Floods of 1960 in the United States

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STEWART L. UDALL, *Secretary*

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Thomas B. Nolan, *Director*

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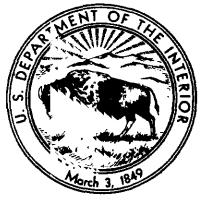
Floods of March–April 1960 in Eastern Nebraska and Adjacent States

By H. D. BRICE *and* R. E. WEST

FLOODS OF 1960 IN THE UNITED STATES

GEOLOGICAL SURVEY WATER-SUPPLY PAPER 1790–A

Prepared in cooperation with the States of Iowa, Kansas, Missouri, Nebraska, and South Dakota and with agencies of the Federal Government



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STEWART L. UDALL, *Secretary*

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FLOODS OF 1960 IN THE UNITED STATES

FLOODS OF MARCH–APRIL 1960 IN EASTERN NEBRASKA AND ADJACENT STATES

By H. D. Brice and R. E. West

ABSTRACT

Snowmelt floods, record breaking on many streams and outstanding in terms of total area affected and runoff volumes generated, occurred in late March and early April 1960 on Missouri River tributaries in adjacent parts of six states. In order of area affected, the States are Nebraska, South Dakota, Iowa, Kansas, Minnesota, and Missouri.

Five lives were lost, and the estimated damage was $14 million. Main-stem reservoirs kept Missouri River stages substantially below potential unregulated levels. Without regulation by reservoirs, the stage at Sioux City and Omaha would have been about 9 feet higher than it was and the damage would have been many millions of dollars more than actually occurred.

The floods were caused by rapid melting of an extensive snow cover of unusual depth and water equivalent, augmented by light to moderate rains. Temperatures almost continuously below normal, beginning in late December and culminating in record lows at many places during the first half of March, resulted in the retention of record snow accumulations, much later and much farther south than normal. The snowfall in eastern Nebraska from December 27 to March 26 was about twice the annual average. The excessive snowfall and below-normal temperatures produced a record-breaking 75-day period of continuous snow cover at Omaha.

A rapidly rising, eastward-moving temperature pattern late in March, in combination with an easterly orientation of many Nebraska streams, tended to magnify flood peaks. The rapid temperature rise started about March 18 in western Nebraska but not until March 26 in the eastern part of the State. As a consequence, flood discharges from the headwaters, often bearing heavy ice floes, arrived in the lower reaches simultaneously with or even ahead of the breakup of the unusually heavy ice cover and caused serious jamming.

Comparisons of the peak discharges of the 1960 snowmelt floods with those of previous floods reveal several interesting facts. Peak discharges on the Missouri main stem were appreciably less than those in several other years, largely because of effective reservoir control of upstream runoff, but, many tributaries throughout the report area had maximum discharges for their periods of record. Particularly significant are comparisons at some stations for which historical flood data were available. For example, the peak discharge of the Platte River at Louisville, Nebr., was the greatest since at least 1891, and the peak on the Elkhorn River at Waterloo, Nebr., was the greatest snowmelt flood

since at least 1912, although it was less than half of the rain peak of June 12, 1944.

Following a characteristic pattern for snowmelt floods, the peaks on the smaller streams generally were not unusual, but the cumulative effect of widespread high runoff throughout the stream systems caused higher and more outstanding peaks in the larger basins. Peaks due to local rains of high intensity often are more significant for small areas.

Snowmelt floods occur less frequently than rainfall floods in most basins of this flood area. Studies made for this report show that an average of only about one out of every four maximum annual flood discharges in the report area results primarily from snowmelt. But for streams flowing from north to south in South Dakota and Iowa, the ratio of snowmelt peaks to rainfall peaks is higher.

Comparisons of 1960 flood volumes with those for previous floods are even more striking than peak-discharge comparisons. Flood volumes at eight selected stations for the maximum 20-day period during March and April 1960 exceeded all previous 20-day volumes with only one exception; the ratios ranged from 3.11 for Vermillion River near Wakonda, S. Dak., to 0.93 for Elkhorn River at Waterloo, Nebr. The ratio of the 20-day volume to the 1960 annual runoff for the same group of stations ranged from 20 percent at Niobrara River near Spencer, Nebr., to 74 percent on the Vermillion River. For the latter stream the 20-day snowmelt volume was 198 percent of the average annual snowmelt volume.

The 1960 snowmelt floods have been analyzed from the standpoint of probable frequency of occurrence, or the recurrence interval. Results of this analysis, expressed either as the recurrence interval or as the ratio of the peak discharge to the 25-year flood, are tabulated for most of the 155 stations in the report area. Some of these data are shown also in graphic form.

Included in the report are daily discharges for March and April 1960 for 102 gaging stations, detailed records of stage and discharge for 64 of these stations, contents in 3 reservoirs, graphs of gage heights and discharges during the flood period for 33 stations, summary of flood stages and discharges, and comparisons of the 1960 data with previous data on floods, temperatures, precipitation, and water equivalent of snow. Estimates of flood damages are tabulated. Sediment data for a few selected stations are given, flood profiles are presented for five selected streams in South Dakota and Nebraska, and inundation maps are shown for eight areas in Nebraska, Iowa, and South Dakota.

INTRODUCTION

Record-breaking or outstanding floods occurred late in March and early in April 1960 on Missouri River tributaries in a large area consisting of eastern Nebraska, southeastern South Dakota, the western edge of Iowa, northeastern Kansas, the southwest corner of Minnesota, and the northwest corner of Missouri. Many areas, both rural and urban, were inundated, five lives were lost, and direct damage was estimated at $14 million.

The floods, which occurred principally on streams tributary to the Missouri River, were due to rapid melting of an extensive snow cover augmented by light to moderate rains. Above-normal winter precipitation and below-normal winter temperatures through the first half

of March extended the area of heavy snow cover much farther south than usual. Temperatures were record low during the first half of March in many places in the flood area and prevented significant runoff. A rapidly rising and eastward-moving temperature pattern late in March and two periods of rainfall, March 26–31 and April 1–3, were the immediate events that triggered the floods. These events, coupled with the easterly orientation of many streams in the area and the absence of significant timber cover to delay the snowmelt, caused the outstanding floods.

Streams just west and north of the flood area outlined in figure 1 contributed runoff to the flood, but peak discharges on these streams were minor and exceeded the mean annual flood at only a few locations. Ice jams caused high stages on some streams, especially along the Elkhorn River in Nebraska.

A significant feature of this flood was the large volume of runoff. The maximum 20-day volume of runoff of the Vermillion River near Wakonda, S. Dak., was 3.11 times the previous maximum 20-day volume. Ratios for other streams in the flood area ranged from 0.93

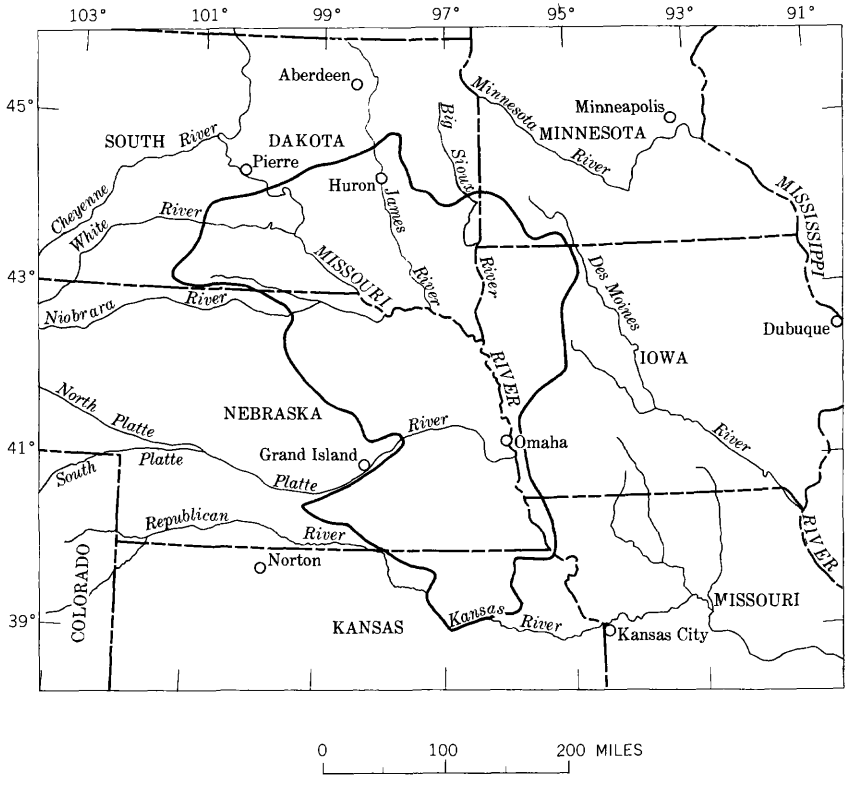

FIGURE 1.—Area covered by this report.

to 2.17. On the larger tributaries, the ratios of the maximum 20-day runoff to the annual runoff for the 1960 water year (Oct. 1, 1959–Sept. 30, 1960) ranged from 20 percent on the Niobrara River near Spencer, Nebr., to 74 percent on the Vermillion River near Wakonda, S. Dak.

Peak stages and discharges during the floods of March–April 1960 and maximums of previous floods are listed in table 6.

Peak discharges along the main stem of the Missouri River between Yankton, S. Dak., and Rulo, Nebr., in 1960 were appreciably less than those of several other floods and were much less than those in 1950 and 1952. The flood in 1952 was generated mainly upstream from the area covered by this report, and the peak discharges decreased from 480,000 cfs (cubic feet per second) at Yankton to 358,000 cfs at Rulo. Between 1952 and 1960, four large dams were built on the Missouri River that effectively controlled all runoff entering the reservoirs in 1960. The floods in 1960 originated on the Missouri River tributaries mainly downstream from Yankton, and the peak discharges increased from 34,700 cfs at Yankton to 181,000 cfs at Rulo.

At the 96 gaging stations and 50 crest-stage stations on tributaries of the Missouri River within the flood area, peak discharges exceeded previous maximum discharges during the period of record at 25 gaging stations and 22 crest-stage stations. Because periods of record ranged from 2 to 33 years at the gaging stations and from 4 to 10 years at the crest-stage stations, all the maximums do not have the same significance.

The 1960 peak stages or discharges at several gaging stations almost equaled those of outstanding floods in the past. The crest on Rock River near Rock Valley, Iowa, was only 1.6 feet lower than that of the great flood of 1897 and 0.6 foot lower than that of the flood of June 8, 1953. The peak discharge of the Platte River at Louisville, Nebr., was the greatest since at least 1881. Although the 46,900-cfs peak on the Elkhorn River at Waterloo, Nebr., was the greatest snowmelt flood since at least 1912, it was less than half the 100,000-cfs rain peak on June 12, 1944. However, the 20-day flood runoff at Waterloo in 1960 was 90 percent of the 20-day flood runoff in 1944.

The stage for a given discharge during a snowmelt flood is significantly lower than that for the same discharge in the summer because leaves on trees along the stream banks and heavy vegetation in overflow sections cause considerable backwater.

This report contains basic data on streamflow which are necessary in hydrologic analysis of the flood and in planning for the future. Data include daily discharges during March and April 1960 for 102

gaging stations, detailed stages and discharges for 64 of these gaging stations, contents in 3 reservoirs, hydrographs for 33 selected gaging stations, summary of the flood stages and discharges, and comparisons of the 1960 data with previous data on floods, temperatures, precipitation, and water equivalent of snow. The locations of the flood-determination points are shown on plate 1.

The collection of basic records of stage and discharge in the area covered by this report is a part of a continuous cooperative program with the States of Iowa, Kansas, Missouri, Nebraska, and South Dakota, and with agencies of the Federal Government.

The basic data were computed and compiled in offices of the Surface Water Branch under the supervision of the following district engineers: V. R. Bennion, Iowa; E. R. Leeson, succeeded by E. J. Kennedy, Kansas; H. C. Bolon, Missouri; F. F. LeFever, Nebraska; and H. M. Erskine, South Dakota. Technical guidance and assistance were given to the authors by H. F. Matthai and by J. O. Rostvedt, Washington, D.C.

The U.S. Weather Bureau, the U.S. Army Corps of Engineers, and several State, municipal, and private organizations supplied information included in this report. Acknowledgment is made at the places where the data appear.

CLIMATIC FACTORS

PRECIPITATION

Total precipitation over the flood area, in the form of rain and snow, during the fall and winter, October–March, was above normal (table 1). Average precipitation for the 12 Weather Bureau geographic divisions was 137 percent of normal; it ranged from 111 percent of normal in south-central South Dakota to 170 percent of normal in southeastern South Dakota.

Sioux City, Iowa, near the center of the flood area, received a total snowfall of 65.1 inches, the greatest amount since 1916–17 and the third highest seasonal total since 1911–12.

Most of the October precipitation fell as rain, but snow fell over most of the area during November. The 15.1-inch snowfall for November at Sioux City, Iowa, was the greatest in 70 years. Rain, as well as snow, fell in December, because above-normal temperatures were prevalent.

January precipitation, mainly snow, was about twice the normal in eastern Nebraska, northeastern Kansas, and southwestern Iowa. Only northwestern Iowa had below-normal precipitation for January. Snowfall in Sioux Falls, S. Dak., totaled 11.8 inches in 24 hours on January 1 and almost equaled the 24-hour record of 12.0 inches in

TABLE 1.—*Average precipitation and departure from normal, by U.S. Weather Bureau geographic divisions, for the 1959–60 snowfall season*

U.S. Weather Bureau geographic division	Precipitation, in inches							
	Average monthly total (upper) / Departure from normal (lower)						Seasonal total (upper)	Percent of normal
	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Departure from normal (lower)	
East-central South Dakota	2.30	0.82	0.81	0.63	0.42	0.98	5.96	124
	+1.03	+.10	+.28	+.11	−.15	−.23	+1.14	
South-central South Dakota	1.13	1.04	.31	.57	1.33	.93	5.31	111
	−.06	+.42	−.18	+.05	+.67	−.39	+.51	
Southeastern South Dakota	3.45	1.72	1.14	.75	.57	1.54	9.17	170
	+2.19	+.94	+.57	+.21	−.23	+.09	+3.77	
North-central Nebraska	2.42	.61	.21	.64	1.30	1.06	6.24	136
	+1.34	+.02	−.31	+.12	+.65	−.18	+1.64	
Northeastern Nebraska	2.48	1.31	.89	1.49	.77	2.01	8.95	140
	+1.19	+.33	+.10	+.65	−.19	+.46	+2.54	
Central Nebraska	2.13	.09	.15	1.75	1.43	1.22	6.77	151
	+1.10	−.60	−.41	+1.26	+.85	+.10	+2.30	
East-central Nebraska	2.17	.55	.93	1.65	1.49	1.99	8.78	158
	+1.77	−.57	+.08	+.82	+.53	+.59	+3.22	
Southeastern Nebraska	3.60	.28	.96	2.15	1.72	2.06	10.77	146
	+1.91	−1.02	+.01	+1.35	+.71	+.45	+3.41	
Northeastern Kansas	4.71	.11	1.11	1.74	1.94	1.95	11.56	130
	+2.55	−1.39	−.15	+.74	+.93	−.03	+2.65	
Northwestern Iowa	2.77	1.70	1.46	.54	.36	1.30	8.13	119
	+1.22	+.61	+.64	−.18	−.62	−.35	+1.32	
West-central Iowa	2.17	1.86	1.82	1.59	1.14	1.59	10.17	132
	+.42	+.55	+1.00	+.63	+.06	−.22	+2.44	
Southwestern Iowa	2.70	.75	1.85	2.62	1.57	1.70	11.19	131
	+.58	−.75	+.96	+1.69	+.48	−.30	+2.66	

1897. Virtually the entire flood area had excessive streamflow during January, and ground-water levels at key wells were at, or near, record highs for January.

February precipitation consisted of freezing rain initially and snow after the 8th; it was above normal in most of the same area which had above-normal precipitation in January. More snow fell in northeastern Kansas during the month than in any other February since 1930. At the end of February the accumulated snow on the ground ranged from about 7 inches in southeastern South Dakota to 22 inches in some parts of eastern Nebraska.

Frequent light to moderate snows fell over most of the flood area during the first few days in March. A storm on March 12–16 brought heavy snows. The snow cover in northeastern Kansas was increased by about 12 to 15 inches to depths of as much as 30 inches. Snow on the ground in the eastern third of Nebraska reached depths of 33 inches at several points and 35 inches at Clay Center, and the snowpack in southeastern South Dakota was 14 to 30 inches deep by March 16. The 25 inches of snow on the ground at Council Bluffs, Iowa, on March 16 was the maximum depth since at least 1948.

The 30-inch depth in northeastern Kansas was the greatest snow depth of record, and the total snowfall of 20 inches during March

was the greatest snowfall in any month since March 1930 and exceeded that in any other March since 1930 by about 7 inches.

The snowfall in most of eastern Nebraska from December 27 to March 26 was about twice the annual average. The excessive snowfall and below-normal temperatures prevailed for a record-breaking period of 75 days during which there was continuous snow cover at Omaha, Nebr.

The period of low temperatures ended on March 25, and the precipitation on March 26–31 (fig. 2) and April 1–3 (fig. 3) was mostly

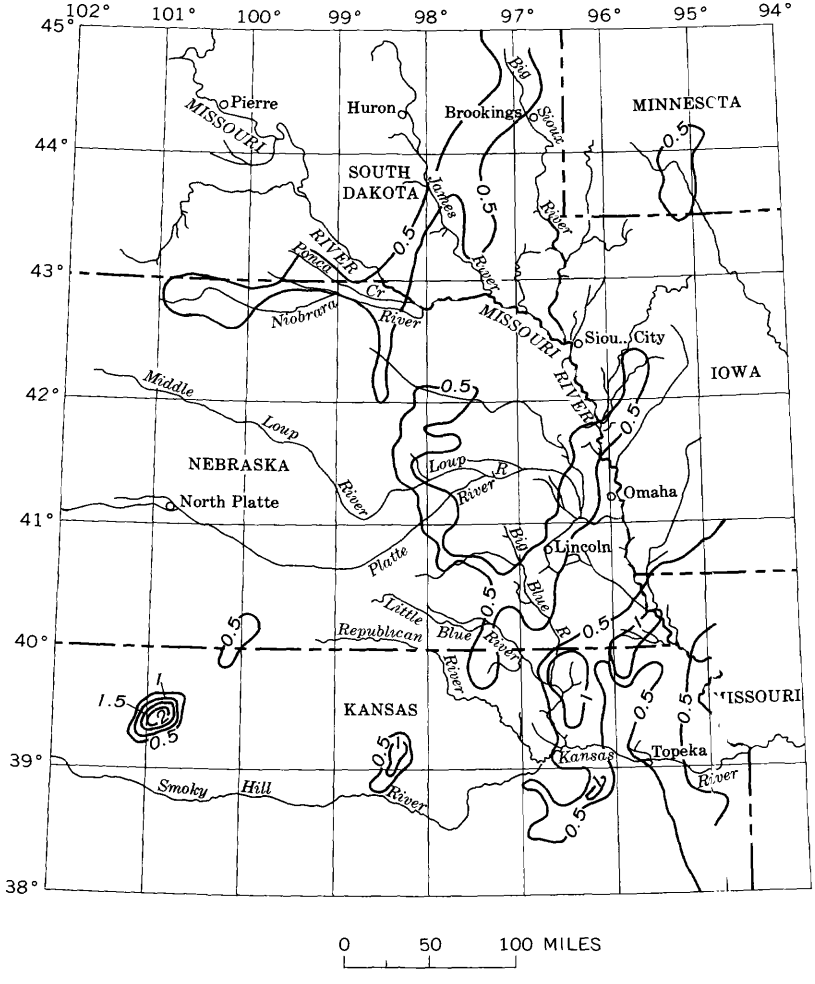

FIGURE 2.—Total precipitation, in inches, March 26–31, 1960. Adapted from U.S. Weather Bureau (1962).

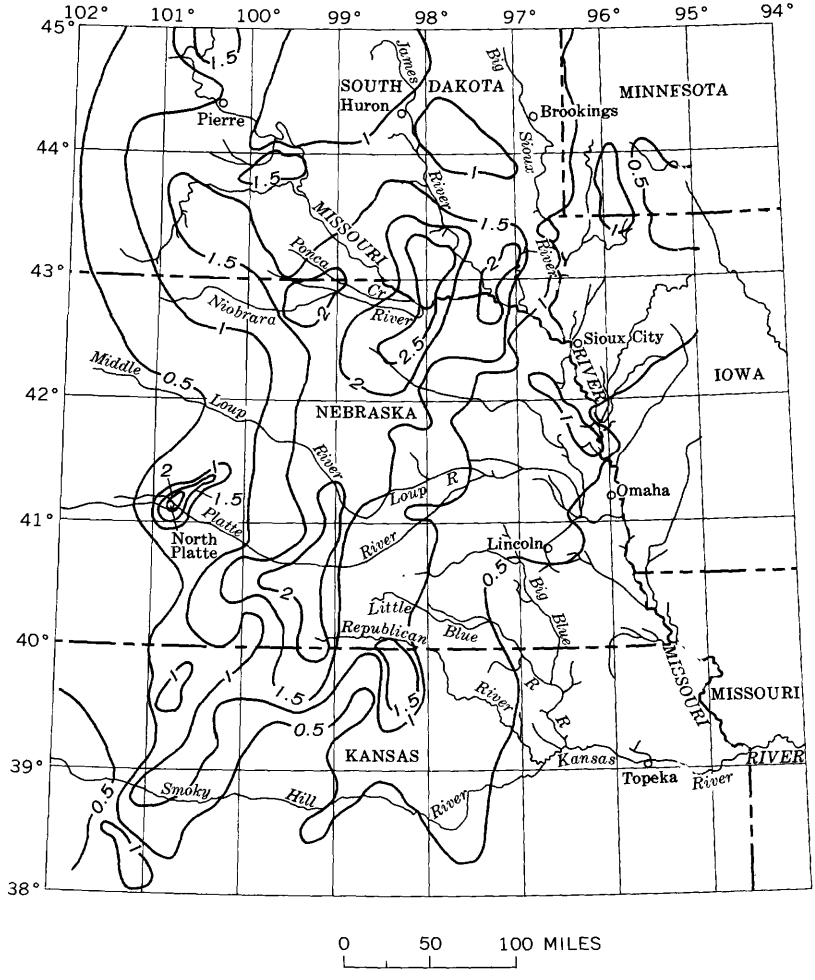

FIGURE 3.—Total precipitation, in inches, April 1–3, 1960. Adapted from U.S. Weather Bureau (1962).

rain; however very wet snow fell in parts of southeastern South Dakota. Sioux Falls received 5 inches of snow containing 1.35 inches of moisture on April 1. The effects of rainfall on the flood runoff varied. In some areas the rainfall was retained temporarily in the snow; in other areas it caused the immediate disappearance of the snow cover and contributed significantly to the peak flows. In still other areas the rain fell after the peak flow and prolonged the runoff and increased its volume.

WATER EQUIVALENT OF SNOW

The excessive accumulation of snow was recognized as a potential flood threat early in March. The Corps of Engineers and the Weather Bureau made cooperative snow surveys on March 11, 18, and 25. The water equivalent of the snowpack on these dates is shown in figures 4, 5, and 6.

The first snow survey provided sufficient information for the Weather Bureau forecast center in Kansas City to predict overflow on most Missouri River tributaries between Sioux City, Iowa, and Jefferson City, Mo., if the heavy snow cover should melt rapidly.

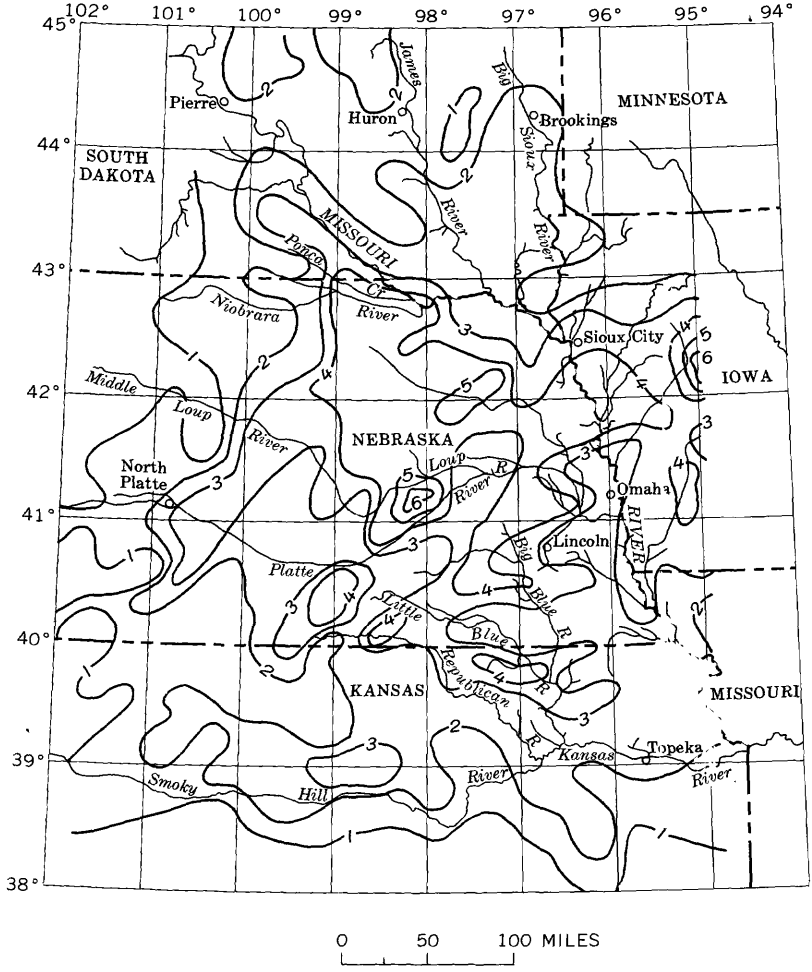

FIGURE 4.—Water equivalent of snow on ground, in inches, March 11, 1960. Adapted from U.S. Weather Bureau (1962).

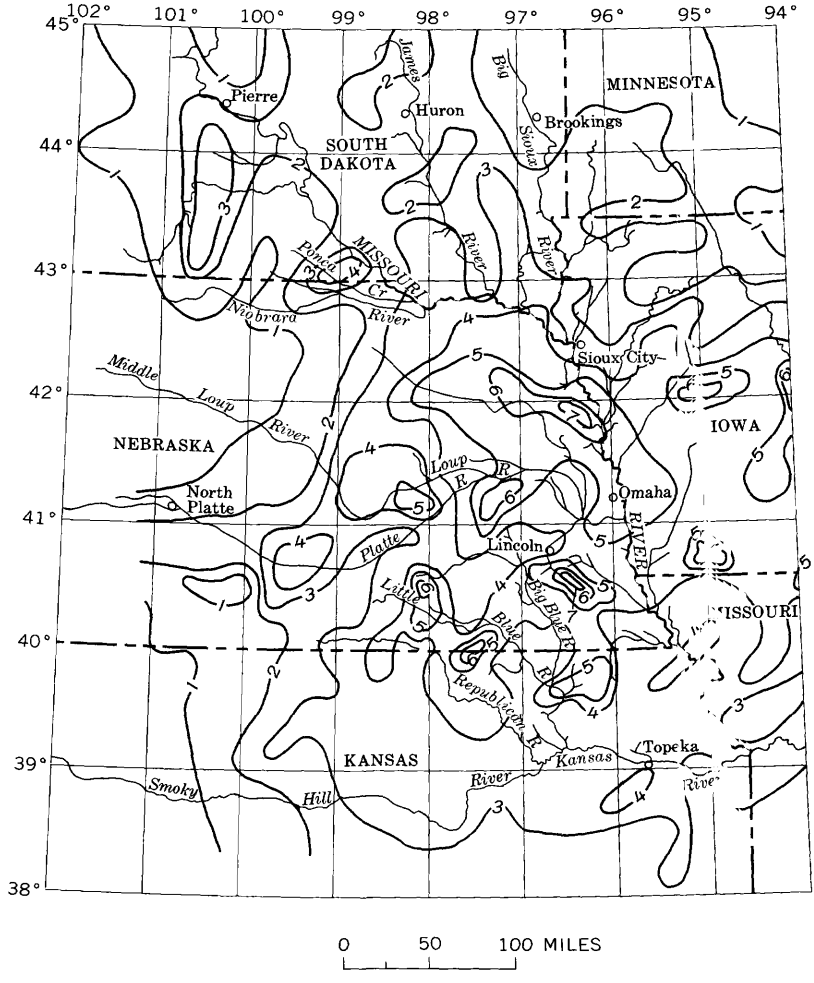

FIGURE 5.—Water equivalent of snow on ground, in inches, March 18, 1960. Adapted from U.S. Weather Bureau (1962).

The accumulated and compacted snow had 3 to 4 times the average water equivalent of newly fallen snow. Snow surveys on March 20 and 22 near Syracuse and Lincoln, Nebr., showed an average water equivalent of 3.5 to 3.6 inches per foot of snow depth.

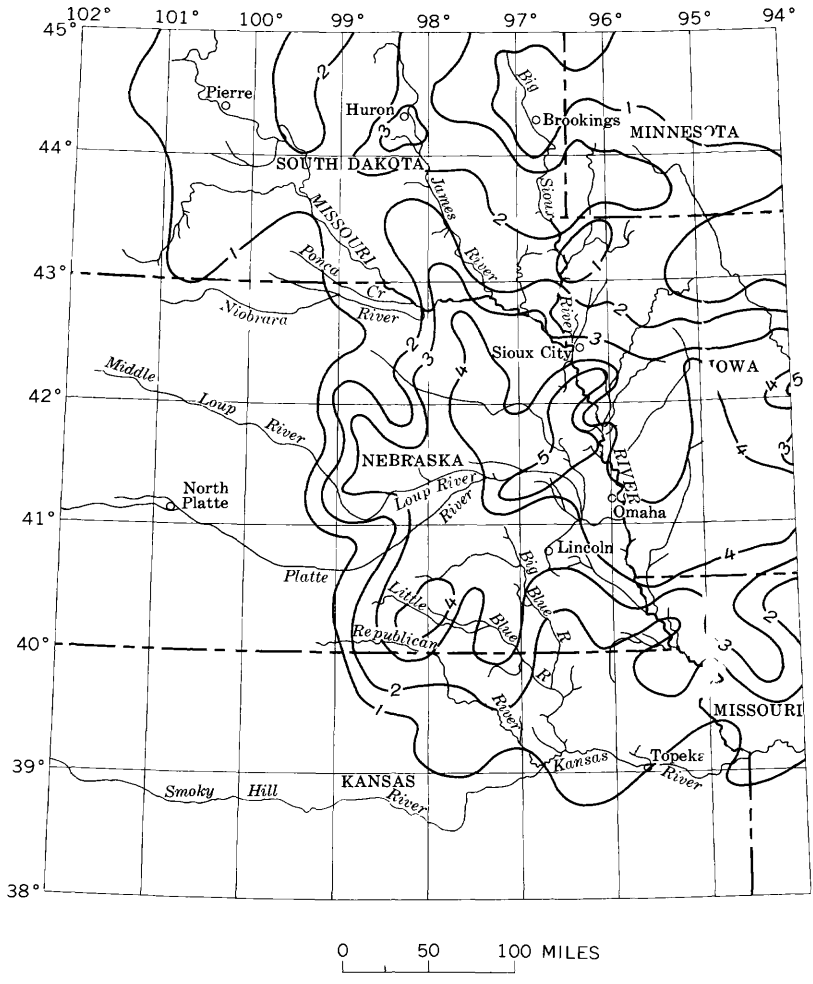

FIGURE 6.—Water equivalent of snow on ground, in inches, March 25, 1960. Adapted from U.S. Weather Bureau (1962).

TEMPERATURE

ANTECEDENT TEMPERATURES

Temperatures during the fall and winter had an effect on the flood second only to the effect of the temperature just prior to and during the flood. Except for December, the mean monthly temperatures

from October through March throughout the flood area were below normal (fig. 7).

October temperatures were 5° to 9°F below normal, and the month was the coldest October since 1925 at many Weather Bureau stations.

Temperatures in November were also 5° to 9°F below normal, and record-breaking minimums near −25°F occurred at several stations. A very sharp drop in temperature on November 5 and 6 caused ice cover to form on streams in the northern part of the flood area 1 to 2 weeks earlier than usual. At some locations in Iowa, November 1959 was the coldest November since 1880. On November 14, LeMars had a temperature of −24°F, which was within 1°F of the alltime low of 1887. A warming trend late in November melted some snow, most of which increased the soil moisture, because the increase in runoff was very small or nonexistent.

December was unusually warm; average temperatures were 5° to 9° F above normal and were generally 3° to 4°F higher than those for November. At Sioux City, Iowa, it was the warmest December since 1889. Low temperatures occurred again at the end of the month (fig. 8).

Wide ranges in temperature were experienced in January, and the mean monthly temperatures were generally 1° to 5°F below normal. Temperatures dropped rapidly in South Dakota on January 3 and reached −20° to −30°F on January 5. Temperatures in northwestern Iowa were down to −16° to −25°F on January 5. Much of the flood area had unseasonably warm weather sometime between the 6th and the 12th, but it was short lived in that temperatures soon dropped below freezing and then below zero again.

February was cold. Average temperatures were 7° to 10°F below normal, and many localities in eastern Nebraska and western Iowa had the coldest February since 1936. The usual seasonal temperature trend was reversed; the coldest weather occurred during the last few days of the month. Streams were frozen by the return of subzero temperatures.

A mass of Arctic air moved over the flood area early in March, and record-low temperatures occurred during the first week. Several Weather Bureau stations reported −25°F on March 3, and −31°F was recorded at Atlantic, Iowa on March 5. The cold weather continued until March 18 in the western part and until March 26 in the eastern part of the flood area. Average temperatures for March were 13° to 17°F below normal, and March temperatures in western Iowa were as low as those usually experienced in January. March 1960 was the coldest March since at least 1874 at Yankton, S. Dak., 1881 at Huron, S. Dak., 1887 in eastern Nebraska, 1886 at Concordia, Kans., and 1887

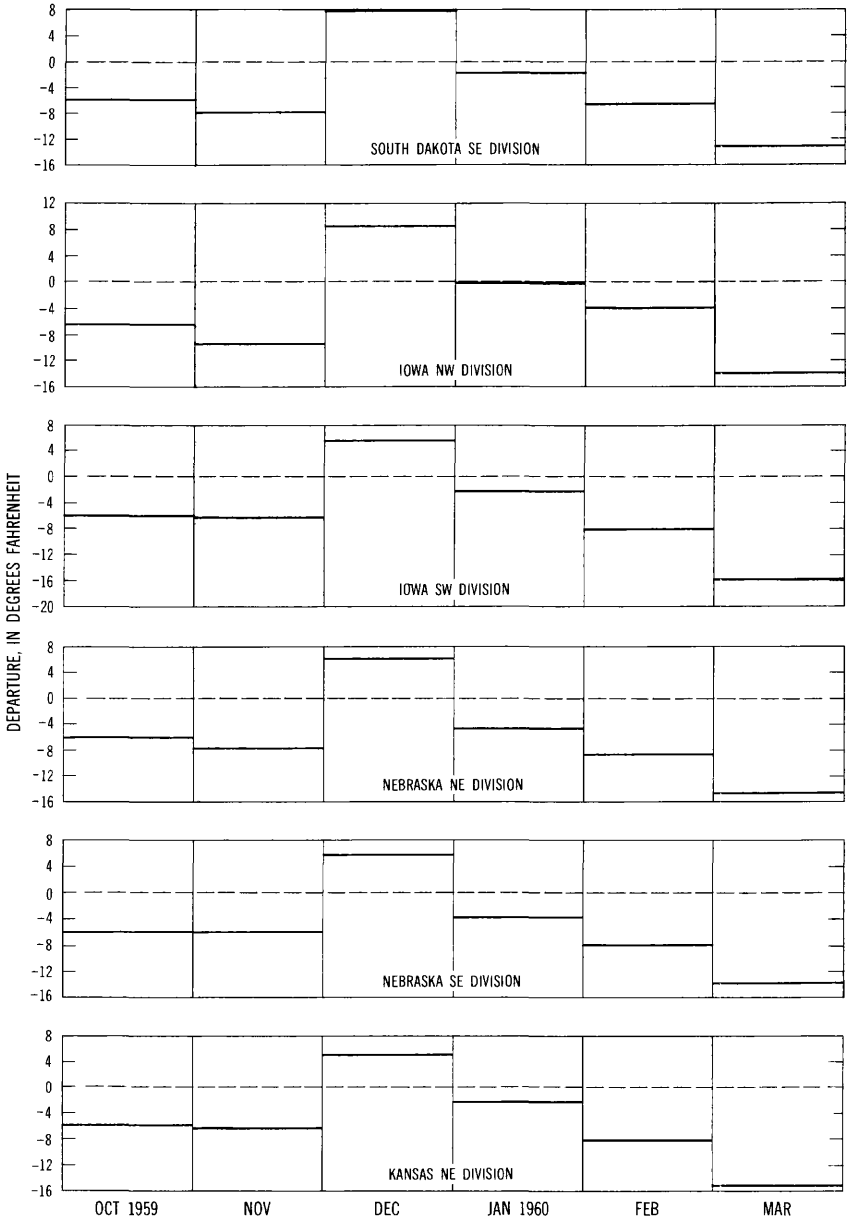

FIGURE 7.—Departure from long-term mean monthly temperature, by U.S. Weather Bureau geographic divisions.

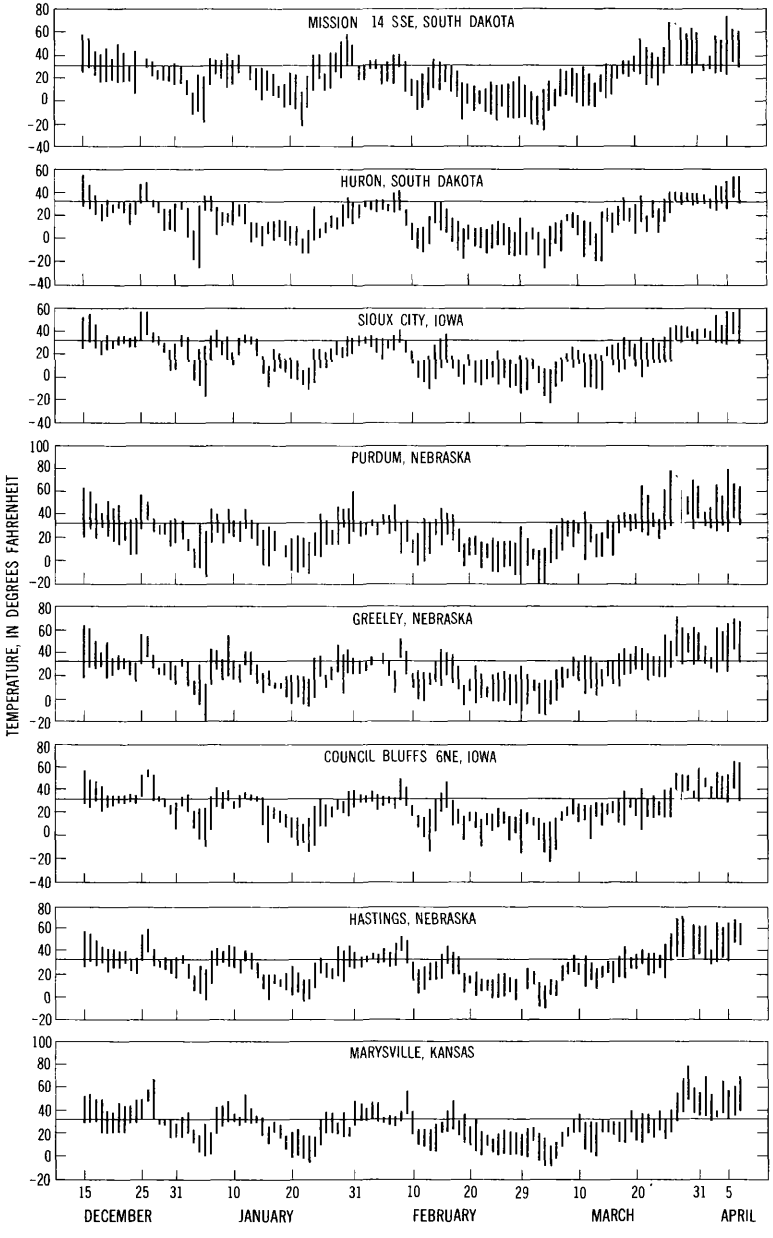

FIGURE 8.—Daily temperature ranges at eight selected weather stations December 15, 1959–April 7, 1960.

at Topeka, Kans. At most of these locations, the average temperature was 1° to 2°F lower than the previous minimum average, but the mean temperature of 27.8°F at Topeka was 3.8°F lower than that of the previous coldest March, which was in 1912.

The extreme cold weather started in mid-February and lasted about 5 weeks, almost without interruption, through most of March. During this period, daily temperatures in southeastern South Dakota averaged 15° to 30°F below normal; they were 10° or more below normal each day at Lincoln, Nebr., and in Kansas they averaged 20°F or more below normal on 14 to 20 days and 30°F or more below normal on 3 to 9 days.

TEMPERATURES ASSOCIATED WITH THE FLOOD

The antecedent precipitation and temperatures, previously described, produced a snowpack having the potential of a major flood should a rapid rise in temperature occur. Rapidly rising temperatures began about March 18 in the western part of the area and about March 26 in the eastern part. The easterly progression of rising temperatures coincided with the easterly direction of flow of many streams in South Dakota and Nebraska and played an important role in intensifying the flood.

The time lag in the temperature rise from west to east is shown graphically in figure 9. Sustained daily maximum temperatures above 40°F began March 18 at Longvalley, S. Dak., and at Arthur, Nebr., the western stations. A further rise of about 20°F by March 21 was the immediate cause of the breakup in the headwaters of the White River and its tributaries in South Dakota and in the headwaters of the Niobrara, the Elkhorn, and the Loup Rivers in Nebraska.

Sustained daily maximum temperatures at the eastern stations, Academy, S. Dak., and Fremont, Nebr., did not reach 40°F until March 25. At this time temperatures in the west were above 60°F. This temperature pattern caused a gradual thaw in the headwaters of the eastward-oriented streams and produced low to moderate peak discharges. The flow from the headwaters arrived at the downstream reaches of these streams at the time the breakup started there. This timing caused record-breaking or outstanding peak discharges in the lower reaches of many Missouri River tributaries. The time lag in the temperature rise from west to east was not important on streams like the James, the Big Sioux, the Rock, and the Little Sioux Rivers. The peak discharges of streams that flow southward in eastern South Dakota and in Iowa increased in the downstream direction by greater than normal amounts because of the water equivalent of the snowpack on March 25 (fig. 6) generally increased in the same direction.

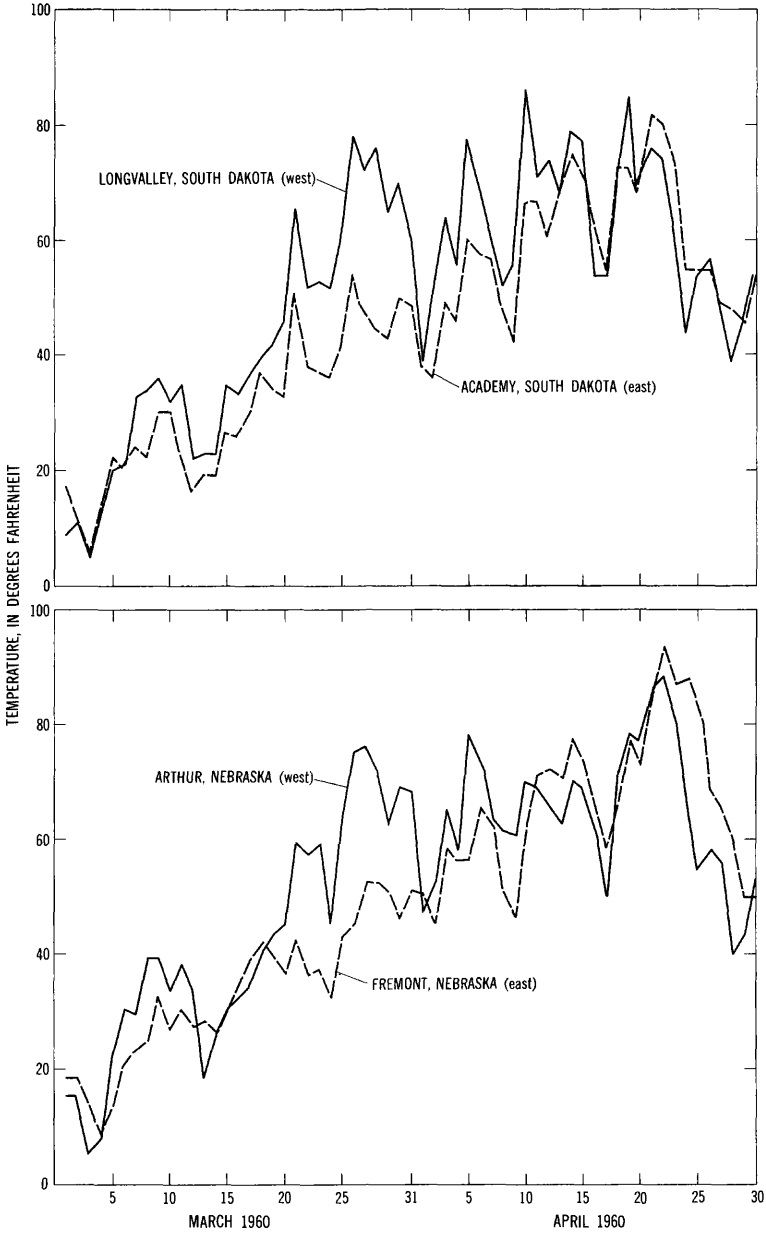

FIGURE 9.—Daily maximum temperatures at selected U.S. Weather Bureau stations and time lag in temperature rise from west to east.

DESCRIPTION OF THE FLOODS

The floods of March–April 1960 occurred on Missouri River tributaries in southeastern South Dakota, eastern Nebraska, northeastern Kansas, the western edge of Iowa, the northwest corner of Missouri, and to a minor extent, in the southwest corner of Minnesota. Many of these streams have basins that are long and narrow and gradients that are generally less than 7 feet per mile. The channels of the smaller streams are cut into the flood plains, but those of the larger streams are wide and relatively shallow. The terrain has low relief, and the vegetal cover is predominantly grasses and agricultural crops such as corn, hay, and wheat. Trees and brush occupy streambanks, narrow bands along the flood plains, and some of the hilly terrain.

The very cold weather started near the end of December and continued almost without interruption until mid-March. The precipitation was above normal during the winter and was mostly snow. The snowpack extended much farther south than the usual areas of heavy snow cover, and the water equivalent on March 18 was as much as 7 inches (fig. 5). These conditions constituted an extremely dangerous flood threat. The long period of below-freezing temperatures brought about a greater accumulation of snow than usual and delayed the normal rise in temperature to such a late date that when it did occur it was very rapid.

Most tributaries of the Missouri River in South Dakota and Nebraska flow eastward; therefore, the breakup took place in the headwaters several days before it did in the downstream reaches. Ice jams formed when flood waves and floating ice met the solid ice cover on the downstream reaches. When a jam was halted by bends or constrictions in the channel, water and ice were impounded upstream from the jam, and the increased backwater often caused inundation of the flood plains.

Flooding in south-central South Dakota generally began on March 21. The rapid rise in temperature started on March 18 and caused rapid stream rises from snowmelt and some ice jams on small streams west of the Missouri River. Moderate flooding of lowlands occurred along Medicine Creek, the South Fork White River, and the Keya Paha River. The peak discharge of South Fork White River below White River, S. Dak., was slightly more than the peak discharge during the record snowmelt flood of March–April 1952. There was only minor flooding along the White River downstream from the South Fork because fairly little runoff originated upstream from the South Fork. All streams in south-central South Dakota were back within their banks by March 28. Ponca Creek at Anoka, Nebr., had

a peak discharge that was 45 percent greater than the previous maximum in April 1950.

By March 26 the ice cover on the Niobrara River was completely broken, and large ice jams occurred. An ice jam 2 miles long formed near the mouth and flooded the State park and State Highway 12 near Niobrara, Nebr. A similar ice jam caused lowland flooding near Pishelville. The peak discharge of 39,000 cfs near Verdel, Nebr., was caused by the release of water that had been stored behind an ice jam. The peak discharge of Keya Paha River at Wewela, S. Dak., was only 77 percent of the 1952 peak.

The principal streams in South Dakota east of the Missouri River are the James, Vermillion, and Big Sioux Rivers. These streams flow southward and only their southern reaches, in the area of heavy snow cover, were subjected to extreme flooding. Many small streams tributary to the Redfield-Huron reach of the James River and to the Watertown-Brookings reach of the Big Sioux River overflowed their banks during the afternoon of March 27.

Severe flooding developed along the James River just upstream from Huron where the extremely flat gradient is not conducive to rapid downstream movement of water, and its flat crest did not reach Huron until April 6 (fig. 10).

The peak stages in 1881 and 1922 were higher than the peak stage in 1960, and the 1960 peak discharge exceeded by 8 percent the previous maximum discharge in 21 years of discharge record. Downstream from Huron, tributary inflow was greater and more rapid than it was upstream, and the crest on April 2 near Forestburg was only 1.7 feet lower than those for the floods of 1920 and 1922. The magnitude of the flood increased rapidly downstream from Forestburg, and local residents believe the 1960 flood was somewhat lower than the great flood of 1881 in the Forestburg-Mitchell reach and slightly higher between Milltown and the mouth. The crest reached the gaging station near Scotland on April 6 and the stage was 2.4 feet higher than any other stage since 1928. The discharge was 29 percent greater than the previous maximum, 10,800 cfs, and remained above it for 10 days from March 31 to April 9 (fig. 10). Some areas in the lower James River valley were under water until mid-April.

According to longtime residents, the flood on the Vermillion River from the confluence of the East and West Forks, near Parker, to the mouth, near Vermillion, was the greatest in about 80 years. The peak discharge at the gaging station near Wakonda on April 1 (fig. 11) was almost twice that of the previous maximum in a 15-year discharge record. Lower temperatures accompanying a heavy snowstorm on April 1 reduced the runoff and caused the stage to fall until April 7. Runoff from the storm caused a second, smaller crest on April 8.

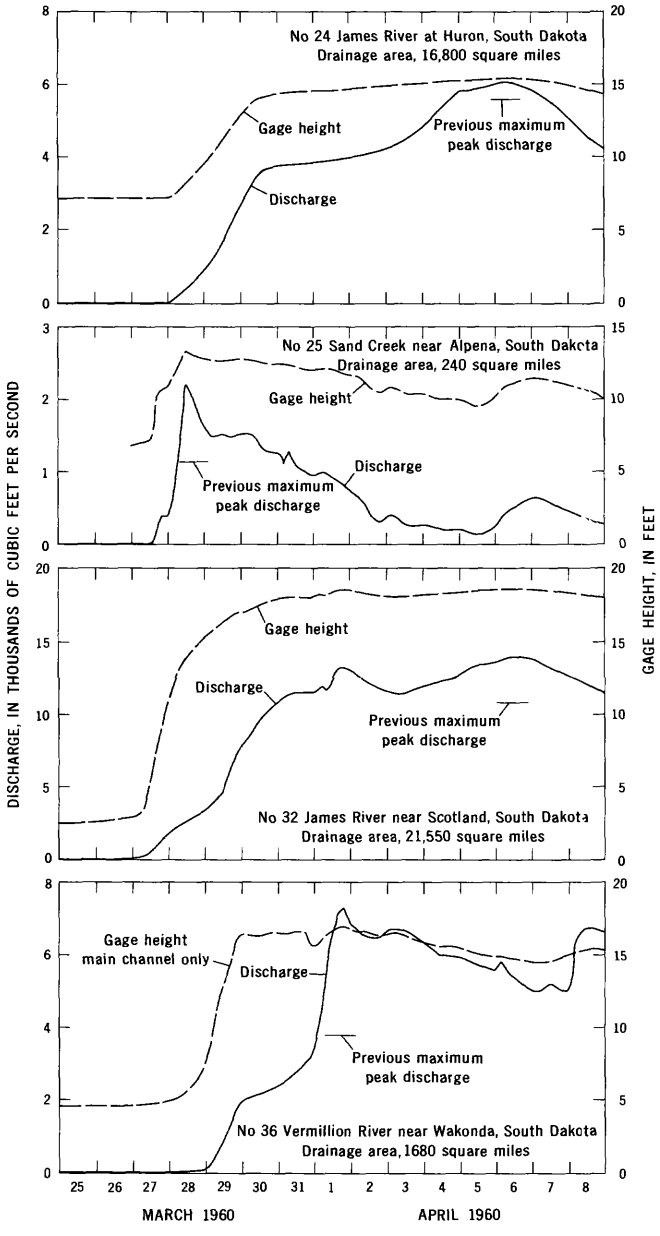

FIGURE 10.—Discharge and gage height at selected gaging stations in James and Vermillion River basins, South Dakota, March 25–April 8.

The Big Sioux River was in flood from near Brookings, S. Dak., to the mouth at Sioux City, Iowa, and had severest flooding downstream from Sioux Falls, S. Dak. The gradient of the Big Sioux River is steeper than those for other streams in eastern South Dakota; therefore the time of concentration was shorter, and the flood peak moved downstream more rapidly. The discharge of Skunk Creek, combined with the flow in the Big Sioux River, caused a crest on the main channel at Sioux Falls on March 30, 2 days before the peak occurred either upstream near Dell Rapids or 11 miles downstream near Brandon.

A flood-control project at Sioux Falls, recently constructed by the Corps of Engineers, appreciably reduced the crest height and prevented much damage in outlying areas that have been inundated by lesser floods in the past. The flood-control project consists of high dikes along the river and a bypass channel that diverts part of the flow across the loop of the river inside of which is the city of Sioux Falls. The 1960 peak discharge (14,300 cfs) in the main channel of the Big Sioux River at Sioux Falls exceeded the combined discharge (13,500 cfs) of the main channel and the bypass channel during the snowmelt flood in April 1952, but it was 1,900 cfs less than the combined discharge in June 1957.

The peak discharge on April 1 at Akron, Iowa, where discharge has been recorded since 1928, was 50 percent greater than that in 1952 (fig. 11), and the stage was 1.6 feet higher than the previous maximum in 1954. The large increase in the peak discharge between Brandon and Akron was due to heavy tributary inflow from an area having a snow pack of high water equivalent. The increase represents about 11 cfs per square mile from 3,220 square miles; this unit runoff is generally associated with snowmelt floods from much smaller areas.

Below Akron, the Big Sioux River flood plain is heavily diked, and nearly all dikes were overtopped. Because of temporary storage of the flood water on the flood plain and because of the absence of major tributaries, the flood crest did not reach Sioux City, Iowa, 50 miles downstream from Akron, until April 3. The river was 2 miles wide in most of this reach, and residents reported that the flood was the greatest since 1881.

Rain and snow on April 1–3 caused minor rises on the Big Sioux River and prolonged the flooding for several days. The Big Sioux River remained above its normal channel at Sioux City until April 18.

Peak discharges, on small-area tributaries to the Rock River in the northwest corner of Iowa, were less than the peaks in March 1952 on four such tributaries, and they were more than the 1952 peaks on two such tributaries. The snowpack in this part of Iowa had less than 3

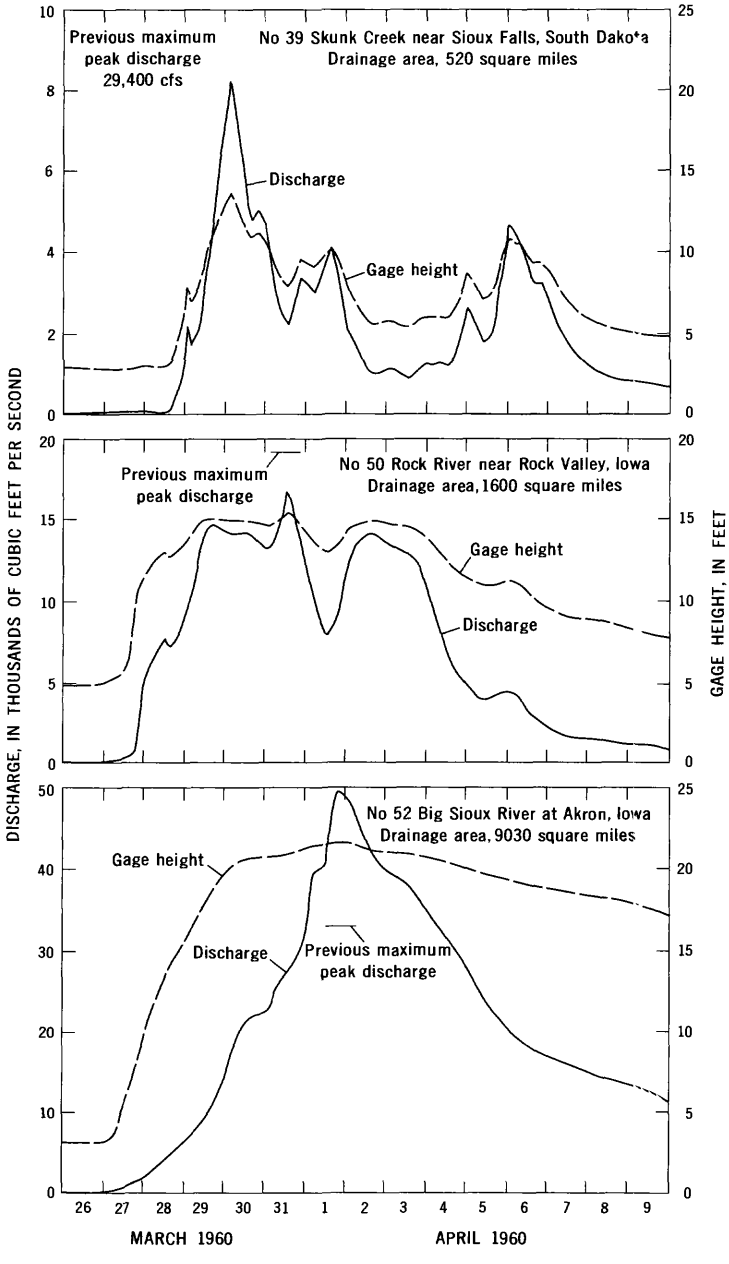

FIGURE 11.—Discharge and gage height at selected gaging stations in Big Sioux River basin, South Dakota and Iowa, March 26–April 9.

inches of water on March 18, 1960, and less than 1 inch on March 25 (figs. 5, 6). The light snow cover probably varied considerably within short distances and thus produced the differences in the relations between discharges in 1952 and 1960.

The flood on the Floyd River at James, Iowa, was the second highest in 26 years of discharge record and exceeded the 1952 snowmelt peak by 9 percent. Peak discharges on small Missouri River tributaries in Nebraska north of Omaha were only 2 to 15 percent of maximums of record. Floods from summer thunderstorms in this area are much more prevalent and severe than snowmelt floods.

The Little Sioux River in Iowa had peak discharges less than the maximums upstream from Correctionville and greater than previous maximums downstream from Correctionville. Smaller streams such as the Soldier and Boyer Rivers in Iowa had peak discharges much less than those during previous floods.

The Platte River has no major tributaries, other than the Wood River, for almost 200 miles upstream from Duncan, Nebr. The water equivalent of snow on the ground and the precipitation during the flood decreased very rapidly in a western direction along the Platte River. Therefore, the peak discharge near Duncan (fig. 12) was a modest 25,400 cfs on March 28. The Loup and Cedar Rivers, Shell Creek, and other streams drain areas which had snow with higher water equivalent. The inflow from these streams raised the peak discharge of the Platte River at North Bend to 112,000 cfs on March 29. Areas which had snow with a still higher water equivalent and had 0.5 to 2.5 inches of precipitation during April 1–3 are drained by the Elkhorn River and Salt Creek. Floods on the lower reaches of these two Platte River tributaries (figs. 13, 14) had recurrence intervals from 6 to 13 years, but the timing of the peaks was such that the Platte River at Louisville crested on March 30 at 124,000 cfs, the greatest discharge since at least 1881 and 1.4 times the discharge of a 25-year flood. If the peaks on the Elkhorn River and on Salt Creek had coincided with the peak coming down the Platte River, the peak at Louisville would have been about 182,000 cfs.

Most Missouri River tributaries downstream from the Platte River reached only moderate discharges. Exceptions were the Little Nemaha River at Auburn, Nebr. (fig. 15), where the peak discharge of 48,000 cfs was 1.4 times that of a 25-year flood, and the North Fork Nemaha River at Humboldt, Nebr. (fig. 16), where the peak discharge of 36,200 cfs was 1.6 times that of a 25-year flood.

