FLOODS IN KANSAS CITY, MISSOURI AND VICINITY, AUGUST 12-13, 1982

By Lawrence D. Becker, Terry W. Alexander,
and Loyd A. Waite

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CONTENTS

	Page
Abstract	1
Introduction	1
Purpose and scope	1
Acknowledgments	3
Description of flood area	3
Description of storm	3
Flood damages	5
Description and measurement of floods	5
Magnitude and frequency of floods	7
Flood hydrographs	15
Flood-crest profiles	15
Volume of floodflows	15
Relative flood magnitude	23
Summary	25
References	26
Glossary	27

ILLUSTRATIONS

		Page
Figure 1.	Map showing areas of flooding in Missouri	2
2.	Map showing location of flood-determination points in flood areas	4
3.	Mass rainfall curves for Independence and Kansas City, Missouri, precipitation gages	6
4.	Map showing distribution of precipitation for the storm of August 12-13, 1982, Kansas City and vicinity	8
5.-6.	Photographs showing:	
5.	Inundation of Independence Memorial Airport, August 13, 1982, by floodwaters of the Little Blue River	9
6.	View of devastation at Valley View Village trailer court, August 13, 1982, after the flood crest on the East Fork Little Blue River	11
7.-10.	Comparisons of discharge hydrographs at U.S. Geological Survey streamflow-gaging stations and miscellaneous site at:	
7.	Little Blue River below Longview Damsite at Kansas City	16
8.	East Fork Little Blue River at Lake Jacomo spillway near Blue Springs	16
9.	East Fork Little Blue River near Blue Springs	17
10.	Little Blue River near Lake City	17
11.-12.	Profiles of water surface for flood of August 12-13, 1982, for:	
11.	Little Blue River	18
12.	East Fork Little Blue River	20
Figure 13.	Graph showing comparison of August 12-13, 1982, peak discharges to upper limits of known floods in Missouri and in the United States	24

TABLES

		Page
Table 1.	Peak stages and discharges for Kansas City area floods of August 12-13, 1982	12
2.	Description of discharge measurement sites	28
3.	Comparison of flood-crest elevations in Rock Creek basin	21
4.	Comparison of flood volumes for Kansas City area floods	22

CONVERSION FACTORS

The analyses and compilations used in this report are based on inch-pound units of measurements. Conversion factors for inch-pound units and metric units are listed below. Multiply inch-pound units by the conversion factor to obtain metric units.

Inch-pound units	Conversion factor	Metric units
inch (in.)	25.40	millimeter (mm)
foot (ft)	0.3048	meter (m)
mile (mi)	1.609	kilometer (km)
square mile (mi^2)	2.590	square kilometer (km^2)
cubic foot per second (ft^3/s)	0.02832	cubic meter per second (m^3/s)
cubic foot per second per square mile [$(ft^3/s)/mi^2$]	0.01093	cubic meter per second per square kilometer [$(m^3/s)/km^2$]
acre-foot (acre-ft)	1233	cubic meter (m^3)
	1.233×10^{-3}	cubic hectometer (hm^3)

National Geodetic Vertical Datum of 1929 (NGVD of 1929):

A geodetic datum derived from a general adjustment of the first-order level nets of both the United States and Canada, formerly called mean sea level. NGVD of 1929 is referred to as sea level in this report.

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ABSTRACT

On August 12-13, 1982, a nearly stationary weather front in the vicinity of Kansas City, Missouri, produced intense thunderstorms. Excessive rainfall (12.6 inches in Raytown, Missouri) caused flash flooding during the nighttime and early daylight hours. Four deaths and damages, unofficially estimated in excess of $30 million, occurred in the three-county area of Jackson, Cass, and Clay Counties.

Peak discharges were determined during and after these floods at 12 current or discontinued streamflow-gaging stations and 17 miscellaneous sites. Flood peaks and volumes at many locations exceeded estimated 100-year recurrence-interval floods and equaled or exceeded the 1977 floods in some drainage basins. Significant flooding occurred in the Blue, East Fork Little Blue, and Little Blue River basins, and in the Rock, Wilkerson, Sni-A-Bar, Shoal, and Big Creek drainage basins.

Brief descriptions of the storm and of the flood damages are included in the report. These floods are noteworthy not only because of their severity, but because of the similarity to the record-breaking September 1977 floods in Kansas City, Missouri and Kansas.

INTRODUCTION

Significant floods occurred on streams in the Kansas City, Mo., area (fig. 1) as a result of intense rainfall on August 12-13, 1982. As much as 12.6 inches (in.) of rain fell (at Raytown, Mo.) in the flood area. Four persons lost their lives and unofficial damage estimates exceeded $30 million in the three-county area of Jackson, Cass, and Clay Counties. Several discharge measurements were made by current meter, but because of the rapid rise and fall of the floodwaters, peak discharges were computed at 23 sites by indirect methods.

Purpose and Scope

This report has been prepared to document these significant floods for future hydraulic and hydrological planning; to provide streamflow information required for orderly development of river basins where the hazard of extreme flooding exists; and to further the general hydrologic knowledge available for Missouri rivers and streams. Streamflow data in the report include peak stages and discharges, flood hydrographs, flood-crest profiles, flood volumes, and flood-frequency information. Descriptions of the storm and of the damages resulting from these floods are given.

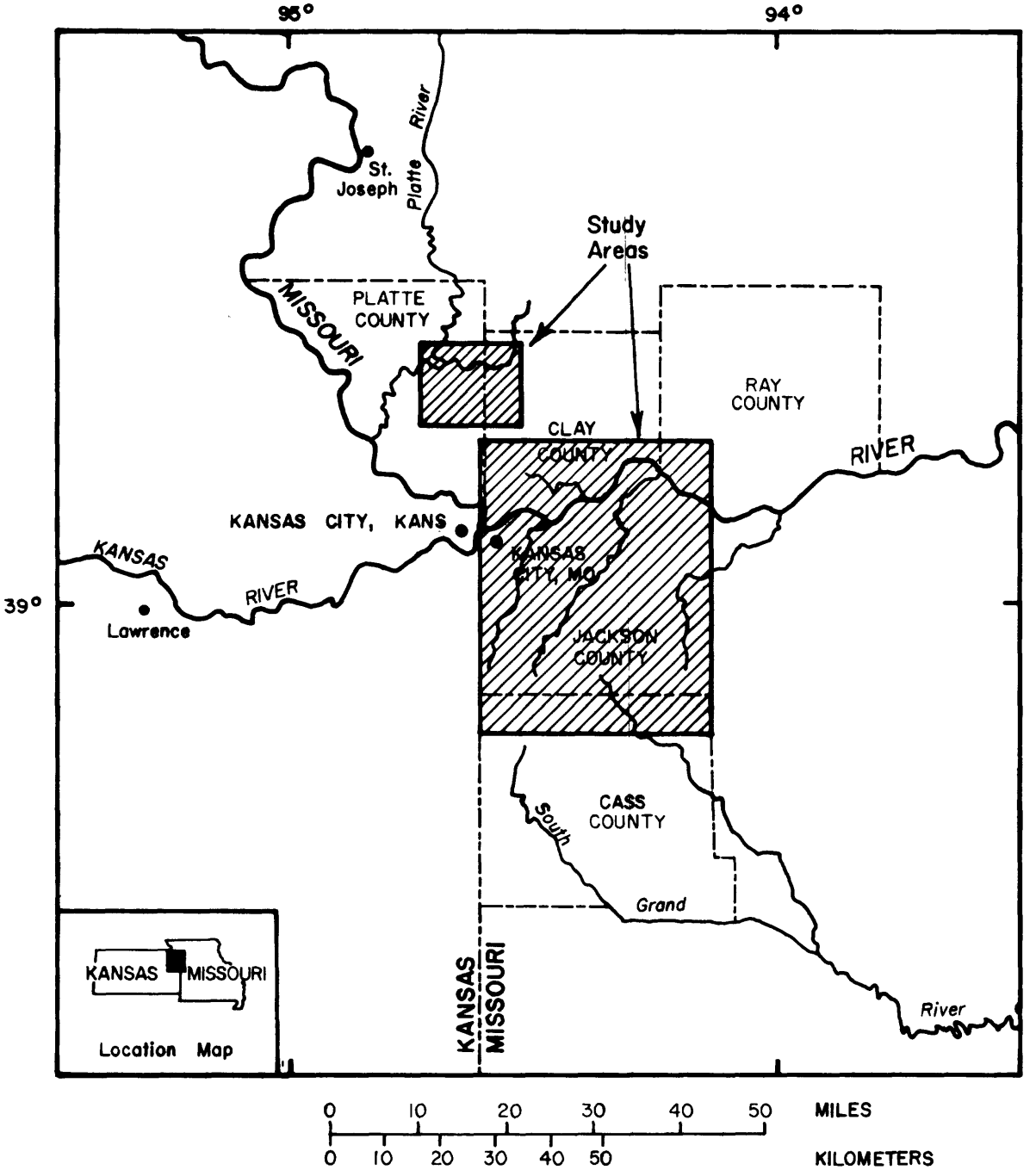

Figure 1.--Areas of flooding in Missouri.

Acknowledgments

Elevations for flood profiles of Little Blue River and East Fork Little Blue River and for the flood-crest comparison on Rock Creek were provided by the U.S. Army, Corps of Engineers, Kansas City District. Photographs were taken by John Spink of "The Kansas City Times," Kansas City, Mo.; and Morris Sealy of "The Examiner," Independence, Mo. The National Weather Service furnished climatological data. Estimates of flood damages were provided by the Federal Emergency Management Agency.

Description of Flood Area

This report encompasses the Kansas City, Mo., metropolitan area and vicinity. The study area (fig. 2) comprises about 1,000 square miles (mi^2) and extends north to Smithville, Mo.; east to the eastern divide of Sni-A-Bar Creek; south to Pleasant Hill, Mo.; and west to the Missouri-Kansas border. Drainage basins of Rock Creek, Big Creek, Wilkerson Creek, Shoal Creek, Sni-A-Bar Creek, East Fork Little Blue River, Little Blue River, and Blue River were among those most affected by the storm.

Streamflow data in this report reflect runoff from both urban and rural drainage basins. For example, the Rock Creek basin is almost entirely urbanized, whereas the Sni-A-Bar Creek basin is predominantly rural. The other drainage basins included in this area range between these extremes of development.

DESCRIPTION OF STORM

Many storms in the central United States are characterized by nearly stationary fronts, as was the storm of August 12-13, 1982, at Kansas City. Strong low-level winds out of the south, laden with moisture from the Gulf of Mexico, fed slow-moving thunderstorms, according to the National Weather Service (G. L. Audsley, written commun., 1982). A flash-flood watch was issued for northwest Missouri by the St. Louis Weather Service Forecast Office at 2140 hours, c.d.t. (9:40 p.m.) on August 12. A flash-flood warning was issued at 2346 hours, c.d.t. (11:46 p.m.) on August 12 by the Weather Service Office at Kansas City International Airport. A series of watches, warnings, statements, and forecasts continued throughout the night.

