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WEATHER BUREAU
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TECHNICAL PAPER NO. 17

KANSAS - MISSOURI FLOODS
of
JUNE - JULY 1951

Prepared by
Hydrologic Services Division



KANSAS CITY, MO.
JULY 1952



Farm home and barn in Kansas River Valley near Lawrence, Kans., after flood had receded. Remains of bumper corn crop in foreground. July 1951.

(Courtesy, St. Louis Post Dispatch)

DEPARTMENT OF COMMERCE
BUREAU OF STANDARDS
TECHNICAL PAPER NO. 17
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of
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PREFACE

The purpose of this report is to compile and record the basic hydrometeorological data for the great Kansas-Missouri floods of June-July 1951. This type of information is essential in the planning of land and water management programs, including the safeguarding of life and property. The report has been prepared by the U. S. Weather Bureau, under the general direction of F. W. Reichelderfer, Chief of Bureau, and William E. Hiatt, Chief, Hydrologic Services Division. Coordination of the project was under the direction of Bennett Swenson, Chief of the River Services Section.

The collection of field data and the final assembly of the report was under the direct supervision of Verne Alexander, North Central Area Hydrologic Engineer, Kansas City, Mo. Assistance with field work and the collection and tabulation of the basic information relating to precipitation and river stages was furnished by the staffs of River District Offices, River Forecast Centers, and Weather Records Processing Center. The officials in charge of offices participating in the collection and preparation of the information were R. A. Garrett, Topeka, Kans.; P. R. Jones, Tulsa, Okla.; J. R. Lloyd, R. E. Johnson, and G. E. Stegall, Kansas City, Mo.; H. F. Wahlgren and Phillip Light, St. Louis, Mo. The Hydrometeorological Section, C. S. Gilman, Chief, assisted in the preparation of the sections on meteorological analysis and transposition limits. Text for these sections was written by James F. Appleby, George A. Lott, and Lillian K. Rubin.

Many other members of the staff of the Weather Bureau, including technical and clerical staffs of the Hydrologic Services Division, made valuable contributions to this work.

The Corps of Engineers, Department of the Army, and the Geological Survey, Department of Interior, have materially aided through the contribution or verification of basic information. The Corps of Engineers assisted with the collection of supplemental precipitation and river stage data and furnished damage statistics. The Geological Survey furnished river stage data for some points and assisted with the correlation of peak values at other points. The hundreds of cooperating weather and river observers performed an invaluable service in making available the precipitation and river stage information used in this report.

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INTRODUCTION

Following a two-month period of above-normal precipitation, rains of unprecedented intensity occurred over the Neosho, Osage, and Kansas Basins in Kansas during a 72-hour period from July 9 to July 12, 1951. The resulting floods, the greatest in more than a century, dealt a heavy blow to the economy of the region. Industrial districts and transportation centers of three metropolitan areas, Kansas City, Kans., Kansas City and St. Louis, Mo., were in the path. Two state capitals,

Topeka, Kans., and Jefferson City, Mo., experienced the devastation. In addition, 150 flourishing communities and smaller cities suffered severe damage. Thirty thousand farms, consisting of three million acres, were affected by the flood waters. Tangible losses amounted to nearly a billion dollars. Twenty-eight lives were lost. This flood, occurring in an important agricultural and industrial area, constituted a major national catastrophe.

BASIN DESCRIPTIONS

The Mississippi River System comprises 41 percent of the area of the United States. It has six major divisions. Portions of three of these divisions--namely, the Missouri, Upper Mississippi and the Arkansas-White--were directly affected by the floods of June-July, 1951. The excessive rains producing the floods were confined, in general, to

the tributary streams of the Arkansas and Missouri Basins in the states of Kansas, Missouri and Nebraska, with the heavier amounts in east-central Kansas. Figure 1 shows the area of flooding under discussion and its location with respect to the major divisions of the Mississippi System. Table 1 shows the relative size of each division.

TABLE 1--GRAND DIVISIONS OF THE MISSISSIPPI BASIN

Designation	Area in square miles	Ratio to whole basin
Upper Mississippi Basin - - - - -	188,000	0.151
Missouri Basin - - - - -	529,400	.426
Ohio Basin - - - - -	204,000	.164
Arkansas and White Basins - - - - -	188,100	.151
Red Basin - - - - -	92,200	.074
Lower Mississippi Basin - - - - -	42,000	.034
Total - - - - -	1,243,700	1.000

Lower Missouri and Tributary Basins--The portion of the basin most seriously affected in this flood was the Missouri drainage below and including the Kansas River Basin. The Kansas River, with a drainage area of approximately 60,000 square miles joins the Missouri River at Kansas City, about 380 miles above the mouth.

The Kansas River proper is formed by the confluence of the Republican and Smoky Hill Rivers at Junction City, Kansas. The Republican River with a drainage area of 25,000 square miles rises in eastern Colorado at an elevation of approximately 5,000 feet. The gradient is fairly steep, approximately 3 feet per mile in the reach between Concordia, Kansas, and the mouth, and the channel is unstable. The height of banks above the stream-bed ranges from 5 to 15 feet. The Smoky Hill with a total drainage area of 20,000 square miles also rises in extreme eastern Colorado. The channel is characterized by extreme meander, especially in the lower reaches. Both the Republican and Smoky Hill Basins are in the semi-arid region with average annual precipitation ranging from 15 inches in the upper reaches to 27 inches in the lower reaches. In general, the topography is gently rolling uplands with local relief of less than 200 feet. The Blue River rises in Nebraska and joins the Kansas 142 miles above the mouth. The Blue River has a total drainage area of 9,600 square miles and makes a major contribution to the Kansas River flows.

The Kansas River, below the junction of the Smoky Hill and Republican Rivers, is only 169 miles in length. The gradient averages about 1.9 feet per mile. Upland areas are quite similar to those of its tributaries but the flood plain is wider and averages 20 to 25 feet above the stream-bed. The flood plain is very fertile and devoted to intensive agricultural production. It is traversed by several important railway lines connecting Kansas City with the west. The average annual rainfall over this portion of the basin is about 34 inches.

The Missouri Basin below the mouth of the Kansas is quite similar to the lower Kansas although it is characterized by wider and slightly higher flood plains and a higher average annual rainfall. The channel of the main stem is navigable and trunk railway lines follow the valley from St. Louis to Kansas City. The Osage River (officially the Marais des Cygnes in Kansas) is the principal tributary of the Missouri below the confluence with the Kansas River. This stream, rising in eastern Kansas, has a drainage area of 15,300 square miles. The upper portion of the basin is mostly rolling uplands with a high percentage of cultivation. The lower portion is in the Ozark Plateau with rugged terrain and heavy timber cover. Runoff from the lower area is much greater due to heavier precipitation and steeper slopes.

Hydroelectric development in the basin consists of four privately operated reservoirs, Bagnell

Reservoir in Missouri with a capacity of 2,087,000 acre-feet being by far the largest.

Agriculture and the processing of agricultural products constitute the principal economy of the lower Missouri and tributary basin area, the important products being corn, wheat, hay, oats, potatoes and livestock. Mineral resources are present in moderate amounts, including oil, gas, coal, salt, gypsum and minor amounts of iron. The region includes the metropolitan areas of Kansas City, Kans., and Kansas City, Mo. The total population of the region in 1950, including the counties bordering the Missouri River between Kansas City and the mouth, was 2,765,000 of whom about 950,000 were living in cities with population of 5,000 or greater.

Middle Mississippi Basin- The drainage area between the mouth of the Missouri River and the Ohio River is about 16,500 square miles. The gradient of the stream is about 0.6 foot per mile. The river valley is several miles wide and protected by levee systems. There are extensive navigation

activities on the Mississippi River and trunk railway lines follow the flood plain. The economy of the area is closely identified with manufacturing and processing activities in the St. Louis district, whose greater metropolitan area has a population of about 1 1/2 million. Floods have always constituted a hazard but protective measures, including levees and effective flood warning services, have done much in recent years to reduce losses.

Arkansas Basin Tributaries in Kansas--In the State of Kansas the Neosho River (officially the Grand in Oklahoma) and the Verdigris River Basins are contiguous with the upper Osage and lower Kansas Basins and have comparable characteristics. There are no large metropolitan areas, but many thriving cities are located in the region. Agriculture, stock raising, and mining are the major activities. Prior to 1951, flood losses had been confined principally to agricultural damage. The severity of the July 1951 flood in the upper reaches of these streams may change the entire social and economic viewpoint of flood management in this area.

FLOOD HISTORY OF THE AREA

The flood of June 1844 is the greatest known in the lower Missouri and middle Mississippi Basins. There is an authentic record of stages reached at Kansas City and St. Louis, Mo., and reliable high-water marks have been located at Manhattan and Topeka, Kans., on the Kansas River, and at Boonville and Hermann, Mo., on the Missouri River. It is known the total rainfall for May and June 1844 was 20.08 inches at Ft. Leavenworth, Kans., and 27.43 inches at Ft. Scott, Kans. Highwater marks of the 1844 flood were not exceeded on the Kansas River proper, although the 1951 flood was 4 to 6 feet higher than any previously recorded gage height readings. No reliable highwater marks have been located for the 1844 flood in the upper Osage Basin but it appears this flood probably was several feet higher than that of 1951. There is no record of the 1844 flood in the Neosho Basin but all previously recorded gage readings were exceeded by 4 to 9 feet in 1951. Most of the documentary evidence on early floods is contained in the following publications:

1. Kansas State Historical Society, Vol. 8, 1903-08
2. Thirty Years in Topeka, by Giles
3. The Floods of the Spring of 1903 in the Mississippi Watershed, Weather Bureau Bulletin M
4. Report of Kansas State Board of Agriculture 1948, Climate of Kansas, by S. D. Flora, Section Director, U. S. Weather Bureau

It appears that noteworthy floods occurred in some portions of the area in 1785, 1828, 1858, 1867, 1877, 1881, and 1895 but, in general, the information is fragmentary. Starting about 1903, records are more comprehensive. Weather Bureau Bulletin M, reference 3 above, gives a detailed report on the May-June 1903 flood. Approximately 100 lives were lost in this disaster. Records established at that time in the lower Missouri-middle Mississippi Basins were, in general, not broken until July 1951. Table 2 summarizes most of the factual information on earlier floods and furnishes a comparison with the recent flood.

On a basis of areal magnitude, there were no outstanding floods during the 39-year period between 1903 and 1943. Several very severe floods occurred during the period but these were confined

to individual tributary basins. Outstanding among these were 1904 in the Neosho Basin, 1928 in the Marais des Cygnes, and 1935 in the Republican. The year 1915 was one of the wettest of record and runoff was exceedingly high. Streams were at, or above, flood stage for several weeks but extremely high stages were not observed.

A review of Table 2 shows the decade 1941-1950 as being one of excessive floods. At St. Louis, the floods of 1943, 1944, and 1947 exceeded all previous records since 1844. At Kansas City, Mo., flood stage was reached 13 times in the period as compared to once in the period 1931-1940. All-time records, not exceeded by the 1951 flood, were established in 1943 along the Osage River from Osceola, Mo., to the mouth and all previous records were broken in 1948 on the Neosho. Basic hydrologic data associated with these floods may be found in Weather Bureau publications. Precipitation data are published in appropriate issues of Monthly Climatological Data and Hydrologic Bulletins. River stage information is in annual issues of Daily River Stages. Monthly Weather Review, prior to January 1950, contains a monthly summary of river and flood conditions and gives preliminary crest stage data. Subsequent to that date, similar data have been published in monthly issues of Climatological Data, National Summary. Annual flood losses for previous years have been published in Monthly Weather Review as follows:

<u>Year</u>	<u>Issue of Review</u>
1933	Vol. 62, No. 1, Jan. 1934
1934	Vol. 62, No. 12, Dec. 1934
1935	Vol. 63, No. 12, Dec. 1935
1936	Vol. 65, No. 1, Jan. 1937
1937	Vol. 66, No. 12, Dec. 1938
1938	Vol. 68, No. 9, Sept. 1940
1939	Vol. 68, No. 11, Nov. 1940
1940	Vol. 69, No. 7, July 1941
1941	Vol. 71, No. 11, Nov. 1943
1942-43	Vol. 73, No. 8, Aug. 1945
1944-45	Vol. 76, No. 6, June 1948
1946	Vol. 76, No. 9, Sept. 1948
1947	Vol. 77, No. 9, Sept. 1949

Data for 1948 and 1949 are contained in Climatological Data National Summary, Vol. 1, Nos. 8 and 13, 1950, respectively.

