	4.76	645	4.46	531	4.20	438	4.05	386	5.52	930	7.60	1,730
6	4.73	645	4.43	531	4.18	431	4.04	383	5.99	1,120	7.20	1,580
8	4.71	626	4.40	512	4.17	428	4.07	393	6.37	1,270	6.80	1,420
10	4.68	626	4.38	512	4.16	424	4.09	400	6.73	1,390	6.48	1,310
12	4.65	607	4.36	494	4.15	420	4.12	410	7.17	1,580	6.15	1,200

Fall River near Eureka, Kans.

Location. —Lat 37°47', long. 96°14', on line between secs. 17 and 18, T. 26 S., R. 11 E., at bridge on State Highway 99, 3 miles southeast of Eureka, and 5 miles downstream from Spring Creek.
Drainage area. —336 square miles.
Gage-height record. —Water-stage recorder graph except July 2, for which graph was drawn based on wire-weight gage reading.
Discharge record. —Stage-discharge relation defined by current-meter measurements below 27,000 cfs and by slope-area determination of peak discharge. Shifting-control method used May 25 to June 7, June 9-20, July 25-31.
Maxima. —May-July 1951: Discharge, 115,000 cfs 3 p.m. June 29 (gage height, 29.60 ft).
1946 to April 1951: Discharge, 20,200 cfs July 31, 1950 (gage height, 19.92 ft).
Remarks. —Records collected and computed by Corps of Engineers and reviewed by Geological Survey.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	5,830	128	1,560	11	361	276	15,000	21	1,550	1,040	260
2	785	117	289	12	276	317	5,370	22	3,280	2,510	229
3	465	128	7,230	13	238	192	3,510	23	1,300	6,340	3,600
4	361	134	1,860	14	200	146	1,110	24	668	2,860	759
5	306	117	547	15	168	1,060	728	25	513	925	450
6	295	117	428	16	3,260	441	569	26	577	677	276
7	276	2,300	338	17	1,890	192	461	27	328	454	219
8	228	644	259	18	906	146	395	28	248	443	219
9	228	854	1,970	19	945	134	333	29	200	35,900	176
10	1,130	295	3,820	20	1,120	258	288	30	176	12,000	160
								31	146	-	153
Monthly mean discharge, in second-feet									911	2,372	1,696
Runoff, in acre-feet									56,040	141,100	104,300
Runoff, in inches									3.13	7.88	5.82

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	June 20		June 21		June 22		June 23		June 24		June 25	
2	2.64	140	2.70	200	3.02	551	3.27	876	4.20	1,740	3.57	1,260
4	2.70	192	2.72	219	2.96	477	3.20	785	3.90	1,560	3.37	1,010
6	2.74	228	2.85	350	2.93	441	3.14	707	3.79	1,480	3.32	941
8	2.85	350	3.50	1,180	7.95	3,950	3.15	720	4.45	1,830	3.28	889
10	2.83	328	4.35	1,830	8.66	4,480	8.50	4,320	6.35	2,850	3.27	876
N	2.79	286	4.95	2,100	8.25	4,100	13.95	8,810	9.15	4,850	3.26	863
2	2.79	286	4.50	1,880	9.18	4,850	16.20	11,100	10.67	6,040	3.25	850
4	2.80	295	3.90	1,560	8.75	4,550	18.10	14,500	9.45	5,000	3.24	837
6	2.80	295	3.44	1,100	6.35	2,850	18.70	16,000	6.85	3,100	3.23	824
8	2.78	276	3.29	902	4.37	1,830	16.60	11,800	5.15	2,200	3.22	811
10	2.75	248	3.18	759	3.57	1,260	9.50	5,080	4.35	1,830	3.21	798
12	2.72	219	3.10	655	3.33	954	5.10	2,150	3.87	1,520	3.19	772
	June 26		June 27		June 28		June 29		June 30		July 1	
2	3.17	746	3.02	551	2.87	372	3.10	655	10.84	6,120	4.91	2,060
4	3.18	759	2.98	501	2.86	361	3.32	941	10.34	5,720	4.59	1,920
6	3.17	746	2.96	477	2.85	350	10.20	5,480	14.44	9,170	4.39	1,830
8	3.14	707	2.95	465	2.84	339	15.50	10,000	17.64	13,400	4.22	1,740
10	3.12	681	2.94	453	2.83	328	19.78	19,800	20.59	24,000	4.06	1,690
N	3.11	668	2.93	441	2.83	328	23.09	43,200	21.44	29,800	4.06	1,690
2	3.10	655	2.93	441	2.84	339	28.50	99,500	20.14	21,100	3.90	1,560
4	3.09	642	2.92	429	2.87	372	28.70	102,000	17.49	13,200	3.75	1,440
6	3.08	629	2.91	417	2.97	489	25.89	68,800	12.29	7,360	3.60	1,290
8	3.07	616	2.90	405	3.15	720	23.54	46,600	7.59	3,650	3.45	1,110
10	3.06	603	2.89	394	3.19	772	20.99	26,800	6.04	2,620	3.30	915
12	3.04	577	2.88	383	3.15	720	17.14	12,400	5.36	2,300	3.14	707
	July 2		July 3		July 4		July 5		July 6		July 7	
2	3.01	538	2.67	176	6.70	3,040	3.10	655	2.94	453	2.89	394
4	2.92	429	2.67	176	6.00	2,620	3.07	616	2.93	441	2.87	372
6	2.84	339	2.66	168	5.25	2,200	3.04	577	2.92	429	2.85	350
8	2.78	276	2.65	160	4.65	1,920	3.02	551	2.92	429	2.84	339
10	2.74	238	5.40	2,300	4.32	1,780	3.01	538	2.91	417	2.83	328
N	2.72	219	12.40	7,450	4.05	1,630	3.01	538	2.91	417	2.83	328
2	2.71	210	16.45	11,300	3.85	1,520	3.01	538	2.91	417	2.83	328
4	2.70	200	18.50	15,500	3.66	1,340	2.98	501	2.91	417	2.83	328
6	2.70	200	19.40	18,200	3.49	1,160	2.97	489	2.92	429	2.82	317
8	2.69	192	19.10	17,200	3.35	980	2.97	489	2.92	429	2.82	317
10	2.68	184	16.20	11,100	3.23	824	2.96	477	2.91	417	2.81	306
12	2.67	176	10.50	5,880	3.15	720	2.95	465	2.90	405	2.80	295

Fall River near Eureka, Kans.--Continued

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	July 8		July 9		July 10		July 11		July 12		July 13	
2	2.80	295	2.75	248	6.90	3,160	3.23	824	7.40	3,510	9.35	5,000
4	2.78	276	2.74	238	3.68	1,390	3.18	759	5.25	2,200	8.53	4,320
6	2.77	266	2.73	228	3.32	941	3.16	733	4.65	1,920	8.51	4,320
8	2.76	257	2.72	219	7.30	3,440	3.45	1,110	4.44	1,830	8.17	4,100
10	2.76	257	2.71	210	10.60	5,960	11.85	6,940	4.78	2,010	8.66	4,480
N	2.75	248	2.71	210	12.45	7,450	16.85	11,900	5.38	2,300	7.90	3,880
2	2.75	248	2.71	210	13.48	8,380	19.45	18,200	7.95	3,950	6.37	2,850
4	2.75	248	3.35	980	10.80	6,120	22.50	38,300	11.80	6,940	5.33	2,250
6	2.75	248	6.95	3,230	5.55	2,400	23.40	45,700	14.15	8,990	4.89	2,060
8	2.75	248	11.10	6,360	3.80	1,480	21.95	34,300	16.00	10,800	4.66	1,960
10	2.75	248	12.68	7,700	3.39	1,030	18.80	16,500	16.50	11,500	4.35	1,830
12	2.75	248	12.20	7,280	3.28	889	13.55	8,470	13.65	8,470	4.07	1,690
	July 14		July 15		July 16		July 17		July 18		July 19	
2	3.86	1,520	3.22	811	3.09	642	2.97	489	2.93	441	2.86	361
4	3.70	1,390	3.19	772	3.07	616	2.96	477	2.92	429	2.86	361
6	3.57	1,260	3.18	759	3.06	603	2.95	465	2.91	417	2.85	350
8	3.49	1,160	3.17	746	3.04	577	2.94	453	2.90	405	2.84	339
10	3.43	1,080	3.16	733	3.03	564	2.94	453	2.89	394	2.83	328
N	3.39	1,030	3.15	720	3.02	551	2.94	453	2.88	383	2.83	328
2	3.36	993	3.14	707	3.02	551	2.94	453	2.87	372	2.82	317
4	3.32	941	3.13	694	3.02	551	2.94	453	2.87	372	2.82	317
6	3.30	915	3.12	681	3.01	538	2.94	453	2.87	372	2.82	317
8	3.27	876	3.12	681	3.00	525	2.94	453	2.87	372	2.82	317
10	3.25	850	3.12	681	3.00	525	2.94	453	2.87	372	2.82	317
12	3.24	837	3.10	655	2.99	513	2.93	441	2.87	372	2.82	317
	July 20		July 21		July 22		July 23		July 24		July 25	
2	2.82	317	2.78	276	2.75	248	2.73	228	3.34	967	3.04	577
4	2.81	306	2.78	276	2.74	238	2.76	257	3.30	915	3.02	551
6	2.80	295	2.77	266	2.74	238	3.50	1,180	3.24	837	3.00	525
8	2.80	295	2.77	266	2.74	238	10.00	5,480	3.21	798	2.98	489
10	2.80	295	2.77	266	2.74	238	14.20	8,990	3.17	746	2.97	477
N	2.79	286	2.76	257	2.73	228	15.60	10,400	3.16	733	2.95	453
2	2.79	286	2.76	257	2.73	228	13.00	7,960	3.14	707	2.93	417
4	2.77	266	2.75	248	2.73	228	7.45	3,510	3.12	681	2.92	405
6	2.76	257	2.75	248	2.72	219	4.55	1,920	3.10	655	2.89	361
8	2.78	276	2.75	248	2.71	210	3.80	1,480	3.08	629	2.88	350
10	2.78	276	2.75	248	2.71	210	3.54	1,220	3.07	616	2.87	328
12	2.78	276	2.75	248	2.71	210	3.40	1,040	3.06	603	2.87	328

Otter Creek at Climax, Kans.

Location.—Lat 37°43', long. 96°14', in SW¼ sec. 8, T. 27 S., R. 11 E., at bridge on State Highway 99, half a mile south of Climax, 5¼ miles upstream from mouth, and 5½ miles downstream from South Branch Otter Creek.

Drainage area.—129 square miles.

Gage-height record.—Water-stage recorder graph.

Discharge record.—Stage-discharge relation defined by current-meter measurements. Shifting-control method used May 10-16, May 25 to June 21, July 24-31. Discharge during periods of backwater from Fall River Reservoir, June 30, July 1, 2, 4-7, 10-20, computed on basis of one discharge measurement, weather records, and records for Fall River near Eureka and for Fall River Reservoir.

Maxima.—May-July 1951: Discharge, 15,400 cfs 8 a.m. June 30 (gage height, 23.73 ft).
1946 to April 1951: Discharge, 11,700 cfs April 4, 1947 (gage height, 22.60 ft).

Remarks.—Records collected and computed by Corps of Engineers, and reviewed by Geological Survey.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	3,360	48	280	11	133	107	3,800	21	864	758	92
2	260	43	102	12	100	462	1,640	22	1,260	1,700	76
3	163	42	3,500	13	84	99	3,990	23	392	4,910	784
4	128	38	1,480	14	70	74	237	24	196	2,210	148
5	108	33	348	15	58	121	132	25	154	442	88
6	108	38	290	16	401	118	118	26	134	299	65
7	96	945	250	17	310	58	113	27	101	210	58
8	81	149	194	18	203	47	109	28	86	162	50
9	521	96	2,010	19	540	43	104	29	75	6,150	42
10	516	73	1,260	20	739	70	99	30	69	6,150	38
								31	59	-	34
Monthly mean discharge, in second-feet									367	856	695
Runoff, in acre-feet									22,590	50,970	42,710
Runoff, in inches									3.28	7.41	6.21

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
			June 21		June 22		June 23		June 24		June 25	
2			3.14	60	8.69	1,870	4.52	289	6.17	734		
4			3.24	73	8.69	1,870	4.37	262	5.97	668		
6			3.80	156	10.00	2,580	4.26	239	6.50	857	5.28	481
8			6.48	857	9.33	2,190	5.60	564	10.00	2,580		
10			9.35	2,240	10.15	2,690	17.55	7,290	13.20	4,450		
N			9.63	2,350	10.51	2,860	21.31	10,000	15.14	5,630	4.90	379
2			7.42	1,230	10.25	2,690	22.65	11,700	14.05	4,940		
4			5.97	668	7.70	1,370	23.12	13,000	10.10	2,630		
6			5.22	454	6.17	734	21.04	9,770	8.05	1,510	5.04	416
8			4.70	333	5.49	535	12.29	3,910	6.88	1,010		
10			4.38	264	5.07	416	7.55	1,320	6.27	768		
12			6.23	768	4.72	333	6.67	914	5.89	653	4.77	344
	June 26		June 27		June 28		June 29		June 30		July 1	
2							3.73	144	12.70	4,140		
4							4.45	278	20.35	9,300		
6	4.66	322	4.18	224	3.88	170	9.55	2,350	23.03	12,700	6.30	365
8							16.10	6,280	23.73	15,400		
10							20.50	9,370	23.15	13,300		
N	4.54	300	4.10	209	3.83	161	22.50	11,500	19.75	8,840	6.22	210
2							22.82	12,100	12.50	4,020		
4							22.96	12,700	8.70	1,870		
6	4.43	278	4.01	192	3.78	153	22.05	10,700	7.81	1,420	6.17	141
8							16.05	6,220	7.06	1,080		
10							8.20	1,610	6.82	870		
12	4.31	249	3.94	180	3.74	146	6.90	1,010	6.59	700	6.13	112
	July 2		July 3		July 4		July 5		July 6		July 7	
2			6.15	100	12.50	4,020						
4			6.16	100	11.15	3,260						
6	6.13	101	6.03	100	9.45	2,240	7.04	370	5.66	300	4.73	260
8			6.42	100	8.85	1,620						
10			8.40	1,710	8.60	1,220						
N	6.16	100	14.15	5,070	8.36	940	6.70	340	5.38	290	4.62	250
2			18.65	7,990	8.17	760						
4			20.75	9,610	8.00	620						
6	6.16	100	19.80	8,840	7.85	530	6.35	325	5.12	280	4.46	240
8			13.40	4,570	7.69	480						
10			9.70	2,410	7.57	440						
12	6.15	100	10.45	2,800	7.47	420	5.98	310	4.80	270	4.30	229

Otter Creek at Climax, Kans.--Continued

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	July 8		July 9		July 10		July 11		July 12		July 13	
2			3.82	159	14.35	5,190	4.56	270	7.17	600	21.65	10,300
4			3.80	156	7.30	1,180	4.49	258	7.10	470	21.60	10,300
6	4.13	215	3.78	153	6.18	750	4.42	248	7.08	400	18.60	7,990
8			3.76	149	5.73	580	4.39	238	7.04	355	13.50	4,630
10			3.75	148	5.54	495	10.50	2,860	7.02	325	10.85	3,020
N	4.00	190	3.73	144	5.35	435	17.65	7,360	7.02	300	10.30	2,100
2			3.71	141	5.17	395	20.65	9,450	7.05	290	10.08	1,540
4			3.75	148	5.00	365	21.27	10,000	7.73	450	9.97	1,200
6	3.90	173	10.40	2,800	4.85	340	19.50	8,620	8.80	1,920	9.90	930
8			16.90	6,800	4.77	318	12.50	4,020	10.95	3,140	9.85	730
10			19.45	8,550	4.72	300	7.95	1,510	16.60	6,600	9.77	580
12	3.84	163	20.40	9,300	4.64	285	7.32	1,180	19.40	8,550	9.68	460
	July 14		July 15		July 16		July 17		July 18		July 19	
2												
4												
6	9.50	280	8.90	137	8.28	120	7.31	114	5.94	110	4.56	105
8												
10												
N	9.35	200	8.76	129	8.06	118	7.05	112	5.60	109	4.30	104
2												
4												
6	9.20	165	8.62	125	7.82	117	6.72	111	5.25	108	4.10	103
8												
10												
12	9.06	148	8.45	122	7.56	116	6.34	111	4.90	107	3.90	101
	July 20		July 21		July 22		July 23		July 24		July 25	
2							3.17	69				
4							3.32	86				
6	3.75	100	3.40	96	3.28	81	3.55	116	3.88	166	3.41	93
8							4.52	289				
10							10.58	2,910				
N	3.63	99	3.38	93	3.24	76	10.85	3,020	3.70	136	3.36	87
2							7.20	1,140				
4							5.70	593				
6	3.52	98	3.35	90	3.20	72	5.12	429	3.59	120	3.30	80
8							4.68	333				
10							4.42	268				
12	3.47	97	3.31	84	3.17	69	4.24	236	3.50	106	3.27	76

Fall River Reservoir near Fall River, Kans.

Location. —Lat 37°39', long. 96°04', in NE¼ sec. 3, T. 28 S., R. 12 E., in control tower of right end of dam on Fall River, about 4 miles northwest of town of Fall River, and 54.2 miles upstream from mouth of Fall River. Datum of gage is at mean sea level, datum of 1929.

Drainage area. —585 square miles.

Gage-height record. —Water-stage recorder graph.

Maxima. —May-July 1951: Contents, 260,200 acre-feet 4 p.m. July 13 (elevation, 987.18 ft).
1949 to April 1951: Contents, 53,080 acre-feet Aug. 1, 1950 (elevation, 956.37 ft).

Remarks. —Reservoir is formed by earth dam. Storage began April 20, 1941; conservation pool stage was first reached June 5, 1949. Capacity, 263,000 acre-feet at elevation 987.5 ft and 27,000 acre-feet at elevation 948.5 ft (conservation pool).

Elevation, in feet, and contents, in acre-feet, at 12 p.m. of indicated day

Day	May		June		July	
	Elevation	Contents	Elevation	Contents	Elevation	Contents
1	957.11	56,040	948.54	27,110	983.46	223,800
2	957.76	58,740	948.51	27,040	983.61	225,200
3	958.09	60,200	948.49	26,990	985.62	244,300
4	957.58	57,950	948.50	27,020	984.83	236,700
5	955.38	49,120	948.50	27,020	983.35	222,800
6	952.65	39,200	948.68	27,460	981.85	209,300
7	949.97	30,960	951.62	35,900	980.05	193,800
8	948.69	27,480	951.46	35,390	977.79	176,000
9	949.82	30,540	950.85	33,440	977.27	171,900
10	951.21	34,590	949.87	30,680	979.70	190,900
11	951.14	34,370	948.97	28,170	983.72	226,200
12	950.51	32,470	948.58	27,210	985.88	246,900
13	949.82	30,540	948.63	27,330	987.10	259,400
14	949.12	28,580	948.60	27,260	986.63	254,600
15	948.58	27,210	949.64	30,030	986.05	248,700
16	950.07	31,240	950.10	31,320	985.10	239,200
17	952.23	37,860	950.09	31,290	983.87	227,700
18	953.70	42,920	950.01	31,070	982.38	213,800
19	954.78	46,810	949.68	30,140	980.81	200,300
20	956.34	52,960	949.39	29,330	979.22	181,700
21	957.66	58,300	950.55	32,580	977.73	175,500
22	959.91	68,200	954.31	45,120	976.67	167,500
23	961.09	73,830	961.64	76,470	976.95	169,400
24	961.14	74,070	964.84	92,770	976.07	163,200
25	960.32	70,140	965.57	96,790	974.68	153,300
26	958.57	62,310	965.92	98,750	973.06	142,300
27	956.44	53,360	966.07	99,590	971.13	129,600
28	953.94	43,780	965.87	98,470	968.82	115,400
29	951.19	34,530	977.61	174,600	965.68	97,410
30	949.82	30,540	983.08	220,200	961.97	78,060
31	948.74	27,600	-	-	958.37	61,430

Fall River near Fall River, Kans.

Location. —Lat 37°37', long. 96°02', in SE¼ sec. 12, T. 28 S., R. 12 E., at bridge on State Highway 96, a quarter of a mile upstream from Salt Creek, and 1 mile northwest of Fall River. Datum of gage is 885.65 ft above mean sea level (levels by Corps of Engineers).

Drainage area. —591 square miles.

Gage-height record. —Water-stage recorder graph.

Discharge record. —Stage-discharge relation defined by current-meter measurements. Discharge for periods of backwater from Salt Creek, May 1, 19, June 23, 24, 29, 30, July 10-13, computed on basis of weather records and records of flow released from Fall River Reservoir.

Maxima. —May-July 1951: Discharge, 10,600 cfs 9:30 a.m. July 8 (gage height, 19.87 ft).
1939 to April 1951: Discharge, 45,600 cfs April 16, 1945 (gage height, 31.15 ft, site and datum then in use).

Remarks. —Flow regulated by Fall River Reservoir (see page 171). Records collected and computed by Corps of Engineers and reviewed by Geological Survey.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	150	614	23	11	807	1,870	429	21	1,130	1,110	6,640
2	12	285	343	12	1,540	1,570	362	22	993	1,230	4,710
3	7.6	221	4,270	13	1,540	305	3,630	23	31	700	4,130
4	1,490	182	7,690	14	1,490	360	4,630	24	812	50	4,380
5	4,850	182	8,510	15	1,100	378	4,500	25	2,640	20	5,240
6	5,420	182	8,160	16	435	406	5,470	26	4,480	12	6,120
7	4,850	228	8,440	17	578	369	6,900	27	4,980	239	6,520
8	2,240	981	10,500	18	578	369	8,050	28	5,030	1,210	7,620
9	287	1,920	7,940	19	600	704	7,800	29	5,290	1,500	8,910
10	191	1,920	529	20	614	1,110	7,500	30	2,370	200	9,890
								31	1,930	-	8,700
Monthly mean discharge, in second-feet									1,886	681	5,759
Runoff, in acre-feet									116,000	40,520	354,100
Runoff, in inches									3.68	1.29	11.24

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge
	July 8		July 9		July 10		July 11		July 12		July 13	
2	19.70	10,400	18.88	9,620	4.09	373	3.97	320	4.04	350	10.57	350
4	19.78	10,500	18.72	9,450	4.12	387	3.96	316	4.03	346	11.22	350
6	19.84	10,500	18.60	9,370	7.90	1,800	3.96	316	4.03	346	8.85	350
8	19.87	10,600	18.52	9,290	8.55	600	3.96	316	4.02	341	8.90	4,250
10	19.86	10,600	18.45	9,210	4.64	420	5.41	1,230	4.01	337	11.14	5,270
N	19.86	10,600	18.39	9,210	4.16	380	7.30	480	4.00	332	11.14	5,270
2	19.85	10,500	18.24	9,050	4.08	369	8.13	380	3.99	328	10.93	5,170
4	19.84	10,500	18.18	9,050	4.04	350	7.56	370	4.35	504	10.76	5,120
6	19.82	10,500	15.00	7,220	4.01	337	6.55	365	4.67	380	10.59	5,030
8	19.80	10,500	10.50	4,980	3.99	328	4.24	360	6.82	370	10.45	4,940
10	19.58	10,300	7.70	3,390	3.98	324	4.06	355	10.13	360	10.33	4,900
12	19.15	9,890	5.18	1,050	3.97	320	4.04	350	9.22	350	10.20	4,850
	July 14		July 15		July 16		July 17		July 18		July 19	
2	10.07	4,800	9.44	4,510	9.32	4,460	13.11	6,270	16.70	8,100	16.36	7,940
4	9.92	4,720	9.43	4,510	9.31	4,460	13.11	6,270	16.72	8,100	16.31	7,880
6	9.82	4,680	9.42	4,510	9.30	4,460	13.30	6,370	16.72	8,100	16.27	7,880
8	9.73	4,640	9.40	4,510	9.29	4,460	13.40	6,420	16.70	8,100	16.22	7,830
10	9.66	4,640	9.37	4,510	10.25	4,850	13.72	6,570	16.68	8,100	16.17	7,830
N	9.61	4,600	9.36	4,510	12.22	5,820	13.64	6,520	16.63	8,050	16.11	7,780
2	9.57	4,600	9.35	4,510	12.77	6,120	13.47	6,470	16.60	8,050	16.06	7,780
4	9.52	4,560	9.37	4,510	13.00	6,220	14.95	7,220	16.56	8,050	16.00	7,720
6	9.48	4,560	9.36	4,510	13.13	6,270	15.94	7,670	16.50	8,000	15.98	7,720
8	9.46	4,560	9.35	4,510	13.12	6,270	16.33	7,880	16.48	8,000	15.96	7,720
10	9.45	4,510	9.34	4,460	13.02	6,220	16.54	8,000	16.43	7,940	15.90	7,670
12	9.44	4,510	9.33	4,460	13.06	6,270	16.65	8,050	16.41	7,940	15.87	7,670
	July 20		July 21		July 22		July 23		July 24		July 25	
2	15.81	7,620	15.15	7,320	11.40	5,420	8.46	4,000	9.28	4,460	8.98	4,310
4	15.78	7,620	15.09	7,270	11.33	5,370	8.62	4,070	9.26	4,460	8.95	4,310
6	15.72	7,570	15.05	7,220	11.28	5,370	8.59	4,070	9.24	4,410	8.93	4,250
8	15.68	7,570	14.97	7,220	11.22	5,320	8.57	4,070	9.21	4,410	8.90	4,250
10	15.62	7,520	14.89	7,170	11.10	5,270	8.54	4,000	9.17	4,410	10.65	5,030
N	15.57	7,520	14.82	7,120	9.42	4,510	8.51	4,000	9.14	4,360	11.96	5,720
2	15.50	7,470	13.58	6,520	8.91	4,250	8.50	4,000	9.12	4,360	12.34	5,870
4	15.45	7,420	13.21	6,320	8.71	4,130	8.51	4,000	9.09	4,360	12.50	5,970
6	15.39	7,420	12.36	5,920	8.62	4,070	8.88	4,250	9.07	4,360	12.57	6,020
8	15.32	7,370	11.92	5,670	8.56	4,070	9.19	4,410	9.04	4,310	12.59	6,020
10	15.26	7,370	11.68	5,570	8.50	4,000	9.27	4,460	9.02	4,310	12.58	6,020
12	15.20	7,320	11.52	5,470	8.47	4,000	9.28	4,460	9.00	4,310	12.57	6,020

Fall River at Fredonia, Kans.

Location.—Lat 37°30'30", long. 95°50'00", in NW¼ sec. 24, T. 29 S., R. 14 E., at bridge on State Highway 96; three-quarters of a mile upstream from Clear Creek, 1 mile downstream from Salt Creek, and 1 mile south of Fredonia. Datum of gage is 819.09 ft above mean sea level (levels by Corps of Engineers).

Drainage area.—827 square miles.

Gage-height record.—Water-stage recorder graph.

Discharge record.—Stage-discharge relation defined by current-meter measurements. Shifting-control method used June 1-9, 13-22, 25-29.

Maxima.—May-July 1951: Discharge, 20,200 cfs 11 a.m. June 30 (gage height, 27.97 ft).
1938 to April 1951: Discharge observed, 49,000 cfs April 16, 1945 (gage height, 36.17 ft).