In Independence, precipitation began about 0730 hours c.d.t. (7:30 a.m.) on August 12 and continued until about 1700 hours c.d.t. (5 p.m.). About 20 percent of the storm total fell during that period. It began raining again about 2200 hours c.d.t. (10 p.m.) and rained intensely until nearly 0200 hours c.d.t. (2 a.m.) on August 13 (fig. 3). In the Kansas City metropolitan area, reports of 6 in. or more of rainfall were quite common. Distribution of precipitation for the storm is shown in figure 4.

The most intense rainfall was in the Raytown area with a largest single official 24-hour report of 12.6 in. According to Hershfield (1961), a 100-year, 24-hour rainfall total for the Kansas City area is 7.8 inches. For other

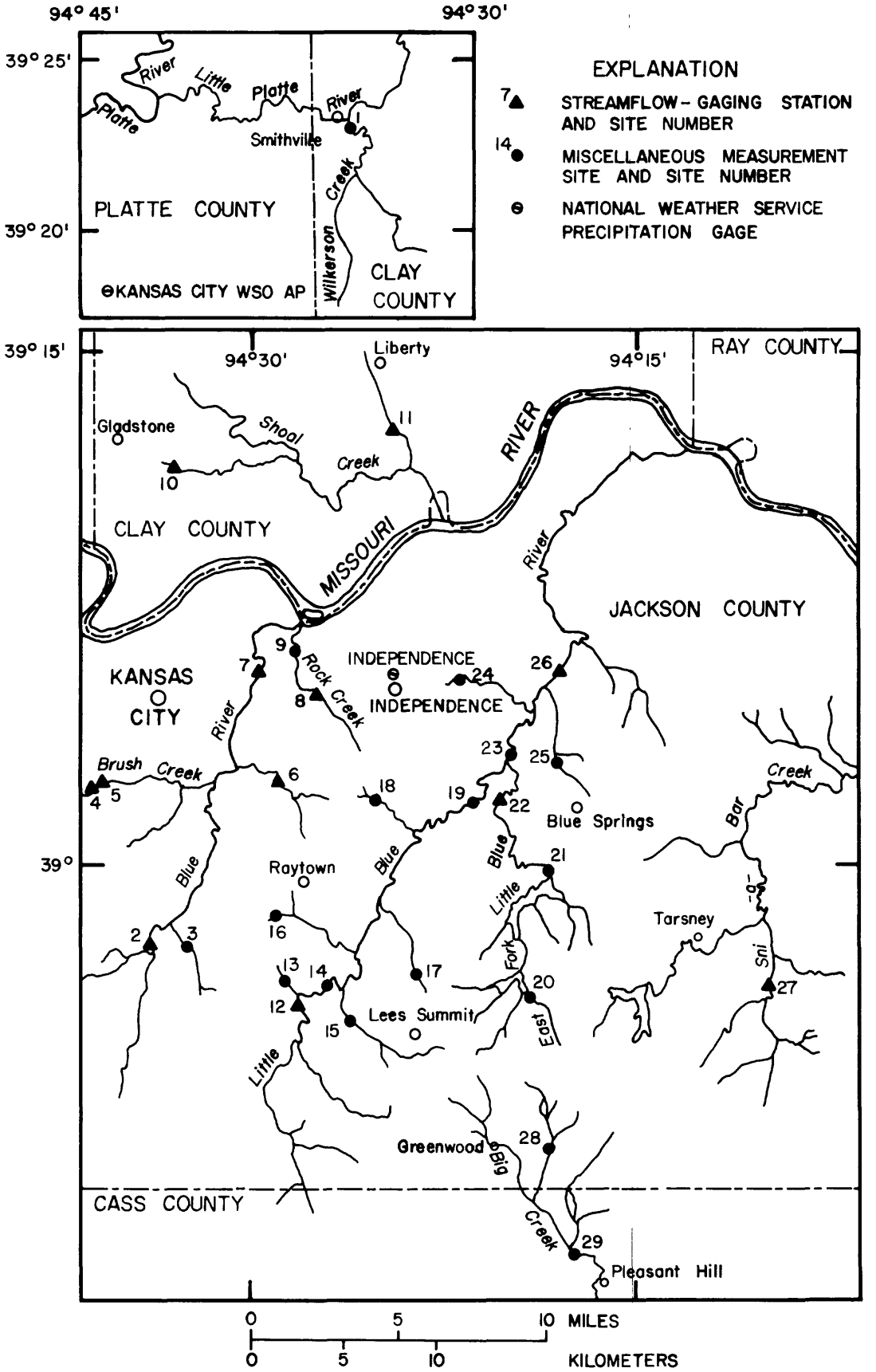

Figure 2.--Location of flood-determination points in flood areas. Location of maps is shown in Figure 1.

durations, the expected 100-year rainfall totals are 3.6 in. during 1 hour; 4.4 in. during 2 hours; 4.8 in. during 3 hours; and 5.8 in. during 6 hours. Rainfall at Independence (fig. 3) equaled or exceeded the 100-year, 2-, 3-, and 6-hour totals and nearly equaled the 100-year, 24-hour total.

The soils in the Kansas City area before the August 12-13, 1982, storm were normal to slightly wetter than normal (G. L. Audsley, written commun., 1982). Monthly precipitation totals at the Kansas City WSO AP precipitation gage at Kansas City International Airport for May to July show precipitation slightly above normal, which is defined as the average monthly rainfall for the period 1950 to 1980. Rainfall during May (9.81 in.) was 229 percent of normal, June (6.04 in.) was 109 percent of normal, and July (2.73 in.) was 62 percent of normal. During August, rainfall was 9.58 in., which was 251 percent of normal for the month. Of this monthly total, 6.19 in. was recorded August 12-13.

FLOOD DAMAGES

Flash flooding on August 12-13, 1982, caused loss of life and widespread damages in rural and urban areas of Jackson, Cass, and Clay Counties, Mo. Governor Christopher S. Bond declared a state of emergency on Friday, August 13, because of the magnitude of this natural disaster. The loss of four lives has been attributed to this storm, and damages to public and private property have been unofficially estimated in excess of $30 million. The Federal Emergency Management Agency, under the Disaster Relief Act and the National Flood Insurance Program, had requests for assistance for damages totaling nearly $19 million (P. D. Ward, written commun., November 1982). As of April 1983, disaster assistance of about $14.4 million had been approved (T. S. Seidel, oral commun., April 1983).

Within Jackson County, the city of Independence sustained some of the most severe flood damages because of the topography, population density, and rainfall distribution. (See figure 4.) Rock Creek and Little Blue River drainage basins experienced the most extreme flooding (fig. 5), which many local officials compare to the floods of September 1977 (Hauth and others, 1981). The Valley View Village trailer court (at Valley View Road), where more than 100 mobilehomes were either badly damaged or destroyed (fig. 6), was among the hardest-hit sections within the Independence area. The towns of Smithville (Clay County) and Pleasant Hill (Cass County) were typical of communities outside Jackson County that suffered flooding that blocked roads, interrupted railroad traffic, collapsed bridges, damaged or destroyed homes, and forced hundreds of people from their homes. Overall, these flood losses would undoubtedly have been even greater had this storm been centered farther to the west over the major metropolitan area of Kansas City.

DESCRIPTION AND MEASUREMENT OF FLOODS

The Kansas City floods of August 12-13, 1982, were the result of a localized storm of great intensity. Most of the rain fell late at night in a short time. Consequently, many of the flood peaks occurred during the early

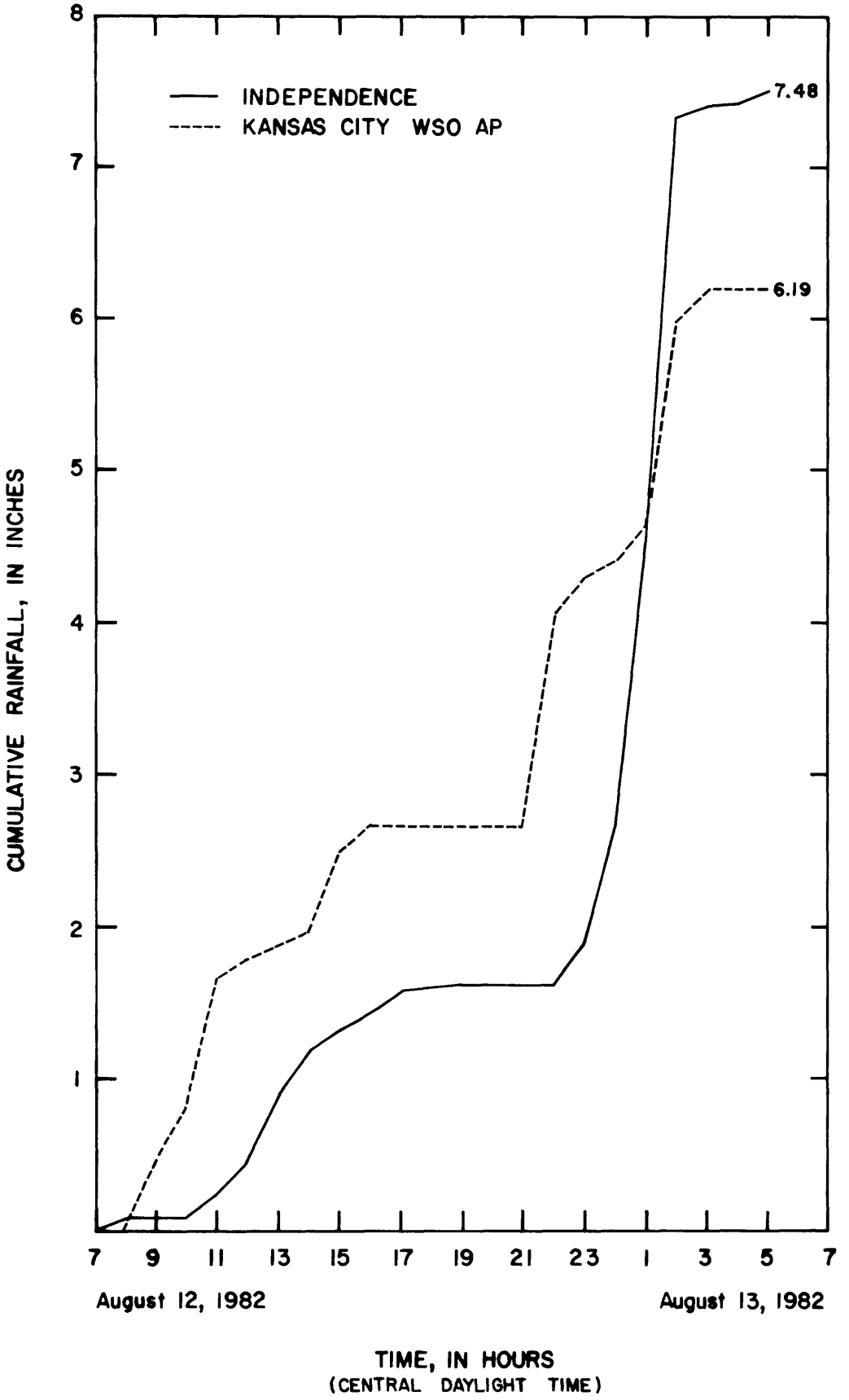

Figure 3.--Mass rainfall curves for Independence and Kansas City, Missouri, precipitation gages.

morning hours on Friday, August 13. Flooding occurred on many of the same streams that flooded the night of September 12-13, 1977 (Hauth and others, 1981), locally known as "The Brush Creek Disaster." Rock Creek and Little Blue River, which flow through Independence, had extreme flooding within their mainstem reaches because of the greater rainfall depths centered over these basins (see fig. 4).