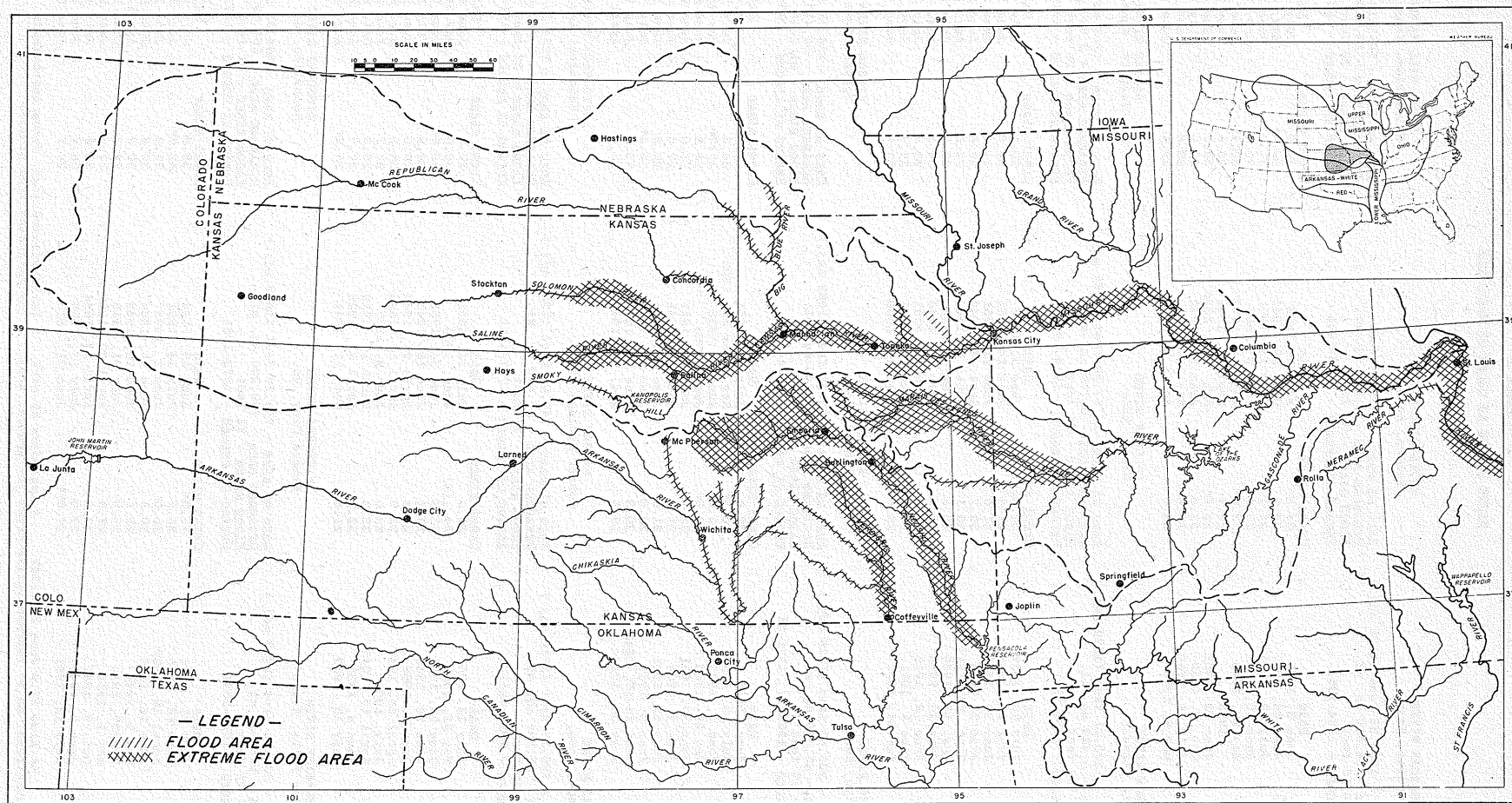


Figure 1.--Map showing areas of flooding, June-July, 1951

TABLE 2
MAJOR FLOODS IN ORDER OF MAGNITUDE

REPUBLICAN RIVER Clay Center, Kans.			SMOKY HILL RIVER Salina, Kans.			SMOKY HILL RIVER Enterprise, Kans.		
<u>Zero of gage</u> - 1159.32 feet (1929 adj.)			<u>Zero of gage</u> - 1199.95 feet			<u>Zero of gage</u> - 1098.14 feet (1929 adj.)		
<u>Drainage area</u> - 24,570 sq. mi.			<u>Drainage area</u> - 8,240 sq. mi.			<u>Drainage area</u> - 19,200 sq. mi.		
<u>Flood stage</u> - 15 feet			<u>Flood stage</u> - 20 feet			<u>Flood stage</u> - 26 feet		
<u>Period of record</u> - 1934-1951			<u>Period of record</u> - 1929-1951			<u>Period of record</u> - 1934-1951		
<u>Crest stage</u>	<u>Date</u>		<u>Crest stage</u>	<u>Date</u>		<u>Crest stage</u>	<u>Date</u>	
1 25.7*	June 3, 1935		24.6*	May 30, 1903		34.0	July 14, 1951	
2 22.9	June 26, 1947		24.2	Oct. 20, 1941		32.0*	May, 1903	
3 22.2	July 12, 1951		24.1	July 13, 1951		31.4	June 28, 1951	
4 21.1	June 10, 1941		23.2	June 5, 1938		30.2	Oct. 20, 1941	
5 20.8	May 22, 1945		22.8*	Aug. 19, 1927		30.1	June 15, 1951	
6 20.2*	1915		22.7	Sept. 6, 1941		29.8	July 18, 1945	
7 20.2	June 22, 1951		22.7*	Aug. 8-9, 1928		29.7	June 8, 1951	
8 19.8	Oct. 3, 1950		22.6	June 23, 1942		29.6	July 21, 1948	
9 19.5	July 11, 1950		22.6	May 16, 1929		29.6	Sept. 7, 1942	
10 19.3	May 9, 1950		22.0	April 28, 1942		29.1	June 9, 1935	
SOLOMON RIVER Beloit, Kans.			SOLOMON RIVER Niles, Kans.			SALINE RIVER Tescott, Kans.		
<u>Zero of gage</u> - 1339.11 feet (1929 adj.)			<u>Zero of gage</u> - 1157.20 feet (1929 adj.)			<u>Zero of gage</u> - 1264.60 feet (1929 adj.)		
<u>Drainage area</u> - 5,430 sq. mi.			<u>Drainage area</u> - 6,770 sq. mi.			<u>Drainage area</u> - 2,820 sq. mi.		
<u>Flood stage</u> - 20 feet			<u>Flood stage</u> - 24 feet			<u>Flood stage</u> - 25 feet		
<u>Period of record</u> - 1904-1951			<u>Period of record</u> - 1919-1951			<u>Period of record</u> - 1919-1951		
<u>Crest stage</u>	<u>Date</u>		<u>Crest stage</u>	<u>Date</u>		<u>Crest stage</u>	<u>Date</u>	
1 39.3	July 13, 1951		32.3(a)	June 3, 1903		30.1	July 13, 1951	
2 35.9	June 11, 1941		31.8	July 14, 1951		29.8	June 9, 1951	
3 35.4	June 24, 1951		31.0	June 21, 1951		29.6	June 3, 1935	
4 34.5	June 3, 1935		30.2	Sept. 4, 1942		29.6	June 25, 1951	
5 33.6	Sept. 20, 1919		30.1	Sept. 8, 1946		29.5	Aug. 17-18, 1927	
6 33.3	Aug. 15, 1950		29.8	June 7, 1935		29.5	July 12, 1928	
7 33.2	June 20, 1908		29.7	July 20, 1948		29.5	Aug. 4, 1928	
8 32.4	June 19, 1915		29.3	June 14, 1951		29.4	July 1, 1935	
9 32.2	June 9, 1951		29.1	June 17, 1941		29.3	Sept. 3, 1942	
10 29.8	May 24, 1951		28.9	Aug. 20, 1950		29.2	June 15, 1941	
KANSAS RIVER Manhattan, Kans.			KANSAS RIVER Wamego, Kans.			KANSAS RIVER Topeka, Kans.		
<u>Zero of gage</u> - 986.62 feet (1929 adj.)			<u>Zero of gage</u> - 953.51 feet (1929 adj.)			<u>Zero of gage</u> - 854.08 feet (1929 adj.)		
<u>Drainage area</u> - 45,460 sq. mi.			<u>Drainage area</u> - 55,240 sq. mi.			<u>Drainage area</u> - 56,710 sq. mi.		
<u>Flood stage</u> - 17 feet			<u>Flood stage</u> - 16 feet			<u>Flood stage</u> - 21 feet		
<u>Period of record</u> - 1904-14, 1921-51			<u>Period of record</u> - 1914-1951			<u>Period of record</u> - 1904-1951		
<u>Crest stage</u>	<u>Date</u>		<u>Crest stage</u>	<u>Date</u>		<u>Crest stage</u>	<u>Date</u>	
1 40.0#	June, 1844		27.6	July 13, 1951		42.2#	June, 1844	
2 33.4	July 13, 1951		26.3*	May 29 or 30, 1903		36.3	July 13, 1951	
3 28.0#	June 4, 1935		23.8	June 4, 1935		32.7*	May 30, 1903	
4 27.9*	May 29, 1903		23.0*	June, 1908		28.9	June 30, 1951	
5 26.8	June 29, 1951		22.9	June 30, 1951		28.0	June 9, 1908	
6 24.8	June 8, 1908		21.9	June 11, 1941		27.6	June 5, 1935	
7 23.5	June 11, 1941		21.6	June 23, 1951		26.8	June 17, 1943	
8 23.0	June 9, 1951		20.8	June 17, 1943		26.8*	July 7, 1904	
9 23.0	June 16-17, 1943		20.3	June 20, 1915		25.8	June 12, 1941	
10 23.0	July 20, 1950		19.8	Aug. 27, 1944		25.4	April 23, 1944	
KANSAS RIVER Lawrence, Kans.			KANSAS RIVER Bonner Springs, Kans.			BIG BLUE RIVER Randolph, Kans.		
<u>Zero of gage</u> - 799.12 feet (1929 adj.)			<u>Zero of gage</u> - 747.01 feet (1929 adj.)			<u>Zero of gage</u> - 1034.73 feet (1929 adj.)		
<u>Drainage area</u> - 58,500 sq. mi.			<u>Drainage area</u> - 59,890 sq. mi.			<u>Drainage area</u> - 9,100 sq. mi.		
<u>Flood stage</u> - 18 feet			<u>Flood stage</u> - 21 feet			<u>Flood stage</u> - 22 feet		
<u>Period of record</u> - 1927-1951			<u>Period of record</u> - 1917-1951			<u>Period of record</u> - 1918-1951		
<u>Crest stage</u>	<u>Date</u>		<u>Crest stage</u>	<u>Date</u>		<u>Crest stage</u>	<u>Date</u>	
1 30.4	July 13, 1951		38.6	July 13, 1951		30.8	June 10, 1941	
2 28.5*	May 31, 1903		34.-(E)	June, 1903		30.6*	May 31, 1903	
3 25.6	June 23, 1951		25.3	June 24, 1951		29.8*	June 7, 1908	
4 23.9	June 18, 1943		25.2	June 18, 1943		28.9	July 13, 1951	
5 23.6*	June 9, 1908		24.4	April 24, 1944		28.6	June 28, 1951	
6 23.3	April 24, 1944		23.9	April 18, 1945		28.2	Aug. 26, 1944	
7 22.5*	July, 1904		23.0	June 6, 1935		28.2	June 22, 1951	
8 22.5	April 17, 1945		22.2	March 17, 1919		28.0	Oct. 9, 1941	
9 22.1	June 6, 1935		22.2	April 21, 1929		27.0	June 25, 1947	
10 22.0	July 20, 1950		21.6	Oct. 11, 1941		26.8*	Aug. 26, 1903	
DELAWARE RIVER Valley Falls, Kans.			MISSOURI RIVER Kansas City, Mo.			MISSOURI RIVER Boonville, Mo.		
<u>Zero of gage</u> - 884.55 feet (1929 adj.)			<u>Zero of gage</u> - 715.79 feet (1929 adj.)			<u>Zero of gage</u> - 564.95 feet (1929 adj.)		
<u>Drainage area</u> - 922 sq. mi.			<u>Drainage area</u> - 489,200 sq. mi.			<u>Drainage area</u> - 505,700 sq. mi.		
<u>Flood stage</u> - 22 feet			<u>Flood stage</u> - 22 feet			<u>Flood stage</u> - 21 feet		
<u>Period of record</u> - 1922-1951			<u>Period of record</u> - 1873-1951			<u>Period of record</u> - 1873-1951		
<u>Crest stage</u>	<u>Date</u>		<u>Crest stage</u>	<u>Date</u>		<u>Crest stage</u>	<u>Date</u>	
1 32.1	June 21, 1951		38.0*	June 16, 1844		32.8	July 17, 1951	
2 29.7	June 16, 1925		36.2	July 14, 1951		32.7*	June 21, 1844	
3 28.4	April 19, 1929		35.0	June 2, 1903		32.0	June 27, 1947	
4 27.8	June 16, 1945		30.3	June 15, 1908		30.9	June 6, 1903	
5 27.5	May 3, 1944		29.1	June 19, 1943		30.9	April 27, 1944	
6 27.2*	May 27, 1915		29.0	July 21, 1915		28.8	June 22, 1943	
7 27.2	May 1, 1951		27.8	April 30, 1881		27.5	June 29, 1942	
8 26.6	Oct. 9, 1941		27.6	April 24, 1944		26.8	July 13, 1909	
9 26.5	June 9, 1943		27.0	July 13, 1909		26.7	June 18, 1908	
10 25.4	July 12, 1951		27.0**	June 21, 1915		26.7	June 5, 1935	

* From HW mark ** Also 27.0 June 25, 1947 # Legendary HW mark (a) Abandoned gage, datum approximate
 # Obstruction downstream, 25.9* representative crest for general area (E) Estimated from profile

TABLE 2
MAJOR FLOODS IN ORDER OF MAGNITUDE

MISSOURI RIVER Hermann, Mo.			MARAIS DES CYGNES RIVER Quenemo, Kans.			MARAIS DES CYGNES RIVER Ottawa, Kans.		
Zero of gage - 481.34 feet (1929 adj.) Drainage area - 528,200 sq. mi. Flood stage - 21 feet Period of record - 1873-1951			Zero of gage - 890.62 feet (1929 adj.) Drainage area - 1,030 sq. mi. Flood stage - 28 feet Period of record - 1922-1951			Zero of gage - 863.26 feet Drainage area - 1,240 sq. mi. Flood stage - 24 feet Period of record - 1920-51, Parts 11-14;		
Crest stage	Date		Crest stage	Date		Crest stage	Date	
1 35.5*	June, 1844		40.4*	July 11, 1951		42.1	July 12, 1951	
2 33.0	July 19, 1951		38.4	Nov. 17, 1928		37.6	Nov. 17, 1928	
3 31.2	June 29, 1947		38.1	April 23, 1944		36.5	April 23, 1944	
4 31.1	May 21, 1943		36.6	June 3, 1935		36.2	April 16, 1945	
5 30.8	April 28, 1944		36.6	April 16, 1945		35.9*	July 8, 1909	
6 29.6	June 28, 1942		36.4	Dec. 5, 1944		34.3	May 30, 1904	
7 29.5	June 7, 1903		35.4	Oct. 22, 1941		33.9	Dec. 6, 1944	
8 28.7	June 7, 1935		35.3	July 21, 1948		32.9	April 10, 1922	
9 28.0	June 24, 1943		35.2	April 11, 1944		32.0	June 3, 1935	
10 27.7	April 20, 1945		35.2	July 6, 1932		31.8*	June 12, 1915	
MARAIS DES CYGNES RIVER Trading Post, Kans.			OSAGE RIVER Osceola, Mo.			OSAGE RIVER St. Thomas, Mo.		
Zero of gage - 761.16 feet Drainage area - 2,910 sq. mi. Flood stage - 24 feet Period of record - 1921-23; 1928-51			Zero of gage - 678.91 feet (1929 adj.) Drainage area - 8,220 sq. mi. Flood stage - 22 feet Period of record - 1911-1951			Zero of gage - 528.06 feet (1929 adj.) Drainage area - 14,500 sq. mi. Flood stage - 23 feet Period of record - 1932-1951		
Crest stage	Date		Crest stage	Date		Crest stage	Date	
1 38.1	July 14, 1951		41.5	May 21, 1943		43.8	May 20, 1943	
2 34.4	Nov. 18, 1928		40.3*	June, 1844		39.4*	June, 1844	
3 30.6	April 25, 1944		36.0	July 6, 1951		35.2	July 13, 1951	
4 30.4	July 1, 1951		35.1	July 19, 1951		34.5	Oct. 7, 1941	
5 29.8	April 18, 1945		33.3*	Dec., 1895		33.3*	April 18, 1927	
6 29.0	May 24, 1938		32.5	Nov. 2, 1941		33.0	June 4, 1935	
7 28.5	June 5, 1935		31.6	May 1, 1944		32.4	April 22, 1941	
8 28.2	July 27, 1948		31.2	April 17, 1945		31.7	Nov. 3, 1941	
9 27.8	May 19, 1943		30.6	Jan. 29, 1916		31.5	Aug. 15, 1946	
10 27.1	April 12, 1922		30.6	May 21, 1929		31.1	April 18, 1945	
MISSISSIPPI RIVER St. Louis, Mo.			MISSISSIPPI RIVER Cape Girardeau, Mo.			MISSISSIPPI-OHIO RIVER Cairo, Ill.		
Zero of gage - 379.94 feet (1929 adj.) Drainage area - 701,000 sq. mi. Flood stage - 30 feet Period of record - 1861-1951 (1)			Zero of gage - 304.77 feet (1929 adj.) Drainage area - 716,000 sq. mi. Flood stage - 32 feet Period of record - 1896-1951			Zero of gage - 270.62 feet (1929 adj.) Drainage area - 717,400 sq. mi. (4) Flood stage - 40 feet Period of record - 1860-1951		
Crest stage	Date		Crest stage	Date		Crest stage	Date	
1 (2) 41.4*	June 27, 1844		42.5*	July 4, 1844		59.5	Feb. 3, 1937	
2 40.3	July 22, 1951		42.4	May 27, 1943		56.4	April 20, 1927	
3 40.3	July 2, 1947		41.9	July 5-6, 1947		55.9	Feb. 15, 1950	
4 39.1	April 30, 1944		41.8	July 24, 1951		54.7	April 4, 1913	
5 38.9	May 24, 1943		40.8	May 6, 1944		54.0	April 6, 1912	
6 38.0	June 10, 1903		40.0	April 20, 1927		53.9	March 11, 1945	
7 37.2*	June 15, 1858		38.7	April 3, 1945		53.6	March 26, 1922	
8 37.1*	- - 1855		38.0	April 21-22, 1922		53.4	Feb. 4, 1916	
9 36.6	June 10, 1851		37.8	March 28-29, 1948		53.0	May 30, 1943	
10 36.4*	- - 1828		37.7*	June, 1858		52.8	April 16, 1936	
NEOSHO RIVER Burlington, Kans.			NEOSHO RIVER Iola, Kans.			NEOSHO RIVER Parsons, Kans.		
Zero of gage - 983.53 feet (1929 adj.) Drainage area - 3030 sq. mi. Flood stage - 27 feet Period of record - 1942-1951 (3)			Zero of gage - 928.18 feet (1929 adj.) Drainage area - 3720 sq. mi. Flood stage - 15 feet Period of record - 1922-1951			Zero of gage - 810.25 feet (1929 adj.) Drainage area - 4820 sq. mi. Flood stage - 24 feet Period of record - 1922-1951		
Crest stage	Date		Crest stage	Date		Crest stage	Date	
1 41.5	July 12, 1951		33.3	July 13, 1951		40.2	July 14, 1951	
2 36.8	July 21, 1948		24.7	July 23, 1948		30.7	July 27, 1948	
3 35.2*	- - 1885		23.5	Sept. 13, 1926		29.7	April 27, 1944	
4 35.2*	July, 1904		22.6	April 25, 1944		29.2	May 20, 1943	
5 35.1	April 24, 1944		22.4	April 18, 1945		29.0	April 21, 1945	
6 35.1	April 17, 1945		22.0*	June 3, 1903		27.5	Nov. 24, 1928	
7 34.9*	April 18, 1927		21.2	July 4, 1951		27.5	June 1, 1935	
8 34.9*	Nov. 18-19, 1928		21.1	Dec. 8, 1944		27.4	April 22, 1927	
9 34.5	July 2, 1951		21.0	Nov. 20, 1928		27.3	Oct. 31, 1941	
10 34.3	Dec. 6, 1944		20.7	May 19, 1943		27.1	Sept. 17, 1926	
NEOSHO RIVER Oswego, Kans.			COTTONWOOD RIVER Emporia, Kans.			VERDIGRIS RIVER Independence, Kans.		
Zero of gage - 790.86 feet (1929 adj.) Drainage area - 4950 sq. mi. Flood stage - 17 feet Period of record - 1905-1951			Zero of gage - 1076.52 (1929 adj.) Drainage area - 1840 sq. mi. Flood stage - 20 feet Period of record - 1909-1951			Zero of gage - 716.61 feet Drainage area - 2890 sq. mi. Flood stage - 30 feet Period of record - 1922-1951		
Crest stage	Date		Crest stage	Date		Crest stage	Date	
1 32.5	July 14, 1951		33.4	July 11, 1951		47.6	May 19, 1943	
2 27.4	July 27, 1948		29.5	July 20, 1948		47.3	April 17, 1945	
3 26.0	April 21, 1945		29.1	June 30, 1951		46.6	July 1, 1951	
4 25.9	April 28, 1944		27.7	April 23, 1944		46.0	Oct. 3, 1927	
5 25.8	May 21, 1943		27.4	April 17, 1945		45.2	April 20, 1927	
6 25.6	June 23, 1948		27.1*	July 5, 1904		44.8	May 30, 1935	
7 25.4	April 23, 1927		27.0	Nov. 17, 1928		44.4	April 10, 1922	
8 25.3	Nov. 24-25, 1928		26.0	Dec. 6, 1944		44.3	July 13, 1951	
9 25.2*	- - 1835		25.9	Sept. 13, 1926		44.1	June 12, 1923	
10 25.1	Sept. 19, 1926		25.5	July 12, 1929		43.9	Nov. 19, 1928	

* From HW marks (1) Also fragmentary record 1828-1860 (2) Flood of April 1785 may have reached 42.0
(3) Partial record 1928-1941 from nearby gage (4) Mississippi River area only

RAINFALL ASSOCIATED WITH FLOODS OF JUNE-JULY 1951

Data from approximately 425 official Weather Bureau rainfall stations (see Fig. 2) and supplemental reports from 700 unofficial rain gages were used in the preparation of this publication. The supplemental reports were collected and evaluated by field survey parties of the Corps of Engineers and the Weather Bureau. Of the 425 official rainfall stations, 150 were of the recording type which indicates the time and intensity of precipitation.

The sequence of significant rainfall began near the end of April and culminated in the critical storm of July 9-13, 1951. Over portions of the Kansas, Osage and Neosho Basins, the rainfall amounts observed during this 11-week period exceeded the normal annual total. Over large areas of the basins, normal monthly values were exceeded by over 200 percent in May, 300 percent in June, and 400 percent in July. Over the State of Kansas, precipitation during May 1951 averaged more than 2.5 inches above normal; in June, 5.5 inches above normal. The June rainfall over Kansas of 9.55 inches was the greatest monthly average ever recorded. Table 3 summarizes May-July precipitation in Kansas and furnishes a comparison with normals. Additional comparisons with normals for June and July are shown in Figures 3 and 4. The details of this precipitation are best presented by a series of graphs and maps. Rainfall observed antecedent to July is shown by Figure 5, an isohyetal map for the entire month of June.

From July 1 to July 8, intermittent rains con-

tinued to fall on watersheds in northern and eastern Kansas, already sodden from the record-breaking rainfall of May and June (see Fig. 6). Beginning July 9, the long period of excessive antecedent rainfall was climaxed by three days of extremely heavy precipitation. Downpours of 5 to 15 inches fell in the same area, with the greatest concentration of 10 to 15 inches extending from Clay, Dickinson, and Marion Counties to Franklin and Coffey Counties. Unofficial reports of rainfall in the Alma and Wilsey area indicate 17 to 19 inches in this period. Figures 7-10 are a sequence of 24-hour isohyetal maps covering the period July 9-13, and Figure 11 is a total isohyetal map for the same period. There were well-defined nocturnal bursts of intense precipitation in each 24-hour interval, and these are illustrated in the mass rainfall curves (Fig. 12) for 16 selected key stations. It may be seen all significant rainfall had ended by noon of July 12. All basic precipitation data, official and otherwise, are shown in Tables 4, 5 and 6.

The July 1951 storm was the greatest of record in the lower Kansas, upper Neosho and upper Verdigris Basins, with the possible exception of the storm of June 1844 for which there are virtually no records of rainfall. The relative magnitude of the major midwestern storms is shown by the depth-area duration computations values given in Table 7. For some areas and durations the July storm was the greatest of record in the United States north of the 37° parallel.