Remarks.—Flow regulated by Fall River Reservoir (see page 171). Records collected and computed by Corps of Engineers and reviewed by Geological Survey.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	3,520	1,140	6,650	11	393	1,840	4,090	21	1,260	1,210	7,140
2	1,820	341	442	12	1,380	3,830	3,280	22	5,560	2,910	5,800
3	224	302	2,550	13	1,380	909	6,480	23	1,010	2,260	4,080
4	163	235	7,470	14	1,380	428	5,350	24	341	6,120	4,030
5	3,060	222	8,000	15	1,340	475	4,370	25	1,770	1,850	4,140
6	4,940	212	8,390	16	609	578	4,270	26	3,680	341	5,380
7	5,160	906	8,160	17	901	424	6,690	27	4,730	197	5,820
8	3,850	709	8,660	18	613	387	7,220	28	4,730	645	6,630
9	850	2,270	10,500	19	1,400	403	7,750	29	5,380	8,270	7,470
10	1,720	1,890	12,600	20	861	1,120	7,510	30	3,460	18,900	8,870
								31	2,210	-	9,700
Monthly mean discharge, in second-feet									2,248	2,045	6,435
Runoff, in acre-feet									138,200	121,700	395,700
Runoff, in inches									3.13	2.76	8.97

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge
	July 8		July 9		July 10		July 11		July 12		July 13	
2	17.25	7,930	19.45	9,700	23.15	13,400	13.85	5,380	14.41	5,820	11.11	3,480
4	17.32	8,000	19.60	9,870	22.92	13,100	11.65	3,820	13.87	5,450	12.85	4,660
6	17.45	8,080	19.70	9,960	23.09	13,300	9.95	2,750	12.90	4,730	15.05	6,260
8	17.62	8,240	19.77	10,000	23.50	13,800	8.65	1,940	11.80	3,960	16.20	7,160
10	17.84	8,390	19.82	10,000	23.85	14,100	7.90	1,600	10.57	3,140	16.71	7,540
N	18.06	8,630	19.83	10,000	23.85	14,100	9.25	2,260	9.50	2,440	16.89	7,690
2	18.31	8,790	19.80	10,000	23.64	13,900	11.33	3,620	8.48	1,890	16.86	7,690
4	18.55	9,030	19.78	10,000	23.03	13,200	12.47	4,450	7.74	1,510	16.68	7,540
6	18.76	9,190	20.80	11,000	22.10	12,300	13.47	5,160	7.72	1,510	16.40	7,310
8	18.96	9,360	21.85	12,000	20.72	10,900	14.10	5,590	8.95	2,150	16.07	7,090
10	19.16	9,530	22.35	12,600	18.80	9,190	14.42	5,820	9.51	2,440	15.70	6,780
12	19.32	9,620	23.13	13,300	16.45	7,310	14.56	5,960	9.88	2,690	15.33	6,480
	July 14		July 15		July 16		July 17		July 18		July 19	
2	14.98	6,260	12.64	4,520	12.18	4,240	13.32	5,020	15.63	6,710	16.97	7,770
4	14.66	6,040	12.57	4,520	12.17	4,240	14.20	5,670	15.70	6,780	17.00	7,770
6	14.35	5,820	12.51	4,450	12.16	4,240	15.72	6,780	15.82	6,860	17.02	7,770
8	14.08	5,590	12.45	4,380	12.15	4,240	16.41	7,310	16.00	7,010	17.02	7,770
10	13.84	5,380	12.41	4,380	12.14	4,170	16.62	7,470	16.15	7,160	17.01	7,770
N	13.61	5,230	12.37	4,380	12.13	4,170	16.48	7,390	16.30	7,240	17.00	7,770
2	13.40	5,090	12.34	4,310	12.11	4,170	16.28	7,240	16.44	7,310	16.99	7,770
4	13.23	4,940	12.31	4,310	12.11	4,170	16.10	7,090	16.57	7,470	16.97	7,770
6	13.07	4,870	12.28	4,310	12.17	4,240	15.94	6,930	16.69	7,540	16.95	7,770
8	12.93	4,730	12.25	4,240	12.36	4,380	15.81	6,860	16.79	7,620	16.92	7,690
10	12.82	4,660	12.23	4,240	12.62	4,520	15.70	6,780	16.87	7,690	16.89	7,690
12	12.72	4,590	12.20	4,240	12.92	4,730	15.63	6,710	16.92	7,690	16.86	7,690
	July 20		July 21		July 22		July 23		July 24		July 25	
2	16.83	7,620	16.40	7,310	15.60	6,710	12.62	4,520	11.71	3,890	12.00	4,100
4	16.80	7,620	16.36	7,310	15.35	6,560	12.37	4,380	11.74	3,890	11.98	4,100
6	16.77	7,620	16.32	7,240	15.07	6,330	12.16	4,240	11.81	3,960	11.97	4,100
8	16.73	7,540	16.28	7,240	14.82	6,110	11.98	4,100	11.88	4,030	11.95	4,100
10	16.70	7,540	16.23	7,160	14.55	5,960	11.85	3,960	11.93	4,030	11.94	4,030
N	16.66	7,540	16.19	7,160	14.31	5,740	11.78	3,960	11.97	4,100	11.92	4,030
2	16.63	7,470	16.15	7,160	14.08	5,590	11.73	3,890	12.00	4,100	11.91	4,030
4	16.59	7,470	16.10	7,090	13.89	5,450	11.72	3,890	12.01	4,100	11.90	4,030
6	16.57	7,470	16.05	7,010	13.70	5,300	11.72	3,890	12.02	4,100	11.98	4,100
8	16.53	7,390	16.00	7,010	13.47	5,160	11.72	3,890	12.02	4,100	12.18	4,240
10	16.49	7,390	15.93	6,930	13.20	4,940	11.71	3,890	12.02	4,100	12.47	4,450
12	16.45	7,310	15.76	6,860	12.91	4,730	11.70	3,890	12.01	4,100	12.77	4,660

Fall River at Fredonia, Kans.--Continued

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	July 8		July 9		July 10		July 11		July 12		July 13	
2	2.30	349	2.15	298	9.00	4,080	10.12	4,910	4.93	1,480	5.97	2,090
4	2.23	332	2.14	298	12.30	6,760	8.27	3,580	5.21	1,640	6.85	2,580
6	2.23	332	2.13	298	12.40	6,850	6.86	2,640	6.95	2,710	11.95	6,490
8	2.22	315	2.12	281	11.24	5,800	6.13	2,150	8.10	3,440	12.83	7,220
10	2.22	315	2.12	281	12.53	6,940	5.73	1,920	8.50	3,720	13.60	7,980
N	2.22	315	2.12	281	13.72	8,080	5.43	1,750	8.40	3,660	14.08	8,460
2	2.21	315	2.12	281	14.35	8,740	5.18	1,640	7.90	3,300	14.09	8,460
4	2.20	315	2.12	281	14.90	9,220	4.95	1,540	7.26	2,900	14.13	8,460
6	2.19	315	2.12	281	14.80	9,120	4.88	1,480	6.27	2,270	14.65	8,930
8	2.18	315	2.12	281	14.30	8,640	4.80	1,440	6.02	2,090	15.15	9,500
10	2.17	298	2.54	444	13.45	7,790	4.79	1,440	5.90	2,030	15.92	10,200
12	2.16	298	6.00	2,090	11.93	6,400	4.79	1,440	5.81	2,030	16.13	10,400
	July 14		July 15		July 16		July 17		July 18		July 19	
2	16.13	10,400	5.24	1,640	2.92	577	4.37	1,240	5.30	1,700	2.89	577
4	16.00	10,300	4.89	1,480	2.92	577	4.22	1,140	4.90	1,480	2.85	539
6	15.75	10,100	4.64	1,340	2.93	577	4.37	1,240	4.52	1,280	2.82	539
8	15.43	9,690	4.50	1,280	3.13	661	7.20	2,840	4.15	1,140	2.80	539
10	15.04	9,310	4.18	1,140	3.34	745	8.69	3,860	3.74	913	2.70	501
N	14.33	8,640	3.92	1,000	3.58	871	9.47	4,460	3.24	703	2.60	463
2	13.24	7,600	3.70	913	3.83	959	8.82	3,940	3.14	661	2.50	425
4	10.90	5,550	3.50	829	4.06	1,100	8.02	3,380	3.09	661	2.40	387
6	9.20	4,230	3.31	745	4.38	1,240	7.30	2,900	3.05	619	2.30	349
8	7.38	2,970	3.17	703	4.75	1,440	6.60	2,450	3.01	619	2.26	332
10	6.50	2,390	3.07	661	4.99	1,540	6.06	2,150	2.97	619	2.22	315
12	5.83	1,970	3.00	619	4.97	1,540	5.67	1,920	2.93	577	2.18	315
	July 20		July 21		July 22		July 23		July 24		July 25	
2	2.15	298	2.00	247	1.80	183			1.70	153	1.68	148
4	2.10	281	1.98	247	1.80	183			1.69	150	1.64	137
6	2.05	264	1.96	230	1.80	183			1.69	150	1.62	131
8	2.00	247	1.94	230	1.80	183			1.69	150	1.60	126
10	2.01	247	1.92	213	1.78	177			1.71	156	1.60	126
N	2.02	247	1.90	213	1.76	171	1.70	153	1.73	162	1.60	126
2	2.03	264	1.87	204	1.74	165			1.75	168	1.60	126
4	2.04	264	1.84	195	1.72	159			1.77	174	1.60	126
6	2.05	264	1.80	183	1.70	153			1.80	183	1.60	126
8	2.04	264	1.80	183	1.70	153			1.80	183	1.60	126
10	2.02	247	1.80	183	1.70	153			1.76	171	1.60	126
12	2.01	247	1.80	183	1.70	153	1.70	153	1.72	159	1.60	126

Elk River near Elk City, Kans.

Location.—Lat 37°16', long. 95°55', in NE¼ sec. 18, T. 32 S., R. 14 E., 150 ft downstream from Salt Creek, and 1-3/4 miles south of Elk City. Datum of gage is 795.80 ft above mean sea level, datum of 1929 (levels by Corps of Engineers).
Drainage area.—575 square miles.
Gage-height record.—Average of twice-daily wire-weight gage readings except for periods of high stage for which graphs were drawn based on two or more daily wire-weight gage readings.
Discharge record.—Stage-discharge relation defined by current-meter measurements below 32,000 cfs and by slope-area determination of peak discharge. Shifting-control method used May 4-18, May 25 to June 7, July 26-31.
Maxima.—May-July 1951: Discharge, 81,500 cfs 3 to 4 p.m. June 30 (gage height, 30.65 ft).
1939 to April 1951: Discharge observed, 39,200 cfs April 16, 1945 (gage height, 28.27 ft).
Remarks.—Records collected and computed by Corps of Engineers and reviewed by Geological Survey.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	5,520	134	26,900	11	539	247	2,370	21	368	80	212
2	7,650	107	2,910	12	298	619	2,580	22	8,010	1,410	169
3	745	100	1,950	13	213	406	7,220	23	5,280	926	153
4	463	92	6,760	14	183	213	7,280	24	959	6,970	163
5	315	83	1,630	15	153	165	1,080	25	482	4,940	131
6	281	77	577	16	142	189	947	26	406	695	124
7	281	368	475	17	539	148	2,610	27	247	417	114
8	247	1,050	321	18	298	114	970	28	230	255	114
9	186	2,290	375	19	1,580	87	451	29	213	8,800	109
10	1,050	482	7,190	20	1,010	73	264	30	264	50,100	81
								31	186	-	76
Monthly mean discharge, in second-feet									1,237	2,721	2,461
Runoff, in acre-feet									76,040	161,900	151,400
Runoff, in inches									2.48	5.28	4.94

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge
	June 20		June 21		June 22		June 23		June 24		June 25	
2	1.38	77	1.36	74	1.80	183	5.72	1,920	2.52	425	13.25	7,600
4	1.38	77	1.37	76	2.04	264	5.19	1,640	8.00	3,380	13.14	7,500
6	1.38	77	1.38	77	2.42	387	4.78	1,440	10.80	5,470	13.04	7,410
8	1.38	77	1.39	79	2.90	577	4.38	1,240	13.20	7,600	12.88	7,320
10	1.37	76	1.39	79	3.60	871	3.90	1,000	14.50	8,840	12.25	6,670
N	1.36	74	1.38	77	4.55	1,340	3.39	787	15.20	9,500	11.19	5,800
2	1.35	72	1.37	76	5.54	1,800	2.87	577	15.49	9,780	9.93	4,760
4	1.34	70	1.36	74	6.42	2,330	2.50	425	15.12	9,400	7.39	2,970
6	1.33	68	1.36	74	6.87	2,640	2.19	315	14.52	8,840	5.61	1,860
8	1.33	68	1.40	81	7.00	2,710	2.00	247	14.00	8,360	5.00	1,540
10	1.34	70	1.44	89	6.86	2,640	1.97	230	13.55	7,980	4.62	1,340
12	1.35	72	1.60	126	6.39	2,330	2.00	247	13.37	7,790	4.31	1,190
	June 26		June 27		June 28		June 29		June 30		July 1	
2	3.93	1,000	2.60	463	2.12	281	2.10	281	25.49	21,400	27.70	42,400
4	3.71	913	2.61	463	2.10	281	2.25	332	26.03	24,100	27.29	38,800
6	3.50	829	2.62	463	2.08	281	2.72	501	26.58	28,200	26.99	36,400
8	3.40	787	2.62	463	2.06	264	3.62	871	27.09	31,800	26.60	33,500
10	3.22	703	2.60	463	2.03	264	6.70	2,520	27.90	38,600	26.00	29,000
N	3.10	661	2.53	444	2.02	247	12.15	6,670	29.42	58,000	25.42	24,600
2	2.97	619	2.50	425	2.00	247	20.10	14,200	30.58	80,000	24.85	20,400
4	2.83	539	2.44	406	1.95	230	22.32	16,400	30.65	81,500	24.15	18,300
6	2.73	501	2.36	368	1.95	230	23.10	17,200	30.30	76,000	23.50	17,600
8	2.70	501	2.30	349	1.95	230	23.95	18,100	29.92	68,800	22.30	16,400
10	2.62	463	2.22	315	1.96	230	24.46	18,700	29.33	60,000	20.83	14,900
12	2.60	463	2.16	298	2.02	247	24.93	19,500	28.23	47,200	19.00	13,100
	July 2		July 3		July 4		July 5		July 6		July 7	
2	15.00	9,310	3.82	959	10.68	5,390	8.10	3,440	3.23	703	2.72	501
4	10.60	5,310	3.74	913	11.24	5,800	6.80	2,580	3.18	703	2.73	501
6	7.00	2,710	3.69	913	11.90	6,400	5.90	2,030	3.12	661	2.73	501
8	5.40	1,750	3.62	871	12.57	7,030	5.27	1,700	3.10	661	2.74	501
10	4.89	1,480	3.69	913	13.03	7,410	4.82	1,440	3.00	619	2.73	501
N	4.63	1,340	3.83	959	13.37	7,790	4.45	1,240	2.83	539	2.72	501
2	4.52	1,280	4.59	1,340	13.58	7,980	4.10	1,100	2.70	501	2.69	501
4	4.38	1,240	6.42	2,330	13.70	8,080	3.83	959	2.62	463	2.62	463
6	4.29	1,190	7.80	3,240	13.42	7,790	3.61	871	2.62	463	2.59	463
8	4.20	1,140	8.60	3,800	12.50	6,940	3.50	829	2.63	482	2.52	425
10	4.10	1,100	9.33	4,300	11.30	5,880	3.39	787	2.70	501	2.44	406
12	3.94	1,000	10.00	4,830	9.65	4,530	3.30	745	2.72	501	2.34	368

Elk River near Elk City, Kans.--Continued

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	July 8		July 9		July 10		July 11		July 12		July 13	
2			5.20	47	8.09	1,150	12.25	3,800	6.98	602		
4			5.20	47	10.66	2,680	15.60	6,200	6.71	494	6.83	542
6			5.19	46	12.25	3,800	16.95	7,260	6.51	414		
8			5.19	46	13.01	4,330	19.33	9,230	7.63	915	6.47	400
10			5.18	45	12.85	4,220	20.68	10,400	10.15	2,350		
N	5.25	53	5.18	45	10.45	2,540	21.19	11,100	15.70	6,280	6.30	340
2			5.18	45	7.46	830	20.55	10,300	18.48	8,510		
4			5.18	45	6.35	358	19.48	9,360	18.51	8,530	6.19	302
6			5.18	45	6.00	235	17.45	7,660	17.69	7,850		
8			5.18	45	5.73	178	14.10	5,090	16.31	6,750	6.12	277
10			5.18	45	5.67	145	9.78	2,120	12.95	4,280		
12	5.22	49	5.66	142	5.61	128	7.60	900	9.11	1,720	6.04	249
	July 14		July 15		July 16		July 17		July 18		July 19	
2												
4												
6												
8												
10												
N	5.89	202	5.73	160	5.63	132	5.55	112	5.48	96	5.43	84
2												
4												
6												
8												
10												
12	5.79	178	5.66	142	5.60	126	5.50	102	5.45	90	5.41	81
	July 20		July 21		July 22		July 23		July 24		July 25	
2					5.32	62	5.77	172				
4					5.32	62	6.00	235				
6					5.32	62	6.47	400				
8					5.32	62	6.51	414				
10					5.31	61	6.71	494				
N	5.40	79	5.35	68	5.31	61	6.85	550	5.42	83	5.32	62
2					5.31	61	6.42	382				
4					5.31	61	6.10	270				
6					5.30	60	5.89	202				
8					5.30	60	5.76	170				
10					5.30	60	5.67	145				
12	5.37	72	5.33	64	5.44	86	5.61	128	5.35	68	5.30	60

Supplemental records.— June 23, 3:30 p.m., 8.04 ft, 1,120 cfs, 9 p.m., 6.78 ft, 552 cfs; June 24, 1 a.m., 10.11 ft, 2,320 cfs; June 29, 1 a.m., 5.50 ft, 150 cfs, 10:30 a.m., 23.70 ft, 52,400 cfs, 11:30 p.m., 7.43 ft, 815 cfs; June 30, 6:30 a.m., 16.79 ft, 7,130 cfs: July 3, 11 a.m., 16.78 ft, 7,120 cfs; July 10, 9 a.m., 13.14 ft, 4,420 cfs; July 12, 3 p.m., 18.70 ft, 8,700 cfs.

Verdigris River at Independence, Kans.

Location.—Lat 37°13', long. 95°41', in NE¼ sec. 32, T. 32 S., R. 16 E., at bridge on U. S. Highway 160, 2 miles east of Independence and 3½ miles downstream from Elk River.
Drainage area.—2,892 square miles.
Gage-height record.—Water-stage recorder graph.
Discharge record.—Stage-discharge relation defined by current-meter measurements.
Maxima.—May-July 1951: Discharge, 104,000 cfs 8 p.m. July 1 (gage height, 46.59 ft).
1904, 1921 to April 1951: Discharge, 117,000 cfs Apr. 17, 1945 (gage height, 47.28 ft).

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	4,210	2,240	89,200	11	6,190	3,060	26,600	21	4,530	4,090	8,610
2	16,200	1,180	77,600	12	4,060	7,920	27,300	22	10,100	6,210	7,960
3	15,500	673	39,000	13	2,540	9,170	57,900	23	20,800	13,500	6,120
4	10,300	606	31,400	14	2,010	2,810	68,400	24	12,000	15,800	4,720
5	4,320	502	29,800	15	1,840	1,240	49,100	25	4,670	25,100	5,770
6	4,940	466	25,400	16	1,580	2,340	32,100	26	4,320	24,500	5,960
7	6,030	1,020	18,000	17	1,730	5,790	24,500	27	6,330	18,800	6,490
8	5,790	5,150	11,200	18	3,690	3,510	15,200	28	7,000	6,020	6,660
9	3,450	10,300	10,300	19	3,530	1,130	9,630	29	5,700	13,300	7,460
10	2,460	6,240	17,100	20	6,920	4,150	9,040	30	6,120	38,200	8,200
								31	3,300	-	9,300
Monthly mean discharge, in second-feet									6,199	7,834	24,070
Runoff, in acre-feet									381.1	466.1	1,480
Runoff, in inches									2.47	3.02	9.59

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge
	June 20		June 21		June 22		June 23		June 24		June 25	
2	5.12	967	11.14	3,900	11.33	4,020	20.20	11,500	21.32	12,600		
4	5.08	953	10.94	3,780	11.60	4,180	21.20	12,500	20.95	12,200		
6	5.04	939	10.95	3,790	12.40	4,740	21.95	13,200	21.00	12,300	31.40	24,100
8	7.40	1,780	10.90	3,760	13.53	5,530	22.57	13,900	21.55	12,800		
10	10.90	3,760	10.85	3,730	14.12	6,000	22.98	14,400	22.40	13,700		
N	13.20	5,300	11.27	3,980	14.14	6,010	23.20	14,600	23.60	15,100	32.60	25,500
2	15.10	6,780	12.04	4,490	14.18	6,040	23.22	14,600	24.80	16,400		
4	16.46	7,910	12.30	4,670	14.68	6,440	23.08	14,500	26.00	17,700		
6	16.10	7,590	12.08	4,520	15.57	7,160	22.80	14,200	27.00	18,800	33.40	26,500
8	14.35	6,180	11.70	4,250	16.70	8,130	22.48	13,800	27.97	20,000		
10	12.80	5,020	11.38	4,050	17.85	9,160	22.10	13,400	28.80	21,000		
12	11.77	4,300	11.18	3,930	19.10	10,400	21.70	13,000	29.58	21,900	33.70	26,800
	June 26		June 27		June 28		June 29		June 30		July 1	
2							7.36	1,760				
4							7.54	1,840			44.25	72,200
6	33.10	26,100	28.30	20,400	18.95	10,200	7.87	1,980	37.50	31,400		
8							9.65	3,010			45.25	84,700
10							15.20	6,860				
N	31.82	24,600	27.20	19,000	11.75	4,280	21.65	13,000	39.60	35,000	45.90	93,800
2					9.40	2,860	26.40	18,100				
4					7.90	2,000	29.40	21,700			46.40	101,000
6	30.55	23,100	25.90	17,600	7.18	1,690	31.45	24,100	41.00	43,700		
8					6.85	1,570	32.85	25,800			46.59	104,000
10					6.87	1,580	33.95	27,100				
12	29.32	21,600	23.55	15,000	7.12	1,670	34.78	28,100	42.70	57,300	46.45	102,000
	July 2		July 3		July 4		July 5		July 6		July 7	
2												
4												
6												
8												
10												
N	44.73	78,000	39.72	35,500	37.37	31,300	36.62	30,300	32.46	25,400	26.15	17,900
2												
4												
6												
8												
10												
12	42.10	52,500	38.15	32,300	37.05	30,900	34.60	27,900	30.30	22,800	21.90	13,200

Verdigris River at Independence, Kans.—Continued

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	July 8		July 9		July 10		July 11		July 12		July 13	
2												
4									33.53	26,600	40.10	37,600
6	20.50	11,800	18.88	10,200	21.00	12,300	33.00	26,000				
8									33.33	26,400	42.10	52,500
10												
N	19.60	10,900	18.93	10,200	25.60	17,300	34.05	27,300	33.40	26,500	43.37	63,000
2												
4							34.35	27,600	33.92	27,100	44.05	69,800
6	19.18	10,500	19.05	10,400	29.20	21,400						
8							34.22	27,500	35.08	28,500	44.28	72,600
10												
12	18.94	10,200	19.38	10,700	31.30	24,000	33.85	27,000	37.10	30,900	44.30	72,800
	July 14		July 15		July 16		July 17		July 18		July 19	
2												
4												
6							34.15	27,400			18.55	9,850
8												
10												
N	44.00	69,200	41.70	49,300	37.82	31,900	31.84	24,600	23.75	15,200	18.07	9,370
2												
4												
6							29.30	21,600			17.90	9,210
8												
10												
12	43.30	62,400	39.70	35,400	35.70	29,200	27.40	19,300	19.70	11,000	17.85	9,160
	July 20		July 21		July 22		July 23		July 24		July 25	
2												
4												
6											13.25	5,340
8												
10												
N	17.74	9,070	17.24	8,620	16.63	8,070	14.28	6,120	12.08	4,520	13.95	5,860
2											14.15	6,020
4											14.32	6,160
6											14.42	6,240
8											14.48	6,280
10											14.50	6,300
12	17.51	8,860	16.93	8,340	15.80	7,340	12.62	4,890	12.68	4,940	14.43	6,240

Verdigris River near Lenapah, Okla.

Location.—Lat 36°51', long. 95°35', at center of sec. 3, T. 27 N., R. 16 E., near right bank on downstream side of pier of county highway bridge 2-3/4 miles east of Lenapah, 4¼ miles upstream from Cedar Creek and at mile 144.6. Datum of gage is 644.89 ft above mean sea level, datum of 1929 (levels by Corps of Engineers).

Drainage area.—3,639 square miles.

Gage-height record.—Water-stage recorder graph.

Discharge record.—Stage-discharge relation defined by current-meter measurements. Shifting-control method used May 4 to June 12, July 15-17.

Maxima.—May-July 1951: Discharge, 94,800 cfs 4 a.m. July 3 (gage height, 38.66 ft).
1939 to April 1951: Discharge, 137,000 cfs May 20, 1943 (gage height, 40.44 ft, from floodmark).

Remarks.—Records collected and computed by Corps of Engineers and reviewed by Geological Survey.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	839	3,140	38,700	11	5,350	4,820	18,200	21	6,400	8,760	9,090
2	8,980	2,030	60,800	12	5,460	4,620	22,300	22	5,660	8,980	8,540
3	15,100	986	85,200	13	3,780	10,600	26,200	23	13,600	13,300	7,660
4	12,600	728	52,700	14	2,630	7,340	30,800	24	17,100	13,000	5,560
5	8,100	656	40,800	15	2,280	1,830	57,700	25	8,870	16,000	5,350
6	4,400	592	34,900	16	2,080	1,370	57,200	26	4,510	20,300	6,610
7	5,980	703	29,600	17	1,540	3,880	42,300	27	6,080	20,600	6,920
8	6,400	2,830	18,600	18	2,940	5,880	33,700	28	7,340	15,300	6,920
9	5,660	8,430	10,800	19	4,400	2,130	18,400	29	6,920	7,030	7,140
10	2,530	9,640	11,600	20	5,240	3,750	9,640	30	6,400	32,300	7,880
								31	6,190	-	8,650
Monthly mean discharge, in second-feet									6,302	7,718	25,170
Runoff, in thousand acre-feet									387.5	459.2	1,548
Runoff, in inches									2.00	2.37	7.97

Verdigris River near Claremore, Okla.

Location. —Lat 36°18'30", long. 95°41'40", in SE¼SW¼ sec. 10, T. 21 N., R. 15 E., at bridge on State Highway 20, 2.3 miles downstream from Caney River, 4½ miles west of Claremore, 12.4 miles upstream from Bird Creek, and at mile 76.0. Datum of gage is 538.62 ft above mean sea level, datum of 1929 (levels by Corps of Engineers).
Drainage area. —6,534 square miles.
Gage-height record. —Water-stage recorder graph.
Discharge record. —Stage-discharge relation defined by current-meter measurements. Shifting-control method used May 4, July 10-21.
Maxima. —May-July 1951: Discharge, 74,900 cfs 12 m. July 6 (gage height, 46.95 ft).
1935 to April 1951: Discharge, 182,000 cfs May 21, 1943 (gage height, 55.05 ft).
Maximum stage known, that of May 21, 1943.
Remarks. —Records collected and computed by Corps of Engineers and reviewed by Geological Survey.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	786	5,400	33,900	11	5,310	11,700	31,000	21	5,820	8,200	40,700
2	5,240	3,490	39,100	12	6,930	8,630	27,500	22	6,160	17,100	26,400
3	15,000	2,350	44,000	13	6,500	8,120	28,700	23	6,930	19,800	18,600
4	19,500	1,310	48,500	14	4,770	11,300	30,900	24	15,300	20,700	13,100
5	18,900	970	61,500	15	3,490	8,040	34,000	25	20,000	19,400	7,950
6	14,900	890	73,500	16	2,780	3,090	36,500	26	15,100	18,900	7,020
7	11,000	1,510	69,700	17	2,460	2,350	39,600	27	6,250	21,600	9,990
8	10,900	2,300	60,500	18	1,910	5,480	44,600	28	7,020	23,500	8,540
9	9,140	5,220	53,300	19	3,490	6,760	49,500	29	7,700	20,500	7,700
10	6,680	9,900	42,200	20	4,590	3,490	50,700	30	6,840	22,900	7,860
								31	6,500	-	8,460
Monthly mean discharge, in second-feet									8,319	9,830	34,050
Runoff, in thousand acre-feet									511.5	584.9	2,094
Runoff, in inches									1.47	1.68	6.01

Verdigris River near Inola, Okla.

Location. —Lat 36°10', long. 95°37', near NW corner of sec. 4, T. 19 N., R. 16 E., at bridge on State Highway 33, 6 miles downstream from Dog Creek, 6 miles west of Inola, and at mile 48.8. Datum of gage is 506.87 ft above mean sea level, datum of 1929 (levels by Corps of Engineers).
Drainage area. —7,911 square miles.
Gage-height record. —Water-stage recorder graph except for periods June 2, 4, 5, 10, 12, 29, 30, July 27-31, for which graph was drawn based on once-daily wire-weight gage readings, and May 29 to June 1, June 3, 11, 19-21, 28, when there was no gage-height record.
Discharge record. —Stage-discharge relation defined by current-meter measurements. Discharge for periods of no gage-height record estimated on basis of weather records and records for station at Claremore and Bird Creek near Sperry. Shifting-control method used June 23 to July 5. Discharge July 23-25 computed from backwater curve defined by current-meter measurements.
Maxima. —May-July 1951: Discharge, 69,200 cfs 12 m. July 8 (gage height, 52.32 ft).
1944 to April 1951: Discharge, 94,500 cfs Apr. 22, 1945; gage height, 52.40 ft June 27, 1948.
Maximum stage known, 54.93 ft May 21, 1943 (discharge, 224,000 cfs, from current-meter measurement near crest by Corps of Engineers).
Remarks. —Records collected and computed by Corps of Engineers and reviewed by Geological Survey.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	995	6,000	34,200	11	7,990	13,000	49,900	21	5,100	10,000	42,800
2	8,270	3,960	37,600	12	7,400	10,600	44,000	22	6,880	18,800	41,700
3	17,500	2,800	39,400	13	7,740	8,160	40,100	23	5,980	26,200	33,000
4	20,500	1,790	40,600	14	5,900	10,900	38,600	24	12,400	28,500	19,100
5	21,100	1,180	41,900	15	4,040	10,500	38,800	25	19,200	25,500	10,800
6	18,300	1,020	44,600	16	3,040	5,260	39,400	26	19,500	21,300	8,160
7	13,300	1,470	55,200	17	2,590	2,840	39,600	27	11,000	22,200	10,200
8	11,700	4,940	67,900	18	2,190	3,960	39,800	28	6,970	25,000	10,300
9	10,700	7,310	64,200	19	2,410	8,000	40,100	29	8,000	25,200	8,340
10	7,820	9,060	55,900	20	4,560	5,000	41,300	30	7,500	24,400	8,080
								31	7,000	-	8,700
Monthly mean discharge, in second-feet									9,280	11,500	35,300
Runoff, in thousand acre-feet									570.6	684	2,170
Runoff, in inches									1.35	1.62	5.14

Neosho River at Council Grove, Kans.

Location.—Lat 38°40', long. 96°30', in NW¼ sec. 14, T. 16 S., R. 8 E., on highway bridge at city water plant in north part of Council Grove, 300 ft downstream from Mozler Creek, and 1 mile upstream from Elm Creek. Datum of gage is 1,205.63 ft above mean sea level (levels by Corps of Engineers).

Drainage area.—250 square miles.

Gage-height record.—Water-stage recorder graph May 1 to July 7, 1 p.m. July 10 to 2 a.m. July 12 when gage well became inoperative due to flood damage. Gage heights obtained from graph drawn on basis of once-daily wire-weight gage readings 2 a.m. July 12 to July 31. Gage-height graph estimated for July 8.

Discharge record.—Stage-discharge relation defined by current-meter measurements below 36,000 cfs and slope-area measurement of peak discharge.

Maxima.—May-July 1951: Discharge, 121,000 cfs 8:30 a.m. July 11 (gage height, 35.5 ft; floodmark, top of surge, in gage house, 36.29 ft; floodmark in wire-weight gage box at upstream side of bridge, 37.97 ft).

1939 to April 1951: Discharge, 65,900 cfs (revised) Oct. 20, 1941 (gage height, 37.13 ft, wire-weight gage).

Flood of 1903 reached a stage of 37.3 ft, from floodmark.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	11,100	109	297	11	300	189	34,000	21	813	189	238
2	651	87	169	12	192	164	24,900	22	1,190	1,500	214
3	320	83	152	13	155	136	1,880	23	633	459	180
4	227	76	152	14	134	115	655	24	227	2,010	164
5	182	72	127	15	120	3,910	446	25	676	253	142
6	145	119	783	16	731	497	338	26	1,700	159	630
7	127	9,780	462	17	581	204	270	27	227	134	600
8	113	1,230	160	18	373	157	240	28	164	162	162
9	419	767	114	19	1,700	293	236	29	138	794	125
10	2,130	253	20,300	20	256	127	236	30	124	1,930	115
								31	136	-	104
Monthly mean discharge, in second-feet									838	865	2,858
Runoff, in acre-feet									51,540	51,490	175,700
Runoff, in inches									3.87	3.86	13.18

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	July 8		July 9		July 10		July 11		July 12		July 13	
2					12.60	1,870	20.34	8,870	18.25	6,700	14.90	3,720
4					19.00	7,430	21.05	9,720	26.00	17,500	13.35	2,470
6			8.75	111	22.10	11,100	26.40	18,300	31.00	35,000	13.00	2,190
8					26.60	18,700	35.05	97,600	33.85	68,200	12.72	1,970
10					30.68	33,400	34.80	90,700	33.35	59,400	12.43	1,750
N	8.93	152	8.72	104	31.60	38,400	33.55	62,800	31.00	35,000	12.15	1,560
2					31.25	36,300	31.70	39,400	28.10	22,500		
4					30.60	33,000	29.15	26,100	25.45	16,400		
6			8.73	107	29.00	25,500	27.10	19,900	23.30	12,800	11.45	1,110
8					26.70	18,900	24.10	14,100	21.35	10,100		
10					24.20	14,200	22.08	11,100	19.15	7,580		
12	8.79	120	8.90	145	21.35	10,100	20.22	8,730	16.90	5,480	10.95	831
	July 14		July 15		July 16		July 17		July 18		July 19	
2												
4												
6	10.70	717										
8												
10												
N	10.53	647	9.96	442	9.63	338	9.38	267	9.27	237	9.27	237
2												
4												
6	10.36	582										
8												
10												
12	10.18	517	9.78	384	9.48	294	9.32	250	9.27	237	9.26	235
	July 20		July 21		July 22		July 23		July 24		July 25	
2												
4												
6												
8												
10												
N	9.26	235	9.28	240	9.19	216	9.04	179	8.99	167	8.88	140
2												
4												
6												
8												
10												
12	9.27	237	9.27	237	9.08	189	9.02	174	8.92	150	8.86	136

Supplemental records.—July 11, 2:30 a.m., 20.15 ft, 8,660 cfs, 8:30 a.m., 35.50 ft, 121,000 cfs; July 12, 8:30 a.m., 34.0 ft, 71,100 cfs.