The larger floods in the Kansas River basin occurred on School Creek near Saronville, Nebr., on Little Blue River (fig. 17) near Gilead, Nebr., and on South Fork Big Sandy Creek downstream from

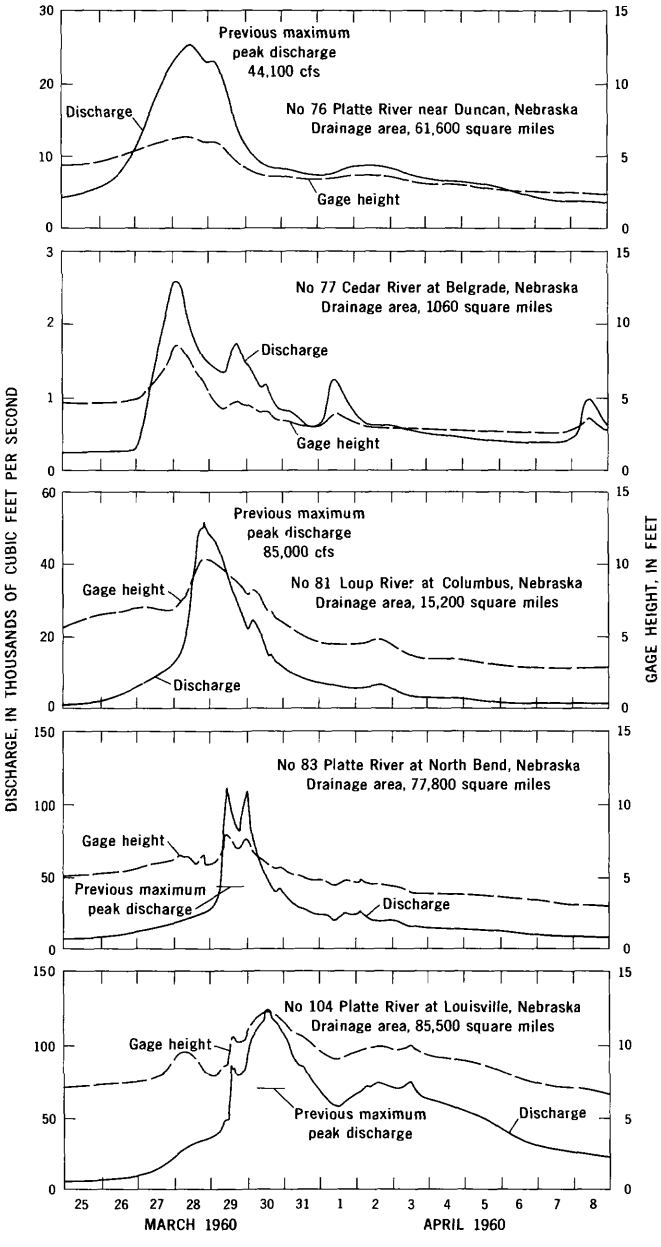

FIGURE 12.—Discharge and gage height at selected gaging stations in Platte River basin, Nebraska, March 25–April 8.

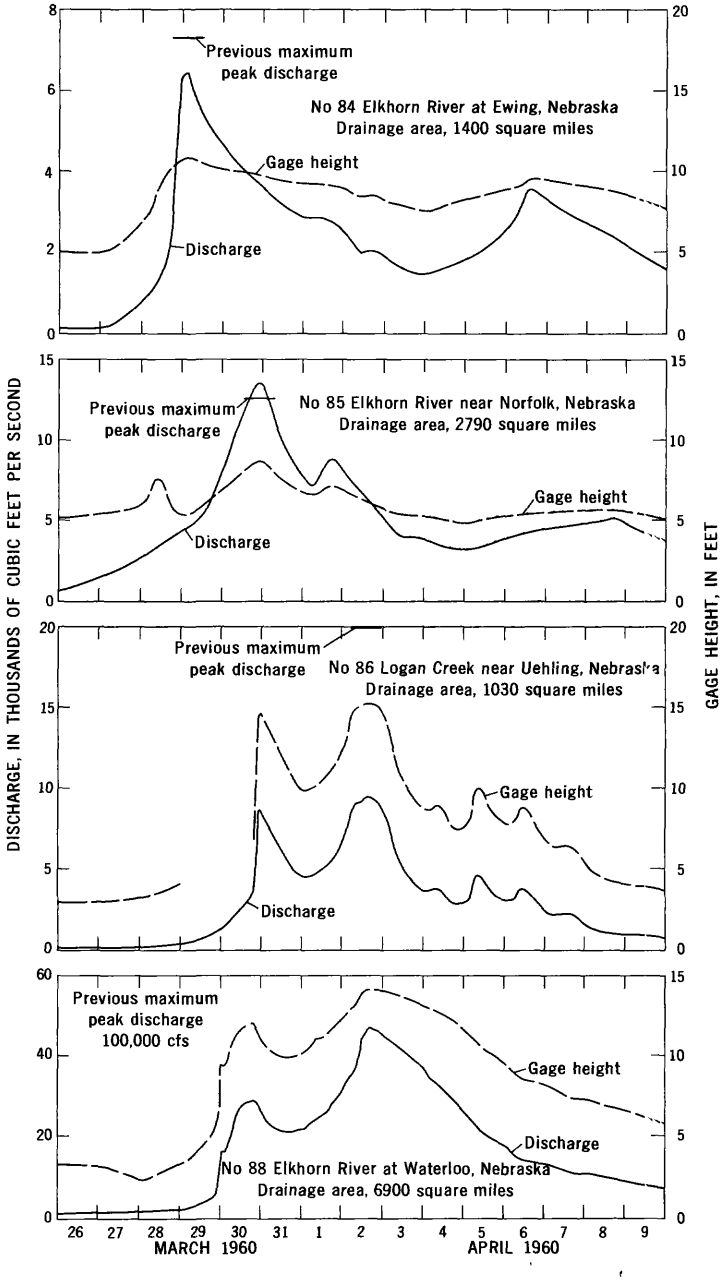

FIGURE 13.—Discharge and gage height at selected gaging stations in Elkhorn River basin, Nebraska, March 26–April 9.

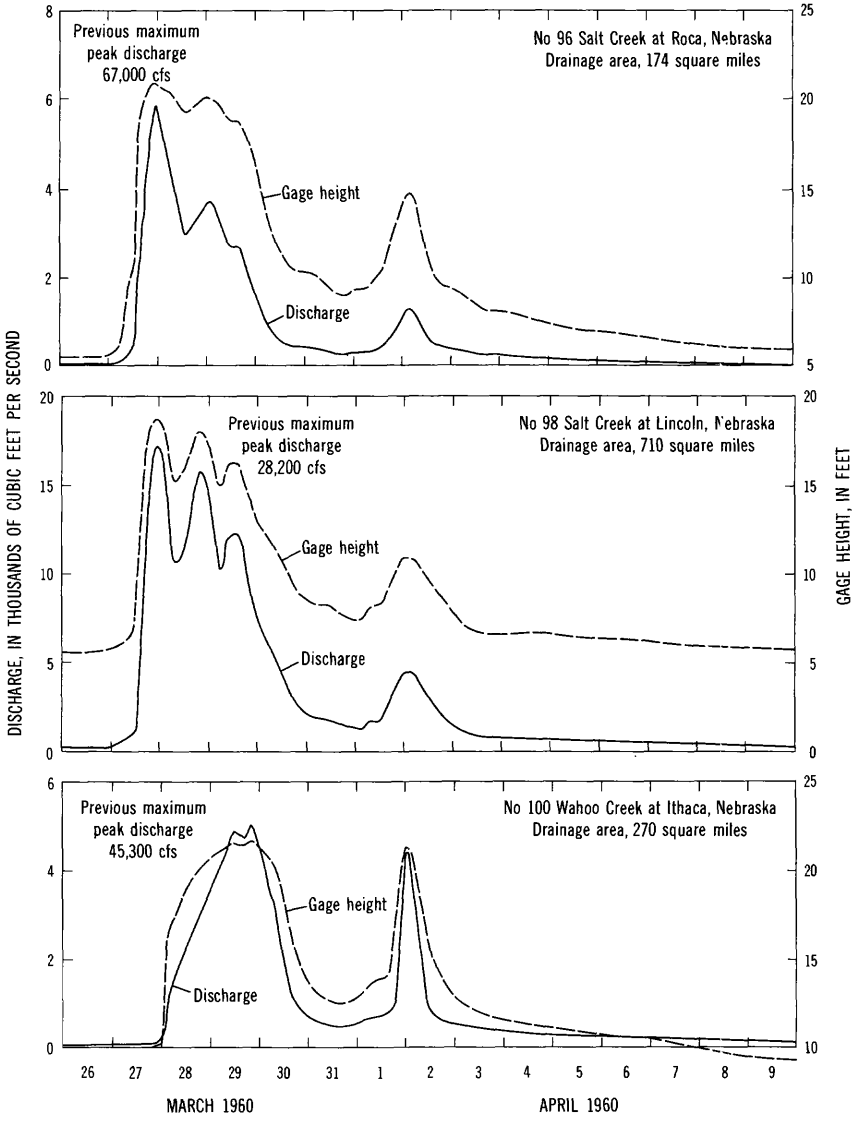

FIGURE 14.—Discharge and gage height at selected gaging stations in Salt Creek basin, Nebraska, March 26–April 9.

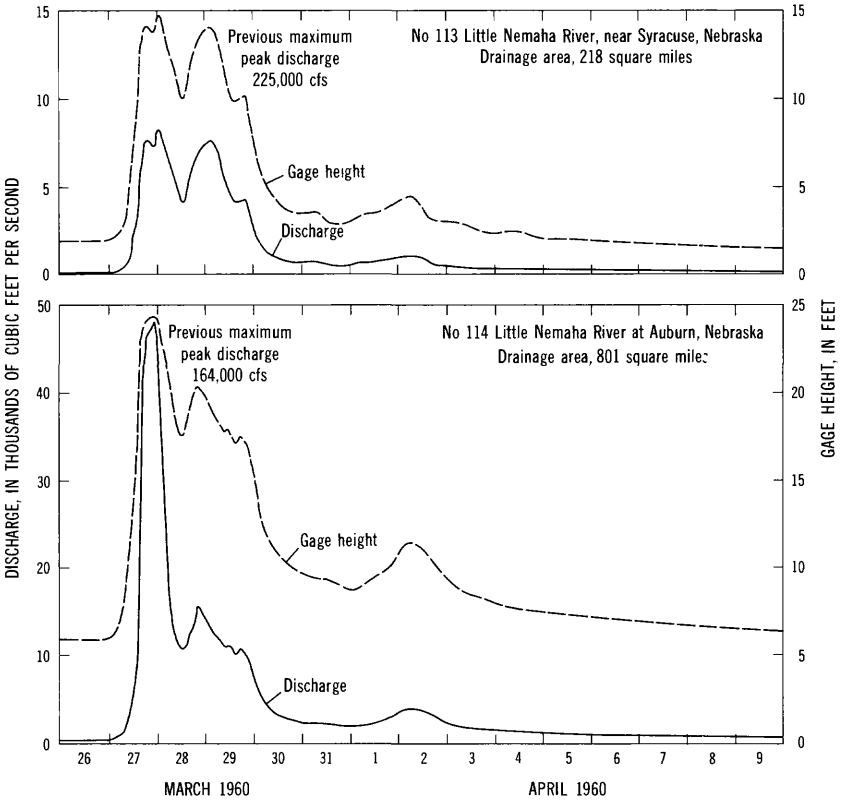

FIGURE 15.—Discharge and gage height at selected gaging stations in Little Nemaha River basin, Nebraska, March 26–April 9.

Davenport, Nebr. These floods equaled or exceeded the 25-year floods. The peak discharge of 3,690 cfs on South Fork Big Sandy Creek near Carleton, Nebr., was 1.8 times that of the 25-year flood. Most Kansas streams east of the Republican River were bankfull or higher. Tuttle Creek Reservoir in Kansas was under construction, but storage of 358,100 acre-feet reduced the 74,000 cfs peak on the Big Blue River at Randolph (fig. 18) to 31,400 cfs near Manhattan.

The flood on the main stem of the Missouri River was quite different from any previous flood. The last major flood was in 1952, but the flood in June 1953 was almost as high as that in 1960 at Omaha, Nebr. Between 1952 and 1960, four large dams were built on the Missouri River, and these effectively controlled all runoff entering the reservoirs in 1960. Fort Randall Reservoir, near the northern edge of the flood area, reduced the maximum daily inflow of 66,000 cfs to a maximum daily outflow of 1,530 cfs, while uncontrolled tributaries were creating

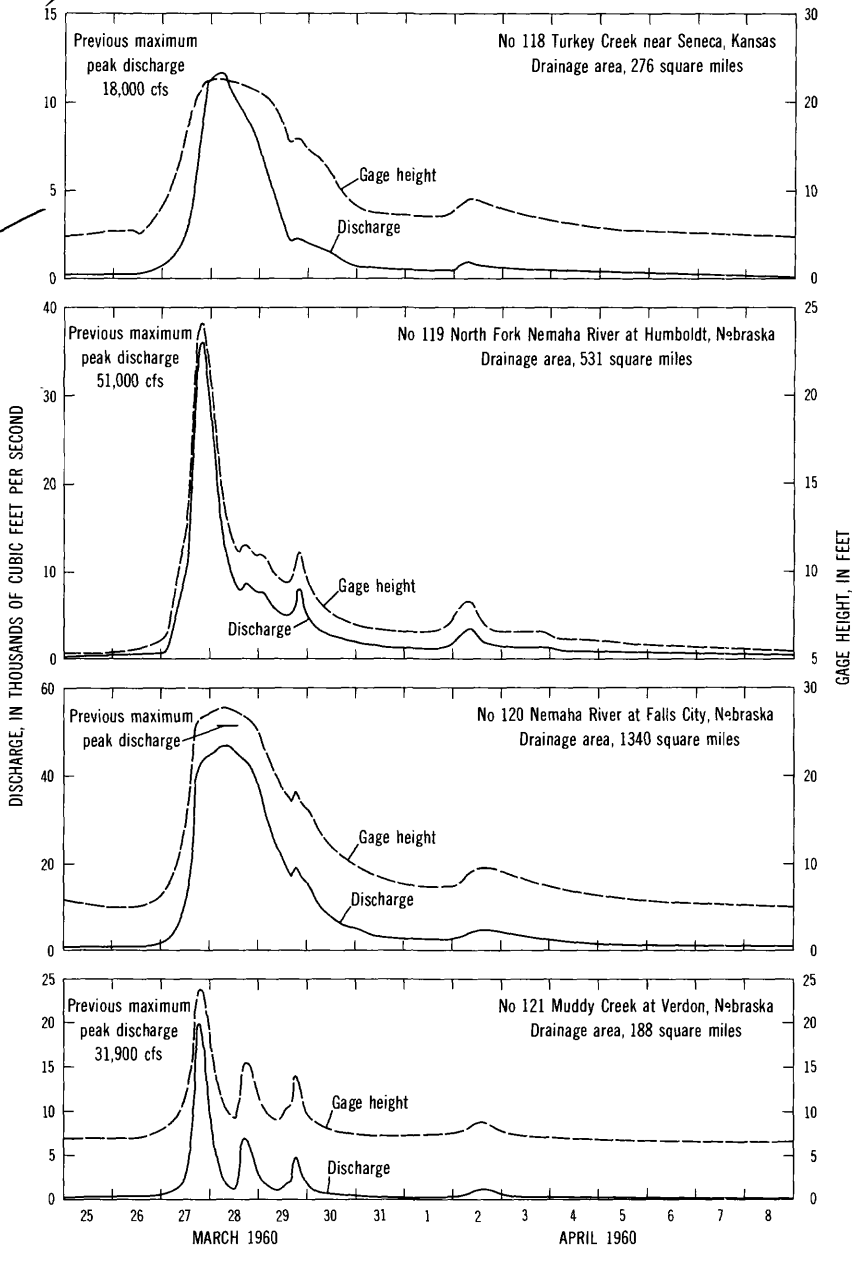

FIGURE 16.—Discharge and gage height at selected gaging stations in Nemaha River basin, Kansas and Nebraska, March 25–April 8.

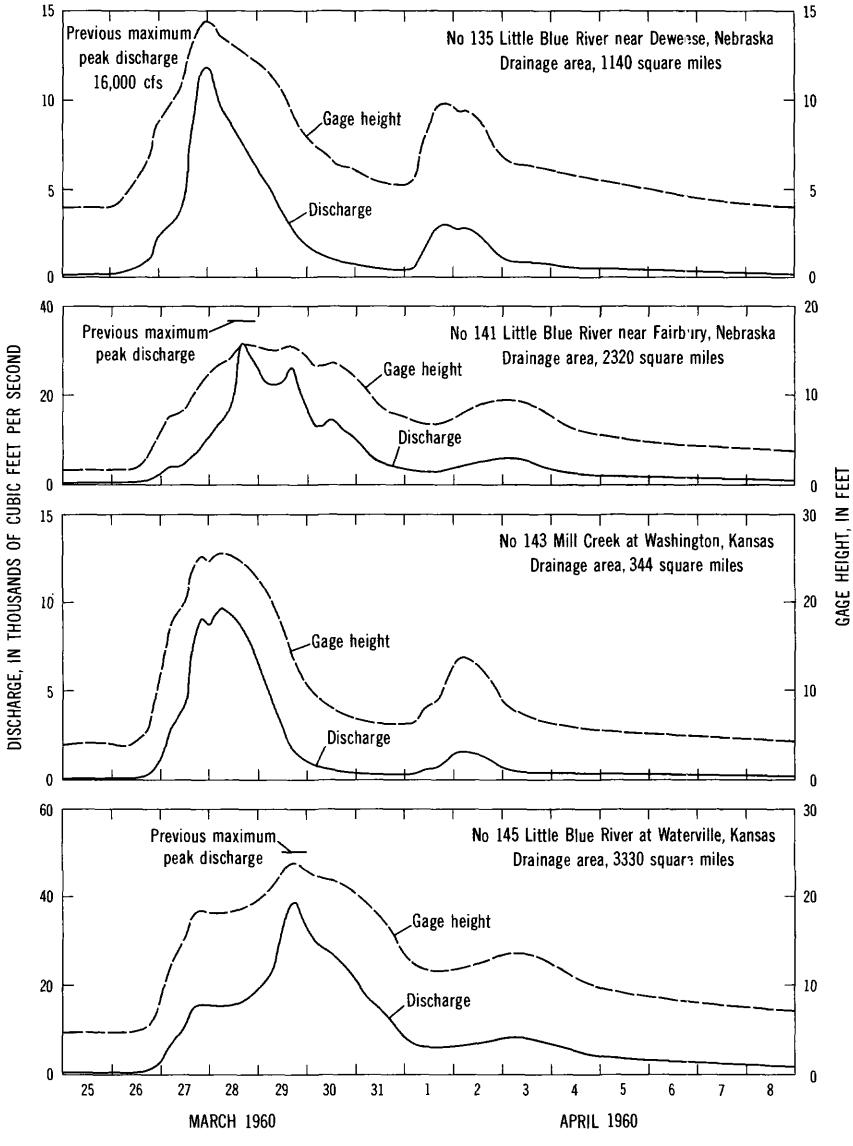

FIGURE 17.—Discharge and gage height at selected gaging stations in Little Blue River basin, Nebraska and Kansas, March 25–April 8.

a flood hazard downstream. The maximum daily inflow to Lewis and Clark Lake was about 47,000 cfs on March 28 where the maximum daily release was about 33,000 cfs on March 29. The peak discharge

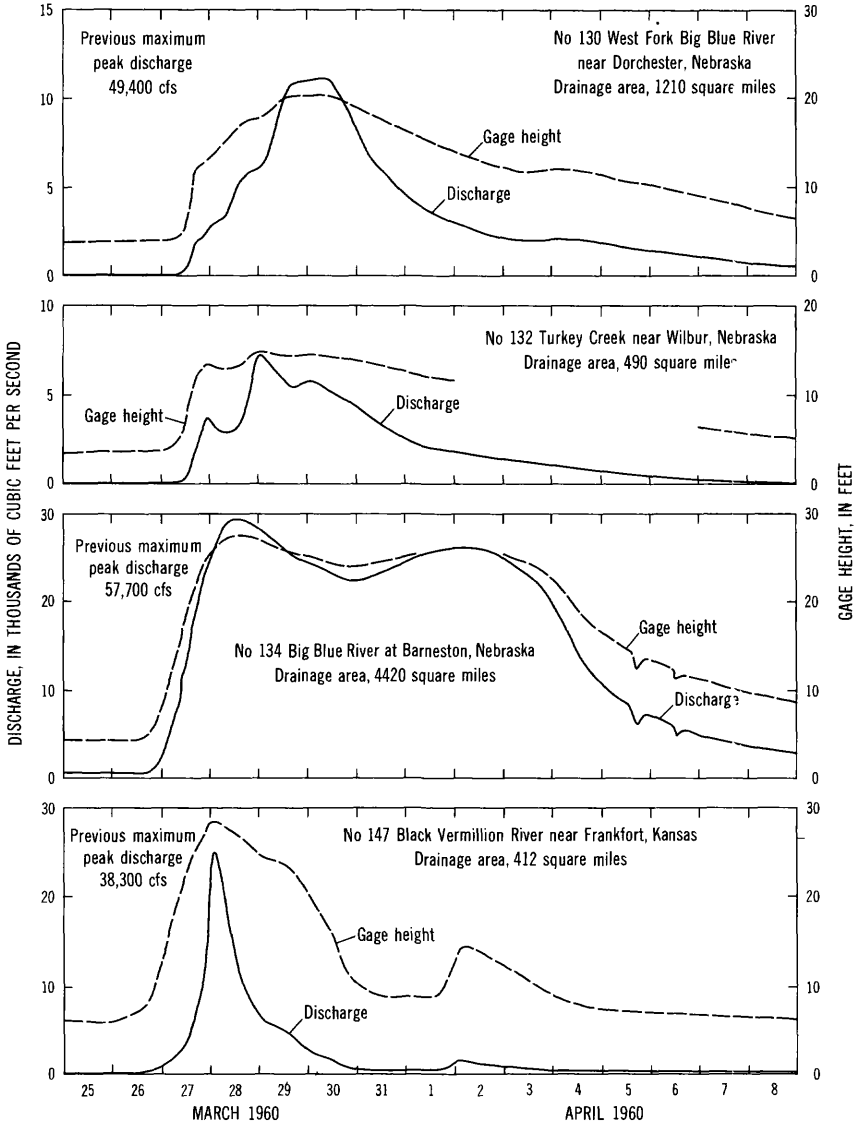

FIGURE 18.—Discharge and gage height at selected gaging stations in Big Blue River basin, Nebraska and Kansas, March 25–April 8.

increased to 34,700 cfs at Yankton, S. Dak., 82 miles downstream from Fort Randall Dam, to 101,000 cfs at Sioux City, Iowa, to 120,000 cfs at Omaha, Nebr., to 178,000 cfs at Nebraska City, Nebr., and to 181,000

cfs at Rulo, Nebr. In contrast, the 1952 flood was generated mainly in the area upstream from the area covered by this report, and peak discharges of the Missouri River decreased from 480,000 cfs at Yankton to 358,000 cfs at Rulo.

Comparative stages for the 1952 and 1960 floods on the Missouri River between Yankton and Rulo are shown in the following table.

Location	April 1952		March-April 1960	
	Day	Stage	Day	Stage
Yankton	13, 14	15.5	March 29	3.59
Sioux City	14	24.28	April 3	10.52
Omaha	18	30.20	4	16.96
Nebraska City	18	27.66	5	21.43
Rulo	22	25.60	6	22.36

FLOOD DAMAGE

INUNDATED AREAS

Ponca Creek overflowed its banks from Bristow to its mouth. At least 60 families were forced to leave their homes in Bristow, Lynch, Monowi, and Verdel, Nebr. A Chicago and North Western Railway employee was marooned while inspecting railroad bridges near Lynch and was rescued by a National Guard helicopter crew. The areas inundated near Bristow and Lynch are shown in figures 19 and 20, which were prepared from data furnished by the U.S. Army Corps of Engineers (1961). Additional information regarding the inundation of these areas and the areas in the following maps is available at the district office of the Corps of Engineers in Omaha, Nebr.

The James River flood plain downstream from Huron, S. Dak., is about half a mile wide and very flat. At the crest of the flood the entire flood plain of about 45,000 acres was inundated. The James River valley is primarily rural, and the towns and farmsteads are generally above the flood plain on bordering uplands; therefore few homes were flooded, and urban property under water was confined to a few city parks near the river.

Extensive flooding on the Vermillion River extended from the confluence of the East and West Forks near Parker, S. Dak., to the mouth near Vermillion. Nearly all the dikes built by farmers in this area were overtopped, and almost the entire flood plain of about 50,000 acres was inundated. The Vermillion River remained above its banks for about 3 weeks.

About 80,000 acres of land were flooded in the Big Sioux River valley. Many farms were inundated, and about three-quarters of North Sioux City, S. Dak., and one-quarter of Riverside, a suburb of Sioux City, Iowa, were flooded (fig. 21). The river was about 2 miles wide in the reach between Akron and Sioux City.

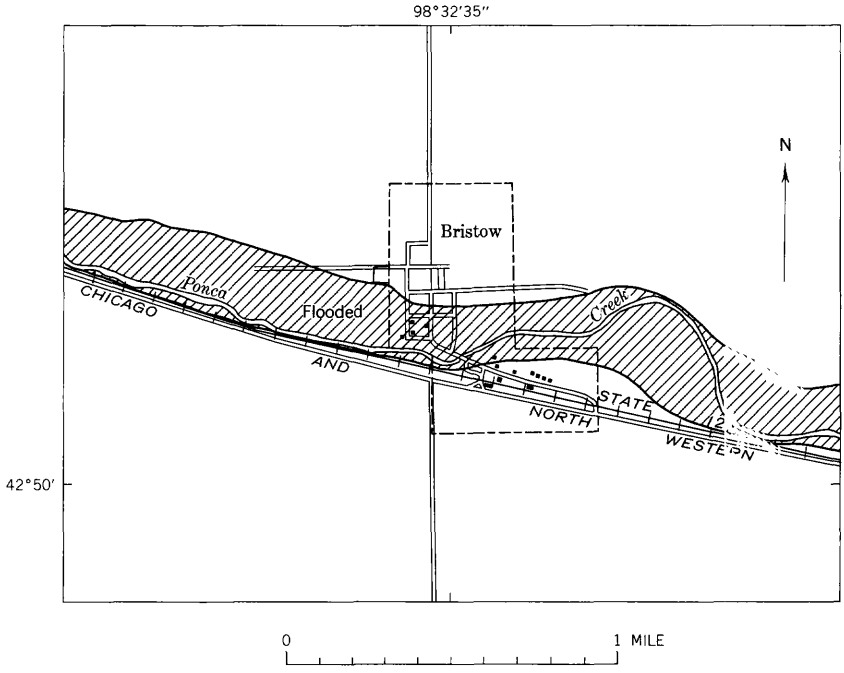

FIGURE 19.—Area inundated by Ponca Creek near Bristow, Nebr. Data furnished by U.S. Army Corps of Engineers (1961).

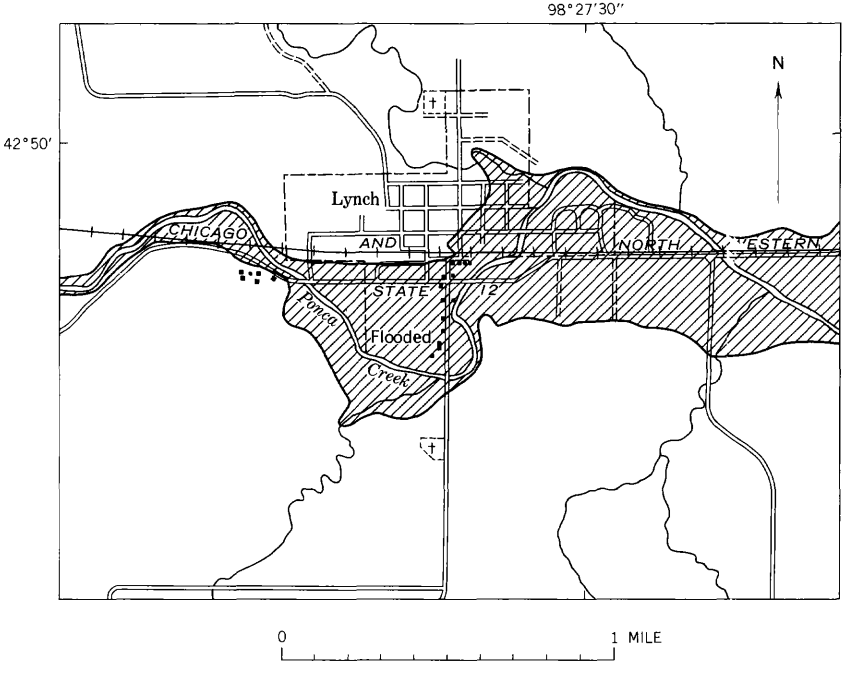

FIGURE 20.—Area inundated by Ponca Creek near Lynch, Nebr. Data furnished by U.S. Army Corps of Engineers (1961).

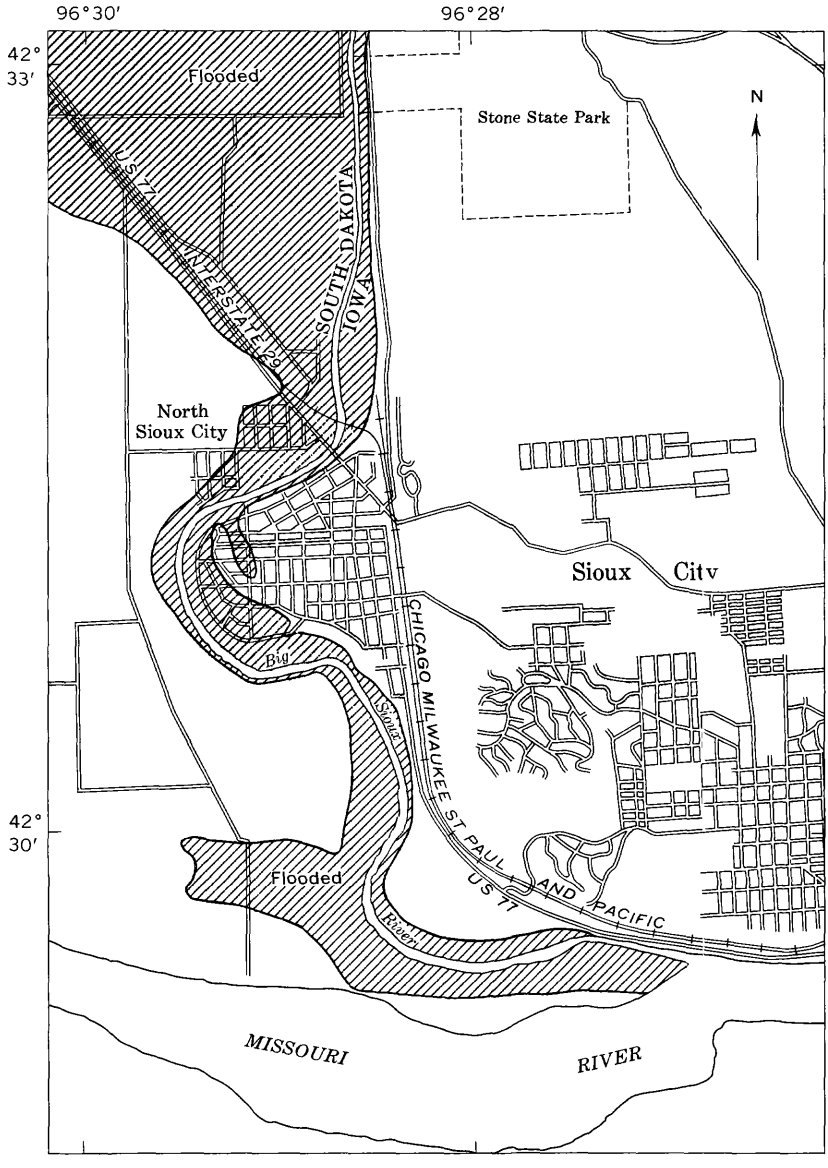

FIGURE 21.—Area inundated by Big Sioux River near North Sioux City, S. Dak.

The entire north end of Columbus, Nebr., was flooded on March 29 by rapid runoff from the hills just north of the city. Because the channel of Lost Creek was too small and its gradient too flat to carry the water, local flooding occurred.

The low banks along the Platte River were no barrier to the flood. One of the most severely flooded sections of the entire flood area was the Platte River valley between the mouth of the Loup River near Columbus and the mouth of the Elkhorn River near Ashland. Nine farm families were isolated between Linwood, Nebr., and the river. North Bend was completely inundated (fig. 22) on March 29, and residents reported that the flooding there was the worst since 1912. Dikes failed between North Bend and South Bend and flood waters entered many homes. By March 29, 24 cities and towns in eastern Nebraska were flooded to some degree.

Increased stage due to ice jams and rainfall in the Elkhorn River basin increased the areas inundated. The North Fork Elkhorn River covered about one-third of Pierce (fig. 23) and part of Norfolk (fig. 24). The Elkhorn River was more than 1 mile wide at several places south of Norfolk on March 30. The crest reached Hooper and Winslow on April 1. Water was reported to be 3 feet deep at the edge of Hooper (fig. 25), and the entire town of Winslow (fig. 26) was inundated. The area at and north of Waterloo was also flooded. On March 30 the Platte River overflowed its east bank at Mercer, some water flowing into a cross channel just south of State Highway 36 and some into a channel from Valley along the Union Pacific Railroad and U.S. Highway 275 (fig. 27). Flow in the cross channel flooded an area north of Waterloo and southwest of Elk City, and flow along the railroad flooded part of Waterloo. On April 2, the Elkhorn River crest reached Waterloo. This flood covered part of the area north of Waterloo for the second time in 3 days and inundated about half of Waterloo. Most of the flood plain to the east of the Platte River near the mouth of the Elkhorn River was also inundated twice.

Inundation of an area is always a disaster, but the problem during the floods of March–April 1960 was compounded by the length of time many areas were under water. The crest of a major flood caused by snowmelt lasts much longer than a crest caused by rainfall. The rains of April 1–3 produced secondary rises on some streams, and the differences in time of travel while water accumulated in the larger rivers were enough to keep other streams above bankfull stage for long periods. Many areas were inundated for 7 to 10 days after the crest had passed. The James River near Scotland, S. Dak., was over its banks until the latter part of April, and the Big Sioux River did not return to its usual channel near Sioux City until April 18. In Nebraska the flood inundated about 250,000 acres, much of which was under water for a period of a few days to more than a week.

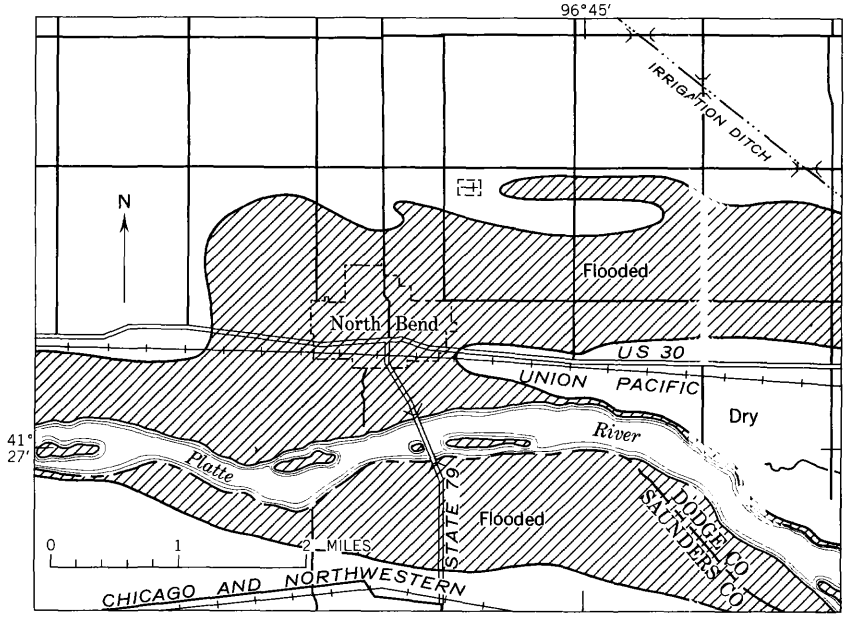

FIGURE 22.—Area inundated by Platte River near North Bend, Nebr., March 29, 1960. Data furnished by U.S. Army Corps of Engineers (1961).

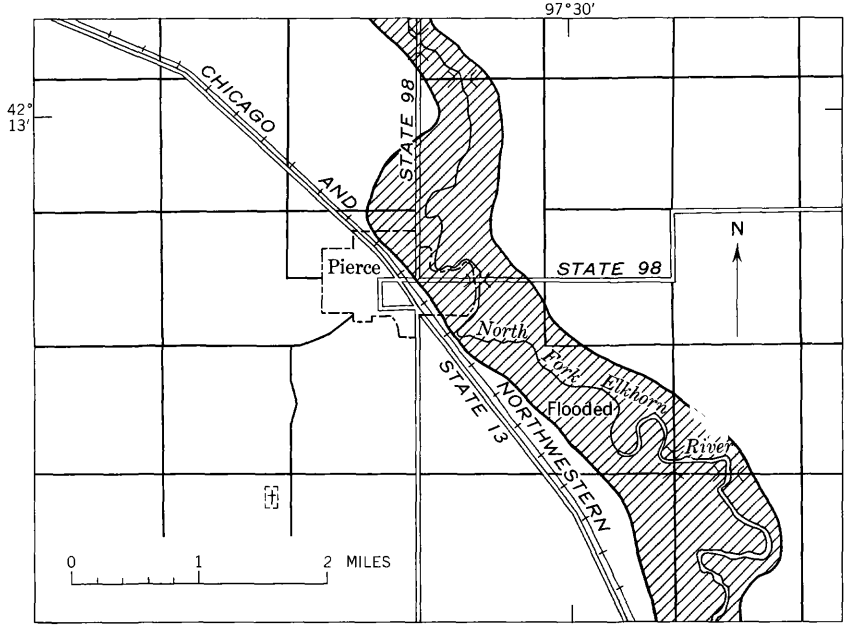

FIGURE 23.—Area inundated by North Fork Elkhorn River near Pierce, Nebr. Data furnished by U.S. Army Corps of Engineers (1961).

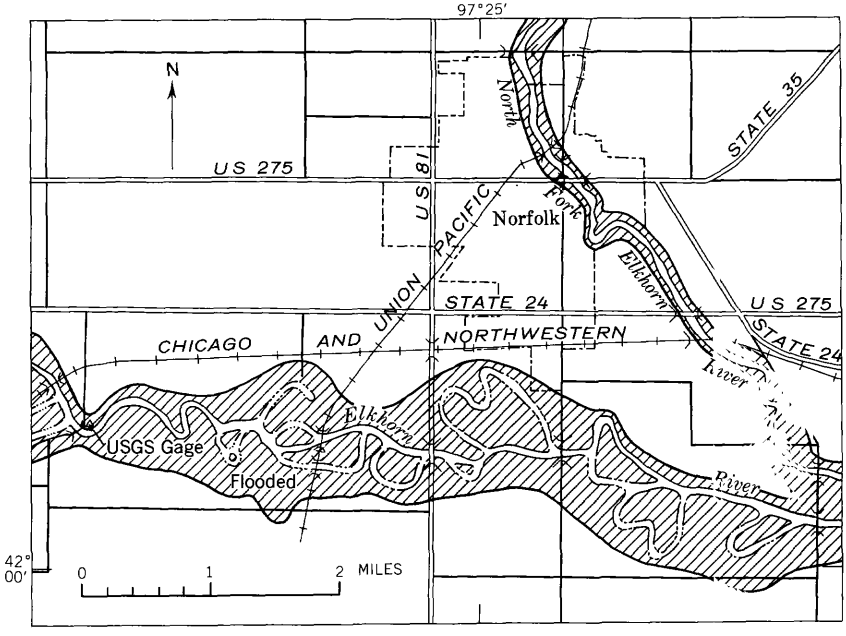

FIGURE 24.—Area inundated by Elkhorn River and North Fork Elkhorn River near Norfolk, Nebr. Data furnished by U.S. Army Corps of Engineers (1961).

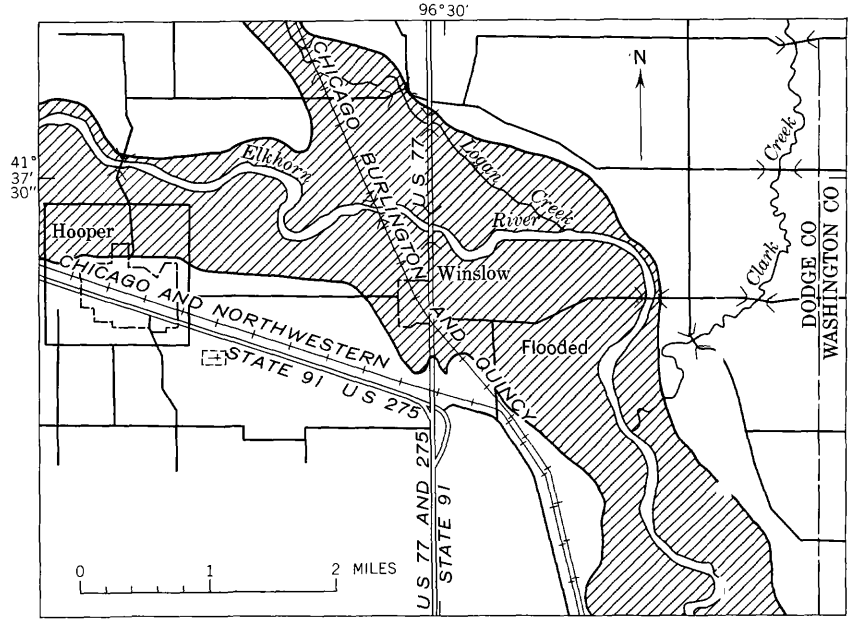

FIGURE 25.—Area inundated by Elkhorn River near Hooper and Winslow, Nebr. Data furnished by U.S. Army Corps of Engineers (1961).

FIGURE 26.—Aerial view of floodwaters from Elkhorn River in Winslow, Nebr., April 2, 1960. Photograph by Omaha World-Herald.

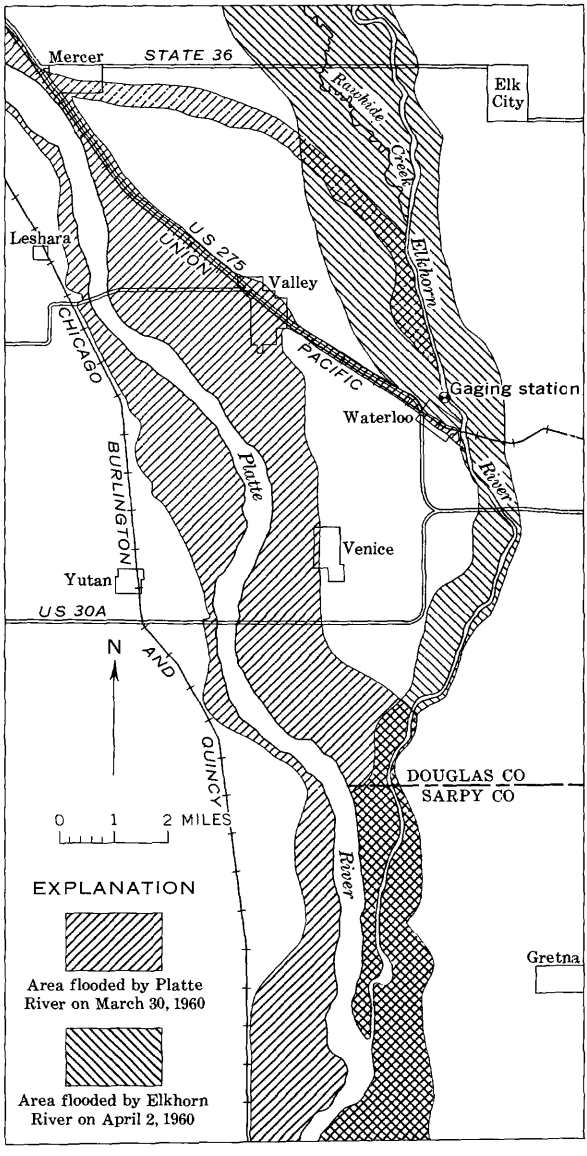

FIGURE 27.—Area inundated by Platte River and Elkhorn River near Waterloo, Nebr.

DAMAGE TO PROPERTY

Ice jams caused backwater, notably on the Elkhorn and Niobrara Rivers in Nebraska, and the higher stages increased the flood damage. Early warnings of flood danger, issued by the Weather Bureau and Corps of Engineers, allowed public agencies and private concerns to take precautionary measures; thereby loss of life and damage to movable property were reduced. Many small areas were severely damaged by erosion or sedimentation; a few such areas were abandoned because reclaiming the land would have been uneconomical.

The ice jam on the Niobrara River near Niobrara, Nebr., caused extensive damage to the State park, caused the washout of several hundred feet of fill along State Highway 12, and damaged a highway bridge (fig. 28) so severely that it had to be replaced.

On March 26 National Guardsmen in a helicopter rescued two persons who were stranded during an attempt to remove cattle from lowlands along the Keya Paha River near Butte, Nebr.

Most of the flood damage along the James River in South Dakota occurred to rural roads, fields, crops, and fences. The river near

FIGURE 28.—Remains of bridge across Niobrara River near Niobrara, Nebr., March 29, 1960. Photograph by Omaha World-Herald.

Scotland was above bankfull stage until almost the end of April, and crop planting in the lower reach of the river was delayed about a month.

Flood waters from the Vermillion River entered only one community, Davis, S. Dak., where 15 homes and the railroad were damaged. Most of the flood damage in this basin consisted of erosion of fields, dikes, and roads; however some fields behind dikes were damaged by sediment deposition.

Floods on the Big Sioux River caused severe damage because its valley is more populous than other valleys in southeastern South Dakota. Farm homes, outbuildings, fences, stored grain and feed, and livestock were heavily damaged. Several hundred persons were evacuated from North Sioux City, S. Dak., and from Riverside, a suburb of Sioux City, Iowa. The estimated damage in this vicinity exceeded half a million dollars.

Platte River floodwaters submerged 2 miles of Union Pacific Railroad main-line tracks to a depth of 8 inches near North Bend, Nebr., and damaged U.S. Highway 275 between Fremont and Valley, Nebr. (fig. 29). Hundreds of farm homes along the Platte River between North Bend and South Bend were damaged after dikes failed in many places. Just upstream from Ashland, an ice jam formed and, according to a resident, when it broke it released a wall of water which rapidly covered his lawn to a depth of 4 feet just before 1 p.m. on March 29. The Chicago, Burlington & Quincy Railroad bridge across the Platte River east of Columbus was partly destroyed on March 30 (fig. 30).

The Elkhorn River flood and the accompanying ice jams damaged the First Street Bridge in Norfolk, Nebr., and an ice jam 1½ miles long between Pilger and Wisner was dynamited. Water from Rawhide Creek came within 20 feet of the Dodge County Hospital in Fremont.

The Weather Bureau compiled estimates of flood damage from several agencies (table 2). Figures in table 2 do not include damage from erosion and sedimentation, or the intangible losses to individuals, to local business, and to the economy of the area.

The types of flood damage were compiled by the U.S. Army Corps of Engineers and are summarized in table 3. More detailed information is available in the district office of the Corps of Engineers in Omaha, Nebr.

FIGURE 29.—Damage to U.S. Highway 275 between Fremont and Valley, Nebr., April 5, 1960. Photograph by Omaha World-Herald.

FIGURE 30.—Chicago, Burlington & Quincy Railroad bridge across Platte River east of Columbus, Nebr., March 30, 1960. Photograph by Omaha World-Herald.

TABLE 2.—*Summary of flood damage, in thousands of dollars, in Missouri River basin, March–April 1960*

[Data furnished by U.S. Weather Bur.]

Stream basin	Urban property					Rural property					Other property		Miscellaneous	Total loss
	Residential		Commerical		Public	Crops		Livestock	Other		Railroads, bridges, highways, and other	Public utilities		
	Fixed	Movable	Fixed	Movable		Growing	Stored		Fixed	Movable				
Minor tributaries in South Dakota and Nebraska	28.0	50.0	20.0	20.0	135.0	34.0			50.0		300.0	10.0	50.0	697.0
James River	40.0	12.0	45.0	15.0	150.0	75.0	250.0		90.0		280.0	9.0	70.0	1,036.0
Vermillion River	15.0		5.0		30.0	150.0	60.0		50.0		350.0		45.0	705.0
Big Sioux River	450.0	75.0	125.0	35.0	260.0	110.0	275.0	13.0	285.0	40.0	950.0	15.0	118.0	2,751.0
Floyd River	30.0	25.0	25.0	210.0	16.0		38.0		42.0	4.0	30.0	7.0	67.0	494.0
Little Sioux River	[a] 38.0					23.0			310.0		83.0			454.0
Loup River	[a] 87.0					7.0		1.5	151.5		80.0			327.0
Elkhorn River	200.0	75.0	50.0	10.5	250.0	42.5	85.0	9.2	106.0	17.5	261.4	58.9	138.1	1,304.1
Salt Creek						6.0			62.0		14.0			82.0
Platte River	[a] 484.0					54.0		32.0	1,218.0		731.0			2,519.0
Nishnabotna River						12.0			61.0		182.0			255.0
Missouri River above Rulo, Nebr						680.0		5.0	1,321.0		265.0			2,271.0
Nemaha River	.7					51.0					54.4			106.1
Little Blue River	2.5	2.4			42.7	11.0	.5	.1	8.5		91.4		6.2	165.3
Big Blue River	44.0	3.0	81.1	4.0	52.5	14.5	5.0	24.5	18.5	1.0	22.7	16.5	6.2	293.5
Kansas River and minor tributaries	3.0	.1	2.0	.5	.5	15.0	1.0	.5	4.0	.5	5.0	.5	2.0	34.6

[a] Includes all urban property.

TABLE 3.—*Summary of types of flood damage, March–April 1960*

[Data furnished by the U.S. Army Corps of Engineers]

Stream basin	Buildings destroyed or damaged			Bridges destroyed or damaged	Persons reported evacuated	Lives lost	Acres flooded (1,000's)
	Residences	Commercial and other	Farm				
Niobrara River and Ponca Creek	65	7				0	
James River	48	10	135			0	45
Vermillion River	24	0	0	Many	9 families	1	49.5
Big Sioux River	718	74	360	6	600	1	80
Floyd River	56	37		4	160	0	11
Little Sioux River	71	28	2	4	60	0	38.8
Loup River	151				15	1	29.8
Elkhorn River	700	20	5	17	712	0	96.2
Platte River	768	60	370	19	1,519	2	71.9
Nishnabotna River	0	0	0	5	0	0	11.5
Missouri River, Omaha to Rulo, Nebr.	181	21	325			0	

LOSS OF LIFE

Five persons were drowned. A 4-year-old boy fell into a drainage ditch in Lincoln, Nebr., and was carried into a storm sewer; a truck driver lost his life near Valley, Nebr., when his truck, carrying emergency supplies, overturned in flood waters; a farmer drowned near Ord, Nebr., after slipping from a tree over Turtle Creek; a railroad employee fell into the Vermillion River while repairing a railroad bridge at Parker, S. Dak.; and a Sioux Falls doctor drowned when his canoe capsized while he was taking flood photographs on the Big Sioux River near Canton, S. Dak.

EFFECTS OF STORAGE

The Missouri River above Yankton, S. Dak., is now effectively controlled by four great dams on the main stem completed since the devastating floods of 1952. About half of the Missouri drainage basin lies upstream from Gavins Point Dam near Yankton, and it was in this upper basin that the 1952 flood was generated. There was little severe flooding in the upper basin during the spring of 1960, but moderately heavy runoff from snowmelt began about March 20, about a week before flooding began along the tributaries downstream from Yankton. Nearly the entire runoff from the upper basin was contained in Fort Peck, Garrison, Oahe, and Fort Randall Reservoirs and in Lewis and Clark Lake during the spring of 1960, and this potential addition to the flood on the Missouri River downstream from Yankton was eliminated. The main-stem reservoir system stored 3,860,000 acre-feet of water during March 1960, and the Corps of Engineers estimates that it thereby reduced the crest stage of the Missouri River by about

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9 feet at Sioux City and Omaha and prevented additional loss of many millions of dollars at these two cities during this flood.

The effectiveness of storage for flood control was illustrated at Fort Randall Reservoir. The maximum daily inflow of 66,000 cfs occurred on March 28, and the daily flow at the gaging station 7 miles downstream from Fort Randall Dam was reduced from 3,030 cfs on March 27 to 236 cfs on March 30. Controlled releases kept the flow below 1,530 cfs until April 8, after which it was safe to increase the flow in the downstream channel.

In Kansas, Tuttle Creek Reservoir, which was under construction, stored a maximum of 358,100 acre-feet and thereby reduced the 74,000 cfs peak on the Big Blue River at Randolph to 31,400 cfs near Manhattan.

SEDIMENT DISCHARGE

Numerous sediment-discharge measurements were made by U.S. Geological Survey personnel on streams in eastern Nebraska March 27–April 8; a report on that work by Mundorff (1962) has been published. The information included here under "Sediment discharge" has been extracted from that report.

Suspended-sediment concentrations and discharges for most of the streams were somewhat lower than they would have been had equal water discharges resulted from torrential rains rather than from snowmelt. During the period March 28–April 8, 1960, when the total water discharge of Platte River at Louisville and of Elkhorn River at Waterloo was about one-fourth of the total for the year, the sediment discharge was an estimated 45 to 50 percent of the estimated total for the year at each station. Both the percentage of sand and the concentration of sand in the suspended sediment were much higher in the Platte and Elkhorn Rivers than in streams in the Big Blue River and Nemaha River basins.

A few data obtained on particle-size distribution of bed material at Louisville, Waterloo, and Beatrice indicate that the material is finest at Waterloo, somewhat coarser at Louisville, and much coarser at Beatrice. (See following table.)

Stream and location	Particle size (millimeters) [1]		
	15 percent	50 percent	85 percent
Elkhorn River at Waterloo, Nebr	0.16	0.27	0.70
Platte River at Louisville, Nebr	.22	.37	.87
Big Blue River at Beatrice, Nebr	.50	.80	2.2

[1] Bed material for the given percentage (by weight) is finer than the particle size listed.

The data are not sufficiently comprehensive for precise determination of total sediment discharge for each stream during the entire flood period. However, estimates of total sediment discharge based on the available data on streamflow and sediment discharge for three streams are as follows:

Elkhorn River at Waterloo, March 30–April 8, 1960, 3.25 million tons; Platte River at Louisville, March 28–April 8, 1960, 11 million tons; Big Blue River at Beatrice, March 29–April 3, 1960, 650,000 tons. The quantity of sediment transported by Platte River at Louisville during the period of March 28–April 8 would be sufficient to form a deposit about 10 feet thick over 1 square mile.

The suspended-sediment discharge of some streams, as computed by standard methods, does not include the suspended sediment in an unsampled zone about 0.4 foot deep immediately above the streambed, nor does it include sediment that may be transported as bedload. Estimates of the total sediment discharge are shown in table 4.

TABLE 4.—*Measured and total sediment discharge for selected streams in eastern Nebraska*

Stream and location	Date (1960)	Time	Discharge (cfs)	Sediment discharge (thousands of tons per day)	
				Measured	Total
Elkhorn River at Waterloo, Nebr.	Mar. 31	3:40 p.m.	21,400	299	327
	Apr. 4	11:15 a.m.	31,800	250	279
	6	11:45 a.m.	14,450	215	228
Platte River at Louisville, Nebr.	Mar. 31	9:30 a.m.	88,400	1,280	1,410
	Apr. 1	11:35 a.m.	59,700	843	913
	4	10:00 a.m.	59,300	874	1,010
Big Blue River at Beatrice, Nebr.	1	11:50 a.m.	24,200	110	115

FLOOD-CREST PROFILES

Graphs of flood-crest elevations versus valley-river miles (figs. 31–34) provide representation of the relation between these two factors under the conditions that existed at maximum stages.

"Valley-river miles" is used in this report as the distance measured along a line approximately midway between the limits of inundation on the flood plains. Normally "river miles" is used to measure the distance along a stream to include all meanders and other irregularities in the stream pattern; therefore the differences between "river miles" and "valley-river miles" may be appreciable when overbank flow occurs.

With the exception of the flood-crest elevations obtained at Geological Survey gaging stations, all others were collected by personnel of the U.S. Army Corps of Engineers. Detailed descriptions of high-water marks are on file in the Corps' district office, Omaha, Nebr. The identifying numbers shown on the Big Sioux River profile are those assigned by the Corps of Engineers.

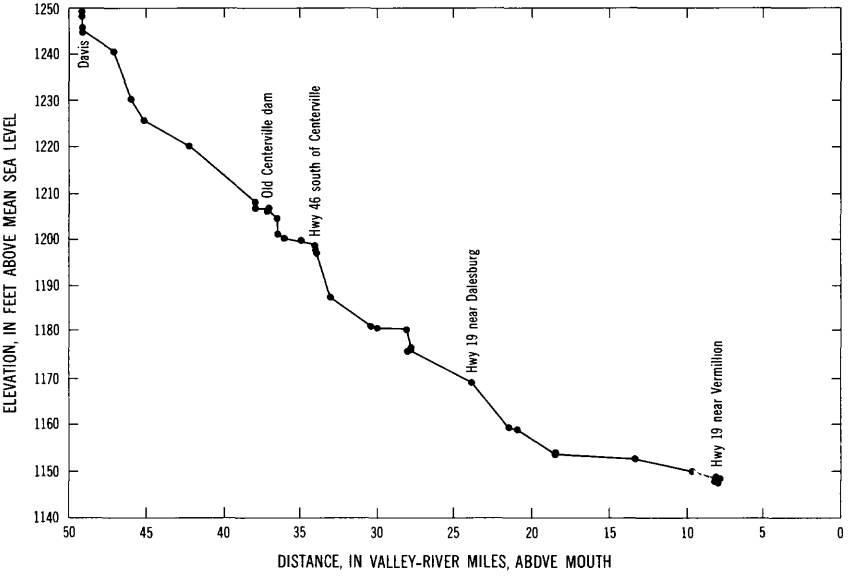

FIGURE 31.—Flood-crest elevations on Vermillion River, S. Dak. Water-surface elevations were selected from the high-water marks collected by the Corps of Engineers.

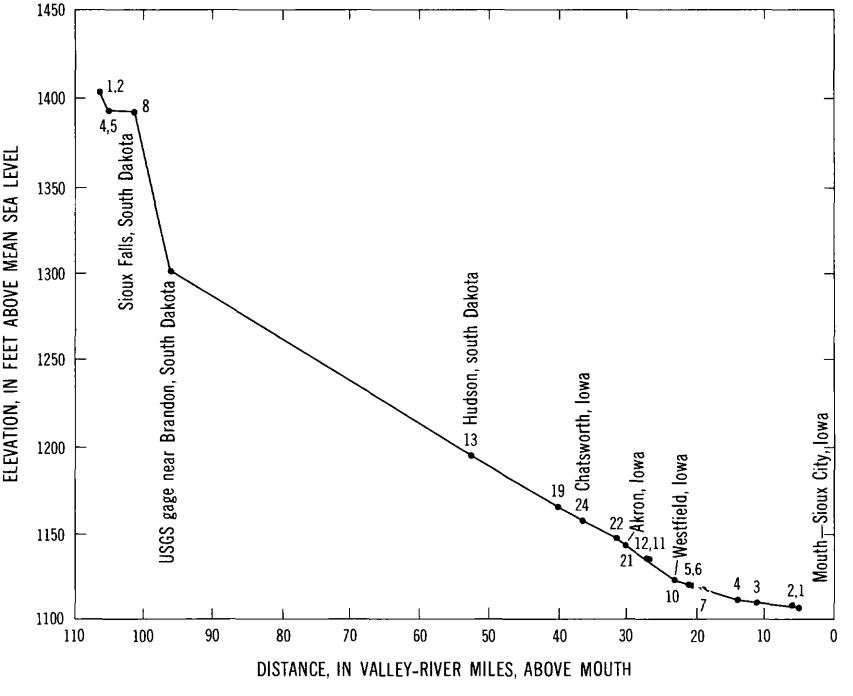

FIGURE 32.—Flood-crest elevations on Big Sioux River, S. Dak. and Iowa. Water-surface elevations were obtained at Geological Survey gages or were selected from the high-water marks collected by the Corps of Engineers.

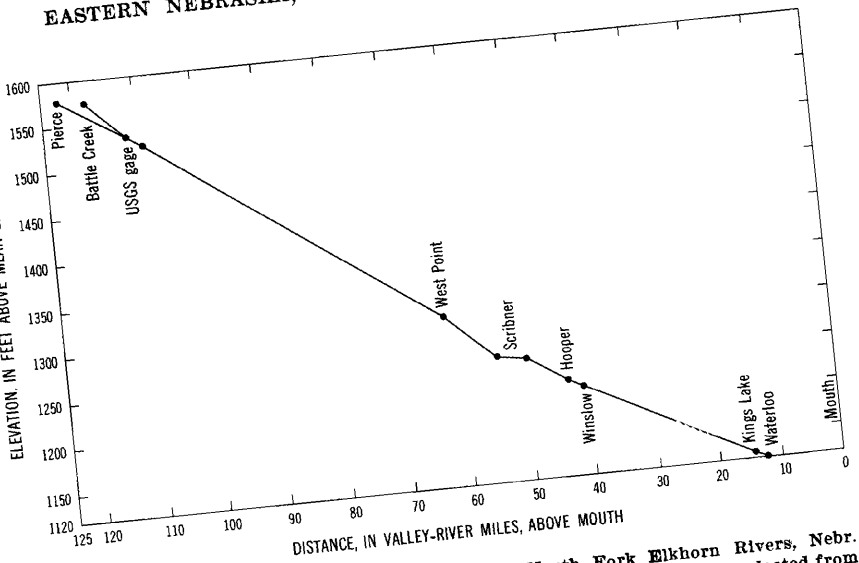

FIGURE 33.—Flood-crest elevations on Elkhorn and North Fork Elkhorn Rivers, Nebr. Water-surface elevations were obtained at Geological Survey gages or were selected from the high-water marks collected by the Corps of Engineers.