TABLE 3
SUMMARY OF MAY-JULY, 1951 PRECIPITATION IN KANSAS
(Normal, observed, and departure from normal, in inches, shown in monthly columns)

State Division	May			June			July			Accumulated May-July		
	Nor.	Obs.	Dep.	Nor.	Obs.	Dep.	Nor.	Obs.	Dep.	Nor.	Obs.	Dep.
Northwest	2.69	4.50	+1.81	2.96	6.70	+3.74	2.73	5.36	+2.63	8.38	16.56	+8.18
N. Central	3.63	5.12	+1.49	4.11	11.42	+7.31	2.93	8.00	+5.07	10.67	24.54	+13.87
Northeast	4.37	6.69	+2.32	4.60	12.37	+7.77	3.34	9.36	+6.02	12.31	28.42	+16.11
W. Central	2.79	5.32	+2.53	3.07	10.82	+7.75	2.58	3.02	+0.44	8.44	19.16	+10.72
Central	3.87	6.69	+2.82	4.25	9.52	+5.27	2.77	7.64	+4.87	10.89	23.85	+12.96
E. Central	4.81	6.88	+2.07	4.74	9.74	+5.00	3.46	13.07	+9.61	13.01	29.69	+16.68
Southwest	2.74	6.88	+4.14	2.85	6.16	+3.31	2.49	3.80	+1.31	8.08	16.84	+8.76
S. Central	4.13	8.28	+4.15	4.10	8.75	+4.65	2.86	4.32	+1.46	11.09	21.35	+10.26
Southeast	4.90	6.59	+1.69	5.19	12.02	+6.83	3.51	6.67	+3.16	13.60	25.28	+11.68
State Avg.	3.77	6.43	+2.66	3.97	9.55	+5.58	2.95	6.60	+3.65	10.69	22.58	+11.89

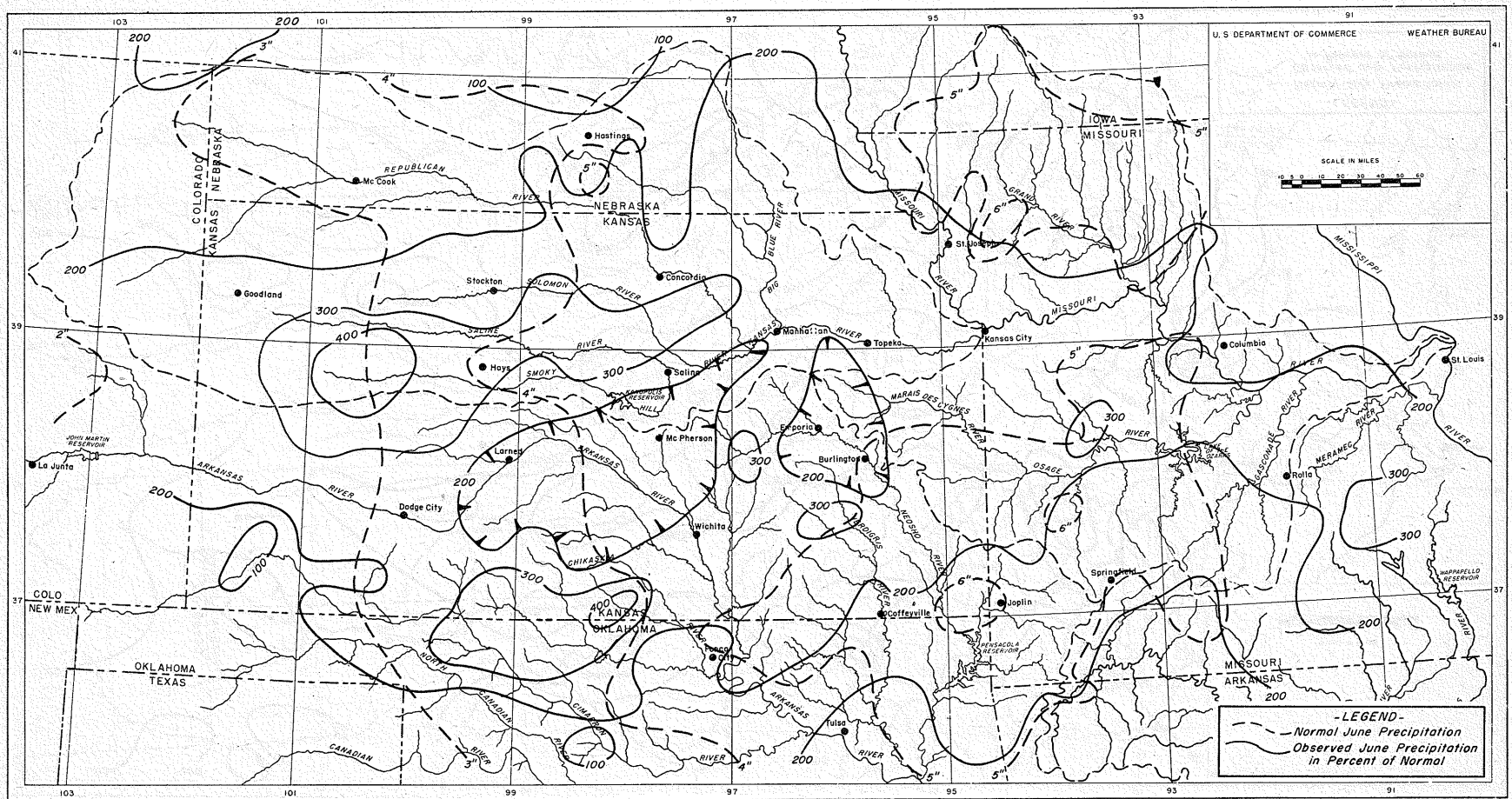


Figure 3.--June 1951 precipitation in relation to normal

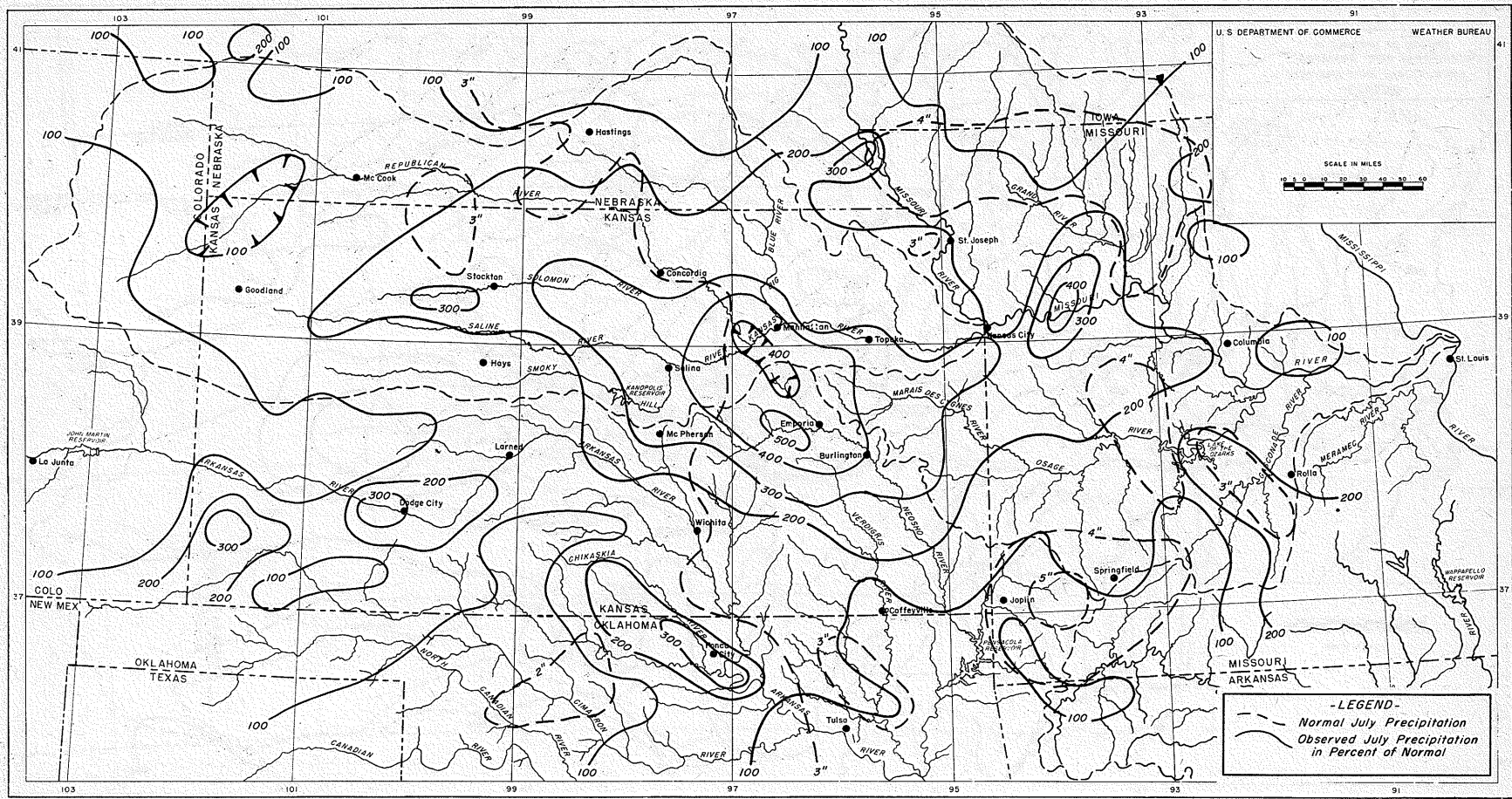


Figure 4.--July 1951 precipitation in relation to normal

TABLE 4

DAILY PRECIPITATION

Station	JUNE 1951																															Total	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31		
PAWNEE CITY 6 SE	R	1.37				2.11	.66	.16					.44	.17			.85		.39	.85	1.64	.65		.83	.50	.10	.35	.04					12.54
RAVENNA		.06	.08			.19		.27					.06	.75	.05			.65		.07	.68	.23			.28	.15	.04	T				3.46	
RED CLOUD		.04	4.29			.08	.50	2.08	.02	.24		.20		.13	.50	.01	.01	.05			1.00	1.39		.01		.07	.15	.06	.01				11.11
ROSEMONT 2 S			4.42			.02	.33	.91	T	.18	T			.84	.10		.01	.61			.48	.84		.01		1.91	.12	T	.05			10.27	
SEDAN		1.00	3.10				.42	.31	.32					.56	.14			.61			.54	.71	T			3.45	.11	T	.06			11.33	
STERLING			3.65			.56	1.05	1.18		.46				.65			1.22	.88			.67	.86	.22		1.01	.28						10.17	
STOCKVILLE						.25	1.18									.50	.88				1.20						.05						4.52
STOCKVILLE 5 SSW		RO5		-	-							.08				.05	.49	.57			.27	.50	.42		.31	.10							-
STOCKVILLE 6 NE		T				.03	.38	1.40			.58		T	.50	T	.30	.34			T	1.73	.07	.21		.28	T	.16	.10				6.08	
STRATTON							.54	.14			.57		.14				.34				.19	.54	.15	.35			.14						3.23
SUPERIOR						.93	.98	.01	.16				.70	.29			T				1.22	.99		.20		.11	.29	.03	.02				7.70
TABLE ROCK 4 N		.07	1.20			T	.76	.69	.10				.41	.51	.57			.40		.09	1.13	.80	.38	.01	1.14	.15	.09	.04				8.54	
TECUMSEH		.30	2.40				.92	.60	.05				.33	.40	.40			1.88		.03	.95	1.07	.43		1.05	.28			T			11.09	
TRENTON		.02	.10				.19	.05	.99	T	.44	.03	.01				.08	.75	.05		.01	.17	.64	.17	.01		.04		.04			3.79	
TRENTON 8 SSW		.23				.12	.41	.12			.40	.11								.59	.84	.40							T			3.22	
UPLAND		.32	1.53			T	.61	.41	.06	.10			.21	.44	.01	.06	.10			.21	.82		.28	*	.96	.07		.04				6.23	
WESTERN			2.56			.13	.22	.34	.30				.52	.72					.35		.97	.81	.44		1.85	.15		.06				9.42	
WILSONVILLE				T			.27	.18	.95		.42		.16	T	T		.62	.13		.16	.90	.54			.09							4.44	
WYMORE		.36	1.62			T	1.26	1.24	.22				.71		.80			.06		.07	1.12	1.10	.37		.05	2.03	.20	.15	.06	T		12.53	
OKLAHOMA																																	
BLACKWELL	R	.16	.35					.42	1.05		.01	.19		.50	.08			.04			1.53		.05	1.47			.10	2.45				8.40	
BURBANK			.32			.55	1.15		1.35		.35	.23	.04	T	.35			T			2.55	.10	.45	.58			.13	2.30				10.45	
FORAKER		.48				.23	.96		.59				.25								1.83	.63	.43	.84	.18								8.42
HOMINY 4 N			.05			T	2.70	.06	.91		T	.36	T	.06	.60	.02		.04	.04	2.88	.82	T	.05				T	2.16	.06				10.81
HULAH DAM	R		.12	.04		.05		1.11		.40				.25	.22	.31					1.60	.39	.51	.15			.47	2.12				-	
HULAH DAM	R																					.49	.15					.47	2.12				-
PAWHUSKA	R		.10			.22	1.51			.30		.24	.01	.01	.28	.14					2.14	.22	T	.17			.05	1.78				7.17	
PAWHUSKA	R		.10			.20	1.52	.34				.23		.29	.17						2.16	.05		.16			.05	1.75					7.24
PONCA CITY		.04	.05			T	.23	.40	1.90			.22	.14	T	.51					T	1.62	.08	.95	T			.01	3.00				9.23	
PONCA CITY CAA AP	R	.05	T			.01	.10	.39	1.64		T	.24		.03	.02	.61		.09		.01	1.69	.03	T	1.37	T		.66	1.99				8.95	
PONCA CITY CAA AP	R	.05		.02		.01	.11	.42	1.67		T	.26		.06	.02	.61		.10			1.70	.05	T	1.19			.68	2.00				8.95	
RENFROW			.07			.08	.94				T	.28	.13	1.28	.02						.85	.33			2.50		.04	.14	2.36			9.02	

TABLE 5
HOURLY PRECIPITATION

Station	A. M. Hour ending												P. M. Hour ending												Total	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12		
KANSAS																										
JULY 9																										
Achilles					.10																				.10	
Allen 1 W	T						*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	
Anthony 1 E	T												.40	.04											.44	
Baldwin																	.02	.03			.03	.01	.01	.04	.28	.56
Beaumont															1.18	1.14	.07	.01							2.40	
Beaver	//								.02	.01	.01	.01	.16	.08											.29	
Burlingame																						.03	.06	.17	.34	.60
Burns 3 N	T													.05	.02								.14	.01	.22	
Caldwell														.24	.01										.25	
Cassoday															.02	.01									.48	
Centropolis 5 NE																.02	.03					.11	.21	.82	1.21	
Chanute CAA AP	6												*	*	*	*	*	*			.99				-	
Columbus 6 NNW																	.41	.08			.01				.50	
Concordia WB City															.01	.07									.08	
Cottonwood Falls	T															.06	.01	.01							.21	
Council Grove 5 NW	T																			*	*	*	*	*	*	
Diamond Springs																						.09	.20	.16	.66	1.11
Dodge City WB Airport	//										.03														.03	
Dover 5 ENE	T																						.05	.05	.07	.17
El Dorado 4 SSE	T														.44	.01									.45	
Emporia 5 S	T															.04	.01				.01				.07	
Emporia CAA AP	6												*	*	*	*	*	*			.10	*	*	*	-	
Fall River Dam																.93	.16	.02							1.11	
Frankfort																					.07	.01	.01		.11	
Grenola														.17	.83	.02								.01	.01	1.02
Harris																		.02	.06		.01				.68	.77
Hays 1 S				.01		.01	.01		.03	.01															.07	
Herington 3 WSW	T																				.57	.15	.30	.15	.71	1.88
Hill City CAA AP 1 NE								.02	.02	.01															.05	
Horton																					.01	.02	.01		.04	
Iola																.01	.85	.06		.02					.94	
Ionia 1 NW													.02	.25											.27	
Junction City																					.14	.06	.15	.02	.20	.73
Junction City 1 NW	T									.01	.03		.01	.03	.03	.04				.17	.03	.07	.09	.17	.18	.76
Kanopolis Dam																									.07	
Kiowa													.17	.03											.20	
Lebo 5 S	T															.02	.03	.05							.10	
Le Loup 1 S	T																.05	.04	.01						1.53	
Luray 1 SE										.01			.01	.01	.03								.22	.38	.83	.05
Manhattan Agro. Farm														.03			.04	.05	.03		.24	1.32	1.30	.46	3.47	
Marysville																.03	.15	.07	.05						.30	
McFarland	T													.01	.01	.01		*	*	*	*	*	*	*	*	
Morland			.01	.01	.01	.02		.10	.01	.03															.19	
Morse																	.03	.02	.04	.01					.24	
Newton 3 E	T									.01	.02	.01		.02	.02								.08	.06	.08	
Osage City 2 S	T												.05	.01									.05	.93	1.02	2.10
Osawatomie	T									.01	.02	.01	.01	.01	.01	.01	.01	.10					.14	.14	.48	
Ottawa														.03	.05	.03	.03	.03	.01				.67	.33	.31	1.46
Overbrook 2 WSW	T													.01	.01	.03	.03				.02		.05	.51	.24	.90
Reading														.04	.01	.01							.01	1.05	.06	1.18
Russell CAA AP 3 SE	6							*	*	*	*	*	.13	*	*	*	*	*		.03					-	
Salina																					.11	.02			.13	

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TABLE 5

HOURLY PRECIPITATION

Station	A. M. Hour ending												P. M. Hour ending												Total		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12			
Fall River Dam	.26	.02																							.28		
Grenola	.14	.04	.01	.02		.02	.15	.09	.03	.15	.10	.01													.76		
Harris	.02	.01	.02																						.05		
Hillsboro 1 NE								.01	.01	.01	.01														.04		
Hutchinson 4 E							.04		.01																.05		
Iola	.02	.21																							.23		
Kiowa				.34	1.40		.02	.07	.01																1.84		
Toronto	.18																								.18		
Wellington		.18		.10	1.12	.18	.04	.18	.20	.12	.01	.02													2.05		
Williamsburg			.02	.02			.02																		.06		
MISSOURI																											
JULY 9																											
Alton 6 ENE																						1.23	.02		1.25		
Amsterdam																	.15	.07	.03						.22	.47	
Appleton City																.10	.17	.03						.04	.34		
Butler CAA AP 2 N	6												*	*	*	*	*				*	*	*				
Clinton 1 NNW																.05	.11	.01							.17		
Ellington																.30	.52	.88	.60	.02	.03				2.35		
Eminence 3 NNW																.07	2.18	1.08	.02	.03					3.35		
Henrietta																							.05		.05		
High Point 2 NE																	.47	.07	.01						.55		
Houston 1 SE																		.10	.02						.12		
Joplin CAA AP 4 N	6												*	*	*	*	*	.01				.02	.08	.10	.20		
Kansas City WB Airport																						.02	.08	.10	.20		
Kansas City St. John & Elmwood																						.03	.07	.10	.25		
Kansas City 75th & Holmes																.02	.02		.01		.03	.07	.10	.25			
Kansas City 37th & Raytown Rd																					.02	.07	.09	.18			
Kansas City University of K.C.			.01	.01															.05	.01	.09	.07			.24		
Lebanon 1 SW																			.15	.08	.04	.01	.09	.01	.29		
Lees Summit 1 N	.01		.01															.01	.03	.01	.04	.06	.15	.31			
Lockwood																		.38	.01			.01			.40		
Marshall																							.05		.05		
Marshfield																	.30	.05	.07						.42		
Mora																	.01	.11	.10						.25		
Mountain Grove 2 N																.01	.02	1.21	.13	.01					1.08		
Nevada																									1.38		
Oregon 1 NE																		.01	.02	1.21	.13	.01	.02	.08	.02	.12	
Osceola 3 NE																						.02	.08	.02	.12		
Owensville	.01	.24																.26	.12	.01	.01				.40		
Potosi 2 S																					.47	.38	.09	.06	1.00		
Richwoods			.20	.01	.22	.01															.14	.14	.12		.84		
Rogersville																				.10	1.17				1.27		
Rolla School of Mines																					.44	.03			.47		
Rolla 5 SE																					.60	.06	.01		.67		
Rolla 3 W																					.77	.04	.01		.82		
Rolla 4 SE																					1.01	.04			1.05		
Rolla 7 S																					.30	.05			.35		
Saint James 3 NW																					.45	.03	.01	.01	.50		
Saint Joseph WB Airport																					.05	.01			.06		
Salem																					1.18	.06	.01		1.25		
Speed 2 W																					.06	.02			.08		
Steelville																											
Stet 6 SE																								.03	.03		
Sullivan 5 E			.21	.01																	.44	.22	.18	.02	1.08		