Current-meter measurements were obtained at stages near the flood crests at several U.S. Geological Survey streamflow-gaging stations both in and outside the study area on August 13-14. Floodwaters had receded before the daylight hours on drainage basins of small to moderate areal size. Therefore, suitable sites were located and floodmarks were identified for indirect determinations of discharge on selected small basins and at ungaged sites on the larger basins. Moderate to extreme flood peaks occurred on most small drainage basins within the area; however, flood measurements were obtained only at a sufficient number of sites (ranging from predominately rural to almost completely urban) to provide an adequate sampling of these floods. Site selection was based on the following criteria: (1) Determining peak discharges at U.S. Geological Survey streamflow-gaging stations in the flood area, (2) obtaining general hydrologic information of value to future river basin planning and development in the urban setting, (3) further extending flood-frequency information, (4) comparing these floods to the similar high-recurrence interval floods of September 1977 (Hauth and others, 1981), and (5) local and national interest generated by the extent of private and public damages incurred.

Magnitude and Frequency of Floods

Peak stages and discharges are given in table 1 for the 29 sites described in table 2 (at the end of the report). The location of the sites and the drainage systems are shown in figure 2.

The peak discharges at East Fork Little Blue River near Blue Springs, Mo. (06893890) and Little Blue River near Lake City, Mo. (06894000) were determined by current-meter measurements. Peak discharges at four other streamflow-gaging stations were obtained by extension of the gaging-station stage-discharge relationships. Indirect determinations of peak discharge were made at 4 current and 2 discontinued streamflow-gaging stations and at 17 miscellaneous sites, based on methods described in the reports, "Techniques of Water-Resources Investigations" (Dalrymple and Benson, 1967; Matthai, 1967; Bodhaine, 1968; and Hulsing, 1968).

Because the area affected by the 1982 flooding is partly included in the area affected by the 1977 flooding (Hauth and others, 1981), peak-flow measurements following the 1982 floods were obtained at 15 sites where flow measurements were made during 1977. Many of the 1982 peak flows exceeded or about equaled those of 1977. The variation in relative flood magnitudes at the 15 sites common to both 1977 and 1982 flooding reflects the similarities or differences in intensity, location, and movement of the two storms (see table 1). Therefore, some of the sites chosen for comparison had smaller discharges

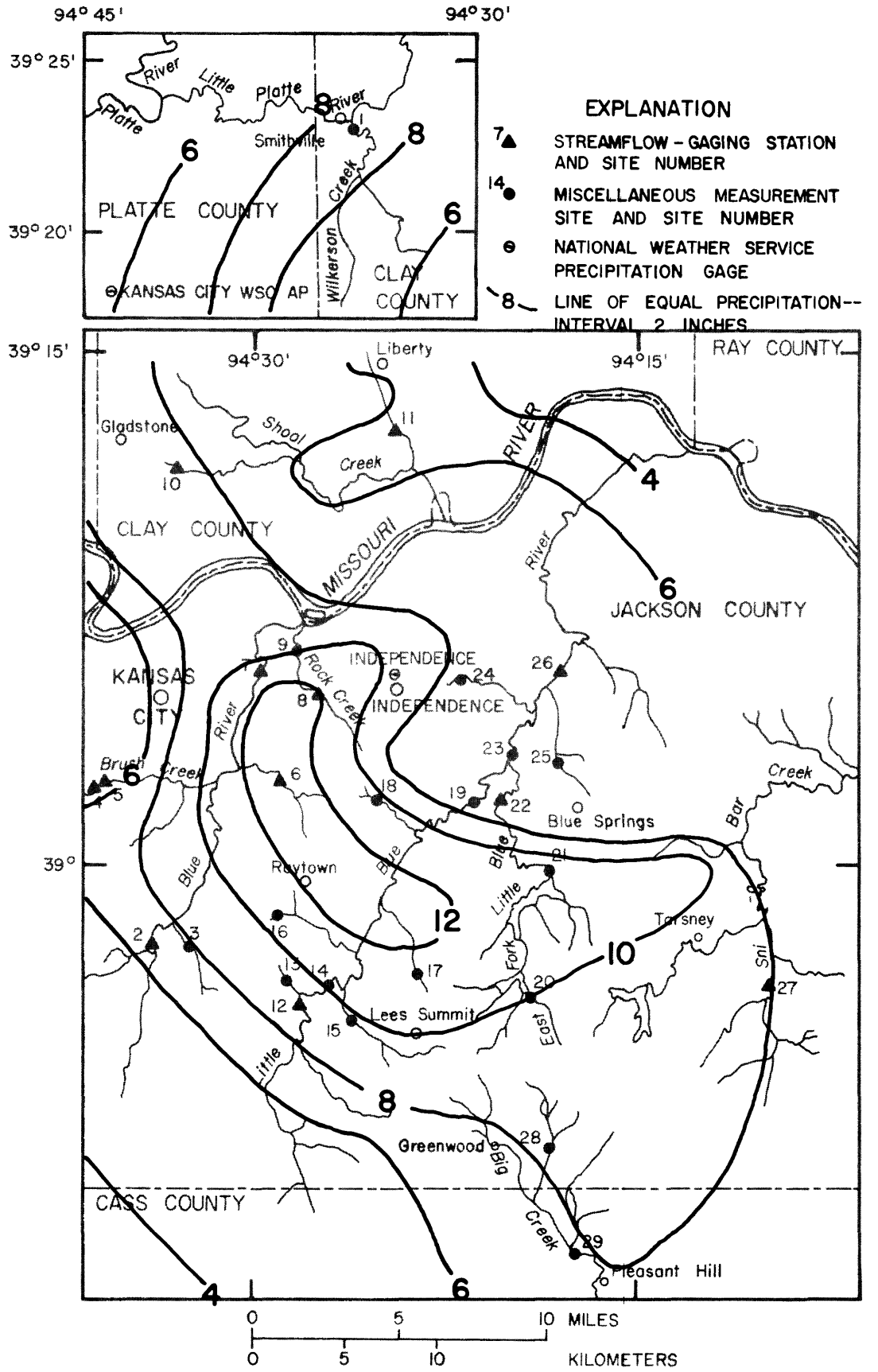

Figure 4.-- Distribution of precipitation for the storm of August 12-13, 1982, Kansas City and vicinity. Location of maps is shown in Figure 1.

Courtesy of The Kansas City Times, Kansas City, Mo.
John Spink, photographer

Figure 5.--Inundation of Independence Memorial Airport, August 13, 1982, by floodwaters of the Little Blue River.

during 1982. For example, Brush Creek at Main Street at Kansas City, Mo., had a peak discharge of 17,600 cubic feet per second (ft^3/s) during September 1977, but the August 1982 peak was 10,500 ft^3/s. In contrast, at the Little Blue River near Lake City, Mo., streamflow-gaging station, a peak discharge two and one-half times that of 1977 (17,000 ft^3/s) occurred during 1982 (42,300 ft^3/s) because of storm intensity, location, and movement. The 1982 flood (9,520 ft^3/s) was greater than the 1977 flood (7,760 ft^3/s) by about one and one-quarter times at the Rock Creek at Independence, Mo., streamflow-gaging station site (discontinued 1979).

A knowledge of the recurrence intervals of floods can be useful in future design of hydraulic structures, in land use planning, in establishing rates for flood insurance, and in formulating emergency plans for flood-prone areas. Recurrence intervals given in table 1 indicate the relative frequencies with which floods of these magnitudes may be expected to occur. Frequencies of flood discharge are estimated for recurrence intervals of 100 years or less. For greater discharges, recurrence intervals are noted only as "greater than 100 years," because of the uncertainties of the frequency relations for greater recurrence intervals. Peak flows at 19 of the 29 sites where flows were determined exceeded the expected 100-year floods as defined for rural and urban basins (Hauth, 1974; Spencer and Alexander, 1978).

In assigning frequencies to these floods, it was recognized that varying degrees of urbanization exist within the separate drainage basins in the flood area and that rural and urban flood relationships differ. Therefore, frequency relations developed for rural areas by Hauth (1974) were used for the larger (greater than 40 mi^2) and the predominately rural drainage basins (less than 5 percent impervious area). However, frequency relations developed for the urban setting of St. Louis County, Mo. (Spencer and Alexander, 1978) were used for those drainage basins which are predominately urban, as indicated by the percentage of impervious area in each basin. These urban frequency relations were assumed transferable and applicable to the urban environment of the study area because the Kansas City area and St. Louis County are similar with respect to topography and to ranges of values determined for basin characteristics (drainage area, percentage of impervious area, and basin slope). Techniques for deriving flood-frequency relations are described by the U.S. Water Resources Council (1981).

Rock Creek has been subjected to two floods exceeding the 100-year recurrence interval (at Northern Boulevard) in just less than 5 years based on estimating relations given by Spencer and Alexander (1978). The likelihood of a given magnitude of flood occurring in a given time period is based on long-term averages. By definition, a 100-year flood is a flood that is equaled or exceeded once in an average 100-year period. Thus there is a 1 percent chance that such a flood will occur in any year. The fact that two 100-year floods have occurred in a 5-year time period is not contradictory, nor does it alter the likelihood (frequency relationships) of future floods of similar magnitude occurring.

Courtesy of The Examiner, Independence, Mo.
Morris Sealy, photographer

Figure 6.--View of devastation at Valley View Village trailer court, August 13, 1982, after the flood crest on the East Fork Little Blue River.