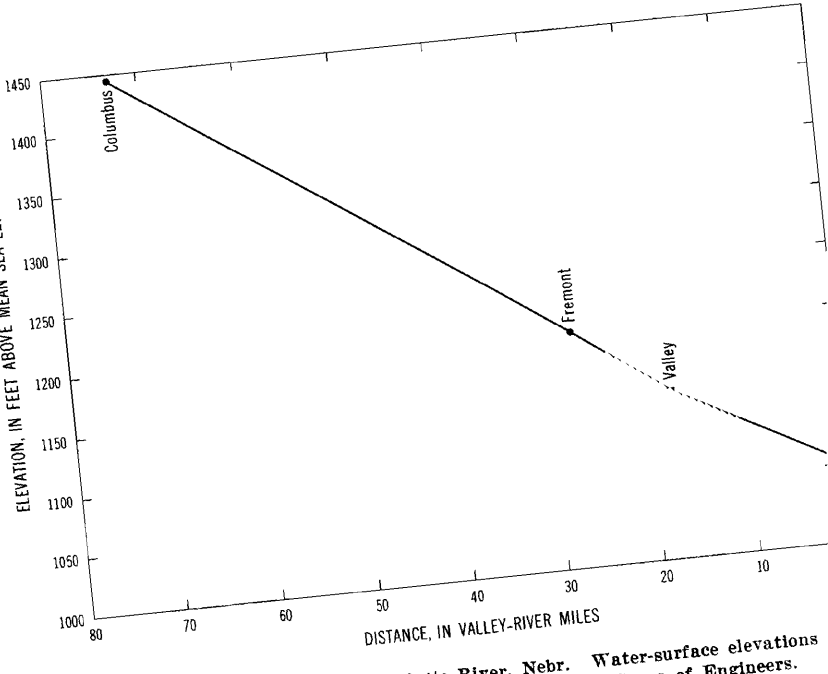

FIGURE 34.—Flood-crest elevations on Platte River, Nebr. Water-surface elevations selected from the high-water marks collected by the Corps of Engineers.

FLOOD VOLUMES

A comparison (table 5) of the volume of runoff during the floods of March–April 1960 with that during the prior maximum recorded floods at selected stations in the area shows that, with one exception, the maximum 20-day volumes during March and April 1960 exceeded the previous maximum 20-day volumes even though peak discharges in eastern Nebraska generally were not maximum discharges. Because of different lengths in the period of record and because of climatic variations within the area, these comparisons may not be representative of the entire area. The stations listed in table 5 are among those having the longest periods of record. Only at the station on Elkhorn River at Waterloo, Nebr., was the maximum 20-day volume of runoff during 1960 less than the prior maximum 20-day volume. It was only 7 percent less than the maximum of the greatest flood in the memory of residents; the peak discharge during that flood in 1944, was more than twice as large as the peak discharge in 1960.

The ratios in table 5 support the premise that, in general, the volume of runoff during snowmelt floods exceeds that during rainfall floods even though the peak discharge resulting from rainfall is appreciably greater than the peak discharge caused by snowmelt.

Another aspect of the flood represented in table 5 is the fact that the maximum 20-day volumes at three locations, on the James, Vermillion, and Big Sioux Rivers, were 67, 74, and 69 percent, respectively, of the total runoff during the 1960 water year and were 161, 198, and 118 percent, respectively, of the average annual runoff at these locations.

TABLE 5.—*Comparison of maximum discharges and maximum 20-day volumes of runoff at selected stations*

Stream and location	Maximum known discharge			Maximum known 20-day volume of runoff			
	Prior to March 1960 (cfs)	March–April 1960 (cfs)	Ratio of 1960 maximum to prior maximum	Prior to March 1960 (cfs-days)	March–April 1960 (cfs-days)	Ratio of 1960 volume to prior volume	Percent 1960 annual runoff
Niobrara River near Spencer, Nebr.	27,400	23,400	0.85	73,580	119,110	1.62	20
James River near Scotland, S. Dak.	10,800	13,900	1.29	129,100	196,690	1.52	67
Vermillion River near Wakonda, S. Dak.	3,790	7,300	1.93	29,060	90,350	3.11	74
Big Sioux River at Akron, Iowa	33,000	49,500	1.50	304,410	356,410	1.17	69
Elkhorn River at Waterloo, Nebr.	100,000	46,900	.47	314,030	293,020	.93	33
Platte River at Louisville, Nebr.	71,000	124,000	1.75	394,900	819,200	2.07	27
Nemaha River at Falls City, Nebr.	51,400	46,900	.91	68,181	120,920	1.77	34
Big Blue River at Barneston, Nebr.	57,700	29,400	.51	108,857	235,800	2.17	44

FLOOD FREQUENCY

The proper design of dams, bridges, highways, levees, waterworks, and all other structures located on the flood plains of streams requires consideration of the flood hazard. In addition to the magnitude of floods at the site of a proposed structure, the frequency of flood occurrence is a major factor in the economical design of a structure. It is seldom feasible to design a structure to withstand the maximum flood that may occur. Economical design balances the cost of flood protection against potential flood damage or liabilities arising from failure and interruption of services. The selection of the flood to be considered in planning a structure, the "design flood," is usually determined on the basis of some definite frequency of recurrence.

The "recurrence interval" as used in this study is defined as the average number of years within which a given flood peak will be equaled or exceeded once by an annual maximum discharge. A flood of a given recurrence interval may occur in any year, even in successive years, or it may not occur for a period much greater than the designated recurrence interval. Probability terms may be used to avoid an inference of regularity of occurrence. For example, a flood with a 100-year recurrence interval has a 1-percent chance of occurring in any given year, and a flood with a 25-year recurrence interval has a 4-percent chance of occurring in any given year.

Each existing flood-frequency study has been based primarily on data for one State; although the studies cover the entire flood area, the small drainage areas are considered only in Nebraska. The highest flood defined by the studies is the 25-year flood. The last column of table 6 gives the ratio of the peak discharge to the discharge of the 25-year flood; however, if the peak discharge is for a flood of less than a 25-year recurrence interval, the interval is given in years and footnoted as such.

Graphs of the outstanding floods during March–April 1960 (figs. 35–38) show the relation of peak discharge to the size of the drainage basin and to selected recurrence intervals in southeastern Nebraska, in Little Blue River basin, Nebr., and for the main stems of the James, Big Sioux, and Platte Rivers. Lines of recurrence interval were computed directly from the several flood-frequency studies. These graphs which compare peak discharges of the 1960 flood with those of several recurrence intervals, show that the recurrence interval tends to be greater for the larger drainage basins. The explanation of this trend is that although rainstorms on the smaller basins produce much higher peak discharges than snowmelt does, the cumulative effect of many small streams having moderate floods from snowmelt at the same time

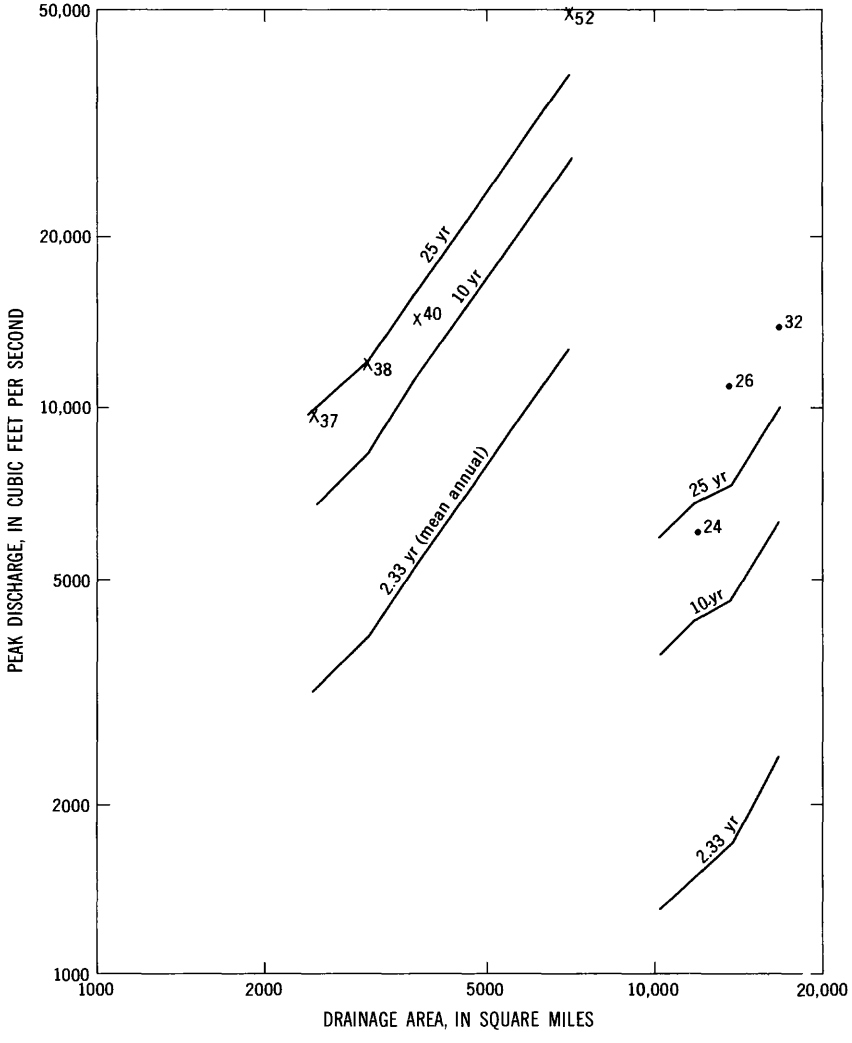

FIGURE 35.—Relation of peak discharge to size of drainage basin, James River and Big Sioux River, S. Dak. ● [32], James River; × [37], Big Sioux River. Numbers conform to those in table 6.

can be greater than a flood caused by rain on only part of the drainage area of the larger basins.

A comparison was made of annual maximum discharges before and after April 15 each year on the assumption that the earlier floods were caused by snowmelt and the later floods by rain. A few of the later floods may include some snowmelt, but the contribution from the snowpack is generally small. Records at least 20 years long for 16 selected gaging stations throughout the flood area show that, of 390 annual

maximums of record, 103 (about 1 out of 4) were caused by snowmelt. Those streams flowing from north to south in South Dakota and Iowa had a higher percentage, or greater frequency, of snowmelt floods than either those streams farther south or those having a west-east orientation.

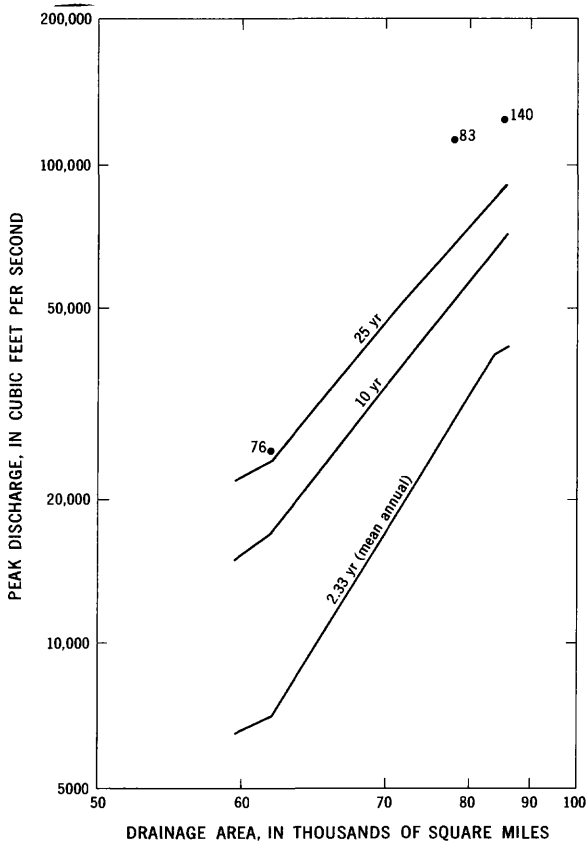

FIGURE 36.—Relation of peak discharge to size of drainage basin, for main stem of Platte River, Nebr. Numbers conform to those in table 6.

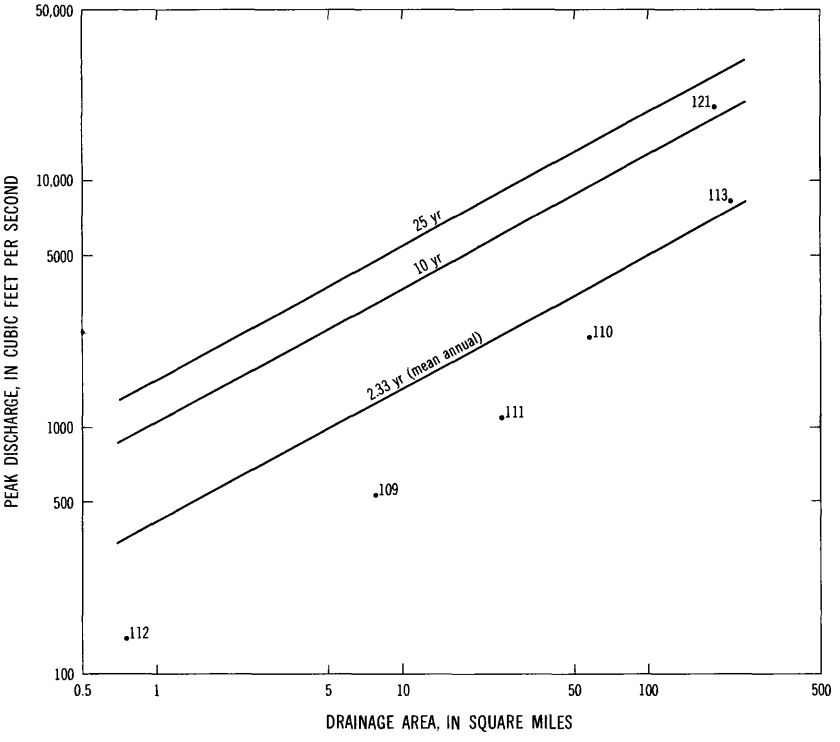

FIGURE 37.—Relation of peak discharge to size of drainage basin, in southeastern Nebraska. Numbers conform to those in table 6.

DETERMINATION OF FLOOD DISCHARGES

The method used by the Geological Survey to determine the amount and rate of flow at a stream-gaging station involves two main factors: (1) A record of stage obtained either from a water-stage recorder that produces a continuous graphic record of the stage or from periodic direct readings on a nonrecording gage and (2) the measurement of discharge, generally by current meter, but also by indirect methods.

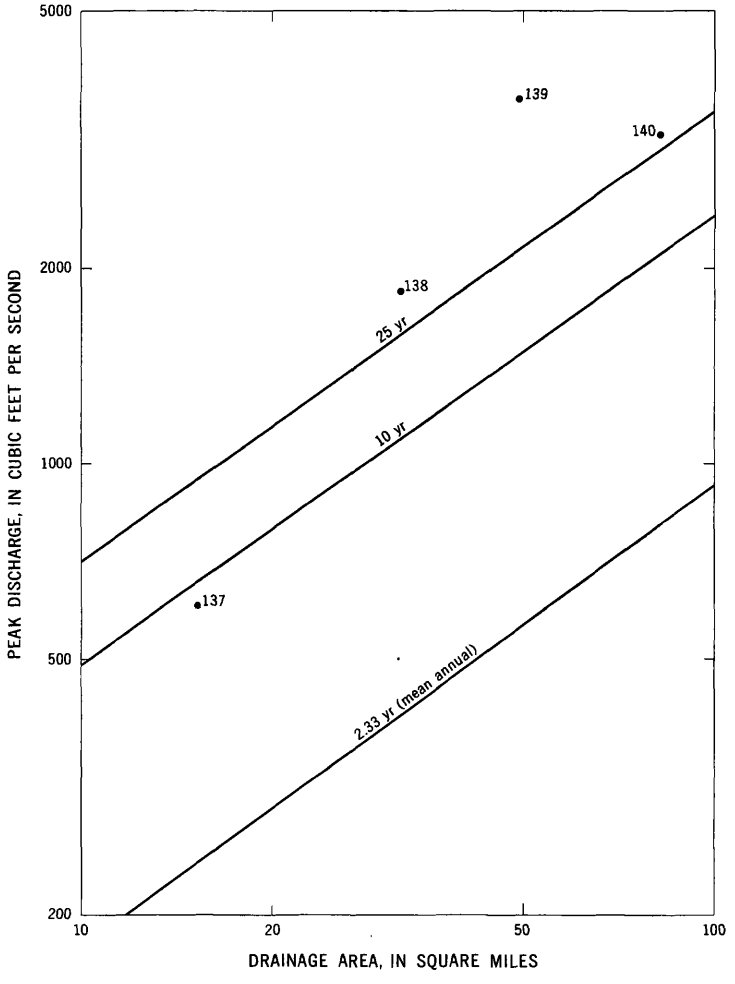

FIGURE 38.—Relation of peak discharge to size of drainage basin, in Little Blue River basin, Nebraska. Numbers conform to those in table 6.

The discharge measurements, at known stages, are used to compute a stage-discharge relation from which discharge may be calculated for any given stage.

The stage-discharge relation at most gaging stations during the snowmelt floods of March–April 1960 was defined by current-meter measurements. Where a short extension of the relation was required above the highest current-meter measurement, the extension was made by logarithmic plotting, from velocity-area studies, or by use of other measurable hydraulic factors. The high-water part of the stage-discharge relation at 26 gaging stations was defined by indirect measurements made prior to 1960. Indirect measurements were required at only 10 gaging stations to determine the peak discharge in 1960. Some of these stations were inaccessible during the flood, and some peaks occurred while current-meter measurements were being made at other gaging stations. The indirect methods used consisted of computation of flow over roadways or through contracted openings, the slope-area method, or a combination of methods.

EXPLANATION OF DATA

The "Station data" of this report contains hydrologic information collected by the Geological Survey during the flood. Records of stage and discharge are presented for 102 streamflow stations and 50 crest-stage stations. Records of elevation and contents are given for three reservoirs in and along the fringe of the flood area. Information, more detailed than that in the regular annual reports of the Geological Survey, is presented here for hydraulic and hydrologic studies.

The data collected at crest-stage stations are those pertinent to the determination of peak stages and discharges only. These stations are generally maintained on water courses of fairly small drainage areas, where it is usually not feasible to operate regular stream-gaging stations in the numbers desired. Crest-stage stations are equipped with a device that records only the peak stages occurring between inspections. If the date of the peak stage is not certain, it may usually be determined by comparison with nearby continuous-record stations, from weather records, or by local inquiry. Discharge measurements are made by current meter at low stages, but indirect measurements are generally required to obtain peak discharges.

The stations are numbered consecutively in downstream order, and these numbers identify the locations on plate 1. The permanent station number corresponds to the number in the annual reports. Stations with permanent numbers less than 5,000 are published in water-supply papers for part 6A, Missouri River basin above Sioux City, Iowa, stations with numbers greater than 5,900 are published in papers for part 6B, Missouri River basin below Sioux City, Iowa. These publications contain data for many stations near the flood area that are not included in this report.

The data for gaging stations on the pages following table 6 consist of a station description, a tabulation of daily mean discharges for two months (March and April 1960), and a list of stages and discharges at indicated times during the rise to and recession from the flood peak. Only the station description is presented for crest-stage stations.

The station description gives information concerning the location, datum, type of gage, and drainage area. It also gives the method used to determine the stage during the flood period, the definition of the stage-discharge relation, and conditions that might have affected that relation. The maximum stage and discharge at each station are given for March–April 1960, for the indicated period of discharge record, and for known floods antedating the period of record. Remarks on regulation and diversions and other pertinent information are included where applicable.

Tables of daily mean discharges are presented for the flood period, March–April 1960. The 2-month period was chosen to show sufficient data on the antecedent streamflow, the rise resulting from the snowmelt runoff, and the recession after the flood. The tables show the monthly mean discharges and the monthly volumes of runoff in acre-feet. For stations at reservoirs, the tables show elevation (in feet), contents (in acre-feet) at an indicated time each day, and a summary of change in contents during each month.

Tables of stages and discharges at indicated times are presented generally for gaging stations from the end of the ice period until the recession reached the point where daily mean discharges sufficiently defined the hydrograph. Local standard time is used throughout.

SUMMARY OF FLOOD STAGES AND DISCHARGES

Maximum stages and discharges at stream-gaging stations and crest-stage stations on streams in the report area are summarized in table 6. The numbers in the first column correspond to those on plate 1; the sites at which flood data are tabulated may thus be located.

The first column under "Maximum floods" shows the period of known floods before March 1960. This period is often longer than the period of continuous records of discharge. More than one period of known floods are shown for some stations. A period is shown if it can be associated with a maximum stage even though the discharge at that stage may not be known; a second period is then given for which both the maximum stage and discharge are known.

The second column under "Maximum floods" shows the year in which the maximum stage or discharge occurred.

The third column under "Maximum floods" gives the date of the maximum stage or discharge during the flood of March–April 1960.

The last column contains figures of mixed designations. If the recurrence interval, in years, is 25 years or less, this figure is listed and footnoted as the recurrence interval; otherwise the figure is the ratio of the peak discharge in 1960 to the discharge of the 25-year flood.

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U.S. Weather Bureau, 1959, 1960, Climatological data [by States]: October–December 1959, January–April 1960, Washington.

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Table 6.--Summary of flood stages and discharges

No.	Permanent station number	Stream and place of determination	Drainage area (sq mi)	Maximum previously known				Maximum March-April 1960			
				Period	Year	Gage height (feet)	Discharge (cfs)	Date	Gage height (feet)	Discharge	
										Cfs	Ratio to 25-year flood
		Medicine Creek basin									
1	6-4423.5	North Fork Medicine Creek near Vivian, S. Dak.....	45.9	1956-60	1957	3.83	195	Apr. 3	7.05	1,080	-
2	4423.8	Medicine Creek tributary near Vivian, S. Dak.....	.30	1956-60	1959	8.03	214	Apr. 3	5.78	106	-
3	4424	Medicine Creek tributary No. 2 near Vivian, S. Dak.	8.62	1956-60	1957	4.58	340	Mar. 26	4.80	475	-
4	4425	Medicine Creek at Kennebec, S. Dak.....	465	1952-60	1952	17.0	(a)	Mar. 28	16.71	8,970	b17
					1955	13.54	1,840				
		White River basin									
5	4491	South Fork White River near Vetal, S. Dak.....	c590	-	-	-	-	Mar. 24	7.12	1,120	b9
6	4492.5	Spring Creek near St. Francis, S. Dak.....	c57	-	-	-	-	Apr. 5	6.80	51	-
7	4495	South Fork White River near Rosebud, S. Dak.....	c1,020	1943-60	1944	13.92	4,470	Mar. 21	d10.27	2,370	1.1
8	4497	South Fork White River tributary near Mission, S. Dak.	2.62	1956-60	1957	5.79	66	Mar. 21	7.95	170	-
9	4497.5	Horsehead Creek tributary near Mission, S. Dak....	6.05	1956-60	1957	5.26	(a)	Mar. 21	4.10	26	-
10	4498	South Fork White River tributary near White River, S. Dak.	9.50	1956-60	1956	4.78	(a)	Mar. 21	3.70	(a)	-
11	4505	South Fork White River below White River, S. Dak..	c1,570	1949-60	1952	d10.90	5,850	Mar. 21	d8.86	-	-
								Mar. 22	-	6,050	b3
12	4520	White River near Oacoma, S. Dak.....	10,200	1928-60	1950	de17.6	-	Mar. 21	d17.07	-	-
					1952	-	51,900	Mar. 27	-	23,400	b12
		Missouri River main stem									
13	4525	Fort Randall Reservoir at Pickstown, S. Dak.....	263,500	1952-60	1959	1,359.3	f4,607	Apr.14,15	-	f5,034	-
								Apr. 20	1,364.06	-	-
14	4530	Missouri River below Fort Randall Dam, S. Dak.....	263,500	1881-1960	1881	21.5	(a)				
				1947-60	1952	20.82	447,000	Apr. 28	-	g16,600	-
		Ponca Creek basin									
15	4535	Ponca Creek at Anoka, Nebr.....	410	1949-60	1950	15.0	6,770	Mar. 27	16.86	9,810	1.1
16	4536	Ponca Creek at Verdel, Nebr.....	820	1957-60	1958	7.10	1,800	Mar. 27	15.10	15,700	1.1
		Niobrara River basin									
17	4645	Keya Paha River at Wewela, S. Dak.....	1,070	1937-40, 1947-60	1950	d13.5	-	Mar. 24	10.56	4,210	1.7
					1952	-	5,430				
18	4649	Keya Paha River near Naper, Nebr.....	1,630	1957-60	1958	-	2,150	Mar. 23	d13.34	-	-
					1959	d7.30	-	Mar. 27	-	6,890	b10
19	4650	Niobrara River near Spencer, Nebr.....	10,400	1913-14, 1927-36, 1940-60	1955	e12.16	27,400	Mar. 27	8.6	23,400	b4
20	4655	Niobrara River near Verdel, Nebr.....	10,900	1938-40, 1958-60	1938	-	10,000	Mar. 27	10.10	h39,000	-
					1959	d6.69	-				
		Bazile Creek basin									
21	4665	Bazile Creek near Niobrara, Nebr.....	440	1951-60	1957	19.96	68,600	Apr. 1	12.80	7,810	b2

		Missouri River main stem									
22	4670	Lewis and Clark Lake near Yankton, S. Dak.	279,500	1955-60	1958	1,208.7	f499.4	Apr. 1	1,210.72	f565.4	-
23	4675	Missouri River at Yankton, S. Dak.	279,500	1881-1960	1881	d30.5	(a)	Mar. 29	3.59	134,700	-
					1952	15.5	480,000				
		James River basin									
24	4760	James River at Huron, S. Dak.	16,800	1881-1960	1881	19.8	(a)	Apr. 6	15.42	6,050	b20
				1928-32, 1943-60	1952	15.23	5,580				
25	4765	Sand Creek near Alpena, S. Dak.	240	1950-60	1950	d14.1	-	Mar. 28	13.35	2,240	1.7
					1952	-	1,130				
26	4770	James River near Forestburg, S. Dak.	18,600	1920	1920	18	(a)	Apr. 2	16.27	10,900	1.4
				1922	1922	18	(a)				
				1950-60	1952	15.46	6,290				
27	4775	Firesteel Creek near Mount Vernon, S. Dak.	540	1955-60	1957	6.60	539	Mar. 28	15.13	5,780	3.0
28	4782.5	North Branch Dry Creek tributary near Parkston, S. Dak..	3.19	1956-60	1958	4.47	27	Mar. 27	6.52	(a)	-
29	4782.6	North Branch Dry Creek near Parkston, S. Dak.	37.0	1956-60	1958	4.50	146	Mar. 27	8.55	1,470	-
30	4782.8	South Branch Dry Creek near Parkston, S. Dak.	17.1	1956-60	1959	4.36	104	Mar. 27	7.37	920	-
31	4783	Dry Creek near Parkston, S. Dak.	76.8	1956-60	1958	5.62	234	Mar. 27	12.70	4,210	-
32	4785	James River near Scotland, S. Dak.	21,550	1928-60	1942	-	10,800	Apr. 6	18.66	13,900	1.4
					1952	16.23	-				
		Vermillion River basin									
33	4788	Saddlerock Creek near Canton, S. Dak.	14.8	1956-60	1957	5.38	77	Apr. 1	7.83	710	-
34	4788.2	Saddlerock Creek tributary near Beresford, S. Dak.	2.32	1956-60	1957	4.17	23	Apr. 12	5.93	72	-
35	4788.4	Saddlerock Creek near Beresford, S. Dak.	26.3	1956-60	1957	4.91	140	Apr. 1	-	1,100	-
36	4790	Vermillion River near Wakonda, S. Dak.	1,680	1945-60	1947	16.63	-	Apr. 1	16.94	7,300	b16
					1954	-	3,790				
		Big Sioux River basin									
37	4800	Big Sioux River near Brookings, S. Dak.	c4,420	1953-60	1957	11.67	5,320	Mar. 30	12.28	9,620	b19
38	4810	Big Sioux River near Dell Rapids, S. Dak.	c5,060	1948-60	1957	14.93	15,500	Mar. 31	d14.83	-	-
								Apr. 1	-	11,900	b17
39	4815	Skunk Creek near Sioux Falls, S. Dak.	520	1948-60	1957	17.78	29,400	Mar. 30	13.64	8,200	1.9
40	4820	Big Sioux River at Sioux Falls, S. Dak.	c5,750	1943-60	1957	j16.01	j16,100	Mar. 30	j15.56	j14,300	b18
41	4821	Big Sioux River near Brandon, S. Dak.	c5,810	-	-	-	-	Apr. 1	18.61	14,400	b18
42	4828.7	Little Beaver Creek tributary near Canton, S. Dak.	.22	1956-60	1959	3.78	(a)	Apr. 1	2.49	20	-
43	4832.7	Rock River at Rock Rapids, Iowa.	788	-	-	-	-	Mar. 30	8.86	15,500	2.0
44	4834.1	Otter Creek north of Sibley, Iowa.	11.9	1952-60	1953	8.06	982	Mar. 30	6.60	229	-
45	4834.2	Schutte Creek near Sibley, Iowa.	1.43	1952-60	1953	5.15	503	Mar. 30	4.17	100	-
46	4834.3	Otter Creek at Sibley, Iowa.	29.9	1952-60	1953	9.82	5,400	Mar. 30	7.74	554	-
47	4834.4	Dawson Creek near Sibley, Iowa.	4.35	1952-60	1953	6.21	4,290	Mar. 30	5.27	440	-
48	4834.5	Wagner Creek near Ashton, Iowa.	7.09	1952-60	1953	5.37	2,840	Mar. 30	4.53	475	-
49	4834.6	Otter Creek near Ashton, Iowa.	88.0	1952-60	1953	12.16	17,400	Mar. 30	9.37	1,300	-
50	4835	Rock River near Rock Valley, Iowa.	1,600	1897	1897	17.0	(a)	Mar. 31	15.38	16,700	1.5
				1948-60	1953	15.99	-				
					1954	-	19,200				
51	4840	Dry Creek at Hawarden, Iowa.	48.4	1926	1926	18.0	(a)	Apr. 2	15.36	3,000	-
				1948-60	1953	17.57	10,900				
52	4855	Big Sioux River at Akron, Iowa.	c9,030	1928-60	1952	-	33,000	Apr. 1	21.56	49,500	1.3
					1954	19.95	-				

See footnotes at end of table.

Table 6.--Summary of flood stages and discharges--Continued

No.	Permanent station number	Stream and place of determination	Drainage area (sq mi)	Maximum previously known				Maximum March-April 1960			
				Period	Year	Gage height (feet)	Discharge (cfs)	Date	Gage height (feet)	Discharge	
										Cfs	Ratio to 25-year flood
		Missouri River main stem									
53	6-4860	Missouri River at Sioux City, Iowa	314,600	1928-31, 1938-60	1952	24.28	441,000	Apr. 3	10.52	1101,000	-
		Perry Creek basin									
54	5999.5	Perry Creek near Hinton, Iowa	30.7	1953-60	1953	17.93	4,980	-	(k)	(a)	-
55	6000	Perry Creek at 38th Street, Sioux City, Iowa	65.1	1944, 1946-60	1944	25.5	9,600	Apr. 1	13.05	3,020	-
		Floyd River basin									
56	6001	Floyd River at Alton, Iowa	265	1956-60	1959	12.77	1,130	Mar. 28	17.27	4,150	b14
57	6003	West Branch Floyd River near Struble, Iowa	181	1956-60	1957	11.32	840	Mar. 29	14.72	3,880	b20
58	6005	Floyd River at James, Iowa	882	1935-60	1953	25.3	71,500	Mar. 29	21.93	15,100	1.8
		Omaha Creek basin									
59	6006	South Omaha Creek tributary near Walthill, Nebr.	2.64	1950-60	1957	14.57	1,410	(a)	13.23	340	b2
60	6010	Omaha Creek at Homer, Nebr	170	1940	1940	m32.5	(a)	Apr. 2	6.45	1,460	b1
				1945-60	1958	23.62	14,400				
		Monona-Harrison ditch basin									
61	6020	West Fork ditch at Holly Springs, Iowa	399	1939-60	1954	n22.91	7,860	Mar. 30	22.43	10,000	1.7
62	6024	Monona-Harrison ditch near Turin, Iowa	900	1958-60	1959	14.72	9,120	Mar. 30	16.32	10,400	1.2
		Little Sioux River basin									
63	6056	Little Sioux River at Gillett Grove, Iowa	1,334	1953, 1958-60	1953	17.87	15,000	Mar. 30	13.78	5,140	b3
64	6066	Little Sioux River at Correctionville, Iowa	2,500	1891	1891	29.34	(a)	Mar. 29	22.57	16,000	1.2
				1918-25, 1928-32, 1936-60	1954	23.36	20,900				
65	6067	Little Sioux River near Kennebec, Iowa	2,738	1939-60	1954	26.63	13,500	Mar. 30	23.26	16,400	1.2
66	6070	Odebolt Creek near Arthur, Iowa	39.3	1957-60	1959	12.18	5,160	Mar. 29	d13.00	700	-
67	6072	Maple River at Mapleton, Iowa	669	1941-60	1950	22.1	-	Mar. 30	17.90	11,400	1.6
					1954	-	15,600				
68	6075	Little Sioux River near Turin, Iowa	3,526	1958-60	1959	21.80	14,000	Mar. 30	25.08	23,900	1.6
		Tekamah Creek basin									
69	6080	Tekamah Creek at Tekamah, Nebr	23.0	1949-60	1950	-	4,400	Apr. 2	7.39	650	b1
					1959	15.10	-				
		Soldier River basin									
70	6085	Soldier River at Pisgah, Iowa	407	1940-60	1950	28.17	22,500	Mar. 28	d12.46	-	-
								Mar. 29	-	4,310	b1
		New York Creek basin									
71	6088	New York Creek north of Spiker, Nebr	6.50	1951-60	1957	23.40	3,160	(a)	10.34	280	b1
72	6090	New York Creek at Herman, Nebr	25.4	1944, 1946-60	1944	20.8	-	Apr. 1	8.20	252	b1
					1950	-	5,500				

		Boyer River basin									
73	6095	Boyer River at Logan, Iowa	871	1918-25, 1937-60	1957	21.5	23,600	Mar. 29	14.62	10,200	b2
		Missouri River main stem									
74	6100	Missouri River at Omaha, Nebr	322,800	1928-60	1952	30.20	396,000	Apr. 1 Apr. 4	- 16.96	1120,000 -	- -
		Indian Creek basin									
75	6105	Indian Creek at Council Bluffs, Iowa	7.99	1954-60	1958	14.16	2,200	Mar. 27 Mar. 29	d4.24 -	- p15	- -
		Platte River basin									
76	7740	Platte River near Duncan, Nebr	61,600	1895-1909, 1912-15, 1928-60	1905	e6.50	44,100	Mar. 28	6.36	25,400	1.1
77	7918	Cedar River at Belgrade, Nebr	c1,060	-	-	-	-	Mar. 28	d8.64	2,600	b3
78	7920	Cedar River near Fullerton, Nebr	c1,220	1931-32, 1940-60	1950	9.64	10,100	Mar. 28	d11.75	4,300	b4
79	7930	Loup River near Genoa, Nebr	c14,400	1928-32, 1943-60	1947	10.12	90,000	Mar. 28	d11.7	45,000	b9
80	7940	Beaver Creek at Genoa, Nebr	c627	1940-60	1950	d18.70	21,200	Mar. 30	12.02	3,340	b4
81	7945	Loup River at Columbus, Nebr	c15,200	1894-1915, 1931, 1933-60	1947	12.0	85,000	Mar. 28	10.50	52,000	b7
82	7955	Shell Creek near Columbus, Nebr	270	1947-60	1947	21.7	-	Mar. 30	d19.7	-	-
					1950	-	5,970	Apr. 2	-	1,640	b2
83	7960	Platte River at North Bend, Nebr	77,800	1949-60	1952	d8.17	-	Mar. 29	d8.04	112,000	1.7
					1957	-	44,200				
84	7975	Elkhorn River at Ewing, Nebr	c1,400	1947-60	1947	11.32	-	Mar. 28	d10.97	-	-
					1949	-	7,280	Mar. 29	-	6,440	b20
85	7990	Elkhorn River near Norfolk, Nebr	c2,790	1945-60	1947	-	12,600	Mar. 30	8.60	13,500	b7
					1949	d e13.63	-				
86	7995	Logan Creek near Uehling, Nebr	1,030	1940-60	1940	18.6	20,000	Apr. 2	15.20	9,400	b8
87	8000	Maple Creek near Nickerson, Nebr	450	1944, 1951-60	1944	16.28	m35,000	Mar. 31	13.40	6,260	b11
88	8005	Elkhorn River at Waterloo, Nebr	c6,900	1880-1960	1944	e16.6	100,000	Apr. 2	14.11	46,900	b13
89	8012	Olive Branch above Sprague, Nebr	43	1956-60	1956	17.46	1,670	Mar. 27	18.28	1,950	b2
90	8013.2	Olive Branch below Sprague, Nebr	81	1956-60	1958	16.02	4,380	Mar. 27	17.12	5,700	b3
91	8013.4	Hickman Branch above Hickman, Nebr	18	1956-60	1958	13.94	(a)	Mar. 27	11.43	2,500	b3
92	8013.6	Hickman Branch at Hickman, Nebr	32	1956-60	1958	19.31	(a)	Mar. 27	14.75	3,600	b3
93	8014	Salt Creek subwatershed No. 1 near Roca, Nebr	1.46	1954-60	1956	3.12	610	Mar. 27	1.95	46	b1
94	8015	Salt Creek subwatershed No. 12 at Roca, Nebr	1.12	1954-60	1958	7.95	528	Mar. 27	2.99	245	b2
95	8025	Salt Creek subwatershed No. 34 near Roca, Nebr	5.72	1954-60	1956	9.89	2,600	Mar. 27	9.71	1,800	b4
96	8030	Salt Creek at Roca, Nebr	174	1950-60	1950	26.0	67,000	Mar. 27	20.85	5,900	b2
97	8034	Antelope Creek at Lincoln, Nebr	12.5	1958-60	1958	q11.99	2,800	Mar. 27	5.29	691	b1
98	8035	Salt Creek at Lincoln, Nebr	710	1949-60	1951	26.15	28,200	Mar. 27	18.75	17,200	b12
99	8035.5	Dee Creek at Greenwood, Nebr	14.3	-	-	-	-	Mar. 28	4.84	558	b1
100	8040	Wahoo Creek at Ithaca, Nebr	270	1949-60	1959	e r23.22	45,300	Mar. 29	21.68	5,080	b2
101	8043	Silver Creek tributary near Colon, Nebr	c14.3	1951-60	1959	s17.32	5,000	Mar. 29	13.30	340	b1
102	8044	Silver Creek tributary at Colon, Nebr	c22.4	1951-60	1959	s19.29	4,640	Mar. 29	14.00	710	b1
103	8050	Salt Creek near Ashland, Nebr	1,640	1947-60	1947	15.13	-	Mar. 29	-	23,100	b6
					1951	-	46,200	Mar. 30	t13.85	-	-

See footnotes at end of table.

Table 6.--Summary of flood stages and discharges--Continued

No.	Permanent station number	Stream and place of determination	Drainage area (sq mi)	Maximum previously known				Maximum March-April 1960			
				Period	Year	Gage height (feet)	Discharge (cfs)	Date	Gage height (feet)	Discharge	
										Cfs	Ratio to 25-year flood
		Platte River basin--Continued									
104	6-8055	Platte River at Louisville, Nebr.	85,500	1953-60	1957	10.35	71,000	Mar. 30	12.45	u124,000	1.4
		Waubonsie Creek basin									
105	8060	Waubonsie Creek near Bartlett, Iowa.	30.4	1946-60	1950	37.8	14,500	Mar. 28 Mar. 29	d16.65 -	- p150	- -
		Weeping Water Creek basin									
106	8065	Weeping Water Creek at Union, Nebr.	238	1950-60	1950	26.80	60,300	Mar. 29	21.40	4,200	b2
		Missouri River main stem									
107	8070	Missouri River at Nebraska City, Nebr.	414,400	1929-60	1952	27.66	414,000	Apr. 5	21.43	178,000	-
		Nishnabotna River basin									
108	8100	Nishnabotna River above Hamburg, Iowa.	2,806	1922-23, 1928-60	1947	26.03	55,500	Mar. 31	24.56	23,900	b9
		Little Nemaha River basin									
109	8101	Hooper Creek tributary near Palmyra, Nebr.	7.81	1950-60	1951	16.55	3,090	Mar. 27	14.81	530	b1
110	8102	Hooper Creek near Palmyra, Nebr.	57.5	1950-60	1950	23.0	47,600	Mar. 27	18.42	2,340	b2
111	8103	Owl Creek near Syracuse, Nebr.	25.4	1950-60	1950	30.6	16,000	Mar. 27	11.94	1,100	b2
112	8104	Little Nemaha River tributary near Syracuse, Nebr.	.76	1950-60	1950	16.6	1,280	Mar. 27	10.28	140	b1
113	8105	Little Nemaha River near Syracuse, Nebr.	218	1950-60	1950	36.7	225,000	Mar. 28	14.77	8,270	b3
114	8115	Little Nemaha River at Auburn, Nebr.	801	1949-60	1950	27.65	164,000	Mar. 27	24.2	48,000	1.4
		Tarkio River basin									
115	8130	Tarkio River at Fairfax, Mo.	508	1922-60	1929 1942	22.33 -	- 16,300	Mar. 29	19.8	11,900	b5
		Missouri River main stem									
116	8135	Missouri River at Rulo, Nebr.	418,905	1949-60	1952	25.60	358,000	Apr. 6	22.36	181,000	-
		Nemaha River basin									
117	8137	Tennessee Creek tributary near Seneca, Kans.	c0.90	1957-60	1959	18.64	1,220	Mar. 27	13.84	165	-
118	8140	Turkey Creek near Seneca, Kans.	276	1949-60	1958	24.20	18,000	Mar. 28	22.73	11,700	b7
119	8145	North Fork Nemaha River at Humboldt, Nebr.	531	1952-60	1958	31.70	51,000	Mar. 27	24.20	36,200	1.6
120	8150	Nemaha River at Falls City, Nebr.	1,340	1944-60	1949 1954	28.8 -	- 51,400	Mar. 28	27.75	46,900	b15
121	8155	Muddy Creek at Verdon, Nebr.	188	1952-60	1958	31.50	31,900	Mar. 27	23.90	20,000	b12
		Kansas River basin									
122	8568	Moll Creek near Green, Kans.	4.0	1957-60	1958	15.53	700	Mar. 27	15.45	650	-
123	8797	Wild Cat Creek at Riley, Kans.	13	1957-60	1958	18.00	1,400	Mar. 27	19.85	2,050	-
124	8800	Lincoln Creek near Seward, Nebr.	420	1953-60	1957	20.53	10,100	Mar. 29	18.59	3,300	b3
125	8805	Big Blue River at Seward, Nebr.	1,070	1954-60	1957	22.34	15,300	Mar. 30	19.70	8,200	b5
126	8807.1	School Creek tributary near Harvard, Nebr.	13.1	1953-60	1958	12.85	164	Mar. 27	d13.64	190	b2
127	8807.2	School Creek near Harvard, Nebr.	55.1	1953-60	1958	16.74	960	Mar. 27	17.11	1,240	b7

128	8807.3	School Creek tributary No. 2 near Harvard, Nebr...	14.0	1953-60	1958	16.17	510	Mar. 27	16.83	584	b9
129	8807.4	School Creek near Saronville, Nebr.....	89.4	1952-60	1952	17.6	1,280	Mar. 27	19.29	3,720	1.2
130	8808	West Fork Big Blue River near Dorchester, Nebr....	1,210	1950, 1958-60	1950	24.8	49,400	Mar. 30	20.28	11,200	b8
131	8810	Big Blue River near Crete, Nebr.....	2,680	1945-60	1950	28.74	27,600	Mar.30-31	28.00	23,000	b8
132	8812	Turkey Creek near Wilber, Nebr.....	490	-	-	-	-	Mar. 28	14.92	7,300	b9
133	8814.5	Indian Creek at Beatrice, Nebr.....	74	-	-	-	-	Mar. 28	16.7	(a)	-
134	8820	Big Blue River at Barneston, Nebr.....	4,420	1932-60	1941	34.3	57,700	Mar. 28	27.60	29,400	b8
135	8830	Little Blue River near Deweese, Nebr.....	1,140	1951, 1953-60	1951	e14.9	16,000	Mar. 27	14.45	11,800	b11
136	8835.7	Little Blue River near Gilead, Nebr.....	1,400	1959-60	1959	-	8,000	Mar. 28	17.30	25,600	1.5
137	8836	South Fork Big Sandy Creek near Edgar, Nebr.....	15.2	1953-60	1957	13.56	595	Mar. 27	13.57	600	b8
138	8837	South Fork Big Sandy Creek near Davenport, Nebr...	32.0	1950, 1952-60	1950	17.3	1,400	Mar. 27	17.78	1,870	1.2
139	8838	South Fork Big Sandy Creek near Carleton, Nebr....	49.4	1952-60	1952	16.4	1,740	Mar. 27	17.02	3,690	1.8
140	8839	South Fork Big Sandy Creek near Hebron, Nebr.....	81.9	1952-60	1952	21.8	3,160	Mar. 27	21.90	3,220	1.1
141	8840	Little Blue River near Fairbury, Nebr.....	2,320	1908-15, 1928-60	1951	e16.82	36,800	Mar. 28	15.80	31,700	1.0
142	8841	Mill Creek tributary near Haddam, Kans.....	1.5	1957-60	1958	15.30	584	Mar. 27	12.73	(a)	-
143	8842	Mill Creek at Washington, Kans.....	344	1903-60	1941	36	(a)	Mar. 28	25.58	9,690	b8
144	8843	Mill Creek tributary near Washington, Kans.....	3	1957-60	1959	16.88	1,070	Mar. 27	12.37	(a)	-
145	8845	Little Blue River at Waterville, Kans.....	3,330	1903	1903	e28	(a)	Mar. 29	23.90	38,800	b11
				1922-25, 1928-60	1941	e26.20	50,400				
146	8849	Robidoux Creek at Beattie, Kans.....	40	1957-60	1958	20.23	3,600	Mar. 27	22.46	6,200	-
147	8855	Black Vermillion River near Frankfort, Kans.....	412	1948	1948	30.2	(a)	Mar. 28	28.52	25,100	b23
				1953-60	1959	29.40	38,300				
148	8860	Big Blue River at Randolph, Kans.....	9,100	1918-60	1941	30.81	v98,000	Mar. 30	-	74,000	b14
								Apr. 2	w36.48	-	-
149	8865	Fancy Creek at Winkler, Kana.....	176	1915-60	1944	22.3	-	Mar. 27	17.10	8,720	b10
				1953-60	1958	21.80	19,600				
150	8869	Tuttle Creek Reservoir near Randolph, Kans.....	9,550	1960	-	-	-	Apr. 4	1,071.1	f358.1	-
151	8870	Big Blue River near Manhattan, Kans.....	9,560	1903	1903	35.85	(a)	Apr. 5	23.05	131,400	-
				1951, 1954-60	1951	33.04	93,400				
152	8872	Cedar Creek near Manhattan, Kans.....	14	1957-60	1958	18.97	3,000	Mar. 27	11.63	460	-
153	8876	Kansas River tributary near Wamego, Kans.....	2.3	1951, 1957-60	1951	16.9	563	Mar. 27	9.10	23	-
154	8880	Vermillion Creek near Wamego, Kans.....	243	1873-1960	1915	30.9	x38,500	Mar. 28	26.80	8,800	b6
155	8883	Rock Creek near Louisville, Kans.....	128	1958-60	1959	27.8	6,040	Mar. 27	27.70	5,960	b6

a Unknown.
b Recurrence interval, in years.
c Part of drainage area noncontributing; see station description.
d Affected by backwater from ice.
e At site and datum then in use; see station description.
f Contents, in thousands of acre-feet.
g Daily discharge; flow completely regulated.
h From release of stored water from ice jam upstream.
i Flow regulated or partly regulated.
j In main channel only; part of flow bypasses gage at high stages.
k Peak stage did not reach bottom of gage.
m Greatest flood known.
n At site then in use; see station description.
p Daily discharge.
q Affected by backwater from Salt Creek.
r Maximum stage known since about 1910.
s Maximum stage known since about 1895.
t Affected by backwater from Platte River.
u Maximum discharge known since at least 1881.
v Maximum discharge known since at least 1897.
w Affected by backwater from Tuttle Creek Dam.
x Not necessarily maximum discharge for the period.

STATION DATA

MEDICINE CREEK BASIN

1. (4423.5) North Fork Medicine Creek near Vivian, S. Dak.

(Crest-stage station)

Location.--Lat 43°57', long 100°20', in SE¼sec. 29, T. 106N., R. 79W., at bridge on U.S. Highway 83, 2¾ miles northwest of Vivian.

Drainage area.--45.9 sq mi.

Gage-height record.--Crest stages only.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 480 cfs.

Maxima.--March-April 1960: Discharge, 1,080 cfs Apr. 3 (gage height, 7.05 ft).
1956 to February 1960: Discharge, 195 cfs Apr. 18, 1957 (gage height, 3.83 ft).

2. (4425.8) Medicine Creek tributary near Vivian, S. Dak.

(Crest-stage station)

Location.--Lat 44°06', long 100°20', in SE¼sec. 5, T. 107N., R. 79W., at culvert on U.S. Highway 83, 12¼ miles northwest of Vivian.

Drainage area.--0.30 sq mi.

Gage-height record.--Crest stages only.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 13 cfs and by indirect measurement at 202 cfs.

Maxima.--March-April 1960: Discharge, 106 cfs Apr. 3 (gage height, 5.78 ft).
1956 to February 1960: Discharge, 214 cfs Sept. 1, 1959 (gage height, 8.03 ft).

3. (4424) Medicine Creek tributary No. 2 near Vivian, S. Dak.

(Crest-stage station)

Location.--Lat 44°02', long 100°19', in NW¼sec. 35, T. 107N., R. 79W., at bridge on U.S. Highway 83, 8 miles northwest of Vivian.

Drainage area.--8.62 sq mi.

Gage-height record.--Crest stages only.

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

Maxima.--March-April 1960: Discharge, 475 cfs Mar. 28 (gage height, 4.80 ft).
1956 to February 1960: Discharge, 340 cfs Apr. 18, 1957 (gage height, 4.58 ft).

4. (4425) Medicine Creek at Kennebec, S. Dak.

Location.--Lat 43°54', long 99°52', in NW¼NE¼sec. 18, T. 105N., R. 75W., on right bank 4 ft downstream from highway bridge, half a mile west of Kennebec, and half a mile downstream from nearest tributary.

Drainage area.--465 sq mi, approximately.

Gage-height record.--Water-stage recorder graph except Mar. 20-23, Apr. 6-14, for which graph was drawn on basis of once-daily wire-weight gage readings.

Discharge record.--Stage discharge relation defined by current-meter measurements. Backwater from ice Mar. 20-25.

Maxima.--March-April 1960: Discharge, 8,970 cfs 7:30 a.m. Mar. 28 (gage height, 16.71 ft).
1954 to February 1960: Discharge, 1,840 cfs Mar. 10, 1955 (gage height, 13.54 ft).
Flood of April 1952 reached a stage of 17.0 ft.

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	0	394	9	0	194	17	0	13	25	90	4.8
2	0	158	10	0	110	18	0	9	26	594	4.2
3	0	120	11	0	63	19	0	15	27	3,850	4.5
4	0	542	12	0	40	20	0	11	28	6,130	3.3
5	0	2,400	13	0	36	21	0	10	29	2,430	3.6
6	0	1,430	14	0	28	22	0	6	30	1,800	2.8
7	0	681	15	0	15	23	.8	5	31	885	-
8	0	361	16	0	13	24	50	5			
Monthly mean discharge, in cubic feet per second										511	223
Runoff, in acre-feet										31,400	13,250
Runoff, in inches										-	-

Medicine Creek at Kennebec, S. Dak.

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1960

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Mar. 25			Mar. 30			Apr. 4* Con.		
12 p.m.	4.17	90	8 a.m.	12.71	1,670	2 p.m.	6.07	331
			12 m	12.67	1,650	4	7.70	530
Mar. 26			3 p.m.	12.49	1,790	6	9.45	840
			12	11.45	1,440	8	10.70	1,170
3 a.m.	4.44	114				10	12.16	1,620
6	5.65	215	Mar. 31*			12	13.41	2,100
9	7.01	358						
1 p.m.	8.08	504	9 a.m.	9.60	935	Apr. 5*		
2	8.08	504	3 p.m.	8.48	700			
5	9.33	741	12	7.75	574	4 a.m.	14.21	2,570
9	11.21	1,280				7	14.28	2,620
12	12.39	1,700	Apr. 1			10 a.m.	14.18	2,550
						5 p.m.	13.81	2,320
Mar. 27			12 m	6.34	378	9	13.62	2,220
			6 p.m.	5.60	303	12	13.30	2,050
2 a.m.	12.96	1,900	9	5.46	291			
3	13.26	2,030	12	5.15	263	Apr. 6*		
6	14.52	2,840						
8	14.91	3,310	Apr. 2*			6 a.m.	12.42	1,710
10	15.08	3,560				12 m	11.50	1,410
12 m	15.05	3,520	4 a.m.	4.43	201	6 p.m.	10.72	1,180
3 p.m.	15.46	4,280	11	3.47	127	12	9.95	962
6	15.75	5,010	6 p.m.	3.47	127			
9	15.98	5,730	9	3.59	136	Apr. 7		
12	16.09	6,130	11	4.08	173			
			12	4.05	171	6 a.m.	9.20	790
Mar. 28*						12 m	8.45	650
			Apr. 3			6 p.m.	7.91	562
2 a.m.	16.08	6,100				12	7.40	487
6	16.61	8,460	4 a.m.	3.44	121			
7:30	16.71	8,970	6	3.22	107	Apr. 8		
9	16.65	8,660	7	3.20	105			
2 p.m.	16.09	6,130	9	3.34	114	6 a.m.	6.79	409
12	14.82	3,190	12 m	2.97	90	12 m	6.31	355
			1 p.m.	2.97	90	6 p.m.	5.82	307
Mar. 29*			6	3.54	128	12	5.31	262
			9	3.68	138			
3 a.m.	14.51	2,910	12	3.57	130	Apr. 9		
12 m	13.73	2,320				6 a.m.	4.77	219
6 p.m.	13.39	2,140	Apr. 4*			12 m	4.40	189
12	13.22	2,050				6 p.m.	4.08	163
			4 a.m.	3.52	122	12	3.83	144
			8	3.67	133			
			11	4.40	189			

*Daily means computed from data in addition to figures shown.

WHITE RIVER BASIN

5. (4491) South Fork White River near Vetal, S. Dak.

Location.--Lat 43°06', long 101°14', in NW¼sec. 17, T. 36N., R. 33W., on left bank 120 ft downstream from highway bridge, 10¾ miles southeast of Vetal, and 12½ miles upstream from Spring Creek.

Drainage area.--590 sq mi, approximately, of which about 175 sq mi is probably noncontributing.

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

Discharge record.--Stage-discharge relation defined by current-meter measurements. Backwater from ice Mar. 1-24.

Maxima.--March-April 1960: Discharge, 1,120 cfs 7 p.m. Mar. 24 (gage height, 7.12 ft).

Remarks.--Station established Aug. 1, 1959; no peaks above base of 150 cfs prior to Mar. 24, 1960.

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	60	229	9	60	87	17	70	74	25	978	86
2	60	222	10	65	81	18	75	71	26	725	86
3	55	227	11	65	79	19	85	73	27	532	86
4	55	223	12	65	79	20	100	77	28	370	93
5	55	192	13	65	72	21	140	92	29	268	109
6	60	149	14	65	70	22	130	93	30	231	102
7	60	145	15	70	65	23	180	93	31	225	-
8	60	113	16	70	70	24	660	86			
Monthly mean discharge, in cubic feet per second										186	111
Runoff, in acre-feet										11,460	6,600
Runoff, in inches										-	-

6. (4492.5) Spring Creek near St. Francis, S. Dak.

Location.--Lat 43°04', long 101°02', in NE¼sec. 25, T. 36N., R. 32W., on left bank 20 ft upstream from highway culvert, 3½ miles upstream from mouth, and 8¼ miles southwest of St. Francis.

Drainage area.--57 sq mi, approximately, of which about 10 sq mi contributes directly to surface runoff.

Gage-height record.--Water-stage recorder graph except Mar. 1-24, Apr. 7-30, for which graph was drawn on basis of once-daily staff gage readings.

Discharge record.--Stage-discharge relation defined by current-meter measurements. Backwater from ice Mar. 1-21.

Maxima.--March-April 1960: Discharge, 51 cfs 3 a.m. Apr. 5 (gage height, 6.80 ft).

Remarks.--Station established Aug. 1, 1959; no peaks above base of 25 cfs prior to March 1960.

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	0	28	9	0	18	17	0	17	25	30	17
2	0	25	10	0	18	18	0	17	26	21	14
3	0	37	11	0	15	19	.3	17	27	24	15
4	0	48	12	0	16	20	.4	17	28	38	17
5	0	48	13	0	17	21	.5	17	29	32	26
6	0	36	14	0	17	22	4.7	15	30	33	34
7	0	28	15	0	15	23	1.6	18	31	28	-
8	0	23	16	0	17	24	27	18			
Monthly mean discharge, in cubic feet per second										7.76	22.2
Runoff, in acre-feet										477	1,320
Runoff, in inches										-	-

7. (4495) South Fork White River near Rosebud, S. Dak.

Location.--Lat 43°19'30", long 100°53'05", in NW¼sec. 28, T. 39N., R. 30W., on left bank at downstream side of bridge on U.S. Highway 18, 4½ miles downstream from Rosebud Creek and 6½ miles northwest of Rosebud.

Drainage area.--1,020 sq mi, approximately, of which about 260 sq mi is probably noncontributing.

Gage-height record.--Water-stage recorder graph. Altitude of gage is 2,295 ft (by barometer).

Discharge record.--Stage-discharge relation defined by current-meter measurements. Backwater from ice Mar. 1-23.

Maxima.--March-April 1960: Discharge, 2,370 cfs 11 p.m. Mar. 21 (gage height, 9.52 ft); gage height, 10.27 ft Mar. 21 (backwater from ice).
1943 to February 1960: Discharge, 4,470 cfs May 17, 1944 (gage height, 13.92 ft, from floodmarks), from rating curve extended above 810 cfs by velocity-area studies.

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	70	386	9	80	219	17	100	192	25	1,120	170
2	70	371	10	80	181	18	150	166	26	1,110	159
3	70	383	11	85	173	19	200	155	27	804	181
4	70	382	12	85	166	20	400	159	28	614	181
5	70	367	13	85	163	21	1,400	152	29	481	211
6	75	306	14	90	155	22	1,430	163	30	390	204
7	75	264	15	95	141	23	650	207	31	359	-
8	80	253	16	95	170	24	580	188			
Monthly mean discharge, in cubic feet per second										357	218
Runoff, in acre-feet										21,940	12,990
Runoff, in inches										-	-

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1960

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Mar. 21			Mar. 22 Con.			Mar. 23 Con.		
9 p.m.	8.53	1,950	4 p.m.	6.37	1,120	1 p.m.	5.15	595
11	9.52	2,370	5	6.75	1,150	6	5.11	599
12	9.36	2,300	6	6.13	1,020	8	5.15	614
			9	5.58	815	9	5.10	614
Mar. 22			10	5.73	872	12	5.16	656
			11	5.76	884			
3 a.m.	8.42	1,900	12	5.68	853	Mar. 24		
5	8.22	1,820						
7	7.53	1,560	Mar. 23			1 a.m.	5.22	679
9	7.59	1,580				2	5.26	694
11	8.14	1,640	3 a.m.	5.73	758	7	4.89	553
			8	5.36	618			

South Fork White River near Rosebud, S. Dak.--Continued

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1960

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Mar. 24 Con.			Mar. 26			Mar. 27		
1 p.m.	4.83	530	6 a.m.	6.48	1,160	6 a.m.	5.68	853
6	4.71	485	8	6.55	1,180	12 m	5.52	795
12	5.38	739	9	6.40	1,130	6 p.m.	5.42	755
			12 m	6.34	1,100	12	5.24	686
Mar. 25			1 p.m.	6.37	1,120			
			6	6.24	1,070	Mar. 28		
6 a.m.	6.05	994	11	6.06	998			
12 m	6.63	1,210	12	5.92	945	12 m	5.04	614
2 p.m.	6.76	1,260				12 p.m.	4.85	542
4:30	6.83	1,290						
7	6.75	1,260						
12	6.62	1,210						

8. (4497) South Fork White River tributary near Mission, S. Dak.