TABLE 5
HOURLY PRECIPITATION

Station	A. M. Hour ending												P. M. Hour ending												Total
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	
Tyrone 2 N																					.06	.02		.08	
Vichy 2 SE																					.11	.01		.13	
Vichy AP CAA 2 NW																				*	*	*	*	-	
Vienna 3 NW																					.08	.10	.01	.19	
Wappapello Dam																.05	.04	.01			.06	.11	.18	.58	
Warrensburg 4 E	.34	.01																	.05	.01			.01	.42	
Wasola																				.22	.50	.01		.73	
West Plains																					.50	.01	.01	.60	
Willow Springs For. Service																				.01	.46		.08	.47	
JULY 10																									
Alton 6 ENE								.30	.20	.20														.72	
Amsterdam	.95	.10	.08	.12	.10	.02	.01	.02	.02			.03	.02	.02	.02	.21	.40	.25	.03					2.38	
Appleton City	.56	.37	.18	.15	.10	.10								.05	.04					.07	.02			2.27	
Butler AP CAA 2 N	.22	*	*	*	*	*	1.52	*	*	*	*	*	*		.08	*	*	*	*	*	*	*	*	-	
Clinton 1 NNW	.60	.17	.23	.15	.05	.02									.04	.01	.03	.05	.02	.05				1.42	
Columbia 9 NW U. of Mo.			.07	.10	.06				.01	.01														.25	
Ellington			.01	.04					.13	.17	.01			.01										.37	
Eminence 3 NNW			.15	.09	.01		.45	.27	.06	.02														1.05	
Henrietta	.05	.03	.02					.03	.01	.01	.05	.05	.02									.02	.01	.01	.31
High Point 2 NE	.03	.11	.20	.08	.03																			.45	
Houston 1 SE			.08	.13	.75		.07	.01	.02		.01	.01												1.08	
Joplin AP CAA 4 N	.01	*	*	*	*	*	1.20	*	*	*	*	*		.19									.01	.04	.57
Kansas City WB Airport	.01	.08	.02	.03						.06	.05	.20					.03	.04						.01	.55
Kansas City St. John & Elmwood	.05	.06	.02	.06					.01	.10	.05	.13					.02	.04						.01	.80
Kansas City 75th & Holmes	.12	.11	.06	.07						.15	.05	.15	.01	.01				.03						.04	.66
Kansas City 37th & Raytown Rd	.06	.06	.08	.08						.06	.09	.14	.02	.01			.02	.01						.03	.65
Kansas City U. of K. C.	.05	.10	.05	.05						.18	.01	.11	.02	.02	.01		.01	.02	.01	.03				.01	.13
Knoxville 2 SSE	.01	.01								.02	.06	.02													1.23
Lebanon 1 SW	.01	.45	.35	.30						.04						.03	.05							.27	.98
Lees Summit 1 N	.15	.15	.10	.08	.02				.02				.08	.06		.01	.01	.01	.01					1.60	
Lockwood			.65	.07	.13	.20	.18	.12							.08	.17								.27	1.60
Marshall	.09	.14	.04																					.27	1.10
Marshfield				*	*	*	*	1.10																	.68
Mora	.05	.15	.20	.15	.05												.01	.01		.04	.01	.01		1.72	
Mountain Grove 2 N	.09	.39	.01	.68	.43	.04	.06	.01	.01	.01	.10	.06	.06	.01			.01	.01						1.80	
Nevada		.80	.16	.10	.16	.18	.02	.01	.03	.09	.10	.06	.02	.15	.01	.06	.01	.01		.02	.15	.14	.16	.13	.80
Oregon 1 NE										.02	.15	.05	.02	.03	.05	.05	.09	.01						1.45	
Osceola 3 NE	.23	.38	.19	.17	.09	.06	.03	.07	.18	.13	.01													.42	
Potosi 2 S					.03	.07	.18	.13	.01															.23	
Richwoods					.01	.01	.12																	1.03	
Rogersville				.02	.61	.05	.13	.07	.10	.05														.26	
Rolla School of Mines			.03	.02	.16	.05																		.23	
Rolla 5 SE					.06	.14	.01	.02																.26	
Rolla 3 W			.02	.02	.15	.07																		.23	
Rolla 4 SE			.01	.02	.09	.10	.01																	.34	
Rolla 7 S				.05	.15	.11	.03																	.20	
Saint James 3 NW				.01	.09	.10																		.77	
Saint Joseph WB Airport										.05	.15	.07					.07	.02	.01	.06	.11	.09	.07	.07	1.05
Salem		.01		.20	.43	.20	.21																	.33	
Speed 2 W		.02	.15	.13	.03																				
Steelville 2 N																									
Stet 6 SE	.02	.03	.01	.01								.05	.01											.13	
Sullivan 5 E					.08	.20																		.28	
Tyrone 2 N		.17	.14		.05	1.12	.15	.03	.02															1.68	
Vichy 2 SE			.02	.06	.19	.02	.01																	.30	

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TABLE 5

HOURLY PRECIPITATION

Station	A. M. Hour ending												P. M. Hour ending												Total	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12		
Vichy AP CAA 2 NW	6	.16	*	*	*	*	*	*	.30																-	
Vienna 3 NW		.01	.02	.08	.07	.06																			.24	
Wappapello Dam		.02							.03	.02															.07	
Warrensburg 4 E		.06	.20	.18	.05	.01	.01									.01									.57	
Wasola						.57	.30	.19	.07	.03	.01														1.17	
West Plains							1.00	.30	.20	.06	.03	.01													1.60	
Willow Springs For. Service					.02	.80	.21	.07	.10	.05															1.25	
JULY 11																										
Amsterdam		.01		.01	.01	.02	.05	.12	.06	.42	.63	.16	.06												1.55	
Appleton City									.03	.02	.04	.24	.07							.01	.01	.01			.43	
Butler AP CAA 2 N	6	.08	*	*	*	*	*	.03	*	*	*	*	*	1.11											-	
Clinton 1 NNW						.08	.02	.03	.04	.15	.18	.01	.01			.01				.01	.01				.55	
Columbia 9 NW U. of Mo.							.03	.12	.43	.52	.45	.05													1.60	
Dora															.01	.10									.11	
Ellington																									.10	
Eminence 3 NNW																					.47	.01	.77	.15	1.40	
Hannibal Water Works					.03	.02		.01	.06	.01	.18	.09						.05							.65	
Henrietta		.01	.35	.13	.07	.30	.15	.05	.15	.20	.07	.03	.05												1.56	
High Point 2 NE												.08	.05					.01							.14	
Kansas City WB Airport		.16	.44	.13	.26	.25	.07	.21	.12	.15	.06	.02													1.87	
Kansas City St. John & Elmwood		.24	.31	.10	.25	.20	.10	.20	.20	.10	.08	.02	.07												1.80	
Kansas City 75th & Holmes		1.01	.42	.08	.20	.15	.10	.20	.20	.12	.13	.05	.01		*	*	*	*	*	*	*	*	*	*	*	
Kansas City 37th & Raytown Rd		.22	.63	.08	.20	.17	.09	.21	.10	.16	.09	.08		.01	*	*	.01	*	*	*	*	*	*	*	2.07	
Kansas City U. of K. C.		.80	.20	.10	.25	.15	.08	.22	.20	.10	.15	.05													-	
Knoxville 2 SSE		.05	.14	.20	.10	.25	.15	.04	.13	.16	.01	.03													1.26	
Lebanon 1 SW		.01	.01																						.26	
Lees Summit 1 N		.38	.50	.06	.24	.30	.12	.20	1.48	.40	.04	.12	.01		.17		.01	.01	.05						3.85	
Lockwood														.10											.10	
Marshall		.02	.13	.26	.04	.15	.05	.15	.10	.55	.20	.03													1.68	
Marshfield																									.67	
Mora					.03		.02	.01	.07	.13	.02	.05	.01	.01	.37	.18		.12							.35	
Nevada										.01	.08	.02	.05	.01	.01										.17	
Oregon 1 NE		.19	.11	.18	.12	.09	.01							.02	.01		.03	.05							.78	
Osceola 3 NE										.01	.02	.06	.03												.15	
Potosi 2 S				.06	.16	.33												.05	.22	.07					.89	
Richwoods						.05	.05									.17	.03	.34	.01						.65	
Rolla School of Mines			.01	.01	.80	.01	.01								.42	.07	.01	.15							1.49	
Rolla 5 SE				.15	.13											.18	.01		.30						.77	
Rolla 3 W				.02	.45										.32	.03		.07							.89	
Rolla 4 SE				.03	.31	.01									.36	.08		.05	.15						.99	
Rolla 7 S				.18	.13										.06		.05	.15	.02	.01					.42	
Saint James 3 NW					.26	.28									.17	.13		.12	.04						1.00	
Saint Joseph WB Airport		.09	.18	.23	.09	.23	.10	.01	.01		.06	.03	.02										.01	.01	1.07	
Salem				.02																					.17	
Speed 2 W								.05	.77	.44	.29	.18	.01	.01						.15					1.75	
Steeleville 2 N					.82			.03																	1.45	
Stet 6 SE			.06	.28	.13	.13	.27	.10	.13	.20	.17	.04	.12	.02											1.65	
Sullivan 5 E						.08		.02								.05	.01	.04							.20	
Tyrone 2 N																.10			.10			.05	.01		.26	
Vichy 2 SE				.35	.16										.51		.03								1.05	
Vichy AP CAA 2 NW	6	*	*	*	*	*	.28							.07	*	*	*	*	.43						-	
Vienna 3 NW				.01	.01																				.10	
Warrensburg 4 E			.27			.01	.09	.92	.43	.45	.25	.07													2.49	
Wasola																			.10						.10	
Willow Springs For. Service																.45						.50	.95		1.90	

TABLE 5

HOURLY PRECIPITATION

Station	A. M. Hour ending												P. M. Hour ending												Total
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	
	JULY 12																								
Amsterdam					.55	.60	.15	.05	.02	.13	.06	.07	.07	.05											1.75
Appleton City		.01	.02		.05	.02	.01			.01	.02	.01	.03				.02	.01							.29
Butler AP CAA 2 N	6	*	*	*	*	*	.36	*	*	*	*	*	.18	*	*	*	*	*	*	*	*	*	*	*	-
Clinton 1 NNW				.25	.07	.11	.01																.02	.46	
Columbia 9 NW U. of Mo.							.10	.05																.15	
Eminence 3 NNW																.03	.03	.01						.07	
Henrietta			.02	.08	.15	.20	.15	.10	.10	.05	.05													.90	
High Point 2 NE				.58	.60	.30	.11																	1.60	
Houston 1 SE															.15	.15		.03			.01			1.60	
Joplin AP CAA 4 N	6													*	*	*	*	*	.67	*	*	*	*	.36	
Kansas City WB Airport		.02	.14	.13	.18	.20	.19	.12	.18	.22	.10	.03	.02					.01						1.54	
Kansas City St. John & Elmwood		.23	.10	.10	.15	.19	.18	.13	.25	.12	.10	.03	.04											1.62	
Kansas City 75th & Holmes		*	*	*	*	1.13	.14	.13	.20	.14	.05	.01												4.47	
Kansas City 37th & Raytown Rd			.10	.15	.15	.13	.21	.14	.12	.17	.12	.04	.01	.01										1.35	
Kansas City U. of K. C.		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Knoxville 2 SSE				.01	.10	.14	.21	.05	.15	.15	.10	.02												.93	
Lees Summit 1 N		.20	.31	.09	.07	.18	.10	.10	.14	.08	.03													1.30	
Marshall		.01	.01	.01	.10	.09	.06			.05														.33	
Marshfield																						.02		.02	
Mora			.10	.30	.45	.18	.07																	1.10	
Nevada																	.11	.02	.02					.15	
Oregon 1 NE						.09	.05		.01	.09	.02													.26	
Osceola 3 NE												.01	.19	.01	.37	.04							.01	.63	
Potosi 2 S						.02	.01																	.03	
Richwoods																						.03	1.08	.22	
Rolla School of Mines																						.30		.30	
Rolla 5 SE																						.03	.45	.48	
Rolla 3 W																						.03	.59	.63	
Rolla 4 SE																							.27	.35	
Rolla 7 S																							.07	.05	
Saint James 3 NW																						.07	.18	.25	
Saint Joseph WB Airport				.01	.04	.07	.17	.11	.03	.05	.03	.01	.01	.01	.01									.55	
Salem																							.02	.02	
Speed 2 W		.01				.11	.14	.04	.01															.31	
Steelville 2 N																						.02	.25	.27	
Stet 6 SE		.01			.10	.12	.17	.10	.15	.13	.05	.01	.01											.85	
Sullivan 5 E																					.01	.10	.04	.71	
Tyrone 2 N		.11	.08																					.19	
Vichy 2 SE																							.15	.10	
Vichy AP CAA 2 NW	6																		*	*	*	*	*	-	
Vienna 3 NW																			.05	.07	.45	.79	.01	1.37	
Wappapello Dam		.02		.28	.05	.10	.10		.01	.04	.40	.73												1.13	
Warrensburg 4 E		.87									.01													.61	
Willow Springs For. Service			.03																					.90	
	JULY 13																								
Alton 6 ENE			.58	.02																				.60	
Amsterdam		.38							.02	.02														.42	
Appleton City		.10	.02	.01																				.13	
Butler AP CAA 2 N	6	.03	*	*	*	*	*	.04																-	
Clinton 1 NNW		.02	.04	.02																				.08	
Dora																.03								.03	
Ellington		.01	.01	.08	.28	.12																		.50	

TABLE 5

HOURLY PRECIPITATION

Station	A. M. Hour ending												P. M. Hour ending												Total	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12		
Eminence 3 NNW			.03	.35	.15		.05																	.58		
High Point 2 NE		.06	.01	.03	.08																			.18		
Joplin AP CAA 4 N	6	* .05	* .01	*	*	*	.04																	.28		
Lebanon 1 SW		.24	.03	.01																				.10		
Lockwood			.03	.07																				.03		
Marshall								.03																.10		
Marshfield									.03															.12		
Mora			.04	.03						.03														.09		
Mountain Grove 2 N		.12																						.37		
Nevada		.06	.01	.01	.01																			.24		
Osceola 3 NE		.05	.30	.02																				.79		
Owensville																								.12		
Potosi 2 S			.24	.75	.30	.79	.11	.21																2.40		
Richwoods		.70	.07	.02	.09	.33	.12	.10																1.43		
Rolla School of Mines				.35	.01	.01	.01																	.38		
Rolla 5 SE				.02	.28	.02																		.32		
Rolla 3 W				.41	.04																			.45		
Rolla 4 SE				.30	.07	.03																		.40		
Rolla 7 S				.22	.03																			.25		
Saint James 3 NW			.01	.01	.35	.04	.20	.01																.62		
Salem	1.08	.44	.79	.18	.01	.21																		2.71		
Steelville 2 N	.23	.25	.18	.67	.05	.08																		1.46		
Sullivan 5 E	.02	.09	.08	.02	.59	.21	.08	.01	.01	.01	.01	.01	.01											1.13		
Tyrone 2 N		.06	.35				.07	.01	.01															.50		
Vichy 2 SE		.05	.03	.12	.43	.07	.08																	.78		
Vichy AP CAA 2 NW	6	* .24	* .01	* .01	* .01	* .01	.76	*	*	*	*	*	.01											.10		
Vienna 3 NW		.18	.10	.32	.34	.15	.21	.02	.05							.30	.05							1.30		
Wappapello Dam					.04	.01	.01	.02	.01	.01														1.05		
West Plains																								.10		
NEBRASKA																										
JULY 9																										
Curtis						.06	.01	.04														.01		.12		
Elm Creek																								.12		
Gibbon										.02						.01					.04	.05		.02		
Johnson #2									.01	.01														.08		
McCook	.02	.01				.03	.02																	.04		
Moorefield 3 NW							.10	.02																.04		
Pawnee City 6 SE																					.01	.03		.04		
JULY 10																										
Beatrice No. 2								.04	.16	.15							.02	.02	.07	.17	.09	.33	.20	.05	1.30	
Curtis				1.53	.12					.01						.01	.01	.01	.01	.09	.05	.01			1.85	
Edison						.27	.03									.05	.03			.09	.02	.25	.03	.32	1.90	
Gibbon							.07	.02							.01	.01	.01		.02	.37		.14	.10	.75		
Harlan County Dam						.18	.10											.01	.05	.06	.02	.02	.62	.07	1.16	
Hebron					.04	.01	.42	.75	.05	.13	.02	.01					.01	.05	.02	.42	.15	.02	.06	.04	2.85	
Hickman 2 SW							.05	.13		.13	.02	.01	.01				.01				.10	.03	.06	.17	1.10	
Johnson #2					.14	.08		.01													.02	.07	.16	.07	1.01	
Macon					.01	.56	.19	.01	.02			.02					.03	.01	.27	.15	.02	.07	.16	.07	1.76	
McCook																				.01	.01	.04	.24	.54	.03	1.97
Moorefield 3 NW		.02		.74	.23												.05	.05	.01	.66	.08	.01	.09	.03	.97	
Pawnee City 6 SE																	.01	.01	.01	.16		.01			1.19	
Stockville 5 SSW				.02	.28					.14	.16	.05					.02	.01	.03	.03	.07	.18	.07	.25	.09	1.10
																	.05	.13		.38	.22	.03	.01	.07	1.23	

TABLE 5

HOURLY PRECIPITATION

Station	A. M. Hour ending												P. M. Hour ending												Total
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	
	JULY 11																								
Beatrice No. 2	.40	.35	.17	.03							.01														.96
Curtis															.01	.01									.02
Edison	.13				.01	.01																			.15
Gibbon	.02	.04	.01									.01	.02			.01					.01				.12
Harlan County Dam	.43	.14	.03																						.60
Hebron	.40	.15	.02	.07	.05	.01																.11			.81
Hickman 2 SW	.20	.19	.06	.02							.01			.01											.50
Johnson #2	.03	.03		.01		.02	.01	.02					.01	.01											.14
Macon	.31	.25	.06	.01																	.02				.65
McCook	.03	.05									.01											.01			.10
Moorefield 3 NW																	.01	.02							.03
Pawnee City 6 SE	.11	.17	.17	.10	.03				.08	.01															.67
Stockville 5 SSW																						.01	.01		.02
	JULY 12																								
Beatrice No. 2				.15	.26	.09	.01	.03	.01	.14	.01			.01	.09	.11	.02	.01	.01	.01					.96
Curtis		.36	.09	.18	.05	.05	.01			.02	.01	.01	.03	.01	.03	.01									.82
Edison	.18	.27	.18	.14	.05	.03	.10					.02	.02	.02	.02	.01	.01								1.03
Gibbon		.35	.30	.10	.12	.02	.01	.07	.03	.04	.01	.01	.03	.02			.01			.01					1.13
Harlan County Dam	.45	.28	.14	.10	.18	.10	.07	.03																	1.35
Hebron		.02	.28	.27	.03	.06	.04		.07	.03				.03											.80
Hickman 2 SW				.07	.13		.05	.05	.04	.03	.01	.02													.40
Johnson #2	.01	.28	.36	.10	.02	.03	.02	.07			.01	.01	.04		.01	.01									.97
Macon		.34	.26	.10	.15	.10	.05	.11	.01																1.12
McCook	.26	.32	.10	.01	.06	.14	.01				*	*	*	.10											1.00
Moorefield 3 NW		.21	.08	.15	.04	.02		.01	.01	.01	.02	.06	.02												.62
Pawnee City 6 SE				.01	.18	.25	.01	.01	.04	.05								.04	.02						.61
Stockville 5 SSW	.10	.44	.08		.05	.08		.01	.01	.01	.01	.02	.01												.82
	JULY 13																								
Elm Creek	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
OKLAHOMA																									
	JULY 9																								
Ponca City CAA AP																					.01	.01			.02
	JULY 12																								
Hulah Dam																		*	*	*	*	*	*	*	*
Pawhuska																									
Ponca City CAA AP														.74	.01						.10	.70	.72	.23	2.20
	JULY 13																								
Hulah Dam	*	*	*	*	2.40							.08	.04	.01	.01										2.54
Pawhuska	.10	.03	.02	.04	.04	.04	.02							.01	.01					.03					.30
Ponca City CAA AP	.07	.06	.13	.03	.01	.01	.01	.05	.24	.10	.13	.03													.86