Table 1.--Peak stages and discharges for Kansas City area floods of August 12-13, 1982

[mi^2, square mile; ft, feet; ft^3/s, cubic feet per second; $(ft^3/s)/mi^2$, cubic feet per second per square mile; >, greater than]

Site number (fig.2)	U.S. Geological Survey station number	Stream and place of determination	Drainage area (mi^2)	Period of record	Maximum previously known flood			Flood of Aug. 12-13, 1982			
					Date	Gage height[a] (ft)	Discharge (ft^3/s)	Gage height[a] (ft)	Discharge (ft^3/s)	Discharge [$(ft^3/s)/mi^2$]	Recurrence interval[b] (years)
1	--------	Wilkerson Creek at State Highway DD at Smithville, Mo.	20.8	----	----	----	----	----	10,700	514	>100
2	06893500	Blue River near Kansas City, Mo. (old Bannister Road)	188	1940-	9-13-61	798.19	41,000	783.58	14,000	74.5	5
3	--------	Blue River tributary at Bannister Road near Kansas City, Mo. (U.S. Highway 71)	[c]5.08	----	9-13-77	----	4,040	----	4,740	933	30
4	06893558	Brush Creek at Summit Avenue at Kansas City, Mo.	14.4	1980-	----	----	----	832.6	10,400	722	45
5	06893560	Brush Creek at Main St. at Kansas City, Mo.	14.8	1971-79	9-12-77	834.26	17,600	827.3	10,500	709	45
6	06893570	Round Grove Creek at Raytown Road at Kansas City, Mo.	5.87	1975-	9-12-77	----	13,200	----	10,200	1,740	>100
7	06893590	Blue River at 12th St. at Kansas City, Mo.	264	1981-	9-13-77	[d]750.74	34,900	745.51	16,700	63.3	15
8	06893600	Rock Creek at Independence, Mo. (Northern Boulevard)	5.20	1968-79	9-12-77	841.93	7,760	842.33	9,520	1,830	>100
9	--------	Rock Creek at Winner Road at Independence, Mo.	8.42	----	----	----	----	----	10,100	1,200	>100
10	06893680	Mill Creek at 56th St. at Gladstone, Mo.	1.24	1976-	9-12-77	----	800	882.8	2,060	1,660	30
11	06893710	Cates Branch at Liberty, Mo. (Sherril Drive)	1.95	1976-	9-12-77	765.87	2,480	765.14	1,850	949	10
12	06893793	Little Blue River below Longview Damsite at Kansas City, Mo.	50.7	1967-	9-13-77	819.67	18,100	819.84	18,700	369	>100
13	--------	Little Blue River tributary at Interstate Highway 470 at Kansas City, Mo.	2.80	----	----	----	----	----	4,330	1,550	>100
14	--------	Little Blue River at Interstate Highway 470 at Kansas City, Mo.	56.0	----	----	----	----	----	16,600	296	>100

See footnotes at end of table.

Table 1.--Peak stages and discharges for Kansas City area floods of August 12-13, 1982--continued

Site number (fig. 2)	U.S. Geological Survey station number	Stream and place of determination	Drainage area (mi^2)	Period of record	Maximum previously known flood			Flood of Aug. 12-13, 1982			
					Date	Gage height[a] (ft)	Discharge (ft^3/s)	Gage height[a] (ft)	Discharge (ft^3/s)	Discharge [(ft^3/s)/mi^2]	Recurrence interval[b] (years)
15	--------	Cedar Creek above Chipman Road at Lees Summit, Mo.	7.95	----	----	----	----	----	14,700	1,850	>100
16	--------	White Oak Creek at 83rd St. at Raytown, Mo.	1.66	----	9-12-77	----	[e]2,290	----	3,360	2,020	>100
17	--------	Little Cedar Creek at Colborn Road, at Unity Villlage, near Lees Summit, Mo.	1.65	----	----	----	----	----	4,140	2,510	>100
18	--------	Little Blue River tributary at Noland Road at Independence, Mo.	0.83	----	9-12-77	----	2,330	----	1,670	2,010	35
19	--------	Little Blue River at Interstate Highway 470 (State Highway 291) at Independence, Mo.	108	----	----	----	----	----	22,300	206	>100
20	--------	East Fork Little Blue River tributary at Blackwell Road near Lees Summit, Mo.	2.59	----	----	----	----	----	4,580	1,770	>100
21	--------	East Fork Little Blue Piver at Lake Jacomo[f] spillway near Blue Springs, Mo. (Liggett Road).	25.7	----	9-13-77	[d]838.37	[d]6,700	840.32	14,200	553	----
22	06893890	East Fork Little Blue River (U.S. Highway 40) near Blue Springs, Mo.	34.4	1970-	9-13-77	774.22	6,100	775.23	11,000	320	>100
23	--------	Little Blue River at 39th St. at Independence, Mo.	155	----	----	----	----	----	32,800	212	>100
24	--------	Spring Branch at State Highway 291 at Independence, Mo.	2.92	----	----	----	----	----	3,840	1,320	50
25	--------	Burr Oak Creek at Pink Hill Road at Blue Springs, Mo.	2.47	----	----	----	----	----	3,650	1,480	>100
26	06894000	Little Blue River (State Highway 78) near Lake City, Mo.	184	1949-	9-13-77	742.45	17,000	746.21	42,300	230	>100
27	06894680	Sni-A-Bar Creek (Colburn Road) near Tarsney, Mo.	29.1	1971-79	9-13-77	811.67	15,700	811.12	16,800	577	>100

Table 1.--Peak stages and discharges for Kansas City area floods of August 12-13, 1982--continued

Site number (fig. 2)	U.S. Geological Survey station number	Stream and place of determination	Drainage area (mi^2)	Period of record	Maximum previously known flood			Flood of Aug. 12-13, 1982			
					Date	Gage height[a] (ft)	Discharge (ft^3/s)	Gage height[a] (ft)	Discharge (ft^3/s)	Discharge [(ft^3/s)/mi^2]	Recurrence interval[b] (years)
28	--------	East Branch Big Creek at State Highway 150 near Greenwood, Mo.	10.0	----	----	----	----	----	9,920	992	>100
29	--------	Big Creek near Pleasant Hill, Mo.	35.8	----	----	----	----	----	20,500	573	>100

[a]National Geodetic Vertical Datum of 1929.
[b]Hauth (1974); Spencer and Alexander (1978).
[c]Revised from data shown by Hauth and others (1981).
[d]Not previously published.
[e]At Raytown Road; drainage area, 1.78 mi^2.
[f]Lake Jacomo, formerly Jackson County Lake.

Flood Hydrographs

Discharge hydrographs at selected U.S. Geological Survey streamflow-gaging stations and miscellaneous site in the area are shown in figures 7 through 10. Each figure shows a comparison of the 1977 flood to the 1982 flood. The 1982 peak discharges were more than twice as great as those of the 1977 floods at East Fork Little Blue River at Lake Jacomo spillway near Blue Springs (fig. 8), and Little Blue River near Lake City (fig. 10). The discharges of the 1982 floods were greater than the 1977 floods at Little Blue River below Longview Damsite at Kansas City (fig. 7) and at East Fork Little Blue River near Blue Springs (fig. 9). The discharge hydrographs were developed from the relationships between stage and discharge at each site.

Flood-crest Profiles

The storm caused flood stages within the Little Platte River, Blue River, Little Blue River, Rock Creek, Sni-A-Bar Creek, Big Creek, and other drainage basins.

Flood-profile data are available for the Blue River at the office of the U.S. Army, Corps of Engineers, Kansas City District. Peak stages and discharges within the Blue River watershed were much lower than those experienced during the floods of 1977. For example, 1982 flood crests were approximately 5 feet (ft) lower at Blue River near Kansas City (06893500), approximately 7 ft lower at Brush Creek at Summit Avenue (06893558), and approximately 1 ft lower at Round Grove Creek at Raytown Road (06893570).

The Rock Creek basin in Independence was subjected to extreme flooding during 1977 and 1982. The 1977 flood profile is given in Hauth and others (1981, p. 40). The relation of the two floods at selected control points along the main stem of Rock Creek is given in table 3.

New maximums for peak stage and discharge were recorded on both the East Fork Little Blue and Little Blue Rivers. The water-surface profiles are shown for Little Blue River in figure 11, and for East Fork Little Blue River in figure 12. The 1977 Little Blue River flood profile also is given in Hauth and others (1981, p. 42-43). Flood crests during 1982 were 1 ft higher at East Fork Little Blue River near Blue Springs (06893890), and 2 ft higher at East Fork Little Blue River at Lake Jacomo spillway near Blue Springs than during the 1977 flood. For comparison, flood crests on the Little Blue River were at higher stages than the maximum previously known flood (1977) by approximately 0.2 ft below Longview Damsite (06893793), approximately 1 ft at Interstate Highway 470 at Independence, and approximately 4 ft near Lake City (06894000).

Volume of Floodflows

The 1-day and 3-day flood volumes, in both acre-feet and in inches of runoff, were determined at four sites for which discharge hydrographs (see figs. 7-10) are available. These volumes are represented by the area under each hydrograph. A comparison of the 1977 and 1982 flood volumes, given in table 4,

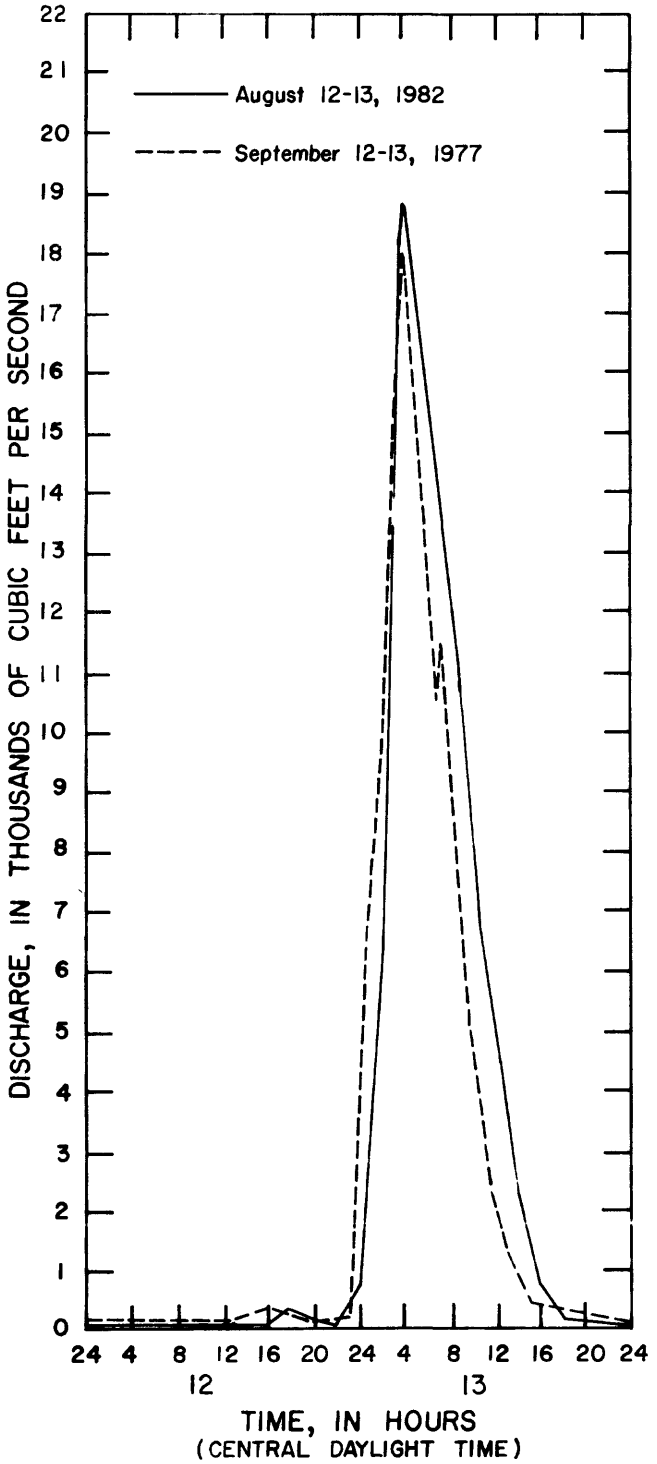

Figure 7.-- Comparison of discharge hydrographs at U.S. Geological Survey streamflow-gaging station at Little Blue River below Longview Damsite at Kansas City (06893793).