(Crest-stage station)

Location.--Lat 43°20', long 100°43', in NW¼sec. 25, T. 39N., R. 29W., at culvert on U.S. Highway 83, 3¾ miles northwest of Mission.

Drainage area.--2.62 sq mi.

Gage-height record.--Crest stages only.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 76 cfs.

Maxima.--March-April 1960: Discharge, 170 cfs Mar. 21 (gage height, 7.95 ft).
1956 to February 1960: Discharge, 66 cfs June 1957 (gage height, 5.79 ft).

9. (4497.5) Horsehead Creek tributary near Mission, S. Dak.

(Crest-stage station)

Location.--Lat 43°24', long 100°43', in SW¼sec. 36, T. 40N., R. 29W., at culvert on U.S. Highway 83, 6¼ miles northwest of Mission.

Drainage area.--6.05 sq mi.

Gage-height record.--Crest stages only. Datum of gage is 2,357.45 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 26 cfs.

Maxima.--March-April 1960: Discharge, 26 cfs Mar. 21 (gage height, 4.10 ft).
1956 to February 1960: Gage height, 5.26 ft June 1957 (discharge not determined).

10. (4498) South Fork White River tributary near White River, S. Dak.

(Crest-stage station)

Location.--Lat 43°30', long 100°44', in NE¼sec. 26, T. 41N., R. 29W., at bridge on U.S. Highway 83, 5 miles south of White River.

Drainage area.--9.50 sq mi.

Gage-height record.--Crest stages only.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 18 cfs.

Maxima.--March-April 1960: Gage height, 3.70 ft Mar. 21 (discharge not determined).
1956 to February 1960: Gage height, 4.78 ft Aug. 7, 1956 (discharge not determined).

11. (4505) South Fork White River below White River, S. Dak.

Location.--Lat 43°36'00", long 100°43'50", in NE¼SE¼sec. 23, T. 42N., R. 29W., on right bank 1 mile upstream from small tributary, 2 miles downstream from Pine Creek, and 2½ miles northeast of town of White River.

Drainage area.--1,570 sq mi, approximately, of which about 260 sq mi is probably noncontributing.

Gage-height record.--Water-stage recorder graph. Gage-height record Mar. 24-27, Apr. 8-13, 17-20 doubtful. Altitude of gage is 1,906 ft (by barometer).

Discharge record.--Stage-discharge relation defined by current-meter measurements. Backwater from ice Mar. 1-23. Discharge for periods of doubtful gage-height record estimated on basis of five discharge measurements, hydrographers' notes, weather records, and records for station near Rosebud.

Maxima.--March-April 1960: Discharge, 6,050 cfs 2 a.m. Mar. 22 (gage height, 6.66 ft); gage height, 8.86 ft Mar. 21 (backwater from ice).
1949 to February 1960: Discharge, 5,850 cfs Mar. 29, 1952 (gage height, 6.15 ft); gage height, 10.90 ft Mar. 28, 1952 (backwater from ice).

South Fork White River below White River, S. Dak.

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	80	352	9	90	250	17	95	190	25	1,200	184
2	75	352	10	90	210	18	100	210	26	1,400	173
3	75	398	11	90	190	19	150	180	27	1,160	174
4	75	459	12	90	180	20	200	159	28	849	190
5	80	409	13	90	170	21	1,000	180	29	585	213
6	80	376	14	95	156	22	4,900	193	30	420	216
7	85	342	15	90	159	23	2,800	216	31	352	-
8	90	300	16	95	171	24	1,800	220			
Monthly mean discharge, in cubic feet per second										583	239
Runoff, in acre-feet										36,460	14,230
Runoff, in inches										-	-

12. (4520) White River near Oacoma, S. Dak.

Location.--Lat 43°44'55", long 99°33'20", in SE¼SW¼sec. 3, T. 103N., R. 73W., near center span at downstream side of bridge on State Highway 47, 8 miles southwest of Oacoma, 8¾ miles downstream from Black Dog Creek, and 16¼ miles upstream from mouth.

Drainage area.--10,200 sq mi, approximately.

Gage-height record.--Water-stage recorder graph except Mar. 1-21 for which graph was drawn on basis of once-daily wire-weight gage readings. Altitude of gage is 1,375 ft (from topographic map).

Discharge record.--Stage-discharge relation defined by current-meter measurements. Backwater from ice Mar. 1-21.

Maxima.--March-April 1960: Discharge, 23,400 cfs 4:30 a.m. Mar. 27 (gage height, 11.43 ft); gage height, 17.07 ft Mar. 21 (backwater from ice).
1928 to February 1960: Discharge, 51,900 cfs Mar. 30, 1952 (gage height, 15.40 ft, at site 1¼ miles downstream at different datum); gage height, 17.6 ft Mar. 31, 1950 (at site 12½ miles downstream at different datum), from floodmark (ice jam).

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	200	2,090	9	100	1,660	17	95	361	25	14,200	552
2	140	1,810	10	100	896	18	100	391	26	15,300	531
3	95	1,700	11	95	837	19	300	397	27	19,000	452
4	85	1,790	12	90	752	20	800	427	28	9,850	373
5	85	2,400	13	90	531	21	3,000	837	29	6,020	391
6	90	4,080	14	90	445	22	13,000	914	30	3,500	439
7	90	3,850	15	95	367	23	20,400	719	31	2,800	-
8	95	2,530	16	95	361	24	20,900	695			
Monthly mean discharge, in cubic feet per second										4,223	1,106
Runoff, in acre-feet										259,600	65,810
Runoff, in inches										-	-

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1960

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Mar. 21			Mar. 25			Mar. 28* Con.		
12 p.m.	9.20	13,700	2 a.m.	10.20	17,700	3 p.m.	7.45	8,690
			6	10.02	17,000	5	7.36	8,470
Mar. 22			12 m	9.17	13,600	7	7.15	7,970
			6:30 p.m.	8.58	11,500	8	7.15	7,970
6 a.m.	8.98	12,900	9	8.70	12,000	12	7.04	7,710
9	8.81	12,300	12	8.74	12,100			
10	8.88	12,600				Mar. 29		
12 m	8.84	12,400	Mar. 26					
2 p.m.	8.95	12,800				6 a.m.	6.65	6,800
4	9.04	13,100	1 a.m.	8.74	12,100	12 m	6.25	5,880
5	8.88	12,600	4	8.77	12,200	6 p.m.	5.98	5,280
6	9.04	13,100	10	9.18	13,600	12	5.69	4,600
8	8.92	12,700	12 m	9.04	13,100			
9	8.95	12,800	3 p.m.	9.32	14,200	Mar. 30*		
11	9.48	14,800	6	10.22	17,800			
12	9.43	14,600	9	11.11	21,800	6 a.m.	5.31	3,800
			11	11.22	22,400	12 m	5.05	3,320
Mar. 23*			12	11.19	22,200	6 p.m.	5.00	3,250
						12	5.01	3,250
2 a.m.	9.83	15,400	Mar. 27*					
6	10.91	20,800				Mar. 31*		
12 m	11.28	22,700	1 a.m.	11.11	21,800			
1 p.m.	11.17	22,200	4:30	11.43	23,400	1 a.m.	5.02	3,270
1:30	11.40	23,300	9	10.70	19,900	7	4.83	2,930
4	11.13	22,000	1 p.m.	9.94	16,700	8	4.83	2,950
8	10.87	20,700	5	10.18	17,600	12 m	4.78	2,870
12	11.15	22,000	6	10.11	17,300	6 p.m.	4.58	2,560
			9	10.10	17,300	12	4.43	2,340
Mar. 24			12	9.63	15,400			
						Apr. 1*		
5 a.m.	11.35	23,000	Mar. 28*					
10	11.03	21,400				12 m	4.27	2,130
6 p.m.	10.73	20,000	4 a.m.	8.53	11,400	12 p.m.	4.02	1,830
12	10.19	17,700	12 m	7.78	9,500			

*Daily means computed from data in addition to figures shown.

MISSOURI RIVER MAIN STEM

13. (4525) Fort Randall Reservoir at Pickstown, S. Dak.

Location.--Lat 43°04', long 98°33', in sec. 8, T. 95N., R. 65W., in tower 6 of outlet works of dam on Missouri River at Pickstown, 1 mile upstream from Randall Creek and at mile 880.C (revised).

Drainage area.--263,500 sq mi, approximately.

Gage-height record.--Water-stage recorder graph. Datum of gage is at mean sea level, datum of 1929.

Maxima.--March-April 1960: Contents, 5,034,000 acre-ft Apr. 14, 15;elevation, 1,364.06 ft (affected by wind) Apr. 20.
1952 to February 1960: Contents, 4,607,000 acre-ft June 8, 1959 (elevation, 1,359.3 ft)

Remarks.--Reservoir is formed by an earth-fill dam, storage began in December 1952. Maximum capacity 6,281,000 acre-ft below elevation 1,375.0 ft (top of spillway gates). Normal maximum, 5,174,000 acre-ft below elevation 1,365.0 ft. Figures given herein represent elevation and total contents at 12 p.m. Contents are corrected for wind effect.

Cooperation.--Records furnished by Corps of Engineers.

Elevation, in feet, and contents, in thousands of acre-feet, 1960

Day	March		April		Day	March		April	
	Elevation (feet)	Contents (acre-feet)	Elevation (feet)	Contents (acre-feet)		Elevation (feet)	Contents (acre-feet)	Elevation (feet)	Contents (acre-feet)
1	1,350.77	3,847	1,360.22	4,684	16	1,350.01	3,784	1,363.90	5,033
2	1,350.69	3,840	1,360.56	4,732	17	1,350.01	3,787	1,363.61	5,032
3	1,350.58	3,835	1,360.96	4,771	18	1,350.11	3,790	1,363.59	5,026
4	1,350.43	3,824	1,361.33	4,809	19	1,350.13	3,794	1,363.74	5,019
5	1,350.36	3,817	1,361.83	4,858	20	1,350.22	3,803	1,363.30	5,010
6	1,350.42	3,822	1,362.49	4,918	21	1,350.42	3,817	1,363.28	4,998
7	1,350.30	3,815	1,363.00	4,969	22	1,350.79	3,850	1,363.24	4,983
8	1,350.29	3,807	1,363.33	5,001	23	1,351.48	3,905	1,363.00	4,965
9	1,350.28	3,806	1,363.48	5,018	24	1,352.19	3,967	1,362.96	4,951
10	1,350.24	3,804	1,363.82	5,029	25	1,352.98	4,034	1,362.51	4,929
11	1,350.19	3,802	1,363.61	5,031	26	1,354.01	4,120	1,362.37	4,906
12	1,350.22	3,800	1,363.66	5,032	27	1,355.37	4,234	1,362.12	4,881
13	1,350.23	3,804	1,663.64	5,033	28	1,356.59	4,361	1,361.99	4,854
14	1,350.13	3,794	1,363.64	5,034	29	1,357.90	4,474	1,361.70	4,833
15	1,350.06	3,788	1,363.67	5,034	30	1,358.70	4,554	1,361.48	4,820
					31	1,359.46	4,626		
Change in contents during month						-	+773	-	+194

14. (4530) Missouri River below Fort Randall Dam, S. Dak.

Location.--Lat 42°58'55", long 98°29'35", in SW¼NE¼sec. 28, T. 35N., R. 10W., sixth principal meridian, on right bank 6 miles downstream from Randall Creek, 7 miles downstream from Fort Randall Dam, 12 miles south of Lake Andes, and at mile 873 (revised).

Drainage area.--263,500 sq mi, approximately.

Gage-height record.--Water-stage recorder graph. Datum of gage is 1,230.00 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation defined by current-meter measurements. Backwater from ice Mar. 1-18.

Maxima.--March-April 1960: Daily discharge, 18,600 cfs Apr. 28; flow completely regulated by Fort Randall Reservoir.
1947 to February 1960: Discharge, 447,000 cfs Apr. 12, 1952; gage height, 20.82 ft Apr. 12, 1952.
Flood in April 1943 reached a stage of about 18.5 ft. Maximum stage known, in April 1881, was about 5 ft higher than that of April 1943.

Remarks.--Flow regulated by Fort Randall Reservoir (see preceding record).

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	9,500	1,530	9	7,000	4,820	17	5,830	3,070	25	3,190	13,000
2	9,000	725	10	6,500	3,660	18	4,380	5,370	26	2,380	14,800
3	9,000	590	11	6,000	4,840	19	3,870	6,200	27	3,030	15,000
4	9,500	1,010	12	6,000	5,410	20	2,480	7,980	28	1,780	16,600
5	9,000	820	13	5,000	4,270	21	3,740	11,100	29	506	14,300
6	5,500	398	14	8,000	3,240	22	3,420	11,800	30	236	9,690
7	7,000	1,010	15	8,500	3,720	23	2,820	12,800	31	484	-
8	9,000	3,550	16	7,500	4,030	24	3,380	11,200			
Monthly mean discharge, in cubic feet per second										5,286	8,544
Runoff, in acre-feet										323,800	389,400
Runoff, in inches										-	-

PONCA CREEK BASIN

15. (4535) Ponca Creek at Anoka, Nebr.

Location.--Lat 42°56'25", long 98°50'30", in NE¼sec. 9, T. 34N., R. 13W., on downstream side of left pier of bridge on U.S. Highway 281, half a mile southwest of Anoka and half a mile upstream from Dry Creek.

Drainage area.--410 sq mi, approximately.

Gage-height record.--Wire-weight gage read twice daily. Water-stage recorder graph for stages above 1.6 ft except Mar. 1-24 and Apr. 2-4, 11-19 for which graph was drawn on basis of wire-weight gage readings and fragmentary recorder record.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 8,100 cfs; affected by ice Mar. 1-26.

Maxima.--March-April 1960: Discharge, 9,810 cfs 9:30 p.m. Mar. 27 (gage height, 16.86 ft). 1949 to February 1960: Discharge, 6,770 cfs Apr. 2, 1950 (gage height, 15.0 ft, from graph based on gage readings).

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	5.8	525	9	3.1	510	17	2.6	232	25	550	57
2	4.9	325	10	3.1	320	18	1.8	195	26	3,000	56
3	5.0	216	11	2.4	283	19	1.7	139	27	7,990	52
4	4.0	483	12	2.2	312	20	2.2	100	28	6,990	92
5	4.0	813	13	2.4	293	21	2.5	89	29	2,390	145
6	4.0	1,230	14	2.2	174	22	50	74	30	1,380	125
7	3.6	1,280	15	2.4	102	23	150	57	31	793	-
8	3.8	900	16	2.5	94	24	250	57			
Monthly mean discharge, in cubic feet per second										762	311
Runoff, in acre-feet										46,840	18,510
Runoff, in inches										-	-

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1960

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Mar. 26			Mar. 27* Con.			Mar. 29*		
3 p.m.	9.40	2,820	2 p.m.	15.00	7,760	3 a.m.	10.16	3,320
4	10.05	3,240	4	15.75	8,580	6	9.48	2,870
5	10.90	3,870	6	16.45	9,360	9	8.83	2,520
6	11.95	4,760	9:30	16.86	9,810	12 m.	8.32	2,260
7	12.95	5,680	12	16.20	9,080	4 p.m.	7.84	2,020
9	13.95	6,680	Mar. 28*			8	7.50	1,890
12	14.60	7,330				12	7.12	1,760
Mar. 27*			2 a.m.	15.70	8,530	Mar. 30*		
			4	15.35	8,140			
1 a.m.	14.75	7,480	6	15.20	7,980	6 a.m.	6.60	1,580
3	14.50	7,230	12 m.	14.82	7,560	12 m.	6.05	1,380
5	14.00	6,730	2 p.m.	14.45	7,180	6 p.m.	5.55	1,210
6	13.65	6,380	4	13.95	6,680	12	5.10	1,050
8	14.30	7,030	6	13.30	6,030			
10	14.75	7,480	8	12.55	5,300	Mar. 31*		
11	14.60	7,330	10	11.85	4,680			
			12	11.02	3,970	12 m.	4.40	810
						12 p.m.	3.85	645

*Daily means computed from data in addition to figures shown.

16. (4536) Ponca Creek at Verdel, Nebr.

Location.--Lat 42°48'40", long 98°10'35", in NE¼NE¼sec. 30, T. 33N., R. 7W., near left downstream bridge abutment on county road, 0.6 mile east of Verdel and 3.1 miles upstream from mouth.

Drainage area.--820 sq mi, approximately.

Gage-height record.--Water-stage recorder graph except Mar. 2-17 and Apr. 14-25. Gage heights for Apr. 14, 17, 20, and 25 based on wire-weight gage readings and fragmentary recorder record. Datum of gage is 1,232.54 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation defined by current-meter measurements; affected by ice Mar. 1-27. Discharge for periods of no gage-height record estimated on basis of weather records, records for station at Anoka, and station on Bazile Creek near Niobrara, Nebr.

Maxima.--March-April 1960: Discharge, 15,700 cfs 5 p.m. Mar. 27 (gage height, 15.10 ft). 1957 to February 1960: Discharge, 1,800 cfs July 8, 1958 (gage height, 7.10 ft), from rating curve extended above 850 cfs by logarithmic plotting.

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	8.3	1,360	9	2.5	729	17	3.5	386	25	550	161
2	7.0	713	10	2.5	470	18	4.0	300	26	900	148
3	4.0	508	11	2.5	394	19	4.5	250	27	9,000	148
4	2.0	689	12	2.5	380	20	6.7	228	28	14,800	180
5	2.0	1,460	13	2.0	527	21	7.4	215	29	10,600	222
6	2.0	1,400	14	2.0	356	22	8.2	200	30	3,620	222
7	2.0	1,460	15	2.5	300	23	50	185	31	1,480	-
8	2.5	1,100	16	3.0	320	24	250	170			
Monthly mean discharge, in cubic feet per second										1,333	506
Runoff, in acre-feet										81,980	30,110
Runoff, in inches										-	-

Ponca Creek at Verdel, Nebr.

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1960

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Mar. 27			Mar. 31*			Apr. 5*		
2 p.m.	13.05	10,700	6 a.m.	6.40	1,760	2 a.m.	5.10	1,080
3	14.35	13,500	12 m.	6.00	1,510	4	6.15	1,600
5	15.10	15,700	6 p.m.	5.45	1,240	6	6.60	1,900
9	14.80	14,800	12	5.12	1,090	10	6.90	2,140
12	14.72	14,600	Apr. 1			2 p.m.	6.30	1,690
Mar. 28			2 a.m.	5.00	1,040	6	5.55	1,290
3 a.m.	14.75	14,600	6	5.64	1,330	12	5.00	1,040
8	15.12	15,800	12 m.	5.93	1,480	Apr. 6		
1 p.m.	14.74	14,600	4 p.m.	6.30	1,690	6 a.m.	5.40	1,220
4	14.80	14,800	8	5.80	1,410	12 m.	6.40	1,760
9	14.50	13,900	12	5.17	1,120	6 p.m.	5.90	1,460
10	14.64	14,300	Apr. 2*			12	5.60	1,310
12	14.64	14,300	6 a.m.	4.50	825	Apr. 7*		
Mar. 29*			12 m.	4.05	648	12 m.	6.10	1,570
4 a.m.	14.48	13,800	12 p.m.	3.85	578	12 p.m.	5.70	1,360
8	14.08	12,800	Apr. 3*			Apr. 8		
10	13.80	12,200	12 m	3.50	460	12 m	5.10	1,095
12 m.	13.25	11,100	12 p.m.	3.70	525	12 p.m.	4.60	865
2 p.m.	12.75	10,100	Apr. 4*			Apr. 9*		
4	12.35	9,320	6 a.m.	4.07	654	12 m.	4.25	725
6	11.72	8,170	10	4.35	765	12 p.m.	3.85	578
8	11.15	7,220	10 p.m.	4.18	697	Apr. 10*		
10	10.62	6,370	12	4.40	785	12 m.	3.55	476
12	10.05	5,500				12 p.m.	3.35	416
Mar. 30*								
6 a.m.	9.37	4,620						
12 m.	8.35	3,530						
6 p.m.	7.56	2,740						
12	6.90	2,140						

*Daily means computed from data in addition to figures shown.

NIOBRARA RIVER BASIN

17. (4645) Keya Paha River at Wewela, S. Dak.

Location.--Lat 43°01'40", long 99°46'45", in NE¼SE¼ sec. 24, T. 95N., R. 76W., on left bank 13 ft downstream from bridge on U.S. Highway 183, three-quarters of a mile north of Wewela, 4½ miles upstream from Holt Creek, and 11½ miles downstream from Lost Creek.

Drainage area.--1,070 sq mi, approximately.

Gage-height record.--Water-stage recorder graph except Mar. 22-30, Apr. 6-14 for which graph was drawn on basis of once-daily wire-weight gage readings. Datum of gage is 2,049.78 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation defined by current-meter measurements. Backwater from ice Mar. 1-22.

Maxima.--March-April 1960: Discharge, 4,210 cfs 3 a.m. Mar. 24 (gage height, 10.56 ft).
1937-40, 1947 to February 1960: Discharge, 5,430 cfs Mar. 31, 1952 (gage height, 13.08 ft); gage height, 13.5 ft Mar. 25, 1950 (from floodmark, backwater from ice).

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	35	370	9	30	297	17	35	234	25	2,110	214
2	30	240	10	30	256	18	40	260	26	2,100	213
3	25	197	11	30	228	19	45	216	27	2,130	197
4	25	332	12	35	207	20	55	183	28	1,200	200
5	25	552	13	35	195	21	70	166	29	689	242
6	25	647	14	35	190	22	600	154	30	542	272
7	30	504	15	35	195	23	3,440	151	31	450	-
8	30	364	16	35	188	24	3,940	156			
Monthly mean discharge, in cubic feet per second										598	261
Runoff, in acre-feet										36,770	15,510
Runoff, in inches										-	-

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1960

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Mar. 22			Mar. 23 Con.			Mar. 24		
12 p.m.	7.48	2,330	4 a.m.	9.79	3,710	3 a.m.	10.56	4,210
Mar. 23			9	9.09	3,280	8	10.51	4,180
1:30 a.m.	8.89	3,160	11	8.84	3,130	11	10.28	4,030
2	8.45	2,900	4 p.m.	9.42	3,480	7 p.m.	9.73	3,670
			12	10.25	4,010	12	9.54	3,550

Keya Paha River at Wewela, S. Dak.--Continued

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1960

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Mar. 25			Mar. 29			Apr. 3		
6 a.m.	8.94	3,190	8 a.m.	4.24	703	6 a.m.	2.42	186
12 m	7.75	2,480	12 m	4.20	689	12 m	2.37	178
4 p.m.	7.44	2,310	12 p.m.	3.91	590	12 p.m.	2.75	249
8	7.50	2,340	Mar. 30			Apr. 4*		
12	7.20	2,180						
Mar. 26			12 m	3.75	539	6 a.m.	3.03	318
			12 p.m.	3.63	501	11	2.95	297
6 a.m.	6.75	1,930				12 p.m.	3.48	453
8	6.71	1,910	Mar. 31			Apr. 5		
10	6.78	1,950						
2 p.m.	6.80	1,930	12 m	3.46	447	6 a.m.	3.77	545
8	7.55	2,370	12 p.m.	3.32	403	11	3.83	585
10	7.51	2,350				12 m	3.78	549
12	7.57	2,380	Apr. 1			5 p.m.	3.80	555
Mar. 27			4 a.m.	3.34	409	12	4.05	637
			2 p.m.	3.16	355			
6 a.m.	7.25	2,210	5	3.17	358	Apr. 6		
8	7.33	2,250	12	3.03	318			
12 m	7.10	2,120				3 a.m.	4.23	700
6 p.m.	7.01	2,080	Apr. 2			7	4.07	644
12	6.43	1,760				10	4.11	658
			10 a.m.	2.83	267	6 p.m.	4.06	640
Mar. 28			3 p.m.	2.50	200	12	3.90	587
			12	2.34	173			
9 a.m.	5.51	1,280						
6 p.m.	4.79	930						
12	4.53	816						

*Daily means computed from data in addition to figures shown.

18. (4649) Keya Paha River near Naper, Nebr.

Location.--Lat 42°55'00", long 99°05'50", in SE¼SE¼sec. 17, T. 34N., R. 15W., on left bank 8 ft downstream from highway bridge, 3.3 miles south of Naper, and 8.6 miles upstream from mouth.

Drainage area.--1,630 sq mi.

Gage-height record.--Water-stage recorder graph. Altitude of gage is 1,680 ft (from topographic map).

Discharge record.--Stage-discharge relation defined by current-meter measurements below 5,300 cfs; affected by ice Mar. 1-26.

Maxima.--March-April 1960: Discharge, 6,890 cfs 12:30 a.m. Mar. 27 (gage height, 9.82 ft). 1957 to February 1960: Discharge, 2,150 cfs July 30, 1958 (gage height, 6.95 ft), from rating curve extended above 760 cfs on basis of velocity-area study; gage height, 7.30 ft Mar. 3, 1959 (backwater from ice).

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	71	632	9	60	506	17	58	580	25	5,000	346
2	70	438	10	55	444	18	61	513	26	5,300	390
3	52	357	11	55	402	19	70	506	27	5,650	374
4	51	715	12	52	408	20	71	450	28	2,670	315
5	50	1,140	13	52	520	21	100	396	29	1,510	340
6	51	1,190	14	54	471	22	1,500	357	30	1,120	285
7	53	958	15	57	408	23	2,400	352	31	780	-
8	55	656	16	57	444	24	6,500	330			
Monthly mean discharge, in cubic feet per second										1,087	506
Runoff, in acre-feet										66,810	30,100
Runoff, in inches										-	-

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1960

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Mar. 26			Mar. 27* Con.			Mar. 29*		
4 p.m.	9.18	5,610	8 p.m.	8.77	4,860	12 m	6.19	1,490
8	9.78	6,810	12	8.52	4,480	12 p.m.	6.00	1,310
12	9.78	6,810	Mar. 28*			Mar. 30*		
Mar. 27*								
			6 a.m.	7.85	3,480	12 m	5.76	1,110
12:30 a.m.	9.82	6,890	12 m	7.13	2,460	12 p.m.	5.61	988
6	9.65	6,550	6 p.m.	6.75	2,050			
10	9.50	6,250	12	6.48	1,780	Mar. 31*		
2 p.m.	8.86	4,930						
						12 m	5.46	770
						12 p.m.	5.36	672

*Daily means computed from data in addition to figures shown.

19. (4650) Niobrara River near Spencer, Nebr.

Location.--Lat 42°48'33", long 98°30'19", in SE¼NW¼sec. 30, T. 33N., R. 11W., 250 ft below Spencer powerplant dam and 5 miles southwest of Spencer.

Drainage area.--10,400 sq mi, approximately.

Gage-height record.--Water-stage recorder graph except Mar. 1 to 9 a.m. Mar. 9, 12 m Mar. 22 to 12 m Mar. 24, 3 p.m. Mar. 25 to 5:25 p.m. Mar. 28. Datum of gage is 1,473.67 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation defined by current-meter measurements; affected by ice Mar. 1-23, 25. Discharge for periods of no gage-height record and periods of ice effect computed on basis of partial gage-height record, powerplant log, floodmark in gage well, notes by engineers and plant operators and by hydrographic comparison with the sum of upstream stations.

Maxima.--March-April 1960: Discharge, 23,400 cfs 5:30 p.m. Mar. 27 (gage height, 8.6 ft, from floodmark).
1913-14, 1927-36, 1940 to February 1960: Discharge, 27,400 cfs Mar. 12, 1955 (gage height, 12.16 ft), at site 0.3 mile downstream at datum 9.78 ft lower.

Remarks.--Flood flow not significantly affected by power developments.

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	1,000	3,590	9	1,140	2,970	17	1,550	2,240	25	13,000	1,910
2	1,000	3,150	10	1,240	1,850	18	1,650	2,210	26	15,000	1,680
3	980	2,960	11	1,400	1,650	19	1,700	2,290	27	19,000	1,670
4	980	2,940	12	1,450	1,710	20	1,950	2,180	28	11,800	2,420
5	930	4,030	13	1,450	1,880	21	2,000	1,900	29	5,990	2,570
6	980	3,130	14	1,450	1,700	22	2,700	1,710	30	4,510	2,430
7	1,020	2,940	15	1,450	1,620	23	4,900	1,700	31	3,610	-
8	1,100	2,090	16	1,550	1,730	24	9,800	1,900			
Monthly mean discharge, in cubic feet per second										3,816	2,265
Runoff, in acre-feet										234,700	134,800
Runoff, in inches										-	-

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1960

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Mar. 26			Mar. 27* Con.			Mar. 28		
12 p.m.	7.19	16,900	10 a.m.	7.74	19,500	2 a.m.	6.81	15,100
			11	7.50	18,400	5	6.39	13,700
Mar. 27*			2 p.m.	8.00	20,800	8	6.14	12,500
			4	7.98	20,700	1 p.m.	5.62	11,100
3 a.m.	7.34	17,600	5:30	8.45	23,400	5	5.32	9,800
6	7.50	18,400	8	7.98	20,700	12	5.09	8,530
9	7.39	17,800	12	7.65	18,200			

*Daily means computed from data in addition to figures shown.

20. (4655) Niobrara River near Verdel, Nebr.

Location.--Lat 42°44'25", long 98°12'45", near center of N½sec. 23, T. 32N., R. 8W., on left bank 4 ft downstream from Pishelville bridge, 6 miles south of Verdel, and 7 miles upstream from Verdigre Creek.

Drainage area.--10,900 sq mi, approximately.

Gage-height record.--Water-stage recorder graph except Mar. 25, 26. Gage height for Mar. 26 estimated from fragmentary record. Datum of gage is 1,308.12 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 26,000 cfs and by velocity-area data at 31,700 cfs; affected by ice Mar. 1-25.

Maxima.--March-April 1960: Discharge, 39,000 cfs 4 p.m. Mar. 27 (gage height, 10.10 ft), result of release of ice jam.
1938-40, 1958 to February 1960: Discharge, 10,000 cfs May 2, 1938 (gage height, 5.70 ft), from rating curve extended above 7,200 cfs; gage height, 8.89 ft Mar. 19, 1959 (backwater from ice).

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	1,140	5,220	9	1,240	3,080	17	1,600	3,320	25	11,400	2,580
2	1,140	4,540	10	1,250	2,800	18	1,700	3,080	26	15,000	2,120
3	1,140	4,260	11	1,300	2,870	19	1,750	2,710	27	25,100	2,200
4	1,100	4,570	12	1,350	2,990	20	1,800	2,050	28	16,200	2,830
5	1,000	4,630	13	1,400	3,100	21	2,200	2,400	29	9,900	2,900
6	1,060	4,930	14	1,450	2,620	22	3,100	2,530	30	7,090	2,870
7	1,160	4,160	15	1,550	2,490	23	5,400	2,510	31	5,680	-
8	1,220	3,810	16	1,550	2,780	24	9,200	2,710			
Monthly mean discharge, in cubic feet per second										4,425	3,195
Runoff, in acre-feet										272,100	190,100
Runoff, in inches										-	-

Niobrara River near Verdel, Nebr.

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1960

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Mar. 26			Mar. 27* Con.			Mar. 28*		
12 p.m.	8.72	18,700	2 p.m.	6.90	24,400	2 a.m.	6.75	24,800
			3	7.35	26,300	4	5.87	21,300
Mar. 27*			4	10.10	39,000	6	5.15	18,400
			5	9.35	35,600	10	4.53	14,900
2:30 a.m.	9.12	21,700	6	8.10	30,600	1 p.m.	4.58	15,100
4	8.00	19,000	8	7.18	26,900	3	4.20	13,700
6	7.45	19,600	9	7.48	28,100	5	4.00	12,600
8	7.45	22,000	11	7.18	26,900	12	3.85	12,100
10	7.70	25,800	12	7.23	27,100			
12 m	7.22	25,300						

*Daily means computed from data in addition to figures shown.

BAZILE CREEK BASIN

21. (4665) Bazile Creek near Niobrara, Nebr.

Location.--Lat 42°45'00", long 97°56'10", in NE¼sec. 18, T. 32N., R. 5W., on downstream side of left pier of bridge on State Highway 12, 2½ miles upstream from mouth and 4½ miles east of Niobrara.

Drainage area.--440 sq mi, approximately.

Gage-height record.--Wire-weight gage readings once daily, and water-stage recorder graph for stages above 4.3 ft. Datum of gage is 1,210.81 ft above mean sea level, datum of 1929, supplementary adjustment of 1949.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 5,600 cfs and extended above on basis of indirect measurements at 24,400 cfs and 68,600 cfs; affected by ice Mar. 1-30.

Maxima.--March-April 1960: Discharge, 7,810 cfs 12 m Apr. 1 (gage height, 12.80 ft).
1951 to February 1960: Discharge, 68,600 cfs June 16, 1957 (gage height, 19.96 ft), from rating curve extended above 6,500 cfs on basis of indirect measurements at 24,400 cfs and 68,600 cfs.

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	32	4,670	9	28	244	17	52	209	25	65	68
2	31	1,380	10	29	114	18	61	109	26	72	62
3	31	195	11	29	132	19	59	132	27	300	80
4	25	795	12	28	1,170	20	58	96	28	1,000	114
5	26	1,460	13	30	1,480	21	61	89	29	1,100	272
6	28	1,680	14	29	578	22	68	74	30	1,850	195
7	28	984	15	39	345	23	68	65	31	1,650	-
8	31	480	16	42	258	24	64	77			
Monthly mean discharge, in cubic feet per second										226	587
Runoff, in acre-feet										13,910	34,920
Runoff, in inches										-	-

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1960

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Mar. 30			Apr. 2*			Apr. 5*		
4 p.m.	8.64	1,930	2 a.m.	10.05	3,210	3 a.m.	8.70	1,980
7	8.80	2,060	4	9.15	2,360	9	7.85	1,310
10	9.14	2,350	6	8.50	1,820	4 p.m.	7.38	960
12	9.16	2,360	12 m	7.55	1,090	8	7.90	1,350
			6 p.m.	6.93	660	12	8.90	2,140
Mar. 31*			12	6.60	375			
						Apr. 6*		
1 a.m.	9.20	2,400	Apr. 3*					
4	9.04	2,260				4 a.m.	9.26	2,450
8	8.70	1,980	6 a.m.	6.24	120	6	9.15	2,360
12 m	8.15	1,540	12 m	6.24	120	10	8.20	1,580
6 p.m.	7.62	1,140	6 p.m.	6.38	216	4 p.m.	7.45	1,010
8	7.60	1,120	12	6.74	480	8	8.00	1,420
9	7.85	1,310				12	8.35	1,700
12	7.80	1,280	Apr. 4*					
						Apr. 7*		
Apr. 1			6 a.m.	6.97	652			
			2 p.m.	6.90	600	2 a.m.	8.40	1,740
3 a.m.	8.00	1,420	7	7.23	848	6	8.00	1,420
6	9.00	2,220	9	7.80	1,280	12 m	7.10	750
9	11.50	4,920	12	8.64	1,930	6 p.m.	6.77	502
12 m	12.80	7,810				12	6.83	548
3 p.m.	12.24	6,290						
6	12.11	6,010						
10	11.90	5,600						
12	11.15	4,440						

*Daily means computed from data in addition to figures shown.

MISSOURI RIVER MAIN STEM

22. (4670) Lewis and Clark Lake near Yankton, S. Dak.

Location.--Lat 42°51', long 97°29', in SW¼sec. 7, T. 33N., R. 1W., in powerhouse of Gavins Point Dam on Missouri River, 3¾ miles southwest of Yankton, 11.9 miles upstream from James River, 38.8 miles downstream from Niobrara River, and at mile 811.0 (revised).

Drainage area.--279,500 sq mi, approximately.

Gage height record.--Water-stage recorder graph. Datum of gage is at mean sea level, datum of 1929.

Maxima.--March-April 1960: Contents, 565,400 acre-ft Apr. 1 (elevation, 1,210.72 ft).
1955 to February 1960: Contents, 499,400 acre-ft Aug. 14, 1958 (elevation, 1,208.7 ft).

Remarks.--Reservoir is formed by earth-fill dam; storage began in July 1955. Maximum capacity, 541,000 acre-ft below elevation 1,210.0 ft (top of spillway gates). Normal maximum, 477,000 acre-ft below elevation 1,208.0 ft. Figures given herein represent elevation and total contents at 12 p.m. Contents are corrected for wind effect.

Cooperation.--Records furnished by Corps of Engineers.

Elevation, in feet, and contents, in acre-feet, 1960

Day	March		April		Day	March		April	
	Elevation (feet)	Contents (acre-feet)	Elevation (feet)	Contents (acre-feet)		Elevation (feet)	Contents (acre-feet)	Elevation (feet)	Contents (acre-feet)
1	1,207.82	471,100	1,210.68	564,100	16	1,208.30	486,700	1,208.08	480,600
2	1,207.98	477,300	1,210.27	550,500	17	1,208.34	488,300	1,207.96	476,000
3	1,208.12	480,700	1,209.94	540,400	18	1,208.27	484,300	1,207.80	471,100
4	1,208.09	480,300	1,209.60	528,300	19	1,208.00	477,900	1,207.77	469,600
5	1,208.09	480,300	1,209.44	523,100	20	1,207.76	470,300	1,207.72	468,100
6	1,208.10	480,300	1,209.24	516,600	21	1,207.49	462,700	1,207.60	466,600
7	1,207.91	474,100	1,208.92	506,300	22	1,207.32	456,500	1,207.74	468,100
8	1,208.00	477,300	1,208.54	495,600	23	1,207.22	452,300	1,207.73	468,100
9	1,208.11	480,500	1,208.18	483,600	24	1,207.07	448,900	1,207.60	466,600
10	1,208.22	483,500	1,208.06	479,200	25	1,207.20	453,400	1,207.53	462,000
11	1,208.21	483,500	1,207.96	475,700	26	1,207.86	473,400	1,207.37	458,900
12	1,208.22	483,500	1,208.17	482,000	27	1,209.33	519,800	1,207.43	460,600
13	1,208.22	483,500	1,208.39	489,600	28	1,210.43	555,800	1,207.50	462,000
14	1,208.09	480,300	1,208.27	487,400	29	1,210.58	560,500	1,207.58	465,000
15	1,208.19	483,500	1,208.14	484,400	30	1,210.54	559,500	1,207.49	462,000
					31	1,210.49	558,100		
Change in contents during month.						-	+90,000	-	-96,100

23. (4675) Missouri River at Yankton, S. Dak.

Location.--Lat 42°52', long 97°24', between sec. 18, T. 93N., R. 55W., and sec. 13, T. 93N., R. 56W., on downstream end of left pier of Meridian Highway Bridge on U.S. Highway 281 in Yankton, 5.8 miles upstream from James River, 6.1 miles downstream from Gavins Point Dam, and at mile 804.9 (revised).

Drainage area.--279,500 sq mi, approximately.

Gage-height record.--Water-stage recorder graph. Datum of gage is 1,159.68 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation defined by current-meter measurements. Backwater from ice Mar. 4-15.

Maxima.--March-April 1960: Discharge, 34,700 cfs 9 a.m. Mar. 29 (gage height, 3.59 ft).
1930 to February 1960: Discharge, 480,000 cfs Apr. 13, 1952; gage height, 15.5 ft Apr. 13, 14, 1952.
Maximum stage known, 30.5 ft Apr. 5, 1881 (ice jam), present datum.

Remarks.--Flow regulated by Lewis and Clark Lake (see preceding record).

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	7,580	18,700	9	8,000	15,500	17	8,610	9,100	25	8,560	15,900
2	7,530	22,800	10	7,500	11,900	18	8,480	9,330	26	8,160	16,600
3	8,070	15,600	11	7,500	9,950	19	8,560	9,460	27	9,420	17,500
4	9,500	15,600	12	7,500	9,510	20	8,790	10,500	28	28,900	18,200
5	10,500	15,600	13	7,500	9,510	21	8,480	13,200	29	33,900	18,600
6	10,500	15,600	14	8,000	8,970	22	8,160	13,700	30	24,800	18,700
7	9,500	15,400	15	8,500	8,880	23	7,800	14,800	31	18,200	-
8	8,500	15,500	16	8,740	9,200	24	8,120	15,300			
Monthly mean discharge, in cubic feet per second										10,770	13,970
Runoff, in acre-feet										662,200	831,300
Runoff, in inches										-	-

JAMES RIVER BASIN

24. (4760) James River at Huron, S. Dak.

Location.--Lat 44°21'55", long 98°11'45", in SW¼SE¼NE¼sec. 6, T. 110N., R. 61W. on right bank 15 ft upstream from city dam at Huron, 135 ft downstream from Chicago and North Western Railway Co. bridge, and 165 ft upstream from bridge on U.S. Highway 14.

Drainage area.--16,800 sq mi, approximately.

Gage-height record.--Water-stage recorder graph except Mar. 27-30, Apr. 19 for which graph was drawn on basis of once-daily staff gage readings. Datum of gage is 1,223.44 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation defined by current-meter measurements. Backwater from ice Mar. 27 to Apr. 4

Maxima.--March-April 1960: Discharge, 6,050 cfs 9:30 a.m. Apr. 6 (gage height, 15.42 ft).
1928-32, 1943 to February 1960: Discharge, 5,580 cfs Apr. 15, 1952 (gage height, 15.23 ft).
Maximum stage known, 19.8 ft between Apr. 11 and 13, 1881, from U.S. Weather Bureau publication.
Flood of Mar. 22, 1922, reached a stage of 16.5 ft.

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	0	3,900	9	0	4,070	17	0	1,710	25	0	770
2	0	4,100	10	0	3,760	18	0	1,440	26	0	783
3	0	4,450	11	0	3,620	19	0	1,270	27	0	758
4	0	5,370	12	0	3,500	20	0	1,180	28	400	746
5	0	5,880	13	0	3,300	21	0	1,010	29	1,600	783
6	0	5,980	14	0	2,850	22	0	887	30	3,550	710
7	0	5,510	15	0	2,360	23	0	874	31	3,800	-
8	0	4,630	16	0	2,020	24	0	786			
Monthly mean discharge, in cubic feet per second										302	2,634
Runoff, in acre-feet										18,550	156,700
Runoff, in inches										-	-

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1960

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Apr. 4			Apr. 6			Apr. 7 Con.		
12 p.m.	15.25	5,780	9:30 a.m.	15.42	6,050	12 p.m.	14.92	5,120
			6 p.m.	15.35	5,930			
Apr. 5			12	15.31	5,870	Apr. 8		
12 m	15.31	5,870	Apr. 7			2 p.m.	14.60	4,510
12 p.m.	15.40	6,010				12	14.35	4,240
			12 m	15.15	5,520			

25. (4765) Sand Creek near Alpena, S. Dak.

Location.--Lat 44°09'20", long 98°26'10", in NE¼NE¼sec. 19, T. 108N., R. 63W., on left bank 5 ft downstream from highway bridge, 4 miles southwest of Alpena, and 10½ miles upstream from interlink with Cain Creek.

Drainage area.--240 sq mi, approximately.

Gage-height record.--Water-stage recorder graph. Altitude of gage is 1,315 ft (by barometer).

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

Maxima.--March-April 1960: Discharge, 2,240 cfs 11:30 a.m. Mar. 28 (gage height, 13.35 ft).
1950 to February 1960: Discharge, 1,130 cfs Apr. 3, 1952; gage height, 14.1 ft Mar. 28, 1950 (backwater from ice), from graph based on gage readings.

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	0	898	9	0	213	17	0	24	25	0	10
2	0	493	10	0	114	18	0	19	26	0	9
3	0	313	11	0	54	19	0	16	27	112	9
4	0	216	12	0	52	20	0	14	28	1,580	9
5	0	153	13	0	41	21	0	13	29	1,510	8
6	0	472	14	0	55	22	0	13	30	1,400	7
7	0	555	15	0	39	23	0	11	31	1,110	-
8	0	348	16	0	29	24	0	11			
Monthly mean discharge, in cubic feet per second										184	141
Runoff, in acre-feet										11,330	8,370
Runoff, in inches										-	-

Sand Creek near Alpena, S. Dak.

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1960

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Mar. 26			Mar. 30			Apr. 3		
12 p.m.	6.82	0.1	8 a.m.	12.70	1,520	4 a.m.	10.85	400
			12 m	12.59	1,410	4 p.m.	10.31	256
Mar. 27*			6 p.m.	12.45	1,280	12	10.35	265
12 m	7.17	.2	12	12.42	1,260			
2 p.m.	7.37	2.1				Apr. 4		
6	10.39	285	Mar. 31					
8	10.78	391	3 a.m.	12.38	1,220	4 a.m.	10.28	254
12	10.77	388	5	12.25	1,120	2 p.m.	10.00	194
			8	12.44	1,280	12	9.96	187
Mar. 28			2 p.m.	12.18	1,070	Apr. 5*		
			12	12.00	940			
1 a.m.	11.10	491				6 a.m.	9.79	161
7	12.44	1,280	Apr. 1			3 p.m.	9.56	128
11:30	13.35	2,240				12	10.13	225
4 p.m.	12.19	2,050	9 a.m.	12.07	982			
12	12.80	1,620	12 p.m.	11.67	740	Apr. 6		
Mar. 29			Apr. 2			4 a.m.	10.68	368
						10	11.03	474
6 a.m.	12.65	1,470	8 a.m.	11.43	612	12 p.m.	11.39	617
12 m	12.70	1,520	1 p.m.	10.95	433			
6 p.m.	12.65	1,470	8	10.45	292	Apr. 7		
12	12.69	1,510	12	10.86	348			
						3 a.m.	11.43	641
						9 p.m.	11.03	478
						12	10.90	436

*Daily means computed from data in addition to figures shown.

28. (4770) James River near Forestburg, S. Dak.

Location.--Lat 43°58'45", long 98°04'05", in SW¼SW¼NW¼sec. 20, T. 106N., R. 60W., on right bank 5 ft downstream from highway bridge, 3¾ miles southeast of Forestburg, 4½ miles downstream from Chicago, Milwaukee, St. Paul and Pacific Railroad bridge, and 5½ miles downstream from Sand Creek.

Drainage area.--18,600 sq mi, approximately.

Gage-height record.--Water-stage recorder graph except Apr. 7-8 for which graph was drawn on basis of once-daily wire-weight gage readings. Altitude of gage is 1,205 ft (by barometer).

Discharge record.--Stage-discharge relation defined by current-meter measurements. Backwater from ice Mar. 27-31.

Maxima.--March-April 1960: Discharge, 10,900 cfs 1 a.m. Apr. 2 (gage height, 16.27 ft).
1950 to February 1960: Discharge, 8,290 cfs Apr. 15-17, 1952 (gage height, 15.46 ft).
Floods in March 1920 and March 1922 reached a stage of about 18 ft, from information by local residents.

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	2.6	9,310	9	2.6	6,830	17	5	3,530	25	8	1,040
2	2.4	9,240	10	2.6	5,790	18	5	3,070	26	18	922
3	2.4	8,030	11	2.8	5,350	19	5	2,690	27	185	862
4	2.2	8,120	12	3.3	4,950	20	6	2,300	28	682	830
5	2.2	7,750	13	3.9	4,650	21	6	1,960	29	1,080	790
6	2.4	7,650	14	4.2	4,440	22	7	1,650	30	1,650	766
7	2.4	7,850	15	5	4,150	23	8	1,380	31	4,400	-
8	2.4	7,090	16	5	3,860	24	8	1,190			
Monthly mean discharge, in cubic feet per second										282	4,284
Runoff, in acre-feet										16,110	253,700
Runoff, in inches										-	-

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1960

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Mar. 31			Apr. 1* Con.			Apr. 2		
12 p.m.	15.65	7,180	12 m	16.11	9,770	1 a.m.	16.27	10,900
			6 p.m.	16.22	10,600	7	16.14	9,980
Apr. 1*			12	16.26	10,800	1 p.m.	15.95	8,750
						12	15.82	8,010
6 a.m.	15.87	8,280						
9	15.99	8,990						

*Daily means computed from data in addition to figures shown.

27. (4775) Firesteel Creek near Mount Vernon, S. Dak.

Location.--Lat 43°46', long 98°15', in SW¼SW¼sec. 26, T. 104N., R. 62W., near center of span on downstream side of highway bridge, 4½ miles north of Mount Vernon, 5¼ miles downstream from West Firesteel Creek, and 12 miles northwest of Mitchell.

Drainage area.--540 sq mi, approximately.

Gage-height record.--Wire-weight gage read once daily. Graph for Mar. 25 to Apr. 15 drawn on basis of once-daily gage readings and crest-stage gage marks. Altitude of gage is 1,310 ft (from topographic map).

Discharge record.--Stage-discharge relation defined by current-meter measurements. Backwater from ice Mar. 1-28.

Maxima.--March-April 1960: Discharge, 5,780 cfs 11:30 p.m. Mar. 28 (gage height, 15.13 ft).
1955 to February 1960: Discharge, 539 cfs July 8, 1957 (gage height, 6.60 ft).

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	0	1,900	9	0	250	17	0	32	25	1	13
2	0	1,540	10	0	186	18	0	28	26	50	13
3	0	1,210	11	0	125	19	1	26	27	400	12
4	0	1,160	12	0	93	20	1	26	28	2,500	11
5	0	1,160	13	0	69	21	2	20	29	4,610	12
6	0	798	14	0	59	22	2	19	30	3,810	9
7	0	540	15	0	48	23	1	16	31	2,740	-
8	0	347	16	0	36	24	1	14			
Monthly mean discharge, in cubic feet per second										455	326
Runoff, in acre-feet										28,000	19,380
Runoff, in inches										-	-

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1960

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Mar. 27			Mar. 29*			Mar. 31*		
12 p.m.	9.28	919	6 a.m.	14.61	5,210	9 a.m.	12.05	2,890
			12 m	13.76	4,360	4 p.m.	11.55	2,520
Mar. 28*			12 p.m.	13.29	3,930	12	11.07	2,210
6 a.m.	10.77	1,480	Mar. 30			Apr. 1		
12 m	12.30	2,230						
3 p.m.	13.40	3,490	12 m	13.24	3,890	12 m	10.43	1,860
9	15.02	5,500	6 p.m.	13.08	3,740	12 p.m	10.08	1,690
11:30	15.13	5,780	12	12.75	3,450			
12	15.12	5,770						

*Daily means computed from data in addition to figures shown.

28. (4782.5) North Branch Dry Creek tributary near Parkston, S. Dak.

(Crest-stage station)

Location.--Lat 43°22', long 97°55', in NE¼sec. 27, T. 99N., R. 60W., at culvert on county highway, 3¾ miles southeast of Parkston.

Drainage area.--3.19 sq mi.

Gage-height record.--Crest stages only. Altitude of gage is 1,350 ft (from topographic map).

Discharge record.--Stage-discharge relation defined subsequent to flood by current-meter measurements below 120 cfs.

Maxima.--March-April 1960: Gage height, 6.52 ft Mar. 27 (discharge not determined).
1956 to February 1960: Discharge, 27 cfs Mar. 26, 1958 (gage height, 4.47 ft).

29. (4782.6) North Branch Dry Creek near Parkston, S. Dak.

(Crest-stage station)

Location.--Lat 43°22', long 97°51', in NE¼sec. 29, T. 99W., R. 59W., at bridge on county highway, 7½ miles southeast of Parkston.

Drainage area.--37.0 sq mi.

Gage-height record.--Crest stages only. Altitude of gage is 1,275 ft (from topographic map).

Discharge record.--Stage-discharge relation defined by current-meter measurements below 810 cfs.

Maxima.--March-April 1960: Discharge, 1,470 cfs Mar. 27 (gage height, 8.55 ft).
1956 to February 1960: Discharge, 146 cfs Mar. 26, 1958 (gage height, 4.50 ft).

30. (4782.8) South Branch Dry Creek near Parkston, S. Dak.

(Crest-stage station)

Location.--Lat 43°21', long 97°50', in NW¼sec. 33, T. 99N., R. 59W., at bridge on county highway, 8¼ miles southeast of Parkston.

Drainage area.--17.1 sq mi.

Gage-height record.--Crest stages only. Altitude of gage is 1,270 ft (from topographic map).

Discharge record.--Stage-discharge relation defined by current-meter measurements below 350 cfs.

Maxima.--March-April 1960: Discharge, 920 cfs Mar. 27 (gage height, 7.37 ft).
1956 to February 1960: Discharge, 104 cfs May 31, 1959 (gage height, 4.36 ft).

31. (4783) Dry Creek near Parkston, S. Dak.

(Crest-stage station)

Location.--Lat 43°22', long 97°49', in SE¼sec. 21, T. 99N., R. 59W., at bridge on county highway, 8½ miles southeast of Parkston.

Drainage area.--76.8 sq mi.

Gage-height record.--Crest stages only. Altitude of gage is 1,240 ft (from topographic map).

Discharge record.--Stage-discharge relation defined by current-meter measurements below 1,400 cfs and by slope-area measurement at 4,210 cfs.

Maxima.--March-April 1960: Discharge, 4,210 cfs Mar. 27 (gage height, 12.70 ft).
1956 to February 1960: Discharge, 234 cfs Mar. 26, 1958 (gage height, 5.62 ft).

32. (4785) James River near Scotland, S. Dak.

Location.--Lat 43°11'00", long 97°37'55", in SW¼SW¼sec. 30, T. 97N., R. 57W., on left bank 50 ft upstream from highway bridge, 500 ft upstream from Dawson Creek, and 5 miles northeast of Scotland.

Drainage area.--21,550 sq mi, approximately.

Gage-height record.--Water-stage recorder graph. Datum of gage is 1,168.51 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation defined by current-meter measurements. Backwater from ice Mar. 25-29.

Maxima.--March-April 1960: Discharge, 13,900 cfs 10:30 a.m. Apr. 6 (gage height, 18.66 ft).
1928 to February 1960: Discharge, 10,800 cfs May 15, 1942; gage height, 16.32 ft Apr. 23, 1952.

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	23	12,400	9	17	11,000	17	17	5,220	25	23	3,270
2	19	12,200	10	17	10,100	18	17	4,860	26	30	3,090
3	19	11,500	11	16	9,080	19	16	4,530	27	430	2,910
4	22	12,300	12	17	8,480	20	17	4,230	28	2,640	2,770
5	19	13,200	13	16	7,800	21	18	4,000	29	4,530	2,590
6	18	13,800	14	16	6,950	22	21	3,800	30	9,380	2,320
7	18	13,200	15	16	6,190	23	22	3,600	31	11,300	-
8	18	12,100	16	17	5,650	24	23	3,440			
Monthly mean discharge, in cubic feet per second										928	7,219
Runoff, in acre-feet										57,070	429,500
Runoff, in inches										-	-

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1960

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Mar. 29			Apr. 1 Con.			Apr. 5		
12 p.m.	17.07	7,770	6 p.m.	18.50	13,200	12 m	18.53	13,400
			12	18.45	13,100	12 p.m.	18.60	13,600
Mar. 30								
			Apr. 2			Apr. 6		
2 a.m.	16.98	8,070						
6	17.15	8,570	6 a.m.	18.32	12,600	10:30 a.m.	18.63	13,900
12 m	17.43	9,450	12 m	18.21	12,100	12 p.m.	18.63	13,800
6 p.m.	17.65	10,200	12 p.m.	18.06	11,600			
12	17.83	10,800				Apr. 7		
Mar. 31			Apr. 3*					
			12 m	18.01	11,400	12 m	18.50	13,200
6 a.m.	17.95	11,200	12 p.m.	18.15	11,900	12 p.m.	18.37	12,700
12 m	18.00	11,400				Apr. 8		
12 p.m.	18.04	11,500	Apr. 4					
						12 m	18.19	12,100
Apr. 1			12 m	18.24	12,300	12 p.m.	18.04	11,500
			12 p.m.	18.34	12,600			
6 a.m.	18.14	11,900				Apr. 9		
9	18.08	11,700						
12 m	18.23	12,200				12 m	17.83	11,000
						12 p.m.	17.73	10,600

*Daily means computed from data in addition to figures shown.

VERMILLION RIVER BASIN

33. (4788) Saddlerock Creek near Canton, S. Dak.

(Crest-stage station)

Location.--Lat 43°12', long 96°44', in SW¼sec. 23, T. 97N., R. 50W., at bridge on county highway, 9¾ miles southwest of Canton.

Drainage area.--14.8 sq mi.

Gage-height record.--Crest stages only. Altitude of gage is 1,405 ft (from topographic map).

Discharge record.--Stage-discharge relation defined by current-meter measurements below 570 cfs.

Maxima.--March-April 1960: Discharge, 710 cfs Apr. 1 (gage height, 7.83 ft).
1956 to February 1960: Discharge, 77 cfs June 17, 1957 (gage height, 5.38 ft).

34. (4788.2) Saddlerock Creek tributary near Beresford, S. Dak.

(Crest-stage station)

Location.--Lat 43°13', long 96°48', in SW¼sec. 16, T. 97N., R. 50W. at culvert on U.S. Highway 77, 9¼ miles north of Beresford.

Drainage area.--2.32 sq mi.

Gage-height record.--Crest stages only. Altitude of gage is 1,360 ft (from topographic map).

Discharge record.--Stage-discharge relation defined by current-meter measurements below 40 cfs.

Maxima.--March-April 1960: Discharge, 72 cfs Apr. 12 (gage height, 5.93 ft).
1956 to February 1960: Discharge, 23 cfs June 17, 1957 (gage height, 4.17 ft).

35. (4788.4) Saddlerock Creek near Beresford, S. Dak.

(Crest-stage station)

Location.--Lat 43°13', long 96°50', in SE¼sec. 14, T. 97N., R. 51W., at bridge on county highway, 9¼ miles northwest of Beresford.

Drainage area.--26.3 sq mi.

Gage-height record.--Crest stages only. Altitude of gage is 1,300 ft (from topographic map).

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

Maxima.--March-April 1960: Discharge, about 1,100 cfs Apr. 1.
1956 to February 1960: Discharge, 140 cfs June 17, 1957 (gage height, 4.91 ft).

36. (4790) Vermillion River near Wakonda, S. Dak.

Location.--Lat 42°59'20", long 96°57'50", in SW¼NW¼sec. 2, T. 94N., R. 52W., on left bank 40 ft downstream from bridge on State Highway 19, 2½ miles downstream from Frog Creek, 7¼ miles southeast of Wakonda, and 16½ miles downstream from Turkey Ridge Creek.

Drainage area.--1,680 sq mi, approximately.

Gage-height record.--Water-stage recorder graph. Datum of gage is 1,150.9 ft above mean sea level (levels by Corps of Engineers). Supplementary staff gage readings on bypass channel.

Discharge record.--Stage-discharge relation defined by current-meter measurements. Backwater from ice Mar. 1-29. Stage-discharge relation affected by bypass flow from levee breaks Mar. 30 to Apr. 27; discharge computed by combining main channel and bypass discharge as determined from their respective stage-discharge relations.

Maxima.--March-April 1960: Discharge, 7,300 cfs 8 p.m. Apr. 1 (includes 4,600 cfs bypass flow from levee breaks); gage height, 16.94 ft Apr. 1.
1945 to February 1960: Discharge, 3,790 cfs June 21, 1954 (includes 1,850 cfs bypass flow from levee breaks); gage height, 16.63 ft June 13, 1947, from graph based on gage readings.

Remarks.--At times during periods of high stage, part of flow leaves main channel through levee breaks and bypasses gage through two relief openings on left bank.

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	2	5,800	9	2	6,100	17	2	2,700	25	2	460
2	2	6,600	10	2	5,100	18	2	2,250	26	5	380
3	2	6,600	11	2	4,300	19	2	1,700	27	10	330
4	2	6,100	12	2	3,700	20	2	1,300	28	50	314
5	2	5,700	13	2	3,600	21	2	1,040	29	800	314
6	2	5,400	14	2	3,200	22	2	860	30	2,100	309
7	2	5,400	15	2	3,200	23	2	700	31	2,700	-
8	2	6,600	16	2	3,200	24	2	520			
Monthly mean discharge, in cubic feet per second										184	3,126
Runoff, in acre-feet										11,340	186,000
Runoff, in inches										-	-

Vermillion River near Wakonda, S. Dak.