TABLE 6
SUPPLEMENTAL PRECIPITATION DATA
STORM OF JULY 9-13, 1951

LOCATION	LAT.	LONG.	AMOUNTS					OBS. TIME	REPORTED BY	TYPE OF GAGE	
			9	10	11	12	13				TOTAL
KANSAS											
ABILENE	38 55	97 13	2.50	2.90	2.20	3.60		11.20			
ABILENE 3 W	38 55	97 16			1.90	6.00	4.25	12.15	AM	VIRGIL DENICK	
ABILENE 5 NW	38 58	97 17			*	*	13.25	13.25		J. I. SLIFER	
ABILENE 6 S	38 50	97 12	2.50	5.85	5.50			13.85		DOUGLAS BOELL	
ABILENE 7 NW	39 00	97 18	2.50	5.00	7.25			14.75		PAUL SHERWOOD	
ABILENE 9 SW	38 49	97 21	TOTAL FOR PERIOD						12.15		MRS. WENDELL CHASE
ABILENE 14 N	39 07	97 13			8TH - - -14TH			12.00		GERALD BOLLIGER	
ADA	39 09	97 53		.20	5.25	2.65		8.30		MRS. C. DEBENHAM	
ADA 3 1/2 NW	39 11	97 57	.20	.60	6.10	2.40		9.30		PAUL E. WILLIAMS	
ADA 6 WNW	39 10	98 00			3.00	4.10	2.80	9.90	7PM	RISDON GODLOVE	
ADMIRE 4 S	38 34	96 05		5.00	5.00	3.20		13.20	NOON	GERALD GROUT	
ADMIRE 6 S	38 33	96 05	4.70	5.30	3.00	.30		13.30	8AM	J. L. WRIGHT	
AGENDA 1 1/2 NE	39 42	97 25	3.85	2.45	1.38			7.68		HOWARD VERNON	
AGENDA 2 S	39 41	97 26		5.50	1.60	1.40	.10	8.60	7:30A	C. E. LARSON	
AGRA 5 N	39 50	99 07	.60		2.10	1.10		3.80	8AM	A. M. THOMPSON	
AGRA 14 N	39 58	99 08		.62	1.60	2.20		4.42		G. E. MCCLORY	
AGRICOLA 1 NE	38 26	95 31	*	*	*	7.25		7.25E		V. TOMLINE	
ALICEVILLE	38 09	95 33	.25	2.30	4.75	1.75	1.30	10.35		J. W. HULL	
ALLEN 3 NNE	38 42	96 09		3.50	5.00+	5.00+		13.50+	AM	H. F. STOSHS	
ALLEN 3 SSW	38 36	96 12	1.60	4.92+	3.02	1.57		11.11+	7PM	W. A. SCHLUP	
ALLEN 5 S	38 35	96 10		5.00	5.00	4.00		14.00	NOON	GEORGE L. JENSEN	
ALLEN 7 1/2 WNW	38 40	96 19		3.50	3.50	3.50		10.50		MRS. HUGH MCGREW	
ALLENBORPH	38 59	96 17		5.50	6.00+	6.00+		17.50+	7AM	MRS. CURTIS TRIMER	
ALMA	39 01	96 18		3.45	3.90	3.55	1.00	11.90	7AM	ROSS PALENSKI	
ALMA 3 SSE	38 58	96 16		5.00	6.00	4.50		15.50	7AM	FREDERICK THOWE	
ALMENA	39 53	99 42		.61	2.36	1.92		4.89	8AM	W. H. MISKE	
ALTA VISTA	38 51	96 29		.56	4.81	4.57	3.70	13.64		L. E. GISHMILLER	
ALTA VISTA 4 E	38 51	96 26		5.50	4.50	5.50		15.50		JAY A. RINABARGER	
ALTA VISTA 9 1/2 E	38 51	96 18		6.10	3.88	5.00		14.98	AM	ALBERT MEINBARDT	
ALTON	39 28	98 57		.37	3.25	3.35		6.97		EDWARD MARTIN	
ALTON 9 SSW	39 21	99 00	1.00	4.00	3.00			8.00	6AM	NILES C. ENDSELEY	
ALTON 12 N	39 38	98 57	.50	5.05	2.00			7.25		O. MILLER	
AMERICUS	38 31	96 16		1.75	5.50	2.87		10.12	8AM	GEORGE H. NAGEL	
AMERICUS 3 E	38 30	96 13		3.20	2.50	5.70		11.40	AM	FRANK BRINKMAN	
AMERICUS 3 W	38 31	96 19		3.00	2.00	6.00		11.00	8AM	CHESTER LAUGHLIN	
AMERICUS 3 1/2 N	38 33	96 16		3.90	6.00	4.00		13.90		ALFRED MATILE	
AMERICUS 4 S	38 27	96 16	*	*	*	12.00+		12.00+		C. N. NORRIS	
AMERICUS 7 E	38 31	96 08		5.00	2.70	4.70		12.40	7AM	PAUL EVANS	
AMES	39 34	97 27		1.37	2.63	2.73		6.73		EARL KELLER	
AMES 6 S	39 29	97 27		1.50	2.50	2.75		6.75		E. RAY BUKLES	
ANNELEY	37 58	97 12		9TH - - - -14TH				5.00E		GENE KERN	
ANNELEY 2 SW	37 57	97 14		9TH - - - -14TH				3.00E		MRS. HILL	
ANTELOPE	38 26	96 58	*	9.70+				9.70+		MR. W. A. SCHMIDT	
ANTELOPE 5 SE	38 24	96 53	2.50	8.50	4.00			15.00		NIENSTED	
ANTONINO 3 1/2 W	38 47	99 28	.50	1.00	.30	1.25		3.05		WASH TUB	
ARVONIA 3 NNE	38 31	95 52		4.50	3.60	3.00		11.10		LEE BAUERS	
ASHERVILLE	39 24	97 59		6.00	4.50			10.50		JOHN URBAN	
ASH GROVE	39 09	98 22		2.50	2.00			4.50		H. T. STANDIFERO	
ASSARIA	38 41	97 36			6.05	4.20		10.25	AM	RAY SEELEY	
ASSARIA 4 W	38 41	97 41			5.80	4.50		10.30		CLAUDE GERING	
ATHENS 2 1/2 NE	37 45	95 34	3.25	1.65	*	*	1.25	6.15		FRED OLSON	
ATHOL	39 46	98 55		2.60	1.80	1.30		5.70		MR. PIHL	
ATWOOD 12 S	39 39	101 07		2.25	4.20	.20		6.65	AM	H. T. WEBER	
AUBURN 1 1/2 W	38 54	95 51	*	*	*	9.00		9.00		RUSSEL FRAZIER	
AUBURN 3 SE	38 52	95 48		4.00		4.50		8.50		O. R. COOPER	
AULNE 3/4 W	38 17	97 05		7.75		4.65		12.40		A. R. HENDERSON	
AURORA 3 1/2 NNW	39 30	97 33	2.50	1.90	.15	4.25	T	8.80	PM	GLEN PALMER	
AURORA 5 W	39 27	97 37		4.00	2.00	2.85		8.85		ANDREW SEIBEL	
AXTELL	39 52	96 15			4.50			4.50		LEROY SNAUELY	
BARCLAY	38 34	95 52			4.00	4.50	4.50	13.00		ALCID ODETTE	
BARNARD 2 SSE	39 10	98 02			7.88	1.65		9.53	6:30A	STATER HARNESS SHOP	
BARNARD 3 NNE	39 11	98 04		6.40	1.80			8.20		P. F. HORTON	
BARNES	39 42	96 52		4.50	1.50	1.00		7.00		RAY O. SMITH	
BARNES 5 S	39 38	96 51		*	4.70	1.40		6.10		DARYL SIMMONS	
BARNES 10 S	39 33	96 52		3.50	4.00	.90		8.40	AM	KEITH CLARK	
BATESVILLE 1 E	37 50	95 51						10.00E		GLEN WANAMAKER	
BAVARIA 2 N	38 49	97 45				4.00		9.00		WM. STEENBACK	
BAVARIA 4 E	38 47	97 41			4.50	5.50		10.00		ENOS SEXTON	
BAXTER SPRINGS 4 NNE	37 05	94 47		1.40	.50	4.40		2.30		MR. KOMART	
BAZAR	38 16	96 32		3.27	6.00	2.50		11.77		LLOYD DAUER	
BAZAR 3 1/2 SSE	38 14	96 31			3.00	6.00	3.50	12.50		M. M. MITCHELSON	
BAZAR 6 SSE	38 12	96 30			3.00	5.65		8.65		D. J. FISK	
BEAGLE 5 WNW	39 25	95 05		TOTAL FOR PERIOD				8.00E		HOWARD SCHWILLING	
BEARDLEY 6 1/2 NNE	39 52	101 13		.95	1.50	.90		3.35	AM	FRED WAGONER	
BELTIE 2 S	39 49	96 25		3.40		1.60		5.00		C. HAY	
BELLAIRE	39 48	98 41			2.52	2.20		4.72		PAUL KOPRIVA	
BELLAIRE 1 1/2 NW	39 49	98 42	*	*	*	4.75		4.75		RAY EASTON	
BELLAIRE 4 S	39 45	98 40		.50	4.50	4.00		9.00		STEVE BROWN	
BELOIT 4 SW	39 25	98 11		TOTAL FOR PERIOD				9.20		SHIVELY	
BELOIT 6 S	39 22	98 07		1.60	2.50	4.00		8.10		VERA RORABAUGH	
BELOIT 5 W	39 27	98 12		TOTAL FOR PERIOD				8.50		W. V. STUDER	
BELOIT 10 SSW	39 19	98 10		4.50	2.25	2.75		9.60		PAUL CRIETZ	
BELOIT 11 SSW	39 18	98 10		2.00	4.00	6.70		12.70		CLARENCE SLATE	
BELPP: 1/2 N	37 58	99 06	.10	1.85	.28		.90	3.19	AM	CHARLES JORDON JR.	
BELVUE	39 12	96 11		2.00	1.35	4.70		8.05		LAWRENCE THOMPSON	
BELVUE 6 NW	39 18	96 14		4.50	5.00+	3.00		12.50+		D. L. DUTTON	
BI NOLA	39 44	95 14		.50	2.15+	1.00	.20	3.85		JAMES SHOOT	
BLINNING	39 02	97 36		5.00	3.60	1.00+		9.60+		JOHN WHITE	
BLINNINGTON 5 NNE	39 06	97 33	.04	.58	3.84	2.50		6.96		FRANK SCHROEDL	
BLINNINGTON 5 SW	38 59	97 39		TOTAL FOR PERIOD				9.00		MRS. A. WAGNER	

TABLE 6
SUPPLEMENTAL PRECIPITATION DATA
STORM OF JULY 9-13, 1951

LOCATION	LAT.	LONG.	AMOUNTS					TOTAL	OBS. TIME	REPORTED BY	TYPE OF GAGE
			9	10	11	12	13				
BERN	39 57	95 58		.42	1.75	.50		2.67		STATE BANK OF BERN	4" COLLECTOR ON ROOF
BEVERLY 2 E	39 01	97 56	3.00	7.00	3.25	3.00		16.25		H. J. WOODY	3/4" X 5 1/2"
BEVERLY 5 N	39 06	97 59	.50	*	5.20	1.70		7.40		JOE MC BRIDE	" "
BEVERLY 10 S	38 52	97 58			5.00	2.20		7.20		C. B. HOBBS	1" X 6" VICTOR
BIGELOW	39 38	96 30		*	6.10			6.10		C. A. BRONAUGH	3/4" X 5 1/2"
BIGELOW 4 1/2 S	39 33	96 30		*	4.70	1.25		5.95	AM	F. W. CAREY	" "
BIRMINGHAM 1 E	39 24	95 39		TOTAL FOR PERIOD				5.00E		WILBUR DECKER	UNKNOWN
BISON 1 3/4 S	38 30	99 11	.65	.10	.45	.50		1.70		C. H. HARDY	STD. 8"
BISON 6 1/4 W	38 32	99 19	.25	.10	2.00	.49	.10	2.94		C. CUNNINGHAM	STD. 8"
BISON 6 3/4 NW	38 35	99 17	T		3.50	1.12	T	4.62		L. R. HONDERICK	3/4" X 5 1/2"
BLACK WOLF	38 45	98 22		.25	3.75	.70		4.70	7:30A	D. WILLIAMS	" "
BLAINE 2 NE	39 31	96 24		2.10	1.90	1.20		5.20	7-8 A	WAYNE NORTHROP	1" X 6" VICTOR
BLAINE 3 SW	39 28	96 28		3.40	*	1.50		4.90		JOHN EASTWOOD	3/4" X 5 1/2"
BLAINE 7 WNW	39 32	96 32		4.00		2.75		6.75		J. A. HAWKINSON	" "
BLOOMINGTON 1/2 S	39 27	98 47	1.00	3.87	4.00			8.87		G. GILSON	2 GAL. STONE JAR
BLUE MOUND 4 SW	38 04	95 04		TOTAL FOR PERIOD				9.00E		WORLAND COX	3/4" X 5 1/2"
BLUE MOUND 4 1/2 N	38 09	95 00		TOTAL FOR PERIOD				7.50E		MERLE COX	" "
BLUE RAPIDS 5 NNE	39 44	96 38	*	*	6.75			6.75		STAN D. SUGGETT	" "
BLUE RAPIDS 5 E	39 41	96 33	.15	2.45	1.95	1.25		5.80	PM	WM. H. JOHNSON	" "
BOGUE 7 N	39 28	99 41		4.00	2.90	1.95		8.85	8:00A	M. A. DUNNING	" "
BOICOURT 5 ESE	38 14	94 38		TOTAL FOR PERIOD				6.00E		F. W. CARPENTER	COFFEE CAN
BONITA	38 49	94 49	.25	1.00	3.35	3.12	.65	8.37	7:00A	SAM SHAFFER	1" X 6" VICTOR
BREMEN 4 S	39 50	96 47	*	*	4.90	1.50		6.40		F. H. STOKS	3/4" X 5 1/2"
BREMEN 4 1/2 NNE	39 57	96 45	.25	1.90	1.30	1.15		4.60		HENRY GLEUE	" "
BREWSTER 12 SSW	39 11	101 28		.19	.50	.68		1.37		PETE WEIS	UNKNOWN
BRIDGEPORT 2 E	38 38	97 34		3.70	3.55	5.50		12.75		LESTER E. JOHNSON	3/4" X 5 1/2"
BROOKVILLE 1 N	38 48	97 31			4.75	3.50		8.25		LEATON	" "
BROOKVILLE 5 1/2 N	38 51	97 51			5.25	8.00		9.05		BILL FLEMING	UNKNOWN
BROUGHTON 2 NE	39 20	97 01		6.30	2.30	3.65		12.25	PM	GEO. DIETRICH	1" X 6" VICTOR
BROUGHTON 4 SE	39 17	96 59		TOTAL FOR PERIOD				11.75		LYLE LOFLIN	3/4" X 5 1/2"
BUFFALO	37 43	95 42	1.51	2.15	1.72	.80		6.18		MAX DECKER	" "
BUFFALO 3 SW	37 42	95 44	1.15	2.62	.62	.55		4.94		OSCAR HINES	" "
BUNKER HILL 7 NE	38 57	98 38	T	T	1.90	1.70		3.60		RALPH GOODHEART	" "
BURDICK	38 34	96 51	4.10	7.50	5.20			16.80		T. D. DRAIN	" "
BURDICK 3 N	38 37	96 51		3.00	8.50	4.50		16.00		DONALD L. MILLER	46 OZ. JUICE CAN
BURLINGAME 5 N	38 49	95 49		5.50	2.50	-		8.00+		JOHN SMELSER	3/4" X 5 1/2"
BURLINGAME 6 NNE	38 50	95 49		4.50	2.50	5.00		12.00		BEN BEAL	" "
BURLINGTON 5 N	38 17	95 45			7.00	3.00		10.00		FLOYD SKILLMAN	UNKNOWN
BURLINGTON 8 WSW	38 10	95 53		TOTAL FOR PERIOD				10.00		TOM MERRITT	3/4" X 5 1/2"
BURNS	38 05	96 53	.13		2.10	1.68		3.91		E. M. STRONG	1" X 6" VICTOR
BURR OAK 3 S	39 50	98 19			1.90	2.70		4.60		UNKNOWN	3/4" X 5 1/2"
BURR OAK 5 SW	39 49	98 22			2.75	1.60		4.35	AM	UNKNOWN	" "
BURR OAK 8 NW	39 57	98 25			4.50	2.50		7.00	AM	UNKNOWN	" "
BUSHONG	38 39	96 16	*	*	*			12.00		JOHN GIBSON	" "
BUSHONG 4 S	38 35	96 15		3.50	3.50	5.00+		12.00+		MRS. JOHN REDOLFS	" "
BUSHTON	38 31	98 24	.15	T	2.50	1.50		4.15		JOHN BREFDFELDT	" "
CANADA	38 21	97 06	.50	.80	7.00	3.00		11.30	MID	ED GROTHE	2" X 7"
CANTON	38 23	97 26			*	7.46		7.46		NEWSPAPER	UNKNOWN
CANTON 2 SE	38 22	97 25	.02	4.00	3.35	3.29		7.66	5:00P	K.S.C. EXP. FARM	" "
CANTON 5 NNE	38 27	97 22			5.00	4.00		9.00		JOHN L. MACKLIN	3/4" X 5 1/2"
CANTON 5 NNW	38 27	97 29		1.00	5.00	4.90		10.90		MR. KOEHN	" "
CANTON 6 SSE	38 19	97 23		4.25	*	4.10		8.35		DIRCKSON	" "
CANTON 6 N	38 28	97 26		TOTAL FOR PERIOD				11.25		LLOYD BISHOP	" "
CANTON 7 SSW	38 18	97 30			2.70	3.20		5.90	AM	A.J.C. BECKER	" "
CARBONDALE 2 NNW	38 50	95 43	T	2.80	2.55	4.10		9.45		HENRY O. BERLE	1" X 6" VICTOR
CARLTON	38 41	97 17	2.00	6.00	4.00	.50	.25	12.75		UNKNOWN	3/4" X 5 1/2"
CARLTON	38 41	97 17	*	*	13.00+			13.00+		VIRGIL MEYER	1" X 6" VICTOR
CARLTON 5 NW	38 44	97 21		7.50+	5.60	.60		13.70+	AM	KEITH MC ARTY	3/4" X 5 1/2"
CARLTON 5 NW	38 45	97 21	1.10		5.85	5.15		12.10		MRS. CLARENCE SHEETS	" "
CARLTON 6 NE	38 45	97 13		3.90	6.10	5.30		15.30		FRED GEISERT	" "
CASSODAY 2 1/2 SE	38 02	96 35	1.00		4.00	2.00		7.00+		MRS. FISK WATKINS	MISC.
CASSODAY 6 SW	38 00	96 43			3.50			3.50	NOON	J. HOY	UNKNOWN
CASSODAY 7 SW	38 00	96 44		9TH-----14TH				3.00E		L. E. VOGELMAN	3/4" X 5 1/2"
CAWKER CITY	39 31	98 26	.02	.85	3.35	3.02		7.24	7:00P	FRED LIPKE	UNKNOWN
CAWKER CITY	39 31	98 26	.05	1.15	3.10	2.11		6.41		FRANK SUTER	1" X 6" VICTOR
CAWKER CITY 3 1/2 NE	39 33	98 23		TOTAL FOR PERIOD				6.65		MRS. F. KUHN	3/4" X 5 1/2"
CAWKER CITY 9 1/2 NNE	39 38	98 25	.30	.13	3.37	1.53		5.33		ROLLA DIETZ	3/4" X 5 1/2"
CEDAR	39 40	98 56	.20	4.60	.70	2.60		8.10	8:00A	O. R. SEARS	" "
CEDAR 2 1/2 WSW	39 38	98 59	.130	1.80	4.80	1.10		8.00		ELLIE CLANDELL	1" X 6" VICTOR
CENTERVILLE 4 W	38 13	95 04	1.50	2.00	2.90	2.50	3.00	11.50		MRS. J. MAJORS	3/4" X 5 1/2"
CHALK 1 E	38 47	96 18		4.00	4.50	4.50		13.00		ROY REED	" "
CHANUTE 7 ENE	37 43	95 19		9TH-----14TH				3.50		L. L. LOCKE	10 QT. FEED BUCKET
CHANUTE 12 SW	37 34	95 37	*	8.00				8.00		CLAUD CARTER	3/4" X 5 1/2"
CHAPMAN 2 NW	38 59	97 03		4.00	5.75+	3.00		12.75+	AM	GARDNER	" "
CHAPMAN 5 W	38 58	97 06		5.00	5.50	7.00		17.50	AM	TOBIAS	5 GAL PAINT BUCKET
CHAPMAN 6 1/2 NW	39 02	97 06		3.50	3.00	3.50		10.00		FLOYD DUFFY	3/4" X 5 1/2"
CHAPMAN 7 S	38 52	97 01		TOTAL FOR PERIOD				11.95		E. T. COUNTER	" "
CHAPMAN 7 1/2 N	39 05	97 01		TOTAL FOR PERIOD				12.50		KARL STEIN	" "
CHAPMAN 8 W	38 58	97 10		*	*	14.50E		14.50E		HAROLD WICK	" "
CHAPMAN 12 N	39 09	97 01		TOTAL FOR PERIOD				12.00		W. SAUTTER	1 GAL STONE JAR
CHENEY 2 1/2 SSE	37 37	97 46	.40	.34	.35	.75		1.84		C. KOHLER	STD. 8"
CIMARRON 4 1/2 ENE	37 50	100 17		1.50	.65	.30	.75	3.20	6:30P	J. W. HAGEN	1" X 6" VICTOR
CIMARRON 12 1/2 SSW	37 39	100 27			.20	1.70	.40	2.30		A. E. KINNAMAN	" "
CLAFLIN 8 NNE	38 38	98 30			3.25	1.50		4.75	9:00A	J. J. HOMOLKA	GLASS 1" DIAM.
CLAUDELL 1 S	39 38	99 02	T	2.25	3.00+	2.48		7.73+		PERRY SWEAT	3/4" X 5 1/2"
CLAY CENTER 2 1/2 SW	39 21	97 10	.15	4.75	2.55	3.40	.18	11.03		JOHN MUGLER	3/4" X 5 1/2"
CLAY CENTER 4 1/2 NW	39 25	97 12		5.50	2.90	3.85		12.25		CECIL COLE	1" X 6" VICTOR
CLAY CENTER 4 1/2 SSW	39 19	97 08		3.30	3.80	4.30		11.40	AM	RAY E. HANNA	1 GAL. CAN
CLAY CENTER 5 N	39 27	97 07		2.90	1.35	.50		4.75	7:00A	DON HAMMEL	3/4" X 5 1/2"
CLAY CENTER 5 NE	39 27	97 05	3.40	1.15	2.25	1.90		8.70		HOMER RUNDLE	" "