Cottonwood River near Marion, Kans.

Location.—Lat 38°21', long. 97°04', in SW¼ sec. 36, T. 19 S., R. 3 E., at county highway bridge, three-quarters of a mile downstream from South Cottonwood River and 2 miles west of Marion. Datum of gage is 1,289.85 ft above mean sea level, datum of 1929 (levels by Corps of Engineers).

Drainage area.—329 square miles.

Gage-height record.—Water-stage recorder graph except for periods May 24-27, July 2, July 5 to 2 a.m. July 10, when there was no record.

Discharge record.—Stage-discharge relation defined by current-meter measurements below 13,000 cfs and by slope-area measurement of peak discharge. Shifting-control method used May 28 to June 6. Backwater rating curve used during periods affected by return of overbank storage May 17, 18, June 7, 8, 30, July 1, 13, 14. Discharge for periods of no gage-height record estimated on basis of weather records and trend of flow.

Maxima.—May-July 1951: Discharge, 66,000 cfs 2 p.m. July 11 (gage height, 28.57 ft, from floodmark in gage-well).

1939 to April 1951: Discharge, 15,200 cfs Oct. 20, 1941 and Apr. 16, 1945 (gage height, 25.68 ft, from floodmark), from rating curve extended above 13,000 cfs.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	5,010	107	1,400	11	361	167	30,600	21	2,000	96	143
2	1,170	74	280	12	124	153	17,800	22	1,000	439	151
3	148	68	3,370	13	94	137	10,300	23	1,990	1,580	3,400
4	98	63	2,870	14	76	228	1,330	24	330	1,970	559
5	74	55	410	15	72	231	402	25	220	259	169
6	63	603	300	16	3,150	142	252	26	160	132	141
7	57	12,000	260	17	8,820	120	204	27	120	107	129
8	50	3,100	250	18	2,600	96	185	28	103	137	120
9	486	1,330	250	19	1,260	89	176	29	94	9,780	105
10	3,060	219	3,640	20	409	83	159	30	87	8,600	96
								31	114	-	92
Monthly mean discharge, in second-feet									1,077	1,406	2,566
Runoff, in acre-feet									66,250	83,630	157,800
Runoff, in inches									3.78	4.77	8.99

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge
	July 8		July 9		July 10		July 11		July 12		July 13	
2					3.85	565	13.32	5,090				
4					6.10	1,520	17.40	7,580	24.95	15,000	25.18	15,600
6					9.44	3,090	21.46	10,800				
8					11.69	4,220	25.66	17,100	24.10	13,300	23.80	13,000
10					13.04	4,930	27.82	41,400				
N					13.80	5,350	28.46	61,500	24.72	14,400	20.89	10,000
2					13.88	5,390	28.57	66,000				
4					13.43	5,150	28.31	56,000	25.90	17,800	17.45	7,200
6					12.54	4,660	27.81	41,200				
8					11.37	4,060	27.17	29,000	26.96	26,100	14.13	4,900
10					9.85	3,300	26.44	20,600				
12					9.45	3,100	25.95	18,000	26.19	19,000	10.76	3,300
	July 14		July 15		July 16		July 17		July 18		July 19	
2												
4	7.86	2,100										
6												
8	6.00	1,300										
10												
N	5.27	1,100	3.70	370	3.35	250	3.19	204	3.11	184	3.08	177
2												
4	4.78	841										
6												
8	4.44	688										
10												
12	4.20	580	3.47	290	3.24	218	3.14	192	3.09	180	3.04	168
	July 20		July 21		July 22		July 23		July 24		July 25	
2					2.90	136	8.90	2,820	6.45	1,600		
4					2.89	134	9.00	2,870	5.26	1,060		
6					2.88	131	9.30	3,020	4.35	648		
8					2.88	131	9.80	3,270	3.82	418		
10					2.87	129	10.46	3,600	3.55	318		
N	3.00	159	2.93	143	2.87	129	11.02	3,880	3.40	265	3.04	168
2					2.86	127	11.45	4,100	3.32	241		
4					2.86	127	11.76	4,250	3.28	229		
6					2.86	127	11.72	4,230	3.24	218		
8					2.85	124	11.10	3,920	3.20	207		
10					2.85	124	9.78	3,260	3.17	200		
12	2.96	150	2.90	136	4.35	648	8.10	2,420	3.14	192	2.95	148

Supplemental records.—July 10, 11 p.m., 8.85 ft, 2,800 cfs; July 12, 7 p.m., 27.06 ft, 27,400 cfs.

Cedar Creek near Cedar Point, Kans.

Location.—Lat 38°12', long. 96°50', in NE¼ sec. 25, T. 21 S., R. 5 E., at county highway bridge, 4 miles south of Cedar Point, and 9.4 miles upstream from mouth. Datum of gage is 1,262.50 ft above mean sea level, datum of 1929 (levels by Corps of Engineers).

Drainage area.—110 square miles.

Gage-height record.—Water-stage recorder graph.

Discharge record.—Stage-discharge relation defined by current-meter measurements below 7,500 cfs and extended to peak stage on basis of contracted-opening and flow-over-road determination of peak flow.

Maxima.—May-July 1951: Discharge, 52,400 cfs 10:30 a.m. June 29 (gage height, 23.70 ft).
1938 to April 1951: Discharge, 22,500 cfs (revised) Apr. 22, 1944 (gage height, 22.50 ft).
Maximum stage known 1856 to April 1951: 23.50 ft July 1929, from floodmark and information by local residents (discharge, about 46,000 cfs, from rating curve extended above 7,500 cfs on basis of contracted-opening and flow-over-road determination at gage height of 23.7 ft.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	3,710	52	208	11	71	63	6,920	21	571	80	68
2	188	50	120	12	63	64	4,020	22	689	95	62
3	112	52	2,670	13	59	51	474	23	196	466	• 295
4	92	49	193	14	54	56	208	24	99	782	90
5	81	48	98	15	52	50	160	25	86	112	63
6	78	65	74	16	462	48	133	26	78	74	56
7	70	346	64	17	281	44	113	27	69	63	53
8	66	279	53	18	136	41	96	28	66	390	50
9	228	133	50	19	105	40	85	29	61	10,900	49
10	99	60	1,720	20	77	39	78	30	58	3,100	47
								31	56	-	45
Monthly mean discharge, in second-feet									262	590	594
Runoff, in acre-feet									16,090	35,090	36,530
Runoff, in inches									2.74	5.98	6.23

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	June 20		June 21		June 22		June 23		June 24		June 25	
2			4.66	37	4.93	63	5.20	93	9.63	2,030		
4			4.72	43	4.89	59	5.11	82	8.18	1,200		
6			4.76	46	4.93	63	5.03	73	7.22	729	5.38	124
8			4.85	55	4.98	68	5.00	70	6.89	596		
10			5.31	110	4.99	69	4.99	69	7.14	696		
N	4.68	39	5.32	112	5.09	80	5.08	79	7.30	765	5.24	99
2			5.32	112	5.21	94	6.75	540	7.11	684		
4			5.36	120	5.38	124	7.86	1,030	6.70	520		
6			5.27	104	5.49	148	7.54	873	6.30	375	5.17	89
8			5.16	88	5.48	146	6.90	600	6.00	280		
10			5.07	78	5.44	137	7.75	975	5.80	225		
12	4.66	37	4.98	68	5.32	112	9.83	2,150	5.65	188	5.11	82
	June 26		June 27		June 28		June 29		June 30		July 1	
2					4.88	58	6.75	540	10.07	2,300		
4					4.87	57	12.44	3,930	15.02	5,760		
6					4.88	58	17.77	7,920	16.72	7,080	6.02	242
8					5.32	112	20.50	10,200	16.44	6,850		
10					6.60	480	23.14	36,000	15.30	5,980		
N	5.03	73	4.93	63	8.59	1,420	22.75	27,500	12.90	4,250	5.85	192
2					7.68	940	21.00	10,800	9.46	1,930		
4					6.85	580	19.88	9,700	7.66	930		
6					6.32	382	18.01	8,110	7.02	618	5.74	162
8					5.98	274	14.29	5,220	6.66	474		
10					5.74	210	8.56	1,410	6.43	386		
12	4.97	67	4.89	59	5.57	168	7.59	895	6.28	333	5.66	142
	July 2		July 3		July 4		July 5		July 6		July 7	
2			5.50	102								
4			5.49	100								
6	5.61	128	7.00	610	5.94	217						
8			13.08	4,380								
10			16.52	6,920								
N	5.58	121	16.34	6,770	5.76	168	5.48	96	5.38	74	5.34	66
2			15.04	5,780								
4			12.68	4,100								
6	5.54	110	9.25	1,800	5.65	140						
8			7.19	695								
10			6.58	442								
12	5.51	104	6.41	378	5.57	119	5.42	83	5.34	66	5.29	58

Cottonwood River at Cottonwood Falls, Kans.

Location.—Lat 38°22', long. 96°31', in NE¼ sec. 28, T. 19 S., R. 8 E., 1 mile east of Cottonwood Falls and 3½ miles upstream from South Fork Cottonwood River. Datum of gage is 1,147.41 ft above mean sea level, datum of 1929.
Drainage area.—1,402 square miles.
Gage-height record.—Water-stage recorder graph.
Discharge record.—Stage-discharge relation defined by current-meter measurements below 48,000 cfs and extended to peak stage on basis of one indirect determination of peak discharge (combination, slope-area and contracted opening) at stage 22.50 ft and the average of two indirect determinations (combination, slope-area, contracted-opening and slope-area) made at stage 27.06 ft.
Maxima.—May-July 1951: Discharge, 196,000 cfs 11:30 a.m. July 11 (gage height, 27.06 ft).
1932 to April 1951: Discharge, 78,000 cfs (revised) July 20, 1948 (gage height, 23.30 ft).
Remarks.—Field notes for survey of slope-area reach furnished by Corps of Engineers.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	14,400	636	23,800	11	3,350	2,560	107,000	21	2,790	557	1,080
2	16,100	611	13,800	12	2,260	1,200	117,000	22	4,410	1,140	1,040
3	11,600	528	6,960	13	815	1,030	63,000	23	5,480	1,840	4,320
4	3,740	484	7,060	14	649	899	22,100	24	4,340	3,960	4,490
5	1,320	463	9,580	15	568	2,220	13,200	25	1,830	4,830	4,350
6	1,070	473	5,720	16	695	1,690	6,290	26	1,110	2,200	2,050
7	914	9,030	1,910	17	3,520	922	2,320	27	907	860	3,470
8	800	9,960	1,530	18	7,020	729	1,740	28	778	2,560	1,610
9	815	13,300	1,360	19	10,400	623	1,480	29	722	12,700	1,050
10	1,520	10,400	12,700	20	7,640	568	1,320	30	662	51,200	868
								31	675	-	778
Monthly mean discharge, in second-feet									3,642	4,672	14,350
Runoff, in acre-feet									223,900	278,000	882,600
Runoff, in inches									2.99	3.72	11.80

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge
	July 8		July 9		July 10		July 11		July 12		July 13	
2					4.80	1,530	20.57	20,000	25.70	142,000		
4					7.15	3,980	20.72	21,800	25.20	126,000	23.39	79,800
6	4.80	1,530			13.60	8,920	21.28	32,400	24.70	111,000		
8					17.60	12,300	22.84	68,700	24.43	104,000	22.85	68,900
10					18.38	13,200	26.15	157,000	24.60	108,000		
N	4.75	1,480	4.61	1,360	18.70	13,700	27.02	194,000	24.54	106,000	22.65	64,500
2					19.37	15,300	26.38	166,000	24.65	110,000		
4					20.03	12,200	25.64	139,000	25.41	132,000	22.22	54,500
6	4.85	1,580			20.43	18,900	25.15	124,000	25.22	127,000		
8					20.65	20,900	25.20	126,000	24.75	112,000	21.85	45,400
10					20.71	21,600	25.77	144,000	24.30	100,000		
12	4.77	1,500	4.48	1,240	20.50	19,400	26.02	153,000	23.95	91,900	21.52	37,700
	July 14		July 15		July 16		July 17		July 18		July 19	
2					14.81	9,890						
4	21.16	29,800	19.16	14,800	13.89	9,150	5.89	2,590				
6					12.87	8,340						
8	20.78	22,600	18.82	14,000	11.78	7,490	5.68	2,360				
10					10.65	6,700						
N	20.45	19,000	18.31	13,100	9.65	6,000	5.56	2,240	5.00	1,710	4.75	1,480
2					8.75	5,420						
4	20.19	17,800	17.70	12,400	7.93	4,780	5.52	2,200				
6					7.28	4,120						
8	19.83	16,600	16.88	11,600	6.83	3,620	5.41	2,090				
10					6.48	3,240						
12	19.50	15,600	15.62	10,500	6.23	2,960	5.27	1,950	4.86	1,580	4.65	1,400
	July 20		July 21		July 22		July 23		July 24		July 25	
2							7.10	3,920			8.63	5,340
4							8.61	5,330			8.59	5,310
6							7.50	4,360	7.04	3,850	8.48	5,230
8							7.96	4,800			8.31	5,100
10							7.99	4,830			8.07	4,900
N	4.57	1,320	4.40	1,180	4.23	1,030	7.68	4,540	7.57	4,430	7.80	4,660
2							7.49	4,350			7.46	4,320
4							7.47	4,330			7.09	3,910
6							7.51	4,370	8.19	5,000	6.72	3,500
8							7.48	4,340			6.39	3,140
10							7.34	4,180			6.11	2,830
12	4.48	1,240	4.32	1,110	4.16	978	7.18	4,010	8.61	5,330	5.81	2,500

Supplemental records.—July 11, 1 a.m., 20.63 ft, 20,700 cfs; 11:30 a.m., 27.06 ft, 196,000 cfs; 7 p.m., 25.08 ft, 122,000 cfs; July 12, 1 p.m., 24.46 ft, 104,000 cfs; July 23, 9 a.m., 8.03 ft, 4,870 cfs.

Cottonwood River at Emporia, Kans.

Location. - Lat 38°23', long. 96°11', in SE¼NW¼ sec. 22, T. 19 S., R. 11 E., on upstream side of concrete-arch bridge on State Highway 11 just outside south city-limits of Emporia. Datum of gage is 1,076.52 ft above mean sea level, datum of 1929 (levels by U. S. Weather Bureau).
Drainage area. - 1,840 square miles.
Gage-height record. - Wire-weight gage readings once daily, more frequently during flood periods.
Maxima. - May-July 1951: Gage-height, 33.40 ft, 6 p.m., July 11.
1908 to April 1951: Gage-height, 29.5 ft, 6 p.m. July 20, 1948.
Remarks. - Records furnished by U. S. Weather Bureau.

Daily stage, in feet, 1951

Day	June	July	Day	June	July	Day	June	July
1	3.4	28.8	11	23.8	21.9	21	3.0	5.0
2	3.2	26.1	12	15.1	31.6	22	3.4	4.2
3	3.1	25.1	13	5.1	30.4	23	8.7	10.8
4	3.0	23.6	14	4.9	28.6	24	17.2	18.6
5	2.8	19.3	15	4.8	25.8	25	16.3	14.0
6	2.7	20.2	16	11.0	24.7	26	14.8	12.7
7	5.9	19.4	17	5.9	22.1	27	6.7	11.7
8	18.5	7.9	18	4.1	10.6	28	5.5	11.4
9	21.5	8.2	19	3.9	7.0	29	11.8	6.2
10	23.0	9.3	20	3.4	5.4	30	22.0	4.4
						31	-	4.0

Supplemental records. — June 10, 8 p.m., 24.00 ft; June 24, 1 p.m., 17.50 ft; June 30, 6 p.m., 29.10 ft; July 10, 1 p.m., 17.05 ft; July 11, 1 p.m., 30.25 ft, 6 p.m., 33.40 ft: July 12, 7 p.m., 31.30 ft; July 13, 7 p.m., 29.30 ft; July 14, 7 p.m., 26.65 ft; July 15, 7 p.m., 25.18 ft.

Neosho River near Neosho Rapids, Kans.

Location. — Lat 38°22', long. 96°00', in SW¼ sec. 29, T. 19 S., R. 13 E., on downstream side of highway bridge. 1.1 miles west of Neosho Rapids. Datum of gage is 1,044.88 ft above mean sea level (levels by U. S. Weather Bureau.
Drainage area. — 2,736 square miles.
Gage-height record. — Wire-weight gage readings once or twice-daily during flood periods.
Maxima. — May-July 1951: Gage-height, 34.30 ft, 10 p.m., July 11.
1904 to April 1951: Gage-height, 29.9 ft, 9:30 a.m., July 21, 1948.
Remarks. — Records furnished by U. S. Weather Bureau.

Daily stage, in feet, 1951

Day	June	July	Day	June	July	Day	June	July
1	-	27.6	11	-	28.2	21	-	-
2	-	26.2	12	19.0	32.1	22	3.7	-
3	-	24.7	13	-	31.3	23	-	13.6
4	-	23.1	14	-	29.0	24	19.4	17.7
5	-	19.2	15	4.9	26.0	25	18.3	-
6	-	16.9	16	-	24.2	26	-	-
7	6.0	20.3	17	17.4	22.2	27	-	-
8	17.9	15.7	18	-	17.0	28	-	-
9	24.7	-	19	-	-	29	-	-
10	22.0	9.3	20	-	-	30	16.5	-
						31	-	-

Supplemental records. — June 9, 1:30 a.m., 24.82 ft; June 24, 9 a.m., 19.62 ft; July 1, 5 a.m., 27.57 ft; July 3, 8:30 p.m., 24.99 ft; July 10, 1 p.m., 15.28 ft; July 11, 10 p.m., 34.30 ft; July 12, 7 p.m., 31.42 ft; July 13, 7 p.m., 29.28 ft; July 14, 7 p.m., 27.10 ft.

Neosho River at Strawn, Kans.

Location.—Lat 38°16', long. 95°52', in SE¼NE¼ sec. 33, T. 20 S., R. 14 E., near left bank on downstream side of pier of bridge on State Highway 57, at Strawn, and about 1½ miles downstream from Eagle Creek. Datum of gage is 1,018.78 ft above mean sea level, datum of 1929, Kansas City Supplementary adjustment of 1943 (levels by Corps of Engineers).

Drainage area.—2,933 square miles.

Gage-height record.—Water-stage recorder graph, except for periods May 29-31, June 18-22, 28, July 9, 20-22, 27-31, for which a graph was drawn based on once-daily wire-weight gage readings.

Discharge record.—Stage-discharge relation defined by current-meter measurements below 97,000 cfs and extended to peak stage on basis of rainfall-runoff studies and flood-routing study to station near Iola.

Maxima.—May-July 1951: Discharge, 400,000 cfs 12 p.m. July 11 (gage height, 30.54 ft).
1948 to April 1951: Discharge observed, 99,200 cfs July 21, 1948 (gage height, 27.48 ft).

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	10,700	1,530	36,200	11	4,530	15,900	115,000	21	10,700	1,310	2,690
2	18,900	1,330	41,400	12	5,280	13,800	274,000	22	9,380	1,830	2,440
3	33,700	1,190	31,700	13	4,370	4,790	166,000	23	7,030	8,470	12,900
4	24,900	1,060	23,600	14	1,930	2,320	64,000	24	8,100	15,800	12,700
5	17,700	980	17,400	15	1,130	3,680	39,700	25	6,770	13,100	7,620
6	6,650	920	12,600	16	1,360	7,900	29,400	26	5,860	9,500	5,530
7	2,840	3,430	16,600	17	2,760	10,100	22,200	27	5,630	5,550	4,150
8	2,550	10,400	10,600	18	5,540	4,060	12,700	28	3,490	3,100	4,400
9	2,500	17,400	3,790	19	6,960	2,210	4,180	29	1,850	4,260	3,400
10	4,320	19,200	9,860	20	8,860	1,380	3,030	30	1,280	12,400	2,270
								31	1,690	-	1,190
Monthly mean discharge, in second-feet									7,395	6,630	32,040
Runoff, in thousand acre-feet									454.7	394.5	1,970
Runoff, in inches									2.91	2.52	12.59

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge
	July 8		July 9		July 10		July 11		July 12		July 13	
2	17.24	14,100	7.11	5,280	3.56	3,070	20.15	17,900	30.40	383,000	28.82	215,000
4	16.81	13,600	6.35	4,780	3.77	3,260	20.62	18,700	30.00	339,000	29.05	238,000
6	16.32	13,100	5.71	4,400	5.05	4,030	21.85	22,200	29.56	291,000	29.00	233,000
8	15.73	12,400	5.15	4,080	7.85	5,800	22.98	28,800	29.45	278,000	28.81	214,000
10	14.94	11,600	4.57	3,780	10.90	8,120	23.65	34,400	29.37	270,000	28.50	187,000
N	14.12	10,900	4.00	3,430	13.38	10,200	24.74	46,800	29.35	268,000	28.25	168,000
2	13.14	9,980	3.80	3,280	15.35	12,000	26.20	80,700	29.34	267,000	27.89	148,000
4	12.12	9,100	3.60	3,110	16.94	13,700	27.45	126,000	29.23	256,000	27.55	130,000
6	11.00	8,200	3.47	2,990	18.10	15,100	28.29	171,000	29.05	238,000	27.23	117,000
8	9.87	7,300	3.45	2,970	18.90	16,100	29.25	258,000	28.82	215,000	26.93	106,000
10	8.90	6,530	3.45	2,970	19.45	16,800	30.23	364,000	28.56	192,000	26.67	96,200
12	7.92	5,840	3.47	2,990	19.82	17,300	30.54	400,000	28.50	187,000	26.43	88,000
	July 14		July 15		July 16		July 17		July 18		July 19	
2									20.49	18,200	8.50	5,560
4	26.08	77,100	24.55	44,000					20.10	17,400	7.74	5,010
6							22.20	23,500	19.60	16,400	7.16	4,690
8	25.79	69,000	24.35	41,400					19.00	15,300	6.68	4,400
10									18.28	14,100	6.25	4,140
N	25.52	62,300	24.16	39,300	23.04	29,300	21.90	22,400	17.31	12,900	5.92	3,940
2									16.18	11,700	5.64	3,770
4	25.27	56,700	23.97	37,300					14.82	10,300	5.39	3,630
6							21.46	20,800	13.37	9,100	5.14	3,500
8	25.00	51,300	23.78	35,500					11.93	7,940	4.92	3,380
10									10.57	6,990	4.79	3,320
12	24.77	47,300	23.60	33,900	22.47	25,000	20.80	18,800	9.42	6,180	4.68	3,260
	July 20		July 21		July 22		July 23		July 24		July 25	
2							4.20	3,020				
4					3.22	2,490	10.25	6,760	18.80	15,000	13.18	8,940
6							14.35	9,920				
8					3.17	2,430	17.25	12,800	18.00	13,800	12.25	8,200
10							18.55	14,600				
N	4.19	3,020	3.50	2,670	3.15	2,400	19.28	15,800	16.98	12,500	11.30	7,500
2							19.67	16,600				
4					3.14	2,380	19.78	16,800	15.97	11,500	10.40	6,870
6							19.74	16,700				
8					3.14	2,380	19.58	16,400	15.00	10,500	9.69	6,370
10							19.39	16,000				
12	3.80	2,820	3.38	2,610	3.20	2,480	19.20	15,700	14.07	9,660	9.20	6,030

Neosho River at Burlington, Kans.

Location.—Lat 38°12', long. 95°44', in sec. 26, T. 21 S., R. 15 E., on downstream side of concrete-arch bridge at east end of main street, Burlington. Datum of gage is 983.53 ft above mean sea level, datum of 1929 (levels by Corps of Engineers).
Drainage area.—3,030 square miles.
Gage-height record.—Wire-weight gage readings once daily.
Maxima.—May-July 1951: Gage-height, 41.53 ft, 6 a.m., July 12.
1942 to April 1951: Gage-height, 36.8 ft, 11:30 p.m., July 21, 1948.
Remarks.—Records furnished by U. S. Weather Bureau.

Daily stage, in feet, 1951

Day	June	July	Day	June	July	Day	June	July
1	8.3	26.4	11	28.2	30.5	21	8.7	10.4
2	8.2	34.4	12	25.7	41.5	22	8.4	9.8
3	8.2	33.2	13	18.4	41.0	23	9.7	19.3
4	8.0	32.0	14	9.6	36.0	24	26.9	27.2
5	7.9	30.7	15	9.3	34.3	25	25.8	20.7
6	7.8	25.8	16	14.5	32.9	26	20.9	15.3
7	8.9	28.5	17	20.5	31.7	27	16.5	12.4
8	16.9	25.6	18	14.7	29.8	28	11.2	13.2
9	24.3	13.8	19	9.4	16.0	29	10.6	13.0
10	28.2	13.2	20	8.8	11.2	30	23.9	10.0
						31	-	8.9

Supplemental records.—June 10, 4 p.m., 28.75 ft; June 17, 1 p.m., 20.75 ft; June 24, 1 p.m., 27.27 ft; July 2, 5 a.m., 34.50 ft; July 7, 1 p.m., 28.55 ft; July 12, 6 a.m., 41.53 ft.

Neosho River at LeRoy, Kans.

Location.—Lat 38°05', long. 95°38', in NE¼ sec. 3, T. 23 S., R. 16 E., at upstream side of highway bridge at south edge of LeRoy. Datum of gage is 961.63 ft above mean sea level, datum of 1929 (levels by Corps of Engineers).
Drainage area.—3,393 square miles.
Gage-height record.—Wire-weight gage readings once daily, more frequently during flood periods.
Maxima.—May-July 1951: Gage-height, 34.55 ft, 11 a.m., July 12.
1908 to April 1951: Gage-height, 30.7 ft, 9 a.m., July 22, 1948.
Remarks.—Records furnished by U. S. Weather Bureau.

Daily stage, in feet, 1951

Day	June	July	Day	June	July	Day	June	July
1	3.7	25.2	11	23.0	25.2	21	4.8	7.1
2	3.9	24.8	12	23.1	34.3	22	4.9	6.4
3	3.9	27.5	13	19.7	33.1	23	6.4	10.5
4	3.4	26.6	14	7.1	30.3	24	22.6	23.3
5	3.3	25.8	15	6.0	27.7	25	23.5	19.0
6	3.4	24.6	16	11.2	26.2	26	18.9	12.5
7	4.2	24.5	17	15.4	25.4	27	14.9	11.1
8	11.2	23.6	18	13.9	24.7	28	8.3	8.6
9	18.2	15.3	19	6.8	20.2	29	10.4	6.1
10	21.4	10.4	20	6.2	8.2	30	23.1	5.0
						31	-	5.2

Supplemental records.—June 24, 7 p.m., 24.18 ft; June 30, 8 p.m., 25.60 ft; July 12, 11 a.m., 34.55 ft; July 23, 7 p.m., 21.32 ft.

Neosho River at Iola, Kans.

Location.—Lat 37°55', long. 95°24', in SW¼ sec. 27, T. 24 S., R. 18 E., on upstream side of bridge on U. S. Highway 54, one mile west of Iola and 4 miles upstream from U. S. Geological Survey gage. Datum of gage is 928.18 ft above mean sea level, datum of 1929 (levels by Corps of Engineers).
Drainage area.—3,720 square miles.
Gage-height record.—Wire-weight gage read once daily; more frequent readings during flood periods.
Maxima.—May-July 1951: Gage-height, 33.26 ft, 4 a.m., July 13.
1936 to April 1951: Gage-height, 24.75 ft, July 23, 1948.
Remarks.—Records furnished by U. S. Weather Bureau.

Daily stage, in feet, 1951

Day	June	July	Day	June	July	Day	June	July
1	8.3	19.2	11	14.4	18.8	21	8.7	-
2	8.2	18.3	12	16.4	21.6	22	9.0	-
3	8.1	18.0	13	15.8	33.1	23	9.2	-
4	8.0	21.0	14	9.8	29.0	24	14.2	-
5	8.0	20.6	15	9.5	24.9	25	16.6	-
6	8.0	19.8	16	10.0	22.3	26	16.1	-
7	8.2	18.9	17	10.5	21.5	27	12.4	-
8	9.6	17.8	18	11.0	20.0	28	10.0	-
9	11.0	16.7	19	9.2	19.0	29	10.4	-
10	13.2	10.4	20	9.4	10.9	30	17.3	-
						31	-	-

Supplemental records.—June 12, 1 p.m., 16.92 ft; June 30, 11 p.m., 19.50 ft; July 4, 1 p.m., 21.20 ft; July 10, 7 p.m., 17.65 ft; July 11, 6 p.m., 20.10 ft; July 12, 8:30 p.m., 32.80 ft; July 13, 4 a.m., 33.26 ft.

Neosho River near Iola, Kans.

Location.—Lat 37°53', long. 95°26', in NE¼ sec. 9, T. 25 S., R. 18 E., 1 mile downstream from Elm Creek and 3 miles southwest of Iola. Datum of gage is 914.77 ft above mean sea level, datum of 1929 (levels by Corps of Engineers).

Drainage area.—3,818 square miles.

Gage-height record.—Water-stage recorder graph except for periods June 10-11, June 21 to July 2, 2 p.m. July 12 to 6 p.m. July 22.

Discharge record.—Stage-discharge relation defined by current-meter measurements below 84,000 cfs and extended to peak stage on basis of slope-area determination of peak discharge. Discharge for periods June 10-11, June 21 to July 2, and 2 p.m. July 12-19, computed on basis of gage-height record and rating for U. S. Weather Bureau gage 4 miles upstream. Discharge for July 20-22 estimated.

Maxima.—May-July 1951: Discharge, 436,000 cfs 4 a.m. July 13 (gage height, 43.0 ft, from flood-mark).