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1960

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Mar. 29			Apr. 2*			Apr. 6*		
12 p.m.	16.36	1,910	6 a.m.	16.61	6,680	3 a.m.	14.90	5,820
			9	16.61	6,550	10	14.72	5,460
Mar. 30*			8 p.m.	16.33	6,480	12 m	14.77	5,400
			12	16.46	6,570	6 p.m.	14.63	5,220
6 a.m.	16.31	2,050				12	14.52	5,050
12 m	16.34	2,140	Apr. 3*					
6 p.m.	16.53	2,250				Apr. 7*		
12	16.52	2,360	5 a.m.	16.57	6,700			
			12 m	16.38	6,660	6 a.m.	14.48	5,050
Mar. 31*			12 p.m.	15.87	6,380	12 m	14.56	5,220
						12 p.m.	15.00	5,060
6 a.m.	16.43	2,550	Apr. 4*					
12 m	16.57	2,740				Apr. 8*		
6 p.m.	16.63	3,010	2 a.m.	15.81	6,310			
7	16.59	3,100	7	15.73	6,190	6 a.m.	15.18	6,500
10	15.71	3,160	1 p.m.	15.58	6,000	12 m	15.35	6,770
12	15.64	3,400	4	15.65	6,020	5 p.m.	15.39	6,760
			8	15.61	5,980	12	15.36	6,630
Apr. 1*			12	15.53	5,920			
						Apr. 9*		
6 a.m.	15.97	4,660	Apr. 5*					
9	16.32	5,590				12 m	15.14	6,170
12 m	16.66	6,450	6 a.m.	15.31	5,860	12 p.m.	14.82	5,600
3 p.m.	16.84	7,030	12 m	15.09	5,750			
6	16.91	7,220	6 p.m.	14.96	5,650	Apr. 10*		
8	16.94	7,300	12	14.88	5,600			
10	16.91	7,110				12 m	14.39	5,040
12	16.86	6,870				12 p.m.	14.12	4,650

*Daily means computed from data in addition to figures shown.

BIG SIOUX RIVER BASIN

37. (4800) Big Sioux River near Brookings, S. Dak.

Location.--Lat 44°11', long 96°45', in NW¼NW¼sec. 8, T. 108N., R. 49W., on right bank 3 ft downstream from highway bridge, 1½ miles downstream from Deer Creek and 9½ miles southeast of Brookings.

Drainage area.--4,420 sq mi, approximately, of which about 1,970 sq mi is probably noncontributing.

Gage-height record.--Water-stage recorder graph except Mar. 3-21, when wire-weight gage readings were used. Altitude of gage is 1,545 ft (by barometer).

Discharge record.--Stage-discharge relation defined by current-meter measurements. Backwater from ice Mar. 1-30.

Maxima.--March-April 1960: Discharge, 9,620 cfs 12 p.m. Mar. 30 (gage height, 12.28 ft).
1953 to February 1960: Discharge, 5,320 cfs June 17, 1957 (gage height, 11.67 ft).

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	0.5	4,570	9	1	2,810	17	0.5	478	25	0.5	230
2	.5	2,660	10	1	2,100	18	.5	417	26	1	214
3	.5	2,260	11	1	1,400	19	.5	372	27	20	203
4	.5	2,090	12	.5	914	20	.5	334	28	400	197
5	.5	1,670	13	.5	751	21	.5	313	29	1,450	196
6	.5	1,840	14	.5	695	22	.5	289	30	3,800	189
7	.5	3,500	15	.5	625	23	.5	267	31	7,400	-
8	.5	3,940	16	.5	552	24	.5	248			
Monthly mean discharge, in cubic feet per second										422	1,211
Runoff, in acre-feet										25,950	72,050
Runoff, in inches										-	-

38. (4810) Big Sioux River near Dell Rapids, S. Dak.

Location.--Lat 43°47'25", long 96°44'45", in NW¼NW¼sec. 29, T. 104N., R. 49W., on right bank at downstream side of highway bridge, a quarter of a mile downstream from confluence of divided channels, 1¾ miles upstream from nearest tributary, and 3 miles southwest of Dell Rapids.

Drainage area.--5,060 sq mi, approximately, of which about 1,970 sq mi is probably noncontributing.

Gage-height record.--Water-stage recorder graph except Mar. 1-27, when once-daily wire-weight gage readings were used. Altitude of gage is 1,455 ft (by barometer).

Discharge record.--Stage-discharge relation defined by current-meter measurements. Backwater from ice Mar. 1-31.

Maxima.--March-April 1960: Discharge, 11,900 cfs 8 p.m. Apr. 1 (gage height, 14.42 ft); gage height, 14.93 ft Mar. 31 (backwater from ice).
1948 to February 1960: Discharge, 15,500 cfs June 18, 1957 (gage height, 14.93 ft).

Big Sioux River near Dell Rapids, S. Dak.

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	4	11,000	9	4	4,120	17	3	919	25	7	388
2	4	10,300	10	4	4,560	18	3	797	26	8	344
3	4	6,220	11	3	3,750	19	3	697	27	9	333
4	4	4,310	12	3	2,870	20	4	611	28	250	320
5	4	4,940	13	3	2,170	21	4	547	29	2,500	310
6	4	5,390	14	3	1,530	22	4	502	30	7,500	290
7	4	4,760	15	3	1,200	23	5	463	31	8,500	-
8	4	3,910	16	3	1,040	24	6	424			
Monthly mean discharge, in cubic feet per second										609	2,634
Runoff, in acre-feet										37,420	156,700
Runoff, in inches										-	-

39. (4815) Skunk Creek near Sioux Falls, S. Dak.

Location.--Lat 43°32'35", long 96°48'30", in NW¼NW¼sec. 23, T. 101N., R. 50W., on left bank at downstream side of bridge on U.S. Highway 16, 600 ft upstream from nearest tributary, 2½ miles upstream from mouth, and 4 miles west of Sioux Falls.

Drainage area.--520 sq mi, approximately.

Gage-height record.--Water-stage recorder graph except Mar. 1-26. Once-daily wire-weight gage readings were used Mar. 1-5, 7-12, 14. Datum of gage is 1,415.29 ft above mean sea level, datum of 1929 (levels by Corps of Engineers).

Discharge record.--Stage-discharge relation defined by current-meter measurements below 8,100 cfs. Backwater from ice Mar. 17-26. Discharge Mar. 6, 13, 15, 16 interpolated.

Maxima.--March-April 1960: Discharge, 8,200 cfs 3 a.m. Mar. 30 (gage height, 13.64 ft).
1948 to February 1960: Discharge, 29,400 cfs June 17, 1957 (gage height, 17.78 ft), from rating curve extended above 8,100 cfs on basis of slope-area measurement of peak flow.

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	1.9	3,290	9	1.4	765	17	1.4	257	25	5	92
2	1.8	1,360	10	1.4	637	18	1.4	223	26	15	85
3	1.8	1,080	11	1.4	538	19	1.3	196	27	46	74
4	1.8	1,560	12	1.4	461	20	1.3	166	28	295	71
5	1.8	2,530	13	1.4	707	21	1.3	151	29	3,710	79
6	1.8	3,700	14	1.4	499	22	1.2	134	30	6,080	76
7	1.8	1,810	15	1.4	351	23	1.2	121	31	3,030	-
8	1.8	961	16	1.4	290	24	1.2	108			
Monthly mean discharge, in cubic feet per second										426	746
Runoff, in acre-feet										26,220	44,370
Runoff, in inches										-	-

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1960

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Mar. 26			Mar. 31*			Apr. 5*		
12 p.m.	2.84	36	7 a.m.	8.88	2,800	4 a.m.	8.07	2,280
			2 p.m.	7.90	2,200	9	7.09	1,800
Mar. 27			9	9.50	3,350	12 m	7.25	1,880
			12	9.36	3,210	3 p.m.	7.77	2,140
12 m	2.88	40				6	8.93	2,840
12 p.m.	3.07	69	Apr. 1*			12	10.73	4,580
Mar. 28*			5 a.m.	9.11	2,990	Apr. 6		
			11	9.77	3,620			
6 a.m.	2.96	52	2:30 p.m.	10.27	4,120	12:30 a.m.	10.79	4,640
12 m	3.05	66	7	9.67	3,520	7	10.43	4,280
3 p.m.	3.20	92	12	7.95	2,220	2 p.m.	9.40	3,250
6	4.33	453				4	9.32	3,180
9	5.13	819	Apr. 2			7	9.36	3,210
12	6.68	1,590				12	8.89	2,810
			4 a.m.	7.12	1,810			
Mar. 29			7	6.63	1,560	Apr. 7*		
			12 m	5.73	1,120			
1:30 a.m.	7.82	2,160	4 p.m.	5.54	1,020	6 a.m.	7.82	2,160
3	6.88	1,690	12	5.77	1,140	12 m	7.06	1,780
6	7.39	1,940				4 p.m.	6.51	1,500
9	7.95	2,220	Apr. 3			8	6.09	1,300
12 m	9.45	3,300				12	5.85	1,180
7 p.m.	11.75	5,620	2 a.m.	5.78	1,140			
9	12.30	6,250	1 p.m.	5.36	931	Apr. 8		
12	13.01	7,220	11	6.04	1,270			
			12	6.04	1,270	6 a.m.	5.56	1,030
Mar. 30						12 m	5.36	931
			Apr. 4*			6 p.m.	5.25	878
3 a.m.	13.64	8,200				12	5.16	833
8	12.80	6,920	2 a.m.	5.97	1,240			
1 p.m.	11.48	5,330	6	6.07	1,280			
4	10.95	4,800	12 m	5.92	1,210			
8	11.19	5,040	4 p.m.	6.44	1,470			
12	10.84	4,690	12	8.69	2,660			

*Daily means computed from data in addition to figures shown.

40. (4820) Big Sioux River at Sioux Falls, S. Dak.

Location.--Lat 43°30', long 96°44', in S½sec. 32, T. 101N., R. 49W., on left bank 5 ft downstream from highway bridge, 0.25 mile downstream from Great Northern Railway bridge, 1 mile southwest of Sioux Falls, and 3 miles downstream from Skunk Creek.

Drainage area.--5,750 sq mi, approximately, of which about 1,970 sq mi is probably noncontributing.

Gage-height record.--Water-stage recorder graph except Mar. 6-16, 18-22. Datum of gage is 1,392.83 ft above mean sea level, datum of 1929 (levels by Corps of Engineers).

Discharge record.--Stage-discharge relation defined by current-meter measurements. Backwater from ice Mar. 1-29. Discharge Mar. 6-16, 18-22, estimated on basis of two discharge measurements, recorded ranges in stage, weather records, and records for nearby stations.

Maxima.--March-April 1960: Discharge, main channel only, 14,300 cfs Mar. 30 (gage height, 15.56 ft). 1943 to February 1960: Combined discharge, 16,200 cfs June 17, 1957; main channel only, 16,100 cfs June 17, 1957 (gage height, 16.01 ft); maximum for bypass canal, 2,820 cfs June 19, 1957.

Remarks.--During periods of high stage, part of flow leaves channel above gage and bypasses gage through a bypass canal which returns to main channel at a point about 8 miles below gage. Records for 1960 do not include bypass flow.

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	6	7,470	9	7	2,540	17	3	1,310	25	20	570
2	6	4,580	10	6	2,760	18	3	1,160	26	60	506
3	6	3,800	11	5	2,850	19	4	1,040	27	100	466
4	5	4,120	12	5	2,820	20	4	938	28	300	462
5	5	5,030	13	4	2,970	21	5	842	29	3,800	462
6	5	6,410	14	4	2,450	22	6	774	30	11,000	438
7	5	4,280	15	3	1,810	23	6	698	31	6,610	-
8	6	2,960	16	3	1,480	24	6	630			
Monthly mean discharge, in cubic feet per second										710	2,288
Runoff, in acre-feet										43,650	136,100
Runoff, in inches										-	-

41. (4821) Big Sioux River near Brandon, S. Dak.

Location.--Lat 43°36', long 96°38', in NE¼SE¼sec. 30, T. 102N., R. 48 W., on left bank 130 ft upstream from Great Northern Railway bridge, 2¾ miles northwest of Brandon, and 7 miles upstream from Split Rock Creek.

Drainage area.--5,810 sq mi, approximately, of which about 1,970 sq mi is probably noncontributing.

Gage-height record.--Water-stage recorder graph. Datum of gage is 1,283.38 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation defined by current-meter measurements. Backwater from ice Mar. 1-19.

Maxima.--March-April 1960: Discharge, 14,400 cfs 9 p.m. Apr. 1 (gage height, 18.61 ft).

Remarks.--Station established July 1, 1959; no peaks above base of 2,600 cfs prior to March 1960.

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	18	13,200	9	17	4,720	17	15	1,410	25	26	621
2	17	12,100	10	16	4,710	18	15	1,260	26	45	579
3	17	12,800	11	15	4,830	19	15	1,120	27	195	534
4	16	9,560	12	15	4,250	20	16	1,010	28	581	526
5	15	8,020	13	15	3,890	21	23	912	29	2,700	530
6	15	9,960	14	15	3,040	22	27	824	30	11,000	498
7	15	8,290	15	15	2,100	23	25	736	31	11,800	-
8	16	5,950	16	15	1,640	24	25	674			
Monthly mean discharge, in cubic feet per second										863	4,010
Runoff, in acre-feet										53,080	238,600
Runoff, in inches										-	-

42. (4828.7) Little Beaver Creek tributary near Canton, S. Dak.

(Crest-stage station)

Location.--Lat 43°15', long 96°38', in NE¼sec. 4, T. 97N., R. 49W., at culvert on county highway, 4 miles southwest of Canton.

Drainage area.--0.22 sq mi.

Gage-height record.--Crest stages only. Altitude of gage is 1,330 ft (from topographic map).

Discharge record.--Stage-discharge relation defined by current-meter measurements below 16 cfs.

Maxima.--March-April 1960: Discharge, 20 cfs Apr. 1 (gage height, 2.49 ft).
1956 to February 1960: Gage height, 3.78 ft May 21, 1959 (discharge not determined).

43. (4832.7) Rock River at Rock Rapids, Iowa

Location.--Lat 43°26'13", long 96°09'58", in NE¼SW¼sec. 33, T. 100N., R. 45W., on right bank at dam at north side of city park in Rock Rapids, a third of a mile upstream from Tom Creek and half a mile northeast of junction of U.S. Highway 75 and State Highway 9.

Drainage area.--788 sq mi.

Gage-height record.--Water-stage recorder graph except Mar. 1-26. Datum of gage is 1,337.81 ft above mean sea level (State Highway Commission bench mark).

Discharge record.--Stage-discharge relation defined by current-meter measurements below 11,000 cfs and extended above by logarithmic plotting; affected by ice Mar. 1-28.

Maxima.--March-April 1960: Discharge, 15,500 cfs 9:30 p.m. Mar. 30 (gage height, 8.86 ft). 1959 to February 1960: Daily discharge, 90 cfs Dec. 28, 1959 (gage height, 1.99 ft, backwater from ice).

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	9.0	4,760	9	8.0	666	17	7.0	430	25	7.0	143
2	9.0	8,440	10	8.0	454	18	7.0	360	26	7.0	130
3	9.0	5,110	11	8.0	350	19	7.0	290	27	15	130
4	9.0	3,150	12	8.0	370	20	7.0	256	28	250	130
5	8.5	3,450	13	7.5	1,370	21	7.0	224	29	7,960	150
6	8.5	2,130	14	7.5	1,850	22	7.0	200	30	11,900	150
7	8.5	1,550	15	7.5	900	23	7.0	171	31	8,920	-
8	8.5	1,040	16	7.5	574	24	7.0	157			
Monthly mean discharge, in cubic feet per second										943	1,303
Runoff, in acre-feet										58,010	77,520
Runoff, in inches										1.38	1.84

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1960

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Mar. 27.			Mar. 30* Con.			Apr. 3* Con.		
12 m	1.80		2 p.m.	7.52	12,000	12 m	4.63	4,950
6 p.m.	2.47		4	8.12	13,500	4 p.m.	4.20	3,990
9	2.42		6	8.65	14,900	8	3.87	3,290
12	2.95		8	8.83	15,400	12	3.76	3,070
			9:30	8.86	15,500			
Mar. 28			12	8.63	14,800	Apr. 4*		
2 a.m.	2.85		Mar. 31*			6 a.m.	3.72	2,990
6	3.89					12 m	3.70	2,950
8	4.30		2 a.m.	8.29	14,000	6 p.m.	3.82	3,190
9	4.07		4	7.82	12,700	12	4.01	3,570
11	4.44		6	7.38	11,600			
1 p.m.	4.00		8	6.91	10,400	Apr. 5*		
2	4.08		10	6.43	9,230			
3	3.89		12 m	6.07	8,370	6 a.m.	4.18	3,950
5	5.52		4 p.m.	5.43	6,830	8	4.20	3,990
7	4.77		8	4.89	5,550	10	4.18	3,950
12	5.02	5,850	12	4.54	4,740	12 m	4.12	3,810
Mar. 29*			Apr. 1*			6 p.m.	3.79	3,130
						12	3.56	2,670
2 a.m.	5.18	6,230	4 a.m.	4.21	4,010			
4	5.40	6,760	8	4.01	3,570	Apr. 6*		
6	5.60	7,240	12 m	4.19	3,970			
8	5.81	7,740	4 p.m.	4.45	4,540	6 a.m.	3.38	2,310
10	5.94	8,060	8	5.29	6,500	12 m	3.32	2,190
12 m	5.93	8,030	12	5.74	7,580	6 p.m.	3.10	1,750
2 p.m.	5.88	7,910				12	3.05	1,660
4	5.97	8,130	Apr. 2*					
6	6.35	9,040				Apr. 7*		
8	6.57	9,570	4 a.m.	6.09	8,420			
10	6.56	9,540	6	6.18	8,630	12 m	3.02	1,610
12	6.48	9,350	8	6.14	8,540	6 p.m.	2.98	1,530
			10	6.15	8,560	12	2.85	1,300
Mar. 30*			12 m	6.23	8,750			
			2 p.m.	6.26	8,820	Apr. 8*		
2 a.m.	6.48	9,350	4	6.28	8,870			
4	6.55	9,520	6	6.24	8,780	12 m	2.67	1,010
6	6.74	9,980	10	6.11	8,460	12 p.m.	2.56	836
8	6.91	10,400	12	6.00	8,200			
10	7.07	10,800				Apr. 9*		
12 m	7.28	11,300	Apr. 3*					
						12 m	2.42	638
			4 a.m.	5.62	7,290	12 p.m.	2.34	538
			8	5.14	6,140			
						Apr. 10*		
						12 m	2.26	442
						12 p.m.	2.21	390

*Daily means computed from data in addition to figures shown.

44. (4834.1) Otter Creek north of Sibley, Iowa

(Crest-stage station)

Location.--at NE corner sec. 29, T. 100N., R. 41W., at bridge on County Road H, 4.0 miles north of Sibley.

Drainage area.--11.9 sq mi.

Gage-height record.--Crest stages only.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 335 cfs and by contracted-opening measurement at 952 cfs.

Maxima.--March-April 1960: Discharge, 229 cfs Mar. 30 (gage height, 6.60 ft).
1952 to February 1960: Discharge, 982 cfs June 7, 1953 (gage height, 8.06 ft).

45. (4834.2) Schutte Creek near Sibley, Iowa

(Crest-stage station)

Location.--Near NW corner sec. 33, T. 100N., R. 42W., at culvert on county road, 6 miles northwest of Sibley.

Drainage area.--1.43 sq mi.

Gage-height record.--Crest stages only.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 75 cfs and by contracted-opening measurement at 503 cfs.

Maxima.--March-April 1960: Discharge, 100 cfs Mar. 30 (gage height, 4.17 ft).
1952 to February 1960: Discharge, 503 cfs June 7, 1953 (gage height, 5.15 ft, from floodmark).

48. (4834.3) Otter Creek at Sibley, Iowa

(Crest-stage station)

Location.--Near $M\frac{1}{4}$ corner sec. 14, T. 99N., R. 42W., at bridge on old State Highway 9, 1 mile northwest of Sibley.

Drainage area.--29.9 sq mi.

Gage-height record.--Crest stages only.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 1,290 cfs and by contracted-opening measurement at 5,430 cfs.

Maxima.--March-April 1960: Discharge, 554 cfs Mar. 30 (gage height, 7.74 ft).
1952 to February 1960: Discharge, 5,400 cfs June 7, 1953 (gage height, 9.82 ft).

47. (4834.4) Dawson Creek near Sibley, Iowa

(Crest-stage station)

Location.--Lat 43°24', long 95°44', near NW corner sec. 20, T. 99N., R. 41W., at culvert on County Road D, 2 miles southeast of Sibley.

Drainage area.--4.35 sq mi.

Gage-height record.--Crest stages only.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 113 cfs and by flow over embankment and sluice measurement at 4,290 cfs.

Maxima.--March-April 1960: Discharge, 440 cfs Mar. 30 (gage height, 5.27 ft).
1952 to February 1960: Discharge, 4,290 cfs June 7, 1953 (gage height, 8.21 ft).

43. (4834.5) Wagner Creek near Ashton, Iowa

(Crest-stage station)

Location.--Lat 43°21', long 95°47', on S line sec. 35, T. 99N., R. 42W., at bridge on county road, 3 miles northeast of Ashton.

Drainage area.--7.09 sq mi.

Gage-height record.--Crest stages only.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 275 cfs and by contracted-opening measurements at 1,710 cfs and 2,940 cfs.

Maxima.--March-April 1960: Discharge, 475 cfs Mar. 30 (gage height, 4.53 ft).
1952 to February 1960: Discharge, 2,840 cfs June 7, 1953 (gage height, 5.37 ft).

49. (4834.6) Otter Creek near Ashton, Iowa

Location.--Lat 43°20', long 95°26', near SE corner sec. 2, T. 98N., R. 42W., at bridge on county road, 2 miles northeast of Ashton.

Drainage area.--88.0 sq mi.

Gage-height record.--Crest stages only.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 5,590 cfs and by slope-area measurements at 7,080 cfs and 17,800 cfs.

Maxima.--March-April 1960: Discharge, 1,300 cfs Mar. 30 (gage height, 9.37 ft).
1952 to February 1960: Discharge, 17,400 cfs June 7, 1953 (gage height, 12.16 ft).

50. (4835) Rock River near Rock Valley, Iowa

Location.--Lat 43°12'05", long 96°20'15", in NE¼NE¼ sec. 25, T. 97N., R. 47W., on downstream side of bridge on U.S. Highway 18, 1.8 miles west of Rock Valley and 16.4 miles upstream from mouth.

Drainage area.--1,600 sq mi.

Gage-height record.--Water-stage recorder graph. Datum of gage is 1,216.00 ft above mean sea level (State Highway Commission bench mark).

Discharge record.--Stage-discharge relation defined by current-meter measurements; affected by ice Mar. 1-27.

Maxima.--March-April 1960: Discharge, 16,700 cfs 1 p.m. Mar. 31 (gage height, 15.38 ft).
1948 to February 1960: Discharge, 19,200 cfs June 21, 1954; gage height recorded, 15.99 ft June 8, 1953.
Flood in 1897 reached a stage of 17.0 ft (discharge not determined), from information by State Highway Commission.

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	17	9,400	9	16	1,080	17	15	855	25	16	395
2	17	13,700	10	16	832	18	15	735	26	18	366
3	17	12,500	11	16	700	19	15	665	27	300	352
4	17	6,950	12	16	690	20	15	595	28	7,150	352
5	17	4,130	13	16	1,830	21	15	530	29	13,300	366
6	16	3,260	14	16	2,650	22	15	485	30	14,100	380
7	16	1,740	15	16	1,740	23	15	455	31	14,500	-
8	16	1,420	16	16	1,080	24	15	425			
Monthly mean discharge, in cubic feet per second										1,605	2,355
Runoff, in acre-feet										98,710	140,100
Runoff, in inches										1.16	1.64

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1960

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Mar. 27			Mar. 30*			Apr. 2*		
6 a.m.	5.30		6 a.m.	14.90	14,100	6 a.m.	14.75	13,500
12 m	5.82		12 m	14.93	14,200	12 m	14.90	14,100
3 p.m.	6.35		6 p.m.	14.83	17,800	2 p.m.	14.93	14,200
6	9.08		12	14.70	13,300	6	14.88	14,000
9	10.73					12	14.77	13,600
12	11.53	5,040	Mar. 31*					
						Apr. 3*		
Mar. 28*			4 a.m.	14.73	13,400			
			8	14.99	14,500	12 m	14.60	12,900
6 a.m.	12.46	6,670	12 m	15.31	16,200	6 p.m.	14.38	12,000
12 m	13.00	7,750	1 p.m.	15.38	16,700	12	14.03	10,600
2 p.m.	12.80	7,350	2	15.34	16,400			
4	12.76	7,270	6	15.07	14,900	Apr. 4*		
6	12.90	7,550	12	14.36	11,900			
12	13.47	9,040				12 m	12.46	6,670
			Apr. 1*			6 p.m.	11.88	5,570
Mar. 29*						12	11.49	4,980
			4 a.m.	13.83	10,000			
3 a.m.	13.93	10,300	10	13.19	8,270	Apr. 5*		
9	14.68	13,200	12 m	13.07	7,940			
12 m	14.90	14,100	2 p.m.	13.10	8,020	6 a.m.	11.11	4,150
2 p.m.	15.00	14,500	6	13.41	8,880	10	11.03	4,020
4	15.03	14,700	12	14.36	11,900	12 p.m.	11.30	4,450
6	15.02	14,600						
12	14.93	14,200						

*Daily means computed from data in addition to figures shown.

51. (4840) Dry Creek at Hawarden, Iowa

Location.--Lat 42°59'45", long 96°28'15", in NE¼NE¼sec. 2 T. 94N., R. 48W., on left bank 6 ft downstream from bridge on State Highway 10 at east edge of Hawarden and 1.7 miles upstream from mouth.

Drainage area.--48.4 sq mi.

Gage-height record.--Water-stage recorder graph except Mar. 1-26. Wire weight gage read Mar. 23 and 26. Datum of gage is 1,170.42 ft above mean sea level, datum of 1929 (Corps of Engineers bench mark).

Discharge record.--Stage-discharge relation defined by current-meter measurements below 830 cfs and by contracted-opening measurement at 10,900 cfs; affected by ice Mar. 22-27.

Maxima.--March-April 1960: Discharge, 3,000 cfs 3:30 a.m. Apr. 2 (gage height, 15.36 ft).
1948 to February 1960: Discharge, 10,900 cfs June 7, 1953 (gage height, 17.57 ft).
Flood in September 1926 reached a stage of 18.0 ft (discharge not determined) and flood in 1934 reached a stage of 15.8 ft (discharge not determined), from information by State Highway Commission.

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	0	746	9	0	2.2	17	0	4.2	25	10	2.0
2	0	1,210	10	0	1.9	18	0	3.6	26	20	1.9
3	0	98	11	0	2.0	19	0	3.2	27	250	1.8
4	0	86	12	0	84	20	0	2.7	28	1,130	1.8
5	0	7.3	13	0	87	21	0	2.5	29	660	1.9
6	0	3.9	14	0	15	22	.2	2.4	30	156	1.9
7	0	3.1	15	0	6.1	23	1.0	2.2	31	25	-
8	0	2.6	16	0	4.7	24	5.0	2.0			
Monthly mean discharge, in cubic feet per second										72.8	79.8
Runoff, in acre-feet										4,480	4,750
Runoff, in inches										1.73	1.84

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1960

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Mar. 27			Mar. 29* Con.			Apr. 2*		
6 a.m.	6.82		4 p.m.	10.24	383	2 a.m.	15.32	2,940
10	7.05		5	10.08	364	3:30	15.36	3,000
12 m	7.95		6	10.03	358	4	15.34	2,980
3 p.m.	12.77		9	10.30	383	6	15.13	2,570
5	13.80		10	10.25	377	10	14.00	1,150
6	14.38		12	9.84	330	12 m	12.75	810
7	14.55		Mar. 30*			2 p.m.	10.05	364
10	14.15					4	8.73	205
12	14.70	1,960	3 a.m.	9.36	271	8	7.66	121
Mar. 28			6	8.95	230	12	7.06	85
			12 m	7.90	142	Apr. 3*		
1 a.m.	14.98	2,360	6 p.m.	6.94	77			
2	15.09	2,410	9	6.63	59	6 a.m.	6.67	61
3	15.08	2,400	12	6.45	48	2 p.m.	6.50	51
5	14.72	1,920				6	7.48	110
7	13.95	1,120	Mar. 31*			10	9.13	247
12 m	12.35	733				12	9.14	248
2 p.m.	12.17	699	12 m	6.03	23			
8	11.82	635	12 p.m.	5.74	8.3	Apr. 4*		
9	11.72	618						
10	11.77	626	Apr. 1*			6 a.m.	7.78	132
12	12.52	765				12 m	6.68	62
			6 a.m.	5.71	7.3	6 p.m.	6.18	32
Mar. 29*			8	6.93	77	12	5.88	15
			10	8.32	170			
3 a.m.	13.85	1,070	12 m	9.70	310	Apr. 5*		
5	14.08	1,200	2 p.m.	11.90	644			
7	13.65	1,000	4	12.60	775	12 m	5.65	5.7
12 m	11.45	572	6	13.55	975	12 p.m.	5.58	4.4
			10	15.25	2,800			
			12	15.27	2,840			

*Daily means computed from data in addition to figures shown.

52. (4855) Big Sioux River at Akron, Iowa

Location.--Lat 42°49'40", long 96°33'50", in W½sec. 31, T. 93N., R. 48W., on left bank 300 ft downstream from highway bridge in Akron and 2¾ miles upstream from Union Creek.

Drainage area.--9,030 sq mi, approximately, of which about 1,970 sq mi is probably noncontributing.

Gage-height record.--Water-stage recorder graph. Datum of gage is 1,118.90 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation defined by current-meter measurements. Backwater from ice Mar. 1-29.

Maxima.--March-April 1960: Discharge, 49,500 cfs 7 p.m. Apr. 1 (gage height, 21.56 ft).
1928 to February 1960: Discharge, 33,000 cfs Apr. 1, 1952, from rating curve extended above 20,000 cfs on basis of velocity-area study; gage height, 19.95 ft June 22, 1954.

Big Sioux River at Akron, Iowa

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	70	42,700	9	65	12,400	17	60	4,590	25	60	1,610
2	70	43,900	10	65	9,810	18	60	3,420	26	60	1,490
3	70	38,100	11	65	7,780	19	60	2,860	27	500	1,390
4	70	31,600	12	65	6,600	20	60	2,500	28	4,000	1,330
5	70	23,200	13	60	6,750	21	60	2,260	29	9,000	1,290
6	70	18,100	14	60	8,130	22	60	2,050	30	20,200	1,270
7	65	15,900	15	60	8,790	23	60	1,830	31	27,300	-
8	65	14,000	16	60	7,580	24	60	1,740			
Monthly mean discharge, in cubic feet per second										2,021	10,830
Runoff, in acre-feet										124,300	644,600
Runoff, in inches										0.33	1.71

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1960

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Mar. 29			Mar. 31			Apr. 1 Con.		
12 p.m.	19.73	15,200	6 a.m.	20.75	25,600	1 p.m.	21.54	42,500
			3 p.m.	20.38	27,900	7	21.56	49,500
Mar. 30			12	21.25	32,100	12	21.50	48,500
4 a.m.	20.07	17,800	Apr. 1			Apr. 2		
10	20.48	20,600						
2 p.m.	20.58	21,500	4 a.m.	21.29	39,200	6 a.m.	21.39	46,600
12	20.89	22,400	11	21.40	40,100	12 m	21.19	43,400
						12 p.m.	20.95	39,800

MISSOURI RIVER MAIN STEM

5. (4860) Missouri River at Sioux City, Iowa

Location.--Lat 42°29'10", long 96°24'45", in NW¼SE¼sec. 16, T. 29N., R. 9E., sixth principal meridian, on right bank on upstream side of bridge on U.S. Highway 77 at Sioux City, 2.0 miles downstream from Big Sioux River.

Drainage area.--314,600 sq mi, approximately.

Gage-height record.--Water-stage recorder graph. Datum of gage is 1,076.96 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation defined by current-meter measurements; affected by ice Mar. 1-30.

Maxima.--March-April 1960: Discharge, 101,000 cfs 7 p.m. Apr. 3 (gage height, 10.52 ft).
1928-31, 1938 to February 1960: Discharge, 441,000 cfs Apr. 14, 1952; gage height, 24.28 ft Apr. 14, 1952.

Remarks.--Flow partly regulated by upstream main stem reservoirs.

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	8,000	52,600	9	10,000	53,500	17	8,500	33,000	25	8,800	24,000
2	8,000	78,200	10	8,500	50,800	18	9,000	29,800	26	8,800	23,600
3	8,000	95,100	11	8,500	45,800	19	9,500	25,800	27	13,000	23,400
4	7,800	89,100	12	8,400	40,500	20	9,000	23,000	28	20,000	23,800
5	7,800	79,400	13	8,400	38,900	21	9,000	21,800	29	30,000	24,600
6	9,000	69,800	14	8,300	37,700	22	9,000	24,000	30	65,000	25,000
7	11,000	62,000	15	8,200	36,500	23	8,800	24,200	31	57,100	-
8	11,000	57,100	16	8,000	35,100	24	8,800	24,200			
Monthly mean discharge, in cubic feet per second										13,330	42,400
Runoff, in acre-feet										819,600	2,523,000
Runoff, in inches										-	-

PERRY CREEK BASIN

54. (5999.5) Perry Creek near Hinton, Iowa

(Crest-stage station)

Location.--Lat 42°38', long 96°23', near W¼ corner sec. 11, T. 90N., R. 47W., at bridge on State Highway 7, 4 miles west of Hinton.

Drainage area.--30.7 sq mi.

Gage-height record.--Crest stages only.

Discharge record.--Stage-discharge relation defined by current-meter measurement at 227 cfs, by slope-area measurement at 1,660 cfs, and by contracted-opening measurement at 4,930 cfs.

Maxima.--March-April 1960: Discharge, peak stage did not reach bottom of gage.
1953 to February 1960: Discharge, 4,980 cfs June 7, 1953 (gage height, 17.93 ft).

55. (6000) Perry Creek at 38th Street, Sioux City, Iowa

Location.--Lat 42°32'05", long 96°24'35", in SE¼SE¼sec. 8, T. 89N., R. 47W., on right upstream abutment of bridge on 38th Street in Sioux City, 3.6 miles upstream from mouth.

Drainage area.--65.1 sq mi.

Gage-height record.--Water-stage recorder graph except Apr. 3-10. Graph for Apr. 3 and 5 based on once-daily wire-weight gage readings. Datum of gage is 1,117.04 ft above mean sea level (city of Sioux City bench mark).

Discharge record.--Stage-discharge relation defined by current-meter measurements below 1,700 cfs and by slope-area measurement at 7,780 cfs; affected by ice Mar. 1-27.

Maxima.--March-April 1930: Discharge, 3,020 cfs 8:30 p.m. Apr. 1 (gage height, 13.05 ft).
1945 to February 1960: Discharge, 7,780 cfs Sept. 10, 1949 (gage height, 21.80 ft).
Flood of July 7, 1944, reached a stage of about 25.5 ft, from floodmarks (discharge, 9,600 cfs, by contracted-opening measurement by Corps of Engineers).

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	0.7	1,610	9	0.5	12	17	0.3	7.0	25	0.8	3.5
2	.6	768	10	.5	12	18	.3	6.0	26	2.5	2.9
3	.6	39	11	.4	11	19	.4	5.4	27	300	2.9
4	.6	20	12	.4	11	20	.5	5.4	28	718	3.8
5	.8	15	13	.4	15	21	.6	4.8	29	1,780	3.8
6	.5	14	14	.4	11	22	.6	4.2	30	549	2.7
7	.5	13	15	.4	8.5	23	.7	3.8	31	185	-
8	.5	13	16	.3	7.7	24	.7	3.5			
Monthly mean discharge, in cubic feet per second										114	88.0
Runoff, in acre-feet										7,040	5,240
Runoff, in inches										2.03	1.51

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1960

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Mar. 27			Mar. 29 Con.			Apr. 1 Con.		
6 a.m.	1.07		1 p.m.	10.70	2,140	8 a.m.	7.70	1,250
10	1.13		2	10.58	2,110	10	8.12	1,370
12 m	1.39		4	10.32	2,050	12 m	9.50	1,900
4 p.m.	4.54		6	10.15	1,980	2 p.m.	10.70	2,150
7	7.58		9	9.67	1,820	2:30	10.87	2,210
10	7.10		12	8.65	1,500	4	10.57	2,100
12	6.56	874	Mar. 30*			6	11.55	2,450
Mar. 28*						8:30	13.05	3,020
			4 a.m.	6.56	927	10	12.45	2,800
4 a.m.	5.08	538	8	4.85	535	12	11.50	2,430
8	4.07	353	12 m	3.56	305	Apr. 2		
12 m	3.52	263	3 p.m.	3.32	266			
4 p.m.	4.94	509	7	3.93	367	4 a.m.	10.50	2,070
6	7.48	1,110	10	3.78	340	8	5.75	733
8	8.60	1,450	12	3.95	371	12 m	3.33	268
10	8.91	1,540	Mar. 31			4 p.m.	2.61	164
12	8.82	1,520				8	2.17	110
Mar. 29			6 a.m.	3.20	248	12	1.87	76
			12 m	2.49	148	Apr. 3*		
3 a.m.	9.34	1,680	6 p.m.	2.05	95			
8	8.65	1,460	12	2.31	126	6 a.m.	1.57	48
10	9.50	1,730	Apr. 1			12 m	1.40	35
12 m	10.50	2,070				6 p.m.	1.30	28
			4 a.m.	2.61	163	12	1.24	24
			6	6.00	793			

*Daily means computed from data in addition to figures shown.

FLOYD RIVER BASIN

56. (6001) Floyd River at Alton, Iowa

Location.--Lat 42°58'40", long 96°00'00", in NE¼sec. 11, T. 94N., R. 44W., on left bank at downstream side of Chicago and North Western Railway Co. bridge at east edge of Alton, 22 miles upstream from confluence with West Floyd River and 42 miles upstream from mouth.

Drainage area.--285 sq mi.

Gage-height record.--Water-stage recorder graph. Datum of gage is 1,269.55 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 2,700 cfs and extended above by logarithmic plotting; affected by ice Mar. 9-28.

Maxima.--March-April 1960: Discharge, 4,150 cfs 5 p.m. Mar. 28 (gage height, 17.27 ft).
1955 to February 1960: Discharge, 1,130 cfs June 1, 1959 (gage height, 12.77 ft).

Floyd River at Alton, Iowa

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	2.5	771	9	2.2	44	17	2.1	45	25	2.4	23
2	2.3	2,420	10	2.2	38	18	2.2	38	26	2.6	22
3	2.3	2,000	11	2.2	36	19	2.2	35	27	200	21
4	2.3	282	12	2.2	34	20	2.2	32	28	2,200	23
5	2.2	121	13	2.2	75	21	2.2	29	29	2,580	29
6	2.2	81	14	2.2	124	22	2.3	27	30	917	30
7	2.2	64	15	2.1	73	23	2.3	25	31	289	-
8	2.2	53	16	2.1	54	24	2.3	24			
Monthly mean discharge, in cubic feet per second										201	222
Runoff, in acre-feet										12,390	13,240
Runoff, in inches										0.88	0.94

57. (6003) West Branch Floyd River near Struble, Iowa

Location.--Lat 42°55'15", long 96°10'30", in NE¼sec. 32, T. 94N., R. 45W., on right bank at downstream side of highway bridge, 0.2 mile west of U.S. Highway 75, 2.2 miles northeast of Struble, and 14 miles upstream from confluence with Floyd River.

Drainage area.--181 sq mi.

Gage-height record.--Water-stage recorder except Apr. 6-12, 15-23. Datum of gage is 1,239.40 ft above mean sea level (State Highway Commission bench mark).

Discharge record.--Stage-discharge relation defined by current-meter measurements; affected by ice Mar. 1-27. Discharge Apr. 6-12, 15-23 estimated on basis of one discharge measurement, weather records, and records for nearby stations.

Maxima.--March-April 1960: Discharge, 3,680 cfs 12:30 a.m. Mar. 29 (gage height, 14.72 ft).
1955 to February 1960: Discharge, 840 cfs July 4, 1957 (gage height, 11.32 ft).

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	0.2	1,340	9	0.1	35	17	0.1	48	25	0.2	24
2	.2	2,630	10	.1	25	18	.1	44	26	.3	22
3	.2	420	11	.1	20	19	.1	40	27	180	20
4	.2	161	12	.1	25	20	.1	36	28	3,130	19
5	.2	89	13	.1	260	21	.1	34	29	3,130	19
6	.2	65	14	.1	87	22	.1	32	30	605	20
7	.2	55	15	.1	55	23	.1	29	31	172	-
8	.2	45	16	.1	50	24	.1	26			
Monthly mean discharge, in cubic feet per second										233	193
Runoff, in acre-feet										14,320	11,490
Runoff, in inches										1.48	1.19

58. (6005) Floyd River at James, Iowa

Location.--Lat 42°34'30", long 96°18'45", in SE¼SE¼sec. 30, T. 90N., R. 46W., on right bank at downstream side of highway bridge at James, 10.7 miles upstream from mouth and 15.1 miles downstream from West Branch Floyd River.

Drainage area.--882 sq mi.

Gage-height record.--Water-stage recorder graph. Datum of gage is 1,102.59 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation defined by current-meter measurements; affected by ice Mar. 1-27.

Maxima.--March-April 1960: Discharge, 15,100 cfs 5 p.m. Mar. 29 (gage height, 21.93 ft).
1934 to February 1960: Discharge, 71,500 cfs June 8, 1953 (gage height, 25.3 ft, from flood-marks), from rating curve defined by current-meter measurements below 16,000 cfs and by contracted-opening and flow-over-embankment measurement of peak flow.

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	7.5	2,910	9	7.0	234	17	7.0	180	25	7.0	107
2	7.5	6,100	10	7.0	206	18	7.0	159	26	8.0	103
3	7.5	6,810	11	7.0	193	19	7.0	147	27	300	100
4	7.5	3,930	12	7.0	175	20	7.0	139	28	4,650	100
5	7.5	1,320	13	7.0	184	21	7.0	131	29	2,000	96
6	7.0	494	14	7.0	418	22	7.0	123	30	9,700	96
7	7.0	341	15	7.0	268	23	7.0	119	31	4,050	-
8	7.0	268	16	7.0	211	24	7.0	111			
Monthly mean discharge, in cubic feet per second										996	926
Runoff, in acre-feet										61,260	55,090
Runoff, in inches										1.30	1.17

Floyd River at James, Iowa

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1960

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Mar. 27			Mar. 31*			Apr. 4*		
6 a.m.	6.84		4 a.m.	19.32	5,380	6 a.m.	18.67	4,300
12 m	6.88		8	18.87	4,600	12 m	18.37	3,890
2 p.m.	7.05		12 m	18.54	4,110	6 p.m.	18.09	3,560
6	11.85		4 p.m.	18.02	3,470	12	17.74	3,190
12	17.40	2,870	8	17.22	2,730			
Mar. 28*			12	15.71	1,820	Apr. 5*		
			Apr. 1*			2 a.m.	17.43	2,890
4 a.m.	18.55	4,120				4	16.75	2,400
8	18.82	4,530	4 a.m.	14.86	1,450	6	15.60	1,770
12 m	18.98	4,770	8	16.05	2,000	8	14.50	1,320
4 p.m.	19.16	5,090	10	16.35	2,170	10	13.64	1,080
8	19.44	5,590	12 m	17.40	2,870	12 m	13.12	950
12	19.88	6,610	2 p.m.	17.84	3,290	2 p.m.	12.75	844
			6	18.43	3,970	4	12.43	780
Mar. 29*			12	19.27	5,290	8	11.92	682
						12	11.56	620
4 a.m.	20.02	6,980	Apr. 2*					
8	21.06	10,500				Apr. 6*		
10	21.61	13,300	4 a.m.	19.80	6,420			
12 m	21.76	14,200	8	20.24	7,620	4 a.m.	11.28	554
2 p.m.	21.84	14,700	12 m	20.71	9,160	8	11.02	518
5	21.93	15,100	3:30 p.m.	20.83	9,480	12 m	10.81	489
8	21.88	15,000	6	20.78	9,410	6 p.m.	10.51	453
10	21.83	14,600	8	20.73	9,230	12	10.24	421
12	21.76	14,200	12	20.58	8,690			
						Apr. 7*		
Mar. 30*			Apr. 3*					
						6 a.m.	10.02	367
4 a.m.	21.53	12,800	6 a.m.	20.32	7,860	12 m	9.78	341
8	21.21	11,200	12 m	19.99	6,880	6 p.m.	9.59	320
12 m	20.77	9,370	6 p.m.	19.60	5,940	12	9.41	301
4 p.m.	20.41	8,130	12	19.11	5,000			
8	20.09	7,170						
12	19.78	6,370						

*Daily means computed from data in addition to figures shown.

OMAHA CREEK BASIN

59. (6006) South Omaha Creek tributary near Walthill, Nebr.

(Crest-stage station)

Location.--Lat 42°06', long 96°30', in SW¼NW¼sec. 35, T. 25N., R. 8E., on right downstream wingwall of county highway bridge 3½ miles south of Walthill.

Drainage area.--2.64 sq mi.

Gage-height record.--Crest stages only.

Discharge record.--Stage-discharge relation defined by point of zero flow and low-flow estimates, and by indirect measurements at 366 cfs and 1,330 cfs.

Maxima.--March-April 1960: Discharge, 340 cfs, date unknown (gage height, 13.23 ft).
1950 to February 1960: Discharge, 1,410 cfs June 16, 1957 (gage height, 14.57 ft).

60. (6010) Omaha Creek at Homer, Nebr.

Location.--Lat 42°20', long 96°29', in SE¼sec. 11, T. 27N., R. 8E., on right pier on downstream side of bridge on main street of Homer.

Drainage area.--170 sq mi, approximately.

Gage-height record.--Water-stage recorder graph except Apr. 3-6. Datum of gage is 1,082.45 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation defined by current-meter measurements; affected by ice Mar. 1 to Apr. 1. Discharge Mar. 1 to Apr. 1 estimated on basis of discharge measurements, gage heights, engineers' notes, and weather records. Discharge Apr. 3-6 estimated on basis of discharge measurements, weather records, and records for stations on New York and Tekamah Creeks.

Maxima.--March-April 1960: Discharge, 1,460 cfs 1 a.m. Apr. 2 (gage height, 6.45 ft).
1945 to February 1960: Discharge, 14,400 cfs July 2, 1958 (gage height, 23.62 ft), from rating curve extended above 3,700 cfs on basis of slope-area measurements at 7,580 cfs and 14,400 cfs.
Greatest flood known occurred June 4, 1940 (stage, about 32.5 ft).

Omaha Creek at Homer, Nebr.

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	8.0	590	9	7.2	144	17	9.3	108	25	16	64
2	8.0	820	10	7.6	131	18	9.8	89	26	17	61
3	8.0	312	11	7.6	129	19	10	81	27	22	59
4	8.0	212	12	8.0	115	20	11	78	28	26	64
5	7.6	188	13	8.4	152	21	11	71	29	112	67
6	7.6	275	14	8.8	112	22	12	67	30	535	60
7	7.2	250	15	8.8	98	23	14	64	31	475	-
8	7.2	175	16	8.8	94	24	15	64			
Monthly mean discharge, in cubic feet per second										45.9	159
Runoff, in acre-feet										2,820	9,490
Runoff, in inches										-	-

MONONA-HARRISON DITCH BASIN

61. (6020) West Fork ditch at Holly Springs, Iowa

Location.--Lat 42°15'34", long 96°04'41", in SE¼SE¼sec. 16, T. 86N., R. 45W., on right bank 10 ft downstream from bridge on county road, three-quarters of a mile south of Holly Springs, 11.4 miles miles upstream from Wolf Creek, 15.7 miles north of Onawa, and 22 miles southeast of Sioux City.

Drainage area.--399 sq mi.

Gage-height record.--Water-stage recorder graph except Apr. 4-12 when gage-height record is doubtful. Datum of gage is 1,052.82 ft above mean sea level, datum of 1929 (Corps of Engineers bench mark).

Discharge record.--Stage-discharge relation defined by current-meter measurements below 2,000 cfs and extended to 3,300 cfs by logarithmic plotting; affected by ice Mar. 1-28. Indefinite stage-discharge relation Mar. 29, 30, due to levee break; discharge estimated on basis of rating at site three-quarters of a mile upstream. Discharge Apr. 4-12 estimated on basis of records for nearby stations.

Maxima.--March-April 1960: Discharge, about 10,000 cfs Mar. 30 (estimated on basis or records at former site, three-quarters of a mile upstream); gage height, 22.43 ft Mar. 30 (after levees broke in vicinity of gage), 25.2 ft, from floodmark, at former site three-quarters of a mile upstream.
1939 to February 1960: Discharge, 7,860 cfs June 20, 1954 (gage height, 22.91 ft, site then in use).

Remarks.--West Fork ditch is a dredged channel which diverts flow of West Fork Little Sioux River at Holly Springs and carries it 5.5 miles south, thence southeast 6.5 miles to a point 1.5 miles west of Kennebec, where Wolf Creek enters from left. From this point ditch roughly parallels Little Sioux River and becomes known as Monona-Harrison ditch 3 miles southwest of Turin.

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	12	1,640	9	11	215	17	11	124	25	10	62
2	12	2,830	10	11	200	18	11	119	26	12	59
3	12	2,200	11	11	180	19	11	109	27	50	56
4	12	700	12	11	175	20	11	94	28	1,000	57
5	12	480	13	11	183	21	10	92	29	3,600	59
6	12	340	14	11	202	22	10	88	30	8,000	59
7	11	280	15	11	148	23	10	73	31	2,060	-
8	11	241	16	11	133	24	10	64			
Monthly mean discharge, in cubic feet per second										484	375
Runoff, in acre-feet										29,750	22,340
Runoff, in inches										1.40	1.05

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1960

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Mar. 27			Mar. 29 Con.			Apr. 1*		
6 a.m.	4.96		12 m	17.35		2 a.m.	9.50	1,140
12 m	5.06		4 p.m.	19.07		4	9.62	1,170
4 p.m.	5.00		8	20.72		8	10.22	1,300
8	5.24		12	22.02		12 m	12.02	1,750
12	6.14		Mar. 30			2 p.m.	12.47	1,860
Mar. 28						6	12.85	1,960
			2 a.m.	22.22		12	13.90	2,250
3 a.m.	6.26		5:30	22.43		Apr. 2*		
6	7.03		12 m	22.15				
9	8.32		3 p.m.	21.95		6 a.m.	14.82	2,510
12 m	11.90		4	21.65		12 m	16.03	2,870
3 p.m.	13.47		6	19.85		4 p.m.	16.80	3,120
6	14.78		9	18.52		8	17.20	3,240
9	15.05		12	17.36	3,300	10	17.27	3,270
10	16.40		Mar. 31*			12	17.21	3,250
12	14.75					Apr. 3*		
Mar. 29			6 a.m.	15.37	2,670			
			12 m	13.23	2,060	2 a.m.	17.03	3,190
1 a.m.	14.54		6 p.m.	10.87	1,450	6	16.35	2,970
3	14.76		10	9.89	1,230	8	15.88	2,820
6	15.28		12	9.63	1,170	10	15.25	2,640
9	15.93					12 m	14.36	2,380
						6 p.m.	10.98	1,480
						12	8.72	968

*Daily means computed from data in addition to figures shown.

62. (6024) Monona-Harrison ditch near Turin, Iowa

Location.--Lat 41°57'55", long 95°59'30", in NE¼NW¼sec. 32, T. 83N., R. 44W., on right pier at downstream side of bridge on Brown's grade, 1.0 mile west of gaging station on Little Sioux River near Turin, 4 miles southwest of Turin, 5.2 miles northeast of Blencoe, and 12.5 miles upstream from mouth.

Drainage area.--900 sq mi.

Gage-height record.--Water-stage recorder graph except Apr. 11-18. Wire-weight gage read on Apr. 13. Datum of gage is 1,020.00 ft above mean sea level, datum of 1929 (Corps of Engineers bench mark).

Discharge record.--Stage-discharge relation defined by current-meter measurements; affected by ice Mar. 1-29.

Maxima.--March-April 1960: Discharge, 10,400 cfs 9 a.m. Mar. 30 (gage height, 16.32 ft).
1958 to February 1960: Discharge, 9,120 cfs May 31, 1959; gage height, 14.72 ft May 29, 1959.

Remarks.--Monona-Harrison ditch is a dug channel and is a continuation of West Fork ditch, paralleling Little Sioux River, and empties into the Missouri River 1½ miles upstream from mouth of Little Sioux River.

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	36	4,980	9	30	950	17	28	300	25	23	129
2	34	7,030	10	30	535	18	28	270	26	23	122
3	34	6,100	11	30	420	19	28	240	27	32	115
4	34	4,800	12	28	380	20	28	212	28	170	113
5	32	4,080	13	28	369	21	28	195	29	5,400	117
6	32	3,600	14	28	390	22	28	191	30	9,780	116
7	32	2,780	15	28	500	23	26	171	31	5,520	-
8	30	1,750	16	28	400	24	26	151			
Monthly mean discharge, in cubic feet per second										693	1,384
Runoff, in acre-feet										42,980	82,330
Runoff, in inches										0.90	1.72

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1960

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Mar. 28			Apr. 1*			Apr. 4* Con.		
6 a.m.	2.17		6 a.m.	10.18	4,140	12 m	10.96	4,770
12 m	2.27		10	10.30	4,240	12 p.m.	10.53	4,420
6 p.m.	3.42		12 m	10.52	4,420			
12	5.87		6 p.m.	12.17	5,870	Apr. 5*		
			10	13.53	7,280			
Mar. 29			12	13.82	7,600	6 a.m.	10.27	4,220
						12 m	10.08	4,080
6 a.m.	10.45		Apr. 2*			6 p.m.	9.95	3,940
12 m	12.08					12	9.87	3,900
6 p.m.	13.88		3 a.m.	13.95	7,800			
12	15.27	9,200	6	13.86	7,650	Apr. 6*		
			12 m	13.17	6,890			
Mar. 30			4 p.m.	12.78	6,480	6 a.m.	9.68	3,740
			6	12.70	6,400	12 m	9.48	3,580
4 a.m.	16.12	10,200	8	12.67	6,370	6 p.m.	9.24	3,390
9	16.32	10,400	12	12.72	6,420	12	8.98	3,190
12 m	16.22	10,300						
4 p.m.	15.98	9,980	Apr. 3*			Apr. 7*		
6	15.71	9,880						
12	13.73	7,500	4 a.m.	12.73	6,430	6 a.m.	8.71	3,000
			8	12.67	6,370	12 m	8.38	2,770
Mar. 31*			12 m	12.47	6,170	6 p.m.	8.02	2,510
			6 p.m.	12.09	5,790	12	7.62	2,270
6 a.m.	12.54	6,240	12	11.54	5,290			
12 m	11.72	5,450				Apr. 8*		
6 p.m.	11.03	4,830	Apr. 4*					
12	10.53	4,420				6 a.m.	7.16	2,000
			6 a.m.	11.15	4,940	12 m	6.64	1,720
						6 p.m.	6.18	1,490
						12	5.79	1,300

*Daily means computed from data in addition to figures shown.

LITTLE SIOUX RIVER BASIN

63. (6056) Little Sioux River at Gillett Grove, Iowa

Location.--Lat 43°01'05", long 95°02'45", in SE¼NW¼sec. 25, T. 95N., R. 36W., on left bank 5 ft downstream from highway bridge, 0.2 mile northwest of Gillett Grove and 0.9 mile above Elk Creek.

Drainage area.--1,334 sq mi.

Gage-height record.--Water-stage recorder graph. Datum of gage is 1,266.84 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation defined by current-meter measurements; affected by ice Mar. 1-28.

Maxima.--March-April 1960: Discharge, 5,140 cfs 6 a.m. Mar. 30 (gage height, 13.78 ft).
1958 to February 1960: Discharge, 4,500 cfs June 3, 1959 (gage height, 13.23 ft).
Flood of June 9, 1953, reached a stage of 17.87 ft, from floodmark (discharge, about 15,000 cfs).

Little Sioux River at Gillett Grove, Iowa

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	26	3,140	9	25	1,140	17	26	910	25	30	416
2	26	2,780	10	25	852	18	27	880	26	36	384
3	25	4,310	11	25	686	19	27	768	27	450	344
4	25	4,090	12	25	608	20	27	660	28	1,400	344
5	25	2,580	13	25	686	21	28	582	29	4,420	354
6	25	2,000	14	26	970	22	28	518	30	5,010	374
7	25	1,730	15	26	1,000	23	29	471	31	4,310	-
8	25	1,490	16	26	910	24	29	427			
Monthly mean discharge, in cubic feet per second										525	1,213
Runoff, in acre-feet										32,290	72,210
Runoff, in inches										0.45	1.01

64. (6066) Little Sioux River at Correctionville, Iowa

Location.--Lat 42°28'20", long 95°47'50", in NE¼NW¼sec. 1, T. 88N., R. 43W., on right bank 10 ft upstream from bridge on State Highway 31, 0.2 mile upstream from Bacon Creek, 0.5 mile west of Correctionville, and 0.8 mile downstream from Pierson Creek.

Drainage area.--2,500 sq mi.

Gage-height record.--Water-stage recorder graph except Mar. 1-21, when once-daily wire-weight gage readings were used. Datum of gage is 1,096.49 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 17,000 cfs and extended above by logarithmic plotting; affected by ice Mar. 1-28.

Maxima.--March-April 1960: Discharge, 16,000 cfs 9 p.m. Mar. 29 (gage height, 22.57 ft).
1918-25, 1928-32, 1936 to February 1960: Discharge, 20,900 cfs June 21, 1954 (gage height, 23.36 ft).
Flood of June 23 or 24, 1891, reached a stage of 29.34 ft, from levels to floodmark by Soil Conservation Service (discharge not determined).

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	120	7,660	9	110	2,980	17	110	1,410	25	110	820
2	120	8,440	10	110	2,180	18	110	1,330	26	110	775
3	120	9,080	11	110	1,790	19	110	1,260	27	200	730
4	120	8,600	12	110	1,440	20	110	1,220	28	2,500	715
5	115	6,300	13	110	1,520	21	110	1,150	29	14,200	700
6	110	4,800	14	110	1,410	22	110	1,050	30	13,500	685
7	110	4,970	15	110	1,290	23	110	948	31	8,440	-
8	110	4,390	16	110	1,330	24	110	884			
Monthly mean discharge, in cubic feet per second										1,347	2,729
Runoff, in acre-feet										82,800	162,400
Runoff, in inches										0.62	1.22

65. (6067) Little Sioux River near Kennebec, Iowa

Location.--Lat 42°04'55", long 96°00'50", in SE¼SW¼sec. 18, T. 84N. R. 44W., near left bank on downstream side of pier of bridge on Monona County Highway A, 1.1 miles south of Kennebec, 5.5 miles northeast of Onawa, and 6.2 miles upstream from Maple River.

Drainage area.--2,738 sq mi.

Gage-height record.--Water-stage recorder graph except Mar. 1-27. Datum of gage is 1,027.02 ft above mean sea level (Monona County Highway Department bench mark).

Discharge record.--Stage-discharge relation defined by current-meter measurements to 12,000 cfs and extended above by logarithmic plotting; affected by ice Mar. 1-29.

Maxima.--March-April 1960: Discharge, 16,400 cfs 9 p.m. Mar. 30 (gage height, 23.26 ft).
1939 to February 1960: Discharge, 13,500 cfs June 22, 1954; gage height, 26.63 ft June 21, 1954 (before levees broke in vicinity of gage).

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	120	8,470	9	120	3,440	17	115	1,820	25	110	1,200
2	120	8,750	10	120	2,700	18	115	1,920	26	110	1,090
3	120	8,190	11	115	2,220	19	115	1,920	27	110	998
4	120	8,610	12	115	1,970	20	115	1,820	28	500	937
5	120	7,230	13	115	1,920	21	110	1,770	29	5,000	897
6	120	5,130	14	115	1,920	22	110	1,670	30	14,900	857
7	120	4,420	15	115	1,820	23	110	1,470	31	13,100	-
8	120	4,420	16	115	1,770	24	110	1,340			
Monthly mean discharge, in cubic feet per second										1,181	3,090
Runoff, in acre-feet										72,630	183,800
Runoff, in inches										0.50	1.26

66. (6070) Odebolt Creek near Arthur, Iowa

Location.--Lat 42°20'05", long 95°22'55", in SE¼NE¼ sec. 21, T. 87N., R. 39W., near center of span on downstream side of county road bridge, 700 ft south of State Highway 175, 2 miles west of Arthur, 4.5 miles east of Ida Grove, and 5 miles upstream from mouth and Maple River.

Drainage area.--39.3 sq mi.

Gage-height record.--Water-stage recorder graph except Mar. 1-27, Apr. 10-24. Wire-weight gage read Mar. 21 and Apr. 18. Datum of gage is 1,258.57 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation defined by current-meter measurements; affected by ice Mar. 1-31. Discharge Apr. 10-17, 19-24 estimated on basis of weather records and records for nearby stations.

Maxima.--March-April 1960: Discharge, about 700 cfs 8 p.m. Mar. 29 (gage height, 13.00 ft, backwater from ice).
1957 to February 1960: Discharge, 5,160 cfs May 31, 1959 (gage height, 12.18 ft).
Flood of July 3, 1951, reached a stage of 11.96 ft, from floodmark (discharge, 4,320 cfs, from contracted-opening measurement of peak flow).