TABLE 6
SUPPLEMENTAL PRECIPITATION DATA
STORM OF JULY 9-13, 1951

LOCATION	LAT.	LONG.	AMOUNTS					TOTAL	OBS. TIME	REPORTED BY	TYPE OF GAGE
			9	10	11	12	13				
CLAY CENTER 5 1/2 WNW	39 24	97 13	*	*	*		3.00				3/4" X 5 1/2"
CLAY CENTER 6 E	39 23	97 01		4.50	3.50	1.90	9.90	6:30A	ELMER WELCH		NO. 2 CAN
CLAY CENTER 7 N	39 29	97 07		4.00	2.00	1.85	7.85		WM. STEINEACH		3/4" X 5 1/2"
CLAY CENTER 7 SW	39 19	97 14		4.70	6.40	2.10	13.20		MERYL VOLEN		1" X 6" VICTOR
CLAY CENTER 8 1/2 E	39 22	96 58		9TH-----14TH			10.50		L. V. STEWART		"
									ALVIN HOFFMAN		
CLAY CENTER 11 1/2 SW	39 17	97 17		3.20	4.80	3.50	11.90		E. J. MITCHELL		3/4" X 5 1/2"
CLAY CENTER 14 NE	39 32	96 58		6.75	2.25	1.50	10.50	AM	C. E. SPURRIER		"
CLAY CENTER 15 N	39 36	97 07		6.37	1.85	1.28	9.50		ORVILLE MEYER		"
CLEARWATER 6 1/2 N	37 36	97 31	.50	*	1.10	.20	1.40		F. STEWART		UNKNOWN
CLEMENTS 9 S	38 10	96 44		6.00	3.20		2.10	11.30	ELMER LUDWIG		3/4" X 5 1/2"
CLIFTON 6 SW	39 30	97 21		3.00	2.75	2.25	8.00	AM	PAUL RASSETTE		"
CLIFTON 7 NW	39 39	97 22		6.15	1.40	1.70	9.25	NOON	MORRIS NELSON		"
CLIFTON 9 N	39 41	97 16		6.20	1.20	1.45	8.85		HARRY CARLSON		"
CLIFTON 9 1/2 NE	39 40	97 09		4.40	1.90	1.70	8.00		A. LEISZLER		"
CLIFTON 10 1/2 NNW	39 42	97 20		5.00	1.90	1.85	8.75		WARREN BREEDING		"
CLIMAX 5 1/2 ENE	37 45	96 08	3.41			1.51	1.25	6.17	C. E. KUNKEL		3/4" X 5 1/2"
CLINTON 3 N	38 57	95 24		9TH-----12TH				8.00	F. BUCHHEIM		"
CLINTON 3 W	38 55	95 27		2.50	2.00	4.00	8.50		J. M. CLOUGH		"
CLINTON 5 SSW	38 51	95 26		*	*	6.70	6.70E		W. A. OWEN		"
CLYDE	39 36	97 25		4.04	1.88	2.40	8.32		L. F. FOSTER		"
CLYDE	39 36	97 25		4.15	2.20	2.60	8.95		C. C. BRANDON		"
CLYDE 2 SW	39 34	97 25		2.50	2.50	2.00	7.00		F. E. CAILTEUX		3/4" X 5 1/2"
CLYDE 4 NW	39 39	97 27		1.95	2.05	1.85	20	6.05	FRANCIS RALEIGH		1" X 6" VICTOR
COLDWATER 3 SW	37 14	99 21	.30	.75		.65	4.00+	5.70+	C. BLACKARD		3/4" X 5 1/2"
COLUMBUS	37 10	94 51		.20	2.16	.50		2.86	F. BURGETT		"
CONCORDIA 6 1/2NW	39 37	97 45	.65	1.55	3.08	T		5.28	R. A. HANSON		1" X 6" VICTOR
CONCORDIA 20 1/2 S	39 17	97 40	.03	3.63	2.02	3.02		8.70	R. HALBERSTADT		"
CONWAY	38 21	97 46		.15	2.40	4.20		6.75	IVAN BEATTIE		3/4" X 5 1/2"
CONWAY 2 NW	38 22	97 48			3.90	4.10		8.00	ROBERT BURNS		"
CONWAY 5 NW	38 25	97 51			3.40	3.00		6.40	MELVIN LINSTROM		"
CORINTH	39 25	98 33		.50 7.50E				8.00E	UNKNOWN		1 LB COFFEE CAN
COTTONWOOD FALLS 5 ESE	38 21	96 27		5.50	2.50	2.00		10.00	7:00A ROLLAND PIERSON		3/4" X 5 1/2"
COTTONWOOD FALLS 7 SSE	38 18	96 30		5.00	4.00	-		9.00+	7:00A MRS. H. T. PINKSTON		"
COTTONWOOD FALLS 7 SE	38 18	96 27		3.50	6.25	4.00		13.75	6:30A JAMES HARBAUGH		NO. 2 TIN CAN
COTTONWOOD FALLS 15 S	38 09	96 31		7.00	4.00	3.00		14.00	8:00A HENRY REIDEL		8" DIA-5GAL CAN
COUNCIL GROVE 1 SE	38 39	96 28		5.00	5.65+	5.00		15.65+	5:30A ROY FOSTER		3/4" X 5 1/2"
COUNCIL GROVE 4 SSW	38 37	96 31		2.00	5.00	3.00		10.00	8:30A L. H. RICHARDSON		5-GAL. CAN 8" X 11"
COUNCIL GROVE 5 S	38 36	96 31		4.25	5.35	3.75		13.35	RAY BURNS		ST. SIDED CAN
COUNCIL GROVE 6 NNW	38 45	96 33		6.00+	4.00+	4.00+		14.00+	M. DISBERGER		4" X 10"
COUNCIL GROVE 7 ENE	38 41	96 21		3.90	4.10	2.20		10.20	AM ALFRED RICHARDS		3/4" X 5 1/2"
COURTLAND 3 SSE	39 44	97 53		TOTAL FOR PERIOD				7.72	C. H. BARBER		1" X 6" VICTOR
COURTLAND 4 1/2 SSE	39 43	97 53		.94	1.30	2.87		5.11	L. HAGGMAN		STD. 8"
COURTLAND 5 SSW	39 43	97 56		TOTAL FOR PERIOD				7.70	PETE A. HENSEN		1" X 6" VICTOR
COVERT 4 NW	39 20	98 52	.42	1.55	3.46	1.91		7.34	ALVIS I. LAKE		STD. 8"
COVERT 13 SE	39 10	98 38	1.00	5.50	2.40			8.90	ORVILLE STANDLEY		3/4" X 5 1/2"
CRAWFORD	38 30	98 02	T	3.70 3.30				7.00	AM RODNEY ELEVATOR		"
CUBA	39 48	97 28		TOTAL FOR PERIOD				9.25	E. L. BRANUM		"
CULVER 2 NNW	39 00	97 46			6.00	2.25		8.25	P. REED		GALLON JAR
CULVER 3 NNW	39 00	97 46			5.15	2.25		7.40	MRS. W. BRENEMAN		3/4" X 5 1/2"
DAMAR	39 19	99 35	.60	.50	2.70	1.40		5.20	8:00A VAN OBOIT		"
DAMAR 3 1/2 NW	39 21	99 39	.13	4.50	2.00	2.00	2.50	11.13	SIMON DAVIGNON		"
DEGRAFF	37 59	96 51	1.50	1.40	.10	2.10		5.10	A. G. ZIEMAN		1" X 6" VICTOR
DELAVAN 1/2 N	38 40	96 48	*	*	17.00			17.00	JOHN FALEN		3/4" X 5 1/2"
DELIA 2 NNE	39 16	95 58		TOTAL FOR PERIOD				6.50	GEORGE AIKEN		GALLON CAN
DELIA 5 E	39 16	95 52		TOTAL FOR PERIOD				6.00+	FRANK BROMADA		3/4" X 5 1/2"
DELPHOS	39 17	97 46		TOTAL FOR PERIOD				8.00	GERALD F. GRIGGS		"
DELPHOS 8 E	39 17	97 37	3.00	5.00	4.50			12.50	AM ARTHUR HAVERING		"
DELPHOS 9 ESE	39 15	97 36	2.00	1.00	4.50		4.50	12.00	EVERETT MC KAIN		"
DELPHOS 9 SW	39 12	97 54	.50	2.50	4.45	2.65		10.10	LEONARD REYNOLDS		"
DELPHOS 10 1/2 E	39 16	97 35	1.60	3.80	4.00			9.40	F. J. HOGAN		"
DENMARK 2 1/2 N	39 07	98 15		* * *	4.50	1.50		6.00	GEORGE LETSCH		5 GALLON BUCKET
DENSMORE 8 N	39 45	99 45		3.00	4.00			7.00	8:00A A. C. HARPERS		NO. 2 1/2 TIN CAN
DE SOTO 6 1/2 E	38 58	94 51	*	* * *	7.00E			7.00E	A. BEAVER		3/4" X 5 1/2"
DETROIT	38 56	97 07		3.50	4.00	4.50		12.00	R. M. MEDLEY		"
DETROIT 1 1/2 NE	38 57	97 07	.15	3.15	3.80	5.10		12.20	FRANK K. HELLER		1" X 6" VICTOR
DEVIZES 1 1/2 W	40 00	100 05		1.90	2.10			4.00	7:00A L. ANDERSON		3/4" X 5 1/2"
DEVON 4 SE	37 53	94 46	1.00	2.25	1.00	1.00		5.25	10:00P JOHN RAMSEY		HOME MADE
DEXTER 2 W	37 11	96 45		1.50				1.50	7:00A FRED PALMER		1" X 6" VICTOR
DIGHTON	38 29	100 28		.30	.25	.05		0.60	NOLEN YATES		"
DORRANCE	38 51	98 36	.27	*	2.62	.93		3.82	RALPH COFFEEN		STD. 8"
DORRANCE 4 SW	38 49	98 39	.50	.10	2.60	1.10		4.30	MRS. ALFRED BACHMAN		UNKNOWN
DOVER 1 S	38 56	95 56		3.00	3.50	4.50		11.00	C. H. LISTER		3/4" X 5 1/2"
DOWNES	39 30	98 33		1.10	2.23	2.35		5.68	MARY PHYANER		3" TAYLOR
DOWNES 3 E	39 30	98 29	.10	.60	2.80	2.20		5.70	JOHN C. STEPHENSON		3/4" X 5 1/2"
DOWNES 4 1/2 SE	39 27	98 29	.15	.65	2.95	2.90		6.65	O. H. HALL		"
DOWNES 7 N	39 37	98 33		2.50	2.50	3.00		8.00	7:00A JOE R. MUCK		"
DUNLAP 5 SW	38 31	96 27		4.75	2.75	3.00		10.50	7:00A FRANK BACON		7" X 8" GREASE CAN
DUNLAP 6 SW	38 32	96 27		2.30	5.00	3.55		10.85	E. E. MACKENTHUM		3/4" X 5 1/2"
DURHAM	38 29	97 13		4.50	1.50+	.65		6.65+	R. H. FUNK		STD. 8"
DURHAM 1 NE	38 30	97 13		6.00+	2.00+			8.00+	CARL DECKER		3/4" X 5 1/2"
DURHAM 6 WNW	38 32	97 19	1.50	6.00	2.50			10.00	NORMAN UNRUH		"
DURHAM 6 NNW	38 34	97 14		5.50+	1.00	3.00		9.50+	C. C. WADEL		"
DURHAM 8 N	38 36	97 12	1.50	6.00	3.50			11.00	JOHN SCHMIDT		"
DURHAM 9 NW	38 35	97 20			5.25	4.20		9.45	H. P. RICHERT		"
DWIGHT	38 52	96 35		6.50+	4.00	3.75		14.25+	7:00A HARVEY L. GOSS		"
DWIGHT 3 ESE	38 50	96 32	5.50	4.75	5.00			15.25	HARRY ZAHNLEY		3 1/2" X 12"
DWIGHT 9 ESE	38 49	96 25	2.50	7.50	4.80			14.80	GEORGE EBERLY		3/4" X 5 1/2"
EARLTON	37 35	95 28	.09	2.59	.87	1.13	.15	4.83	A. A. COCHRAN		"
EDGERTON 1 N	38 47	95 00		TOTAL FOR PERIOD				10.50E	C. F. GILLESPIE		"
EDGERTON 5 E	38 46	94 55		9TH-----12TH				7.00E	MARVIN TURNER		"