1895-1903, 1917 to April 1951: Discharge, 83,100 cfs July 23, 1948 (gage height, 34.63 ft).

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	8,400	1,580	27,800	11	6,240	17,400	30,700	21	9,540	2,320	5,200
2	15,100	1,510	23,000	12	5,250	20,300	189,000	22	11,800	3,000	2,500
3	16,000	1,400	24,300	13	5,250	19,100	344,000	23	13,600	6,400	9,200
4	17,300	1,270	41,000	14	4,000	6,290	166,000	24	8,610	18,000	16,700
5	19,500	1,160	39,400	15	2,280	2,630	91,600	25	8,320	20,200	17,400
6	22,600	1,130	31,800	16	2,130	5,700	54,900	26	7,590	18,400	9,980
7	17,200	2,510	26,800	17	4,460	8,750	45,800	27	6,190	12,000	6,380
8	3,130	5,730	23,000	18	3,490	9,480	34,700	28	5,370	6,400	5,050
9	2,590	11,200	18,700	19	7,220	3,780	25,300	29	2,860	11,600	5,000
10	8,590	15,000	18,500	20	8,370	5,140	10,200	30	1,930	23,000	3,610
								31	1,670	-	2,280
Monthly mean discharge, in second-feet									8,277	8,746	43,540
Runoff, in thousand acre-feet									508.9	502.4	2,677
Runoff, in inches									2.50	2.56	13.15

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge
	July 8		July 9		July 10		July 11		July 12		July 13	
2					14.25	11,000	25.52	26,600	29.48	42,400		433,000
4			22.54	21,600	13.80	10,400	25.56	26,700	29.83	44,800		436,000
6					14.75	11,700	25.60	26,800	30.18	47,400		424,000
8			21.95	20,900	17.15	15,000	25.80	27,300	30.80	53,300		396,000
10					18.70	17,000	26.20	28,300	33.30	80,600		367,000
N	23.55	22,900	20.85	19,600	20.70	19,400	26.67	29,600	36.55	115,000		339,000
2					22.15	21,200	27.10	30,800		223,000		317,000
4			19.15	17,600	23.40	22,700	27.52	32,200		314,000		299,000
6					24.25	23,700	27.94	33,900		342,000		278,000
8			17.20	15,100	24.88	25,000	28.32	35,700		374,000		263,000
10					25.26	25,900	28.72	37,800		400,000		246,000
12	22.87	22,000	15.27	12,400	25.44	26,400	29.10	40,100		424,000		230,000
	July 14		July 15		July 16		July 17		July 18		July 19	
2												
4		204,000				61,200						
6								47,700		37,600		28,600
8		180,000				56,700						
10												
N		161,000		90,100		53,000		46,500		34,000		25,600
2												
4		145,000				51,000						
6								44,100		31,600		22,300
8		131,000				49,500						
10												
12		119,000		67,400		48,700		41,000		30,000		19,600
	July 20		July 21		July 22		July 23		July 24		July 25	
2												
4												
6							10.7	6,440	17.9	16,000	19.81	18,400
8												
10												
N							13.2	9,660	18.60	16,900	19.54	18,000
2												
4												
6					6.9	2,460	15.2	12,300	19.16	17,600	18.64	16,900
8												
10												
12					6.7	2,280	16.8	14,500	19.62	18,100	17.00	14,800

Neosho River near Chanute, Kans.

Location.—Lat 37°41', long. 95°25', in sec. 22, T. 27 S., R. 18 E., on downstream side of highway bridge on State Highway 39, 2 miles east of Chanute. Datum of gage is 884.49 ft above mean sea level, datum of 1929 (levels by Corps of Engineers).
Drainage area.—4,207 square miles.
Gage-height record.—Chain gage read frequently during flood periods.
Maxima.—May-July 1951: Gage-height, 38.60, 12 m., July 13.
1934 to April 1951: Gage-height, 30.9 ft, July 23, 1948 (present datum).
1915-34: Gage-height, 29.6 ft, Sept. 14, 1926, (city gage datum then in use).
Remarks.—Records furnished by U. S. Weather Bureau.

Daily stage, in feet, 1951

Day	June	July	Day	June	July	Day	June	July
1	-	25.1	11	16.5	24.8	21	-	13.7
2	-	26.0	12	18.6	26.6	22	-	-
3	-	25.2	13	21.4	38.4	23	10.3	- 4
4	-	25.2	14	17.6	36.5	24	20.0	14.4
5	-	27.3	15	-	32.0	25	22.8	18.3
6	-	27.8	16	-	30.0	26	22.6	16.5
7	-	26.4	17	-	28.6	27	20.2	-
8	-	25.5	18	11.8	27.7	28	11.3	-
9	11.5	24.6	19	-	26.4	29	11.2	-
10	14.8	23.4	20	-	25.0	30	22.0	-
						31	-	-

Supplemental records.—July 2, 7 p.m., 26.20 ft; July 5, 8 p.m., 28.10 ft; July 6, 7 p.m., 27.30 ft; July 9, 6 p.m., 24.30 ft; July 10, 6 p.m., 24.10 ft; July 12, 4 p.m., 27.40 ft; July 13, 12 m, 38.60 ft; July 15, 7 p.m., 30.45 ft.

Neosho River near Erie, Kans.

Location.—Lat 37°33', long. 95°15', in sec. 5, T. 29 S., R. 20 E., at downstream end of first pier from left bank of highway bridge on U. S. Highway 59, 1.3 miles south of Erie. Datum of gage is 858.64 ft above mean sea level, datum of 1929 (levels by Corps of Engineers).
Drainage area.—4,523 square miles.
Gage-height record.—Staff gage readings once daily, more frequently during flood periods.
Maxima.—May-July 1951: Gage-height, 35.10 ft, 2 p.m., July 13.
1947 to April 1951: Gage-height, 28.2 ft, July 24, 1948.
1902-47: Gage height, 28.8 ft, Sept. 14, 1926 and April 9, 1927 (gage maintained by City of Erie, datum uncertain).
Remarks.—Records furnished by U. S. Weather Bureau.

Daily stage, in feet, 1951

Day	June	July	Day	June	July	Day	June	July
1	3.1	25.0	11	15.0	25.6	21	7.2	16.0
2	2.0	25.1	12	16.5	25.0	22	4.6	11.5
3	1.8	26.0	13	19.3	34.0	23	8.0	5.7
4	1.4	26.6	14	19.5	33.9	24	20.0	10.8
5	1.4	27.2	15	7.2	28.4	25	22.0	16.8
6	1.3	25.5	16	3.5	26.0	26	22.0	17.5
7	1.3	25.9	17	8.0	24.8	27	21.5	9.6
8	3.0	25.8	18	10.4	24.2	28	17.0	7.8
9	6.1	25.3	19	10.0	23.6	29	8.5	6.6
10	13.0	25.3	20	4.4	22.9	30	22.0	6.4
						31	-	5.0

Supplemental record.—July 13, 2 p.m., 35.10 ft.

Neosho River near Parsons, Kans.

Location.—Lat 37°20', long. 95°06', in NE¼ sec. 21, T. 31 S., R. 21 E., at bridge on U. S. Highway 160, half a mile upstream from Hickory Creek, three-quarters of a mile upstream from St. Louis-San Francisco Railway bridge, 2½ miles upstream from dam of Kansas Ordnance Plant, and 8½ miles east of Parsons. Datum of gage is 810.25 ft above mean sea level (levels by Corps of Engineers).
Drainage area.—4,817 square miles, including that of Hickory Creek.
Gage-height record.—Water-stage recorder graph, except for period July 14-21, for which a graph was drawn based on high-water mark in gage well and a stage record at the Kansas Gas and Electric Company plant about 3 miles downstream.
Discharge record.—Stage-discharge relation defined by current-meter measurements.
Maxima.—May-July 1951: Discharge, 410,000 cfs 1 to 2 p.m. July 14 (gage height, 40.20 ft, from floodmark in gage well).
1921 to April 1951: Discharge, 87,800 cfs July 27, 1948 (gage height, 30.74 ft).
Remarks.—Small diversion from pool in which gage is located by the Kansas Ordnance Plant.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	1,210	2,060	27,800	11	9,030	13,900	40,100	21	9,220	7,500	39,800
2	8,480	1,890	28,800	12	7,280	16,200	38,900	22	17,800	7,230	30,600
3	14,900	1,780	29,200	13	5,650	18,800	66,000	23	22,400	12,200	15,100
4	16,100	1,660	30,500	14	5,640	20,900	366,000	24	17,300	17,100	8,440
5	16,500	1,530	32,300	15	4,600	12,800	248,000	25	11,400	23,300	14,500
6	18,000	1,420	33,100	16	2,960	3,830	125,000	26	8,640	24,800	17,500
7	20,100	1,590	32,600	17	2,950	6,540	85,800	27	7,980	24,900	14,100
8	21,700	4,600	33,800	18	5,340	8,730	70,200	28	6,980	22,600	7,410
9	9,830	7,410	35,300	19	4,570	9,300	60,200	29	5,830	15,400	5,690
10	4,630	11,200	39,400	20	7,020	5,970	50,300	30	3,830	24,500	5,440
								31	2,430	-	4,350
Monthly mean discharge, in second-feet									9,687	11,050	52,780
Runoff, in thousand acre-feet									5,956	6,578	3,245
Runoff, in inches									2.32	2.56	12.63

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	July 8		July 9		July 10		July 11		July 12		July 13	
2											26.76	38,400
4					26.54	36,100					26.78	38,600
6											26.79	38,700
8					26.89	39,800					26.81	38,900
10											26.82	39,000
N	26.29	33,700	26.47	35,400	27.01	41,100	26.92	40,100	26.80	38,800	26.82	39,000
2											26.83	39,100
4					26.98	40,800					26.92	40,100
6											28.28	55,900
8					26.96	40,600					32.23	115,000
10											35.15	174,000
12	26.40	34,700	26.51	35,800	26.96	40,600	26.86	39,500	26.76	38,400	36.90	232,000
	July 14		July 15		July 16		July 17		July 18		July 19	
2	38.02	?81,000										
4	38.80	320,000										
6	39.40	354,000	38.40	300,000	33.58	139,000	30.75	91,000				
8	33.82	381,000										
10	40.05	398,000										
N	40.18	408,000	37.12	240,000	32.66	122,000	30.32	84,300	29.35	69,900	28.63	60,200
2	40.20	410,000										
4	40.16	407,000										
6	40.02	396,000	35.80	194,000	31.92	110,000	30.03	80,000				
8	39.82	381,000										
10	39.60	366,000										
12	39.36	352,000	34.58	160,000	31.30	99,800	29.78	76,200	28.97	64,600	28.29	56,000
	July 20		July 21		July 22		July 23		July 24		July 25	
2									12.33	6,500		
4					26.30	33,800	22.15	22,400	12.35	6,520		
6									12.47	6,700	16.89	13,500
8					26.08	32,200	19.74	18,000	12.69	7,040		
10									12.99	7,480		
N	27.84	50,600	26.89	39,800	25.77	30,600	17.32	14,100	13.35	8,020	17.68	14,700
2									13.72	8,580		
4					25.36	29,100	15.36	11,200	14.10	9,160		
6									14.59	9,940	18.32	15,600
8					24.80	27,600	13.60	8,400	15.01	10,600		
10									15.41	11,300		
12	27.26	43,900	26.48	35,500	23.85	25,700	12.48	6,720	15.87	12,000	18.86	16,500

Supplemental record.—July 14, 1 p.m., 40.20 ft, 410,000 cfs.

Neosho River at Oswego, Kans.

Location.—Lat 37°10', long. 95°06', in NE¼NE¼ sec. 16, T. 33 S., R. 21 E., on downstream handrail of second span from right bank of county bridge, 1 mile northeast of Oswego, 2 miles upstream from Lightning Creek, and 3½ miles upstream from bridge on State Highway 96. Records include flow of Lightning Creek. Datum of gage is 790.86 ft above mean sea level, datum of 1929 (levels by Corps of Engineers).

Drainage area.—5,190 square miles, includes that of Lightning Creek.

Gage-height record.—Graph based on one or more daily wire-weight gage readings.

Discharge record.—Stage-discharge relation defined by current-meter measurements below 336,000 cfs and extended to peak stage by logarithmic plotting.

Maximum.—May-July 1951: Discharge, 395,000 cfs 12 p.m. July 14 (gage height, 32.5 ft).

Remarks.—Wire-weight gage readings furnished by U. S. Weather Bureau. Only records for flood period, July 10-22, have been computed.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1				11			46,400	21			43,400
2				12			48,600	22			35,200
3				13			45,100	23			
4				14			274,000	24			
5				15			303,000	25			
6				16			165,000	26			
7				17			106,000	27			
8				18			79,000	28			
9				19			63,900	29			
10			39,400	20			53,500	30			
								31			
Monthly mean discharge, in second-feet									-	-	-
Runoff, in acre-feet									-	-	-
Runoff, in inches									-	-	-

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	July 8		July 9		July 10		July 11		July 12		July 13	
2												
4												
6												
8					23.40	37,700	24.10	46,000			24.15	46,800
10												
N									24.30	49,000		
2												
4					23.70	40,500	24.15	46,800			24.00	44,500
6												
8												
10												
12					24.00	44,500	24.25	48,200	24.25	48,200	23.65	40,000
	July 14		July 15		July 16		July 17		July 18		July 19	
2	23.70	40,500										
4	24.00	44,500	32.20	371,000								
6	28.00	137,000			29.20	185,000						
8	30.85	276,000	31.70	334,000			27.20	111,000	26.05	81,200		
10	31.60	327,000										
N	31.95	352,000	31.25	302,000	28.70	163,000					25.20	63,500
2	32.10	363,000										
4	32.25	375,000	30.70	267,000			26.75	98,800	25.80	75,500		
6	32.35	383,000			28.15	142,000						
8	32.40	387,000	30.20	237,000								
10	32.45	391,000										
12	32.5	395,000	29.80	215,000	27.70	126,000	26.40	90,000	25.55	70,500	24.90	58,000
	July 20		July 21		July 22		July 23		July 24		July 25	
2												
4												
6												
8												
10												
N	24.60	53,500	23.90	43,100	23.05	35,200						
2												
4												
6												
8												
10												
12	24.30	49,000	23.50	38,500	22.45	32,000						

Neosho River near Commerce, Okla.

Location.—Lat 36°56', long. 94°57', in SW¼SE¼ sec. 5, T. 28 N., R. 22 E., at county highway bridge, 1¼ miles upstream from Mud Creek, 1-3/4 miles downstream from Four Mile Creek, 4½ miles west of Commerce and at mile 153.4. Datum of gage is 748.97 ft above mean sea level, datum of 1929 (Corps of Engineers bench mark).

Drainage area.—5,876 square miles.

Gage-height record.—Water-stage recorder graph except for period 4 a.m. July 15 to 2 p.m. July 19, for which a graph was drawn based on floodmark, observed crest time, and wire-weight gage readings on July 17.

Discharge record.—Stage-diacharge relation at gage site defined by current-meter measurements except for period July 15-19, for which discharge was computed by flood-routing method from hydrograph determined for station at Miami. Shifting-control method or backwater rating used May 1, 2, May 31 to June 8, July 1-4, 11-14, 20-25.

Maxima.—May-July 1951: Discharge, 267,000 cfs 6 p.m. July 15; gage height, 34.03 ft, from floodmark, 2 to 3 a.m. July 16, from information by local resident.
1939 to April 1951: Discharge, 105,000 cfs May 20, 1943 (gage height, 25.12 ft).
Maximum discharge known prior to July 1951, that of May 20, 1943.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	1,590	2,260	36,200	11	7,060	12,500	37,900	21	8,820	14,000	54,300
2	3,920	1,950	41,000	12	9,620	16,400	42,500	22	12,700	18,400	45,200
3	12,000	1,790	39,000	13	6,420	20,000	43,200	23	19,600	20,400	37,900
4	15,200	1,640	35,300	14	5,940	19,300	67,400	24	21,800	17,300	26,600
5	16,000	1,510	35,300	15	5,460	19,800	251,000	25	17,400	19,100	13,800
6	16,700	1,360	34,400	16	4,600	9,520	225,000	26	10,600	22,000	16,200
7	18,900	1,710	33,600	17	3,400	4,820	145,000	27	8,820	23,300	17,400
8	19,600	2,800	33,200	18	4,960	7,540	101,000	28	8,180	23,900	12,500
9	20,000	7,060	32,900	19	5,780	9,780	78,300	29	6,420	25,100	7,220
10	8,100	10,300	33,900	20	5,620	12,700	65,200	30	5,300	33,200	5,780
								31	3,190	-	5,620
Monthly mean discharge, in second-feet									10,120	12,710	53,350
Runoff, in thousand acre-feet									622.2	756.6	3,280
Runoff, in inches									1.99	2.41	10.47

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge
	July 8		July 9		July 10		July 11		July 12		July 13	
2												
4					19.29	32,700						
6	19.36	33,300	19.32	33,000			19.87	36,600	20.42	42,000	20.56	43,400
8					19.31	32,900						
10												
N	19.34	33,100	19.31	32,900	19.31	32,900	19.95	37,400	20.50	42,800	20.55	43,300
2												
4					19.53	34,700						
6	19.34	33,100	19.30	32,800			20.11	38,900	20.54	43,200	20.53	43,100
8					19.63	35,600						
10												
12	19.33	33,000	19.29	32,700	19.74	36,600	20.28	40,600	20.55	43,300	20.52	43,000
	July 14		July 15		July 16		July 17		July 18		July 19	
2			28.00	214,000	33.99	255,000	31.51	172,000				
4			28.81	232,000	33.99	251,000	31.22	166,000				
6	20.53	43,100	29.55	242,000	33.92	246,000	30.93	159,000	27.63	108,000	25.18	82,100
8			30.27	250,000	33.77	239,000	30.63	154,000				
10			30.98	257,000	33.60	234,000	30.31	149,000				
N	20.56	44,100	31.60	262,000	33.37	227,000	30.02	144,000	26.94	100,000	24.67	77,800
2	20.58	44,900	32.21	264,000	33.13	221,000	29.73	139,000				
4	20.71	50,000	32.75	266,000	32.89	214,000	29.45	135,000				
6	21.45	65,000	33.20	267,000	32.62	206,000	29.18	130,000	26.28	93,000	24.22	74,300
8	23.45	110,000	33.55	266,000	32.36	196,000	28.91	126,000				
10	25.70	161,000	33.80	264,000	32.08	188,000	28.64	122,000				
12	27.10	192,000	33.95	260,000	31.81	180,000	28.38	118,000	25.70	87,200	23.80	71,100
	July 20		July 21		July 22		July 23		July 24		July 25	
2												
4												
6	23.39	68,200	22.09	56,800	21.10	47,200	20.29	39,500	19.45	32,100	12.30	12,900
8												
10												
N	23.03	65,200	21.86	54,600	20.90	45,200	20.12	37,700	18.72	28,000	11.48	13,000
2												
4												
6	22.69	62,200	21.57	51,500	20.67	43,000	19.98	36,500	16.75	21,300	11.58	14,000
8												
10												
12	22.39	59,400	21.34	49,400	20.46	41,100	19.76	34,500	14.25	16,000	11.94	14,800

Neosho River at Miami, Okla.

Location.—Lat 36°52', long. 94°53', in NE¼NW¼ sec. 31, T. 28 N., R. 23 E., at bridge on U. S. Highway 66 at Miami, 2 miles upstream from Tar Creek, 2¼ miles downstream from Coal Creek, and at mile 144.2. Datum of gage is 1.10 ft above mean sea level, datum of 1929 (Corpa of Engineers bench mark).

Drainage area.—6,000 square milea.

Gage-height record.—Water-stage recorder graph except for period 7 p.m. July 15 to 8 p.m. July 16, for which graph was drawn based on frequent readings of staff gage.

Discharge record.—Stage-discharge relation defined by current-meter measurements and computed inflow for Lake O'The Cherokees.

Maxima.—July 1951: Discharge, 254,000 cfa 3-5 a.m. July 16 (gage height, 778.53 ft).
Maximum stage known prior to July 1951, 768.37 ft May 20, 1943, from gage reading on crest (discharge, 105,000 cfs).

Remarks.—Water-stage recorder graph furnished by Grand River Dam Authority.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1				11				21			62,700
2				12				22			53,300
3				13				23			44,500
4				14			44,100	24			
5				15			174,000	25			
6				16			238,000	26			
7				17			170,000	27			
8				18			119,000	28			
9				19			92,200	29			
10				20			74,900	30			
								31			
Monthly mean discharge, in second-feet									-	-	-
Runoff, in acre-feet									-	-	-
Runoff, in inchea									-	-	-

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	July 14		July 15		July 16		July 17		July 18	
2			763.90	78,500	778.44	253,000				
4			766.95	96,200	778.53	254,000	776.37	191,000	772.54	132,000
6			769.30	113,000	778.52	253,000				
8			771.90	140,000	778.47	251,000	775.76	179,000	771.88	124,000
10			773.90	168,000	778.40	248,000				
N	757.77	43,100	775.12	189,000	778.27	243,000	775.07	168,000	771.32	118,000
2			776.02	206,000	778.12	238,000				
4			776.78	221,000	777.95	231,000	774.42	158,000	770.74	112,000
6	757.70	43,100	777.35	234,000	777.75	225,000				
8	757.77	43,800	777.71	241,000	777.55	218,000	773.77	149,000	770.20	107,000
10	758.30	47,300	778.01	246,000	777.28	211,000				
12	760.10	57,000	778.25	250,000	776.99	205,000	773.15	140,000	769.67	103,000
	July 19		July 20		July 21		July 22		July 23	
2										
4	769.14	99,000								
6			766.35	78,500	764.13	65,200	762.23	55,500	760.44	46,700
8	768.64	95,500								
10										
N	768.18	91,800	765.79	74,700	763.65	62,600	761.80	53,300	759.97	44,600
2										
4	767.74	88,500								
6			765.20	71,100	763.16	60,000	761.34	51,100	759.49	42,200
8	767.33	85,700								
10										
12	766.93	82,700	764.65	68,000	762.70	57,800	760.89	48,900	759.03	40,000

Lake O' The Cherokees at Langley, Okla.

Location.—Lat 36°28', long. 95°02', in SW¼ sec. 14, T. 23 N., R. 21 E., on upstream side of pier at intake structure near right end of Pensacola Dam on Neosho River at Langley, 5 miles east of Pensacola, 9.9 miles upstream from Big Cabin Creek, and at mile 77.0. Datum of gage is 1.10 ft above mean sea level, datum of 1929 (Corps of Engineers bench mark).

Drainage area.—10,298 square miles.

Gage-height record.—Water-stage recorder graph.

Maxima.—May-July 1951: Contents, 2,195,000 acre-feet 5 p.m. July 18 (gage height, 754.96 ft).
1940 to April 1951: Contents, 2,172,000 acre-feet May 20, 1943, June 26, 27, 1948 (gage height, 754.57 ft).

Remarks.—Reservoir is formed by multiple-arch concrete dam, with top of taintor-type spillway gates at gage height 755.0 ft. Storage began Mar. 21, 1940; power-pool stage was first reached Apr. 19, 1941. Capacity between gage heights 682.0 ft (sill of powerhouse penstock) and 745.0 ft (maximum power pool) is 1,492,000 acre-feet. Capacity between gage heights 745.0 ft and 755.0 ft is 525,000 acre-feet and is reserved for flood control. Dead storage below gage height 682.0 ft is 180,200 acre-feet. Reservoir is utilized for power development and flood control. Figures given represent total contents.

Elevation, in feet, and contents, in acre-feet, at 12 p.m. of indicated day

Day	May		June		July	
	Elevation	Contents	Elevation	Contents	Elevation	Contents
1	744.63	1,655,000	744.95	1,670,000	753.08	2,084,000
2	744.65	1,656,000	744.87	1,666,000	753.54	2,111,000
3	744.84	1,665,000	744.95	1,670,000	753.21	2,092,000
4	744.84	1,665,000	744.80	1,663,000	752.99	2,079,000
5	744.91	1,668,000	744.67	1,657,000	752.84	2,071,000
6	744.93	1,669,000	744.57	1,652,000	752.20	2,035,000
7	744.88	1,666,000	744.62	1,654,000	751.54	1,999,000
8	744.86	1,666,000	744.58	1,653,000	750.94	1,967,000
9	745.08	1,676,000	744.84	1,665,000	750.42	1,939,000
10	745.03	1,673,000	745.27	1,685,000	750.39	1,938,000
11	745.07	1,675,000	745.45	1,693,000	749.99	1,916,000
12	745.37	1,689,000	745.65	1,703,000	749.11	1,872,000
13	745.57	1,699,000	745.84	1,712,000	748.06	1,819,000
14	745.40	1,691,000	745.79	1,709,000	746.69	1,752,000
15	745.19	1,681,000	745.75	1,707,000	748.28	1,830,000
16	745.16	1,680,000	745.45	1,693,000	753.12	2,087,000
17	745.10	1,677,000	745.12	1,678,000	754.80	2,185,000
18	745.09	1,676,000	745.15	1,679,000	754.73	2,181,000
19	745.15	1,679,000	745.37	1,689,000	754.60	2,173,000
20	745.25	1,684,000	745.73	1,706,000	754.42	2,163,000
21	745.48	1,695,000	745.96	1,717,000	754.05	2,141,000
22	745.92	1,715,000	746.88	1,761,000	753.31	2,098,000
23	746.30	1,733,000	747.42	1,788,000	752.25	2,038,000
24	746.39	1,738,000	747.68	1,800,000	750.91	1,965,000
25	746.37	1,737,000	748.27	1,830,000	749.06	1,869,000
26	746.05	1,721,000	748.44	1,838,000	747.52	1,792,000
27	745.75	1,707,000	748.29	1,830,000	746.27	1,732,000
28	745.37	1,689,000	748.25	1,828,000	745.41	1,691,000
29	745.10	1,677,000	749.19	1,876,000	745.38	1,690,000
30	745.17	1,680,000	751.70	2,008,000	745.27	1,685,000
31	745.08	1,676,000			745.13	1,678,000

Neosho River near Langley, Okla.
(Below Spring River, known locally as Grand River)

Location.—Lat 36°26', long. 95°03', in SE¼ sec. 27, T. 23 N., R. 21 E., on left bank, 2 miles south of Langley, 3.6 miles downstream from Pensacola Dam, 6.3 miles upstream from Big Cabin Creek, and at mile 73.4. Datum of gage is 607.65 ft above mean sea level, datum of 1929 (Corps of Engineers bench mark).

Drainage area.—10,335 square miles.

Gage-height record.—Water-stage recorder graph.

Discharge record.—Stage-discharge relation defined by current-meter measurements. Shifting-control method used May 23 to July 8, July 25-31.

Maxima.—May-July 1951: Discharge, 158,000 cfs 12:15 a.m. July 18 (gage height, 36.25 ft).
1939 to April 1951: Discharge, 300,000 cfs May 20, 1943 (gage height, 45.5 ft, from floodmark), from computation of outflow from Lake O' The Cherokees.
Maximum stage known, that of May 20, 1943.

Remarks.—Flow regulated by Lake O' The Cherokees (see preceding page).

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	5,920	5,980	43,400	11	9,020	8,970	63,100	21	5,790	13,700	79,400
2	6,360	5,420	56,100	12	5,960	13,400	81,600	22	5,470	18,500	81,200
3	9,430	2,200	67,700	13	3,930	16,900	82,900	23	11,800	25,900	81,000
4	16,500	4,940	64,300	14	10,900	22,000	82,400	24	20,800	22,600	78,300
5	17,600	5,410	65,300	15	12,600	21,200	87,900	25	21,200	8,540	69,600
6	17,600	4,740	63,800	16	7,560	20,800	94,400	26	20,100	18,600	57,700
7	20,100	5,600	59,400	17	6,200	15,000	130,000	27	17,600	28,900	49,500
8	20,400	5,190	54,200	18	5,620	8,770	137,000	28	18,600	28,900	37,800
9	16,600	4,320	52,100	19	5,820	6,260	113,000	29	14,900	32,800	11,200
10	14,200	2,560	50,700	20	4,520	8,510	89,900	30	4,760	36,100	8,500
								31	6,010	-	12,200
Monthly mean discharge, in second-feet									11,740	14,090	67,920
Runoff, in thousand acre-feet									721.7	838.4	4,176
Runoff, in inches									1.31	1.52	7.58

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
	July 8		July 9		July 10		July 11		July 12		July 13	
2	20.87	54,500	20.04	50,100	19.75	48,800	19.57	47,900	25.96	79,000	27.07	84,600
4	20.38	52,200	19.81	49,000	19.32	46,800	19.28	46,600	25.56	77,000	26.56	82,000
6	20.25	51,500	19.70	48,500	19.25	46,400	19.23	46,400	25.31	75,800	26.21	80,200
8	20.20	51,300	19.98	49,800	19.95	49,700	19.77	48,800	25.48	76,600	26.31	80,800
10	20.60	53,200	20.70	53,200	20.32	51,400	20.38	51,700	25.93	78,800	26.74	82,900
N	20.86	54,400	20.93	54,300	20.53	52,400	23.07	64,600	26.49	81,600	26.84	83,400
2	21.07	55,400	20.90	54,100	20.53	52,400	24.33	70,800	26.61	82,200	26.78	83,000
4	21.07	55,400	20.95	54,400	20.60	52,700	24.58	72,100	26.67	82,600	26.71	82,800
6	21.11	55,600	20.75	53,400	20.45	52,000	25.80	78,200	27.14	85,000	26.86	83,500
8	21.02	55,100	20.65	53,000	20.40	51,800	26.43	81,400	27.61	87,600	26.84	83,400
10	21.11	55,600	20.70	53,200	20.45	52,000	26.68	82,600	27.66	87,800	26.78	83,100
12	20.64	53,400	20.40	51,800	20.29	51,300	26.56	82,000	27.57	87,300	26.58	82,100
	July 14		July 15		July 16		July 17		July 18		July 19	
2	25.86	78,500	27.13	84,900	27.73	88,200	31.53	115,000	36.18	158,000	33.20	130,000
4	25.33	75,800	27.47	86,800	27.84	88,800	31.66	116,000	36.08	157,000	33.66	134,000
6	25.04	74,400	27.37	86,200	27.60	87,500	31.80	117,000	35.68	153,000	31.91	118,000
8	25.68	77,600	27.40	86,400	28.02	89,800	32.30	122,000	35.60	152,000	31.96	119,000
10	26.62	82,300	27.40	86,400	26.96	84,000	32.76	126,000	34.05	137,000	31.58	115,000
N	26.80	83,200	27.23	85,500	27.64	87,700	33.01	128,000	32.14	120,000	31.16	112,000
2	27.23	85,500	27.82	88,700	28.71	94,000	33.23	130,000	31.37	113,000	30.93	110,000
4	27.28	85,700	28.10	90,300	29.39	98,300	33.44	132,000	31.49	115,000	30.03	103,000
6	27.40	86,400	28.04	89,900	30.15	104,000	34.25	139,000	32.84	127,000	29.56	99,500
8	27.53	87,100	27.90	89,200	30.23	104,000	35.20	148,000	33.59	133,000	29.39	98,300
10	27.64	87,700	28.36	91,900	30.52	106,000	36.08	157,000	33.82	135,000	29.31	97,800
12	27.48	86,800	28.00	89,700	30.95	110,000	36.25	158,000	33.82	135,000	29.20	97,000
	July 20		July 21		July 22		July 23		July 24		July 25	
2	28.99	95,600	25.78	77,500	26.65	82,300	25.97	78,500	25.53	76,100	24.82	71,800
4	28.78	94,400	25.65	76,800	26.46	81,200	25.78	77,500	25.21	74,400	24.38	69,600
6	28.46	92,500	25.56	76,300	26.25	80,100	25.75	77,300	25.07	73,600	24.30	69,200
8	28.68	93,800	25.72	77,200	26.27	80,200	25.85	77,900	25.45	75,700	24.55	70,400
10	28.47	92,500	25.90	78,200	26.40	80,900	26.55	81,700	26.13	79,400	24.94	72,400
N	28.27	91,300	25.95	78,400	26.56	81,800	26.95	83,900	26.50	81,400	24.85	72,000
2	28.09	90,200	25.95	78,400	26.60	82,000	26.98	84,100	26.51	81,500	24.65	71,000
4	28.06	90,100	25.90	78,200	26.47	81,300	26.97	84,000	26.47	81,300	24.44	69,900
6	27.36	86,200	26.59	81,900	26.41	81,000	26.76	82,900	26.27	80,200	23.95	67,400
8	26.69	82,500	26.89	83,600	26.37	80,700	26.67	82,400	26.15	79,500	23.78	66,600
10	26.40	80,900	27.07	84,600	26.41	81,000	26.60	82,000	26.05	79,000	23.53	65,400
12	26.15	79,500	26.93	83,800	26.23	80,000	26.15	79,500	25.54	76,200	23.15	63,400

Supplemental records.—July 16, 9 a.m., 28.08 ft, 90,200 cfs, 10:40 a.m., 26.40 ft, 75,400 cfs; July 17, 5 p.m., 33.59 ft, 133,000 cfs; July 18, 12:15 a.m., 36.25 ft, 158,000 cfs, 3 p.m., 31.26 ft, 112,000 cfs; July 19, 9 a.m., 32.07 ft, 120,000 cfs; July 20, 8:45 a.m., 28.78 ft, 94,400 cfs.