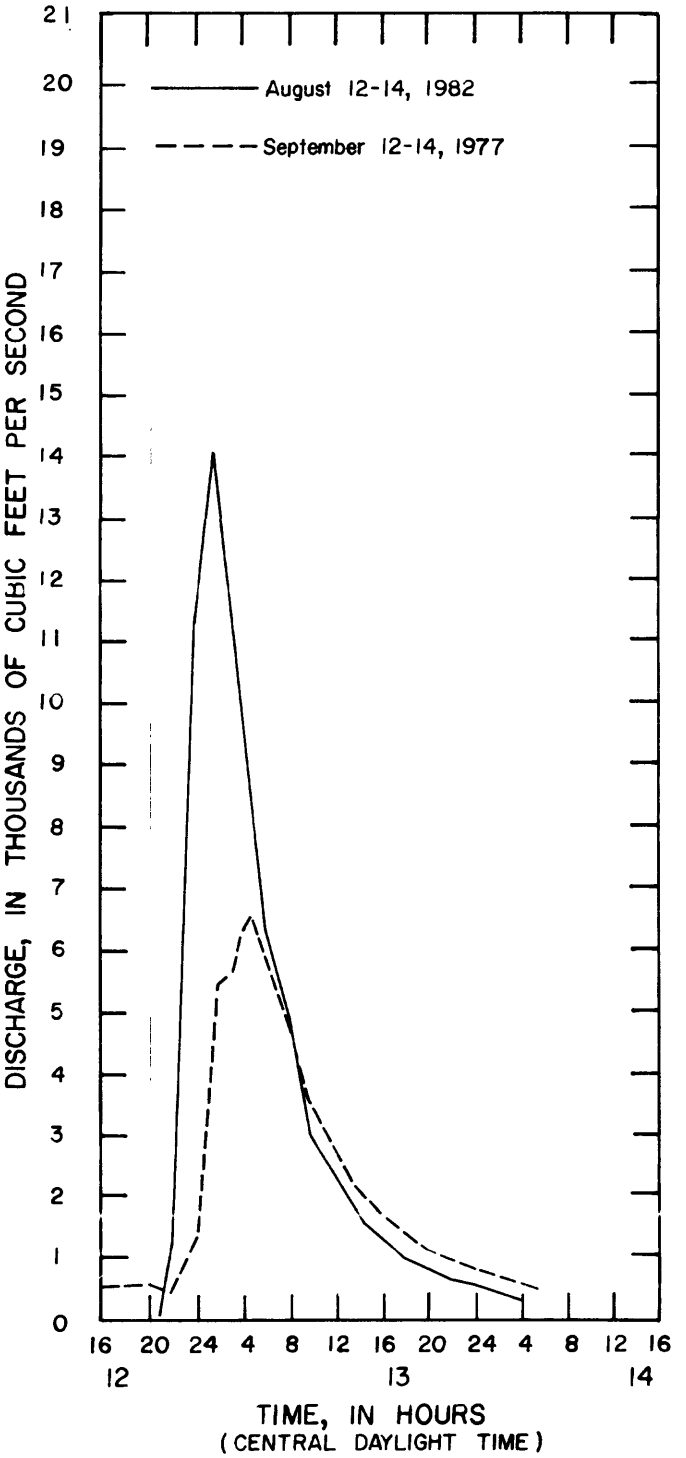

Figure 8.-- Comparison of discharge hydrographs at East Fork Little Blue River at Lake Jacomo spillway near Blue Springs.

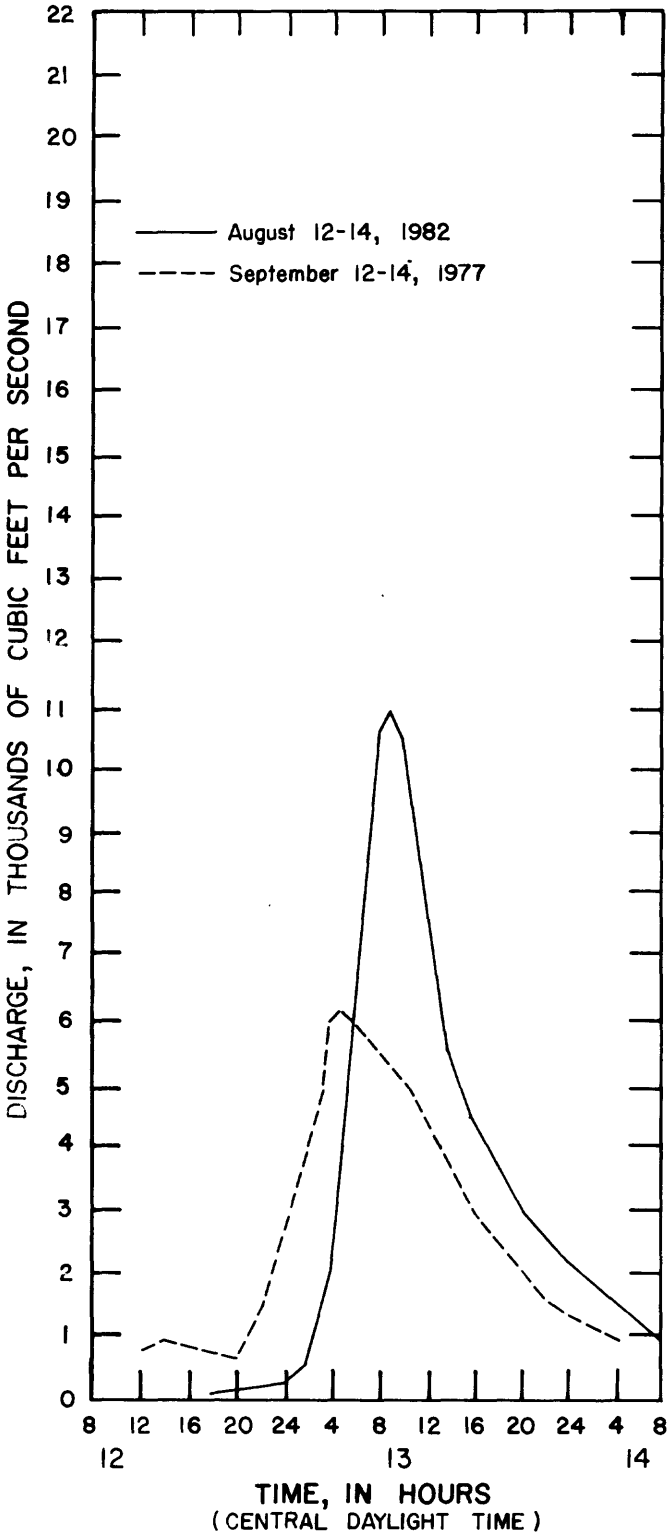

Figure 9.--Comparison of discharge hydrographs at U.S. Geological Survey streamflow-gaging station at East Fork Little Blue River near Blue Springs (06893890).

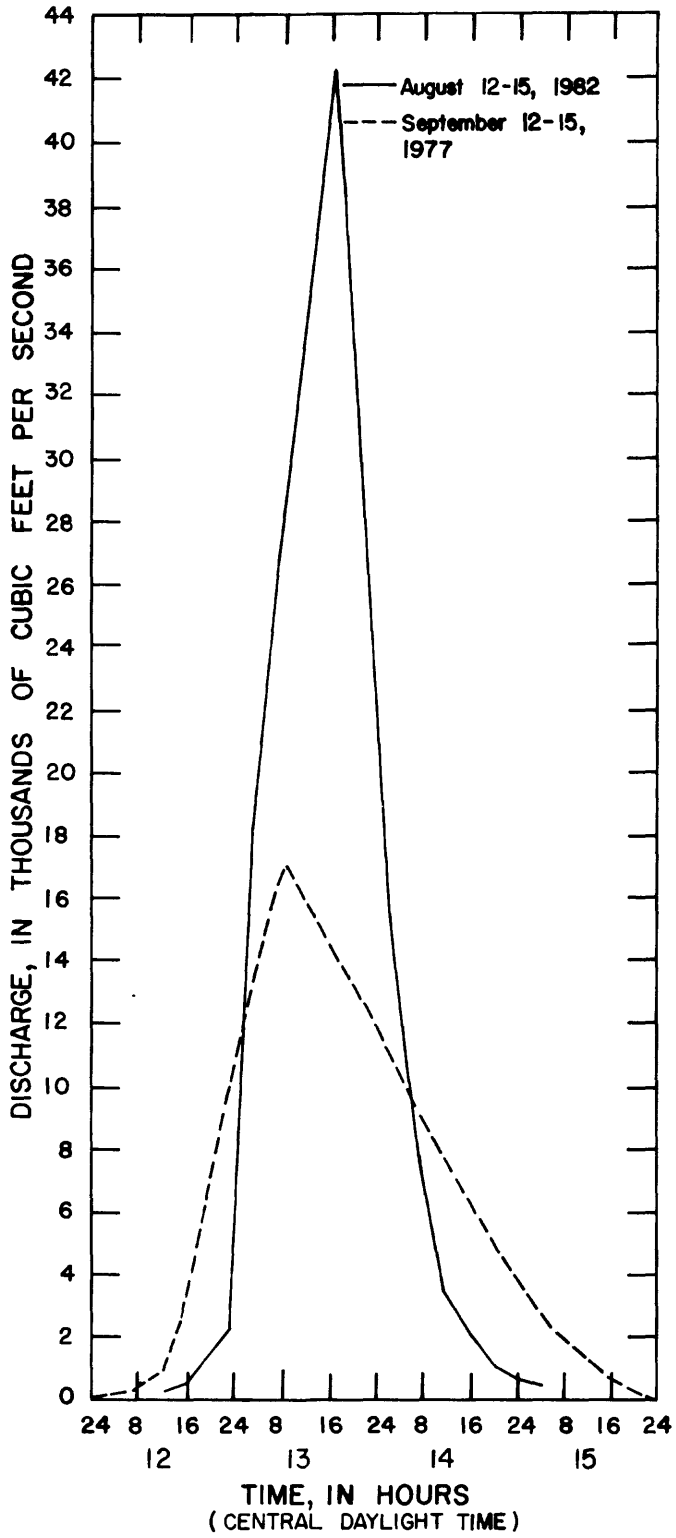

Figure 10.--Comparison of discharge hydrographs at U.S. Geological Survey streamflow-gaging station at Little Blue River near Lake City (06694000).