TABLE 6
SUPPLEMENTAL PRECIPITATION DATA
STORM OF JULY 9-13, 1951

LOCATION	LAT.	LONG.	AMOUNTS					TOTAL	OBS. TIME	REPORTED BY	TYPE OF GAGE
			9	10	11	12	13				
EDMOND 4 W	39 37	99 54						6.00E		A. GROVE	UNKNOWN
EFFINGHAM	39 31	95 24						5.75		C. W. VETTER	
ELBING	38 04	97 06	.70					1.50		H. B. SCHMIDT	3/4" X 5 1/2"
ELBING 4 ENE	38 04	97 03						6.00E		THEO. REGIER	"
EL DORADO	37 49	96 50	.23	.03	1.87	.56	.19	2.88		CITY WATER PLANT	UNKNOWN
EL DORADO 4 NE	37 52	96 48						2.80E		EL DORADO TIMES	"
EL DORADO 6 E	37 49	96 43		1.60	3.80		4.00	9.40		CHARLES SIEGRIST	3/4" X 5 1/2"
EL DORADO 7 NNE	37 55	96 47						2.50E		GLEN LUCAS	"
EL DORADO 7 SE	37 46	96 44						6.00E		H. H. MURPHEY	5T. SIDED VESSEL
EL DORADO 10 NE	37 56	96 44						5.00E		GLENN CHAPMAN	3/4" X 5 1/2"
EL DORADO 12 E	37 49	96 37						9.50E		MR. C. G. HALL	"
ELKHART 5 NE	37 03	101 51		.21			.65	0.86		L. H. HOLMES	UNKNOWN
ELKHART 12 NNW	37 10	101 59			.04	.25		0.29		H. SMITH	3/4" X 5 1/2"
ELKINWOOD 2 1/2 N	38 24	98 35			3.10	.55		3.65	8:00A	W. W. RINKER	1" X 6" VICTOR
ELLIS	38 57	99 34			1.03	.49		1.52	7:00A	GLEN THOMAS	STD. 8"
ELLIS	38 57	99 34		.05	.04	1.04	.47	1.60		CHARLES E. NELSON	BENDIX FRIES
ELLIS 5 SW	38 53	99 37	.40	.02	.88	.30		1.60		WM. F. NELSON	1" X 6" VICTOR
ELLSWORTH	38 44	98 14			3.95	2.10		6.05		OTTO KATZENMEIER	3/4" X 5 1/2"
ELLSWORTH 5 NE	38 48	98 09			3.80	3.10		6.90	7:00A	GERALD SLAIGHT	1" X 6" VICTOR
ELLSWORTH 7 N	38 50	98 13			4.20	2.90		7.10	AM	C. SCHWERTDFEGER	3/4" X 5 1/2"
ELLSWORTH 7 N	38 50	98 14						6.30		ERNEST E. SCHWERTDFEGER	"
ELLSWORTH 7 NE	38 49	98 09	.10	*	4.48	2.25		6.83		JIM DOLEZAL	"
ELLSWORTH 7 1/2 S	38 37	98 14			2.80	2.30		5.10	AM	UNKNOWN	"
ELLSWORTH 15 S	38 44	97 56			3.85	4.00		7.85		RALPH FARRINGTON	FRUIT JUICE CAN
ELLSWORTH 16 ENE	38 48	97 58			4.00	1.70		5.70	8:00A	FRED BURMASTER	1" X 6" VICTOR
ELMDALE 2 W	38 23	96 41		4.10	2.50	6.00		12.60+	6:30A	CHARLES H. DAVIS SR.	
ELYRIA	38 17	97 38		4.15	3.70			7.85		TED KREHBIL	3/4" X 5 1/2"
EMPORIA 2 NW	38 26	96 13		3.50	4.90	4.00		12.40	6:30A	EDWARD H. PALMER (MRS)	"
EMPORIA 3 1/2 NW	38 26	96 14			5.90	3.00		8.90	NOON	ED ATKINSON	"
EMPORIA 4 NE	38 28	96 07		3.50	5.50	2.50		11.50	8:00A	CLARENCE PEDERSEN	"
EMPORIA 4 N	38 28	96 10	1.50		4.70	3.75		10.85		J. W. PRIEFERT	"
EMPORIA 5 NE	38 27	96 08			4.85	2.95		10.60		E. J. DELONG	"
EMPORIA 5 E	38 24	96 05						11.00E		EDWIN COLLINS	"
EMPORIA 5 SE	38 20	96 06			3.00	* 9.00		12.00E		ROY V. BOLING	"
EMPORIA 5 S	38 20	96 10	*	4.00	4.00	4.00		12.00E		ROBERT H. KORTE	NO. 2 CAN
EMPORIA 6 SSW	38 19	96 15		3.00	7.50+	3.70		14.20+		W. M. WILLIAMS	3/4" X 5 1/2"
EMPORIA 7 WSW	38 22	96 17						15.00E		MRS. C. F. WAGAMAN	MISC. CONTAINERS
EMPORIA 7 1/2 E	38 23	96 01		*	*	* 12.00		12.00E		E. J. SCHEIKOFSKI	RAIN BARREL
EMPORIA 8 ENE	38 27	96 03		3.90	3.20	4.80		11.90	NOON	JOHN SMITH	3/4" X 5 1/2"
EMPORIA 8 SW	38 19	96 17						16.00E		FATE THEYE	2 GALLON JAR
EMPORIA 9 SSW	38 16	96 16		5.80	6.50	5.00		17.30		E. B. HEINS	3/4" X 5 1/2"
EMPORIA 10 S	38 16	96 14		5.80	7.70	3.90		17.40		JACOB SCHWINDT	1" X 6" VICTOR
EMPORIA 11 SW	38 18	96 19						16.00E		DAVE SEENEY	3/4" X 5 1/2"
ERIE 5 NW	37 38	95 17	1.20	1.40	.70	1.00		4.30		MILTON DARRIS	"
ESKRIDGE 5 SE	38 49	96 01		4.40	2.35	3.70		10.45		CLAYTON PONTIUS	"
EUREKA	37 50	96 18		1.50	.50	2.50	1.50	6.00		RALPH BURSON	6" X 8"
EUREKA 5 SSW	37 45	96 19						5.10		C. B. WESTWOOD	3/4" X 5 1/2"
EUREKA 5 W	37 50	96 22						7.50E		MRS. ROY PACE	"
EUREKA 6 ENE	37 50	96 12						6.50E		MRS. STAN HALE	"
EUREKA 7 N	37 56	96 19						8.00E		VIRGIL STEVER	"
EUREKA 8 NNE	37 56	96 14		3.50	2.00			5.50E		FRED C. SCHURTER	"
EUREKA 10 NE	37 55	96 10						9.00		ROY FECHTER	TIN CAN
EUREKA 10 NW	37 54	96 26						6.50E		RALPH SEELEY	3/4" X 5 1/2"
EUREKA 12 NNW	37 54	96 30						7.00E		MRS. HARRY JACKSON	"
EVEREST 3 E	39 41	95 22			6.50	1.00		7.50		MR. SCHWARTZ	"
FAIRVIEW	39 50	95 44		.60	1.65	1.20	.10	3.55		E. G. BAVERLE	1" X 6" VICTOR
FALL RIVER 6 NNE	37 42	96 00	*		*	5.75		5.75		CLYDE SHINKLE	TIN CAN
FALUN	38 41	97 45			5.10	3.00		8.10		CARL G. FORSLUND	1" X 6" VICTOR
FALUN 2 N	38 42	97 45		6.00	3.50			9.50		UNKNOWN	3/4" X 5 1/2"
FALUN 2 SSE	38 39	97 45		4.70	3.50			8.20		JOHNSON	3/4" X 5 1/2"
FALUN 2 SW	38 40	97 47		*	9.00E			9.00E		JACOB LINDSTROM	3/4" X 5 1/2"
FALUN 5 SW	38 37	97 49	.15		4.27	3.05	.05	7.52		GEORGE BLOMBERG	1" X 6" VICTOR
FARLINVILLE 4 N	38 17	94 52	1.80	2.30	1.90	2.00		8.00		FRANK WEIKERT	3/4" X 5 1/2"
FLORENCE 1 1/2 SW	38 14	96 58			6.00+	2.00		8.00+		ART ROBINSON	GALLON CAN
FONTANA 2 N	38 27	94 50	.20	3.70	3.20			7.10	AM	E. W. SMART	1" X 6" VICTOR
FORMOSO 3 NNE	39 50	97 58						5.30		H. W. WATSON	3/4" X 5 1/2"
FORT SCOTT 5 N	37 54	94 42						7.25E	AM	ED. BLAIR	3/4" X 5 1/2"
FORT SCOTT 20 W	37 51	95 05	.85	3.85	2.00	1.75	.25	8.70		W. M. ROSS	"
FOSTORIA 2 W	39 26	96 33		7.00	2.00	2.00		11.00		REUBEN NELSON	"
FRANKFORT 5 ESE	39 41	96 20		1.80	2.00	.90		4.70	AM	CHARLES WITHAM	1" X 6" VICTOR
FRANKFORT 5 S	39 37	96 24		2.50		4.50		7.00	AM	V. C. LEINWEBER	3/4" X 5 1/2"
FREMONT 1 N	38 34	97 46		.15	4.90	4.75		9.80		ALEX DAHLSTEN	"
FREMONT 2 N	38 34	97 46			4.50	4.40		8.90		MRS. ENGSTROM	"
FREMONT 4 NNW	38 36	97 47			3.80	3.80		7.60		MARK JOHNSON	1" X 6" VICTOR
FREMONT 5 S	38 28	97 47			4.50	3.75		8.25		KUEHL	3/4" X 5 1/2"
GALATIA	38 39	98 57	T		2.80	T		2.80		UNKNOWN	"
GALESBURG	37 28	95 21	.55	1.42	T		.83	2.80		H. D. SHAW	UNKNOWN
GALVA	38 23	97 32	T	T	3.50	3.77		7.27	NOON	WALTER NELSON	1" X 6" VICTOR
GALVA 1 NW	38 24	97 33	T	T	3.90	4.25		8.15		HENRY J. KOLHN	3/4" X 5 1/2"
GALVA 2 NNW	38 24	97 34	T	3.80	4.30	.40		8.50		CLARENCE RUSSELL	"
GAYLORD	39 38	98 51		2.30	3.75	2.60		8.65	7:00A	C. D. CARTER	1" X 6" VICTOR
GAYLORD 3 NE	39 40	98 48	.18	2.00	4.25	2.50	T	8.93		HILDA BECKMANN	3/4" X 5 1/2"
GLADE	39 41	99 17		1.25	3.35	1.65		6.25	8:00A	L. SNYDER	1 QT. OIL CAN
GLASCO	39 20	97 50	.90	3.90	1.50	3.70		10.00	7:00P	J. L. FLETCHER	3/4" X 5 1/2"
GLASCO	39 20	97 50		4.00	2.00	3.40		9.40		GEORGE COLWELL	"
GLASCO 3 E	39 20	97 47		.40	5.30	3.20		8.90	7:00A	ROY R. LAVY	1" X 6" VICTOR
GLASCO 4 E	39 20	97 46	1.00	3.50	1.50	3.50		9.50		C. H. JORDAN	3/4" X 5 1/2"
GLASCO 5 NE	39 25	97 47			8.00	3.50		11.50		GUS LITKE	5 GAL. BUCKET
GLASCO 5 NNE	39 25	97 48		.70	6.45	3.25		10.40		LEO WILSON	3/4" X 5 1/2"

TABLE 6
SUPPLEMENTAL PRECIPITATION DATA
STORM OF JULY 9-13, 1951

LOCATION	LAT	LONG.	AMOUNTS					OBS. TIME	REPORTED BY	TYPE OF GAGE	
			9	10	11	12	13				TOTAL
GLASCO 8 E	39 20	97 41		.50	4.20	2.80	.25	7.75	7:30A	LEON AMBERG	1" X 6" VICTOR
GLASCO 8 NNW	39 28	97 55		5.00	5.50	3.00	1.85	15.35		WILLIAM CRISWELL	3/4" X 5 1/2"
GLASCO 8 NNE	39 27	97 46			.06	1.36	2.50	10.50		J. J. WRIGHT	" "
LENDALE 3 N	38 55	97 52			5.00	4.10		9.10		C. P. JENSON	" "
LENDALE 3 S	38 51	97 52			*	8.50E		8.50E		HAROLD HARRIS	" "
GLEN ELDER 8 N	39 38	98 20	.40	3.75	2.00			6.15		FRED REMUS	" "
GODDARD 3 1/2 NE	37 41	97 32		.41	.22	.05		.68	8:00A	R. L. WHITE	24" X 2" BRASS SLV.
GOESSEL	38 15	97 21			3.00	3.00	2.80	8.80	PM	PETER SCHMIDT	1" X 6" VICTOR
GOESSEL	38 15	97 21			3.30	3.05	2.81	9.16		T. C. LEHRMAN	" "
GOFF	39 40	95 56		1.30	1.88	1.77		4.95		RAY RILEY	3/4" X 5 1/2"
GOODLAND 11 S	39 11	101 41		.66	1.06			1.72		L. D. MORGAN	STD. 8"
GOODLAND 12 NW	39 30	101 49	.15	.94	2.22	.05		3.36	6:00P	WILMOT R. PRICE	" "
GOODLAND 15 NE	39 31	101 34			.06	1.36	2.25	3.67	6:00A	P. KUNERT	" "
GRANTVILLE	39 05	95 34	.20	.30	2.25	3.50	.75	7.00		CEROPHYL LAB.	1" X 6" VICTOR
GREAT BEND 7 NW	38 26	98 52		TOTAL FOR PERIOD				2.90		O. H. EVERETT	3/4" X 5 1/2"
GREELEY	38 22	95 08		1.55	2.30	1.75	.17	5.77		ANTON RUES	" "
GREEN 3 NW	39 27	97 01		4.70	3.50	2.50		10.70		ROY C. SCHRUM	" "
GREENLEAF 3 WNW	39 44	97 02	.15	5.00	1.70	.85		7.70	PM	ARNOLD THOMPSON	" "
GREENLEAF 6 S	39 38	96 58		3.75	3.00	1.00		7.75	AM	W. C. CRAIN	" "
GREYNA 4 N	39 49	99 12		.50	1.75	1.37		3.62		JOE WISENBURG	" "
GRIDLEY 6 S	38 00	95 54		9TH-----14TH				10.00E		R. D. KNEISLY	UNKNOWN
GROVELAND 1 ESE	38 17	97 43		3.50 3.75				7.25E		HENRY BAERG	1" X 6" VICTOR
GYPSUM	38 42	97 25		TOTAL FOR PERIOD				14.00		R. ROBSON	UNKNOWN
GYPSUM	38 42	97 25	1.25	1.50	10.00	4.50		17.25		R. C. MARTIN	HOMEMADE
GYPSUM 6 1/2 SE	38 39	97 20		1.00	6.00	4.00		11.00		R. MC BRIDE	3/4" X 5 1/2"
GYPSUM 7 SSE	38 36	97 22		1.00	8.00	3.50		12.50		HENRY EURICH	" "
HADDAM 4 3/4 S	39 47	97 17		2.50	*	*	5.75	8.25		CLARK BURTON	UNKNOWN
HALIFAX 4 SW	38 53	96 16		3.50	6.00	4.50		14.00	NOON	E. THOSS	3/4" X 5 1/2"
HALSTEAD 3 W	38 01	97 33			.76	.95	.05	1.76	10:00A	S. A. SMITH	2 1/2" X 20" FRIEZ
HALSTEAD 3 SW	37 58	97 32			.68	.65	.08	1.41	8:00A	S. A. SMITH	" "
HALSTEAD 5 N	38 04	97 31			1.39	1.77		3.16		WARD M. LEHMAN	1" X 6" VICTOR
HALSTEAD 5 1/2 S	37 55	97 30		.76	4.40	.03		1.19	AM	S. A. SMITH	2 1/2" X 20" FRIEZ
HAMILTON 1/2 E	37 59	96 09		3.80	2.30	2.00		8.10		A. C. JOHNSON	1" X 6" VICTOR
HAMILTON 3 ESE	37 58	96 06	1.00	6.00+	3.20			10.20+		C. H. RESER	3/4" X 5 1/2"
HAMILTON 4 NE	38 01	96 07	*	*	*	10.00		10.00		ROBERT MARTIN	" "
HAMILTON 5 NW	38 01	96 15		3.50	3.60	3.00		10.10		R. M. HEDGES	" "
HAMILTON 5 WNW	38 01	96 15		6.00	3.25	3.00		12.25E		PHIL EDWARDS	MISC.
HARLAN 1' NE	39 37	98 45	.20	2.50	3.00	2.12		7.82		SHIRLEY CROUSE	1" X 6" VICTOR
HARLAN 3 NNE	39 38	98 45	.20	2.00	3.05	2.00		7.25	6:30A	UNKNOWN	3/4" X 5 1/2"
HARLAN 9 NE	39 38	98 36		2.30	2.00	3.00		7.30	6:00A	EMIL RYPMA	" "
HARRIS 4 N	38 23	95 27		3.50	4.50	1.50		9.50		KARNOSKI	UNKNOWN
HARTFORD 2 SSW	38 17	95 59		TOTAL FOR PERIOD				12.00E		GLEN HERRICK	3/4" X 5 1/2"
HARTFORD 2 1/2 WNW	38 18	96 00		*	*	*	12.50	12.50E		ALLEN DICKENSEN	" "
HARTFORD 4 SW	38 17	96 01		2.00	5.00	4.50		11.50		VERL SMITH	" "
HARTFORD 7 S	38 11	95 58	*	*	*	11.50		11.50E		CARL THOMPSON	" "
HARTFORD 8 NW	38 24	96 04		2.50	5.50	3.50		11.50	AM	C. R. MARTIN	" "
HAVANA	37 06	95 58		.38			3.02	3.40		E. J. FIALICK	UNKNOWN
HAVENSVILLE 3 E	39 31	96 01	T	1.75	2.25	2.00	.25	6.25	7:00P	W. C. RAIRDON	1" X 6" VICTOR
HAVENSVILLE 7 S	39 24	96 05		1.50	1.70	2.00		5.20	PM	GEORGE ACKLEY	3/4" X 5 1/2"
HAYS 6 W	38 53	99 27	.18		1.17	.33		1.68	AM	KENNETH L. KRAUS	STD. 8"
HAYS 8 SSE	38 45	99 18	.31		1.09	.30		1.70	6:00P	F. P. WASINGER	BRASS TUBE
HAYS 9 N	39 00	99 18	.20	1.72	.08	.69		2.69		OLIVER M. BAKER	HOMEMADE
HAYS 9 SSE	38 45	99 17	.75	1.05	.30	1.30		3.40		PAUL LEIKER	3/4" X 5 1/2"
HAYS 12 SSE	38 44	99 26	.19	.05	1.21	.49		1.94	7:00A	ALEX SCHMIDT	" "
HENSON	38 30	94 52		1.90	2.60	3.50	2.70	10.70		ALVA WINDLER	" "
HERINGTON 4 N	38 44	96 57		4.65	5.10	4.85		14.60		FRED GENTS	" "
HERINGTON 8 WSW	38 38	97 05		4.50	6.00+	3.50		14.00+		HALDEMAN	" "
HERINGTON 13 N	38 52	96 56		6.00	4.50	4.50	2.25	17.25		BEN F. GUGLER	HOMEMADE
HESSTON	38 10	97 25		.07	1.32	1.36	1.87	4.62	7:30A	H. SOMMERFELD	3/4" X 5 1/2"
HIATTVILLE	37 43	94 52		3.75	4.00	3.50		11.25		IRA B. ARMSTRONG	" "
HILL CITY 7 N	39 28	99 51		3.40	.60	3.10		7.10		UNKNOWN	" "
HILL CITY 9 S	39 14	99 52	.50	.25	1.00	1.50		3.25		UNKNOWN	" "
HILLSBORO 3 1/2 SW	38 19	97 15		7.00+	3.40			10.40+		ADOLPH BARTLE	1" X 6" VICTOR
HILLSBORO 4 N	38 26	97 13	1.00	5.50+	4.00			10.50+		A. UNRUH	3/4" X 5 1/2"
HILLSBORO 4 SW	38 20	97 16	.50		5.60	3.25		9.35		PAUL DUERKSEN	" "
HILLSBORO 5 N	38 25	97 12	1.00	8.00	2.70			11.70+		MR. HETT	1" X 6" VICTOR
HILLSBORO 5 1/2 SSE	38 17	97 10		3.60	5.00+	3.50		8.50+		MART FRIESEN	3/4" X 5 1/2"
HILLSDALE 1 1/2 S	38 38	94 51		2.00	5.00+	1.50		8.50+	AM	WARD CHAPMAN	" "
HILLSDALE 4 1/2 N	38 43	94 50		2.00	5.50		2.00	9.50+		A. CUTHBERTSON	" "
HILLSDALE 10 W	38 39	95 02		2.50	5.50	2.00		10.00E		F. W. TOWNER	" "
HILLSDALE 15 WNW	38 43	95 07		2.60	2.00	6.00		10.60E		OTIS L. BROERS	" "
HILLTOP 3 1/4 SE	38 02	96 02		TOTAL FOR PERIOD				12.00		E. H. SAUDER	" "
HOLLENBERG	39 58	96 59			4.90	1.50		6.40		TOM WOODS	" "
HOLLIS	39 38	97 33		3.00	2.00	1.50		6.50		FRANK BAURSOC	" "
HOLTON 6 WSW	39 25	95 52		2.25	T	2.25		4.50		WILEY CARPENTER	" "
HOLTON 10 NE	39 34	95 36		1.50	3.00	2.25		6.75	AM	WILL MILLER	" "
HOLYROOD	38 35	98 24	.10		3.25	1.75		5.10	10:00A	D. H. WHISLER	" "
HOLYROOD 4 1/2 NW	38 38	98 27		3.60	1.75			5.35		W. R. NOVATNY	" "
HOLYROOD 6 1/2 N	38 41	98 23		.50	3.00	1.50		5.00	7:30A	ERNEST BONTA	" "
HOME 1 E	39 50	96 29		1.20	3.75	.30		5.25	AM	HARRY HARDMAN	" "
HOMEGOOD	38 30	95 23		.50	2.25	5.90	2.50	11.15	PM	H. A. FRANK	" "
HOMEGOOD 3 ENE	38 32	95 20		3.60	5.00+	2.50		11.10+		R. E. TURNER	UNKNOWN
HOPE 2 NE	38 44	97 03		*	*	*	14.50	14.50E		LAWRENCE MORGAN	3/4" X 5 1/2"
HOPE 2 E	38 42	97 02		3.80	6.00	.55	3.80	14.15		DAVE MC MAHAN	1" X 6" VICTOR
HOPE 3 S	38 40	97 07		TOTAL FOR PERIOD				11.22		HOWARD L. FRY	3/4" X 5 1/2"
HOPE 4 NW	38 44	97 08		3.90	6.50	4.25	.98	15.63	7:30A	CLINTON COVERT	1" X 6" VICTOR
HOWARD 7 NE	37 33	96 11	1.30		.80	1.00	1.50	4.60	7:00P	W. A. HEATHER	3/4" X 5 1/2"
HOYT	39 15	95 42		TOTAL FOR PERIOD				6.07		JESS WILLIAMS	" "
HOYT 4 ENE	39 16	95 38		TOTAL FOR PERIOD				12.50		J. D. BRAUM	" "
HOYT 4 E	39 14	95 38		TOTAL FOR PERIOD				11.00		PAUL HERDE	PAISLS AND CANS