Fort Gibson Reservoir near Fort Gibson, Okla.

Location.—Lat 35°52', long. 95°14', in NW¼NW¼ sec. 18, T. 16 N., R. 20 E., in control tower near left end of Fort Gibson Dam on Neosho River, 4 miles north of Fort Gibson and 7.7 miles upstream from mouth. Datum of gage is at mean sea level, datum of 1929.

Drainage area.—12,492 square miles.

Gage-height record.—Water-stage recorder except for periods May 1-4, 19-24, May 30 to June 15, June 17, 18, 20, July 6, 7, for which a graph was drawn based on twice-daily staff-gage readings.

Maxima.—May-July 1951: Contents, 554,500 acre-feet 8:30 a.m. July 20 (elevation, 562.50 ft).

Remarks.—Reservoir is formed by a concrete gravity and earth fill dam. Regulated storage began Sept. 5, 1949. Capacity, 1,284,000 acre-feet at elevation 582.0 ft (flood control pool) and 365,200 acre-feet at elevation 554.0 ft (maximum power pool). Reservoir was designed for flood control and power development. Figures given herein represent total contents. Records furnished by Corps of Engineers.

Elevation, in feet, and contents, in acre-feet, at 12 p.m. of indicated day

Day	May		June		July	
	Elevation	Contents	Elevation	Contents	Elevation	Contents
1		55,450		89,300		341,600
2		57,650		77,320		341,800
3		58,480		60,450		342,200
4		64,410		45,870		339,800
5		77,250		46,330		337,900
6		89,380		48,950		335,900
7		105,000		51,650		330,500
8		120,900		54,080		324,200
9		136,400		59,360		320,600
10		141,800		62,850		317,900
11		140,800		58,970		322,200
12		128,200		64,350		346,300
13		114,100		71,600		355,700
14		98,000		94,320		356,500
15		105,000		111,800		361,000
16		97,700		133,100		364,200
17		87,350		152,800		395,500
18		75,920		143,500		486,600
19		66,330		130,700		548,800
20		54,900		120,100		543,600
21		46,380		125,100		509,400
22		43,520		135,800		485,300
23		45,410		171,100		456,700
24		62,550		198,100		418,300
25		80,050		197,200		368,000
26		97,730		18[illegible],900		340,600
27		109,800		218,800		324,400
28		118,300		248,300		312,500
29		128,500		274,600		276,500
30		120,000		315,900		250,100
31		102,300		-		246,000

Arkansas River near Muskogee, Okla.

Location. —Lat 35°46', long. 95°18', in NW¼ sec. 21, T. 15 N., R. 19 E., on downstream side of left pier of bridge on U. S. Highway 62, 1.7 miles downstream from Neosho River, 3½ miles northeast of Muskogee, and at mile 457.8. Datum of gage is 471.38 ft above mean sea level, datum of 1929 (Corps of Engineers bench mark).

Drainage area. —96,409 square miles (revised).

Gage-height record. —Water-stage recorder graph.

Discharge record. —Stage-discharge relation defined by current-meter measurements. Shifting-control method used July 6-16.

Maxima. —May-July 1951: Discharge, 242,000 cfs 10 a.m. July 5; gage height, 31.40 ft 10:30 p.m. July 17.

1935 to April 1951: Discharge, 700,000 cfs May 21, 1943 (gage height, 48.20 ft).

Flood of May 21, 1943, is greatest known since June 1833 when a similar stage was probably reached.

Remarks. —Natural flow regulated by reservoirs above station.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	9,920	53,300	152,000	11	29,400	80,000	142,000	21	130,000	39,800	192,000
2	13,900	46,200	176,000	12	31,400	67,000	149,000	22	137,000	49,000	180,000
3	54,500	37,600	212,000	13	28,800	53,300	164,000	23	96,000	73,000	173,000
4	85,000	31,400	228,000	14	32,000	51,500	162,000	24	100,000	81,000	169,000
5	81,000	24,400	239,000	15	30,000	58,700	184,000	25	128,000	92,700	160,000
6	70,000	20,800	215,000	16	26,000	57,800	220,000	26	130,000	104,000	119,000
7	56,900	23,900	195,000	17	23,900	59,600	235,000	27	99,300	126,000	107,000
8	41,400	26,000	186,000	18	22,800	45,400	236,000	28	79,000	128,000	95,800
9	36,200	34,800	159,000	19	28,200	44,600	223,000	29	62,300	119,000	69,800
10	32,000	60,500	144,000	20	96,400	46,200	202,000	30	58,700	116,000	46,000
								31	57,800	-	38,300
Monthly mean discharge, in second-feet									61,540	61,720	166,900
Runoff, in thousand acre-feet									3,784	3,672	10,260
Runoff, in inches									0.74	0.71	2.00

Gage height, in feet, and discharge, in second-feet, at indicated time, 1951

Hour	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge	Gage height	Dis-charge
	July 8		July 9		July 10		July 11		July 12		July 13	
2	27.44	192,000	26.17	170,000	24.73	146,000	24.48	143,000	24.38	143,000	25.71	160,000
4	27.43	192,000	26.00	168,000	24.68	145,000	24.48	143,000	24.46	144,000	25.83	161,000
6	27.40	191,000	25.82	165,000	24.65	145,000	24.47	142,000	24.56	145,000	25.98	163,000
8	27.37	191,000	25.70	163,000	24.63	144,000	24.46	142,000	24.66	146,000	26.08	164,000
10	27.33	190,000	25.57	160,000	24.60	144,000	24.43	142,000	24.78	147,000	26.18	165,000
N	27.27	190,000	25.43	159,000	24.55	143,000	24.41	142,000	24.90	149,000	26.24	166,000
2	27.14	187,000	25.30	156,000	24.54	143,000	24.38	141,000	25.03	150,000	26.27	166,000
4	27.00	185,000	25.18	155,000	24.52	143,000	24.36	141,000	25.12	151,000	26.27	166,000
6	26.84	182,000	25.03	152,000	24.50	143,000	24.32	141,000	25.20	152,000	26.24	166,000
8	26.68	179,000	24.92	150,000	24.48	143,000	24.30	140,000	25.30	154,000	26.20	166,000
10	26.50	176,000	24.86	148,000	24.48	143,000	24.30	140,000	25.40	155,000	26.18	165,000
12	26.31	173,000	24.80	148,000	24.50	143,000	24.33	141,000	25.54	156,000	26.12	165,000
	July 14		July 15		July 16		July 17		July 18		July 19	
2	26.08	165,000	25.90	164,000	29.37	211,000	30.71	230,000	31.23	237,000	31.00	234,000
4	26.03	165,000	26.17	168,000	29.58	213,000	30.78	231,000	31.21	237,000	30.88	232,000
6	25.98	164,000	26.44	171,000	29.76	216,000	30.88	232,000	31.15	236,000	30.76	231,000
8	25.92	163,000	26.75	175,000	29.90	217,000	30.98	234,000	31.12	236,000	30.67	229,000
10	25.88	163,000	27.08	179,000	30.03	219,000	31.08	235,000	31.17	236,000	30.56	228,000
N	25.83	162,000	27.42	184,000	30.14	221,000	31.03	234,000	31.09	235,000	30.30	224,000
2	25.78	162,000	27.75	188,000	30.25	222,000	31.06	235,000	31.12	236,000	30.10	221,000
4	25.70	161,000	28.08	192,000	30.34	223,000	31.16	236,000	31.15	236,000	29.88	218,000
6	25.63	160,000	28.35	196,000	30.43	225,000	31.28	238,000	31.20	237,000	29.60	215,000
8	25.60	160,000	28.66	200,000	30.50	226,000	31.34	239,000	31.23	237,000	29.28	211,000
10	25.63	160,000	28.92	203,000	30.58	227,000	31.38	239,000	31.23	237,000	29.08	208,000
12	25.70	161,000	29.15	206,000	30.67	228,000	31.33	239,000	31.14	236,000	29.00	207,000
	July 20		July 21		July 22		July 23		July 24		July 25	
2	28.90	206,000	28.25	197,000	27.12	183,000	26.48	174,000	26.32	172,000	26.12	170,000
4	28.80	204,000	28.19	196,000	27.02	181,000	26.39	173,000	26.20	171,000	26.02	168,000
6	28.72	203,000	28.11	195,000	26.91	180,000	26.30	172,000	26.08	169,000	25.88	167,000
8	28.68	203,000	28.02	194,000	26.82	179,000	26.23	171,000	25.93	167,000	25.80	166,000
10	28.60	202,000	27.93	193,000	26.83	179,000	26.12	170,000	25.82	166,000	25.63	164,000
N	28.62	202,000	27.85	192,000	26.92	180,000	26.27	172,000	25.70	164,000	25.43	161,000
2	28.63	202,000	27.76	191,000	26.92	180,000	26.40	173,000	25.85	166,000	25.14	158,000
4	28.59	202,000	27.67	190,000	26.90	180,000	26.43	174,000	26.00	168,000	24.95	155,000
6	28.50	200,000	27.55	188,000	26.82	179,000	26.58	176,000	26.10	169,000	24.70	152,000
8	28.44	200,000	27.45	187,000	26.73	177,000	26.61	176,000	26.20	171,000	24.49	150,000
10	28.40	199,000	27.34	185,000	26.65	176,000	26.53	175,000	26.18	170,000	24.23	147,000
12	28.32	198,000	27.23	184,000	26.58	176,000	26.45	174,000	26.12	170,000	23.88	143,000

Arkansas River near Sallisaw, Okla.

Location.—Lat 35°21', long. 94°46', in SW¼ sec. 9, T. 10 N., R. 24 E., near center of span on downstream side of pier of bridge on State Highway 59, 3.9 miles downstream from San Bois Creek, 7½ miles south of Sallisaw, and at mile 395.0. Datum of gage is 413.42 ft above mean sea level, datum of 1929 (levels by Corps of Engineers).
Drainage area.—147,491 square miles
Gage-height record.—Water-stage recorder graph.
Discharge record.—Stage-discharge relation defined by current-meter measurements. Shifting-control method used May 1-15, 22-25, May 27 to July 3, July 5-8, 10-17, 19, 21-31.
Maxima.—May-July 1951: Discharge, 253,000 cfs 1 a.m. July 6. Gage height, 25.84 ft 12:30 a.m. July 19.
1947 to April 1951: Discharge, 442,000 cfs May 12, 1950 (gage height, 31.04 ft).
Maximum stage known, 37.90 ft May 11, 1943.
Remarks.—Natural flow regulated by reservoirs above station. Records collected and computed by Corps of Engineers and reviewed by Geological Survey.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	14,700	61,100	142,000	11	38,400	95,000	158,000	21	155,000	57,200	203,000
2	22,600	52,700	173,000	12	36,400	117,000	152,000	22	176,000	53,600	185,000
3	32,000	46,700	202,000	13	37,100	111,000	163,000	23	148,000	66,100	170,000
4	73,300	39,000	225,000	14	35,200	83,900	172,000	24	117,000	82,700	166,000
5	95 000	34,100	243,000	15	37,100	88,700	172,000	25	133,000	91,100	161,000
6	86,500	28,100	248,000	16	35,200	98,900	199,000	26	148,000	102,000	142,000
7	75.700	27,600	220,000	17	32,000	92,400	223,000	27	126,000	118,000	112,000
8	57,700	35,500	205,000	18	29,600	78,000	238,000	28	100,000	139,000	103,000
9	46,000	61,100	191,000	19	46,100	61,100	243,000	29	85,100	136,000	88,700
10	42,400	61,100	169,000	20	101,000	59,100	225,000	30	70,300	124,000	65,100
								31	64,100	-	47,500
Monthly mean discharge, in second-feet									74,080	76,730	174,400
Runoff, in thousand acre-feet									4,555	4,566	10,720
Runoff, in inches									0.58	0.58	1.36

Arkansas River at Van Buren, Ark.

Location.—Lat 35°26', long. 94°22', in sec. 24, T. 9 N., R. 32 W., at Van Buren, 1½ miles downstream from Lee Creek and 8½ miles downstream from Poteau River. Datum of gage is 372.36 ft above mean sea level, datum of 1929.
Drainage area.—150,218 square miles.
Gage-height record.—Water-stage recorder graph.
Discharge record.—Stage-discharge relation defined by current-meter measurements.
Maxima.—May-July 1951: Discharge, 250,000 cfs 2 p.m. July 6 (gage height, 26.76 ft); maximum gage height, 26.92 ft 9 p.m. July 19.
1927 to April 1951: Discharge, 850,000 cfs May 12, 1943 (gage height, 38.0 ft), maximum gage height, 38.1 ft, April 16, 1945.

Mean discharge, in second-feet, 1951

Day	May	June	July	Day	May	June	July	Day	May	June	July
1	16,400	65,200	129,000	11	44,400	106,000	156,000	21	129,000	64,200	207,000
2	21,400	58,600	169,000	12	38,600	130,000	153,000	22	162,000	59,500	191,000
3	28,100	51,300	207,000	13	38,600	135,000	156,000	23	153,000	64,200	178,000
4	61,400	43,500	232,000	14	37,000	106,000	167,000	24	119,000	83,000	169,000
5	92,800	37,000	244,000	15	37,000	91,600	167,000	25	113,000	94,000	165,000
6	94,000	30,200	247,000	16	37,600	104,000	173,000	26	137,000	104,000	158,000
7	82,000	26,700	232,000	17	33,200	98,800	207,000	27	138,000	113,000	129,000
8	71,000	33,200	207,000	18	30,200	91,600	226,000	28	114,000	134,000	112,000
9	54,900	70,000	191,000	19	28,800	72,000	235,000	29	96,400	140,000	104,000
10	47,800	89,400	169,000	20	77,000	63,300	229,000	30	81,000	130,000	84,000
								31	69,000	-	62,400
Monthly mean discharge, in second-feet									73,660	82,980	176,000
Runoff, in thousand acre-feet									4,529	4,937	10,820
Runoff, in inches									0.57	0.62	1.35

SUMMARY OF FLOOD STAGES AND DISCHARGES

The determinations of maximum flood flows at existing stream-gaging stations and other places on streams in the area covered by this report are summarized and presented in table 6. The time of day in this table is for standard time; the reference number is applicable to plate 5 and will aid in identifying the place where the discharge was determined.

The discharges for the existing stream-gaging stations were determined by methods described in greater detail in the records for the stations in the section: Stages and discharges at stream-gaging stations. When the recorded discharge was measured at miscellaneous points, a headnote is used to show the method of determination.

Figure 22 shows the flood discharges, in second-feet per square mile, which are listed in table 6, plotted against the corresponding drainage areas. In this connection it should be understood that, except for a small number of items, as indicated in the table, the discharges are given as observed; and some may be affected by artificial storage, release of water resulting from failure of dams, or other similar factors, about which available information is presented in the preceding section: Stages and discharges at stream-gaging stations.

The basic data and computations for the determinations of discharge are filed in the district offices of the Geological Survey in the several districts where the floods occurred and may be examined in those offices.

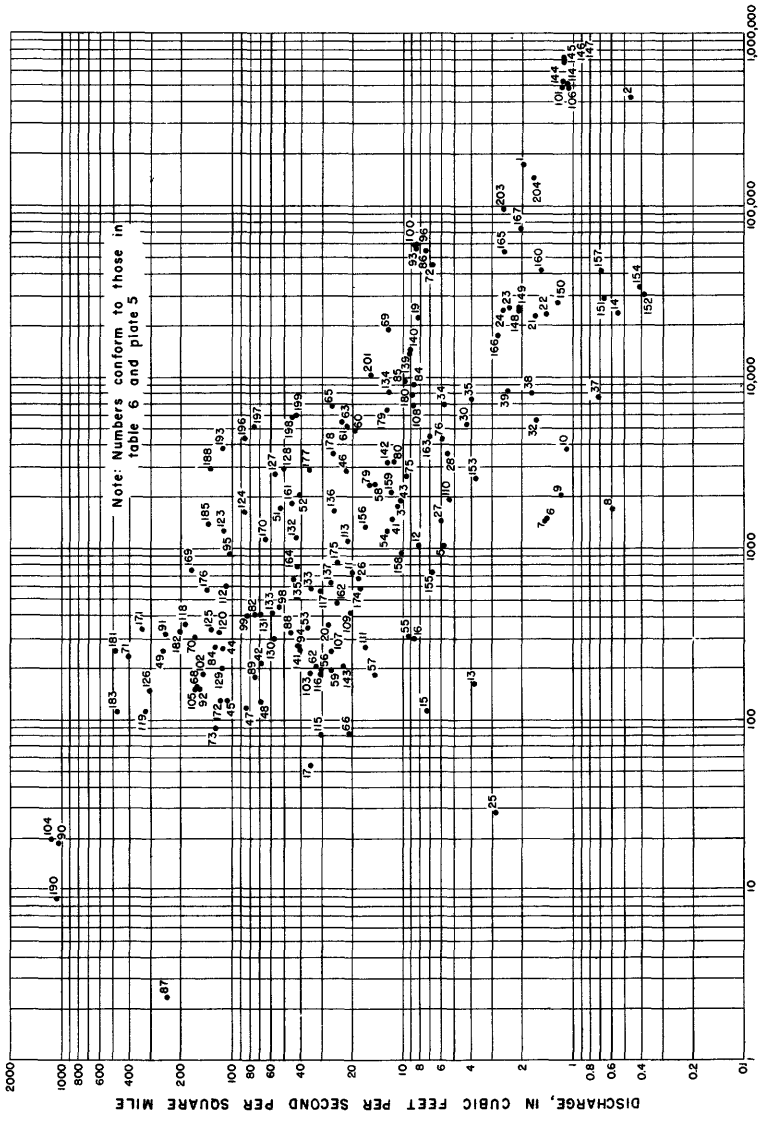

Figure 22.--Relation of unit discharge to size of drainage area.

Table 6. - Summary of flood discharges in Arkansas, Kansas, Missouri, and Nebraska for the floods of May-July 1951

(Maximum discharges for the floods of July 1951 were obtained from gaging-station records, except as otherwise indicated by the following symbols: A, slope-area measurement; B, contracted-opening measurement.)

No. on fig.	Stream and place of determination	Drainage area (square miles)	Period of record	Maximum flood previously known				Maximum during flood May-July 1951			
				Date	Gage height (ft)	Discharge (cfs)	cfs per square mile	Time	Gage height (ft)	Discharge (cfs)	cfs per square mile
1	Mississippi River at Alton, Ill.	171,500	1933-38, 1939-	May 24, 1943	a 429.91	437,000	2.55	May 10, 5 p.m.	b 419.69	333,000	1.94
2	Missouri River at St. Joseph, Mo.	424,300	1928-	Apr. 29, 1881	27.2	c 370,000	0.87	May 3, 6 a.m.	19.9	198,000	0.47
3	Platte River near Agency, Mo.	1,760	1924-30, 1932-	June 23, 1947	30.46	50,000	28.4	May 3, 11:30 a.m.	23.5	18,800	10.7
4	Republican River near Orleans, Nebr.	-	1947-	June 22, 1948	11.25	40,600	-	May 21, 9:30 p.m.	11.65	11,600	-
5	Sappa Creek near Oberlin, Kans.	1,050	1929-32, 1944-	July 16, 1944	15.04	8,000	7.62	July 12, 12 p.m.	14.6	6,010	5.72
6	Sappa Creek near Beaver City, Nebr.	1,500	1937-	July 17, 1944	d 21.3	5,500	3.67	July 16, 5 p.m.	17.36	2,170	1.45
7	Beaver Creek at Ludell, Kans.	1,460	1929-32, 1945-	Sept. 8, 1930	e 15.0	(f)	-	July 13, 5 p.m.	g 14.15	2,140	1.46
8	Beaver Creek at Cedar Bluffs, Kans.	1,710	1946-	Oct. 8, 1946	16.58	955	0.56	July 14, 5 a.m.	17.89	990	0.58
9	Beaver Creek near Beaver City, Nebr.	2,060	1937-	July 19, 1944	h 13.8	3,800	1.84	July 17, 1 a.m.	12.60	2,430	1.18
10	Sappa Creek near Stamford, Nebr.	j 3,840	1945-	June 22, 1947	20.10	7,430	1.93	July 19, 6 a.m.	17.10	4,260	1.11
11	Prairie Dog Creek at Norton, Kans.	721	1944-	June 22, 1947	22.38	8,080	11.2	July 12, 8 p.m.	k 23.65	14,400	20.0
12	Prairie Dog Creek near Woodruff, Kans.	1,050	1929-32, 1945-	June 23, 1947	m 21.04	(f)	-	July 14, 9:30 a.m.	h 19.25	8,560	8.15
13	Turkey Creek at Naponee, Nebr.	160	1948-	Sept. 20, 1950	9.50	1,920	12.0	July 11, 8 a.m.	6.14	635	3.97
14	Republican River near Bloomington, Nebr.	n 20,800	1929-	June 1, 1935	h, m 20.4	260,000	12.5	May 22, 9 a.m.	7.14	11,500	0.55
15	Center Creek at Franklin, Nebr.	111	1948-	Sept. 20, 1950	h 6.8	3,150	28.4	July 11, 9 a.m.	3.00	815	7.34
16	Thompson Creek at Riverton, Nebr.	295	1948-	July 9, 1950	11.90	12,200	41.4	July 11, 8 a.m.	6.83	2,530	8.58
17	Elm Creek at Amboy, Nebr.	54	1948-	Sept. 20, 1950	8.45	3,860	71.5	July 11, 1 a.m.	7.00	1,950	36.1
18	Republican River near Guide Rock, Nebr.	-	1950-	Sept. 20, 1950	8.47	10,300	-	May 22, 2 p.m.	9.82	14,300	-

19	Republican River near Hardy, Nebr.	22,400	1932-	June 2, 1935	19.4	225,000	10.0	June 2, 11:45 a.m.	12.59	18,600	0.83
20	Whiterock Creek at Lovewell, Kans.	358	1946-	July 10, 1950	22.8	23,300	65.1	June 7, 7:30 p.m.	20.6	9,800	27.4
21	Republican River at Scandia, Kans.	n 22,930	1919-25, 1928-44, 1950-	June 2, 1935	h 17.8	215,000	9.38	July 11, 8 a.m.	11.60	38,100	1.66
22	Republican River at Concordia, Kans.	n 23,540	1946-	June 25, 1947	14.90	75,000	3.19	July 13, 2 p.m.	11.23	33,600	1.43
23	Republican River at Clay Center, Kans.	n 24,570	1917-	June 3, 1935	h 25.74	-	-	July 12, 6 p.m.	22.20	51,500	2.10
24	Republican River at Milford, Kans.	24,900	1950-	-	-	-	-	July 12, 12 m.	19.70	62,900	2.53
25	Rose Creek near Wallace, Kans.	28.5	1946-	Aug. 31, 1949	11.0	p 3,870	136	June 30, 5 a.m.	4.66	81	2.84
26	North Fork Smoky Hill River near McAllaster, Kans.	670	1946-	June 5, 1949	8.63	4,110	6.13	June 6, 12:30 a.m.	q 10.95	12,200	18.2
27	Ladder Creek below Chalk Creek near Scott City, Kans.	1,460	1904-5, 1950-	Aug. 6, 1933	r 16.1	(f)	-	June 11, 8:30 a.m.	12.32	8,650	5.92
28	Smoky Hill River at Elkader, Kans.	3,555	1939-	Oct. 7, 1946	s 7.55	9,440	2.66	June 11, 5 a.m.	8.79	19,700	5.54
29	Hackberry Creek at Gove, Kans.	421	1946-	May 20, 1949	10.27	2,110	5.01	June 7, 2 a.m.	19.0	18,200	43.2
30	Smoky Hill River near Ransom, Kans.	5,370	1950-	July 31, 1950	10.15	12,800	2.38	June 11, 9 p.m.	t 12.57	23,800	4.43
31	Cedar Bluff Reservoir near Ellis, Kans.	-	1951-	-	-	-	-	July 2, 12 p.m.	2,154.90	u 269,400	-
32	Smoky Hill River near Ellis, Kans.	5,630	1941-	Oct. 5, 1946	10.45	9,860	1.75	May 21, 12 p.m.	9.83	9,290	1.65
33	Big Creek near Hays, Kans.	594	1946-	Oct. 6, 1946	19.65	4,000	6.73	May 22, 4 a.m.	21.46	19,900	33.5
34	Smoky Hill River near Russell, Kans.	6,965	1939-	June 18, 1942	r 18.70	22,300	3.20	May 23, 6:30 p.m.	23.26	39,500	5.67
35	Smoky Hill River at Ellsworth, Kans.	7,580	1895-1905, 1918-25, 1928-	June 1, 1938	27.2	61,000	8.05	May 23, 9:15 p.m.	24.12	30,000	3.96
36	Kanopolis Reservoir near Kanopolis, Kans.	7,857	1948-	Sept. 1, 2, 1950	1,491.03	u 248,400	-	July 14	1,506.90	u 434,000	-
37	Smoky Hill River near Langley, Kans.	7,857	1941-	Oct. 20, 1941	23.47	17,200	2.19	July 15, 8 a.m.	15.29	5,570	0.71

Table 6.- Summary of flood discharges in Arkansas, Kansas, Missouri, and Nebraska for the floods of May-June 1951--Continued

No. on fig.	Stream and place of determination	Drainage area (square miles)	Period of record	Maximum flood previously known				Maximum during flood May-July 1951			
				Date	Gage height (ft)	Discharge (cfs)	cfs per square mile	Time	Gage height (ft)	Discharge (cfs)	
38	Smoky Hill River at Lindsborg, Kans.	8,110	1930-	June 3, 1938	v 32.55	26,000	3.21	July 12, 4 p.m.	29.32	14,200	1.75
39	Smoky Hill River near Mentor, Kans.	8,230	1923-32, 1947-	Aug. 17, 1927	m 25.8	7,450	0.90	July 13, 10 a.m.	24.93	20,000	2.43
40	Smoky Hill River at Salina, Kans.	8,243	1929-	May 30, 1903	24.6	-	-	July 13, 11:30 a.m.	24.10	-	-
41	Saline River near Russell, Kans.	1,502	1946-	July 26, 1950	18.40	14,300	9.52	June 28, 9 p.m.	19.12	17,000	11.3
42	Paradise Creek near Paradise, Kans.	212	1946-	July 16, 1950	17.47	4,160	19.6	July 11, 4 a.m.	23.10	14,800	69.8
43	Saline River near Wilson, Kans.	1,900	1929-	June 2, 1935	w 24.79	21,900	11.5	June 23, 9 a.m.	22.06	19,300	10.2
44	Wolf Creek near Sylvan Grove, Kans.	261	1945-	July 16, 1950	24.99	3,850	14.8	July 11, 11 a.m.	30.96	29,300	112
45	Spillman Creek near Denmark, Kans.	129	-	-	-	-	-	July	-	13,800 A	107
46	Saline River at Tescott, Kansas	2,820	1919-	June 3, 1935	29.57	6,850	2.43	July 13, 4 a.m.	30.06	61,400	21.8
47	Mulberry Creek near Hedville, Kans.	116	-	-	-	-	-	July	-	9,770 A	84.2
48	Spring Creek near Bavaria, Kans.	126	-	-	-	-	-	July	-	8,530 A	67.7
49	Gypsum Creek near Kipp, Kans.	250	-	-	-	-	-	July	-	64,500 A	258
50	South Fork Solomon River at Webster, Kans.	-	1945 -	June 22, 1948	11.12	15,000	-	-	h 14.9	55,200	-
51	South Fork Solomon River at Alton, Kans.	1,720	1919-25, 1928-32, 1942-	June 16, 1943	x 19.94	11,500	6.69	July 12, 8 p.m.	h 27.10	91,900	53.4
52	South Fork Solomon River at Osborne, Kans.	2,024	1946-	Aug. 29, 1950	20.13	10,000	4.94	July 13, 2 a.m.	27.65	81,200	40.1
53	Bow Creek near Stockton, Kans.	337	1951-	-	-	-	-	July 12, 7:30 a.m.	h 13.60	12,900	38.3
54	North Fork Solomon River at Kirwin, Kans.	1,290	1919-25, 1928-32, 1941-	Sept. 18, 1919	22.5	p 24,000	18.6	July 11, 4:30 a.m.	20.42	15,600	12.1