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	2.9	318	9	2.6	33	17	2.6	28	25	3.1	17
2	2.8	112	10	2.6	31	18	2.6	24	26	3.2	16
3	2.8	67	11	2.6	28	19	2.6	21	27	3.4	15
4	2.7	58	12	2.6	25	20	2.7	20	28	20	18
5	2.7	49	13	2.6	23	21	2.7	19	29	600	19
6	2.7	46	14	2.6	22	22	2.8	18	30	435	19
7	2.7	43	15	2.6	23	23	2.8	18	31	270	-
8	2.6	35	16	2.6	28	24	3.0	17			
Monthly mean discharge, in cubic feet per second										45.1	40.3
Runoff, in acre-feet										2,780	2,400
Runoff, in inches										1.32	1.15

67. (6072) Maple River at Mapleton, Iowa

Location.--Lat 42°09'30", long 95°48'25", in SE¼SE¼ sec. 23, T. 85N., R. 43W., on right pier on downstream side of bridge on State Highway 175, 80 ft downstream from Chicago and North Western Railway Co. bridge, 0.5 mile southwest of Mapleton, 12.5 miles northeast of Turin, and 16.0 miles upstream from mouth.

Drainage area.--669 sq mi.

Gage-height record.--Water-stage recorder graph except Mar. 1, 2, 4-16, Apr. 1-5. Datum of gage is 1,085.86 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation defined by current-meter measurements; affected by ice Mar. 1-29. Discharge Apr. 1-5 estimated on basis of weather records and records for nearby stations.

Maxima.--March-April 1960: Discharge, 11,400 cfs 10:30 a.m. Mar. 30 (gage height, 17.90 ft).
1941 to February 1960: Discharge, 15,600 cfs June 20, 1954; gage height, 22.1 ft June 12, 1950.

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	22	2,500	9	22	434	17	22	377	25	20	225
2	22	3,100	10	22	403	18	22	348	26	20	214
3	22	1,500	11	22	390	19	22	311	27	25	198
4	22	850	12	22	367	20	22	290	28	500	190
5	22	750	13	22	373	21	22	276	29	5,500	198
6	22	678	14	22	386	22	20	264	30	10,400	188
7	22	599	15	22	393	23	20	250	31	4,080	-
8	22	523	16	22	367	24	20	233			
Monthly mean discharge, in cubic feet per second										680	572
Runoff, in acre-feet										41,790	34,070
Runoff, in inches										1.17	0.95

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1960

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Mar. 27			Mar. 28 Con.			Mar. 30 Con.		
6 a.m.	3.48		7 p.m.	8.50		10:30 a.m.	17.90	11,400
12 m	3.58		8	10.00		4 p.m.	17.44	10,700
6 p.m.	3.94		12	10.42		8	16.25	9,200
12	5.04		Mar. 29			12	14.68	7,480
Mar. 28			6 a.m.	11.30		Mar. 31		
6 a.m.	5.79		12 m	13.10		6 a.m.	12.30	5,260
12 m	6.12		6 p.m.	15.60		12 m	10.27	3,710
6 p.m.	9.70		12	17.30	10,500	6 p.m.	9.10	2,890
			Mar. 30			12	8.32	2,350
			4 a.m.	17.64	11,000			
			8	17.78	11,200			

68. (6075) Little Sioux River near Turin, Iowa

Location.--Lat 41°57'55", long 95°58'20", in NW¼NE¼sec. 33, T. 83N., R. 44W., on downstream side of left pier of bridge on Brown's grade, 1.0 mile east of gaging station on Monona-Harrison ditch near Turin, 2.5 miles downstream from Maple River, 3.8 miles south of Turin, 6.2 miles northeast of Blencoe, and 13.8 miles upstream from mouth.

Drainage area.--3,526 sq mi.

Gage-height record.--Water-stage recorder graph except Apr. 12 when a graph, based on once-daily wire-weight gage readings, was used. Datum of gage is 1,019.85 ft above mean sea level, datum of 1929 (Corps of Engineers bench mark).

Discharge record.--Stage-discharge relation defined by current-meter measurements below 19,000 cfs and extended above by logarithmic plotting; affected by ice Mar. 1-29.

Maxima.--March-April 1960: Discharge, 23,900 cfs 8:30 p.m. Mar. 30 (gage height, 25.09 ft).
1958 to February 1960: Discharge, 14,000 cfs May 31, 1959 (gage height, 21.80 ft).

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	110	12,200	9	130	4,310	17	140	2,250	25	140	1,450
2	100	12,700	10	135	3,400	18	140	2,250	26	140	1,300
3	100	11,200	11	140	2,980	19	140	2,150	27	200	1,200
4	100	10,900	12	140	2,690	20	140	2,050	28	500	1,120
5	110	9,760	13	140	2,520	21	140	1,950	29	8,000	1,120
6	120	8,980	14	140	2,470	22	140	1,850	30	22,200	1,030
7	120	5,380	15	140	2,380	23	140	1,700	31	18,600	-
8	125	5,280	16	140	2,200	24	140	1,550			
Monthly mean discharge, in cubic feet per second										1,706	4,009
Runoff, in acre-feet										104,900	238,500
Runoff, in inches										0.56	1.27

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1960

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Mar. 27			Mar. 31*			Apr. 4		
6 a.m.	7.96		6 a.m.	24.11	21,100	6 a.m.	19.26	11,000
12 m	8.08		12 m	23.14	18,700	12 m	19.23	11,000
6 p.m.	8.68		6 p.m.	22.13	16,300	6 p.m.	19.19	10,900
12	8.53		12	21.09	14,200	12	19.07	10,700
Mar. 28			Apr. 1*			Apr. 5*		
6 a.m.	8.76		6 a.m.	20.12	12,400	6 a.m.	18.88	10,400
12 m	9.80		12 m	19.63	11,600	12 m	18.45	9,830
6 p.m.	12.56		2 p.m.	19.61	11,600	6 p.m.	17.93	9,100
11	14.80		6	19.90	12,000	12	17.41	8,370
12	13.85		12	20.23	12,600			
						Apr. 6*		
Mar. 29			Apr. 2					
						6 a.m.	16.88	7,660
1 a.m.	14.96		6 a.m.	20.46	13,000	12 m	16.28	6,940
2	19.71		12 m	20.44	13,000	6 p.m.	15.65	6,250
5	18.94		6 p.m.	20.25	12,600	12	15.19	5,790
12 m	21.16		12	19.90	12,000			
6 p.m.	22.30					Apr. 7*		
12	23.44	19,500	Apr. 3					
						6 a.m.	14.85	5,480
Mar. 30*			12 m	19.31	11,100	12 m	14.71	5,370
			6 p.m.	19.18	10,900	6 p.m.	14.62	5,300
6 a.m.	24.14	21,200	12	19.19	10,900	12	14.66	5,330
12 m	24.63	22,600						
6 p.m.	25.02	23,700						
8:30	25.08	23,900						
12	24.87	23,200						

*Daily means computed from data in addition to figures shown.

TEKAMAH CREEK BASIN

69. (6080) Tekamah Creek at Tekamah, Nebr.

Location.--Lat 41°46'30", long 96°13'10", in SE¼sec. 19, T. 21N., R. 11E., on left bank 30 ft upstream from bridge 1 block east of U.S. Highway 73 in Tekamah.

Drainage area.--23.0 sq mi.

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

Discharge record.--Stage-discharge relation defined by current-meter measurements below 96 cfs and shape of subsequent rating defined by current-meter measurement at 674 cfs and by slope-area measurements at 2,470 cfs and 4,400 cfs; affected by ice Mar. 1 to Apr. 2.

Maxima.--March-April 1960: Discharge, 650 cfs 12:30 a.m. Apr. 2 (gage height, 7.39 ft).
1949 to February 1960: Discharge, 4,400 cfs July 15, 1950; gage height, 15.10 ft Aug. 13, 1958.

Tekamah Creek at Tekamah, Nebr.

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	1.3	252	9	1.5	22	17	2.3	15	25	2.8	10
2	1.2	234	10	1.7	21	18	2.2	14	26	3.4	9.6
3	1.2	74	11	1.4	21	19	2.2	13	27	8.4	9.6
4	1.3	59	12	1.6	19	20	2.3	13	28	41	9.8
5	1.2	44	13	1.9	22	21	2.3	12	29	80	11
6	1.4	42	14	1.9	18	22	2.4	11	30	135	9.6
7	1.2	32	15	2.3	17	23	2.8	11	31	80	-
8	1.3	26	16	2.4	15	24	2.7	10			
Monthly mean discharge, in cubic feet per second										12.7	35.9
Runoff, in acre-feet										783	2,140
Runoff, in inches										-	-

SOLDIER RIVER BASIN

70. (6085) Soldier River at Pisgah, Iowa

Location.--Lat 41°49'50", long 95°55'50", in NW¼NE¼sec. 14, T. 81N., R. 44W., on left bank on downstream side of highway bridge at west edge of Pisgah, 2.8 miles downstream from Stowe Creek and 13.1 miles upstream from mouth.

Drainage area.--407 sq mi.

Gage-height record.--Water-stage recorder graph except Mar. 31, Apr. 2-7, 14-16, 23-30, when graph based on partial recorder trace and/or wire-weight gage readings was used. Datum of gage is 1,036.53 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation defined by current-meter measurements; affected by ice Mar. 1-29.

Maxima.--March-April 1960: Discharge, 4,310 cfs 7:30 p.m. Mar. 29 (gage height, 11.80 ft); gage height, 12.46 ft Mar. 28 (backwater from ice).
1940 to February 1960: Discharge, 22,500 cfs June 12, 1950 (gage height, 28.17 ft).

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	22	1,760	9	20	219	17	20	204	25	25	120
2	22	1,280	10	20	204	18	20	154	26	30	114
3	22	732	11	20	209	19	20	146	27	90	110
4	22	710	12	20	192	20	20	140	28	1,500	114
5	20	454	13	20	204	21	20	136	29	3,200	126
6	20	424	14	20	197	22	20	136	30	1,750	116
7	20	372	15	20	166	23	20	126	31	875	-
8	20	284	16	20	180	24	20	124			
Monthly mean discharge, in cubic feet per second										257	315
Runoff, in acre-feet										15,780	18,750
Runoff, in inches										0.73	0.86

NEW YORK CREEK BASIN

71. (6088) New York Creek north of Spiker, Nebr.

(Crest-stage station)

Location.--Lat 41°37', long 96°19', in NE¼NE¼sec. 17, T. 19N., R. 10E., on downstream side of abandoned concrete arch bridge, 100 ft west of gravelled county road (former State Highway 93) and 1.1 miles north of Spiker.

Drainage area.--6.50 sq mi.

Gage-height record.--Crest stages only.

Discharge record.--Stage-discharge relation defined by point of zero flow, low-flow estimates, and indirect measurements at 322 cfs, 1,380 cfs, and 3,090 cfs.

Maxima.--March-April 1960: Discharge, 280 cfs approximately, date unknown (gage height, 10.34 ft).
1951 to February 1960: Discharge, 3,160 cfs June 21, 1957 (gage height, 23.40 ft).

72. (6090) New York Creek at Herman, Nebr.

Location.--Lat 41°39'40", long 96°12'10", in NW¼sec. 32, T. 20N., R. 11E., on left bank about 350 ft downstream from bridge on U.S. Highway 73 and half a mile southeast of Herman.

Drainage area.--25.4 sq mi.

Gage-height record.--Water-stage recorder graph except Mar. 5, 6. Gage height for Mar. 6 estimated from fragmentary record. Datum of gage is 1,021.67 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 470 cfs and by slope-area measurement at 4,490 cfs; affected by ice Mar. 1 to Apr. 2.

Maxima.--March-April 1960: Discharge, 252 cfs 11 p.m. Apr. 1 (gage height, 8.20 ft).
1946 to February 1960: Discharge, 5,500 cfs July 15, 1950 (gage height, 19.5 ft, from floodmark), from rating curve extended above 600 cfs on basis of slope-area measurement at 5,500 cfs.
Flood of June 11, 1944, reached a stage of 20.8 ft, from floodmarks (discharge, 4,700 cfs, slope-area measurement).

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	1.8	109	9	2.3	17	17	1.9	12	25	3.7	7.9
2	2.1	100	10	2.5	16	18	2.0	11	26	4.0	7.7
3	2.0	44	11	2.1	16	19	2.2	10	27	11	7.7
4	1.7	30	12	1.8	14	20	2.3	9.3	28	38	8.5
5	1.5	26	13	1.7	14	21	2.3	8.5	29	90	9.9
6	1.8	25	14	1.7	14	22	2.6	8.5	30	64	7.9
7	2.0	23	15	1.9	13	23	2.8	8.2	31	49	-
8	2.0	18	16	1.9	12	24	3.0	8.5			
Monthly mean discharge, in cubic feet per second										9.99	20.6
Runoff, in acre-feet										614	1,220
Runoff, in inches										-	-

BOYER RIVER BASIN

73. (6095) Boyer River at Logan, Iowa

Location.--Lat 41°38'30", long 95°47'00", in SE¼NW¼sec. 19, T. 79N., R. 42W., on downstream handrail of county bridge, 300 ft downstream from Illinois Central Railroad bridge at Logan, 10.5 miles upstream from Willow Creek, and 15.8 miles upstream from mouth.

Drainage area.--871 sq mi.

Gage-height record.--Once-daily wire-weight gage readings except Mar. 27 to Apr. 5 when graph based on partial recorder trace and/or wire-weight gage readings was used. Datum of gage is 1,009.38 ft above mean sea level (Chicago and North Western Railway Co. bench mark).

Discharge record.--Stage-discharge relation defined by current-meter measurements; affected by ice Mar. 1-28.

Maxima.--March-April 1960: Discharge, 10,200 cfs 9 p.m. Mar. 29 (gage height, 14.62 ft, from floodmark).
1918-25, 1937 to February 1960: Discharge, 23,600 cfs June 16, 1957 (gage height, 21.5 ft).

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	50	3,040	9	45	740	17	40	535	25	40	326
2	50	2,870	10	45	605	18	40	518	26	40	321
3	50	1,430	11	45	570	19	40	518	27	200	300
4	50	1,300	12	40	570	20	40	395	28	2,500	287
5	50	1,020	13	40	552	21	40	366	29	6,340	292
6	45	935	14	40	535	22	40	380	30	5,020	305
7	45	890	15	40	470	23	40	366	31	3,740	-
8	45	800	16	40	440	24	40	326			
Monthly mean discharge, in cubic feet per second										610	733
Runoff, in acre-feet										37,530	43,640
Runoff, in inches										0.81	0.94

MISSOURI RIVER MAIN STEM

74. (6100) Missouri River at Omaha, Nebr.

Location.--Lat 41°15'30", long 95°55'20", in SE¼NW¼sec. 23, T. 15N., R. 13E., on right bank on left side of concrete flood wall, beneath Ak-Sar-Ben Bridge in Omaha, at mile 632.1.

Drainage area.--322,800 sq mi, approximately.

Gage-height record.--Water-stage recorder graph. Datum of gage is 958.24 ft above mean sea level, datum of 1929.

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

Maxima.--March-April 1960: Discharge, 120,000 cfs 8 a.m. Apr. 1; gage height, 16.96 ft 7 p.m. Apr. 4.
1928 to February 1960: Discharge, 396,000 cfs Apr. 18, 1952; gage height, 30.20 ft Apr. 18, 1952.

Remarks.--Flow partly regulated by upstream main stem reservoirs.

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	9,130	113,000	9	9,650	71,600	17	8,520	38,200	25	9,910	26,400
2	8,880	96,500	10	10,900	64,000	18	8,520	35,500	26	9,650	26,800
3	8,760	105,000	11	11,300	59,000	19	8,400	32,400	27	9,780	27,000
4	8,760	116,000	12	10,600	51,000	20	9,130	29,700	28	10,700	27,200
5	8,880	116,000	13	9,520	44,700	21	9,650	27,700	29	18,000	26,800
6	8,760	104,000	14	9,260	42,700	22	9,650	26,400	30	41,700	27,200
7	8,400	90,000	15	8,880	41,400	23	9,910	26,800	31	96,500	-
8	8,640	78,500	16	8,640	38,500	24	9,780	27,200			
Monthly mean discharge, in cubic feet per second										13,510	54,570
Runoff, in acre-feet										830,600	3,247,000
Runoff, in inches										-	-

INDIAN CREEK BASIN

75. (6105) Indian Creek at Council Bluffs, Iowa

Location.--Lat 41°17'40", long 95°49'55", in NW¼SE¼sec. 18, T. 75N., R. 43W., on downstream side of left pile bent of bridge on Mud Hollow Road at north edge of Council Bluffs, 8.8 miles upstream from mouth.

Drainage area.--7.99 sq mi.

Gage-height record.--Water-stage recorder graph except Mar. 3-8. Datum of gage is 1,036.86 ft above mean sea level (city of Council Bluffs bench mark).

Discharge record.--Stage-discharge relation defined by current-meter measurements below 1,200 cfs and extended above by logarithmic plotting; affected by ice Mar. 1-30.

Maxima.--March-April 1960: Daily discharge, 15 cfs Mar. 29 (affected by ice); gage height, 4.24 ft 12 m. Mar. 27 (affected by ice).
1954 to February 1960: Discharge, 2,200 cfs July 29, 1958 (gage height, 14.16 ft).

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	0.6	9.5	9	0.6	3.9	17	0.5	4.6	25	0.5	2.0
2	.6	7.4	10	.6	3.5	18	.5	3.3	26	.5	1.9
3	.6	5.9	11	.6	3.4	19	.5	3.0	27	2.0	1.9
4	.6	5.3	12	.5	3.2	20	.5	2.8	28	8.0	2.1
5	.6	4.9	13	.5	3.2	21	.5	2.8	29	15	2.3
6	.6	4.7	14	.5	2.8	22	.5	2.6	30	10	2.2
7	.6	4.4	15	.5	3.0	23	.5	2.2	31	7.6	-
8	.6	4.1	16	.5	4.0	24	.5	2.1			
Monthly mean discharge, in cubic feet per second										1.83	3.63
Runoff, in acre-feet										112	216
Runoff, in inches										0.26	0.51

PLATTE RIVER BASIN

76. (7740) Platte River near Duncan, Nebr.

Location.--Lat 41°22', long 97°29', in sec. 12 T. 16N., R. 2W., on left bank 25 ft downstream from highway bridge, 1½ miles south of Duncan, and 12 miles upstream from Loup River.

Drainage area.--61,600 sq mi, approximately.

Gage-height record.--Water-stage recorder graph. Datum of gage is 1,478.55 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 15,000 cfs; affected by ice Mar. 1-28.

Maxima.--March-April 1960: Discharge, 25,400 cfs 12:30 p.m. Mar. 28 (gage height, 6.36 ft).
1895-1909, 1912-15, 1928 to February 1960: Discharge, 44,100 cfs June 23, 1905 (gage height, 6.50 ft, at site 7 miles downstream at different datum), from rating curve extended above 34,000 cfs.

Remarks.--Peak discharges appreciably affected by storage reservoirs since June 1909.

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	750	7,680	9	1,190	3,420	17	1,500	2,340	25	4,800	1,610
2	750	8,500	10	1,190	2,880	18	1,710	2,400	26	7,000	1,560
3	590	7,450	11	1,190	2,460	19	1,940	2,400	27	17,000	1,340
4	590	6,550	12	1,130	2,560	20	2,200	2,310	28	22,900	1,230
5	670	6,190	13	1,100	2,620	21	2,480	1,990	29	18,400	2,100
6	750	4,900	14	1,190	2,310	22	2,950	2,500	30	9,200	2,590
7	915	3,960	15	1,290	2,310	23	3,650	2,100	31	7,720	-
8	1,080	3,700	16	1,390	2,220	24	4,050	1,850			
Monthly mean discharge, in cubic feet per second										3,976	3,288
Runoff, in acre-feet										244,500	194,400
Runoff, in inches										-	-

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1960

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Mar. 28*			Mar. 30*			Apr. 1*		
12:30 p.m.	6.36	25,400	4 a.m.	3.99	10,400	12 m	3.42	7,540
12	6.00	22,900	8	3.81	9,450	12 p.m.	3.63	8,550
			12 m	3.69	8,850			
Mar. 29*			6 p.m.	3.59	8,350	Apr. 2*		
			12	3.58	8,300			
4 a.m.	6.03	23,100				12 m	3.62	8,500
8	5.86	21,300	Mar. 31*			12 p.m.	3.58	8,300
12 m	5.51	19,500						
4 p.m.	5.03	16,400	12 m	3.46	7,720			
8	4.55	13,500	12 p.m.	3.37	7,320			
12	4.21	11,500						

*Daily means computed from data in addition to figures shown.

77. (7918) Cedar River at Belgrade, Nebr.

Location.--Lat 41°28'26", long 98°04'53", in SE¼NE¼sec. 2, T. 17N., R. 7W., near right bank on downstream side of pier of highway bridge, 0.6 mile west of Belgrade and 4½ miles upstream from Timber Creek.

Drainage area.--1,060 sq mi, approximately, of which about 320 sq mi contributes directly to surface runoff.

Gage-height record.--Water-stage recorder graph. Datum of gage is 1,696.82 ft above mean sea level, datum of 1929 (levels by Bureau of Reclamation).

Discharge record.--Discontinuous stage-discharge relation defined by current-meter measurements below 2,800 cfs; affected by ice Mar. 1-29.

Maxima.--March-April 1960: Discharge, 2,600 cfs 3:30 a.m. Mar. 28 (gage height, 8.64 ft, backwater from ice).
1959 to February 1960: 340 cfs, estimated, Nov. 22, 1959 (no gage-height record).

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	177	983	9	193	535	17	246	490	25	264	224
2	187	650	10	198	454	18	255	490	26	274	212
3	189	540	11	202	384	19	262	432	27	1,350	198
4	171	490	12	206	324	20	282	400	28	2,000	246
5	168	422	13	208	312	21	291	295	29	1,500	275
6	176	392	14	214	324	22	286	292	30	1,180	285
7	183	398	15	204	300	23	284	295	31	730	-
8	189	736	16	219	324	24	275	258			
Monthly mean discharge, in cubic feet per second										405	398
Runoff, in acre-feet										24,880	23,680
Runoff, in inches										-	-

Cedar River at Belgrade, Nebr.

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1960

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Mar. 29*			Mar. 30 Con.			Apr. 1*		
11 a.m.	4.34	1,360	3 p.m.	4.05	1,180	4 a.m.	3.12	656
3 p.m.	4.63	1,590	9	3.65	930	8	3.60	994
7	4.83	1,750	12	3.51	850	11	3.93	1,260
12	4.52	1,500	Mar. 31*			1 p.m.	3.93	1,260
Mar. 30						6	3.66	1,060
			6 a.m.	3.41	808	12	3.38	850
4 a.m.	4.42	1,420	12 m	3.27	724	Apr. 2*		
8	4.16	1,240	6 p.m.	3.07	612			
12 m	4.02	1,150	12	3.03	590	6 a.m.	3.13	684
						12 m	3.00	612
						12 p.m.	3.00	612

*Daily means computed from data in addition to figures shown.

78. (7920) Cedar River near Fullerton, Nebr.

Location.--Lat 41°23'45", long 98°00'15", on line between SE¼SE¼sec. 33, T. 17N., R. 6W., and NE¼NE¼ sec. 4, T. 16N., R. 6W., near left bank on downstream end of pier of bridge on State Highway 52, 3 miles northwest of Fullerton and 5¾ miles upstream from mouth.

Drainage area.--1,220 sq mi, approximately, of which about 480 sq mi contributes directly to surface runoff.

Gage-height record.--Water-stage recorder graph except Mar. 27 to Apr. 1, Apr. 16, 24-26 when gage heights were estimated from fragmentary record, Apr. 12, 14 when gage heights were based on wire-weight gage readings, and Apr. 13, 15. Datum of gage is 1,640.40 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 2,900 cfs; affected by ice Mar. 1-29. Discharge Apr. 13, 15 interpolated and rounded to arbitrary limits.

Maxima.--March-April 1960: Discharge, 4,300 cfs Mar. 28; gage height, 11.75 ft Mar. 28 (backwater from ice).
1931-32, 1940 to February 1960: Discharge, 10,100 cfs July 19, 1950 (gage height, 9.64 ft).

Remarks.--Flood flow not appreciably affected by power developments.

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	161	1,190	9	197	588	17	269	521	25	270	259
2	172	790	10	204	503	18	289	528	26	336	185
3	165	621	11	211	398	19	287	402	27	900	200
4	162	544	12	214	342	20	287	369	28	3,300	238
5	155	417	13	223	350	21	299	293	29	2,000	282
6	173	407	14	235	356	22	306	312	30	1,760	270
7	177	393	15	230	340	23	296	321	31	946	-
8	192	738	16	240	329	24	284	300			
Monthly mean discharge, in cubic feet per second										482	426
Runoff, in acre-feet										29,630	25,320
Runoff, in inches										-	-

79. (7930) Loup River near Genoa, Nebr.

Location.--Lat 41°25'05", long 97°43'25", in SW¼NE¼sec. 25, T. 17N., R. 4W., near right bank on downstream side of pier of bridge on State Highway 39, with auxiliary gage on right bank upstream from bridge, 2 miles south of Genoa, 3 miles upstream from Beaver Creek, and 6 miles downstream from diversion of Loup River Public Power District.

Drainage area.--14,400 sq mi, approximately, of which only about 6,000 sq mi contributes directly to surface runoff.

Gage-height record.--Water-stage recorder graph except Mar. 1-30, for which graph was drawn on basis of twice-daily wire-weight gage readings and fragmentary recorder graph. Datum of gage is 1,540.13 ft above mean sea level, unadjusted.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 28,000 cfs; affected by ice Mar. 1-28.

Maxima.--March-April 1960: Discharge, 45,000 cfs (revised) 3 p.m. Mar. 28; gage height, 11.7 ft 11 a.m. Mar. 28 (backwater from ice).
1928-32, 1943 to February 1960: Discharge, 90,000 cfs June 23, 1947 (gage height, 10.12 ft), from rating curve extended above 32,000 cfs by logarithmic plotting.

Loup River near Genoa, Nebr.

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	110	4,680	9	72	746	17	226	666	25	2,100	218
2	110	4,780	10	82	618	18	265	1,290	26	3,720	420
3	96	2,650	11	82	594	19	312	788	27	9,300	264
4	82	2,000	12	82	718	20	360	498	28	31,700	200
5	82	1,050	13	106	390	21	475	400	29	25,600	546
6	82	802	14	129	844	22	664	350	30	12,700	498
7	75	844	15	158	450	23	980	231	31	5,080	-
8	75	914	16	196	180	24	1,400	115			
Monthly mean discharge, in cubic feet per second										3,113	958
Runoff, in acre-feet										191,400	57,010
Runoff, in inches										-	-

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1960

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Mar. 28			Mar. 29 Con.			Mar. 30		
12 p.m.	10.51	43,700	1 p.m.	9.54	21,000	2 a.m.	9.24	17,900
			2	9.84	25,000	4	9.06	16,400
Mar. 29			4	9.59	21,600	8	8.70	14,300
			5	9.79	24,300	12 m	8.40	12,800
2 a.m.	10.21	33,000	6	9.59	21,600	4 p.m.	7.90	10,400
4	9.89	25,800	7	9.55	21,100	8	7.50	8,600
5	9.88	25,700	9	9.70	23,000	12	7.15	7,200
6	9.94	26,800	11	9.75	23,700			
7	9.90	26,000	12	9.59	21,600			
10	10.22	33,300						
12 m	9.97	27,300						

80. (7940) Beaver Creek at Genoa, Nebr.

Location.--Lat 41°26'30", long 97°44'00", in SE¼SE¼sec. 14, T. 17N., R. 4W., on left bank in city park at southwest corner of Genoa, 0.2 mile downstream from Union Pacific Railroad bridge, 0.2 mile upstream from bridge on State Highway 39, and 2½ miles upstream from mouth.

Drainage area.--627 sq mi, of which about 410 sq mi contributes directly to surface runoff.

Gage-height record.--Water-stage recorder graph except Mar. 1-8, 28, 29, Apr. 3-6. Datum of gage is 1,542.13 ft above mean sea level, unadjusted.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 2,400 cfs; affected by ice Mar. 1-29. Discharge, Mar. 1-8, 28, 29, estimated on basis of discharge measurements, gage heights, engineers' notes, and weather records; Apr. 3-6, estimated on basis of discharge measurements, weather records, and records for Shell Creek at Newman Grove.

Maxima.--March-April 1960: Discharge, 3,340 cfs 9 p.m. Mar. 30 (gage height, 12.02 ft).
1940 to February 1960: Discharge, 21,200 cfs July 19, 1950 (gage height, 18.70 ft, at site 0.4 mile upstream at datum 4.62 ft higher), from rating curve extended above 8,500 cfs.

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	70	1,650	9	67	420	17	99	169	25	150	119
2	70	1,350	10	67	306	18	106	160	26	200	114
3	65	900	11	66	245	19	109	165	27	300	110
4	65	700	12	66	208	20	112	156	28	800	114
5	60	660	13	69	187	21	116	144	29	1,500	117
6	60	620	14	76	169	22	121	136	30	2,760	126
7	65	565	15	86	182	23	126	130	31	2,510	-
8	65	546	16	96	176	24	130	126			
Monthly mean discharge, in cubic feet per second										331	359
Runoff, in acre-feet										20,330	21,360
Runoff, in inches										-	-

81. (7945) Loup River at ~~Columbus, Nebr.~~

Location.--Lat 41°24'50", long 97°22'00", in sec. 30, T. 17N., R. 1E., on left bank 20 ft downstream from highway bridge on U.S. Highway 30 at Columbus, 3½ miles upstream from mouth, and 14 miles downstream from Looking-glass Creek.

Drainage area.--15,200 sq mi, approximately, of which about 6,530 sq mi contributes directly to surface runoff.

Gage-height record.--Water-stage recorder graph except for Apr. 9-12 when intakes were partially plugged. Datum of gage is 1,430.29 ft above mean sea level, unadjusted.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 39,000 cfs and extended above by logarithmic plotting; affected by ice Mar. 1-27. Discharge Apr. 9-12 estimated on basis of weather records, trend of flow, and records for station near Genoa.

Maxima.--March-April 1960: Discharge, 52,000 cfs 9:30 p.m. Mar. 28 (gage height, 10.50 ft). 1894-1915, 1931, 1933 to February 1960: Discharge, 85,000 cfs June 23, 1947 (gage height, 12.0 ft, from floodmark), from rating curve extended above 30,000 cfs by logarithmic plotting.

Remarks.--Records do not include flow of Loup River power canal which diverts at point 25 miles upstream and returns to Platte River below mouth of Loup River.

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	198	6,830	9	156	2,100	17	400	802	25	2,220	408
2	198	6,840	10	156	1,500	18	430	1,410	26	4,050	445
3	198	3,870	11	177	1,300	19	470	1,410	27	9,500	530
4	198	3,300	12	177	1,350	20	530	1,010	28	30,900	400
5	198	2,550	13	198	1,240	21	525	754	29	37,400	470
6	198	1,850	14	223	876	22	850	636	30	18,400	814
7	177	1,700	15	305	1,380	23	1,050	587	31	8,950	-
8	156	1,700	16	370	826	24	1,520	470			
Monthly mean discharge, in cubic feet per second										3,890	1,645
Runoff, in acre-feet										239,200	97,900
Runoff, in inches										-	-

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1960

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Mar. 27			Mar. 28*Con.			Mar. 29* Con.		
12 p.m.	6.75	12,500	7:30 p.m.	10.42	50,900	8 p.m.	8.68	28,800
			8:30	10.38	50,300	12	8.28	24,800
Mar. 28*			9:30	10.50	52,000			
			10:30	10.38	50,300	Mar. 30*		
2 a.m.	6.90	13,400	12	10.28	48,900			
4	7.08	14,700				2 a.m.	7.94	22,400
6	7.28	16,100	Mar. 29*			3	8.06	23,100
8	7.53	18,000				5:30	8.29	24,900
10	7.96	21,600	4 a.m.	10.16	47,200	9	7.99	22,500
12 m	8.68	28,800	8	9.86	43,000	11	7.64	20,200
2 p.m.	9.28	35,400	10	9.71	40,900	1 p.m.	7.24	17,700
4	9.87	43,200	12 m	9.49	37,900	4	6.72	15,100
6	10.22	48,100	4 p.m.	9.08	33,000	5:30	6.75	15,400
						9	6.29	13,200
						12	6.14	12,500

*Daily means computed from data in addition to figures shown.

82. (7955) Shell Creek near Columbus, Nebr.

Location.--Lat 41°31'30", long 97°17'00", in NE¼NW¼sec. 23, T. 18N., R. 1E., on right bank 80 ft upstream from county road bridge, 1 mile upstream from Loseke Creek, and 7 miles northeast of Columbus.

Drainage area.--270 sq mi, approximately.

Gage-height record.--Water-stage recorder graph except Mar. 1-29, when float was affected by ice in well, and Mar. 30 to Apr. 5 when intake action was faulty. Graph was reconstructed for period Mar. 30 to Apr. 5 on basis of wire-weight gage readings.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 2,100 cfs; affected by ice Mar. 1 to Apr. 1. Discharge Mar. 1 to Apr. 1 estimated on basis of discharge measurements, gage heights, engineers' notes, and weather records.

Maxima.--March-April 1960: Discharge, 1,640 cfs 7:30 a.m. Apr. 2; gage height, 19.7 ft Mar. 30 (backwater from ice).
1947 to February 1960: Discharge, 5,970 cfs June 3, 1950 (gage height, 21.38 ft); gage height, 21.7 ft June 2, 1947, from floodmarks.

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1		830	9		68	17	11	29	25	25	20
2		1,260	10		49	18	12	33	26	40	18
3		503	11		42	19	13	31	27	75	19
4	8	296	12	8	39	20	14	28	28	400	19
5		199	13		37	21	15	26	29	950	18
6		132	14		36	22	16	24	30	1,400	19
7		115	15		34	23	18	22	31	1,200	-
8		89	16	10	31	24	20	21			
Monthly mean discharge, in cubic feet per second										140	136
Runoff, in acre-feet										8,610	8,110
Runoff, in inches										-	-

83. (7980) Platte River at North Bend, Nebr.

Location.--Lat 41°27'10", long 96°45'50", in SE¼sec. 7, T. 17N., R. 8E., on left bank 30 ft upstream from bridge on State Highway 79, 1 mile south of North Bend, and 5 miles downstream from Shell Creek.

Drainage area.--77,800 sq mi, approximately.

Gage-height record.--Water-stage recorder graph. Datum of gage is 1,264.32 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 59,000 cfs and extended above by logarithmic plotting; affected by ice Mar. 1-29.

Maxima.--March-April 1960: Discharge, 112,000 cfs 12:00 m. Mar. 29 (gage height, 8.04 ft, backwater from ice).
1949 to February 1960: Discharge, 44,200 cfs June 17, 1957 (gage height, 6.06 ft); gage height, 8.17 ft Feb. 13, 1952 (backwater from ice).

Remarks.--Regulation by powerplants above station does not affect floodflow.

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	3,570	23,100	9	3,120	7,420	17	4,100	5,480	25	9,100	4,580
2	3,680	22,200	10	3,540	6,950	18	4,500	5,620	26	11,200	4,280
3	3,540	16,000	11	3,570	6,300	19	4,700	6,860	27	16,000	4,650
4	3,480	14,100	12	3,570	5,670	20	4,950	6,260	28	22,500	4,720
5	3,300	12,800	13	3,840	5,890	21	5,700	5,600	29	67,600	4,650
6	3,180	11,200	14	3,980	5,940	22	6,200	5,210	30	59,900	5,700
7	3,150	9,320	15	3,900	5,960	23	7,300	5,170	31	29,800	-
8	3,120	8,170	16	3,900	6,190	24	7,900	4,790			
Monthly mean discharge, in cubic feet per second										10,260	8,026
Runoff, in acre-feet										630,500	477,600
Runoff, in inches										-	-

Platte River at North Bend, Nebr.

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1960

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Mar. 29*			Mar. 30*Con.			Apr. 1*		
4 a.m.	6.00		7 a.m.	6.60	67,000	4 a.m.	4.76	24,900
6	6.08		11	6.23	55,900	8	4.59	22,400
9	6.77		3 p.m.	5.88	47,000	12 m	4.39	19,700
10	6.67		8	5.60	40,000	6 p.m.	4.78	25,200
11	8.03		11	5.69	42,000	12	4.66	23,400
12 m	8.04		12	5.64	41,000	Apr. 2*		
2 p.m.	7.51							
6	7.08	83,800	Mar. 31*					
8	7.03	82,000				2 a.m.	4.68	23,700
12	7.63	106,000	4 a.m.	5.41	36,200	4	4.90	27,000
			8	5.19	31,800	8	4.60	22,500
Mar. 30*			12 m	5.06	29,400	12 m	4.47	20,600
			4 p.m.	4.96	27,900	12 p.m.	4.44	20,300
1 a.m.	7.71	110,000	8	4.76	24,900			
3	7.25	90,000	12	4.73	24,400			
5	6.81	74,400						

*Daily means computed from data in addition to figures shown.

84. (7975) Elkhorn River at Ewing, Nebr.

Location.--Lat 42°16'10", long 98°20'20", in sec. 35, T. 27N., R. 9W., on right bank 350 ft downstream from bridge on State Highway 108, three-quarters of a mile north of Ewing, and 1½ miles upstream from South Fork.

Drainage area.--1,400 sq mi, approximately, of which about 740 sq mi contributes directly to surface runoff.

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

Discharge record.--Stage-discharge relation defined by current-meter measurements below 5,700 cfs; affected by ice Mar. 1-28.

Maxima.--March-April 1960: Discharge, 6,440 cfs 3:30 p.m. Mar. 29 (gage height, 10.66 ft); gage height, 10.97 ft Mar. 28 (backwater from ice).
1947 to February 1960: Discharge, 7,280 cfs Apr. 7, 1949 (gage height, 10.74 ft); gage height, 11.32 ft June 23, 24, 1947, from floodmark.

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	73	2,780	9	72	1,820	17	79	1,070	25	116	448
2	72	2,060	10	72	1,360	18	84	918	26	135	364
3	70	1,570	11	69	1,110	19	86	1,010	27	377	346
4	66	1,620	12	68	1,060	20	88	1,150	28	2,220	490
5	62	2,080	13	68	1,220	21	91	998	29	5,530	671
6	65	3,260	14	72	1,150	22	94	762	30	4,040	783
7	66	2,950	15	73	1,130	23	101	615	31	3,160	-
8	68	2,480	16	76	1,260	24	104	505			
Monthly mean discharge, in cubic feet per second										591	1,301
Runoff, in acre-feet										34,490	77,430
Runoff, in inches										-	-

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1960

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Mar. 28			Mar. 30			Apr. 1*		
12 p.m.	10.62	6,280	12 m	9.79	3,980	12 m	9.13	2,840
			12 p.m.	9.60	3,600	12 p.m.	8.83	2,480
Mar. 29*								
			Mar. 31*			Apr. 2*		
3:30 a.m.	10.66	6,440						
12 m	10.38	5,440	12 m	9.31	3,120	10 a.m.	8.32	1,960
4 p.m.	10.25	5,050	12 p.m.	9.13	2,840	12 m	8.37	2,000
12	10.10	4,600				6 p.m.	8.38	2,000
						12	8.18	1,840

*Daily means computed from data in addition to figures shown.

85. (7990) Elkhorn River near Norfolk, Nebr.

Location.--Lat 42°00'20", long 97°28'40", in SW¼sec. 31, T. 24N., R. 1W., on left bank 75 ft downstream from bridge on county road, 3½ miles west-southwest of Norfolk, and 7 miles upstream from North Fork Elkhorn River.

Drainage area.--2,790 sq mi, approximately, of which about 2,400 sq mi contributes directly to surface runoff.

Gage-height record.--Water-stage recorder graph except Mar. 1, 4-17, Apr. 13, 15-25. Datum of gage is 1,522.83 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 13,000 cfs; affected by ice Mar. 1-28. Discharge Apr. 13, 15-25 estimated on basis of discharge measurements, gage heights, engineers' notes, and weather records.

Maxima.--March-April 1960: Discharge, 13,500 cfs 10 p.m. Mar. 30 (gage height, 8.60 ft).
1945 to February 1960: Discharge, 12,600 cfs June 26, 1947 (gage height, 11.1 ft, from graph based on gage readings); maximum observed gage height, 13.63 ft Mar. 11, 1949 (backwater from ice), at site 3¾ miles downstream at datum 17.88 ft lower.

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	295	7,960	9	244	4,210	17	187	2,100	25	685	1,000
2	295	6,500	10	248	3,540	18	198	2,000	26	931	808
3	275	4,210	11	222	3,050	19	252	2,100	27	1,950	726
4	239	3,310	12	206	2,730	20	343	2,150	28	3,500	782
5	206	3,360	13	190	2,410	21	427	2,300	29	5,650	991
6	222	4,210	14	190	2,410	22	495	2,400	30	11,200	1,000
7	230	4,660	15	190	2,200	23	535	1,900	31	10,200	-
8	248	4,900	16	187	2,400	24	589	1,400			
Monthly mean discharge, in cubic feet per second										1,316	2,790
Runoff, in acre-feet										80,940	166,100
Runoff, in inches										-	-

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1960

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Mar. 29			Mar. 31*			Apr. 1*Con.		
12 m	5.75	5,190	2 a.m.	8.43	13,000	8 p.m.	7.00	8,700
12 p.m.	6.79	7,790	12 m	7.45	10,000	12	6.74	7,930
			6 p.m.	6.95	8,600			
Mar. 30*			12	6.67	7,740	Apr. 2*		
12 m	7.91	11,400	Apr. 1*			12 m	6.27	6,620
9 p.m.	8.56	13,400				12 p.m.	5.70	5,080
10	8.60	13,500	6 a.m.	6.45	7,120			
12	8.52	13,300	12 m	6.73	7,900	Apr. 3		
			4 p.m.	7.00	8,700			
						12 m	5.27	3,980
						12 p.m.	5.20	3,810

*Daily means computed from data in addition to figures shown.

86. (7995) Logan Creek near Uehling, Nebr.

Location.--Lat 41°42'50", long 96°31'15", on south line of SE¼SE¼sec. 9, T. 20N., R. 8E., on right bank on downstream side of bridge on county road, 2 miles southwest of Uehling and 8 miles upstream from mouth.

Drainage area.--1,030 sq mi, approximately.

Gage-height record.--Water-stage recorder graph except Mar. 31, Apr. 1, 6-19. Graph based on wire-weight gage readings was used Mar. 31, Apr. 1; wire-weight gage readings used Apr. 6-15, 17, 18. Datum of gage is 1,210.73 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 9,400 cfs; affected by ice Mar. 1-30. Discharge for periods of no gage-height record interpolated or estimated on basis of discharge measurements, weather records, trend of flow, and records for Maple Creek near Nickerson.

Maxima.--March-April 1960: Discharge, 9,400 cfs 3 p.m. Apr. 2 (gage height, 15.20 ft).
1940 to February 1960: Discharge, 20,000 cfs June 5, 1940 (gage height, 18.6 ft, from flood-mark), from rating curve extended above 5,800 cfs on basis of velocity-area studr.

Logan Creek near Uehling, Nebr.

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	46	5,030	9	44	896	17	51	414	25	83	238
2	48	8,700	10	43	725	18	56	385	26	91	222
3	43	5,240	11	43	630	19	61	335	27	106	216
4	40	3,360	12	41	620	20	65	318	28	175	216
5	36	3,680	13	41	602	21	71	298	29	600	238
6	38	3,220	14	41	585	22	75	280	30	3,000	240
7	41	2,070	15	45	483	23	80	260	31	6,230	-
8	43	1,150	16	48	420	24	80	242			
Monthly mean discharge, in cubic feet per second										371	1,377
Runoff, in acre-feet										22,820	81,940
Runoff, in inches										-	-

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1960

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Mar. 31*			Apr. 3*			Apr. 6*		
2 a.m.	14.0	8,000	2 a.m.	13.95	7,950	4 a.m.	7.75	3,000
4	13.6	7,600	4	13.20	7,230	7	8.15	3,260
6	13.2	7,230	6	12.25	6,380	10	8.80	3,710
8	12.8	6,870	8	11.45	5,710	1 p.m.	8.75	3,680
10	12.3	6,420	10	10.75	5,150	5	8.05	3,180
12 m	11.9	6,070	12 m	10.40	4,870	9	7.30	2,730
4 p.m.	11.1	5,430	4 p.m.	9.75	4,380	12	6.75	2,400
8	10.2	4,710	8	9.00	3,850			
12	9.8	4,410	12	8.70	3,640	Apr. 7*		
Apr. 1*			Apr. 4*			6 a.m.	6.30	2,130
						12 m	6.40	2,190
6 a.m.	9.9	4,480	4 a.m.	8.65	3,600	2 p.m.	6.45	2,220
12 m	10.4	4,870	8	8.90	3,780	6	6.15	2,040
4 p.m.	10.9	5,270	12 m	8.60	3,570	9	5.75	1,810
8	11.5	5,750	2 p.m.	8.10	3,220	12	5.30	1,560
10	11.9	6,070	4	7.65	2,940			
12	12.4	6,510	8	7.40	2,790	Apr. 8*		
Apr. 2			12	7.55	2,880			
			Apr. 5*			6 a.m.	4.70	1,250
						12 m	4.40	1,100
2 a.m.	13.1	7,140				6 p.m.	4.25	1,030
4	14.1	8,100	2 a.m.	7.75	3,000	12	4.10	965
6	14.6	8,600	4	8.30	3,360			
8	15.0	9,000	6	9.35	4,100	Apr. 9*		
12 m	15.1	9,200	9	10.05	4,590			
3 p.m.	15.20	9,400	12 m	9.60	4,270	12 m	3.95	900
6	15.1	9,200	2 p.m.	9.00	3,850	12 p.m.	3.70	800
10	14.85	8,850	4	8.60	3,570			
12	14.55	8,550	8	8.05	3,180	Apr. 10*		
			12	7.85	3,060			
						12 m	3.48	718
						12 p.m.	3.32	662

*Daily means computed from data in addition to figures shown.

87. (8000) Maple Creek near Nickerson, Nebr.

Location.--Lat 41°33', long 96°30', in SW¼sec. 11, T. 18N., R. 8E., on downstream handrail of bridge on U.S. Highways 77 and 275, 1½ miles northwest of Nickerson and 4 miles upstream from mouth.

Drainage area.--450 sq mi, approximately.

Gage-height record.--Wire-weight gage readings once daily, or oftener, except Mar. 4-6, 8, 10-21, 26, 27, 29, Apr. 9, 10, 12, 14, 16, 17, 21, 23, 24, 27, 30. Gage-height graph constructed on basis of wire-weight and crest-stage gage readings Mar. 30 to Apr. 4. Datum of gage is 1,194.56 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 2,800 cfs; affected by ice Mar. 1 to Apr. 4. Discharge for period Mar. 30 to Apr. 4 computed as summation of flows in main channel and overflow channel. Discharge for periods of no gage-height record interpolated or estimated on basis of trend of flow, weather records, and records for Logan Creek near Uehling.

Maxima.--March-April 1960: Discharge, 8,260 cfs 10 p.m. Mar. 31 (gage height, 13.40 ft).
1951 to February 1960: Discharge, 5,450 cfs Aug. 4, 1959 (gage height, 13.41 ft).
Maximum stage known, 16.28 ft June 11, 1944, from floodmarks (discharge, 35,000 cfs, from indirect measurement of peak flow).

Maple Creek near Nickerson, Nebr.

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	7.3	3,790	9	6.8	488	17	8.9	206	25	22	101
2	6.5	3,230	10	5.9	400	18	8.6	205	26	33	74
3	4.8	1,990	11	5.1	336	19	7.9	172	27	48	68
4	3.6	1,250	12	5.4	274	20	9.6	134	28	106	65
5	3.6	970	13	5.9	245	21	10	122	29	216	68
6	4.3	701	14	5.9	228	22	9.6	119	30	1,400	68
7	4.8	538	15	5.9	214	23	11	111	31	3,530	-
8	5.4	520	16	7.3	208	24	15	105			
Monthly mean discharge, in cubic feet per second										178	567
Runoff, in acre-feet										10,960	33,720
Runoff, in inches										-	-

88. (8005) Elkhorn River at Waterloo, Nebr.

Location.--Lat 41°17'25", long 96°17'05", in SW¼sec. 3, T. 15N., R. 10E., on right bank 100 ft upstream from bridge at north edge of Waterloo and 3½ miles downstream from Rawhide Creek.

Drainage area.--6,900 sq mi, approximately, of which 6,500 sq mi contributes directly to surface runoff.

Gage-height record.--Water-stage recorder graph. Datum of gage is 1,109.73 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 47,000 cfs; affected by ice Mar. 1-29.

Maxima.--March-April 1960: Discharge, 46,900 cfs 4 p.m. Apr. 2 (gage height, 14.11 ft).
1899-1903, 1911-15, 1928 to February 1960: Discharge, 100,000 cfs June 12, 1944 (gage height, 16.6 ft, from floodmark in gage well, at site 3½ miles upstream at different datum), from rating curve extended above 22,000 cfs on basis of current-meter measurement of peak flow in main channel and velocity-area studies of overflow section.

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	472	25,300	9	461	8,530	17	446	4,010	25	670	2,150
2	469	41,000	10	453	6,860	18	461	3,840	26	717	2,080
3	450	41,000	11	442	5,690	19	500	3,340	27	900	1,930
4	450	31,000	12	442	4,860	20	531	2,960	28	1,020	1,840
5	438	21,100	13	442	4,400	21	560	2,750	29	2,920	1,850
6	450	14,800	14	442	4,440	22	582	2,720	30	23,600	1,960
7	453	11,700	15	450	4,440	23	603	2,540	31	22,200	-
8	453	10,100	16	442	4,150	24	647	2,330			
Monthly mean discharge, in cubic feet per second										2,051	9,189
Runoff, in acre-feet										126,100	546,800
Runoff, in inches										-	-

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1960

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Mar. 29			Apr. 1 Con.			Apr. 4 Con.		
12 p.m.	8.00	11,100	8 p.m.	11.77	28,600	4 p.m.	12.26	29,500
			10	11.95	29,700	8	12.00	28,000
Mar. 30*			12	12.19	31,100	12	11.60	26,000
1 a.m.	9.38	16,100	Apr. 2			Apr. 5*		
3	9.33	15,900						
9	11.00	24,000	2 a.m.	12.50	33,000	4 a.m.	11.15	23,900
3 p.m.	11.77	27,800	4	12.73	34,500	8	10.73	22,100
7	11.95	28,600	6	12.86	35,400	12 m	10.37	20,700
12	11.07	26,200	8	12.98	36,300	4 p.m.	10.07	19,500
			10	13.46	40,200	8	9.90	18,900
Mar. 31			12 m	13.81	43,700	12	9.62	17,900
			2 p.m.	13.98	45,400			
6 a.m.	10.28	22,200	4	14.11	46,900	Apr. 6*		
6 p.m.	9.87	21,000	6	14.06	46,300			
12	10.12	21,700	8	14.04	46,100	4 a.m.	9.27	16,700
			10	14.00	45,600	8	8.81	15,100
Apr. 1			12	13.95	45,100	12 m	8.51	14,200
						4 p.m.	8.37	13,800
2 a.m.	10.22	21,500	Apr. 3			8	8.31	13,600
4	10.39	22,200				12	8.20	13,200
6	10.62	23,100	4 a.m.	13.80	43,600			
8	10.79	23,900	8	13.67	42,300	Apr. 7*		
10	10.95	24,600	12 m	13.57	41,300			
12 m	11.05	25,000	4 p.m.	13.39	39,500	4 a.m.	8.00	12,800
2 p.m.	11.14	25,500	8	13.25	38,400	8	7.78	12,200
4	11.25	26,000	12	13.06	36,900	12 m	7.55	11,500
6	11.55	27,600				4 p.m.	7.38	11,100
			Apr. 4*			8	7.31	10,900
						12	7.36	11,000
			4 a.m.	12.85	34,000			
			8	12.70	32,700			
			12 m	12.51	31,000			

*Daily means computed from data in addition to figures shown.

89. (8012) Olive Branch above Sprague, Nebr.

(Crest-stage station)

Location.--Lat 40°36'29", long 96°46'41", in NW¼NW¼sec. 5, T. 7N., R. 6E., at steel truss bridge on north-south county road, 2 miles west and 1¼ miles south of Sprague.

Drainage area.--43 sq mi, approximately.

Gage-height record.--Crest stages only.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 1,600 cfs.

Maxima.--March-April 1960: Discharge, 1,950 cfs Mar. 27 (gage height, 18.23 ft).
1956 to February 1960: Discharge, 1,670 cfs Aug. 18, 1956 (gage height, 17.46 ft).

90. (8013.2) Olive Branch below Sprague, Nebr.

(Crest-stage station)

Location.--Lat 40°38'20", long 96°43'10", in SW¼sec. 23, T. 8N., R. 6E., at downstream side of steel truss bridge on north-south county road, 1 mile east and 1¼ miles north of Sprague.

Drainage area.--81 sq mi, approximately.

Gage-height record.--Crest stages only.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 2,500 cfs and extended above by logarithmic plotting.

Maxima.--March-April 1960: Discharge, 5,700 cfs Mar. 27 (gage height, 17.12 ft).
1956 to February 1960: Discharge, 4,380 cfs July 10, 1958 (gage height, 16.02 ft).

91. (8013.4) Hickman Branch above Hickman, Nebr.

(Crest-stage station)

Location.--Lat 40°36'47", long 96°34'10", in SW¼SW¼sec. 31, T. 8N., R. 8E., at downstream side of wooden bridge on north-south county road near Missouri-Pacific Railroad crossing, a quarter of a mile south and 3 miles east of Hickman.

Drainage area.--18 sq mi, approximately.

Gage-height record.--Crest stages only.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 3,800 cfs.

Maxima.--March-April 1960: Discharge, 2,500 cfs Mar. 27 (gage height, 11.43 ft).
1956 to February 1960: Discharge, exceeded 4,800 cfs, occurred on July 10, 1958 (gage height, 13.94 ft).

92. (8013.6) Hickman Branch at Hickman, Nebr.

(Crest-stage station)

Location.--Lat 40°37'00", long 96°37'30", in NW¼SW¼sec. 34, T. 8N., R. 7E., at downstream side of steel bridge on north-south county road, a quarter of a mile south of Hickman.

Drainage area.--32 sq mi, approximately.

Gage-height record.--Crest stages only.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 4,100 cfs.

Maxima.--March-April 1960: Discharge, 3,600 cfs Mar. 27 (gage height, 14.75 ft).
1956 to February 1960: Discharge, exceeded 4,100 cfs, occurred on July 10, 1958 (gage height, 19.31 ft).

93. (8014) Salt Creek subwatershed No. 1 near Roca, Nebr.

Location.--Lat 40°38'30", long 96°39'00", in SE¼sec. 20, T. 8N., R. 7E., on right bank at upstream side of U.S. Soil Conservation Service channel-stabilizing structure, 800 ft downstream from county road and 1½ miles southeast of Roca.

Drainage area.--1.46 sq mi.

Gage-height record.--Water-stage recorder graph except Mar. 1 to Apr. 7. Datum of gage is 1,232.2 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 180 cfs and extended above by logarithmic plotting. Discharge Mar. 1 to Apr. 7 estimated on basis of flood-marks, 3 discharge measurements, weather records, and records for nearby streams.

Maxima.--March-April 1960: Discharge, 46.4 cfs Mar. 27 (gage height, 1.95 ft, from floodmark).
1954 to February 1960: Discharge, 810 cfs July 2, 1956 (gage height, 3.12 ft).

Remarks.--Flood flow affected by detention storage in reservoirs upstream.

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	0.03	5.5	9	0.03	0.26	17	0.04	1.10	25	0.40	0.11
2	.03	1.9	10	.03	.21	18	.04	.38	26	.70	.08
3	.03	.9	11	.03	.21	19	.04	.21	27	35	.11
4	.03	.45	12	.03	.17	20	.04	.17	28	25	.14
5	.03	.45	13	.03	.46	21	.05	.11	29	7.0	.17
6	.03	.38	14	.03	.26	22	.06	.08	30	1.9	.21
7	.03	.38	15	.03	.21	23	.10	.08	31	1.5	-
8	.03	.32	16	.04	.26	24	.20	.08			
Monthly mean discharge, in cubic feet per second										2.34	0.512
Runoff, in acre-feet										144	30
Runoff, in inches										-	-

94. (8015) Salt Creek subwatershed No. 12 at Roca, Nebr.

Location.--Lat 40°39'20", long 96°38'40", in SW¼sec. 16, T. 8N., R. 7E., on left bank 10 ft upstream from bridge on east-west county road and three-quarters of a mile east of Roca.

Drainage area.--1.12 sq mi.

Gage-height record.--Water-stage recorder graph except Mar. 1-23. Altitude of gage is 1,258 ft (from topographic map).

Discharge record.--Stage-discharge relation defined by current-meter measurements below 370 cfs; affected by ice Mar. 1-27.

Maxima.--March-April 1960: Discharge, 245 cfs 3 p.m. Mar. 27 (gage height, 2.99 ft).
1954 to February 1960: Discharge, 528 cfs July 10, 1958 (gage height, 7.95 ft).

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	0.04	6.04	9	0.04	0.32	17	0.04	1.26	25	0.23	0.07
2	.04	2.1	10	.04	.36	18	.04	.36	26	.49	.06
3	.04	1.33	11	.04	.29	19	.04	.29	27	58.5	.08
4	.04	.90	12	.04	.29	20	.04	.20	28	27.5	.12
5	.04	.76	13	.04	.49	21	.04	.18	29	8.38	.33
6	.04	.64	14	.04	.29	22	.04	.16	30	2.31	.40
7	.04	.49	15	.04	.26	23	.04	.12	31	1.83	-
8	.04	.38	16	.04	.24	24	.10	.10			
Monthly mean discharge, in cubic feet per second										3.23	0.630
Runoff, in acre-feet										199	37
Runoff, in inches										-	-

95. (8025) Salt Creek subwatershed No. 34 near Roca, Nebr.

Location.--Lat 40°38'20", long 96°39'42", in SW¼SW¼sec. 20, T. 8N., R. 7E., on left bank 50 ft downstream from trestle of Missouri-Pacific Railroad and 1¼ miles south of Roca.

Drainage area.--5.72 sq mi.

Gage-height record.--Water-stage recorder graph except Mar. 28, 29 for which graph was reconstructed on basis of pattern of prior and subsequent graph. Altitude of gage is 1,230 ft (from topographic map).

Discharge record.--Stage-discharge relation defined by current-meter measurements below 600 cfs; affected by ice Mar. 1-27.

Maxima.--March-April 1960: Discharge, 1,800 cfs 4 p.m. Mar. 27 (gage height, 9.71 ft).
1954 to February 1960: Discharge, 2,600 cfs Aug. 18, 1956 (gage height, 9.89 ft).

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	0.32	23.8	9	0.05	1.48	17	0.08	3.21	25	2.53	0.87
2	.32	8.96	10	.04	1.39	18	.10	1.23	26	4.20	.81
3	.27	4.05	11	.06	1.31	19	.38	1.00	27	538	.81
4	.22	2.90	12	.08	1.31	20	.42	1.00	28	144	.94
5	.18	2.32	13	.06	1.53	21	.52	.94	29	42.0	1.11
6	.15	2.12	14	.06	1.23	22	1.31	.87	30	10.3	1.29
7	.12	1.85	15	.08	1.23	23	1.39	.87	31	7.50	-
8	.06	1.66	16	.08	1.15	24	1.85	.87			
Monthly mean discharge, in cubic feet per second										24.4	2.47
Runoff, in acre-feet										1,500	147
Runoff, in inches										4.92	0.48

98. (8030) Salt Creek at Roca, Nebr.

Location.--Lat 40°39'33", long 96°39'39", in SW¼sec. 17, T. 8N., R. 7E., on left bank 15 ft downstream from highway bridge at west edge of Roca.

Drainage area.--174 sq mi.

Gage-height record.--Water-stage recorder graph. Datum of gage is 1,192.50 ft above mean sea level, datum of 1929, Kansas City supplementary adjustment of 1943.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 8,800 cfs; affected by ice Mar. 1-27.

Maxima.--March-April 1960: Discharge, 5,900 cfs 11:30 p.m. Mar. 27 (gage height, 20.85 ft).
1950 to February 1960: Discharge, 67,000 cfs May 8, 1950 (gage height, 28.0 ft, from floodmark).
Flood of July 5, 1908, may have exceeded that of May 8, 1950.

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	12	497	9	10	56	17	19	90	25	33	24
2	11	784	10	11	48	18	20	81	26	36	22
3	11	304	11	13	46	19	22	43	27	1,870	22
4	10	222	12	13	43	20	23	37	28	3,680	22
5	10	135	13	14	44	21	25	31	29	2,830	25
6	9.9	108	14	15	45	22	26	29	30	732	42
7	9.7	81	15	16	39	23	27	26	31	354	-
8	9.9	66	16	17	35	24	30	25			
Monthly mean discharge, in cubic feet per second										320	102
Runoff, in acre-feet										19,680	6,090
Runoff, in inches										-	-

Salt Creek at Roca, Nebr.