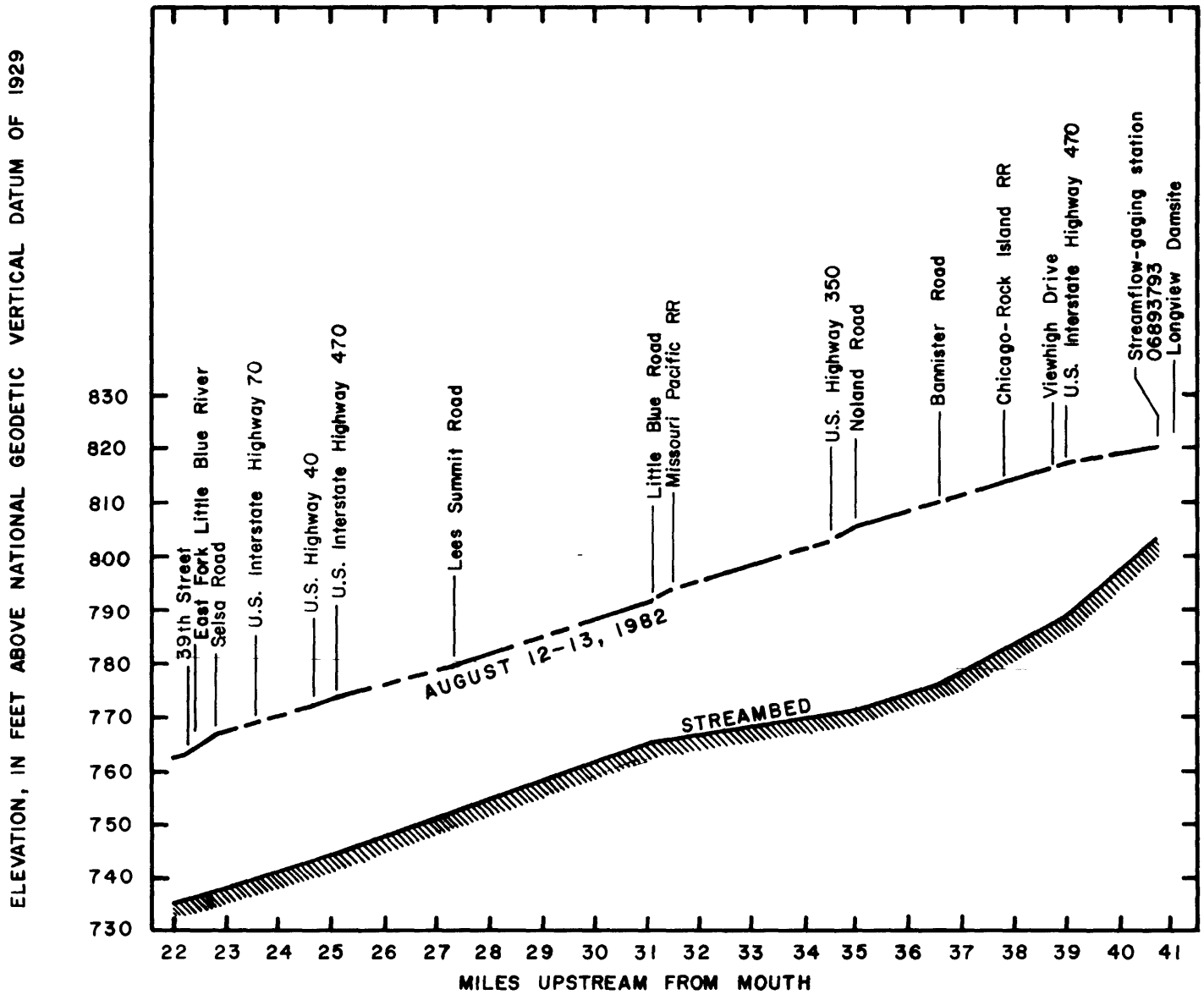

Figure 11.--Profile of water surface for Little Blue River, flood of August 12-13, 1982.

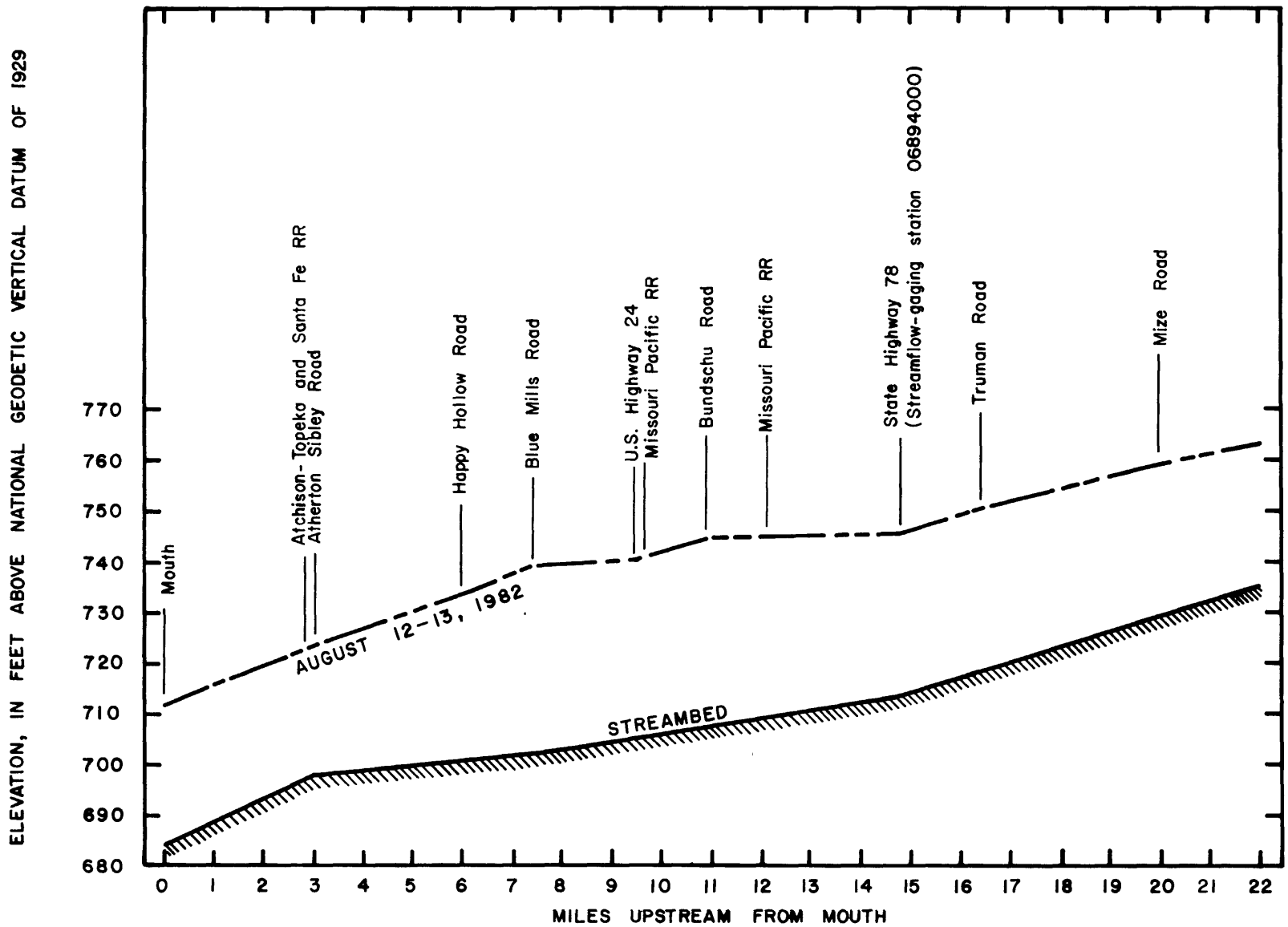

Figure 11.--Profile of water surface for Little Blue River, flood of August 12-13, 1982 -- continued.

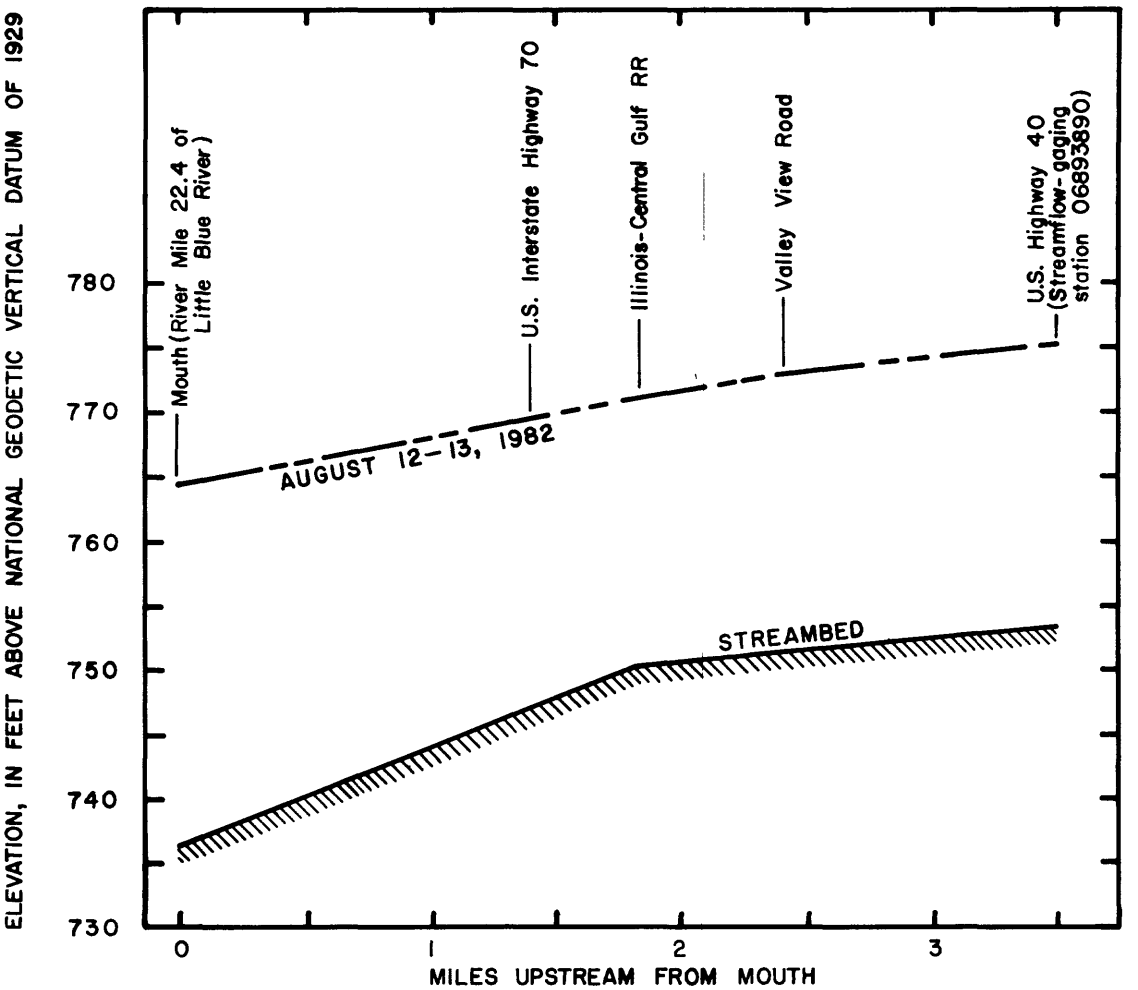

Figure 12.-- Profile of water surface for East Fork Little Blue River, flood of August 12-13, 1982.