55	Deer Creek near Kirwin, Kans.	309	-	-	-	-	-	July	-	2,880 A	9.32
56	Cedar Creek near Cedar, Kans.	191	-	-	-	-	-	July	-	5,860 A	30.7
57	Beaver Creek at Gaylord, Kans.	181	-	-	-	-	-	July	-	2,680 A	14.8
48	North Fork Solomon River near Downs, Kans.	2,390	1945-	Aug. 13, 1950	28.23	22,700	9.50	July 12, 12 p.m.	30.41	35,700	14.9
49	Oak Creek near Cawker City, Kans.	194	-	-	-	-	-	July	-	5,070 A	26.1
60	Solomon River near Cawker City, Kans.	4,960	-	-	-	-	-	July 13	-	94,100 A	19.0
61	Solomon River at Glen Elder, Kans.	5,040	-	-	-	-	-	July 13	-	110,000 A	21.8
62	Limestone Creek near Glen Elder, Kans.	205	-	-	-	-	-	-	-	6,600 A	32.2
63	Solomon River at Beloit, Kans.	5,430	1895-97, 1929-	June 3, 1935	h 34.5	37,800	6.96	July 13, 4 a.m.	39.30	125,000	23.0
64	Solomon River at Minneapolis, Kans.	6,039	1943-	July 21, 1948	32.17	-	-	July 11, 9 p.m.	33.40	-	-
65	Solomon River at Niles, Kans.	6,770	1897-1903, 1917-	June 3, 1903	y 33.8	41,000	6.06	July 14, 6 a.m.	31.76	178,000	26.3
66	Holland Creek near Abilene, Kans.	82.5	-	-	-	-	-	July	-	1,720 A	20.8
67	Smoky Hill River near Abilene, Kans.	18,877	1904-22, 1945-	May 29, 1903	27.3	-	-	July 14	29.4	-	-
68	Turkey Creek near Abilene, Kans.	157	-	-	-	-	-	July	-	25,300 A	161
69	Smoky Hill River at Enterprise, Kans.	19,200	1934-	Oct. 20, 1941	z 30.20	37,800	1.97	July 14, 2 p.m.	33.96	233,000	12.1
70	Chapman Creek near Chapman, Kans.	300	-	-	-	-	-	July	-	46,700 B	156
71	Lyon Creek near Woodbine, Kans.	231	-	-	-	-	-	July	-	93,000 A	403
72	Kansas River at Ogden, Kans.	45,240	1917-	June 3, 1935	28.03	170,000	3.76	July 12, 10 p.m.	30.53	298,000	6.59
73	Wildcat Creek near Manhattan, Kans.	87.9	-	-	-	-	-	-	—	11,100 A	126
74	Kansas River at Manhattan, Kans.	45,464	1904-14, 1921-	June 4, 1945	28.0	-	-	July 13, 3 a.m.	33.4	-	-
75	Big Blue River at Crete, Nebr.	2,680	1945-	July 10, 1950	28.74	27,600	10.3	June 3, 4 a.m.	28.3	25,500	9.51
76	Big Blue River at Barneston, Nebr.	4,420	1932-	June 9, 1941	34.3	57,700	13.1	June 4, 12 p.m.	27.48	26,000	5.88

Table 6. - Summary of flood discharges in Arkansas, Kansas, Missouri, and Nebraska for the floods of May-July 1951--Continued

No. on ~~fig.~~ 5	Stream and place of determination	Drainage area (square miles)	Period of record	Maximum flood previously known				Maximum during flood May-July 1951			
				Date	Gage height (ft)	Discharge (cfs)	cfs per square mile	Time	Gage height (ft)	Discharge (cfs)	cfs per square mile
77	Big Blue River at Marysville, Kans.	4,688	1950-	-	-	-	-	June 15, 6 p.m.	40.20	-	-
78	Little Blue River at Angus, Nebr.	-	1950-	Sept. 21, 1950	h 12.1	11,800	-	June 26, 3 p.m.	13.4	18,500	-
79	Little Blue River near Endicott, Nebr.	2,340	1908-15, 1929-	June 9, 1941	16.23	31,000	13.2	June 27, 8 p.m.	aa 16.82	36,800	15.7
80	Little Blue River at Waterville, Kans.	3,440	1922-25, 1928-	June 10, 1941	h 26.20	50,400	14.7	July 13, 2 a.m.	24.65	38,200	11.1
81	Big Blue River at Blue Rapids, Kans.	-	1904-	June 10, 1941	39.5	-	-	July 13, 5 a.m.	35.6	-	-
82	Black Vermillion River near Frankfort, Kans.	412	-	-	-	-	-	July	-	30,400 B	73.8
83	Big Blue River at Randolph, Kans.	9,100	1918-	June 10, 1941	ab 30.81	98,000	10.8	July 13, 2 p.m.	28.88	77,800	8.55
84	Fancy Creek at Randolph, Kans.	265	-	-	-	-	-	July	-	33,400 B	126
85	Big Blue River near Manhattan, Kans.	9,540	1895-1905, 1950-	May 31, 1903	m 36.5	98,000	10.3	July 12, 10 p.m.	29.9	93,400	9.79
86	Kansas River at Wamego, Kans.	55,240	1919-	June 4, 1935	ac 23.79	177,000	3.20	July 13, 5:30 a.m.	27.56	400,000	7.24
87	Tributary to Kansas River near Wamego, Kans	2.3	-	-	-	-	-	-	-	563 B	245
88	Vermillion Creek near Louisville, Kans.	327	-	-	-	-	-	-	-	14,700 A	45.0
89	Rock Creek near Louisville, Kans.	177	-	-	-	-	-	July	-	13,100 A	74.0
90	Mill Creek near Alta Vista, Kans.	18.7	-	-	-	-	-	-	-	19,800 B	1,060
91	Mill Creek near Paxico, Kans.	316	-	-	-	-	-	-	-	79,000 B	250
92	Cross Creek near Rossville, Kans.	148	-	-	-	-	-	July	-	23,000	155
93	Kansas River at Topeka, Kans.	56,710	1917-	July 5, 1935	m, ad 26.65	154,000	2.72	July 13, 6:30 a.m.	36.34	469,000	8.27
94	Soldier Creek near Topeka, Kans.	268	1929-	Apr. 23, 1944	28.2	9,910	37.0	June 22, 3 p.m.	ae 28.15	11,400	42.5

95	Delaware River at Valley Falls, Kans.	922	1922-	June 16, 1945	h 27.85	45,900	49.8	June 21, 9:30 p.m.	h 32.08	94,600	103
96	Kansas River at Lecompton, Kans.	58,420	1899-1905, 1936-	May 31, 1903	h 27.9	-	-	July 13, 4 p.m.	30.23	483,000	8.27
97	Kansas River at Lawrence, Kans.	58,504	1927-	May 31, 1903	h 28.5	-	-	July 13, 8 a.m. - 11 p.m.	30.40		-
.98	Wakarusa River near Lawrence, Kans.	458	1929-	Apr. 23, 1944	30.0	18,500	40.4	July 12, 12 p.m.	h 31.59	24,200	52.8
99	Stranger Creek near Tonganoxi, Kans.	406	1929-	Dec. 5, 1944	27.40	15,500	38.2	July 12, 12 p.m.	28.94	33,100	81.5
100	Kansas River at Bonner Springs, Kans.	59,890	1917-	June 18, 1943	25.23	147,000	2.45	July 13, 12 p.m.	38.58	510,000	8.52
101	Missouri River at Kansas City, Mo.	489,200	1905-6, 1928-	June 18, 1943	af 29.10	336,000	0.69	July 14, 1 p.m.	36.2	573,000	1.17
102	Blue River near Kansas City, Mo.	188	1939-	Apr. 23, 1944	ag 35.88	26,400	140	July 11, 3:45 p.m.	38.30	31,100	165
103	Little Blue River near Lake City, Mo.	184	1948-	Mar. 20, 1948	h 24.97	6,000	32.6	July 12, 12 m. - 5 p.m.	h 26.1	6,400	34.8
104	East Fork Fishing River at Excelsior Springs, Mo.	19.8	1951-	-	(ah)	-	-	July 6, 5:30 a.m.	15.33	23,100	1,170
105	Crooked River near Richmond, Mo.	159	1948-	June 2, 1949	21.8	3,300	20.8	July 6, 1 p.m.	h 28.8	27,000	170
106	Wakenda Creek at Carrollton, Mo.	248	1948-	Mar. 20, 1948	h 22.64	7,000	28.2	July 7, 6 a.m.	ai 22.4	6,640	26.8
107	Missouri River at Waverly, Mo.	491,200	1929-	Apr. 24, 1944	25.14	347,000	0.71	July 16, 8-11 a.m.	aj 28.20	549,000	1.12
108	Grand River near Sumner, Mo.	6,880	1924-	June 7, 8, 1947	h, ak 39.5	180,000	26.2	July 9, 8 a.m.	am 32.36	60,000	8.72
109	Yellow River near Rothville, Mo.	405	1929-32, 1948-	June 17, 1950	an 21.40	9,000	22.2	June 29, 6 a.m. - 1 p.m.	21.26	8,200	20.2
110	Chariton River near Keytesville, Mo.	1,950	1929-	June 8, 9, 1947	h 25.3	25,600	13.1	June 27, 6 p.m. to June 28, 2 p.m.	h, ap 21.87	10,400	5.33
111	Mussel Fork near Musselfork, Mo.	267	1948-	June 17, 18, 1950	aq, ar 18.7	2,650	9.92	June 29, 8 a.m.	18.96	4,380	16.4
112	Lamine River at Clifton City, Mo.	598	1922-	May 18, 1943	as 32.0	60,000	100	June 29, 5 a.m.	32.5	65,500	110
113	Blackwater River at Blue Lick, Mo.	1,120	1922-33, 1938-	Nov. 18, 1928	41.25	54,000	48.2	July 14, 3-8 a.m.	aq 35.06	23,900	21.3

Table 6.- Summary of flood discharges in Arkansas, Kansas, Missouri, and Nebraska for the floods of May-July 1951--Continued

No. on ~~fig.~~ 1, 5	Stream and place of determination	Drainage area (square miles)	Period of record	Maximum flood previously known				Maximum during flood May-July 1951			
				Date	Gage height (ft)	Discharge (cfs)	cfs per square mile	Time	Gage height (ft)	Discharge (cfs)	cfs per square mile
114	Missouri River at Boonville, Mo.	505,700	1925-	Apr. 27, 1944	at, au 32.02	504,000	1.00	July 17, 2 p.m.	av 32.82	550,000	1.09
115	Moniteau Creek near Fayette, Mo.	81	1948-	Dec. 22, 1949	h, aw 18.48	2,760	34.1	July 11, 9-10 p.m.	h 18.0	2,450	30.2
116	Petite Saline Creek near Boonville, Mo.	182	1948-	Oct. 21, 1949	23.5	6,120	33.6	June 29, 8 a.m.	22.80	5,520	30.3
117	Moreau River near Jefferson City, Mo.	531	1947-	June 23, 1948	h, ax 27.0	23,000	43.3	July 7, 8 a.m.	23.75	16,500	31.1
118	Marais des Cygnes River at Melvern, Kans.	363	1939-	Apr. 23, 1944	26.7	29,000	79.9	July 11, 12 m.	30.8	68,500	189
119	Salt Creek near Lyndon, Kans.	111	1939-	Apr. 22, 1944 Apr. 16, 1945	h, ay 16.0	p 17,900	161	July 11, 10 a.m.	h 17.00	36,400	328
120	Hundred and Ten Mile Creek near Quenemo, Kans.	321	1939-	Apr. 22, 1944	27.34	34,700	108	July 11, 9 a.m.	28.47	38,600	120
121	Marais des Cygnes River near Quenemo, Kans.	1,030	1922-	Nov. 17, 1928	38.4	-	-	July 11, 2:30 p.m.	40.35	-	-
122	Marais des Cygnes River at Ottawa, Kans.	1,240	1902-5, 1911-14, 1920-	Nov. 17, 1928	37.6	-	-	July 12, 1:30 a.m.	42.10	-	-
123	Marais des Cygnes River near Ottawa, Kans.	1,260	1902-5, 1918-	Nov. 17, 1928	38.65	75,000	59.5	July 11, 12 p.m. to July 12, 2 a.m.	42.50	142,000	113
124	Marais des Cygnes River at Osawatomie, Kans	1,627	1944-	Apr. 17, 1945	42.1	-	-	July 12, 9:30 p.m.	az 50.3	140,000 A	86.0
125	Pottawatomie Creek near Garnett, Kans.	334	1939-	Apr. 23, 1944	ba 30.6	23,600	70.7	July 11, 10 p.m.	32.30	45,300	136
126	Big Bull Creek near Hillsdale, Kans.	147	1948-	May 21, 1949	22.50	7,450	50.7	July 11, 12:30 p.m	25.82	45,200	307
127	Marais des Cygnes River at LaCygne, Kans.	2,733	1929-	Nov. 18, 1928	33.2	-	-	July 13	bb 36.2	154,000	56.3
128	Big Sugar Creek at Farlinville, Kans.	198	1929-32, 1948-	July 7, 1949	bc 24.96	p 7,550	38.1	July 11, 10 p.m.	29.1	22,500	114
129	Marais des Cygnes River at Trading Post, Kans.	2,910	1921-23, 1928-	Nov. 18, 1928	34.45	120,000	41.2	July 14, 2-4 a.m.	38.12	148,000	50.9

130	Little Osage River at Fulton, Kans.	295	1948-	July 19, 1950	aq 29.3	16,400	-	July 12, 4:30 p.m.	bd 28.75	15,400	52.2
131	Marmaton River near Ft. Scott, Kans.	411	1921-25, 1929-	May 18, 1943	be 36.90	34,200	83.2	June 30, 1:30 p.m.	35.96	27,800	67.6
132	Sac River near Stockton, Mo.	1,160	1921-	May 19, 1943	31.8	120,000	103	July 4, 10 p.m.	25.35	50,100	43.2
133	Cedar Creek near Pleasant View, Mo.	420	1923-26, 1948-	July 12, 1942	bf 24.0	16,000	38.1	July 4, 3 p.m.	25.56	24,300	57.9
134	Osage River at Osceolo, Mo.	8,220	1921-28, 1930-	May 21, 1943	bg 41.48	146,000	17.8	July 6, 2-7 p.m.	35.87	98,300	12.0
135	Pomme de Terre River at Hermitage, Mo.	655	1921-	Aug. 8, 1927	36.45	70,000	107	July 1, 7 a.m.	26.40	29,000	44.3
136	South Grand River near Brownington, Mo.	1,660	1921-	Nov. 19, 1928	h 39.9	63,900	38.5	July 15, 1 a.m.	h 35.5	42,400	25.5
137	Niangua River near Decaturville, Mo.	627	1930-	May 19, 1943	bh 21.84	33,400	53.3	July 2, 2:30 a.m.	16.06	16,700	26.6
138	Lake of the Ozarks near Bagnell, Mo.	14,000	1931-	May 22, 1943	665.45	u 1,527,000	-	July 7, 12 m. - 10 p.m.	664.41	u 1,482,000	-
139	Osage River near Bagnell, Mo.	14,000	1925-	May 19, 1943	bi 48.8	220,000	15.7	July 8, 5-8 a.m.	38.26	126,000	9.00
140	Osage River near St. Thomas, Mo.	14,500	1931-	May 20, 1943	43.8	216,000	14.9	July 13, 7-11 p.m.	35.20	130,000	8.97
141	Maries River at Westphalia, Mo.	257	1947	Jan. 4, 1950	aq, bj 16.0	15,600	60.7	June 30, 10 p.m.	13.22	10,300	40.1
142	Gasconade River near Rich Fountain, Mo.	3,180	1921-	Apr. 16, 1945	29.13	96,400	30.3	July 3, 6-8 a.m.	20.50	38,700	12.2
143	Loutre River at Mineola, Mo.	202	1947-	Sept. 13, 1949	bk 19.98	11,500	56.9	June 26, 1 p.m.	aq 14.0	4,480	22.2
144	Missouri River at Hermann, Mo.	528,200	1928-	Apr. 28, 1944	bm 31.20	577,000	1.09	July 19, 8 a.m. - 12 m.	33.33	618,000	1.17
145	Mississippi River at St. Louis, Mo.	701,000	1933-	Apr. 30, 1944	bn, bo 40.26	844,000	1.20	July 21, 1 a.m. - 12 m.	bp 40.28	782,000	1.12
146	Mississippi River at Chester, Ill.	712,600	1942-	July 3, 1947	(bq, br)	886,000	1.24	July 22, 11:30 p.m.	bs 39.28	795,000	1.12
147	Mississippi River at Thebes, Ill.	717,200	1941-	May 27, 1943	bt 340.33	893,000	1.25	July 24, 4 a.m.	bu 339.91	805,000	1.12
148	Arkansas River at Coolidge, Kans.	25,309	1893,-94, 1901-2, 1907-	Oct. 20, 1908	-	136,000	bv 5.37	May 15, 11 a.m.	10.67	60,000	2.37
149	Arkansas River at Syracuse, Kans.	25,894	1902-6, 1921-	June 6, 1921	bw 11.75	(f)	-	May 15, 7 p.m.	12.63	54,300	2.10
150	Arkansas River at Garden City, Kans.	27,719	1922-	Apr. 28, 1942	8.87	31,400	1.13	May 16, 10 p.m.	9.57	33,500	1.21
151	Arkansas River at Dodge City, Kans.	29,837	1944-	June 8, 1949	13.29	16,200	0.54	May 18, 4 a.m.	12.54	19,700	0.66

Table 6.- Summary of flood discharges in Arkansas, Kansas, Missouri, and Nebraska for the floods of May-July 1951--Continued

No. on ~~fig.~~ pl-5	Stream and place of determination	Drainage area (square miles)	Period of record	Maximum flood previously known				Maximum during flood May-July 1951			
				Date	Gage height (ft)	Discharge (cfs)	cfs per square mile	Time	Gage height (ft)	Discharge (cfs)	cfs per square mile
152	Arkansas River near Kinsley, Kans.	30,330	1944-	June 10, 1949	11.09	11,300	0.37	May 19, 7 p.m.	11.20	11,700	0.39
153	Pawnee River near Larned, Kans.	2,576	1924-	May 28, 1935	m 31.96	bx 20,000	7.76	June 23, 6 p.m.	27.54	9,510	3.69
154	Arkansas River at Great Bend, Kans.	33,986	1941-	May 1, 1942	10.34	20,200	0.59	May 25, 1 a.m.	by 11.36	13,900	0.41
155	Cow Creek near Lyons, Kans.	728	1938-	Oct. 20, 1941	bz 20.49	12,400	17.0	July 13, 7 a.m.	19.05	4,890	6.72
156	Little Arkansas River at Valley Center, Kans.	1,327	1922-	Apr. 16, 1945	22.05	32,000	24.1	May 17, 8 p.m.	20.50	22,400	16.9
157	Arkansas River at Wichita, Kans.	40,182	1934-	Apr. 24, 1944	ca 11.7	26,600	0.66	July 1, 1 a.m.	13.38	27,600	0.69
158	North Fork Ninnescah River near Cheney, Kans.	947	1950-	-	-	-	-	May 23, 10 a.m.	13.23	9,460	9.99
159	Ninnescah River near Peck, Kans.	2,129	1938-	Apr. 23, 1944	cb 20.58	p 24,600	11.6	May 17, 8 p.m.	20.73	25,100	11.8
160	Arkansas River at Arkansas City, Kans.	43,475	1902-6, 1921-	June 11, 1923	25.46	(f)	-	May 19, 8 a.m.	23.50	66,000	1.52
161	Walnut River at Winfield, Kans.	1,840	1921-	Apr. 23, 1944	38.1	105,000	57.1	July 1, 4 a.m.	37.80	83,000	45.1
162	Whitewater River at Augusta, Kans.	473	1950-	-	-	-	-	May 1, 12 p.m.	25.58	11,800	24.9
163	Salt Fork Arkansas River near Tonkawa, Okla.	4,528	1903-5, 1936-	May 20, 1938	cc 22.82	40,800	9.01	July 15, 5:15 a.m.	21.59	31,200	6.89
164	Chikaskia River near Corbin, Kans.	794	1950-	-	-	-	-	May 17, 2 p.m.	22.50	35,100	44.2
165	Arkansas River at Ralston, Okla.	54,227	1938-	Apr. 25, 1944	cd 22.82	179,000	3.30	July 3, 3 p.m.	21.45	135,000	2.49
166	Cimarron River at Perkins, Okla.	p 17,825	1939-	May 19, 1949	ce 15.22	65,300	3.66	May 20, 9 p.m.	13.90	50,200	2.82
167	Arkansas River at Tulsa, Okla.	74,350	1938-	May 20, 1943	cf 17.00	173,000	2.33	July 4, 3 p.m.	15.70	149,000	2.00
168	Verdigris River at Madison, Kans.	-	-	-	-	-	-	July 11	-	128,000 A	-
169	Verdigris river near Coyville, Kans.	747	1939-	Apr. 16, 1945	39.45	p,cg67,000	89.7	July 12, 1 a.m.	41.25	130,000	174
170	Verdigris River near Altoona, Kans.	1,138	1939-	Apr. 17, 1945	29.50	54,500	47.9	July 12, 7:30 p.m.	31.09	71,000	62.4

171	Fall River near Eureka, Kans.	336	1946-	July 31, 1950	19.92	20,200	60.1	June 29, 3 p.m.	29.60	115,000	342
172	Otter Creek at Climax, Kans.	129	1946-	Apr. 4, 1947	22.60	11,700	90.7	June 30, 8 a.m.	23.73	15,400	119
173	Fall River Reservoir near Fall River, Kans.	585	1940-	Aug. 1, 1950	956.37	u 53,080	-	July 13, 4 p.m.	987.18	u 260,200	-
174	Fall River near Fall River, Kans.	591	1939-	Apr. 16, 1945	m 31.15	45,600	77.2	July 8, 9:30 a.m.	19.87	10,600	17.9
175	Fall River at Fredonia, Kans.	827	1938-	Apr. 16, 1945	36.17	ch 49,000	59.2	June 30, 11 a.m.	27.97	20,200	24.4
176	Elk River near Elk City, Kans.	575	1939-	Apr. 16, 1945	28.27	39,200	68.2	June 30, 3-4 p.m.	30.65	81,500	142
177	Verdigris River at Independence, Kans.	2,892	1904, 1921-	Apr. 17, 1945	47.28	117,000	40.5	July 1, 8 p.m.	46.59	104,000	36.0
178	Verdigris River near Lenapah, Okla.	3,639	1939-	May 20, 1943	h 40.44	137,000	37.6	July 3, 4 a.m.	38.66	94,800	26.0
179	Verdigris River near Claremore, Okla.	6,534	1935-	May 21, 1943	55.05	182,000	27.9	July 6, 12 m.	46.95	74,900	11.5
180	Verdigris River near Inola, Okla.	7,911	1944-	Apr. 22, 1945	cj, ck 52.40	94,500	11.9	July 8, 12 m.	52.32	69,200	8.75
181	Neosho River at Council Grove, Kans.	250	1939-	Oct. 20, 1941	cm 37.13	p 65,900	264	July 11, 8:30 a.m.	h 35.5	121,000	484
182	Cottonwood River near Marion, Kans.	329	1939-	Oct. 20, 1941, Apr. 16, 1945	25.68	15,200	46.2	July 11, 2 p.m.	h 28.57	66,000	201
183	Cedar Creek near Cedar Point, Kans.	110	1938-	Apr. 22, 1944	22.50	p 22,500	204	June 29, 10:30 a.m.	23.70	52,400	476
184	Middle Creek near Elmdale, Kans.	92	Nov. 1939 to Sept. 1950	Aug. 1, 1950	18.90	13,300	144	July 1951	20.6	-	-
185	Cottonwood River at Cottonwood Falls, Kans.	1,402	1932-	July 20, 1948	23.30	p 78,000	55.6	July 11, 11:30 a.m	27.06	196,000	140
186	Cottonwood River at Emporia, Kans.	1,840	1908-	July 20, 1948	29.5	-	-	July 11, 6 p.m.	33.40	-	-
187	Neosho River at Neosho Rapids, Kans.	2,736	1904-	July 21, 1948	29.9	-	-	July 11, 10 p.m.	34.30	-	-
188	Neosho River at Strawn, Kans.	2,933	1948-	July 21, 1948	27.48	99,200	33.8	July 11, 12 p.m.	30.54	400,000	136
189	Neosho River at Burlington, Kans.	3,030	1942-	July 21, 1948	36.8	-	-	July 12, 6 a.m.	41.53	-	-
190	Rock Creek, at Burlington, Kans.	8.8	-	-	-	-	-	July	-	9,560 B	1,090
191	Neosho River at LeRoy, Kans.	3,393	1908-	July 22, 1948	30.7	-	-	July 12, 11 a.m.	34.55	-	-
192	Neosho River at Ida, Kans.	3,720	1936-	July 23, 1948	24.7	-	-	July 13, 4 a.m.	33.26	-	-

Table 6.- Summary of flood discharges in Arkansas, Kansas, Missouri, and Nebraska for the floods of May-July 1951-- Continued

No. on ~~fig.~~ pl-5	Stream and placeof determination	Drainage area (square miles)	Period of record	Maximum flood previously known				Maximum during flood May-July 1951			
				Date	Gage height (ft)	Discharge (cfs)	cfs per square mile	Time	Gage height (ft)	Discharge (cfs)	cfs per square mile
193	Neosho River near Iola, Kans.	3,818	1895-1903, 1917-	July 23, 1948	34.63	83,100	21.8	July 13, 4 a.m.	h 43.0	436,000	114
194	Neosho River near Chanute, Kans.	4,207	1934-	July 23, 1948	30.9	-	-	July 13, 12 m.	38.60	-	-
195	Neosho River near Erie, Kans.	4,523	1947-	July 24, 1948	28.2	-	-	July 13, 2 p.m.	35.10	-	-
196	Neosho River near Parsons, Kans.	4,817	1921-	July 27, 1948	30.74	87,800	18.2	July 14, 1-2 p.m.	cn 40.20	410,000	85.1
197	Neosho River near Oswego, Kans.	5,190	-	-	-	-	-	July 14, 12 p.m.	32.5	395,000	76.1
198	Neosho River near Commerce, Okla.	5,876	1939-	May 20, 1943	25.12	105,000	17.9	July 15, 6 p.m.	h, cp 34.03	267,000	45.4
199	Neosho River at Miami, Okla.	6,000	1951-	May 20, 1943	768.37	105,000	17.5	July 16, 3-5 a.m.	778.53	254,000	42.3
200	Lake O' the Cherokees at Langley, Okla.	10,298	1940-	May 20, 1943 June 26, 27, 1948	754.57	u 2,172,000	-	July 18, 5 p.m.	754.96	u 2,195,000	-
201	Neosho River near Langley, Okla.	10,335	1939-	May 20, 1943	h 45.5	300,000	29.0	July 18, 12:15 a.m.	36.25	158,000	15.3
202	Ft. Gibson Reservoir, Okla.	12,492	1949-	-	-	-	-	July 20, 8:30 a.m.	562.50	u 554,500	-
203	Arkansas River near Muskogee, Okla.	p 96,409	1935-	May 21, 1943	cq 48.20	700,000	7.26	July 5, 10 a.m.	31.40	242,000	2.51
204	Arkansas River near Sallisaw, Okla	147,491	1947-	May 12, 1950	cr 31.04	442,000	3.00	July 6, 1 a.m.	cs 25.84	253,000	1.72
205	Arkansas River at Van Buren, Ark.	150,218	1927-	May 12, 1943 ct	cu 38.10	850,000	-	July 6, 2 p.m.	cv 26.92	250,000	-

a Flood of June 1844 reached an elevation of 432.42 ft, present datum.
b Flood of July 21 reached an elevation of 429.47 ft, affected by backwater.
c About. Furnished by Corps of Engineers.
d About. Stage was 18.70 ft, site and datum then in use.
e Datum then in use.
f Not determined.
g Occurred 7:30 p.m.
h From floodmark.
j 3,560 sq mi directly contributing.
k Outside gage reading, 24.20 ft.
m Site and datum then in use.
n 5,700 sq mi directly contributing.
p Revised.
q Outside gage reading, 11.8 ft.
r Caused by dam failure.
s Maximum stage known, 13.2 ft, May 30, 1938, from floodmark.
t Maximum gage height, 15.41 ft, July 2, backwater from Cedar Bluffs Reservoir.
u Contents in acre-feet.
v Maximum stage known, 33.9 ft, May 1903, discharge 32,000 cfs.
w Maximum stage known, 26.8 ft, July 1928, discharge 25,700 cfs.
x Maximum gage-height, 24.5 ft, Aug. 1, 1928.
y Datum about 1½ ft lower than present.
z Maximum stage known, about 32 ft, May 1903, discharge about 90,000 cfs.
aa Occurred 12 p.m.
ab Flood of 1903 reached a stage of 30.6 ft, from floodmark.
ac Flood of May 1903 reached a stage of 26.3 ft.
ad Flood of May 30, 1903 reached a stage of 32.7 ft at U. S. Weather Bureau gage ½ mile downstream.
ae Maximum gage height, 29.06 ft, 12 p.m. July 12, backwater from Kansas River.
af Occurred June 19, 1943. Maximum stage known 38.0 ft, June 16, 1844, discharge about 625,000 cfs.
ag Maximum stage known about 39 ft, Nov. 17, 1928.
ah At point 200 ft upstream from gage. Flood of June 22, 1947 reached a stage 3.7 ft higher than flood of July 6, 1951.
ai Stage of 23.4 ft occurred 8:30 a.m. July 17, affected by backwater.
aj Occurred 6 a.m.-1 p.m. July 14.
ak Stage of July 9, 1909, 36.7 ft.
am Occurred 4 a.m., June 30.
an Maximum stage known 23.1 ft in June 1947.
ap Occurred 10 a.m.-2 p.m. June 28.
aq From graph based on gage readings.
ar Maximum stage known 20.7 ft in June 1947.
as Maximum stage known 35.3 ft, Sept. 18, 1905.
at Occurred June 27, 1947.
au Maximum stage known 32.7 ft, June 21, 1844, discharge about 710,000 cfs.
av Occurred 11 p.m.
aw Maximum stage known 22.9 ft, April 1944.
ax Flood of 1905 reached a stage of 38.2 ft.
ay Flood of 1935 reached a stage of 20.3 ft.
az At U. S. Weather Bureau gage ½ mile upstream.
ba Flood of Nov. 16, 1928 reached a stage of 32.2 ft, discharge 49,000 cfs.
bb U. S. Weather Bureau gage at LaCygne.
bc Flood of Nov. 1928 reached a stage of 31.9 ft, datum in use Feb. 1929 to June 1932.
bd Flood of June 30 reached approximately same stage and discharge.
be Maximum stage known 42.34 ft in 1915.
bf Maximum stage known 27.7 ft, July 20, 1909.
bg Maximum stage known about 40.3 ft, June 1844, discharge, 135,000 cfs.
bh Maximum stage known 28.0 ft in 1914.
bi Maximum stage known 43.1 ft in June 1844, discharge 164,000 cfs.
bj Flood of June 8, 1937 reached a stage of 22.8 ft.
bk Flood of June 20, 1928, reached a stage of about 28.9 ft.
bm Maximum stage known 35.5 ft, June 1844, discharge about 892,000 cfs.
bn Occurred July 2, 1947.
bo Maximum stage known 41.32 ft, June 27, 1844, discharge 1,300,000 cfs.
bp Occurred 2:30 a.m. July 22.
bq Maximum stage known 38.8 ft, about June 30, 1844, discharge 1,350,000 cfs.
br Flood of May 24, 1943 was greater, discharge uncertain.
bs Occurred 6 a.m. July 23.
bt Maximum elevation known at Grays Point, 2.6 miles upstream, 345.14 ft, July 4, 1844, discharge 1,350,000 cfs.
bu Occurred 8 a.m.
bv At Holly, Colo., 6 miles upstream.
bw About.
bx Estimated.
by Occurred 6 p.m. May 24.
bz Maximum stage known, 22.75 ft July 11, 1929.
ca Maximum stage known, 18 ft, May 13, 1877.
cb Maximum stage known, 26.4 ft, June 9, 1923, from floodmark.
cc Maximum stage known, 26.8 ft, June 10, 1923.
cd Maximum stage known, 23.8 ft, June 12, 1923.
ce Flood of Oct. 4, 5, 1926, reached a stage of 17.0 ft, from floodmarks.
cf Occurred April 26, 1944; maximum stage known, 19.8 ft, June 13, 1923.
cg Also occurred July 20, 1948.
ch Observed.
cj Occurred June 27, 1948.
ck Maximum stage known, 54.93 ft, May 21, 1943, discharge 224,000 cfs.
cm Flood of 1903 reached a stage of 37.3 ft, from floodmark.
cn Floodmark in gage well.
cp Occurred 2-3 a.m. July 16.
cq Greatest known stage since 1833.
cr Maximum stage known 37.90 ft, May 11, 1943.
cs Occurred 12:30 a.m. July 19.
ct Highest flood since June 1833.
cu Occurred April 16, 1945.
cv Occurred 9 p.m. July 19.