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1960

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Mar. 27*			Mar. 30*Con.			Apr. 2*Con.		
1 p.m.	10.98	517	8 a.m.	12.67	757	12 m	11.60	685
2	15.0	1,200	10	12.10	674	2 p.m.	10.82	576
3	18.35	2,420	12 m	11.57	600	4	10.24	496
4	18.90	2,740	2 p.m.	11.15	541	6	9.80	444
6	20.05	3,700	6	10.54	463	8	9.57	416
8	20.55	4,850	8	10.38	441	12	9.44	400
10	20.80	5,700	10	10.30	434			
11:30	20.85	5,900	12	10.32	436	Apr. 3*		
12	20.80	5,700						
			Mar. 31*			6 a.m.	9.02	350
Mar. 28*						12 m	8.55	297
			2 a.m.	10.34	439	6 p.m.	8.15	257
4 a.m.	20.60	5,000	6	10.12	412	12	8.15	257
8	20.25	4,050	12 m	9.57	346			
12 m	19.58	3,220	6 p.m.	9.04	288	Apr. 4		
2 p.m.	19.25	2,980	8	9.03	287			
6	19.65	3,280	12	9.29	313	6 a.m.	8.02	244
12	20.02	3,660				12 m	7.85	227
			Apr. 1*			6 p.m.	7.56	198
Mar. 29*						12	7.38	181
			4 a.m.	9.38	324			
2 a.m.	20.08	3,750	8	9.45	332	Apr. 5*		
6	19.82	3,430	12 m	10.07	406			
8	19.53	3,180	2 p.m.	10.36	441	12 m	7.12	134
12 m	18.90	2,740	4	11.00	520	12 p.m.	6.97	118
4 p.m.	18.83	2,700	6	11.75	625			
6	18.60	2,560	8	12.47	744	Apr. 6*		
8	18.07	2,280	10	13.35	920			
10	17.37	1,950	12	14.10	1,090	6 a.m.	6.98	118
12	16.70	1,680				12 m	6.89	111
			Apr. 2*			12 p.m.	6.65	95
Mar. 30*								
			2 a.m.	14.65	1,260	Apr. 7*		
2 a.m.	15.75	1,390	4	14.77	1,290			
4	14.57	1,100	6	14.50	1,220	12 m	6.48	81
6	13.50	900	8	13.70	1,050	12 p.m.	6.32	72
			10	12.60	842			

*Daily means computed from data in addition to figures shown.

97. (8034) Antelope Creek at Lincoln, Nebr.

Location.--Lat 40°49'30", long 96°41'40", in SE¼NW¼ sec. 24, T. 10N., R. 6E., on right bank 40 ft downstream from 17th Street bridge in Lincoln and 3,600 ft upstream from mouth.

Drainage area.--12.5 sq mi.

Gage-height record.--Water-stage recorder graph. Datum of gage is 1,130.97 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 2,300 cfs; affected by backwater from Salt Creek 9 p.m. Mar. 27 to 7 a.m. Mar. 28, and 5 p.m. Mar. 38 to 6 a.m. Mar. 29.

Maxima.--March-April 1960: Discharge, 691 cfs 6 p.m. Mar. 27 (gage height, 5.29 ft).
1958 to February 1960: Discharge, 2,800 cfs July 10, 1958; maximum gage height, 11.99 ft July 10, 1958 (backwater from Salt Creek).

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	0.42	53.0	9	0.55	1.97	17	0.85	20.3	25	5.57	0.75
2	.34	16.0	10	.42	1.80	18	2.87	2.43	26	19.3	.65
3	.38	8.00	11	.60	2.34	19	4.80	1.58	27	192	.55
4	.38	6.00	12	.34	2.06	20	8.57	1.43	28	124	1.85
5	.14	4.42	13	.49	3.66	21	11.9	1.20	29	95.0	6.02
6	.18	4.03	14	.50	1.50	22	5.75	.80	30	18.9	3.19
7	.38	3.24	15	.38	1.05	23	2.58	.86	31	10.8	-
8	.38	2.52	16	.50	2.53	24	2.61	.50			
Monthly mean discharge, in cubic feet per second										16.50	5.21
Runoff, in acre-feet										1,020	310
Runoff, in inches										-	-

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1960

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Mar. 26			Mar. 27 Con.			Mar. 27 Con.		
12 p.m.	2.25	26	12 m	2.80	65	5 p.m.	4.80	500
			1 p.m.	3.23	111	6	5.29	691
Mar. 27			2	3.97	252	8	4.80	500
			4	4.33	349	9	4.40	370
8 a.m.	1.97	16						
10	2.30	29						

98. (8035) Salt Creek at Lincoln, Nebr.

Location.--Lat 40°50'50", long 96°40'50", in SW¼sec. 7, T. 10N., R. 7E., on downstream end of pier near center of channel at bridge on North 27th Street at north edge of Lincoln, 1 mile downstream from Oak Creek.

Drainage area.--710 sq mi, approximately.

Gage-height record.--Twice-daily wire-weight gage readings, and water-stage recorder graph above gage height 6.2 ft. Datum of gage is 1,113.9 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 15,000 cfs.

Maxima.--March-April 1960: Discharge, 17,200 cfs 11:30 p.m. Mar. 27 (gage height, 18.75 ft).
1949 to February 1960: Discharge, 28,200 cfs June 2, 1951 (gage height, 26.15 ft).
Discharge for flood of June 2, 1951, may have been equaled or exceeded by flood of July 6, 1908 (gage height, 33.6 ft), but channel changes since 1908 have altered the stage-discharge relation materially.

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	76	2,110	9	76	297	17	81	313	25	149	133
2	81	3,020	10	81	253	18	95	297	26	217	128
3	76	880	11	81	260	19	100	194	27	5,850	120
4	76	740	12	81	238	20	126	184	28	13,600	120
5	76	630	13	90	231	21	140	165	29	11,100	131
6	74	505	14	93	238	22	137	159	30	4,320	153
7	76	432	15	83	197	23	161	142	31	1,540	-
8	79	353	16	76	197	24	140	139			
Monthly mean discharge, in cubic feet per second										1,259	432
Runoff, in acre-feet										77,420	25,700
Runoff, in inches										-	-

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1960

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Mar. 26			Mar. 28*Con.			Mar. 31*		
12 p.m.	5.80	236	4 p.m.	17.00	13,700	6 a.m.	8.30	1,800
			8	18.05	15,800	12 m	8.18	1,700
Mar. 27*			12	17.50	14,700	6 p.m.	7.66	1,530
						12	7.40	1,220
6 a.m.	6.00	560	Mar. 29					
12 m	7.10	970				Apr. 1*		
2 p.m.	10.10	3,460	4 a.m.	15.90	11,600			
4	13.50	7,800	6	15.00	10,200	4 a.m.	7.45	1,180
6	17.00	13,700	10	16.10	12,000	7	8.10	1,640
8	18.07	15,800	2 p.m.	16.28	12,300	1 p.m.	8.20	1,720
10	18.65	17,000	4	16.03	11,800	6	9.55	2,900
11:30	18.75	17,200	8	14.45	9,500	12	10.93	4,400
12	18.72	17,100	12	13.10	7,240			
						Apr. 2*		
Mar. 28*			Mar. 30*					
						6 a.m.	10.73	4,160
2 a.m.	18.42	16,500	6 a.m.	12.00	5,700	12 m	9.67	3,020
4	17.30	14,300	12 m	10.92	4,380	6 p.m.	8.78	2,190
6	15.80	11,500	6 p.m.	9.45	2,800	12	7.74	1,390
8	15.25	10,600	12	8.42	1,900			
12 m	15.75	11,400				Apr. 3*		
						6 a.m.	7.03	958
						12 p.m.	6.65	702

*Daily means computed from data in addition to figures shown.

99. (8035.5) Dee Creek at Greenwood, Nebr.

Location.--Lat 40°57'05", long 96°27'00", in NE¼SW¼sec. 6, T. 11N., R. 9E., on left bank 1,000 ft upstream from bridge on U.S. Highway 6, half a mile southwest of Greenwood, and 1 mile upstream from mouth.

Drainage area.--14.3 sq mi.

Gage-height record.--Water-stage recorder graph except Apr. 8-14. Datum of gage is 1,082.2 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 430 cfs. Discharge Apr. 8-14 estimated on basis of recorded range in stage and normal recession pattern.

Maxima.--March-April 1960: Discharge, 558 cfs 10 p.m. Mar. 28 (gage height, 4.84 ft).

Remarks.--Gage installed in February 1960.

Dee Creek at Greenwood, Nebr.

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	1.31	44.9	9	2.20	5.58	17	2.38	5.11	25	2.47	2.56
2	1.47	15.4	10	2.10	5.11	18	2.47	4.75	26	3.46	2.47
3	1.55	11.0	11	2.10	4.79	19	2.56	4.51	27	138	2.38
4	1.64	9.30	12	2.20	4.59	20	2.47	3.96	28	266	2.56
5	1.73	7.92	13	2.29	4.34	21	2.56	3.96	29	260	2.74
6	1.91	7.40	14	2.29	4.16	22	2.65	3.69	30	34.6	3.28
7	1.91	7.10	15	2.29	4.00	23	2.65	2.83	31	24.2	-
8	2.10	6.11	16	2.29	3.93	24	2.47	2.65			
Monthly mean discharge, in cubic feet per second										25.2	6.44
Runoff, in acre-feet										1,550	383
Runoff, in inches										2.03	0.50

100. (8040) Wahoo Creek at Ithaca, Nebr.

Location.--Lat 41°09'50", long 96°32'30", in northeast corner sec. 29, T. 14N., R. 8E., on downstream side of county highway bridge at northwest edge of Ithaca.

Drainage area.--270 sq mi, approximately.

Gage-height record.--Once-daily wire-weight gage readings except Mar. 1-10, 12-16, 20, Apr. 3, 10, 17, 24. Graph drawn on basis of wire-weight gage readings and floodmarks for period Mar. 26 to Apr. 5. Datum of gage is 1,118.69 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 2,400 cfs; affected by ice Mar. 1-18. Discharge for periods of no gage-height record estimated on basis of weather records, trend of flow, and records for Salt Creek near Ashland and at Lincoln.

Maxima.--March-April 1960: Discharge, 5,080 cfs about 9 p.m. Mar. 29 (gage height, 21.68 ft). 1910 to February 1960: Discharge, 45,300 cfs Aug. 2, 1959 (gage height, 23.22 ft, from floodmark, at site 1½ miles downstream at datum 8.21 ft lower), from rating curve extended above 19,000 cfs on basis of logarithmic plotting.

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	31	1,080	9	32	145	17	30	110	25	47	70
2	33	1,390	10	32	130	18	32	91	26	73	63
3	32	470	11	32	140	19	34	88	27	106	61
4	32	331	12	32	122	20	38	82	28	1,900	64
5	31	287	13	34	150	21	46	76	29	4,590	72
6	31	257	14	35	120	22	32	74	30	1,800	67
7	31	220	15	33	105	23	26	71	31	526	-
8	33	170	16	30	95	24	40	70			
Monthly mean discharge, in cubic feet per second										317	209
Runoff, in acre-feet										19,510	12,440
Runoff, in inches										-	-

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1960

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Mar. 27			Mar. 28*Con.			Mar. 30*		
12 p.m.	10.20	216	8 p.m.	20.20	3,070	4 a.m.	20.90	3,860
			12	20.65	3,550	8	20.40	3,270
Mar. 28*						12 m	18.75	2,060
			Mar. 29*			4 p.m.	16.40	1,200
1 a.m.	11.00	298				8	14.70	843
2	14.20	752	6 a.m.	21.15	4,200	12	13.70	667
3	16.00	1,100	12 m	21.60	4,940			
6	17.30	1,450	6 p.m.	21.50	4,760	Mar. 31*		
9	18.25	1,820	9	21.68	5,080			
12 m	19.00	2,200	12	21.45	4,680	6 a.m.	12.90	541
4 p.m.	19.70	2,640				12 m	12.65	505
						6 p.m.	12.50	484
						12	12.75	519

*Daily means computed from data in addition to figures shown.

101. (8043) Silver Creek tributary near Colon, Nebr.

(Crest-stage station)

Location.--Lat 41°21', long 96°39', in NW¼NE¼sec. 20, T. 16N., R. 7E., at downstream end of culvert on county road, 2.3 miles west of State Highway 109 and 4 miles northwest of Colon.

Drainage area.--14.3 sq mi, of which an unknown amount is noncontributing.

Gage-height record.--Crest stages only. Altitude of gage is 1,280 ft (from topographic map).

Discharge record.--Stage-discharge relation defined by current-meter measurements below 520 cfs and by indirect measurements at 686 cfs, 815 cfs, and 5,000 cfs.

Maxima.--March-April 1960: Discharge, 340 cfs Mar. 29 (gage height, 13.30 ft).
1951 to February 1960: Discharge, 5,000 cfs Aug. 2, 1959 (gage height, 17.32 ft).

Remarks.--Flood of Aug. 2, 1959, highest in last 65 years; flood stage of 14.48 ft on May 31, 1951, was higher than that of 1911 and nearly equal to that of 1944, according to local residents.

102. (8044) Silver Creek tributary at Colon, Nebr.

(Crest-stage station)

Location.--Lat 41°18', long 96°36', in NW¼sec. 2, T. 15N., R. 7E., at left bank on downstream end of culvert on State Highway 109, 0.2 mile east of Colon and 0.5 mile south of State Highway 64.

Drainage area.--22.4 sq mi, of which an unknown amount is noncontributing.

Gage-height record.--Crest stages only. Datum of gage is 1,219.36 ft above mean sea level (levels by State Department of Roads).

Discharge record.--Stage-discharge relation defined by current-meter measurements below 1,000 cfs and by an indirect measurement at 4,640 cfs.

Maxima.--March-April 1960: Discharge, 710 cfs Mar. 29 (gage height, 14.00 ft).
1951 to February 1960: Discharge, 4,640 cfs Aug. 2, 1959 (gage height, 19.29 ft).

Remarks.--Flood of Aug. 2, 1959, was highest in last 65 years according to local residents.

103. (8050) Salt Creek near Ashland, Nebr.

Location.--Lat 41°02'50", long 96°20'30", in SW¼sec. 31, T. 13N., R. 10E., on downstream end of pier near center of channel at bridge on U.S. Highway 6, 1 mile east of Ashland and 2½ miles upstream from mouth.

Drainage area.--1,640 sq mi, approximately.

Gage-height record.--Water-stage recorder graph. Datum of gage is 1,047.04 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation defined by current-meter measurements; affected by ice Mar. 1-27 and by backwater from Platte River Mar. 29 to Apr. 2. Discharge Mar. 29 to Apr. 2 estimated on basis of 3 discharge measurements and hydrograph of total flow of Salt Creek at Lincoln and Wahoo Creek at Ithaca.

Maxima.--March-April 1960: Discharge, 23,100 cfs 4 a.m. Mar. 29; gage height, 13.85 ft Mar. 30 (backwater from Platte River).
1947 to February 1960: Discharge, 46,200 cfs June 2, 1951; gage height, 15.13 ft June 13, 1947, from floodmark.

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	200	4,960	9	205	762	17	210	698	25	378	322
2	200	7,750	10	215	658	18	232	698	26	910	315
3	195	3,420	11	200	618	19	250	582	27	3,880	301
4	190	2,080	12	200	602	20	280	448	28	18,600	287
5	190	1,700	13	226	578	21	308	413	29	21,200	315
6	190	1,320	14	238	578	22	301	378	30	15,500	350
7	200	1,100	15	220	530	23	336	357	31	6,180	-
8	210	890	16	220	462	24	332	343			
Monthly mean discharge, in cubic feet per second										2,329	1,126
Runoff, in acre-feet										143,200	67,030
Runoff, in inches										-	-

104. (8055) Platte River at Louisville, Nebr.

Location.--Lat 41°00'50", long 96°09'20", in NW¼sec. 14, T. 12N., R. 11E., on right bank at upstream side of bridge on State Highway 50, three-quarters of a mile north of Louisville.

Drainage area.--85,500 sq mi, approximately.

Gage-height record.--Water-stage recorder graph except Apr. 1-3 for which graph was drawn on basis of gage readings made once-daily or oftener. Datum of gage is 1,007.10 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation Mar. 1-28 defined by current-meter measurements below 46,000 cfs; Mar. 29 to Apr. 30, by current-meter measurements below 119,000 cfs; affected by ice Mar. 1-29.

Maxima.--March-April 1960: Discharge, 124,000 cfs 3:30 p.m. Mar. 30 (gage height, 12.45 ft).
1953 to February 1960: Discharge, 71,000 cfs June 17, 1957 (gage height, 10.35 ft).
Flood of Mar. 30, 1960, maximum known since at least 1881.

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	3,880	63,800	9	2,880	20,800	17	3,820	11,100	25	7,730	7,500
2	3,880	73,300	10	2,880	17,800	18	3,910	10,500	26	9,350	7,080
3	3,730	69,700	11	3,010	15,200	19	4,340	10,100	27	15,700	6,800
4	3,410	59,300	12	3,150	13,200	20	4,760	10,800	28	39,000	6,700
5	3,010	49,800	13	3,440	11,800	21	5,130	9,860	29	62,100	7,020
6	2,850	34,600	14	3,580	11,400	22	5,280	9,060	30	112,000	6,600
7	2,740	27,600	15	3,700	11,100	23	5,680	8,640	31	87,200	-
8	2,710	23,800	16	3,730	10,800	24	5,540	8,280			
Monthly mean discharge, in cubic feet per second										13,710	21,130
Runoff, in acre-feet										843,200	1,258,000
Runoff, in inches										-	-

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1960

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Mar. 29*			Mar. 30 Con.			Apr. 1*		
6 a.m.	8.15	40,000	2 p.m.	12.40	123,000	4 a.m.	9.43	64,300
10	8.70	49,300	3:30	12.45	124,000	8	9.21	60,400
12 m	8.70	49,300	6	12.20	118,000	12 m	9.07	57,900
1 p.m.	9.13	57,400	8	12.10	116,000	2 p.m.	9.05	57,500
2	10.30	80,000	10	12.00	114,000	6	9.30	62,000
3	10.70	88,000	12	11.77	109,000	12	9.53	66,100
4	10.45	83,000						
5	10.60	86,000	Mar. 31			Apr. 2*		
6	10.30	80,000						
10	10.35	81,000	2 a.m.	11.60	106,000	4 a.m.	9.67	68,700
12	10.45	83,000	4	11.35	101,000	8	9.85	71,900
			6	11.10	96,000	10	9.80	71,000
Mar. 30			8	10.80	90,000	12 m	9.85	71,900
			10	10.67	87,400	2 p.m.	9.95	73,700
2 a.m.	11.15	97,000	12 m	10.58	85,600	6	9.92	73,200
4	11.50	104,000	2 p.m.	10.60	86,000	12	9.80	71,000
6	11.75	109,000	4	10.37	81,400			
8	11.90	112,000	6	10.20	78,200	Apr. 3*		
10	12.15	117,000	8	10.02	75,000			
12 m	12.18	118,000	10	9.80	71,000	6 a.m.	9.77	70,500
			12	9.58	68,800	1 p.m.	10.02	75,000
						6	9.50	65,600
						12	9.33	62,500

*Daily means computed from data in addition to figures shown.

WAUBONSIE CREEK BASIN

105. (8060) Waubonsie Creek near Bartlett, Iowa

Location.--Lat 40°53'05", long 95°44'45", in NE¼NE¼sec. 11, T. 70N., R. 43W., or left pier on downstream side of highway bridge, 2.5 miles east of Bartlett and 3.5 miles west of Tabor.

Drainage area.--30.4 sq mi.

Gage-height record.--Water-stage recorder except Mar. 1-9. Datum of gage is 936.96 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation defined by current-meter measurements; affected by ice Mar. 1 to Apr. 2.

Maxima.--March-April 1960: Daily discharge, 150 cfs Mar. 29 (backwater from ice); gage height, 16.65 ft Mar. 28 (backwater from ice).
1946 to February 1960: Discharge, 14,500 cfs May 8, 1950 (gage height, 37.8 ft, from floodmark), from rating curve extended above 800 cfs on basis of slope-area measurements at 10,300 cfs and 14,500 cfs.

Waubonsie Creek near Bartlett, Iowa

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	2.5	50	9	2.5	16	17	2.5	25	25	2.5	9.0
2	2.5	40	10	2.5	15	18	2.5	14	26	2.8	8.1
3	2.5	30	11	2.5	14	19	2.5	12	27	10	8.1
4	2.5	26	12	2.5	13	20	2.5	12	28	100	8.7
5	2.5	23	13	2.5	13	21	2.5	10	29	150	11
6	2.5	20	14	2.5	12	22	2.5	9.6	30	90	16
7	2.5	18	15	2.5	12	23	2.5	9.6	31	70	-
8	2.5	15	16	2.5	11	24	2.5	9.9			
Monthly mean discharge, in cubic feet per second										15.7	16.4
Runoff, in acre-feet										963	974
Runoff, in inches										0.59	0.60

WEEPING WATER CREEK BASIN

106. (8065) Weeping Water Creek at Union, Nebr.

Location.--Lat 40°47'35", long 95°54'40", in NW¼sec. 36, T. 10N., R. 13E., on downstream end of pier near left bank, at bridge on U.S. Highway 73 and 75, 1½ miles southeast of Union, and 2¾ miles downstream from South Branch Weeping Water Creek.

Drainage area.--238 sq mi.

Gage-height record.--Twice-daily wire-weight gage readings, and water-stage recorder graph for stages above 7.9 ft. Datum of gage is 929.72 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation Mar. 1-28 defined by current-meter measurements below 5,200 cfs; Mar. 29 to Apr. 30, by current-meter measurements below 2,600 cfs and extended above on basis of shape of previous stage-discharge relation; affected by ice Mar. 1-28.

Maxima.--March-April 1960: Discharge, 4,200 cfs 6:30 a.m. Mar. 29 (gage height, 21.40 ft).
1950 to February 1960: Discharge, 60,300 cfs May 9, 1950 (gage height, 26.80 ft, from floodmark), from rating curve extended above 12,000 cfs on basis of measurement of peak flow through bridges and over highway embankment.

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	43	1,050	9	42	245	17	40	280	25	62	132
2	43	880	10	41	236	18	42	277	26	65	121
3	43	522	11	40	234	19	46	196	27	100	110
4	42	460	12	40	218	20	49	183	28	1,300	109
5	42	395	13	40	219	21	52	166	29	3,740	115
6	42	358	14	39	220	22	56	154	30	1,630	181
7	42	306	15	38	226	23	59	145	31	770	-
8	42	270	16	38	192	24	62	140			
Monthly mean discharge, in cubic feet per second										282	278
Runoff, in acre-feet										-	-
Runoff, in inches										17,320	16,540

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1960

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Mar. 29*			Mar. 30*Con.			Apr. 1 Con.		
4 a.m.	21.11	4,060	8 p.m.	11.61	1,000	3 p.m.	11.78	1,020
6:30	21.40	4,200	12	11.27	934	12	12.40	1,140
10	21.00	4,000						
2 p.m.	20.67	3,840	Mar. 31*			Apr. 2*		
8	19.85	3,450						
12	18.45	2,920	6 a.m.	10.86	818	2 a.m.	12.52	1,150
			12 m	10.32	715	8	11.76	1,000
Mar. 30*			6 p.m.	10.19	692	2 p.m.	10.90	830
			12	11.38	922	8	10.00	661
4 a.m.	17.15	2,480				12	9.66	604
8	15.27	1,910	Apr. 1					
12 m	13.56	1,450				Apr. 3*		
4 p.m.	12.40	1,160	4 a.m.	11.84	1,030			
			10	11.98	1,060	12 m	9.15	514
						12 p.m.	8.95	482

*Daily means computed from data in addition to figures shown.

MISSOURI RIVER MAIN STEM

107. (8070) Missouri River at Nebraska City, Nebr.

Location.--Lat 40°40'30", long 95°50'10", in NW¼SW¼sec. 10, T. 8N., R. 14E., on downstream side of pier near center of Waubonsie Highway Bridge at Nebraska City.

Drainage area.--414,400 sq mi, approximately.

Gage-height record.--Water-stage recorder graph. Datum of gage is 903.94 ft above mean sea level, datum of 1929.

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

Maxima.--March-April 1960: Discharge, 178,000 cfs 1:30 p.m. Apr. 5 (gage height, 21.43 ft). 1929 to February 1960: Discharge, 414,000 cfs Apr. 19, 1952; gage height, 27.86 ft Apr. 18, 1952.

Remarks.--Flow partly regulated by upstream main stem reservoirs.

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	13,700	162,000	9	13,900	118,000	17	13,900	53,100	25	17,400	35,000
2	13,700	155,000	10	15,100	97,800	18	13,700	51,800	26	18,200	34,800
3	13,700	163,000	11	15,900	84,000	19	13,700	47,100	27	20,000	34,600
4	13,900	172,000	12	16,100	76,200	20	14,300	44,300	28	36,000	35,400
5	13,900	176,000	13	15,500	66,000	21	15,300	40,300	29	62,500	34,800
6	13,900	170,000	14	14,700	62,000	22	16,100	36,000	30	104,000	36,000
7	13,900	152,000	15	14,500	58,000	23	16,400	33,900	31	134,000	-
8	13,700	134,000	16	14,300	53,600	24	16,800	35,400			
Monthly mean discharge, in cubic feet per second										23,980	81,660
Runoff, in acre-feet										1,473,000	4,859,000
Runoff, in inches										-	-

NISHNABOTNA RIVER BASIN

108. (8100) Nishnabotna River above Hamburg, Iowa

Location.--Lat 40°30'00", long 95°37'35", in SW¼SE¼sec. 11, T. 67N., R. 42W., on left bank 1,200 ft downstream from Chicago, Burlington & Quincy Railroad bridge, 1.6 miles downstream from confluence of East Nishnabotna and West Nishnabotna Rivers, and 2 miles northeast of Hamburg.

Drainage area.--2,808 sq mi.

Gage-height record.--Water-stage recorder graph except Apr. 2. Datum of gage is 894.17 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation defined by current-meter measurements; affected by ice Mar. 1-29 and by backwater from Missouri River Apr. 4-14.

Maxima.--March-April 1960: Discharge, 23,900 cfs 7 a.m. Mar. 31 (gage height, 24.56 ft). 1922-23, 1928 to February 1960: Discharge, 55,500 cfs June 24, 1947 (gage height, 26.03 ft, from floodmark).

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	520	20,500	9	450	3,850	17	430	2,440	25	430	1,840
2	520	17,000	10	450	3,400	18	430	3,110	26	430	1,740
3	500	13,800	11	450	3,050	19	430	3,400	27	500	1,620
4	480	9,650	12	450	2,900	20	430	2,570	28	3,000	1,570
5	480	7,750	13	450	2,750	21	430	2,310	29	13,000	1,570
6	460	6,300	14	450	2,600	22	430	2,190	30	19,900	2,130
7	450	5,150	15	430	2,500	23	430	2,070	31	23,300	-
8	450	4,550	16	430	2,310	24	430	1,900			
Monthly mean discharge, in cubic feet per second										2,304	4,617
Runoff, in acre-feet										141,700	274,800
Runoff, in inches										0.95	1.84

LITTLE NEMAHA RIVER BASIN

109. (8101) Hooper Creek tributary near Palmyra, Nebr.

(Crest-stage station)

Location.--Lat 40°46', long 96°25', in NW¼NW¼sec. 9, T. 9N., R. 9E., on left downstream abutment of bridge on east-west section of State Highway 43, 4½ miles north of Palmyra.

Drainage area.--7.81 sq mi.

Gage-height record.--Crest stages only. Altitude of gage is 1,200 ft (from topographic map).

Discharge record.--Stage-discharge relation defined by current-meter measurements below 25 cfs and by indirect measurements at 228 cfs, 536 cfs, and 3,090 cfs.

Maxima.--March-April 1960: Discharge, 530 cfs Mar. 27 (gage height, 14.81 ft). 1950 to February 1960: Discharge, 3,090 cfs June 1, 1951 (gage height, 16.55 ft).

110. (8102) Hooper Creek near Palmyra, Nebr.

(Crest-stage station)

Location.--Lat 40°43', long 96°19', in SE¼SW¼sec. 29, T. 9N., R. 10E., on upstream side of bridge on State Highway 2, 3.3 miles east of Palmyra.

Drainage area.--57.5 sq mi.

Gage-height record.--Crest stages only.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 2,600 cfs and by indirect measurements at 13,100 cfs and 47,600 cfs.

Maxima.--March-April 1960: Discharge, 2,340 cfs Mar. 27 (gage height, 18.42 ft).
1950 to February 1960: Discharge, 47,600 cfs May 9, 1950 (gage height, 23.0 ft).

111. (8103) Owl Creek near Syracuse, Nebr.

(Crest-stage station)

Location.--Lat 40°40', long 96°13', in NE¼NE¼sec. 18, T. 8N., R. 11E., at downstream end of right pier of bridge on former State Highway 2, half a mile upstream from mouth and 2½ miles northwest of Syracuse.

Drainage area.--25.4 sq mi.

Gage-height record.--Crest stages only. Datum of gage is 1,026 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 4,200 cfs and by indirect measurement at 11,500 cfs.

Maxima.--March-April 1960: Discharge, 1,100 cfs Mar. 27 (gage height, 11.94 ft).
1950 to February 1960: Discharge, 16,000 cfs May 9, 1950 (gage height, 30.6 ft).

112. (8104) Little Nemaha River tributary near Syracuse, Nebr.

(Crest-stage station)

Location.--Lat 40°40', long 96°12', in SE¼SE¼sec. 8, T. 8N., R. 11E., at upstream end of center wall of concrete twin-box culvert on former State Highway 2, 1½ miles northwest of Syracuse.

Drainage area.--0.76 sq mi.

Gage-height record.--Crest stages only. Altitude of gage is 1,060 ft (from topographic map).

Discharge record.--Stage-discharge relation defined by current-meter measurements below 10 cfs and by four indirect measurements below 723 cfs.

Maxima.--March-April 1960: Discharge, 140 cfs Mar. 27 (gage height, 10.28 ft).
1950 to February 1960: Discharge, 1,280 cfs May 9, 1950 (gage height, 16.6 ft).

113. (8105) Little Nemaha River near Syracuse, Nebr.

Location.--Lat 40°38', long 96°11', in NW¼SW¼sec. 27, T. 8N., R. 11E., on left bank 300 ft downstream from bridge on State Highway 50, 1.1 miles south of Syracuse, and 3½ miles downstream from Owl Creek.

Drainage area.--218 sq mi.

Gage-height record.--Once-daily wire-weight gage readings except Mar. 12-17, 19, 24, 26, 27, 30, and water-stage recorder graph for stages above 2.0 ft. Datum of gage is 997.87 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 11,000 cfs; affected by ice Mar. 1-24. Discharge for periods of no gage-height record estimated on basis of weather records and records for station at Auburn.

Maxima.--March-April 1960: Discharge, 8,270 cfs 2 a.m. Mar. 28 (gage height, 14.77 ft).
1950 to February 1960: Discharge, 225,000 cfs May 9, 1950 (gage height, 36.7 ft, from flood-marks, at bridge 300 ft upstream , by computation of peak flow through bridge and culvert openings, and over highway embankments).

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	35	682	9	29	141	17	29	194	25	81	54
2	35	770	10	28	128	18	32	149	26	90	52
3	32	398	11	28	119	19	35	95	27	3,060	46
4	30	308	12	26	118	20	40	76	28	6,180	44
5	28	242	13	28	112	21	46	68	29	5,470	46
6	27	188	14	28	118	22	53	65	30	1,160	48
7	29	158	15	28	119	23	63	58	31	550	-
8	28	145	16	28	119	24	74	58			
Monthly mean discharge, in cubic feet per second										563	164
Runoff, in acre-feet										34,590	9,750
Runoff, in inches										-	-

Little Nemaha River near Syracuse, Nebr.

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1960

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Mar. 26			Mar. 28*Con.			Mar. 31*Con.		
12 p.m.	1.97	116	8 p.m.	12.95	6,600	6 p.m.	2.82	446
			10	13.50	7,100	12	2.98	494
Mar. 27*			12	13.85	7,420			
						Apr. 1*		
6 a.m.	2.35	180	Mar. 29*					
8	2.90	305				6 a.m.	3.38	623
10	3.90	590	4 a.m.	14.08	7,620	12 m	3.51	668
12 m	5.90	1,370	6	13.70	7,280	6 p.m.	3.70	735
1 p.m.	7.30	2,200	8	12.95	6,600	12	4.12	888
2	8.30	2,810	10	11.90	5,670			
3	10.00	4,000	12 m	11.00	4,950	Apr. 2*		
4	11.75	5,460	3 p.m.	9.80	4,040			
5	13.05	6,630	7	10.00	4,180	6 a.m.	4.42	1,010
7	14.05	7,620	9	10.10	4,250	8	4.42	1,010
8	14.07	7,650	10	9.50	3,830	12 m	4.00	840
11	13.65	7,240	12	8.25	3,000	6 p.m.	3.10	530
12	14.35	7,950				12	3.00	500
			Mar. 30*					
Mar. 28*						Apr. 3*		
			2 a.m.	6.90	2,200			
2 a.m.	14.77	8,270	4	6.00	1,750	6 a.m.	2.96	488
4	14.15	7,680	6	5.35	1,420	12 m	2.64	395
6	13.10	6,740	8	4.75	1,140	6 p.m.	2.40	335
8	12.35	6,060	2 p.m.	4.05	860	12	2.36	325
10	11.40	5,270	6	3.60	700			
12 m	10.50	4,550	12	3.42	637	Apr. 4*		
2 p.m.	9.95	4,140						
4	10.90	4,870	Mar. 31*			12 m	2.36	330
6	12.15	5,880				12 p.m.	2.10	260
			8 a.m.	3.60	700			
			12 m	3.20	560			

*Daily means computed from data in addition to figures shown.

114. (8115) Little Nemaha River at Auburn, Nebr.

Location.--Lat 40°23'30", long 95°48'40", in NW¼sec. 23, T. 5N., R. 14E., near left bank on downstream side of pier of bridge on State Highway 3, 1 mile downstream from Longs Creek and 1 mile east of Auburn.

Drainage area.--801 sq mi.

Gage-height record.--Water-stage recorder graph for stages above 4.4 ft and once-daily wire-weight gage readings. No record Mar. 2, 3, 14, 16, 20. Datum of gage is 889.87 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 49,000 cfs; affected by ice Mar. 1-26.

Maxima.--March-April 1960: Discharge, 48,000 cfs 11 p.m. Mar. 27 (gage height, 24.2 ft, from flood-mark).

1949 to February 1960: Discharge, 164,000 cfs May 9, 1950 (gage height, 27.65 ft, from flood-mark), by computation of peak flow through bridge and culvert openings and over highway and railway embankments.

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	218	2,020	9	170	482	17	200	622	25	280	262
2	205	2,970	10	170	458	18	205	714	26	305	250
3	194	1,430	11	170	430	19	212	406	27	16,700	238
4	177	1,000	12	170	395	20	225	356	28	17,300	248
5	170	810	13	170	402	21	242	320	29	10,800	280
6	159	690	14	170	480	22	255	298	30	3,490	476
7	170	614	15	182	708	23	265	285	31	1,850	-
8	170	542	16	194	377	24	275	272			
Monthly mean discharge, in cubic feet per second										1,789	628
Runoff, in acre-feet										110,000	37,360
Runoff, in inches										-	-

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1960

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Mar. 27*			Mar. 27*Con.			Mar. 28*		
6 a.m.	7.10	770	3 p.m.	18.35	11,600	1 a.m.	23.95	44,400
8	7.75	1,080	4	21.14	18,800	2	23.60	40,200
9	8.75	1,640	5	23.25	36,000	3	23.00	33,000
10	10.00	2,480	6	23.85	43,200	4	22.35	27,200
11	11.06	3,300	8	24.10	48,500	5	21.95	23,700
12 m	12.08	4,170	10	24.15	47,200	6	20.90	17,600
1 p.m.	13.46	5,510	11	24.2	48,000	7	20.28	15,200
2	15.63	8,060	12	24.10	46,500	8	19.54	13,500

Little Nemaha River at Auburn, Nebr.--Continued

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1960

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Mar. 28*Con.			Mar. 29*Con.			Apr. 1 Con.		
10 a.m.	18.38	11,600	10 p.m.	16.51	9,160	6 p.m.	9.70	2,270
12 m	17.68	10,700	12	15.27	7,620	12	10.55	2,890
1 p.m.	17.51	10,500						
3	17.88	10,900	Mar. 30*			Apr. 2*		
5	18.78	12,200						
7	19.72	13,800	2 a.m.	13.98	6,080	4 a.m.	11.32	3,510
9	20.32	15,400	4	12.83	4,880	8	11.30	3,490
12	19.88	14,200	6	11.98	4,080	12 m	11.01	3,260
			8	11.39	3,560	4 p.m.	10.55	2,890
Mar. 29*			12 m	10.65	2,970	8	9.85	2,380
			6 p.m.	9.98	2,470	12	9.26	1,960
2 a.m.	19.34	13,100	12	9.49	2,120			
4	18.82	12,300				Apr. 3*		
6	18.44	11,700	Mar. 31					
8	18.15	11,300				6 a.m.	8.65	1,580
10	17.68	10,700	6 a.m.	9.20	1,920	12 m	8.35	1,400
12 m	17.79	10,800	12 m	9.15	1,880	6 p.m.	8.15	1,280
2 p.m.	17.44	10,400	6 p.m.	8.90	1,730	12	7.90	1,150
4	17.08	9,900	12	8.70	1,610			
6	17.51	10,500				Apr. 4*		
8	17.20	10,100	Apr. 1					
						12 m	7.61	1,000
			6 a.m.	8.80	1,670	12 p.m.	7.44	920
			12 m	9.35	2,020			

*Daily means computed from data in addition to figures shown.

TARKIO RIVER BASIN

115. (8130) Tarkio River at Fairfax, Mo.

Location.--Lat 40°20'20", long 95°24'20", in SW¼SW¼sec. 22, T. 64N., R. 40W., on downstream side of left pier of bridge, 0.5 mile west of Fairfax and 2 miles downstream from unnamed creek.

Drainage area.--508 sq mi.

Gage-height record.--Water-stage recorder graph. Datum of gage is 867.66 ft above mean sea level, datum of 1929.

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

Maxima.--March-April 1960: Discharge, 11,900 cfs 4-6 a.m. Mar. 29 (gage height, 19.8 ft). 1922 to February 1960: Discharge, 16,300 cfs June 20, 1942, from rating curve extended above 11,000 cfs; gage height, 22.33 ft July 7, 1929, from floodmark.

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March.	April
1		3,120	9		480	17		423	25	200	279
2		2,440	10		466	18	140	495	26	300	249
3		1,350	11		437	19		395	27	1,100	249
4	140	955	12	140	409	20		341	28	5,840	281
5		770	13		409	21	150	281	29	10,400	286
6		681	14		423	22	160	312	30	4,960	694
7		601	15		381	23	170	305	31	2,320	-
8		525	16		368	24	180	279			
Monthly mean discharge, in cubic feet per second										922	623
Runoff, in acre-feet										56,690	37,060
Runoff, in inches										2.09	1.37

MISSOURI RIVER MAIN STEM

116. (8135) Missouri River at Rulo, Nebr.

Location.--Lat 40°03'15", long 95°25'15", in NW¼NW¼sec. 17, T. 1N., R. 18E., on downstream side of middle pier of bridge on U.S. Highway 159 at Rulo, 3.2 miles upstream from Nemaha River.

Drainage area.--418,905 sq mi.

Gage-height record.--Water-stage recorder graph. Datum of gage is 837.23 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation defined by current-meter measurements; affected by backwater from Nemaha River Mar. 28-30.

Maxima.--March-April 1960: Discharge, 181,000 cfs 9 a.m. to 7 p.m. Apr. 6 (gage height, 22.36 ft). 1949 to February 1960: Discharge 358,000 cfs Apr. 22, 1952 (gage height, 25.60 ft). Flood in 1881 reached a stage of 22.9 ft, from floodmark.

Remarks.--Flow partly regulated by upstream main stem reservoirs.

Missouri River at Rulo, Nebr.--Continued

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	13,700	142,000	9	13,500	159,000	17	15,300	56,700	25	17,400	40,300
2	13,900	164,000	10	13,900	137,000	18	15,100	57,800	26	17,900	39,600
3	13,700	172,000	11	15,100	109,000	19	14,900	54,000	27	27,400	39,600
4	13,300	176,000	12	15,900	91,300	20	15,100	49,100	28	37,500	39,200
5	13,300	178,000	13	16,100	78,400	21	15,500	45,900	29	47,000	39,900
6	13,300	179,000	14	15,700	70,500	22	16,600	42,700	30	79,000	41,500
7	13,500	176,000	15	15,500	66,500	23	17,000	39,900	31	123,000	-
8	13,500	168,000	16	15,300	61,000	24	17,200	39,200			
Monthly mean discharge, in cubic feet per second										22,750	91,760
Runoff, in acre-feet										1,399,000	5,460,000
Runoff, in inches										-	-

NEMAHA RIVER BASIN

117. (8137) Tennessee Creek tributary near Seneca, Kans.

(Crest-stage station)

Location.--In SE¼SW¼sec. 2, T. 3S., R. 12E., above culvert on county highway, 1.8 miles southeast of Seneca.

Drainage area.--0.90 sq mi, of which 0.14 sq mi is affected by two stock ponds.

Gage-height record.--Crest stages only.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 31 cfs and by indirect measurements at 383 and 1,220 cfs.

Maxima.--March-April 1960: Discharge, 165 cfs Mar. 27 (gage height, 13.84 ft).
1957 to February 1960: Discharge, 1,220 cfs May 30, 1959 (gage height, 18.64 ft).

118. (8140) Turkey Creek near Seneca, Kans.

Location.--Lat 39°57', long 96°06', on west line of sec. 20 T. 1S., R. 12E., at downstream side of highway bridge, 2 miles downstream from Clear Creek, 5 miles upstream from Nemaha River, and 8 miles northwest of Seneca.

Drainage area.--276 sq mi.

Gage-height record.--Water-stage recorder graph. Altitude of gage is 1,160 ft (from topographic map).

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

Maxima.--March-April 1960: Discharge, 11,700 cfs 4 a.m. Mar. 28 (gage height, 22.73 ft).
1949 to February 1960: Discharge, 18,000 cfs Sept. 4, 1958 (gage height, 24.20 ft).

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	50	520	9	40	167	17	55	135	25	190	83
2	45	744	10	40	153	18	65	152	26	333	77
3	40	556	11	40	149	19	75	128	27	4,580	74
4	40	366	12	40	141	20	80	112	28	9,990	82
5	35	274	13	40	138	21	100	104	29	3,520	100
6	35	237	14	45	150	22	120	96	30	1,300	208
7	35	206	15	45	134	23	130	91	31	572	-
8	40	184	16	50	128	24	186	87		21,956	
Monthly mean discharge, in cubic feet per second										708	193
Runoff, in acre-feet										43,550	11,460
Runoff, in inches										-	-

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1960

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Mar. 25			Mar. 27 Con.			Mar. 29 Con.		
12 p.m.		220	8 p.m.	22.13	9,890	12 m	17.05	2,720
			10	22.57	11,200	2 p.m.	15.68	2,200
Mar. 26			12	22.60	11,300	3	15.47	2,140
						4	15.73	2,220
4 a.m.		210	Mar. 28			6	15.93	2,280
8	5.39	254				8	15.69	2,210
12 m	5.14	216	4 a.m.	22.73	11,700	12	14.50	1,900
4 p.m.	5.84	321	8	22.57	11,200			
8	7.20	525	12 m	22.21	10,100	Mar. 30		
12	8.53	724	4 p.m.	21.93	9,290			
			8	21.65	8,520	4 a.m.	13.76	1,750
Mar. 27			12	21.02	6,950	8	13.07	1,610
						12 m	11.73	1,350
4 a.m.	10.75	1,150	Mar. 29			4 p.m.	10.03	1,010
8	14.06	1,810				8	8.93	786
12 m	17.29	2,820	4 a.m.	20.27	5,500	12	8.32	693
4 p.m.	20.27	5,500	8	19.25	4,160			

119. (8145) North Fork Nemaha River at Humboldt, Nebr.

Location.--Lat 40°09'25", long 95°56'40", in N½ sec. 10, T. 2N., R. 13E., on right pile bent under county road bridge at south edge of Humboldt, 800 ft downstream from Long Branch Creek.

Drainage area.--531 sq mi.

Gage-height record.--Twice-daily wire-weight gage readings and water-stage recorder graph for stages above 8.2 ft. Datum of gage is 944.44 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation for period Mar. 1 to Apr. 11 defined by current-meter measurements below 8,400 cfs and extended above on basis of prior relation; that for Apr. 12-30 defined by current-meter measurements below 620 cfs; affected by ice Mar. 1-26.

Maxima.--March-April 1960: Discharge, 36,200 cfs 7 p.m. Mar. 27 (gage height, 24.20 ft).
1952 to February 1960: Discharge, 51,000 cfs July 10, 1958 (gage height, 31.70 ft), from rating curve extended about 38,000 cfs by logarithmic plotting.

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	106	1,180	9	126	195	17	81	257	25	325	76
2	113	2,160	10	113	171	18	84	194	26	415	66
3	109	1,130	11	103	203	19	93	200	27	16,400	91
4	106	704	12	100	188	20	137	158	28	11,300	78
5	103	500	13	87	170	21	175	144	29	6,050	146
6	103	442	14	78	188	22	215	144	30	2,470	445
7	119	330	15	73	179	23	235	99	31	1,230	-
8	126	248	16	73	112	24	294	86			
Monthly mean discharge, in cubic feet per second										1,327	343
Runoff, in acre-feet										81,600	20,400
Runoff, in inches										-	-

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1960

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Mar. 27*			Mar. 28*			Mar. 29*Con.		
2 a.m.	6.51	1,140	1 a.m.	18.96	24,200	7 p.m.	11.10	7,980
4	7.60	2,460	2	18.01	22,100	8	10.95	7,710
6	9.01	4,480	3	16.86	19,200	10	9.85	5,810
8	10.53	6,950	4	15.64	16,900	12	9.05	4,540
10	11.84	9,350	5	14.68	15,000			
12 m	13.01	11,600	6	13.92	13,400	Mar. 30*		
1 p.m.	14.38	14,400	8	12.80	11,200			
2	16.57	19,000	10	11.99	9,630	2 a.m.	8.50	3,720
3	18.92	24,100	12 m	11.35	8,430	4	8.2	3,280
4	21.13	29,100	2 p.m.	11.01	7,820	8	7.7	2,590
5	22.88	33,100	5	11.39	8,500	12 m	7.45	2,260
6	23.83	35,300	10	10.80	7,440	6 p.m.	7.1	1,820
7	24.20	36,200	12	10.89	7,600	12	6.85	1,520
8	23.92	35,500						
9	23.18	33,800	Mar. 29*			Mar. 31		
10	22.08	31,300						
11	20.85	28,500	4 a.m.	10.46	6,830	6 a.m.	6.7	1,340
12	19.95	26,400	8	9.60	5,410	12 m	6.6	1,230
			2 p.m.	9.25	4,850	6 p.m.	6.45	1,080
			4	9.76	5,670	12	6.4	1,040
			6	10.45	6,820			

*Daily means computed from data in addition to figures shown.

120. (8150) Nemaha River at Falls City, Nebr.

Location.--Lat 40°02'00", long 95°35'30", on line between secs. 22 and 23, T. 1N., R. 16E., near right bank at downstream end of pier of bridge on U.S. Highway 73, 1 mile south of Falls City and 13 miles upstream from mouth.

Drainage area.--1,340 sq mi, approximately.

Gage-height record.--Twice-daily wire-weight gage readings, and water-stage recorder graph for stages above 6.3 ft. Datum of gage 861.24 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 22,000 cfs and extended above by logarithmic plotting; affected by ice Mar. 1-25.

Maxima.--March-April 1960: Discharge, 46,900 cfs 7 a.m. Mar. 28 (gage height, 27.75 ft).
1944 to February 1960: Discharge, 51,400 cfs June 17, 1954; gage height, 28.8 ft June 2, 1949 (from floodmark).

Nemaha River at Falls City, Nebr.

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	290	2,490	9	224	830	17	320	670	25	960	445
2	276	3,910	10	236	755	18	382	920	26	1,040	423
3	259	3,280	11	236	730	19	452	725	27	20,900	396
4	236	2,010	12	224	695	20	530	588	28	44,100	409
5	189	1,420	13	236	680	21	570	538	29	22,300	482
6	189	1,190	14	249	740	22	660	498	30	8,020	920
7	200	1,040	15	262	710	23	760	475	31	3,400	-
8	212	925	16	279	633	24	860	460			
Monthly mean discharge, in cubic feet per second										3,518	996
Runoff, in acre-feet										216,300	59,280
Runoff, in inches										-	-

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1960

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Mar. 26*			Mar. 28*Con.			Mar. 31*		
12 m	5.05	885	8 p.m.	26.20	41,500	6 a.m.	8.92	3,930
6 p.m.	5.55	1,150	10	25.55	39,600	12 m	8.30	3,300
12	6.50	1,780	12	24.40	36,100	12 p.m.	7.61	2,670
Mar. 27*			Mar. 29*			Apr. 1*		
4 a.m.	8.30	3,300	4 a.m.	22.15	29,400	12 m	7.36	2,460
6	9.40	4,480	8	20.20	24,200	12 p.m.	7.40	2,490
8	10.80	6,190	12 m	18.40	19,800			
10	13.20	9,690	4 p.m.	17.00	16,900	Apr. 2*		
12 m	15.20	15,300	6	18.08	19,100			
1 p.m.	17.10	17,100	9	16.95	16,800	4 a.m.	7.80	2,840
2	19.60	22,800	12	16.25	15,400	10	9.35	4,420
3	22.00	28,900				2 p.m.	9.62	4,740
4	24.50	36,400	Mar. 30*			12	9.27	4,320
5	26.00	40,900						
8	26.85	43,800	4 a.m.	14.05	11,100	Apr. 3		
12	27.20	45,000	8	12.70	8,900			
			2 p.m.	11.20	6,710	6 a.m.	8.68	3,680
Mar. 28*			8	10.20	5,440	12 m	8.18	3,180
			12	9.66	4,790	12 p.m.	7.40	2,490
7 a.m.	27.75	46,900						
4 p.m.	26.85	43,800				Apr. 4*		
						12 m	6.75	1,970
						12 p.m.	6.28	1,630

*Daily means computed from data in addition to figures shown.

121. (8155) Muddy Creek at Verdon, Nebr.

Location.--Lat 40°08'40", long 95°43'10", in NE¼NW¼ sec. 15, T. 2N., R. 15E., on downstream end of right pier of bridge on U.S. Highway 73, 0.4 mile west of Verdon and 1 mile downstream from Sardine Creek.

Drainage area.--188 sq mi.

Gage-height record.--Once-daily wire-weight gage readings, and water-stage recorder graph for stages above 7.6 ft, except Mar. 5-15, 17-19. Datum of gage is 896.74 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation Mar. 1-27 defined by current-meter measurements below 6,400 cfs and by slope-area measurement at 31,900 cfs; Mar. 28 to Apr. 30 defined by current-meter measurements below 7,100 cfs; affected by ice Mar. 1-23. Discharge Mar. 5-15, 17-19 estimated on basis of one discharge measurement, engineers' and observer's notes, and weather records.

Maxima.--March-April 1960: Discharge, 20,000 cfs 6:30 p.m. Mar. 27 (gage height, 23.90 ft). 1952 to February 1960: Discharge, 31,900 cfs July 10, 1958 (gage height, 31.50 ft), from rating curve extended above 6,400 cfs on basis of slope-area measurement of peak flow.

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	51	260	9	46	97	17	46	129	25	154	56
2	49	690	10	46	90	18	51	84	26	195	51
3	47	229	11	46	90	19	57	79	27	7,060	52
4	43	147	12	42	82	20	70	62	28	3,980	56
5	40	129	13	46	91	21	83	58	29	1,960	84
6	40	115	14	43	114	22	106	56	30	497	273
7	43	112	15	43	76	23	124	56	31	220	-
8	46	103	16	43	69	24	150	56			
Monthly mean discharge, in cubic feet per second										499	122
Runoff, in acre-feet										30,680	7,230
Runoff, in inches										-	-

Muddy Creek at Verdon, Nebr.

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1960

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Mar. 26			Mar. 28*			Mar. 29*Con.		
12 p.m.	7.86	440	2 a.m.	14.45	5,300	6 a.m.	9.30	1,090
			4	12.55	3,530	8	8.90	870
Mar. 27*			6	11.15	2,200	10	9.00	920
			8	10.10	1,560	1 p.m.	10.35	1,720
4 a.m.	8.45	670	10	9.47	1,180	4	10.70	1,970
8	9.60	1,250	12 m	9.22	1,050	5	12.90	3,800
10	10.52	1,850	2 p.m.	11.33	2,410	6	13.90	4,850
12 m	12.00	3,000	3	13.20	4,120	8	12.60	3,550
1 p.m.	13.30	4,200	4	14.85	5,950	10	11.00	2,170
2	15.20	6,200	5	15.70	7,000	12	9.65	1,400
3	17.65	9,700	6	15.60	6,900			
4	20.60	14,200	7	15.40	6,600	Mar. 30*		
5	22.50	17,300	8	14.67	5,700			
6:30	23.90	20,000	10	12.95	3,880	3 a.m.	8.85	850
7	23.80	19,800	12	11.45	2,550	6	8.37	640
9	21.90	16,400				9	8.00	590
10	20.50	14,000	Mar. 29*			2 p.m.	7.65	365
11	18.95	11,500				12	7.30	265
12	17.40	9,380	2 a.m.	10.45	1,780			
			4	9.75	1,500			

*Daily means computed from data in addition to figures shown.

KANSAS RIVER BASIN

122. (8568) Moll Creek near Green, Kans.

(Crest-stage station)

Location.--In NE¼NW¼sec. 8, T. 8S., R. 4E., at downstream side of bridge on U.S. Highway 24, 3.3 miles southwest of Green.

Drainage area.--4.0 sq mi, approximately.

Gage-height record.--Crest stages only.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 290 cfs and by indirect measurement at 485 cfs.

Maxima.--March-April 1960: Discharge, 650 cfs Mar. 27 (gage height, 15.45 ft).
1957 to February 1960: Discharge, 700 cfs July 3, 1958 (gage height, 15.53 ft).

123. (8797) Wild Cat Creek at Riley, Kans.

(Crest-stage station)

Location.--In SW¼SW¼sec. 1, T. 9S., R. 5E., at downstream side of bridge on U.S. Highway 77 at Riley.

Drainage area.--13 sq mi, approximately.

Gage-height record.--Crest stages only.

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

Maxima.--March-April 1960: Discharge, 2,050 cfs 3 p.m. Mar. 27 (gage height, 19.85 ft).
1957 to February 1960: Discharge, 1,400 cfs Sept. 15, 1958 (gage height, 18.00 ft).

124. (8800) Lincoln Creek near Seward, Nebr.

Location.--Lat 40°55'00", long 97°08'40", in NE¼sec. 24, T. 11N., R. 2E., on left bank 2 miles west of Seward and 2½ miles upstream from mouth.

Drainage area.--420 sq mi, approximately.

Gage-height record.--Water-stage recorder graph. Datum of gage is 1,429.27 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation Mar. 1-27 defined by current-meter measurements below 9,900 cfs; Mar. 28 to Apr. 30, by current-meter measurements below 2,200 cfs and extended above on basis of shape of a prior rating; affected by ice Mar. 1-27.

Maxima.--March-April 1960: Discharge, 3,300 cfs 9 to 10 p.m. Mar. 29 (gage height, 18.59 ft).
1953 to February 1960: Discharge, 10,100 cfs June 17, 1957 (gage height, 20.53 ft).

Lincoln Creek near Seward, Nebr.

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	8.8	1,290	9	9.3	86	17	11	32	25	14	23
2	8.8	874	10	9.4	66	18	12	30	26	17	21
3	8.6	522	11	9.4	55	19	12	29	27	675	20
4	8.2	311	12	9.7	46	20	12	28	28	2,170	20
5	8.2	304	13	10	43	21	13	27	29	2,690	20
6	8.8	257	14	10	38	22	14	25	30	2,910	20
7	8.9	150	15	11	35	23	14	25	31	2,130	-
8	9.2	116	16	11	32	24	14	24			
Monthly mean discharge, in cubic feet per second										350	152
Runoff, in acre-feet										21,540	9,060
Runoff, in inches										-	-

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1960

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Mar. 27			Mar. 30*			Apr. 2*		
12 p.m.	17.17	2,080	6 a.m.	18.43	3,100	6 a.m.	14.34	980
			12 m	18.27	2,920	12 m	13.85	870
Mar. 28*			6 p.m.	18.10	2,740	6 p.m.	13.40	780
			12	17.90	2,570	12	12.92	703
3 a.m.	17.44	2,230						
12 m	17.29	2,140	Mar. 31*			Apr. 3*		
6 p.m.	17.27	2,140						
12	17.32	2,160	6 a.m.	17.71	2,420	6 a.m.	12.33	614
			12 m	17.45	2,240	12 m	11.57	531
Mar. 29*			6 p.m.	17.00	2,000	6 p.m.	10.60	448
			12	16.25	1,630	12	9.55	363
4 a.m.	17.41	2,220						
8	17.74	2,440	Apr. 1*			Apr. 4*		
12 m	18.14	2,780						
4 p.m.	18.47	3,140	6 a.m.	15.62	1,380	8 a.m.	8.72	313
9	18.59	3,300	12 m	15.22	1,240	4 p.m.	8.46	293
10	18.59	3,300	4 p.m.	15.24	1,240	12	8.38	286
12	18.57	3,270	12	14.87	1,130			

*Daily means computed from data in addition to figures shown.

125. (8805) Big Blue River at Seward, Nebr.

Location.--Lat 40°54'10", long 97°06'40", in SE¼SW¼sec. 20, T. 11N., R. 3E., at downstream end of first pier from right abutment of bridge on State Highway 2 at west edge of Seward, 0.2 miles downstream from Lincoln Creek.

Drainage area.--1,070 sq mi, approximately.

Gage-height record.--Water-stage recorder graph. Datum of gage is 1,421.49 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation Mar. 1-29 defined by current-meter measurements below 1,000 cfs and extended above on basis of shape of prior rating curve; Mar. 30 to Apr. 30 defined by current-meter measurements below 7,700 cfs; affected by ice Mar. 1-29.

Maxima.--March-April 1960: Discharge, 8,200 cfs 6 p.m. Mar. 30 (gage height, 19.70 ft).
1954 to February 1960: Discharge, 15,300 cfs June 18, 1957 (gage height, 22.34 ft).

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	18	5,750	9	13	245	17	15	85	25	32	49
2	16	3,280	10	13	195	18	16	77	26	36	47
3	14	1,680	11	13	160	19	18	73	27	560	46
4	11	994	12	12	126	20	19	73	28	2,850	44
5	11	797	13	13	107	21	21	67	29	5,950	45
6	12	606	14	13	104	22	23	61	30	7,840	44
7	13	413	15	15	98	23	25	56	31	7,600	-
8	13	330	16	15	93	24	28	51			
Monthly mean discharge, in cubic feet per second										814	527
Runoff, in acre-feet										50,080	31,330
Runoff, in inches										-	-

Big Blue River at Seward, Nebr.

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1960

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Mar. 29			Mar. 31*			Apr. 2*		
12 p.m.	18.88	7,220	6 a.m.	19.46	7,910	6 a.m.	15.35	3,940
			12 m	19.26	7,670	12 m	14.45	3,280
Mar. 30*			6 p.m.	18.95	7,300	6 p.m.	13.57	2,780
			12	18.56	6,860	12	12.64	2,310
6 a.m.	19.13	7,520						
12 m	19.54	8,010	Apr. 1*			Apr. 3*		
6 p.m.	19.70	8,200						
12	19.61	8,090	6 a.m.	18.03	6,330	6 a.m.	11.75	1,960
			12 m	17.44	5,740	12 m	10.95	1,700
			6 p.m.	16.93	5,280	6 p.m.	10.05	1,450
			12	16.22	4,640	12	8.95	1,200

*Daily means computed from data in addition to figures shown.

126. (8807.1) School Creek tributary near Harvard, Nebr.

(Crest-stage station)

Location.--Lat 40°35'00", long 98°04'00", in SW¼SW¼sec. 12, T. 7N., R. 7W., on downstream right pier of bridge on U.S. Highway 6, 0.9 mile west of junction with State Highway 14, and 3 miles southeast of Harvard.

Drainage area.--13.1 sq mi.

Gage-height record.--Crest stages only.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 85 cfs and by contracted-opening measurement at 190 cfs.

Maxima.--March-April 1960: Discharge, 190 cfs Mar. 27 (gage height, 13.23 ft, may be affected by snow); gage height, 13.64 ft Mar. 27 (result of backwater from snow).
1953 to February 1960: Discharge, 164 cfs Sept. 6, 1958 (gage height, 12.85 ft).

127. (8807.2) School Creek near Harvard, Nebr.

(Crest-stage station)

Location.--Lat 40°35'50", long 98°03'00", in NW¼NW¼sec. 7, T. 7N., R. 6W., on right downstream wingwall of bridge on black-topped county road (formerly State Highway 14), 0.9 mile north of junction of U.S. Highway 6 and State Highway 14, and 3 miles southeast of Harvard.

Drainage area.--55.1 sq mi.

Gage-height record.--Crest stages only.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 216 cfs and by indirect measurement at 1,240 cfs.

Maxima.--March-April 1960: Discharge, 1,240 cfs Mar. 27 (gage height, 17.11 ft).
1953 to February 1960: Discharge, 960 cfs July 10, 1958 (gage height, 16.74 ft).