Table 3.--Comparison of flood-crest elevations in Rock Creek basin

Location		Flood-crest elevation in feet above sea level[a]		Elevation difference
River mile	Street name	Aug. 12-13, 1982	Sept. 12-13, 1977	
0.75	Wilson Road	[b]753.22	[b]751.21	+2.01
1.2	Winner Road	[c]759.33	[c]758.23	+1.10
		[b]756.14	----	----
2.9	Arlington Avenue	[c]805.25	----	----
		[b]800.19	[b]798.35	+1.84
3.7	Westport Road	[b]830.75	[b]830.38	+0.37
4.0	Northern Boulevard	[c]842.33	[c]841.93	+0.40
5.2	30th Street	[b]886.97	[b]886.73	+0.24
5.35	31st Street	[b]895.32	[b]895.62	-0.30

[a]National Geodetic Vertical Datum of 1929.
[b]Downstream from roadway.
[c]Upstream from roadway.

Table 4.--Comparison of flood volumes for Kansas City area floods

[mi^2, square mile; acre-ft, acre-foot; in., inch; yr, year; >, greater than]

Site number (fig. 2)	U.S. Geological Survey station number	Stream name and place of determination	Drainage area (mi^2)	1-day flood volume Sept. 12-14, 1977 (acre-ft)	(in.)	1-day flood volume Aug. 12-14, 1982 (acre-ft)	(in.)	Recurrence interval[1] (yrs)	3-day flood volume Aug. 12-15, 1982 (acre-ft)	(in.)	Recurrence interval[1] (yrs)
12	06893793	Little Blue River below Longview Damsite at Kansas City, Mo.	50.7	9,940	3.68	11,560	4.28	100	11,750	6.35	40
21	--------	East Fork Little Blue River at Lake Jacomo spillway near Blue Springs, Mo.	25.7	6,260	4.57	9,290	6.78	>100	10,120	7.38	> 100
22	06893890	East Fork Little Blue River near Blue Springs, Mo.	34.4	7,740	4.22	9,750	5.31	>100	11,300	6.16	100
26	06894000	Little Blue River near Lake City, Mo.	184	46,360	4.72	60,300	6.14	>100	71,450	7.28	> 100

[1]Skelton (1973).

may be made. Recurrence intervals given in table 4 were determined from flood-volume frequency relationships developed by Skelton (1973, p. 6) for rural areas. The resulting frequencies may be overestimated because they are applied to the partly developed (urban) watersheds of the Kansas City area.

The spillway for Lake Jacomo is a 330-ft broad-crested weir. The lake level was about 0.8 ft below the weir elevation prior to the August 12-13 storm with about 800 acre-feet available for storage. The instantaneous peak discharge probably was reduced because of this, and a part of the total floodflow runoff from the East Fork Little Blue River drainage basin went into detention storage in Lake Jacomo. Therefore, 800 acre-feet of stored flood volume for East Fork Little Blue River at Lake Jacomo spillway needs to be added to the table 4 value if a total volume is needed for the 1982 flood.

Relative Flood Magnitude

A knowledge of the maximum-observed flood at a site is often needed by planners and designers as an initial step in estimating future flood characteristics. Maximum flood peaks of August 12-13, 1982, given in table 1, are related to their respective drainage area sizes in figure 13, to compare the relative magnitude of these flood peaks to previous extreme floods in Missouri and elsewhere in the United States.

Curves developed by Crippen and Bue (1977) on the basis of maximum floods known in the United States, by regions and nationwide, define approximate upper limits for floods observed through 1974 (fig. 13). This figure provides a means of estimating extreme flood potential without regard to frequency or probability. Because of the considerable similarity of the September 1977 (Hauth and others, 1981, p. 27) and August 1982 floods in parts of the Kansas City area, the 1977 flood peaks also are plotted in figure 13 for comparison. The approximately equal significance of the 1977 and 1982 floods, regarding magnitude of floods produced on basins of varying drainage area size, is apparent.

The peak discharges of August 1982 and September 1977 do not approach maximum known floods in the United States. Regional flood information applicable to Missouri, according to Crippen and Bue (1977), indicate a maximum limit of discharge values more than twice as great as the 1977 and 1982 floods. However, these flood peaks, with some exceptions, exceeded the expected 100-year floods as defined for rural conditions (Hauth, 1974) and approach maximum flood experience in the State.

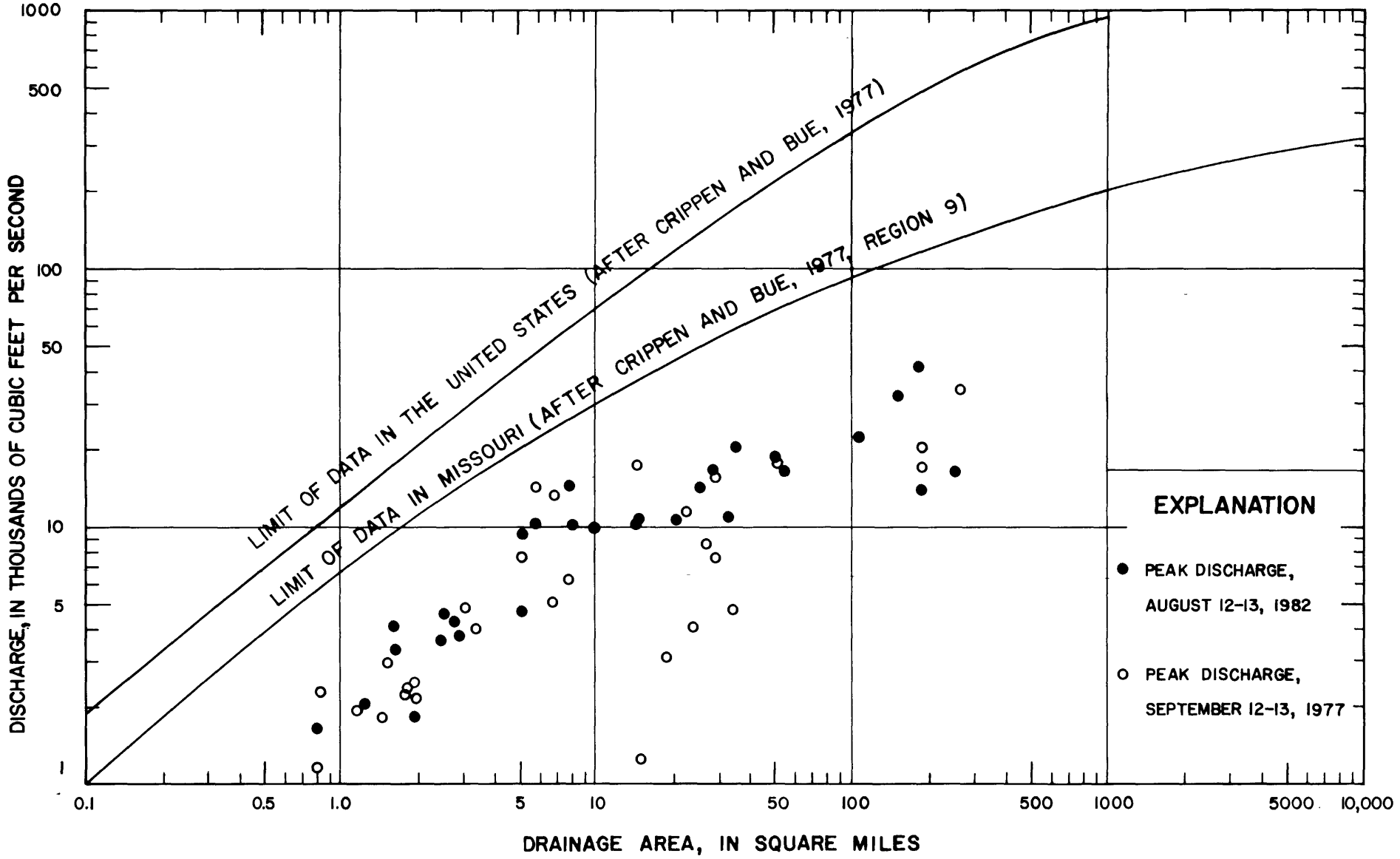

Figure 13.--Comparison of August 12-13, 1982, peak discharges to upper limits of known floods in Missouri and in the United States.

SUMMARY

The Kansas City, Mo., area was subjected on August 12-13, 1982 to the worst flooding since September 12-13, 1977. The floods claimed four lives and caused, by unofficial estimates, property damages in excess of $30 million.

Precipitation, as much as 12.6 in. during 24 hours in the Raytown area, exceeded the 100-year, 24-hour total, which is 7.8 in. for the Kansas City area. This storm caused major flooding in the Rock, Shoal, Wilkerson, Sni-A-Bar, and Big Creek basins and in the Blue, East Fork Little Blue, and Little Blue River drainage basins.

Peak discharges were determined at 29 locations within 8 watersheds in the Kansas City area. Flood peaks and volumes exceeded 100-year recurrence intervals at many locations, and equaled or exceeded the 1977 floods in some drainage basins. All-time maximum peak discharges were recorded at U.S. Geological Survey streamflow-gaging stations on Little Blue River below Longview Damsite (18,700 ft^3/s), East Fork Little Blue River near Blue Springs (11,000 ft^3/s), and Little Blue River near Lake City (42,300 ft^3/s, exceeding the 1977 peak discharge by two and one-half times). Rock Creek at Independence, Mo., had a peak discharge of 9,520 ft^3/s exceeding the 1977 peak discharge of 7,760 ft^3/s both of which exceed the 100-year recurrence interval flood. A 1-day flood volume of 60,300 acre-ft and a 3-day flood volume of 71,450 acre-ft were recorded at Little Blue River near Lake City.

The Kansas City vicinity floods of August 12-13, 1982, are documented because of their severity. They are significant in comparison to other major floods in Missouri.

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GLOSSARY

Acre-foot.--The quantity of water required to cover 1 acre to a depth of 1 foot; it is equal to 43,560 cubic feet.

Cubic feet per second (ft^3/s).--The rate of discharge; 1 cubic foot per second is the rate of discharge of a stream having a cross-sectional area of 1 square foot and an average velocity of 1 ft per second:

1 ft^3/s=0.646 million U.S. gallons per day,
28.32 liters per second, or 0.02832 cubic meter per second.

Flood frequency.--The relation between return period or recurrence interval, in years, and flood magnitude, in cubic feet per second.

Flood hydrograph.--A graphical representation of a stream's fluctuation in flow (in cubic feet per second) with respect to time.

Flood peak.--The highest value of the stage or discharge attained by a flood.

Flood profile.--A graph of the elevation of water surface of a river in a flood, plotted as ordinate, against distance, measured in the upstream direction, plotted as abscissa.

Flood stage.--The approximate elevation of the stream when overbank flooding begins.

Flood volume.--The total runoff, in acre-feet, computed from the area under the flood hydrograph.

Miscellaneous site.--A site where data pertaining to a specific hydrologic event are obtained.

N-year precipitation (rain).--A precipitation amount which can be expected to occur, on the average, once every N years.

Rainfall mass curve.--A graph of the accumulated rainfall depth, plotted as ordinate, against time or duration of storm, plotted as abscissa; the curve represents total precipitation depth throughout the storm.