FLOOD-CREST STAGES

Records of flood crest stages collected by the Corps of Engineers are presented in table 7. The stage records of table 7 are of particular interest to those responsible for projects to be located above the maximum known flood level. Points of measurement are located both by distance above river mouth and by distance and direction from local features; this information is considered adequate for proper reference.

Table 7.--Flood-crest stages
(Furnished by Corps of Engineers except as noted)

Stream and location	Miles above mouth	Day 1951	Altitude in feet
Missouri River			
St. Charles Mo.	28	July 20	450.89
*Hermann, Mo.	97	July 19	514.73
Gasconade, Mo.	104	July 19	521.46
Jefferson City, Mo.	143	July 18	553.91
*Boonville, Mo.	196	July 17	597.84
Glasgow, Mo.	227	July 17	622.81
*Waverly, Mo.	297	July 16	673.69
Lexington, Mo.	327	July 15	696.76
Napoleon, Mo.	333	July 14-15	707.04
*Kansas City, Mo.	378	July 14	751.99
Osage River			
*St. Thomas, Mo.	38	July 13	563.26
Marais des Cygnes River			
*Trading Post, Kans.	337	July 14	799.28
La Cygne, Kans.	354	July 13	812.21
Osawatomie, Kans.	390	July 12	866.50
Ottawa, Kans.	419	July 12	904.76
Quenemo, Kans.	449	July 12	931.02
Maries River			
*Westphalia, Mo.	11	July 13	552.67
South Grand River			
*Brownington, Mo.	18	July 14	711.26
Pomme de Terre River			
*Hermitage, Mo.	28	July 11	747.23
Sac River			
*Stockton, Mo.	43	July 11	782.02

Table 7. --Flood crest stages--Continued
(Furnished by Corps of Engineers except as noted)

Stream and location	Miles above mouth	Day 1951	Altitude in feet
Marmaton River			
*Ft. Scott, Kans.	32	July 11	787.78
Pottawatomie Creek			
*Garnett, Kans.	25	July 11	905.50
Lamine River			
*Clifton City, Mo.	39	July 13	646.31
Blackwater River			
*Blue Lick, Mo.	12	July 14	628.89
Wakenda Creek			
*Carrollton, Mo.	14	July 17	664.57
Crooked River			
*Richmond, Mo.	24	July 6	735.14
Little Blue River			
*Lake City, Mo.	10	July 13	744.55
Big Blue River			
*Bannister Rd. (K. C.)		July 11	792.03
Kansas River			
23rd St. Bridge (K. C.)	6	July 14	768.3
*Bonner Springs, Kans.	20	July 13	785.91
Lawrence, Kans.	50	July 13	829.52
*Lecompton, Kans.	63	July 13	851.49
*Topeka, Kans.	83	July 13	890.42
*Wamego, Kans.	124	July 13	981.07
Manhattan, Kans.	143	July 13	1,020.02
*Ogden, Kans.	160	July 12	1,051.36
Stranger Creek			
*Tonganoxie, Kans.	9	July 12	825.89
Wakarusa River			
*Lawrence, Kans.	11	July 12	830.83
Delaware River			
*Valley Falls, Kans.	34	July 12	910.00

Table 7.--Flood crest stages--Continued
(Furnished by Corps of Engineers except as noted)

Stream and location	Miles above mouth	Day 1951	Altitude in feet
Soldier Creek			
*Topeka, Kans.	7	July 12	895.44
Big Blue River			
*Randolph, Kans.	33	July 13	1,063.61
Blue Rapids, Kans.	62	July 13	1,116.11
Marysville, Kans.	74	July 12	1,149.50
Beatrice, Nebr.	264	July 12	1,237.33
Smoky Hill River			
*Enterprise, Kans.	55	July 14	1,132.10
Salina, Kans.	125	July 13	1,224.05
*Mentor, Kans.	137	July 13	1,236.67
*Lindsborg, Kans.	170	July 12	1,326.51
Solomon River			
Minneapolis, Kans.	46	July 13	1,251.53
*Beloit, Kans.	98	July 13	1,378.41
Solomon River, South Fork			
*Alton, Kans.	41	July 12	1,635.30
Solomon River, North Fork			
*Kirwin, Kans.	56	July 11	1,677.37
Republican River			
Junction City, Kans.	4	July 12	1,076.51
*Clay Center, Kans.	44	July 12	1,181.52
*Concordia, Kans.	108	July 13	1,345.91
*Scandia, Kans.	130	July 11	1,434.51
*Hardy, Nebr.	151	July 11	1,513.66
*Guide Rock, Nebr.	181	July 12	1,638.83
Bloomington, Nebr.	236	July 14	1,831.19
Prairie Dog Creek			
*Norton, Kans.	46	July 12	2,241.56
Sappa Creek			
*Stamford, Nebr.	5	July 19	1,998.41
*Beaver City, Nebr.	30	July 16	2,171.99
*Oberlin, Kans.	88	July 12	2,537.10
Beaver Creek			
Beaver City, Nebr.	25	July 17	2,177.56

* U. S. Geological Survey record.

SPECIAL HYDROLOGIC AND HYDRAULIC STUDIES

By R. W. Carter

The flood of July 1951 in Kansas was one of the great floods of record. Because of its importance as a design flood in the future, every effort has been expended to secure the best possible records of stages and discharges.

Stage hydrographs were obtained at many sites along the streams: U. S. Geological Survey gaging stations, U.S. Weather Bureau forecast points, power plants, and municipal water works. The peak stage could generally be obtained at any point along the stream.

Measurements of discharge were more difficult to obtain during the flood period. This difficulty can be surmised from newspaper accounts of bridges destroyed, roads submerged, and stream surfaces dotted with floating debris including box cars and homes. The discharge measurements obtained were generally made from bridges across the main channel and from small boats across miles of flood plain.

The peak discharge at most gaging stations was determined by slope-area or contracted-opening methods. These determinations were based on field surveys of floodmarks and channel characteristics and were made after the flood waters had receded. The techniques used in these determinations have been greatly improved during the past few years.

A complete discharge hydrograph at a gaging station is based on the stage hydrograph and the relation between stage and discharge as established by discharge measurements. Stage-discharge curves in Kansas tend to be very "flat", once the water has broken into the overflow plain. As can be seen from the typical stage-discharge curve shown in figure 23, numerous discharge measurements would be required to define the shape of the curve above bank-full stage. These measurements are generally not available.

Changes in the stage-discharge relation at a station may occur if the stream bed is scoured or filled during the flood, or if the flow of tributaries downstream causes backwater at the gage. Major changes in the stage-discharge relation occurred at several mainstem stations on the Kansas River. At Ogden the river cut a new low-water channel leaving the bridge and gage in the abandoned loop.

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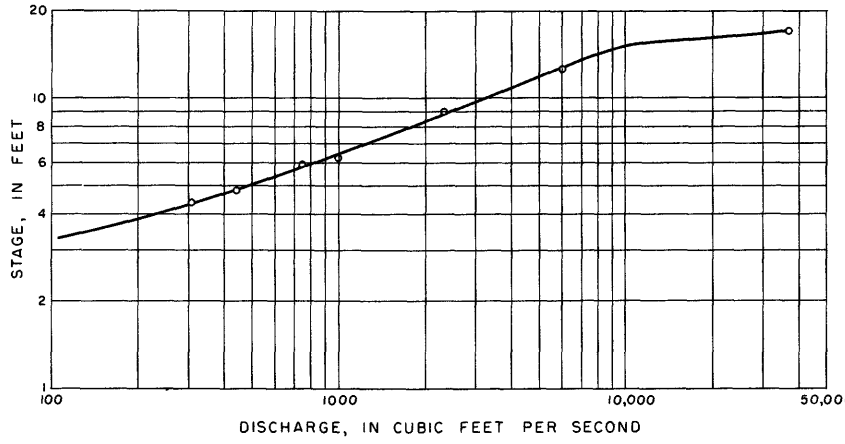


Figure 23. --Relation between stage and discharge, Salt Creek near Lyndon, Kans.

Many techniques have been employed to check the consistency of the flood records at the gaging stations. These methods include: (1) Comparison of the flood volume and peak discharges for the streams in a basin; (2) comparison of the volume of flood runoff with the volume of rainfall; and (3) routing the hydrographs down the main stem of the larger streams. At a few stations these methods have been employed to determine the shape of the stage-discharge curve, the time of major shifts in the stage-discharge relation, or to estimate discharges during periods of no gage-height record. A summary of the consistency study is given.

The volume of flow resulting from the rainfall of July 9-13, 1951 was selected as the basis for study. The runoff volume was computed by summing the discharges from the beginning of the rise to the point on the recession where the base flow was the same as at the beginning of the rise. This assumes the volume of channel storage and ground storage to be the same at the beginning and end of the period. Because of the impervious nature of the drainage area and the high base flow at the beginning of the rise, stream flow receded to the original point of base flow in the relatively short period of seven to ten days. Runoff from the light rainfall of July 16-17 was removed from the discharge hydrographs by graphic methods. The total flood volume at each gaging station is listed in table 8. The volume from the ungaged area between two main-stem stations was computed as the difference in volumes at the gaging stations.

The total rainfall from noon July 9 to noon July 13 is also listed for each area. The rainfall volume was determined by planimetering between isohyetals for each drainage area. Isohyetal maps of total rainfall for the period July 9-13 were furnished by the U. S. Weather Bureau.

(Table 8)

Table 8. --Volumes and peak rates of flow for flood of July 1951

Station	Drainage area (sq mi)	Rainfall (in.)	Flood volume		Peak discharge		Ratio peak to volume
			cfs-days	in.	cfs	cfs per sq mi	
MISSOURI RIVER BASIN							
Kansas River basin							
Republican River near Hardy, Nebr.	22,400		89,600				
White Rock Creek at Lovewell, Kans.	358	5.50	15,400	1.60			
Ungaged	172	5.87	19,600	4.24			
Republican River at Scandia, Kans.	22,930		124,600		28,000		0.225
Ungaged	610	5.90	24,000	1.46			
Republican River at Concordia, Kans.	23,540		148,600		33,600		.226
Ungaged	1,030	8.17	124,100	4.48			
Republican River at Clay Center, Kans.	24,570		272,700		51,500		.189
Ungaged	330	12.09	80,300	9.05			
Republican River at Milford, Kans.	24,900		353,000		62,900		.178
Smoky Hill River at Enterprise, Kans.	19,200		997,700		233,000		.234
Ungaged	1,140	12,34	313,000	10.21			
Kansas River at Ogden, Kans.	45,240		1,663,700		298,000		.179
Big Blue River near Manhattan, Kans.	9,540		418,500		93,400		.223
Ungaged	460	10.84	111,800	9.04			
Kansas River at Wamego, Kans.	55,240		2,194,000		400,000		.182
Ungaged	1,470	8.93	199,000	5.03			
Kansas River at Topeka, Kans.	56,710		2,393,000		469,000		.196
Soldier Creek near Topeka, Kans.	268	6.21	34,800	4.83	10,400	38.8	.299
Delaware River at Valley Falls, Kans	922	4.78	74,000	2.98	32.800	35.6	.443
Ungaged	520	7.07	79,000	5.65			
Kansas River at Lecompton, Kans.	58,420		2,580,800		483,000		.187
Wakarusa River near Lawrence, Kans.	458	9.12	94,900	7.71	24,200	52.8	.255
Stranger Creek near Tonganoxie, Kans.	406	5.93	50,300	4.61	33,100	81.5	.66
Ungaged	606	6.94					
Kansas River at Bonner Springs, Kans.	59,890		2,677,000		510,000		.190
Missouri River at St. Joseph, Mo.	424,300		792,100				
Ungaged	5,010						
Missouri River at Kansas City, Mo.	489,200		3,460,000				
Smoky Hill River basin							
Smoky Hill River near Russell, Kans.	6,965		17,600		6,720		.382
Ungaged	615		23,400				
Smoky Hill River at Ellsworth, Kans.	7,580		a48,400		14,400		.351
Ungaged	277						
Kanopolis Reservoir near Kanopolis, Kans.	7,857		a27,000				
Smoky Hill River near Langley, Kans.	7,857		a42,260		5,570		
Ungaged	253	7.14	30,740	4.52			
Smoky Hill River near Lindsborg, Kans.	8,110		73,000		14,200		
			b48,000				
Ungaged	120	9.70	23,600	7.31			
Smoky Hill River near Mentor, Kans.	8,230		b71,600		20,000		
Saline River at Tescott, Kans.	2,820		133,000		61,400	21.8	.462
Solomon River at Niles, Kans.	6,770		557,400		178,000	26.3	.319
Ungaged	1,380	10.00	235,700	6.35			
Smoky Hill River at Enterprise, Kans.	19,200		997,700		233,000	12.1	.234
Saline River near Russell, Kans.	1,502	2.41	21,500	.53			
Paradise Creek near Paradise, Kans.	212	5.51	17,900	3.14	14,800	69.8	.827
Ungaged	186	3.53	3,100	.62			
Saline River near Wilson, Kans.	1,900	2.87	42,500	.83	17,800	93.7	.419
Wolf Creek near Sylvan Grove, Kans.	261	5.77	22,800	3.25	29.300	112	1.29
Ungaged	659	7.15	67,700	3.82			
Saline River at Tescott, Kans.	2,820	4.14	133,000	1.75	61,400	21.8	.462
S. Fork Solomon River at Alton, Kans.	1,720	4.56	102,300	2.21			
Ungaged	304	6.83	27,900	3.41			
S. Fork Solomon River at Osborne, Kans.	2,024	4.90	130,200	2.39	81,200	40.1	.624
N. Fork Solomon River near Downs, Kans.	2,390	5.86	100,200	1.56	35,700	14.9	.356
Ungaged	1,016	7.32	109,600	4.01			

Table 8.--Volumes and peak rates of flow for flood of July 1951--Continued

Station	Drainage area (sq mi)	Rainfall (in.)	Flood volume		Peak discharge		Ratio peak to volume
			cfs-days	in.	cfs	cfs per sq mi	
Smoky Hill River basin--Continued							
Solomon River at Beloit, Kans.	5,430	5.78	340,000	2.33	125,000	23.0	.368
Ungaged	1,340	8.76	217,400	6.03			
Solomon River at Niles, Kans.	6,770	6.37	557,400	3.06	178,000	26.3	.319
Bow Creek near Stockton, Kans.	347	6.47	14,300	1.53	12,900	37.2	0.902
N. Fork Solomon River at Kirwin, Kans.	1,290	5.97	45,000	1.30	15,600	12.1	.346
Ungaged	1,100	5.73	55,200	1.87			
N. Fork Solomon River near Downs, Kans.	2,390	5.86	100,200	1.56	35,700	14.9	.356
Big Blue River basin							
Big Blue River at Barneston, Nebr.	4,420		65,000		18,700	4.2	.288
Little Blue River at Waterville, Kans.	3,440		154,800		38,200	11.1	.247
Ungaged	1,240	5.82	110,840	3.32			
Big Blue River at Randolph, Kans.	9,100		330,640		77,800	8.5	.235
Ungaged	440	9.31	87,860	7.43			
Big Blue River near Manhattan, Kans.	9,540		418,500		93,400	9.8	.223
Little Blue River near Endicott, Nebr.	2,340		63,800				
Ungaged	1,100	6.95	91,000	3.08			
Little Blue River at Waterville, Kans.	3,440		154,800		38,200	11.1	.247
Marais des Cygnes River basin							
Marais des Cygnes at Melvern, Kans.	363	12.86	103,200	10.58	68,500	189	.66
Salt Creek near Lyndon, Kans.	111	12.80	31,600	10.59	36,400	328	1.15
Hundred and Ten-Mile near Quenemo, Kans.	321	11.01	83,900	9.72	38,600	120	.460
Ungaged	465	10.94	135,100	10.80			
Marais des Cygnes at Ottawa, Kans.	1,260	11.67	353,800	10.44	142,000	113	.402
Pottawatomie Creek near Garnett, Kans.	334	8.11	67,000	7.46	45,300	136	.676
Ungaged	1,316	8.51	224,400	6.34			
Marais des Cygnes at Trading Post, Kans.	2,910	9.86	645,200	8.25	148,000	50.9	.229
Big Sugar at Farlinville, Kans.	198	9.53	45,600	8.56	22,500	114	.493
Little Osage near Fulton, Kans	295	7.73	46,000	5.80	15,400	52.2	.335
Marmaton River near Fort Scott, Kans.	411	7.02	40,400	3.66	21,200	51.6	.525
ARKANSAS RIVER BASIN							
Neosho River basin							
Neosho River at Council Grove, Kans.	256	14.86	83,400	12.41	121,000	484	1.45
Cottonwood River near Marion, Kans.	329	9.68	64,000	7.23	66,000	201	1.03
Cedar Creek near Cedar Point, Kans.	110	7.55	14,300	4.83	11,100	101	.78
Ungaged	963	11.99	305,000	11.78			
Cottonwood River at Cottonwood Falls, Kans.	1,402	11.20	383,300	10.17	196,000	140	.51
Ungaged	1,281	11.96	275,800	8.01			
Neosho River at Strawn, Kans.	2,933	11.84	742,500	9.41	400,000		.54
Ungaged	885	8.88	192,500	8.09			
Neosho River near Iola, Kans.	3,818	11.15	935,000	9.11	436,000	114	.466
Ungaged	999	6.45	130,000	4.84			
Neosho River near Parsons, Kans	4,817	c10.17	1,065,000	c8.43	410,000	85	.385
			c1,092,000				
Ungaged	130		2,800				
Neosho River near Oswego, Kans.	4,947		c1,094,800		395,000	79.8	.361
Ungaged	929						
Neosho River near Commerce, Kans	5,876		c1,093,000		267,000	45.4	.244

a Period 12 p. m. July 10 to 12 p. m. July 20

b Does not include storage release from Kanapolis Reservoir which began July 15.

c Includes about 0.5 inch of rainfall which occurred July 16-17.

The rainfall-runoff data for the gaging stations is shown plotted in figure 24. The infiltration rate was very low except in the headwaters of the Solomon River where the pervious soil, combined with low intensities of rainfall, permitted absorption of the greater part of the rain. In the Marais des Cygnes-Osage and Neosho River basins the total runoff volume was as much as 90 percent on the rainfall.

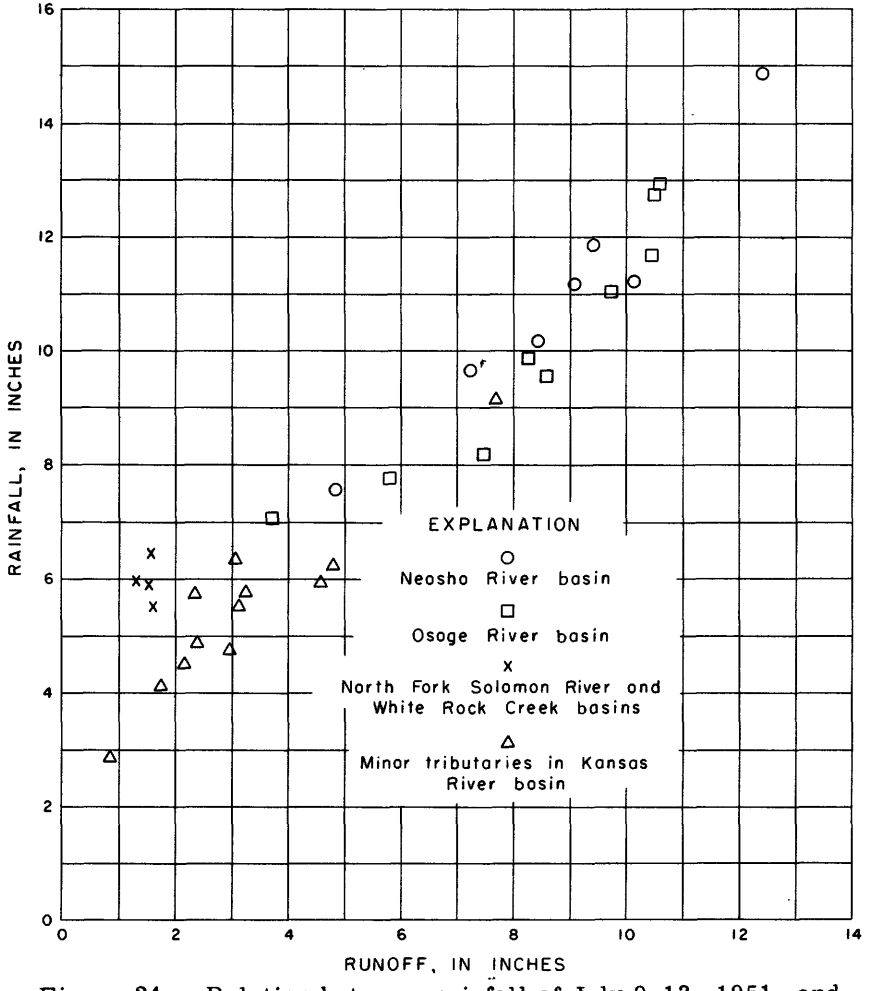


Figure 24.--Relation between rainfall of July 9-13, 1951, and corresponding runoff at selected gaging stations in Kansas

The amount of scatter in figure 24 appears reasonable in view of the storm's tropical nature, which is characteristically associated with large variations in intensity of rainfall and with doubtful position of many storm centers. The rainfall-runoff data for the ungaged inflow between gaging stations are not plotted. However, except for the lower reaches of the Kansas and Neosho Rivers, these data plot within the limits of scatter shown by data for the gaging station. Records for the Kansas and Missouri Rivers below Le-

compton and the Neosho River below Parsons show a consistent loss of volume from the river channel. At these points the rivers leave the area of heavy rainfall and flow into increasingly broad valleys with more pervious structure than exists in the reaches upstream. Hence, an increasing amount of water may be trapped and evaporated into the atmosphere.

The peak discharges along the main stems were compared by plotting the peak discharge per square mile against size of drainage area. These data are shown in table 8.

The ratio of the peak discharge to total volume ($\frac{\text{cfs}}{\text{cfs-days}}$) was also compared with size of drainage area to verify peak discharges along the main stem of the large streams. These data are shown in figure 25. Points for the Neosho River basin and Marais des Cygnes-Osage River basin are identified on the graph to illustrate the consistent trend obtained.

Discharge hydrographs were routed down the main stem of the large streams to check the consistency of the discharge records at each station. The Muskingum method of flood routing was used, as introduced by G. T. McCarthy in an unpublished manuscript presented June 24, 1938 at a conference of the North Atlantic Division, Corps of Engineers, Department of the Army. The basic equation for the method is:

$$\text{Storage} = K\left[XI + (1-X)\,D\right]$$

Where

I = inflow rate at given time.
D = outflow rate at given time.
K = slope of storage-weighted discharge relation and has the dimensions of time. K is the time between center of mass of flood wave at upstream and downstream end of the reach.
X = a dimensionless constant which weights the inflow and outflow.

Values of X were based on a study of the highest floods of record. Values of K were based on the time of travel of the center of mass of the flood wave and the time between peaks for the flood of July 1951.

The reach from Lecompton to Bonner Springs on the Kansas River is used as an example of the flood routing. Inflow to the reach is gaged on the Kansas River at Lecompton, Wakarusa River near Lawrence, and Stranger Creek near Tonganoxie. Flow from the ungaged area of 606 sq mi was estimated from rainfall records, the rainfall-runoff relation defined by records of the July flood, and time distribution graphs for the gaged tributaries to the

reach. The following coefficients were used with K apportioned on a mileage basis:

	K (hours)	X
Lecompton to Bonner Springs	14	0.25
Lawrence to Bonner Springs	11	.25
Tonganoxie to Bonner Springs	10	.25
Ungaged to Bonner Springs	0	

The total of the gaged tributaries routed to Bonner Springs plus the estimate for the ungaged area is shown on figure 26. The total routed hydrograph is compared with the actual flow at Bonner Springs on this same figure. The hydrographs are in good agreement.

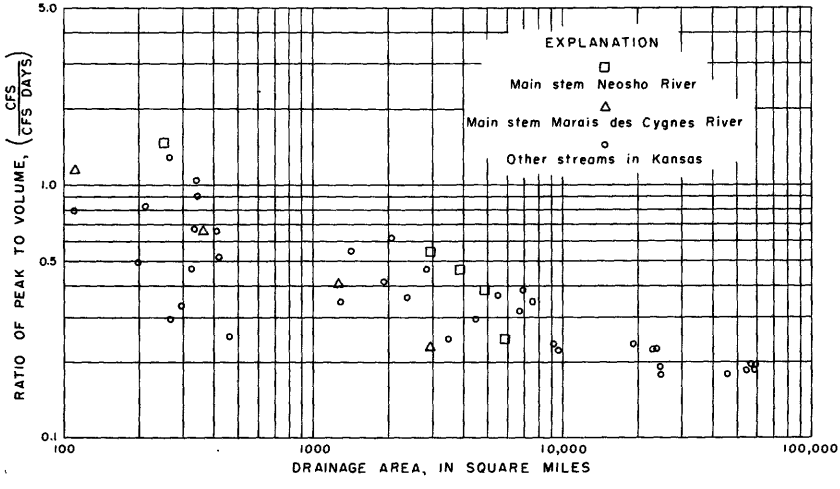


Figure 25.--Relation of ratio between peak discharge and total volume to drainage area for flood of July 1951 in Kansas.

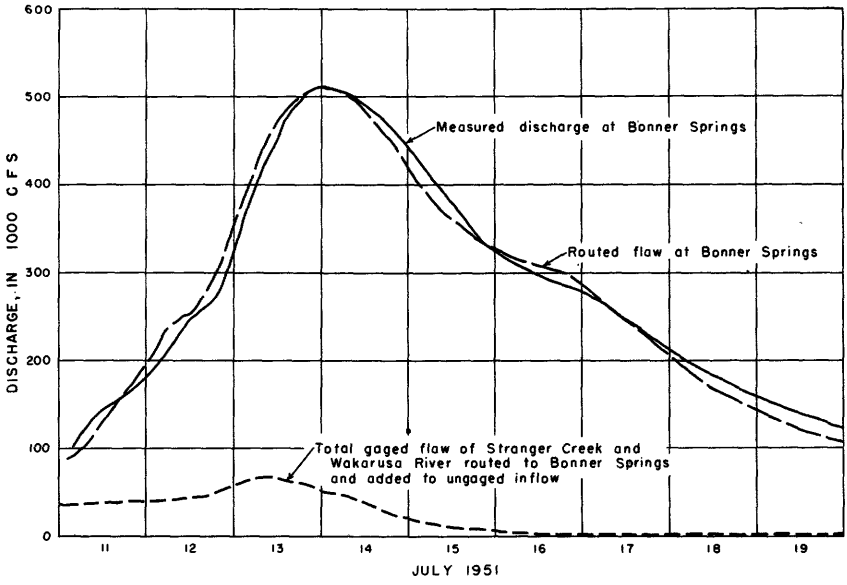


Figure 26. --Comparison between hydrographs of measured and routed discharge of Kansas River at Bonner Springs, Kans.

RECORDS OF PREVIOUS FLOODS

Although the July 1951 flood exceeded any that has occurred in the same area since 1844, a brief discussion of previous floods is included here for comparison. Data on floods in Kansas are fairly complete since about 1900; reports on floods have been issued by many agencies. The great flood of 1903 in the Kansas River basin is described in a report containing stream-flow data published by the Geological Survey (Murphy, 1904, pp. 21-78). Continuous stream-gaging records have been collected by the Geological Survey on the Kansas River and major tributaries since 1918. The same agency collected a few stream-flow records in Kansas prior to 1905. The great flood of 1903 created an interest in river stages, and many river-stage stations were established and have been operated continuously since 1904 by the U. S. Weather Bureau.

The surface rocks of Kansas are, in general, of pervious nature in the western half of the state and relatively impervious in the eastern half. Annual precipitation in Kansas varies from average values of less than 20 in. at the western boundary to about 40 in. in the southeast corner of the state. The monthly distribution of the rainfall is such that more than one-half of the year's total falls during the months of May, June, July and August. The combination of hydrologic factors makes the flood potential high in eastern Kansas. Although a few floods have occurred outside of the period April-September, most flooding occurs during that period of heavy precipitation. In most of Kansas, river channels

are winding, low-banked, and much lined with trees, so that the main-channel conveyance per unit cross-sectional area is low. Observation of the flood plains of Kansas streams indicates that frequent overflows occur-- overflow channels generally paralleling the main channel show evidence of repeated floods. In almost every year overflows have occurred on some stream in Kansas-- many of these overflows do not cause much damage. Information published by the U. S. Weather Bureau on major floods in Kansas is listed in table 9; data subsequent to 1920 have been omitted because of the availability of Geological Survey gaging records that contain flow data. A special report (Follansbee and Spiegel, 1937) was issued by the Geological Survey for the 1935 flood on the Republican River.