128. (8807.3) School Creek tributary No. 2 near Harvard, Nebr.

(Crest-stage station)

Location.--Lat 40°36'50", long 90°02'30", in SE¼SW¼sec. 31, T. 8N., R. 6W., on right downstream wingwall of culvert on east-west portion of black-topped county road, 100 ft north of Chicago, Burlington & Quincy Railroad underpass, and 3 miles east of Harvard.

Drainage area.--14.0 sq mi.

Gage-height record.--Crest stages only.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 119 cfs and by indirect measurements at 218 cfs, 510 cfs, and 584 cfs.

Maxima.--March-April 1960: Discharge, 584 cfs Mar. 27 (gage height, 16.83 ft).
1953 to February 1960: Discharge, 510 cfs July 10, 1958 (gage height, 16.17 ft).

129. (8807.4) School Creek near Saronville, Nebr.

(Crest-stage station)

Location.--Lat 40°35'00", long 97°57'20", in SW¼SW¼sec. 12, T. 7N., R. 6W., on downstream pier of county bridge, 50 ft north of U.S. Highway 6 and 1½ miles southwest of Saronville.

Drainage area.--89.4 sq mi.

Gage-height record.--Crest stages only. Altitude of gage is 1,705 ft (from topographic map).

Discharge record.--Stage-discharge relation defined by current-meter measurements below 886 cfs and by slope-area measurement at 3,720 cfs.

Maxima.--March-April 1960: Discharge, 3,720 cfs Mar. 27 (gage height, 19.29 ft).
1952 to February 1960: Discharge, 1,280 cfs July 14, 1952 (gage height, 17.6 ft from floodmark).

130. (8808) West Fork Big Blue River near Dorchester, Nebr.

Location.--Lat 40°43'55", long 97°10'40", in NW¼SW¼sec. 23, T. 9N., R. 2E., on left bank at downstream end of pier of bridge on county road, 6¼ miles northwest of Dorchester and 19 miles upstream from mouth.

Drainage area.--1,210 sq mi, approximately.

Gage-height record.--Water-stage recorder graph except Apr. 3, 12-15. Datum of gage is 1,403.48 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation Mar. 1-21 defined by current-meter measurements below 2,000 cfs, Mar. 22 to Apr. 30, by current-meter measurements below 11,000 cfs; affected by ice Mar. 1-21. Discharge Apr. 3, 12-15 estimated on basis of fragmentary gage-height graph and trend of flow.

Maxima.--March-April 1960: Discharge, 11,200 cfs 8 a.m. Mar. 30 (gage height, 20.28 ft).
1950, 1958 to February 1960: Discharge, 49,400 cfs July 10, 1950 (gage height, 24.8 ft, from floodmarks), from contracted-opening and flow-over-the road measurement of peak flow.

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	77	3,630	9	70	460	17	70	212	25	87	118
2	76	2,510	10	69	359	18	73	190	26	96	111
3	76	2,000	11	69	311	19	75	164	27	946	110
4	75	1,950	12	68	285	20	78	146	28	4,420	107
5	73	1,550	13	68	260	21	83	136	29	8,800	110
6	72	1,230	14	68	235	22	87	130	30	10,400	111
7	71	898	15	68	210	23	88	127	31	5,960	-
8	70	610	16	68	185	24	87	127			
Monthly mean discharge, in cubic feet per second										1,048	619
Runoff, in acre-feet										64,440	36,860
Runoff, in inches										-	-

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1960

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Mar. 27*			Mar. 29*Con.			Apr. 1*Con.		
10 a.m.	4.80	243	9 a.m.	19.20	8,400	6 p.m.	14.48	3,270
12 m	5.35	350	12 m	19.83	9,920	12	13.98	2,970
1 p.m.	6.10	510	4 p.m.	20.13	10,800			
2	7.19	728	12	20.21	11,000	Apr. 2*		
3	9.07	1,150						
4	10.84	1,560	Mar. 30			6 a.m.	13.64	2,780
5	11.54	1,860				12 m	13.10	2,510
8	12.11	2,080	8 a.m.	20.28	11,200	6 p.m.	12.50	2,240
10	12.78	2,350	2 p.m.	20.11	10,700	12	12.18	2,110
12	13.43	2,680	8	19.62	9,400			
			12	19.12	8,240	Apr. 3*		
Mar. 28*								
			Mar. 31*			12 m	11.80	1,960
3 a.m.	14.02	2,990				12 p.m.	11.93	2,010
6	14.65	3,370	6 a.m.	18.32	6,830			
9	15.45	3,900	12 m	17.61	5,910	Apr. 4*		
12 m	16.25	4,500	6 p.m.	17.08	5,280			
2 p.m.	16.85	5,030	12	16.32	4,560	12 m	11.88	1,990
6	17.42	5,680				12 p.m.	11.37	1,790
12	17.68	6,000	Apr. 1*					
						Apr. 5*		
Mar. 29*			6 a.m.	15.65	4,040			
			12 m	15.00	3,590	12 m	10.68	1,570
3 a.m.	18.08	6,480				12 p.m.	10.15	1,420
6	18.60	7,250						

*Daily means computed from data in addition to figures shown.

131. (8810) Big Blue River near Crete, Nebr.

Location.--Lat 40°35'40", long 96°57'35", in S½sec. 3, T. 7N., R. 4E., on downstream end of right pier of bridge on State Highway 82, 1.8 miles south of Missouri Pacific Railroad Co. station in Crete, 3.5 miles downstream from Walnut Creek, and 3.6 miles upstream from Squaw Creek.

Drainage area.--2,680 sq mi, approximately.

Gage-height record.--Water-stage recorder graph. Datum of gage is 1,311.7 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation Mar. 1-28 defined by current-meter measurements below 22,000 cfs; Mar. 29 to Apr. 30, by current-meter measurements below 21,000 cfs and shape of prior rating curve.

Maxima.--March-April 1960: Discharge, 23,000 cfs 10 p.m. Mar. 30 to 3 a.m. Mar. 31 (gage height, 28.00 ft).
1945 to February 1960: Discharge, 27,600 cfs July 10, 1950 (gage height, 28.74 ft).

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	113	13,900	9	116	964	17	107	416	25	154	249
2	108	9,730	10	111	744	18	117	408	26	168	246
3	122	6,840	11	111	631	19	120	366	27	1,210	218
4	110	4,710	12	111	546	20	120	333	28	6,060	214
5	117	3,440	13	99	498	21	136	307	29	14,000	224
6	131	2,540	14	103	448	22	139	290	30	21,200	226
7	106	1,850	15	111	420	23	154	278	31	21,000	-
8	95	1,340	16	109	389	24	142	260			
Monthly mean discharge, in cubic feet per second										2,148	1,769
Runoff, in acre-feet										132,100	105,200
Runoff, in inches										-	-

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1960

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Mar. 26			Mar. 28*Con.			Mar. 31 Con.		
12 p.m.	5.77	177	6 p.m.	22.49	8,060	12 m	27.73	21,600
			9	23.29	9,260	6 p.m.	27.32	19,600
Mar. 27*			12	24.20	11,000	12	26.77	17,300
6 a.m.	6.35	264	Mar. 29*			Apr. 1*		
12 m	6.86	356						
2 p.m.	7.70	535	6 a.m.	25.40	13,000	8 a.m.	26.04	14,900
4	10.05	1,140	12 m	25.95	14,600	4 p.m.	25.42	13,100
5	12.10	1,740	6 p.m.	26.13	15,200	12	24.81	11,500
6	14.10	2,370	12	26.51	16,400			
7	15.50	2,820				Apr. 2*		
8	16.50	3,180	Mar. 30					
10	17.65	3,670				12 m	23.97	9,770
12	18.30	4,020	4 a.m.	26.97	18,100	12 p.m.	23.12	8,370
			8	27.63	21,200			
Mar. 28*			12 m	27.89	22,400	Apr. 3*		
			10 p.m.	28.00	23,000			
6 a.m.	19.04	4,490	12	28.00	23,000	12 m	21.97	6,910
9	19.74	5,010				12 p.m.	20.54	5,670
12 m	20.44	5,640	Mar. 31					
2 p.m.	21.44	6,720				Apr. 4*		
			3 a.m.	28.00	23,000			
			6	27.95	22,800	12 m	19.01	4,660
						12 p.m.	17.90	4,080

*Daily means computed from data in addition to figures shown.

132. (8812) Turkey Creek near Wilber, Nebr.

Location.--Lat 40°28', long 97°00', in NE¼NE¼sec. 19, T. 6N., R. 4E., on left bank a quarter of a mile downstream from bridge on State Highway 41 and 3 miles southwest of Wilber.

Drainage area.--490 sq mi, approximately.

Gage-height record.--Water-stage recorder graph except Apr. 2-6. Datum of gage is 1,322.00 ft above mean sea level (State Highway Department bench mark).

Discharge record.--Stage-discharge relation defined by current-meter measurements below 5,500 cfs; affected by ice Mar. 1-23. Discharge Apr. 2-6 estimated on basis of trend of flow and weather records.

Maxima.--March-April 1960: Discharge, 7,300 cfs 12 p.m. Mar. 28 (gage height, 14.92 ft).
1959 to February 1960: Daily discharge, 93 cfs.

Turkey Creek near Wilber, Nebr.

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	17	1,960	9	14	98	17	20	76	25	37	45
2	17	1,550	10	14	82	18	21	76	26	41	44
3	16	1,140	11	14	74	19	22	66	27	1,160	42
4	17	845	12	15	68	20	24	59	28	3,700	42
5	17	560	13	15	65	21	25	53	29	5,980	43
6	17	315	14	16	63	22	25	49	30	5,020	43
7	16	186	15	17	60	23	25	47	31	3,220	-
8	15	129	16	18	57	24	29	46			
Monthly mean discharge, in cubic feet per second										632	266
Runoff, in acre-feet										38,880	15,830
Runoff, in inches										-	-

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1960

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Mar. 27*			Mar. 28*			Mar. 30*		
6 a.m.	4.18	64	5 a.m.	13.05	2,920	6 a.m.	14.48	5,540
9	4.95	106	10	13.05	2,920	4 p.m.	14.15	4,800
12 m	7.24	336	4 p.m.	13.65	3,800	12	13.88	4,260
1 p.m.	8.60	580	8	14.54	5,720			
2	9.27	881	12	14.92	7,300	Mar. 31*		
3	10.55	1,200						
4	11.25	1,550	Mar. 29*			6 a.m.	13.65	3,800
5	11.85	1,910				6 p.m.	12.45	2,810
6	12.60	2,480	6 a.m.	14.75	6,500	12	12.57	2,460
10	13.58	3,670	4 p.m.	14.42	5,360			
12	13.43	3,440	12	14.55	5,750	Apr. 1*		
						12 m	11.95	1,970
						12 p.m.	11.67	1,800

*Daily means computed from data in addition to figures shown.

133. (8814.5) Indian Creek at Beatrice, Nebr.

(Crest-stage station)

Location.--Lat 40°17'07", long 96°44'47", in SE¼NE¼sec. 28, T. 4N., R. 6E., on right downstream abutment of Highway 77 bridge at north edge of Beatrice, 2 miles upstream from mouth.

Drainage area.--74 sq mi, approximately.

Gage-height record.--Crest stages only.

Discharge record.--Stage-discharge relation not defined.

Maxima.--March-April 1960: Discharge not determined; stage, 16.7 ft Mar. 28, from floodmark.

Remarks.--Gage established after flood.

134. (8820) Big Blue River at Barneston, Nebr.

Location.--Lat 40°03', long 96°35', in NE¼SW¼sec. 13, T. 1N., R. 7E., near left bank in tailrace of powerplant, 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 sq mi, approximately.

Gage-height record.--Water-stage recorder graph except Mar. 2, 3, for which gage heights were estimated on basis of fragmentary record; affected by ice Mar. 1-22. Datum of gage is 1,164.2 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation defined by discharge measurements below 26,000 cfs.

Maxima.--March-April 1960: Discharge, 29,400 cfs 1 p.m. Mar. 28 (gage height, 27.60 ft).
1932 to February 1960: Discharge, 57,700 cfs June 9, 1941 (gage height, 34.3 ft).

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	228	25,600	9	255	2,400	17	242	1,010	25	520	713
2	216	25,900	10	214	1,940	18	320	1,090	26	913	670
3	286	22,400	11	218	1,640	19	258	990	27	14,400	630
4	216	14,100	12	216	1,410	20	248	941	28	23,500	630
5	196	8,270	13	172	1,310	21	276	880	29	26,000	632
6	236	5,700	14	218	1,180	22	281	827	30	23,100	684
7	240	4,130	15	222	1,110	23	362	768	31	23,500	-
8	226	3,210	16	240	990	24	417	756			
Monthly mean discharge, in cubic feet per second										3,966	4,417
Runoff, in acre-feet										243,800	262,800
Runoff, in inches										-	-

Big Blue River at Barneston, Nebr.

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1960

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Mar. 26			Mar. 30			Apr. 4*Con.		
12 p.m.	8.90	2,990	8 a.m.	24.55	23,400	6 p.m.	17.55	12,000
			4 p.m.	24.05	22,500	12	16.35	10,400
Mar. 27*			12	24.05	22,500			
						Apr. 5*		
3 a.m.	11.45	5,100	Mar. 31					
6	13.90	7,500				12 m	14.70	8,440
8	15.50	9,400	8 a.m.	24.38	23,100	5 p.m.	12.50	6,100
9	17.30	11,600	4 p.m.	24.80	23,800	8	13.60	7,200
12 m	19.10	14,200	12	25.25	24,700	12	13.40	7,000
3 p.m.	21.30	18,600						
6	23.40	21,300	Apr. 1*			Apr. 6*		
9	24.65	23,600						
12	25.65	25,500	12 m	25.72	25,600	6 a.m.	12.80	6,400
			12 p.m.	26.02	26,200	11	12.10	5,700
Mar. 28*						12 m	11.20	4,880
			Apr. 2*			3 p.m.	11.76	5,380
4 a.m.	26.80	27,800				12	11.15	4,840
8	27.35	28,300	8 a.m.	26.02	26,200			
1 p.m.	27.60	29,400	4 p.m.	25.76	25,700	Apr. 7*		
6	27.35	28,300	12	25.25	24,700			
12	26.90	28,000				12 m	10.35	4,130
			Apr. 3*			12 p.m.	9.70	3,610
Mar. 29								
			6 a.m.	24.75	23,800	Apr. 8*		
8 a.m.	26.18	26,600	12 m	24.15	22,700			
4 p.m.	25.47	25,100	6 p.m.	23.55	21,600	12 m	9.20	3,210
12	25.05	24,300	12	22.30	19,300	12 p.m.	8.60	2,780
			Apr. 4*			Apr. 9*		
			6 a.m.	20.80	16,900	12 m	8.20	2,400
			12 m	18.85	13,800	12 p.m.	7.80	2,150

*Daily means computed from data in addition to figures shown.

135. (8830) Little Blue River near Deweese, Nebr.

Location.--Lat 40°20'00", long 98°04'10", in NE¼sec. 11, T. 4N., R. 7W., on right bank about 1,500 ft above bridge on State Highway 14, 1 mile upstream from Walnut Creek, 3¾ miles southeast of Deweese, and 6 miles northwest of Angus.

Drainage area.--1,140 sq mi, approximately.

Gage-height record.--Water-stage recorder graph except 5 p.m. Mar. 27 to 1 p.m. Mar. 28 for which graph was drawn on basis of antecedent and subsequent graph and high-water mark inside gage well. Datum of gage is 1,632.67 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 13,000 cfs; affected by ice Mar. 1-8.

Maxima.--March-April 1960: Discharge, 11,800 cfs 12 p.m. Mar. 27 (gage height, 14.45 ft, from flood-mark).
1951, 1953 to February 1960: Discharge, 16,000 cfs June 26, 1951, estimated on basis of records for station at Angus (gage height, 14.9 ft, at site 1,500 ft downstream at same datum, from information by local resident).

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	78	1,770	9	80	167	17	78	122	25	187	105
2	78	2,230	10	79	153	18	79	118	26	738	102
3	70	825	11	78	148	19	80	115	27	5,970	102
4	70	595	12	77	139	20	80	112	28	8,590	104
5	75	439	13	78	136	21	80	109	29	4,010	106
6	75	312	14	82	128	22	82	106	30	1,120	105
7	80	230	15	82	126	23	84	106	31	534	-
8	88	190	16	81	122	24	100	106			
Monthly mean discharge, in cubic feet per second										744	308
Runoff, in acre-feet										45,740	18,300
Runoff, in inches										-	-

Little Blue River near Deweese, Nebr.

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1960

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Mar. 25			Mar. 28*			Apr. 1*		
12 p.m.	4.09	201	6 a.m.	13.70	9,910	4 a.m.	5.31	480
			12 m	13.17	8,600	6	5.73	610
Mar. 26*			6 p.m.	12.72	7,460	8	6.78	1,040
			12	12.11	6,130	10	7.68	1,590
4 a.m.	4.22	226				12 m	8.28	1,980
8	4.79	349	Mar. 29*			2 p.m.	8.78	2,310
12 m	5.38	499				4	9.40	2,720
4 p.m.	5.99	706	4 a.m.	11.80	5,550	6	9.68	2,920
6	6.50	910	8	11.34	4,860	8	9.78	2,990
8	6.97	1,140	12 m	10.72	3,870	11	9.75	2,960
10	8.44	2,090	3 p.m.	10.07	3,190	12	9.56	2,830
12	8.82	2,330	6	9.32	2,660			
			9	8.59	2,180	Apr. 2		
Mar. 27			12	8.07	1,850			
						4 a.m.	9.35	2,680
3 a.m.	9.45	2,750	Mar. 30*			6	9.45	2,760
6	9.88	3,060				12 m	9.03	2,460
9	10.28	3,360	6 a.m.	7.33	1,360	4 p.m.	8.50	2,090
12 m	11.00	4,260	12 m	6.80	1,050	6	8.07	1,820
2 p.m.	11.75	5,460	6 p.m.	6.35	850	8	7.63	1,520
4	12.80	7,660	12	6.10	750	10	7.22	1,240
6	13.43	9,240				12	6.98	1,100
8	14.09	10,900	Mar. 31*					
10	14.40	11,700				Apr. 3*		
12	14.45	11,800	12 m	5.45	520			
			12 p.m.	5.19	488	6 a.m.	6.40	838
						12 m	6.35	818
						12 p.m.	6.12	726

*Daily means computed from data in addition to figures shown.

136. (8835.7) Little Blue River near Gilead, Nebr.

Location.--Lat 40°11'20", long 97°24'30", in NE¼NE¼sec. 34, T. 3N., R. 1W., near right bank on upstream side of highway bridge, 3 miles north of Gilead, 7½ miles downstream from Dry Creek, and 8 miles upstream from Big Sandy Creek.

Drainage area.--1,400 sq mi, approximately.

Gage-height record.--Water-stage recorder graph except Apr. 4, 5. Datum of gage is 1,371.29 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 18,000 cfs; affected by ice Mar. 1-21. Discharge Apr. 4, 5 estimated on basis of records for stations near Deweese and near Fairbury.

Maxima.--March-April 1960: Discharge, 25,600 cfs 8 a.m. Mar. 28 (gage height, 17.30 ft).
1959 to February 1960: Discharge, about 8,000 cfs July 5, 1959.

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	108	1,820	9	108	410	17	108	228	25	137	176
2	108	3,600	10	108	350	18	111	212	26	286	172
3	105	2,620	11	105	315	19	116	199	27	3,980	172
4	100	1,500	12	105	290	20	120	194	28	16,100	172
5	100	1,100	13	108	274	21	120	188	29	14,800	161
6	100	836	14	108	254	22	123	185	30	6,720	181
7	105	626	15	108	240	23	133	181	31	1,950	-
8	105	493	16	108	228	24	139	179			
Monthly mean discharge, in cubic feet per second										1,504	585
Runoff, in acre-feet										92,490	34,820
Runoff, in inches										-	-

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1930

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Mar. 25			Mar. 27*Con.			Mar. 29*		
12 p.m.	4.01	151	10 a.m.	9.40	2,440	5 a.m.	17.00	22,400
			12 m	10.95	3,560	10	16.53	18,200
Mar. 26*			4 p.m.	13.15	5,940	5 p.m.	15.50	12,000
			8	13.80	7,100	12	14.88	9,840
12 m	4.13	176	12	14.45	8,620			
4 p.m.	4.45	244				Mar. 30*		
8	5.66	590	Mar. 28*					
12	6.25	840				6 a.m.	14.45	8,600
			4 a.m.	16.10	15,200	12 m	13.85	7,200
Mar. 27*			8	17.30	25,600	6 p.m.	12.70	5,250
			12 m	16.70	19,600	12	10.25	3,260
4 a.m.	7.40	1,350	9 p.m.	15.65	12,600			
8	8.56	1,940	12	15.92	14,100			

Little Blue River near Gilead, Nebr.--Continued

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1960

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Mar. 31*			Apr. 1*			Apr. 2*Con.		
4 a.m.	9.02	2,450	6 a.m.	7.32	1,520	6 p.m.	11.35	4,080
10	8.16	1,950	12 m	7.70	1,710	12	11.04	3,850
4 p.m.	7.62	1,670	6 p.m.	8.41	2,090			
12	7.28	1,500	12	9.54	2,750	Apr. 3*		
			Apr. 2*			6 a.m.	10.18	3,210
						12 m	9.38	2,660
			6 a.m.	10.36	3,340	6 p.m.	8.28	2,020
			12 m	10.92	3,760	12	7.30	1,510

*Daily means computed from data in addition to figures shown.

137. (8836) South Fork Big Sandy Creek near Edgar, Nebr.

(Crest-stage station)

Location.--Lat 40°20'10", long 97°58'20", in NW¼NW¼sec. 11, T. 4N., R. 6W., on left downstream corner of twin concrete box culvert on gravelled county road, 0.1 mile south of east-west road and 2 miles south of Edgar.

Drainage area.--15.2 sq mi.

Gage-height record.--Crest stages only.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 230 cfs and by indirect measurement at 600 cfs.

Maxima.--March-April 1960: Discharge, 600 cfs Mar. 27 (gage height, 13.57 ft).
1953 to February 1960: Discharge, 595 cfs Aug. 16, 1957 (gage height, 13.56 ft).

138. (8837) South Fork Big Sandy Creek near Davenport, Nebr.

(Crest-stage station)

Location.--Lat 40°18'30", long 97°52'40", in SW¼SW¼sec. 15, T. 4N., R. 5W., on right downstream wingwall of bridge on dirt road, 50 ft north of State Highway 4, and 3½ miles west of Davenport.

Drainage area.--32.0 sq mi.

Gage-height record.--Crest stages only. Altitude of gage is 1,640 ft (from topographic map).

Discharge record.--Stage-discharge relation defined by current-meter measurements below 477 cfs and by indirect measurement at 1,870 cfs.

Maxima.--March-April 1960: Discharge, 1,870 cfs Mar. 27 (gage height, 17.78 ft).
1950, 1952 to February 1960: Discharge, 1,400 cfs, approximate, July 9, 1950 (gage height, 17.3 ft, approximate).

139. (8838) South Fork Big Sandy Creek near Carleton, Nebr.

(Crest-stage station)

Location.--Lat 40°15'50", long 97°47'30", in NE¼NW¼sec. 5, T. 3N., R. 4W., on downstream end of center pile of wooden bridge on east-west road, 3½ miles southeast of Davenport and 7 miles southwest of Carleton.

Drainage area.--49.4 sq mi.

Gage-height record.--Crest stages only. Altitude of gage is 1,600 ft (from topographic map).

Discharge record.--Stage-discharge relation defined by current-meter and indirect measurements below 228 cfs and by indirect measurements at 463 cfs, 739 cfs, and 3,690 cfs.

Maxima.--March-April 1960: Discharge, 3,690 cfs Mar. 27 (gage height, 17.02 ft).
1952 to February 1960: Discharge, 1,740 cfs July 14, 1952 (gage height, 16.4 ft, from floodmarks).

140. (8839) South Fork Big Sandy Creek near Hebron, Nebr.

(Crest-stage station)

Location.--Lat 40°13'30", long 97°34'30", in NW¼SW¼sec. 17, T. 3N., R. 2W., on downstream end of second pier from left end of concrete bridge on U.S. Highway 81, half a mile south of east-west road and 4 miles north of Hebron.

Drainage area.--81.9 sq mi.

Gage-height record.--Crest stages only. Altitude of gage, 1,490 ft (from topographic map).

Discharge record.--Stage-discharge relation defined by current-meter measurements below 237 cfs and by indirect measurements at 318 cfs, 610 cfs, 1,120 cfs, and 3,220 cfs.

Maxima.--March-April 1960: Discharge, 3,220 cfs Mar. 27 (gage height, 21.90 ft).
1952 to February 1960: Discharge, 3,160 cfs June 27, 1952 (gage height, 21.8 ft, from flood-marks).

141. (8840) Little Blue River near Fairbury, Nebr.

Location.--Lat 40°06'56", long 97°10'23", in sec. 26, T. 2N., R. 2E., on right bank 20 ft downstream from bridge on Stage Highway 15, three-quarters of a mile south of Fairbury, and 5¼ miles upstream from Rose Creek.

Drainage area.--2,320 sq mi, approximately.

Gage-height record.--Wire-weight gage once daily or oftener and water-stage recorder graph Mar. 1-28. Graph for Mar. 29 to Apr. 30 drawn on basis of wire-weight gage readings. Datum of gage is 1,282.19 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation Mar. 1-26 defined by current-meter measurements below 11,000 cfs, Mar. 27 to Apr. 30 defined by current-meter measurements below 32,000 cfs; affected by ice Mar. 1-6, 11, 12, 16-18.

Maxima.--March-April 1960: Discharge, 31,700 cfs 5 p.m. Mar. 28 (gage height, 15.80 ft).
1908-15, 1928 to February 1960: Discharge, 36,800 cfs June 27, 1951; gage height, 16.82 ft June 27, 1951, both at site 3½ miles downstream at different datum).

Remarks.--Regulation by powerplant above station does not affect floodflow.

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	169	3,180	9	146	686	17	140	346	25	217	262
2	158	4,840	10	150	578	18	152	322	26	591	254
3	150	5,100	11	146	521	19	171	313	27	5,300	249
4	138	2,350	12	146	437	20	189	292	28	20,100	257
5	138	1,700	13	148	458	21	210	292	29	22,300	249
6	140	1,350	14	148	412	22	224	270	30	12,400	257
7	148	1,010	15	142	379	23	222	262	31	5,340	-
8	152	816	16	134	346	24	217	262			
Monthly mean discharge, in cubic feet per second										2,262	935
Runoff, in acre-feet										139,100	55,640
Runoff, in inches										-	-

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1960

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Mar. 25			Mar. 27*Con.			Mar. 30*		
12 p.m.	1.72	234	8 p.m.	11.15	7,840	4 a.m.	13.20	12,800
			12	12.45	10,600	8	13.20	12,800
Mar. 26*						12 m	13.60	14,200
			Mar. 28*			6 p.m.	12.90	11,800
12 m	1.82	259				12	12.00	9,550
2 p.m.	1.95	295	4 a.m.	13.25	12,900			
4	2.42	437	8	13.70	14,600	Mar. 31*		
6	3.37	798	12 m	14.40	18,100			
8	4.30	1,270	5 p.m.	15.80	31,700	6 a.m.	10.40	6,740
10	5.15	1,740	12	15.38	25,900	12 m	8.60	4,680
12	6.01	2,340				6 p.m.	7.90	3,960
			Mar. 29*			12	7.40	3,500
Mar. 27*								
			4 a.m.	15.00	22,300	Apr. 1*		
4 a.m.	7.44	3,540	8	14.96	22,000			
8	7.81	3,870	12 m	15.08	22,900	12 m	6.60	2,810
12 m	8.41	4,470	5 p.m.	15.39	26,000	12 p.m.	7.25	3,360
4 p.m.	10.12	6,400	9	14.82	20,900			
			12	14.20	16,900			

*Daily means computed from data in addition to figures shown.

142 (8841) Mill Creek tributary near Haddam, Kans.

(Crest-stage station)

Location.--In NE¼NE¼sec. 10, T. 3S., R. 1E., above culvert on U.S. Highway 36, 3.0 miles so
Haddam.

Drainage area.--1.5 sq mi, approximately.

Gage-height record.--Crest stages only.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 18 cf
by indirect measurement at 584 cfs.

Maxima.--March-April 1960: Discharge not defined, Mar. 27 (gage height, 12.73 ft).
1957 to February 1960: Discharge, 584 cfs Sept. 4, 1958 (gage height, 15.30 ft).

143. (8842) Mill Creek at Washington, Kans.

Location.--Lat 39°48'50", long 97°02'20", on south line of sec. 1, T. 3S., R. 3E., at downstrea
side of bridge on U.S. Highway 36, 0.5 mile east of Washington and about 26 miles upstream fr
mouth.

Drainage area.--344 sq mi.

Gage-height record.--Water-stage recorder. Datum of gage is 1,261.56 ft above mean sea level, da
of 1929.

Discharge record.--Stage-discharge relation defined by current-meter measurements; affected by ice
Mar. 1-25.

Maxima.--March-April 1960: Discharge, 9,690 cfs 7 a.m. Mar. 28 (gage height, 25.58 ft).
1959 to February 1960: Discharge, 2,470 cfs Oct. 6, 1959 (gage height, 16.54 ft).
Maximum stage known since at least 1903, about 36 ft June 8, 1941, from information by
local residents and newspaper files.

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1			9			17			25		
2	30		10	22		18	25	95	26	120	
3	28	627	11	21	146	19	25	94	27	279	58
4	30	1,280	12	20	135	20	30	84	28	5,170	53
5	30	440	13	20	129	21	30	77	29	8,690	49
6	28	287	14	20	122	22	35	74	30	3,240	51
7	25	232	15	20	117	23	45	68	31	573	66
8	24	201	16	22	119	24	55	66		325	188
	23	181		24	110		80	62			
	23	160			101						
Monthly mean discharge, in cubic feet per second										616	182
Runoff, in acre-feet										37,900	10,850
Runoff, in inches										-	-

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1960

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Mar. 25			Mar. 28 Con.			Mar. 31 Con.		
12 p.m.	4.10	140	3 a.m.			6 p.m.	6.13	303
Mar. 26			4	25.13	9,130	12	6.08	297
4 a.m.			5	25.30	9,330			
8	3.94	127	6	25.41	9,470	Apr. 1		
12 m	3.86	121	7	25.53	9,630			
2 p.m.	4.44	167	8	25.58	9,690	2 a.m.	6.03	294
4	4.66	165	12 m	25.51	9,600	4	6.19	309
6	4.86	201	4 p.m.	25.14	9,140	6	6.47	337
8	5.62	262	6	24.70	8,610	8	7.17	420
10	7.52	463	12	23.98	7,780	10	7.91	517
12	9.57	761		22.85	6,600	12 m	8.21	559
	11.89	1,190	Mar. 29			2 p.m.	8.50	600
Mar. 27			4 a.m.			4	8.82	645
2 a.m.			8	21.53	5,380	8	10.81	976
4	14.41	1,730	12 m	19.98	4,190	12	13.03	1,420
6	16.53	2,460	4 p.m.	17.76	2,950			
8	17.85	2,990	8	14.73	1,830	Apr. 2		
10	18.73	3,420	12	12.46	1,300			
12 m	19.26	3,730		10.75	965	2 a.m.	13.56	1,520
2 p.m.	19.93	4,150	Mar. 30			4	13.74	1,560
4	21.35	5,230	4 a.m.			5	13.75	1,560
6	23.23	6,980	8	9.49	748	6	13.73	1,560
8	24.51	8,380	12 m	8.57	610	8	13.54	1,560
9	25.03	9,010	4 p.m.	7.98	527	10	13.32	1,520
10	25.10	9,090	8	7.51	461	12 m	12.98	1,470
11	25.05	9,030	12	7.16	419	4 p.m.	11.98	1,410
12	24.92	8,870		6.86	383	8	10.47	1,210
	24.73	8,650	Mar. 31			12	8.98	915
Mar. 28			6 a.m.			Apr. 3		684
1 a.m.			12 m	6.49	339	6 a.m.		
2	24.75	8,670		6.27	317	12 m	7.67	484
	25.03	9,010				6 p.m.	7.15	416
						12	6.71	365
							6.33	323

144. (8843) Mill Creek tributary near Washington, Kans.

(Crest-stage station)

Location.--In SW¼SW¼sec. 5, T. 3S., R. 4E., at downstream end of culvert on U.S. Highway 36, 2.2 miles east of Washington.

Drainage area.--3 sq mi, approximately.

Gage-height record.--Crest stages only.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 83 cfs and by indirect measurements at 730 cfs and 1,070 cfs.

Maxima.--March-April 1960: Discharge not defined, Mar. 27 (gage height, 12.37 ft).
1957 to February 1960: Discharge, 1,070 cfs July 4, 1959 (gage height, 16.88 ft).

145. (8845) Little Blue River at Waterville, Kans.

Location.--Lat 39°46'40", long 96°51'40", on west line of sec. 22, T. 3S., R. 5E., at downstream side of bridge on State Highway 15 E., 0.4 mile downstream from Malone Creek, 9 miles northwest of Waterville, and 18 miles upstream from mouth.

Drainage area.--3,330 sq mi, approximately.

Gage-height record.--Water-stage recorder graph. Datum of gage is 1,140.06 ft above mean sea level (levels by Corps of Engineers).

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

Maxima.--March-April 1960: Discharge, 38,800 cfs 6 p.m. Mar. 29 (gage height, 23.90 ft).
1903: May 31, gage height, about 28 ft, former site and datum, from information by local resident.
1922-25, 1928 to February 1960: Discharge, 50,400 cfs June 10, 1941 (gage height, 26.20 ft, from floodmarks at site 11.5 miles downstream and at datum 29.19 ft lower), from rating curve extended above 25,000 cfs on basis of velocity-area study.

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	220	6,260	9	205	1,640	17	240	831	25	682	564
2	220	6,830	10	205	1,400	18	270	795	26	1,030	540
3	210	7,730	11	215	1,260	19	280	745	27	10,800	521
4	205	5,210	12	215	1,120	20	295	708	28	16,100	521
5	200	3,520	13	220	1,060	21	320	665	29	30,100	544
6	200	2,820	14	225	1,010	22	400	634	30	26,800	755
7	200	2,340	15	235	948	23	540	596	31	14,200	-
8	200	1,960	16	240	875	24	603	584			
Monthly mean discharge, in cubic feet per second										3,421	1,833
Runoff, in acre-feet										210,400	109,100
Runoff, in inches										-	-

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1960

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Mar. 25			Mar. 29			Apr. 1		
12 p.m.	4.83	688	3 a.m.	20.19	20,500	4 a.m.	12.33	6,760
			6	20.84	22,700	8	11.87	6,270
Mar. 26			9	21.95	27,200	12 m	11.54	5,940
			12 m	23.00	32,800	4 p.m.	11.41	5,810
6 a.m.	4.82	684	3 p.m.	23.65	37,000	8	11.41	5,810
12 m	4.92	730	4	23.77	37,900	12	11.67	6,070
3 p.m.	5.05	795	5	23.82	38,200			
6	5.47	1,000	6	23.90	38,800	Apr. 2		
9	6.67	1,740	7	23.80	38,100			
12	8.41	3,050	8	23.59	36,600	6 a.m.	11.87	6,270
			9	23.49	35,900	12 m	12.35	6,780
Mar. 27			10	23.31	34,700	6 p.m.	12.84	7,320
			11	23.12	33,500	12	13.30	7,860
3 a.m.	11.05	5,450	12	23.00	32,800			
6	12.90	7,390				Apr. 3		
9	14.20	8,940	Mar. 30					
12 m	15.55	10,700				4 a.m.	13.45	8,040
3 p.m.	17.57	14,000	4 a.m.	22.47	29,800	8	13.47	8,060
6	18.33	15,600	8	22.13	28,200	12 m	13.38	7,960
9	18.28	15,500	12 m	21.95	27,200	4 p.m.	13.18	7,720
12	18.20	15,300	4 p.m.	21.51	25,300	8	12.81	7,290
			8	21.07	23,600	12	12.31	6,740
Mar. 28			12	20.30	20,800			
						Apr. 4		
4 a.m.	18.11	15,100	Mar. 31					
8	18.19	15,300				6 a.m.	11.49	5,890
12 m	18.33	15,600	6 a.m.	19.02	17,000	12 m	10.75	5,150
4 p.m.	18.67	16,200	12 m	17.73	14,400	6 p.m.	10.05	4,450
8	19.15	17,400	6 p.m.	15.80	11,100	12	9.55	3,950
12	19.69	19,000	12	13.30	7,860			

146. (8849) Robidoux Creek at Beattie, Kans.

(Crest-stage station)

Location.--In SW¼NE¼ sec. 20, T. 2S., R. 9E., at downstream side of county highway bridge, 0.8 mile northwest of Beattie.

Drainage area.--40 sq mi, approximately.

Gage-height record.--Crest stages only.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 2,600 cfs and by indirect measurement at 6,200 cfs.

Maxima.--March-April 1960: Discharge, 6,200 cfs Mar. 27 (gage height, 22.46 ft).
1957 to February 1960: Discharge, 3,600 cfs July 11, 1958 (gage height, 20.23 ft).

147. (8855) Black Vermillion River near Frankfort, Kans.

Location.--Lat 39°40'50", long 96°26'40", on south line of sec. 20, T. 4S., R. 9E., on right bank at downstream side of bridge on State Highway 9, a quarter of a mile downstream from Vermillion Creek and 2.2 miles southwest of Frankfort.

Drainage area.--412 sq mi.

Gage-height record.--Water-stage recorder graph except Mar. 1-26, Apr. 5-10 when once-daily wire-weight gage readings were used. Datum of gage is 1,106.91 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 19,000 cfs and extended above on basis of previous rating slopes.

Maxima.--March-April 1960: Discharge, 25,100 cfs 3 a.m. Mar. 28 (gage height, 28.52 ft).
1948, 1951, 1953-60: Discharge, 38,300 cfs May 30, 1959 (gage height, 29.40 ft); gage height, 30.2 ft Aug. 3, 1948, from floodmarks.
Flood of Aug. 3, 1948 reported to be about 0.2 ft higher than a flood in 1903.

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	65	550	9	65	160	17	64	156	25	160	81
2	64	1,080	10	65	149	18	65	138	26	300	76
3	60	642	11	65	144	19	70	111	27	4,970	71
4	58	319	12	65	135	20	75	103	28	15,600	76
5	57	250	13	65	133	21	80	97	29	4,920	116
6	60	222	14	66	219	22	100	90	30	1,570	338
7	64	198	15	66	233	23	130	86	31	445	-
8	65	178	16	66	138	24	150	84			
Monthly mean discharge, in cubic feet per second										959	212
Runoff, in acre-feet										58,940	12,640
Runoff, in inches										-	-

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1960

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Mar. 25			Mar. 28			Mar. 30		
12 p.m.	6.11	159	1 a.m.	28.37	23,000	2 a.m.	19.72	2,530
			2	28.49	24,600	4	19.02	2,320
Mar. 26			3	28.52	25,100	6	18.43	2,160
			4	28.49	24,600	8	17.77	1,990
4 a.m.	6.39	181	6	28.31	22,400	10	17.12	1,830
8	6.67	204	8	28.09	20,200	12 m	16.16	1,590
12 m	7.00	230	10	27.82	17,500	2 p.m.	14.97	1,340
2 p.m.	7.20	248	12 m	27.54	15,100	4	13.74	1,110
4	7.62	286	2 p.m.	27.22	13,200	6	12.54	907
6	8.14	334	4	26.78	11,100	8	11.55	752
8	9.24	451	6	26.35	9,550	10	10.84	653
10	10.54	611	8	25.94	8,480	12	10.34	584
12	11.79	788	10	25.49	7,580			
Mar. 27			12	25.12	6,880	Mar. 31		
			Mar. 29			2 a.m.	9.98	538
2 a.m.	13.57	1,080				4	9.71	505
4	15.57	1,460	2 a.m.	24.76	6,340	6	9.49	479
6	17.20	1,850	4	24.49	5,940	8	9.32	460
8	18.85	2,260	6	24.32	5,680	10	9.17	444
10	20.19	2,680	8	24.18	5,480	12 m	9.04	429
12 m	21.72	3,380	10	24.02	5,320	2 p.m.	8.93	417
2 p.m.	23.26	4,560	12 m	23.83	5,130	4	8.83	406
4	24.46	5,900	2 p.m.	23.62	4,920	6	8.74	396
6	25.40	7,390	4	23.24	4,540	8	8.68	390
8	26.21	9,120	6	22.75	4,100	10	8.62	383
10	26.87	11,500	8	22.13	3,640	12	8.78	401
12	27.79	16,200	10	21.31	3,140			
			12	20.52	2,790			

148. (8860) Big Blue River at Randolph, Kans.

Location.--Lat 39°27', long 96°43', in SW¼sec. 12, T. 7S., R. 6E., near right bank on downstream side of pier of bridge on State Highway 16, half a mile upstream from Fancy Creek, three-quarters of a mile east of Randolph, and at mile 32.3.

Drainage area.--9,100 sq mi, approximately.

Gage-height record.--Water-stage recorder graph Mar. 27-31, Apr. 13-30. Weekly wire-weight gage readings for remaining periods. Datum of gage is 1,034.90 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation defined by current-meter measurements. Backwater from Tuttle Creek Dam (under construction) occurred from 8 a.m. Mar. 30 until Apr. 15. Discharge for period of backwater was estimated on basis of records for stations upstream.

Maxima.--March-April 1960: Discharge, 74,000 cfs 1 p.m. Mar. 30; gage height, 36.48 ft Apr. 2 affected by backwater from Tuttle Creek Dam.
1918 to February 1960: Discharge, 98,000 cfs June 10, 1941 (gage height, 30.81 ft), from rating curve extended above 53,000 cfs on basis of velocity-area study.

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	900	40,000	9	800	6,500	17	900	3,150	25	2,000	2,100
2	900	41,000	10	800	5,300	18	1,000	2,950	26	2,550	2,040
3	950	42,000	11	800	5,000	19	1,000	3,010	27	22,000	1,910
4	900	38,000	12	800	4,500	20	1,000	2,800	28	49,300	1,880
5	800	20,000	13	800	4,200	21	1,100	2,630	29	57,700	2,010
6	800	14,000	14	800	3,800	22	1,300	2,480	30	68,600	2,780
7	800	11,000	15	850	3,600	23	1,500	2,320	31	48,300	-
8	800	8,000	16	850	3,430	24	1,600	2,180			
Monthly mean discharge, in cubic feet per second										8,813	9,485
Runoff, in acre-feet										541,900	564,400
Runoff, in inches										-	-

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1960

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Mar. 25			Mar. 27 Con.			Mar. 29		
12 p.m.	6.28	2,180	10 a.m.	16.06	16,100	2 a.m.	28.04	61,300
			11	17.10	18,000	4	27.97	60,400
Mar. 26			12 m	18.17	19,900	6	27.84	58,900
			1 p.m.	19.42	22,300	8	27.72	57,400
6 a.m.	6.28	2,180	2	20.77	25,000	10	27.60	56,000
12 m	6.33	2,230	3	22.03	27,600	12 m	27.52	55,200
1 p.m.	6.34	2,240	4	22.94	29,800	2 p.m.	27.50	55,000
2	6.35	2,250	5	23.54	31,900	4	27.52	55,200
3	6.39	2,290	6	24.07	33,800	6	27.62	56,200
4	6.46	2,360	7	24.51	35,600	8	27.72	57,400
5	6.53	2,430	8	24.85	37,200	10	27.80	58,400
6	6.63	2,530	9	25.13	38,600	12	27.93	60,000
7	6.79	2,690	10	25.31	39,600			
8	6.99	2,890	11	25.46	40,300	Mar. 30		
9	7.32	3,250	12	25.59	41,000			
10	7.81	3,790				4 a.m.	28.37	65,200
11	8.41	4,490	Mar. 28			8	28.95	70,600
12	9.00	5,250				12 m	29.58	73,800
			2 a.m.	25.76	41,800	1 p.m.	29.76	74,000
Mar. 27			4	25.89	42,400	4	30.24	72,800
			6	26.01	43,100	8	30.81	68,000
1 a.m.	9.66	6,120	8	26.19	44,100	12	31.47	61,500
2	10.23	6,920	10	26.42	45,500			
3	10.80	7,730	12 m	26.62	47,000	Mar. 31		
4	11.38	8,580	2 p.m.	26.87	49,000			
5	11.98	9,460	4	27.14	51,400	4 a.m.	32.10	56,000
6	12.65	10,500	6	27.50	55,000	8	32.71	51,000
7	13.38	11,600	8	27.84	58,900	12 m	33.25	47,000
8	14.17	12,900	10	28.08	61,800	4 p.m.	33.77	44,000
9	15.05	14,300	12	28.13	62,400	8	34.17	41,500
						12	34.50	39,000

149. (8865) Fancy Creek at Winkler, Kans.

Location.--Lat 39°28'30", long 96°50'10", in SW¼sec. 2, T. 7S., R. 5E., on left bank at downstream side of highway bridge, 0.2 mile downstream from Otter Creek and 0.4 mile south of Winkler.

Drainage area.--176 sq mi.

Gage-height record.--Water-stage recorder graph except Mar. 1-10 and Mar. 26-28. Record for Mar. 26-28 was reconstructed on basis of fragmentary record and a floodmark. Datum of gage is 1,101.17 ft above mean sea level (levels by Corps of Engineers).

Discharge record.--Stage-discharge relation defined by current-meter measurements below 2,300 cfs and extended above on basis of previous rating shapes. Discharge Mar. 1-10 was estimated on basis of weather records and records for nearby stations.

Maxima.--March-April 1960: Discharge, 8,720 cfs 12 p.m. Mar. 27 (gage height, 17.10 ft).
1953 to February 1960: Discharge, 19,600 cfs Sept. 5, 1958 (gage height, 21.80 ft).
Maximum stage known since at least 1915, 22.3 ft in August 1944, from floodmark. Flood in July 1951 reached a stage of 21.0 ft, from floodmark.

Fancy Creek at Winkler, Kans.

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	25	563	9	23	111	17	21	88	25	65	55
2	25	617	10	24	106	18	22	79	26	281	51
3	24	236	11	23	101	19	24	71	27	2,930	48
4	24	183	12	22	96	20	26	69	28	3,190	91
5	23	157	13	22	96	21	31	66	29	1,120	117
6	23	147	14	23	101	22	44	63	30	546	746
7	23	131	15	23	90	23	45	60	31	346	-
8	23	122	16	22	85	24	59	58			
Monthly mean discharge, in cubic feet per second										295	153
Runoff, in acre-feet										18,150	9,130
Runoff, in inches										-	-

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1960

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Mar. 25			Mar. 28 Con.			Mar. 31 Con.		
12 p.m.	2.30	76	10 a.m.	7.65	2,020	8 p.m.	3.35	312
			12 m	7.38	1,890	12	3.40	325
Mar. 26			2 p.m.	7.10	1,750			
			4	6.78	1,590	Apr. 1		
4 a.m.	2.43	92	6	6.63	1,520			
8	2.45	94	8	6.56	1,480	4 a.m.	3.83	432
12 m	2.42	90	10	6.46	1,430	8	3.56	365
4 p.m.	2.53	104	12	6.38	1,390	10	3.52	355
6	3.00	190				12 m	3.64	385
8	4.85	655	Mar. 29			2 p.m.	4.21	543
10	6.30	1,090				4	4.46	618
12	7.00	1,300	6 a.m.	5.83	1,120	6	4.78	714
			12 m	5.12	828	8	5.20	860
Mar. 27			1 p.m.	5.02	788	10	5.50	980
			6	6.33	1,360	12	5.87	1,140
2 a.m.	7.65	1,530	7	6.38	1,390			
4	8.35	1,770	12	5.45	960	Apr. 2		
6	8.92	1,970						
8	9.13	2,050	Mar. 30			1 a.m.	5.92	1,160
10	9.12	2,050				2	5.85	1,120
12 m	9.25	2,100	4 a.m.	4.62	666	3	5.75	1,080
2 p.m.	9.80	2,360	8	4.27	561	6	5.17	848
4	10.35	2,680	12 m	4.08	504	9	4.63	669
6	12.00	3,600	4 p.m.	3.91	453	12 m	4.13	519
8	13.35	4,470	8	3.77	418	3 p.m.	3.76	415
10	14.95	5,980	12	3.67	392	6	3.52	355
12	17.10	8,720				9	3.37	318
			Mar. 31			12	3.27	292
Mar. 28								
			4 a.m.	3.58	370	Apr. 3		
2 a.m.	16.55	8,060	8	3.51	352			
4	14.60	6,180	12 m	3.51	352	6 a.m.	3.12	255
6	12.10	4,370	4 p.m.	3.42	330	12 m	3.02	230
8	9.55	2,980				6 p.m.	2.93	211
						12	2.88	201

150. (8869) Tuttle Creek Reservoir near Randolph, Kans.

Location.--Lat 39°15', long 96°36', in sec 24, T. 9S., R. 7E., at control house structure of Tuttle Creek Dam on Big Blue River, 5 miles north of Manhattan.

Drainage area.--9,550 sq mi, approximately.

Gage-height record.--Once-daily or more frequent staff gage readings of reservoir elevations except Mar. 1-19, 22, 26, Apr. 16-24, 27-30. Datum of gage is at mean sea level, datum of 1929.

Maxima.--March-April 1960: Contents, 358,100 acre-ft Apr. 4 (elevation, 1,071.1 ft).

Remarks.--Elevations and contents of reservoir are for 12 p.m., from graph based on once-daily or more frequent gage readings. Data furnished by Corps of Engineers.

Tuttle Creek Reservoir near Randolph, Kans.

Elevation, in feet, and contents, in acre-feet, 1960

Day	March		April		Day	March		April	
	Elevation (feet)	Contents (acre-feet)	Elevation (feet)	Contents (acre-feet)		Elevation (feet)	Contents (acre-feet)	Elevation (feet)	Contents (acre-feet)
1		1,710	1,069.5	336,200	16		1,710		38,870
2		1,710	1,069.9	342,700	17		1,710		16,480
3		1,710	1,070.3	348,000	18		1,740		5,670
4		1,710	1,071.0	356,800	19		2,020		3,340
5		1,710	1,070.6	351,800	20	1,014.0	2,370		2,770
6		1,710	1,068.4	319,100	21	1,014.0	2,370		2,530
7		1,710	1,065.8	282,400	22		2,910		2,370
8		1,710	1,061.9	237,000	23	1,013.5	2,200		2,300
9		1,710	1,037.8	195,000	24	1,013.2	2,090		2,230
10		1,710	1,055.5	172,000	25	1,013.7	2,260	1,013.5	2,200
11		1,710	1,055.1	168,000	26		2,610	1,013.5	2,200
12		1,710	1,054.6	163,400	27	1,023.6	9,990		2,160
13		1,710	1,051.0	132,500	28	1,040.0	60,500		2,160
14		1,710	1,046.1	95,400	29	1,051.8	138,500		2,160
15		1,710	1,041.3	66,730	30	1,060.4	222,400		3,500
					31	1,066.8	295,900		
Change in contents during month.						-	+294,200	-	-292,400

151. (8870) Big Blue River near Manhattan, Kans.

Location.--Lat 39°14'14", long 96°34'16", in S½sec. 30, T. 9S., R. 8E., on right bank at downstream side of highway bridge, 4 miles north of Manhattan and 7.0 miles upstream from mouth.

Drainage area.--9,560 sq mi, approximately.

Gage-height record.--Water-stage recorder graph except Mar. 1-8. Wire-weight gage readings were used Mar. 3-5. Datum of gage is 991.86 ft above mean sea level, datum of 1929.

Discharge record.--Stage-discharge relation defined by current-meter measurements. Backwater from channel storage occurred Apr. 10-30; discharge estimated on basis of five discharge measurements, records from the auxiliary recorder, and records for station at Randolph.

Maxima.--March-April 1960: Discharge, 31,400 cfs 4 p.m. Apr. 5 (gage height, 23.05 ft).
1951, 1954 to February 1960: Discharge, 93,400 cfs July 12, 1951 (gage height, 33.04 ft, present site and datum, from floodmarks), from rating curve extended above 35,000 cfs on basis of slope-area measurement of peak flow.
Flood of May 31, 1903, reached a stage of 35.85 ft, from floodmarks and information by local resident. Flood in June 1941 reached a stage of about 34.1 ft, from floodmarks and information by local resident.

Remarks.--Flood flow partly regulated by Tuttle Creek Reservoir (dam under construction). See preceding record.

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	1,200	29,400	9	972	22,400	17	924	8,600	25	1,920	2,300
2	1,300	29,000	10	972	11,000	18	930	4,000	26	2,720	2,200
3	1,270	28,600	11	948	5,300	19	918	3,200	27	9,060	2,100
4	1,250	28,000	12	984	12,000	20	948	3,000	28	18,100	2,100
5	1,130	29,000	13	858	22,000	21	1,100	2,900	29	24,400	2,100
6	1,100	29,100	14	900	20,000	22	1,280	2,600	30	27,300	2,300
7	1,000	29,800	15	894	16,000	23	1,520	2,500	31	29,000	-
8	1,000	29,200	16	882	14,000	24	1,730	2,400			
Monthly mean discharge, in cubic feet per second										4,468	13,240
Runoff, in acre-feet										274,700	787,600
Runoff, in inches										-	-

152. (8872) Cedar Creek near Manhattan, Kans.

(Crest-stage station)

Location.--In NE¼NE¼sec. 19, T. 9S., R. 8E., at downstream side of county highway bridge, 5.5 miles north of Manhattan.

Drainage area.--14 sq mi, approximately.

Gage-height record.--Crest stages only.

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

Maxima.--March-April 1960: Discharge, 460 cfs Mar. 27 (gage height, 11.63 ft).
1957 to February 1960: Discharge, 3,000 cfs July 10, 1958 (gage height, 18.97 ft).

153. (8876) Kansas River tributary near Wamego, Kans.

(Crest-stage station)

Location.--In SE¼SE¼sec. 14, T. 10S., R. 10E., at upstream end of culvert on county highway, 3.0 miles southeast of Wamego.

Drainage area.--2.3 sq mi, approximately.

Gage-height record.--Crest stages only.

Discharge record.--Stage-discharge relation defined by current-meter measurements below 22 cfs and by indirect measurement at 563 cfs.

Maxima.--March-April 1960: Discharge, 23 cfs Mar. 27 (gage height, 9.10 ft, from floodmark). 1951, 1957 to February 1960: Discharge, 563 cfs July 1951 (gage height, 16.9 ft, from floodmark).

154. (8880) Vermillion Creek near Wamego, Kans.

Location.--Lat 39°21'00", long 96°13'10", in NW¼sec. 20, T. 8S., R. 11E., at downstream side of highway bridge, 1 mile upstream from Indian Creek, 14 miles northeast of Wamego, and at mile 19.3.

Drainage area.--243 sq mi.

Gage-height record.--Water-stage recorder graph. Datum of gage is 992.20 ft above mean sea level, datum of 1929 (levels by Corps of Engineers).

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

Maxima.--March-April 1960: Discharge, 8,800 cfs 6 a.m. Mar. 28 (gage height, 26.80 ft). 1936-46, 1954 to February 1960: Discharge, 23,500 cfs Oct. 9, 1941 (gage height, 29.40 ft), from rating curve extended above 4,000 cfs on basis of velocity-area study.
Maximum stage known since at least 1873, 30.9 ft in 1915, from floodmark and information by local resident (discharge, 38,500 cfs, from rating curve extended above 4,000 cfs on basis of velocity-area study). Flood of July 13, 1951, reached a stage of 29.7 ft, from floodmarks.

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	55	517	9	52	164	17	60	120	25	211	79
2	55	603	10	55	156	18	60	106	26	432	73
3	55	467	11	55	152	19	60	101	27	4,300	69
4	55	291	12	50	141	20	70	97	28	6,450	85
5	50	240	13	50	138	21	101	92	29	1,310	161
6	50	223	14	58	136	22	132	88	30	562	256
7	50	197	15	60	132	23	148	85	31	368	-
8	50	180	16	60	128	24	229	81			
Monthly mean discharge, in cubic feet per second										495	179
Runoff, in acre-feet										30,450	10,630
Runoff, in inches										-	-

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1960

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Mar. 25			Mar. 28 Con.			Mar. 31 Con.		
12 p.m.	8.47	237	8 a.m.	26.74	8,680	10 p.m.	9.38	336
Mar. 26			12 m	26.10	7,640	12	9.48	348
			4 p.m.	24.55	5,750			
6 a.m.	8.72	262	6	22.95	4,370	Apr. 1		
12 m	8.80	270	8	21.00	3,250			
6 p.m.	10.15	431	10	19.35	2,570	2 a.m.	9.68	372
8	11.95	702	12	18.08	2,170	4	10.10	424
10	13.60	1,010	Mar. 29			6	10.53	484
12	15.00	1,310				8	10.58	491
			4 a.m.	17.00	1,850	10	10.66	502
Mar. 27			8	16.10	1,590	12 m	10.88	533
			12 m	14.45	1,190	4 p.m.	11.27	595
2 a.m.	16.00	1,560	4 p.m.	13.02	894	8	11.38	611
4	17.30	1,940	6	12.90	872	12	11.00	550
6	18.60	2,330	8	13.10	910			
8	19.60	2,660	10	12.67	831	Apr. 2		
10	20.55	3,020	12	12.23	751			
12 m	21.80	3,680				4 a.m.	10.64	500
2 p.m.	23.90	5,120	Mar. 30			8	10.93	540
4	24.82	6,020				12 m	11.60	648
8	25.65	7,010	6 a.m.	11.45	622	4 p.m.	11.96	704
12	26.05	7,570	12 m	11.04	556	8	11.72	665
			6 p.m.	10.55	487	12	11.15	574
Mar. 28			12	10.06	418			
						Apr. 3		
4 a.m.	26.68	8,560	Mar. 31					
6	26.80	8,800				4 a.m.	10.80	522
						8	10.82	525
			6 a.m.	9.78	384	12 m	10.62	497
			12 m.	9.61	363	6 p.m.	9.88	396
						12	9.40	338

155. (8883) Rock Creek near Louisville, Kans.

Location.--Lat 39°16'00", long 96°22'50", in sec. 14, T. 9S., R. 9E., at downstream side of highway bridge, 1.6 miles downstream from Camp Creek, 3.8 miles upstream from Brush Creek, 4 miles west of Louisville, and 15.4 miles upstream from mouth.

Drainage area.--128 sq mi, approximately.

Gage-height record.--Wire-weight gage read twice daily except Apr. 28-30. Graph drawn for period Mar. 24 to Apr. 2 on basis of wire-weight gage readings and floodmark. Datum of gage is 994.71 ft above mean sea level (Corps of Engineers bench mark).

Discharge record.--Stage-discharge relation defined by current-meter measurements. Discharge Apr. 28-30 estimated on basis of records for nearby stations.

Maxima.--March-April 1960: Discharge, 5,960 cfs 8 p.m. Mar. 27 (gage height, 27.70 ft, from floodmark). 1958 to February 1960: Discharge, 6,040 cfs May 5, 1959 (gage height, 27.8 ft, from floodmark).

Mean discharge, in cubic feet per second, 1960

Day	March	April	Day	March	April	Day	March	April	Day	March	April
1	36	536	9	35	114	17	34	83	25	92	62
2	36	330	10	35	111	18	34	79	26	307	59
3	36	207	11	34	111	19	38	76	27	2,870	54
4	36	176	12	34	103	20	38	73	28	1,160	70
5	36	156	13	34	100	21	39	71	29	466	100
6	35	150	14	34	96	22	42	69	30	348	190
7	35	136	15	34	90	23	49	67	31	240	-
8	35	128	16	34	87	24	68	65			
Monthly mean discharge, in cubic feet per second										206	125
Runoff, in acre-feet										12,660	7,430
Runoff, in inches										-	-

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1960

Hour	Gage height	Discharge	Hour	Gage height	Discharge	Hour	Gage height	Discharge
Mar. 25			Mar. 27 Con.			Mar. 31		
12 p.m.	6.80	132	10 p.m.	25.70	4,650	12 p.m.	7.70	221
Mar. 26			12	21.20	2,960	Apr. 1		
6 a.m.	7.40	190	Mar. 28			6 a.m.	7.70	221
12 m	8.10	260	2 a.m.	18.00	2,150	7	8.50	300
6 p.m.	9.10	374	4	16.30	1,720	8	11.50	720
12	11.10	676	8	14.00	1,200	9	14.00	1,200
Mar. 27			12 m	12.70	940	10	13.50	1,100
4 a.m.	12.90	982	6 p.m.	11.30	684	12 m	12.20	846
8	16.40	1,750	12	10.60	566	2 p.m.	11.20	666
10	19.10	2,420	Mar. 29			6	10.30	522
12 m	21.30	2,990	6 a.m.	10.10	494	12	9.50	420
2 p.m.	21.40	3,020	12 m	9.70	444	Apr. 2		
4	23.00	3,500	6 p.m.	9.60	432	6 a.m.	9.15	378
6	26.60	5,160	12	9.50	420	12 m	8.95	354
8	27.70	5,960				6 p.m.	8.20	270
						12	7.60	212

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