Recurrence interval.--As applied to floods, recurrence interval is the average number of years within which a given flood peak will be equaled or exceeded once. For example, a 100-year flood discharge will be exceeded on the average of once in 100 years. In terms of probability, there is a 1 percent chance that such a flood will occur in any year.

Streamflow-gaging station.--A gaging station where a record of discharge of a stream is obtained. Within the U.S. Geological Survey, this term is used only for those gaging stations where a continuous record of discharge is obtained.

Table 2.--Description of discharge measurement sites

Site number (fig. 2)	U.S. Geological Survey station number	Station name	Location
1	--------	Wilkerson Creek at State Highway DD at Smithville, Mo.	Lat 39°23'06", long 94°34'02", in SE¼SE¼ sec. 23, T.53 N., R.33 W., Clay County, at bridge on State Highway DD 1.0 mile east of U.S. Highway 169, 0.15 mile upstream from confluence with Little Platte River.
2	06893500	Blue River near Kansas City, Mo.	Lat 38°57'26", long 94°33'31", in SE¼NE¼ sec. 28, T.48 N., R.33 W., Jackson County, at bridge on old Bannister Road, 0.4 mile downstream from Indian Creek and at river mile 23.16.
3	--------	Blue River tributary at Bannister Road near Kansas City, Mo.	Lat 38°57'14", long 94°32'17", in SW¼SW¼NW¼ sec. 26, T.48 N., R.33 W., at culvert on Bannister Road and U.S. Highway 71, 1.3 miles upstream from confluence with Blue River.
4	06893558	Brush Creek at Summit Avenue at Kansas City, Mo.	Lat 39°02'21", long 94°35'51", SE¼NW¼SE¼ sec. 30, T.49 N., R.33 W., Jackson County, at bridge on Summit Ave., 4.6 miles upstream from Blue River.

Table 2.--Description of discharge measurement sites--continued

Site number (fig. 2)	U.S. Geological Survey station number	Station name	Location
5	06893560	Brush Creek at Main St. at Kansas City, Mo.	Lat 39°02'24", long 94°35'12", in SW¼NE¼SW¼ sec. 29, T.49 N., R.33 W., Jackson County, at bridge on Main St., 4.0 miles upstream from Blue River.
6	06893570	Round Grove Creek at Raytown Road at Kansas City, Mo.	Lat 39°02'29", long 94°28'59", in SE¼NE¼ sec. 30, T.49 N., R.32 W., Jackson County, at bridge on Raytown Road, 1.1 miles southeast of junction with Interstate Highway 435, 1.8 miles upstream from confluence with Blue River.
7	06893590	Blue River at 12th St. at Kansas City, Mo.	Lat 39°05'48", long 94°29'24", in NW¼NE¼SW¼ sec. 6, T.49 N., R.32 W., Jackson County, at bridge on 12th St. and Interstate Highway 435 exit ramp, 0.2 mile downstream from Truman Road and at river mile 4.3.
8	06893600	Rock Creek at Independence, Mo.	Lat 39°04'37", long 94°27'03", in NW¼ SW¼SE¼ sec. 9, T.49 N., R.32 W., at bridge on Northern Blvd. in Independence, 0.25 mile south of 23rd St. and at river mile 4.0.

Table 2.--Description of discharge measurement sites--continued

Site number (fig. 2)	U.S. Geological Survey station number	Station name	Location
9	--------	Rock Creek at Winner Road at Independence, Mo.	Lat 39°06'17", long 94°28'13", in SE¼ SE¼SW¼ sec. 32, T.50 N., R.32 W., Jackson County, at bridge on Winner Road, 1.0 mile east of Interstate Highway 435.
10	06893680	Mill Creek at 56th St. at Gladstone, Mo.	Lat 39°11'43", long 94°32'54", in NW¼ NW¼NW¼ sec. 31, T.51 N., R.32 W., Clay County, culvert at junction of 56th St. and Antioch Road, at corporate boundary line between Gladstone and Kansas City, and at river mile 6.17.
11	06893710	Cates Branch at Liberty, Mo.	Lat 39°13'16", long 94°24'53", in NW¼NW¼ sec. 20, T.51 N., R.31 W., Clay County, at culvert on Sherril Drive, 0.2 mile west of State Highway 291, 1.2 mile south of junction of State Highways 33 and 291 at Liberty, Mo.
12	06893793	Little Blue River below Longview Damsite at Kansas City, Mo.	Lat 38°55'52", long 94°28'12", in NW¼SE¼SE¼ sec. 32, T.48 N., R.32 W., Jackson County, 700 feet downstream from Longview Damsite, 1.5 miles downstream from Longview Road, and 2.3 miles upstream from mouth of Cedar Creek.

Table 2.--Description of discharge measurement sites--continued

Site number (fig. 2)	U.S. Geological Survey station number	Station name	Location
13	--------	Little Blue River tributary at Interstate Highway 470 at Kansas City, Mo.	Lat 38°56'17", long 94°28'27", in NW¼SW¼NE¼ sec. 32, T.48 N., R.32 W., Jackson County, 0.5 mile upstream from confluence with Little Blue River, 0.25 mile upstream from Raytown Road, 0.4 mile downstream from Lane Avenue.
14	--------	Little Blue River at Interstate Highway 470 at Kansas City, Mo.	Lat 38°56'11", long 94°27'09", in SW¼ SE¼NE¼ sec. 33, T.48 N., R.32 W., Jackson County, at bridge on Interstate Highway 470, 0.9 mile east of Raytown Road, 1.8 miles downstream of Longview Damsite.
15	--------	Cedar Creek above Chipman Road at Lees Summit, Mo.	Lat 38°55'15", long 94°26'00", in SE¼ SE¼NE¼ sec. 3, T.47 N., R.32 W., Jackson County, 0.6 mile upstream from Chipman Road, 1.5 miles upstream from confluence with Little Blue River.
16	--------	White Oak Creek at 83rd St. at Raytown, Mo.	Lat 38°58'20", long 94°28'07", in NW¼ NE¼NE¼ sec. 20, T.48 N., R.32 W., Jackson County, 0.2 mile upstream of Raytown Road, and 0.1 mile downstream 83rd St., 2.7 miles upstream from confluence with Little Blue River.

Table 2.--Description of discharge measurement sites--continued

Site number (fig. 2)	U.S. Geological Survey station number	Station name	Location
17	--------	Little Cedar Creek at Colborn Road at Unity Village, near Lees Summit, Mo.	Lat 38°56'41", long 94°23'54", in NW¼ SE¼ sec. 25, T.48 N., R.32 W., Jackson County, at bridge on Colborn Road, 0.5 mile east of U.S. Highway 50, at Missouri Pacific Railroad overpass.
18	--------	Little Blue River tributary at Noland Road at Independence, Mo.	Lat 39°01'42", long 94°24'50", in NW¼ NW¼NE¼ sec. 35, T.49 N., R.32 W., Jackson County, 0.5 mile south of alternate U.S. Highway 40 and 0.3 mile north of Missouri Pacific Railroad at culvert on Noland Road, and 1.7 miles above confluence with Little Blue River.
19	--------	Little Blue River at Interstate Highway 470 (State Highway 291) at Independence, Mo.	Lat 39°01'40", long 94°21'37", in SE¼ SE¼SW¼ sec. 29, T.~~49 N., R.~~31 W., Jackson County, at bridge on State Highway 291, 0.4 mile south of U.S. Highway 40 and 1.0 mile south Interstate Highway 70.
20	--------	East Fork Little Blue River tributary at Blackwell Road near Lees Summit, Mo.	Lat 38°55'43", long 94°19'05", in SW¼ NW¼SW¼ sec. 35, T.48 N., R.31 W., Jackson County, at culvert on Blackwell Road, 0.85 mile north of Langsford Road and 0.55 mile upstream from Prairie Lee Lake.

Table 2.--Description of discharge measurement sites--continued

Site number (fig. 2)	U.S. Geological Survey station number	Station name	Location
21	--------	East Fork Little Blue River at Lake Jacomo spillway near Blue Springs, Mo.	Lat 38°59'42", long 94°18'40", in NE¼ NW¼NW¼ sec. 11, T.48 N., R.31 W., Jackson County, at weir 0.1 mile upstream of Liggett Road at Lake Jacomo spillway.
22	06893890	East Fork Little Blue River near Blue Springs, Mo.	Lat 39°01'32", long 94°20'37", in NE¼ NE¼NW¼ sec. 33, T.49 N., R.31 W., Jackson County, at bridge on U.S. Highway 40, 2.6 miles west of Blue Springs, 3.5 miles upstream from confluence with Little Blue River.
23	--------	Little Blue River at 39th St. at Independence, Mo.	Lat 39°02'51", long 94°20'13", in NE¼ NW¼SE¼ sec. 21, T.49 N., R.31 W., Jackson County, at bridge on 39th St., 1.6 miles east of State Highway 291 and 0.15 mile east of Illinois Central Railroad.
24	--------	Spring Branch at State Highway 291 at Independence, Mo.	Lat 39°05'24", long 94°22'46", in SW¼ NE¼SW¼ sec. 6, T.49 N., R.31 W., Jackson County, at culvert on State Highway 291, 0.1 mile south of Truman Road, 4.4 miles above confluence with Little Blue River.

Table 2.--Description of discharge measurement sites--continued

Site number (fig. 2)	U.S. Geological Survey station number	Station name	Location
25	--------	Burr Oak Creek at Pink Hill Road at Blue Springs, Mo.	Lat 39°03'12", long 94°18'06", in NW¼ NW¼NE¼ sec. 23, T.49 N., R.31 W., Jackson County, at culvert on Pink Hill Road, 1.8 miles west of State Highway 7, 3.2 miles above confleunce with Little Blue River.
26	06894000	Little Blue River near Lake City, Mo.	Lat 39°06'02", long 94°18'01", in SE¼ SW¼ sec. 35, T.50 N., R.31 W., Jackson County, at bridge on State Highway 78, at river mile 14.7, and 3 miles southwest of Lake City.
27	06894680	Sni-A-Bar Creek near Tarsney, Mo.	Lat 38°56'28", long 94°10'05", in SW¼ SW¼NW¼ sec. 30, T.48 N., R.29 W., Jackson County, at bridge on Colburn Road, 2.3 miles upstream from mouth of West Fork, 2.7 miles east of Tarsney and 5 miles southeast of Grain Valley.
28	--------	East Branch Big Creek at State Highway 150 near Greenwood, Mo.	Lat 38°51'02", long 94°18'42", in SE¼ SW¼SE¼ sec. 26, T.47 N., R.31 W., Jackson County, at bridge on State Highway 150, 3.4 miles east of State Highway 291, 1.5 miles above confluence with Big Creek.

Table 2.--Description of discharge measurement sites--continued

Site number (fig. 2)	U.S. Geological Survey station number	Station name	Location
29	--------	Big Creek near Pleasant Hill, Mo.	Lat 38°48'09", long 94°17'20", in NW¼ SW¼NW¼ sec. 18, T.46 N., R.30 W., Cass County, at bridge on Chicago Rock Island and Pacific Railroad, 0.1 mile upstream from Missouri Pacific Railroad, 4.3 miles southeast of State Highway 150, 2.1 miles northwest of State Highway 7.

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