Table 9. --Years of known major floods in Kansas prior to 1920. 1/

Basin and stream	Year											
	1826	1844	1858	1867	1877	1885	1895	1903	1904	1908	1915	1919
Missouri River Basin												
Kansas River	x	x	x	x	x			x	x	x	x	
Republican River								x			x	
Blue River		x						x		x		
Solomon River		x						x		x	x	x
Saline River		x						x				
Smoky Hill River (above Saline River)		x					x	x				
Marais des Cygnes-Osage River		x										
Arkansas River Basin												
Upper Arkansas (in Kans.)					x				x	x		
Neosho River	x	x				x		x	x			
Cottonwood River		x										

1/ From data published by the U. S. Weather Bureau in Kansas State Board of Agriculture, Climate of Kansas, 1948, p. 279.

Outstanding floods have occurred in Kansas prior to 1951, in 1844, 1903, and 1935. The 1844 flood was caused by a storm and conditions similar to those which caused the July flood. Extensive research on the 1844 flood has been made by Mr. Snowden D. Flora, formerly of the U. S. Weather Bureau, and some of the data collected by him and published in the Topeka Daily Capital (Conklin, 1952) are as follows:

> The cause of the 1844 flood, which crested at Kansas City, Mo., June 15 of that year, was the same as that of the floods of 1903 and 1951 - prolonged and heavy rains over a wide area * * * a total of 27.43 inches fell in May and June.
>
> The diary of the Rev. Jonathan Meeker, missionary * * * Ottawa, mentioned almost continuous rains from May 7 to June 10 and a great flood of the Marais des Cygnes. The diary of Father Hoechen of the Pottawatomie Mission reported that it rained for 40 successive days and that great floods covered the country.
>
> According to Indian legend, the 1844 crest came to the present location of the southwest corner of the Kansas State College campus (Manhattan). Levels * * *showed that the mark was 6.5 feet above a nearby 1951 high-water mark.

A summary of the stages of the 1844 flood along the Kansas River as compared with the 1951 flood is published in the Kansas Historical Quarterly (Flora, 1952).

Evidence collected by the Corps of Engineers shows that a great flood on the Neosho River also occurred in 1844. Many of the 1844 flood data are of value only to show that a great flood occurred, but along the Missouri River downstream from the Kansas River the data have greater reliability and discharges have been computed by the Corps of Engineers (see Missouri River data table 6).

The 1903 flood has been well described in a previous report of the Geological Survey (Murphy, 1904, pp. 21-78). The following corrections should be applied to errata in that report:

Plate VIII - Captions A & B should be interchanged. The bridge shown in A is the existing (damaged and not in use) structure at Lecompton. The bridge shown in B has been replaced since 1903 by a concrete arch structure.

Plate IX - A - The view is from top of the National Bank, Lawrence, Kans., not Lecompton.

The following tabulation shows the crest stages of the Kansas River at several gage points during the 1903, 1935, and 1951 floods:

Year	Ogden (ft)	Wamego (ft)	Topeka (ft)	Lecompton (ft)
1903	28.5	26.3	a32.7	27.9
1935	28.0	23.8	b26.6	---
1951	30.5	27.6	36.3	30.2

a. U. S. Weather Bureau gage at site one half mile downstream.
b. At site $1\frac{1}{2}$ miles downstream at datum 1.74 ft lower.

During field operations following the July 1951 flood, W. H. Goines of the Geological Survey determined the following information on relative heights of great floods on the Big Blue River at the site of the gage in use 1895-1905:

Date	Stage 1/ (ft)
May 31, 1903	35.8
June 1908	35.8
June 1941	34.1
July 12, 1951	33.0

1/ Referred to datum 1895-1905

FLOOD-FREQUENCY

By Tate Dalrymple

A preliminary study has been made of flood frequency and magnitude in the State of Kansas excepting most of the Arkansas River basin. This generalized study was based on all available discharge records in Kansas and some in adjoining States.

The magnitude-frequency relations were determined by relating mean annual floods to the size of drainage areas and developing regional flood-frequency curves expressed in terms of ratio to the mean annual flood.

Figure 27 is a map of Kansas showing the areas (lettered A-E) for which flood-frequency relation have been calculated.

Figure 28 shows curves relating mean annual floods to drainage area, for points along the Kansas River main stem and for points along the Missouri River main stem from St. Joseph, Mo., to the mouth.

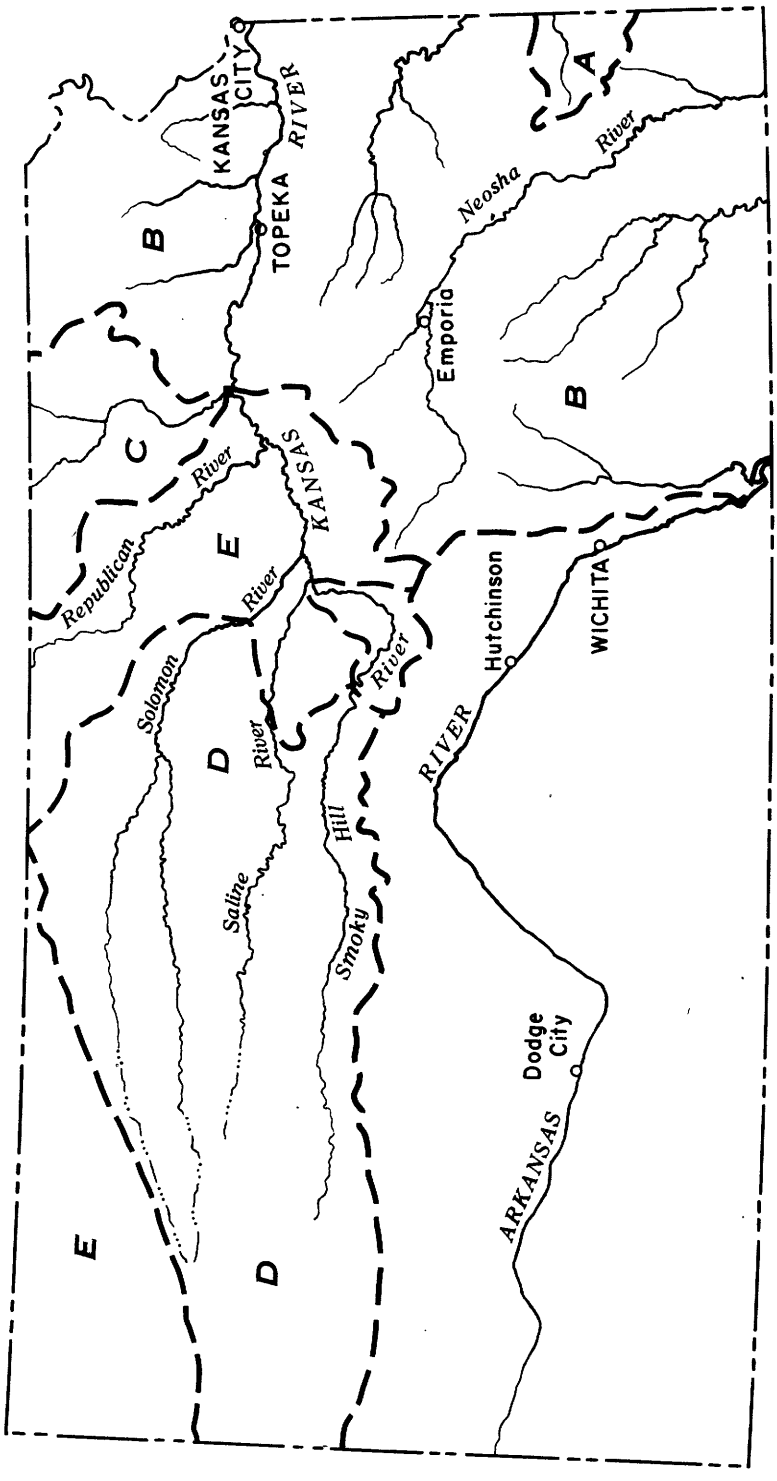
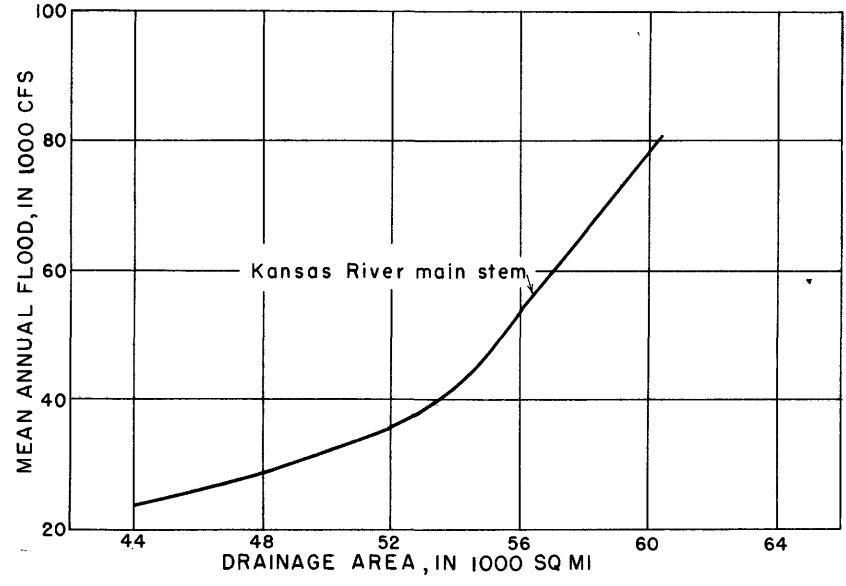


Figure 27.--Map showing regions for determination of mean annual flood.



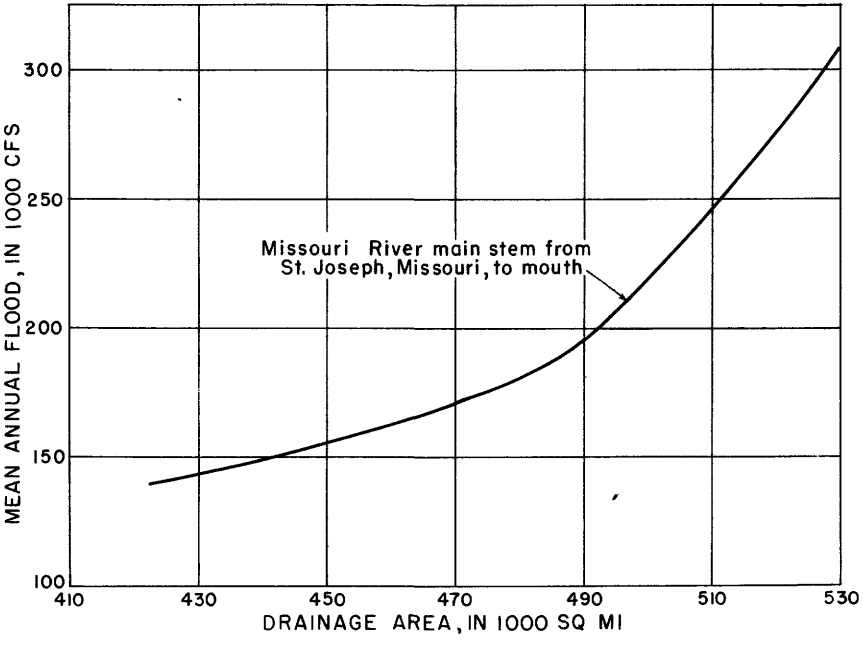
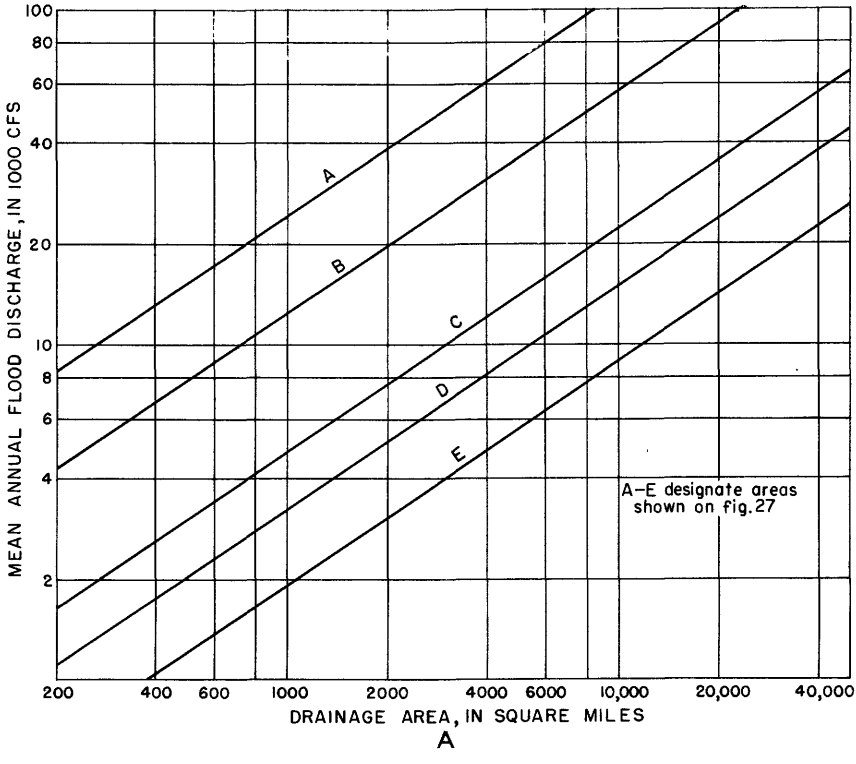


Figure 28. --Variation of mean annual flood with drainage area, Kansas River main stem and Missouri River main stem from St. Joseph to mouth.



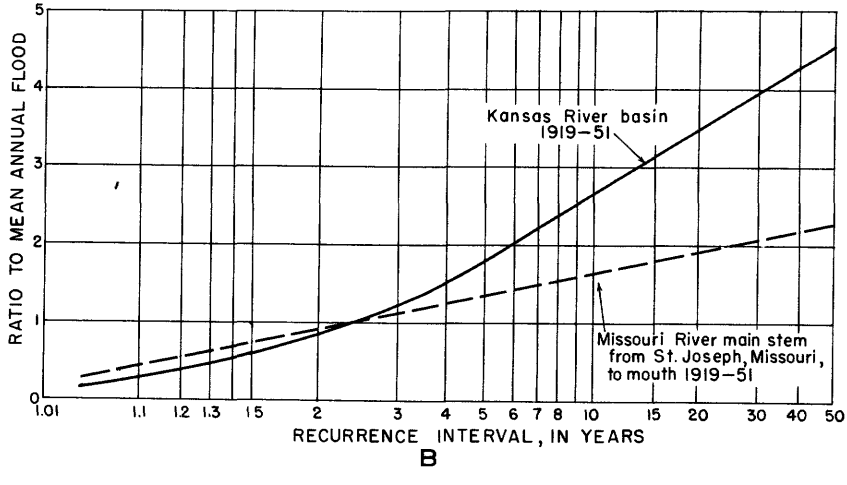


Figure 29.--A, Variation of mean annual flood with drainage area, Kansas streams; B, Frequency of annual floods.

Figure 29A shows curves relating mean annual floods to drainage area, for regions delineated in figure 27. These curves apply to all streams excepting the main stems of the Kansas and Missouri Rivers, to which figure 28 applies.

Figure 29B shows curves defining the relationship of peak discharge (expressed in terms of ratio to the mean annual flood) to frequency of occurrence. It applies to the entire Kansas River basin, including the main stem, except for a small undefined area along the Smoky Hill River from Kanapolis Reservoir to Salina, Kans., and to the Missouri River main stem, from St. Joseph, Mo., to the mouth.

The flood-frequency graph for any particular site on a stream may be obtained by the following procedure:

(1) Determine the size of drainage area at the site.

(2) Determine from figure 27 in which region the stream lies.

(3) Determine the mean annual flood from figure 29A if on a tributary stream, from figure 28 if on the main stem Kansas of Missouri Rivers.

(4) For any recurrence interval, determine the ratio to mean annual flood, using figure 29B. Multiply the ratio by the mean annual flood determined in (3). If a complete frequency graph is desired, it may be defined by plotting, on any type of graph paper, values determined for several recurrence intervals.

The frequency relationships developed here are properly applicable to recurrence intervals not greater than 50 years, based on the range of time covered by available discharge records. Peak discharges in this area during the 1951 floods generally represent recurrence intervals considerably higher than 50 years. A conception of the possible frequency involved at any site may be obtained by computing the ratio of the 1951 discharge to the mean annual flood [determined as in (3) above] and by noting the position of this ratio with respect to the applicable curve of figure 29B. There is no assurance that the frequency curves can be extrapolated beyond 50 years on the basis of the shapes as shown.

FLUCTUATIONS OF GROUND-WATER LEVELS

By V. C. Fishel

Cooperative investigations of the ground-water resources of Kansas were begun in 1937 by the Geological Survey in cooperation with the State Geological Survey of Kansas, the Division of

Sanitation of the State Board of Health, and the Division of Water Resources of the State Board of Agriculture. Also, since 1946, ground-water investigations have been made in Kansas by the Geological Survey as a part of the Interior Department's development program of the Missouri Basin. An extensive observation-well program has been an essential part of these ground-water investigations. During 1951, water-level measurements were made periodically in 867 wells in 71 counties in Kansas. In most of these wells the water level is measured weekly or monthly, but in a few it is measured quarterly. Eleven wells are equipped with automatic recording gages. Some of the wells are in valleys and were directly affected by flood waters. Others are on the uplands and receive ground-water recharge only from infiltration of precipitation.

A very close relation exists between the geology of Kansas and the infiltration of precipitation and the corresponding surface runoff into the streams. Much of western Kansas is underlain by the Ogallala formation of Tertiary age. The Ogallala formation consists of thick deposits of calcareous sand, gravel, and sandy clay. Locally these deposits yield large supplies of water for irrigation, industrial, and municipal use. Deposits of sand, gravel, and silt underlie high-level terraces along many of the larger stream valleys in the State. In general the terraces represent older, higher flood plains of the rivers which have since cut their channels deeper and developed new flood plains. The terrace deposits are generally permeable and therefore readily absorb water directly from rainfall and from the runoff from adjacent uplands. Alluvium is the deposit built up by the present streams in their valleys. It resembles terrace deposits in being loosely consolidated and, where coarse, capable of yielding large quantities of water to wells.

Much of north-central and eastern Kansas is underlain by consolidated rocks of Cretaceous, Permian, Pennsylvanian and Mississippian age. These rocks consist principally of beds of limestone and shale and some sandstone and sandy shale. Locally these older deposits yield abundant supplies of water of excellent quality for stock and domestic use, and they furnish the municipal supply for many towns. In many areas underlain by these rocks, however, it is difficult to obtain a well-water supply of suitable quantity and quality even for domestic use. The storage capacity of these rocks is small in comparison with that of the thick deposits of the Ogallala formation in western Kansas. Thus, in Kansas the ground-water supplies are meager in the eastern part of the State where the precipitation is fairly high but much more plentiful in western Kansas where the precipitation is low. In western Kansas the land surface is comparatively flat and, although the soils have a low infiltration capacity, the surface runoff is very small. Of the water absorbed by the soil probably

not more than about a quarter of an inch reaches the water table in the average year and the remainder is returned to the atmosphere by evaporation and transpiration. Generally less than half an inch of the annual precipitation leaves the basins in western Kansas as stream flow.

In central and eastern Kansas the land surface is more rolling than in western Kansas and a greater percentage of the precipitation reaches the streams by direct surface runoff. However, because of the higher annual precipitation more water is absorbed by the soil and more water reaches the water table than in western Kansas, but the greater excess of precipitation over infiltration in eastern and central Kansas causes more floods. Much of the water that reaches the water table is discharged into the streams, whereas in western Kansas much of the relatively small amount of ground-water recharge is disposed of by evaporation and transpiration at the edge of the High Plains.

The principal source of ground water is precipitation as rain or snow. A part of the precipitation falling on the surface percolates vertically downward through the earth until it reaches the zone of saturation; recharge thus is intermittent. Discharge of ground water, which occurs by evaporation and transpiration, seepage into streams, and discharge from wells and springs, is a relatively continuous process, so that the ground-water levels are receding except during and immediately following periods of precipitation, at which time the ground-water reservoirs may be replenished.

Four wells were selected to show the rise in water levels caused by the high precipitation in 1951 and preceding years. The locations of these wells are shown in figure 30. Wells 11-15-16c, 15-2-18cdd and 24-33-9aa are in the alluvium of Kansas Valley, Smoky Hill Valley, and Arkansas Valley, respectively. Well 25-1-26bd is in the McPherson formation, an upland terrace deposit.

The hydrograph of well 11-15-16c is shown in figure 31. This hydrograph is for the 6-month period May 1 to October 31, 1951, and includes the time of the Kansas River flood of July 1951. On May 1 the water level was 24.7 ft below the land surface. Precipitation during May and June raised the water level to 21.8 ft on July 1. The storm that caused the July flood began on July 9 and continued through July 13. The flood in the Kansas River reached a peak stage at Topeka at 6:30 a. m. on July 13. The ground-water level began rising rapidly on July 11 and rose about 12 ft by noon on July 14 and then rose an additional 0.2 ft by noon on July 16. At the highest stage the water level was 8.9 ft below the land surface. After its crest on July 16 the water level declined about 5.0 ft by July 31 and an additional 3.0 ft by August 25. Precipitation during the last week in August and the

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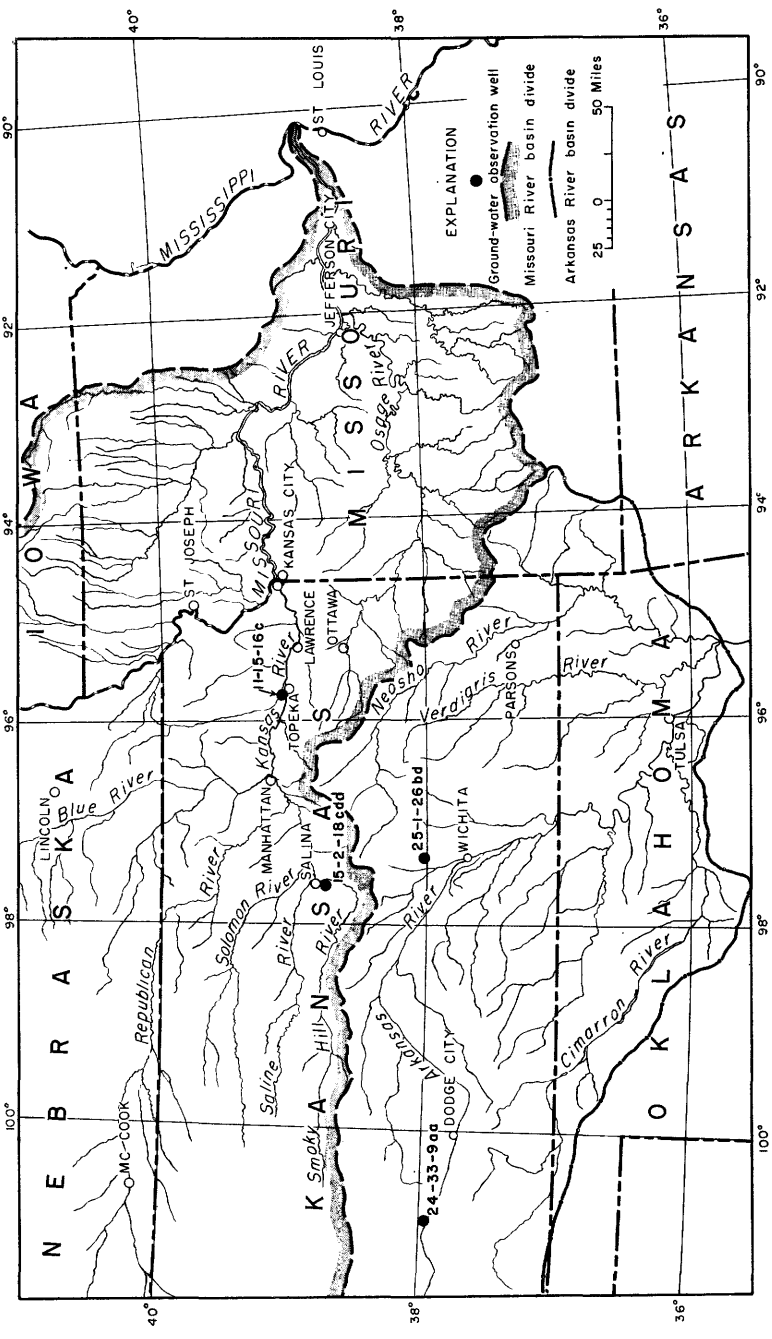

Figure 30.--Map showing location of selected wells.

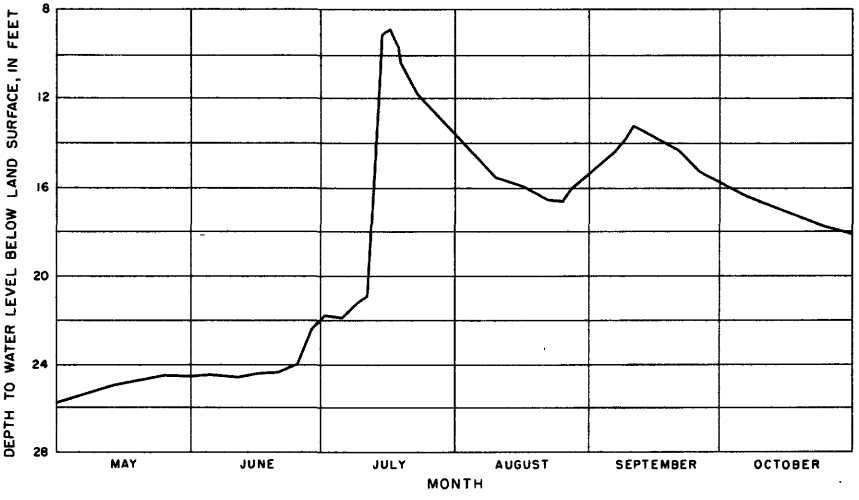

Figure 31. --Hydrograph showing rise of water level in Topeka well 11-15-16c during May to October 1951.

first two weeks of September caused the water level to rise 3.5 ft by September 10, and it then declined 5.0 ft by October 31. On October 31 the water level was still 7.6 ft above its level on May 1.

In 1940 the ground-water levels in Kansas were at a very low level as a result of the low precipitation during the preceding decade. Since 1940 the precipitation in Kansas has been above or near normal. In response to the high precipitation the water levels in Kansas have risen materially during the last 10 years, culminating in the highest recorded level during the flood period of 1951. The response of the ground-water levels to the high precipitation is shown by the hydrographs of the three wells in figure 32. The water level in well 24-33-9aa in southwestern Kansas reached its highest level in June because the high precipitation in southwestern Kansas occurred earlier than that in the Kansas Valley. The water level in well 24-33-9aa was 10.6 ft below the land surface on January 1, 1940. It was only 1.6 ft below the land surface on June 3, 1951. The water level declined to 4.8 ft on December 31, 1951, but was still higher than any recorded level prior to 1951.

The highest recorded water levels in wells 15-2-18cdd and 25-1-26bd occurred in July 1951 at the time of the high precipitation in central and eastern Kansas.

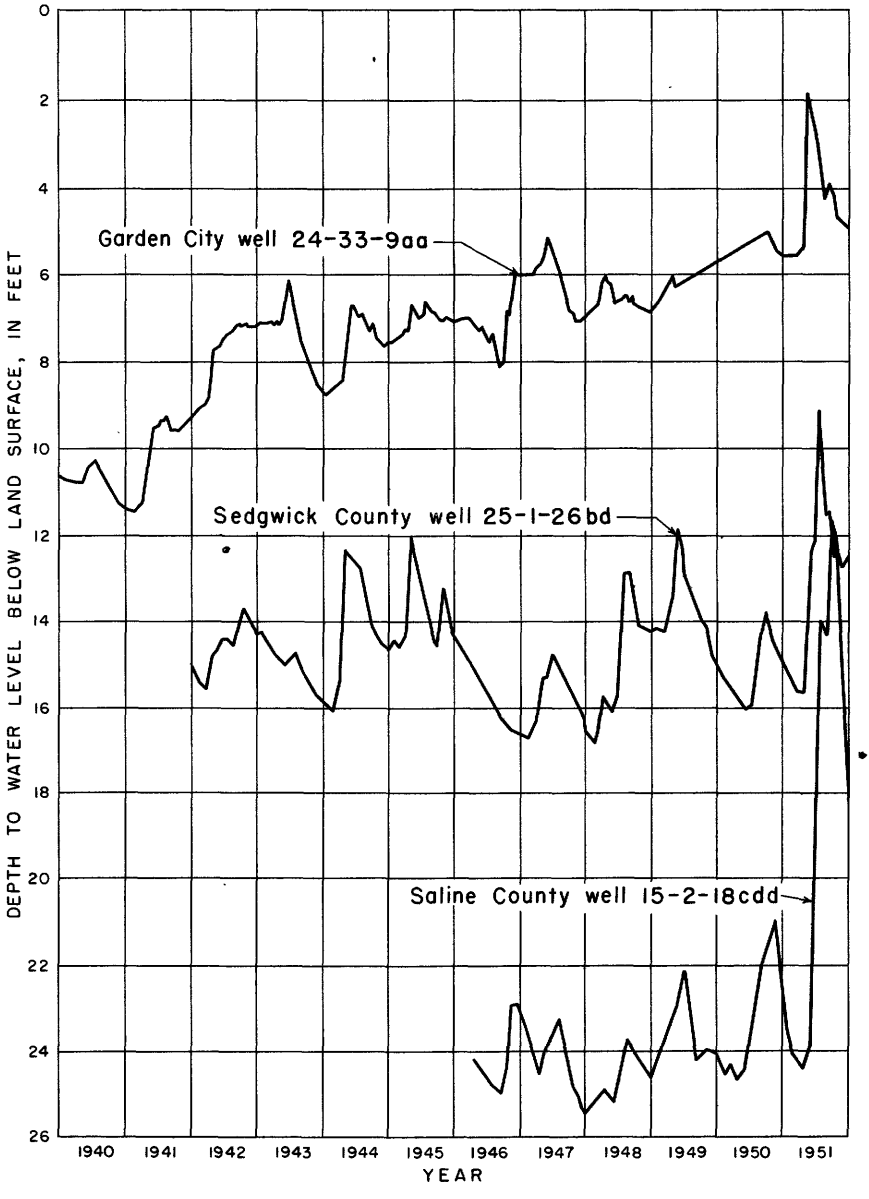

Figure 32. --Hydrographs showing rise of water level in selected wells during decade ending 1951.

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