TABLE 6
SUPPLEMENTAL PRECIPITATION DATA
STORM OF JULY 9-13, 1951

LOCATION	LAT.	LONG.	AMOUNTS					TOTAL	OBS. TIME	REPORTED BY	TYPE OF GAGE
			9	10	11	12	13				
HOYT 4 NW	39 17	95 47			2.16	2.30	3.00	7.46		J. E. ROSTOCIL	3/4" X 5 1/2"
HUDSON 4 3/4 NE	38 10	98 38		.50	1.20	.60	.20	2.50		MELVIN SUFKES	ROUND GLASS CYLINDER
HURON	39 38	95 22		1.50	2.00	1.75		5.25		MR. STARNES	UNKNOWN
HUNTER	39 14	98 24	.50	5.00	2.50			8.00		JOHN BERGMAN	1" X 6" VICTOR
HUNTER 1 SE	39 13	98 23		4.50	1.35	.25		6.10		ELDEN MC PEAK	3/4" X 5 1/2"
HYMER	38 29	96 42	.30	2.50	6.00+	2.70		11.50+		MRS. ROY M. BOOK	1" X 6" VICTOR
IDANA 2 NNW	39 23	97 16		4.75	2.75	3.00		10.50		GEORGE BLOOM	NO. 2 CAN
INMAN 5 SW	38 10	97 47		1.75	1.75			3.50		J. W. KROEKER	ST. SIDED PAN
INMAN 6 N	38 20	97 46			2.70	4.10		6.80		SPENCER	3/4" X 5 1/2"
INMAN 7 1/2 NW	38 19	97 51			3.90	2.00		5.90E		HAROLD KNACKSTEAD	1" X 6" VICTOR
IOLA 4 ESE	37 55	95 20		9TH-----14TH				8.20E		LEE OXENDER	3/4" X 5 1/2"
IONIA	39 40	98 21	.30	.60	3.10	1.75		5.75		W. I. ALCORN	"
IRVING	39 38	96 36		2.40	2.40			4.80	PM	W. T. BLANEY	HOMEMADE
IRVING 4 1/2 SW	39 35	96 39		*	5.00	2.50		7.50	AM	CARL BEACHAM	ZENONE CAN
JAMESTOWN	39 36	97 52		TOTAL FOR PERIOD				5.75		J. H. SWENSON	3/4" X 5 1/2"
JAMESTOWN	39 36	97 52		.45	1.90	2.90		5.25		C. H. ELNIFF	1" X 6" VICTOR
JENNINGS	39 41	100 18	.60	2.80	3.50			6.90		F. E. BADER	3/4" X 5 1/2"
JETMORE 13 NW	38 13	100 04		TOTAL FOR PERIOD				2.50		C. SINDAIR	"
JEWELL	39 40	98 09		TOTAL FOR PERIOD				5.45		CITIZENS STATE BANK	"
JEWELL 5 S	39 35	98 08		.60	3.00	2.50		6.10		LOWELL SWENSON	"
JUNCTION CITY 3 S	38 59	96 48		4.50	5.00	4.50		14.00		MR. HOSMAN	"
JUNCTION CITY 5 1/2 NW	39 03	96 55		4.00	4.00	3.00		11.00		ROBERT LUTHI	"
JUNCTION CITY 6 W	39 01	96 56		3.00	4.00	5.50		12.50		R. Y. KITEMILLER	"
JUNCTION CITY 6 S	38 58	96 47		4.50	4.00	4.70		13.20		EARL MESSINGER	"
JUNCTION CITY 6 SE	38 59	96 45		*	*	13.00		13.00		GUSTAFSON	"
JUNCTION CITY 7 E	39 01	96 43		5.00	3.50	5.50+		14.00+		MR. SHANE	"
JUNCTION CITY 8 1/2 S	38 57	96 43		4.50	5.00	5.50+		15.00+		HARVEY HELLER	"
JUNCTION CITY 8 1/2 NW	39 08	96 55		5.50	2.00	6.00		13.50		FRANK G. FEELER	ST. SIDED BUCKET
JUNCTION CITY 9 SW	38 57	96 54		4.50	5.00	5.00		14.50E		BERTHA BIEGERT	3/4" X 5 1/2"
JUNCTION CITY 10 ENE	39 02	96 38		4.50	1.50	5.50		11.50+		PETE TULLY	"
JUNCTION CITY 10 ESE	38 59	96 40		4.50	5.80	5.60		15.90		L. E. COLLINS	"
JUNCTION CITY 14 ESE	38 57	96 36		*	*	13.50		13.50		MRS. NACE	"
JUNCTION CITY 16 ESE	38 58	96 32		1.80	5.10	4.35		11.25		GROVER POOLE	1" X 6" VICTOR
JUNCTION CITY 17 ESE	38 58	96 32		*	*	14.00		14.00E		UNKNOWN	3/4" X 5 1/2"
KACKLEY 1 N	39 43	97 51	.20	1.20	1.45	2.75		5.60		INEZ BERGSTROM	"
KANOPOLIS	38 42	98 09			3.50	2.60		6.10		BERTHA POWELL	"
KANOPOLIS 5 S	38 33	97 57			4.15	2.50		6.65	AM	CHARLES JACOBS	HOMEMADE
KANOPOLIS 9 SSE	38 35	98 06			3.70	2.10		5.80	AM	LLOYD DOLEZAL	UNKNOWN
KANOPOLIS 11 NE	38 48	98 00			6.10	1.70		7.80		FRED LORENZEN	1" X 6" VICTOR
KEENE 5 W	38 56	96 06		4.20	4.80	4.70		13.70	AM	FRANK PETERSON	3/4" X 5 1/2"
KEIGHLEY 3 W	37 40	96 42		9TH-----14TH				6.00E		MRS. DOYLE	"
KELLY 4 SE	39 41	95 58		.60	2.26	.98	.25	4.09		KONGS	1" X 6" VICTOR
KENSINGTON 2 E	39 46	98 09		3.20	1.00			4.20		MISS DOUGLAS	HOMEMADE
KENSINGTON 9 NNW	39 53	99 03	.40	1.70	1.30			3.40	8:00P	E. FERGUSON	3/4" X 5 1/2"
KIPP 1 NE	38 48	97 27		TOTAL FOR PERIOD				9.68		M. FRED SUNDRON	"
KIPP 2 1/2 E	38 47	97 24	1.20	6.00+	5.50			12.70+		GLEN LEISTER	"
KIPP 3 WSW	38 46	97 30	.75	6.40+	3.30			10.45+		ROBERT DUPES	1" X 6" VICTOR
KIRWIN 4 1/2 SW	39 38	99 10		4.50+	3.50			8.00	7:00A	UNKNOWN	GALLON CAN
KIRWIN 5 SE	39 36	99 06		2.30	3.20	3.70		9.20	8:00A	E. JOHNSON	3/4" X 5 1/2"
LA CROSSE 6 NW	38 36	99 22		T	2.75	1.20		3.95		MRS. FAYE ALLEN	"
LA CYGNE 6 E	38 21	94 39		TOTAL FOR PERIOD				8.00E		CHARLES MILLER	"
LAMAR 6 E	39 15	97 29	1.50	1.00	4.00	.50	4.00	11.00		ALBERT YANEK	5 GAL. PAINT CAN
LAMAR 9 S	39 08	97 33		TOTAL FOR PERIOD				8.00E		H. S. TOEPHER	"
LANG 5 SE	38 25	96 01		4.00	4.00	2.00		10.00		E. JACKSON	"
LANHAM 3 SE	39 58	96 51	.13	2.07	1.44	1.14		4.78	7:00P	AUGUST KRUSE	1" X 6" VICTOR
LATIMER	38 44	96 51		6.00+	3.30	3.20	3.30	15.80+		CHAS. ADIRE	"
LATIMER 1 SW	38 44	96 51		4.50	6.00	5.00		15.50		FRED GRUNDMEIR	3/4" X 5 1/2"
LATIMER 3 SW	38 43	96 53		4.60	5.00+	4.20		13.80+	8:00A	HAROLD NEEDEE	"
LATIMER 3 1/2 SW	38 43	96 53		5.00	5.50+	4.00		14.50+		CLYDE KENDELL	"
LAWRENCE 3 N	39 03	95 15	.50	2.50	4.50	.40		7.90		CYROPHIL LAB.	1" X 6" VICTOR
LAWRENCE 5 WNW	39 00	95 20			3.00	4.00		7.00		F. R. WEMPE	3/4" X 5 1/2"
LAWRENCE 7 W	39 00	95 21		1.78	3.86	2.98	.90	9.52	7:00A	WILLIS R. COLEMAN	1" X 6" VICTOR
LEAVENWORTH 5 SE	39 14	94 52	3.00	1.50	1.00	0.50		6.00		KANS. ST. PRISON FARM	1" X 6" VICTOR
LEBANON 2 S	39 47	98 34		2.00	2.50	3.00		7.50	6:00A	JAMES ROUSH	3/4" X 5 1/2"
LEBANON 7 N	39 55	98 32		TOTAL FOR PERIOD				4.50		NIEL SHIP	"
LEBANON 8 1/2 S	39 41	98 34			4.50	2.50		7.00	6:00A	RUSSELL BONKER	"
LEBO 7 SE	38 20	95 46		4.00+	4.00			8.00+		P. FRESSEN	"
LEHIGH	38 22	97 18			5.45	3.20		8.65	8:00A	JOHN H. FRITZINGER	"
LEHIGH 2 1/2 W	38 23	97 21			4.65	3.50		8.15	AM	C. E. PLETT	1" X 6" VICTOR
LEHIGH 4 N	38 26	97 17			*	10.00		10.00E		LEVI PRIEB	5 GAL. PAINT BUCKET
LE LOUP 1 S	38 41	95 10		2.05	3.85	2.63	.50	9.03	7:00A	C. B. BOSTWICK	STD. 8"
LENAPE	39 00	94 58		.70	.55	3.90		5.15		MRS. STRAUB	1" X 6" VICTOR
LENEXA 1 S	38 56	94 45	*	*	5.00	*	4.00	9.00		H. F. VOIGHT	3/4" X 5 1/2"
LENORA	39 37	100 00			3.20	3.15		6.35		C. KENSER	"
LENORA	39 37	100 00			3.20	3.30		6.50		G. KEELER	"
LENORA	39 37	100 00			3.25	3.50		6.75		JOHN GILBREATH	"
LENORA 3 SSE	39 34	100 00	.02	3.20	2.10			5.32		E. G. PUGH	"
LEON	37 41	96 47	1.69		2.56		1.63	5.88		FRANK TABING	"
LEON 3 W	37 41	96 51		9TH-----14TH				5.00E		MR. ALLEN	"
LEON 10 ENE	37 44	96 35		9TH-----14TH				10.00E		CLEM ADSIT	1" X 6" VICTOR
LEONARDVILLE	39 22	96 51	.80	5.20	2.00	2.00		10.00	AM	L. A. KOPACHEK	3/4" X 5 1/2"
LEONARDVILLE 2 SE	39 20	96 50		6.15	2.68	2.20	.20	11.24		HENRY ZEISSSET	"
LEONARDVILLE 3 NE	39 22	96 45		5.00	2.50	2.50		10.00	7:00A	A. W. GUSTAFSON	"
LEONARDVILLE 5 S	39 18	96 49		2.75	4.00	2.25		9.00	AM	WM. JAHNKE	"
LEONARDVILLE 5 1/2 N	39 27	96 51		TOTAL FOR PERIOD				10.80		FRANK CRAIG	"
LEONARDVILLE 6 S	39 18	96 53		6.00	3.75	2.80		12.55	PM	ED SYLVESTER	"
LEONARDVILLE 6 WNW	39 23	96 57		5.50	2.00	3.00		10.50		MRS. MC KINLEY	"
LEONARDVILLE 6 NW	39 26	96 56		4.60	2.30	2.60		9.50	PM	FRANK BERGSTROM	"
LEONARDVILLE 7 WNW	39 22	96 56		4.80	2.20	2.30		9.30	AM	ELDEN KLOCKE	"
LEONARDVILLE 7 NNW	39 26	96 51		8.20	.30	2.30		10.80	PM	CRAIG A. ANDERSON	"

TABLE 6
SUPPLEMENTAL PRECIPITATION DATA
STORM OF JULY 9-13, 1951

LOCATION	LAT.	LONG.	AMOUNTS							OBS. TIME	REPORTED BY	TYPE OF GAGE
			9	10	11	12	13	TOTAL				
LEWIS 5 1/2 SE	37 52	99 12	.50		1.30	.10	1.00	2.90	8:00A	BRUCE SIBLEY	1" X 6" VICTOR	
LILLIS 1 SE	39 36	96 16		1.50	1.75	4.00		7.25	PM	H. D. BERGMAN	LARGE CROCKERY JAR	
LINCOLN	39 03	98 09		.45	3.70	2.10		6.25		P. A. WEST	1" X 6" VICTOR	
LINCOLN 3 E	39 03	98 05		4.00	2.00			6.00		WILLIAM TRUCK	3/4" X 5 1/2"	
LINCOLN 5 S	38 58	96 08	.20	4.60		1.90		6.70		MARGARET KRUCKENBERG	" "	
LINCOLN 8 NW	39 09	98 13		4.40	1.65			6.05		FRANK SPEAR	" "	
LINCOLN 9 E	39 04	98 00			6.00	3.00	2.50	11.50	AM	BART WEBB	5 GAL. BUCKET	
LINCOLN 9 SW	38 57	98 15	.20		3.90	1.95		6.05		EMIL HILDEBRANDT	STD. 8"	
LINCOLNVILLE	38 29	96 58	4.30	6.50	3.80			14.60		FRANK PECINOVSKY	3/4" X 5 1/2"	
LINCOLNVILLE 1 1/4 S	38 28	96 57		4.40	7.30	4.00		15.70	8:00A	I. H. GILBERT	" "	
LINCOLNVILLE 3 SSE	38 27	96 55	4.00	12.00	4.00			20.00E		GARVIN PRITZ	ST. SIDED BUCKET	
LINCOLNVILLE 3 W	38 30	97 02		4.80	4.70	4.30		13.80	AM	HENRY STEINEN	3/4" X 5 1/2"	
LINCOLNVILLE 4 E	38 29	96 52	4.50	5.50+	1.00	3.50		14.50+		MRS. ALBRIGHT	" "	
LINDSBORG	38 34	97 38	.10	4.70	4.30	1.10	T	10.20		GEORGE BRIGGS	" "	
LINDSBORG 5 SE	38 33	97 36		6.00+	4.50			10.50+		VANCE ARNOLD	" "	
LINDSBORG 5 S	38 29	97 41			4.75	3.15		7.90	AM	A. H. NELSON	1" X 6" VICTOR	
LINN	39 40	97 05		4.50	2.25	1.75		8.50	PM	FRED BERGER	UNKNOWN	
LINWOOD	39 00	95 03	2.05	1.50	3.50			7.05		MRS. JOHN SANDER	" "	
LITTLE RIVER	38 23	98 01			3.10	1.70		4.80		F. E. HODGSON	1" X 6" VICTOR	
LITTLE RIVER	38 23	98 01			2.75	1.00		3.75	8:00A	S. C. CE VAULT	" "	
LITTLE RIVER 5 NE	38 26	97 55	.75	.50	3.50	2.25		7.00		MRS. A. L. MEYERS	3/4" X 5 1/2"	
LITTLE RIVER 5 ENE	38 25	97 55	T	T	4.30	4.50		8.80		GALEN BARRETT	" "	
LITTLE RIVER 5 SSE	38 20	97 58			4.25	2.75		7.00		EDWIN CARLSON	" "	
LOGAN 1/2 S	39 39	99 35	.07	5.60	2.80	.20		8.67	7:00A	FOREST MATY	1" X 6" VICTOR	
LONE ELM 3 1/2 SW	38 04	95 18	.25	3.00	4.05	1.75	.25	9.30		FRANK NEWLON	3/4" X 5 1/2"	
LONGFORD	39 11	97 21		4.50	3.35	2.70		10.55		HERBERT IWIG	" "	
LONGFORD 5 E	39 11	97 14		5.00	4.75	3.30		13.05	7:00A	ED RUSH	" "	
LORRAINE	38 34	98 19		.20	3.90	1.80		5.90	AM	E. E. MC CUBBIN	" "	
LORRAINE 5 1/2 N	38 38	98 18			4.00	1.40		5.40	AM	HERBERT JANZEN	" & 3/4" X 10"	
LOST SPRINGS	38 34	96 58		5.00	6.50	3.10		14.60		R. J. PATTERSON	1" X 6" VICTOR	
LOST SPRINGS	38 34	96 58		5.00	4.10	7.95		17.05	6:00A	OSCAR NELSON	" "	
LOUISBURG	38 37	94 40	3.50		3.75	2.25	.20	9.70		C. C. WORTHINGTON J.P.	" "	
LOUISBURG 7 S	38 31	94 40	.15	2.50	1.40			6.55		CLIFFORD RAINES	3/4" X 5 1/2"	
LOUISBURG 10 SW	38 31	94 48		TOTAL FOR PERIOD				7.00E		HERMAN CLAWSEN	" "	
LUCAS	39 04	98 33	.10	4.20	.50	1.70		6.50		MR. GIBSON	" "	
LUCAS 3 1/2 ESE	39 02	98 29	.15	.80	2.00	1.35		4.30	AM	ERWIN HEINE	1" X 6" VICTOR	
LUCAS 12 NNW	39 14	98 35	.40	8.75+	.50	1.70		11.35+		D. L. CAHILL	" "	
LURAY 4 SW	39 04	98 45	.25	4.00		1.00		5.25		DALE BEATTY	3/4" X 5 1/2"	
LURAY 6 NNW	39 12	98 44		7.70	1.70			9.40	8:00A	D. PRINZ	" "	
LYNDON 4 N	38 39	95 41	*	*	* 15.00			15.00		LEWIS MYERS	HORSE TANK	
LYLE 1 N	39 58	100 11	.11	.25	1.25	1.75		3.36	6:00P	C. HUPT	STD. 8"	
LYONS	38 21	98 12	.10	.20	2.60	1.60	.10	4.60	PM	HENRY BYARD	3/4" X 5 1/2"	
LYONS 3 E	38 21	98 09		TOTAL FOR PERIOD				4.50		J. L. DUESHIN	" "	
LYONS 5 1/2 NW	38 24	98 16		3.00	2.00			5.00		BERT HOYT	" "	
LYONS 8 1/2 N	38 28	98 12			3.35	1.90	.10	5.35		OWAL D. EVANS	1" X 6" VICTOR	
MACKSVILLE 10 SSW	37 49	99 02	.27		.86	.08	.39	1.60	7:00P	W. H. LOVELL	UNKNOWN	
MADISON 7 WSW	38 06	96 15		6.00	5.50	4.00+		15.50+		J. F. HAYWARD	3/4" X 5 1/2"	
MADISON 12 WSW	38 08	96 20	.25	3.50	2.80	*	3.00	9.55		ARTHUR T. LARGE	" "	
MAHASKA	39 59	97 21		4.75	1.95	1.00		7.70		HARRY LIVINGSTON	1" X 6" VICTOR	
MAHASKA 5 1/2 S	39 54	97 20		.71	1.70	1.30		3.71	AM	F. BANNINGER	" "	
MAHASKA 7 E	39 59	97 12		.55	4.35	.85	.30	6.05	6:30A	I. G. PRELLWITZ	" "	
MANCHESTER 2 SSW	39 06	97 21	1.50	2.50	3.80	4.30		12.10	7:30A	F. C. NEADERHISER	3/4" X 5 1/2"	
MANCHESTER 2 3/4 SW	39 05	97 23		1.75	2.75	3.50		8.00	6:00A	MRS. HARVEY CHERRY	" "	
MANCHESTER 3 NE	39 07	97 16	3.00	3.60	3.70	1.00		11.30		WM. GISH	" "	
MANCHESTER 5 E	39 06	97 12		4.30	2.70	3.00+		10.00+		ROMBERGER	" "	
MANCHESTER 5 E	39 06	97 12		4.00	2.80	4.50		11.30		WM. STEFFE	" "	
MANCHESTER 5 1/2 NE	39 09	97 13	.15	4.35	3.80	4.60		12.90		ROY FOUSE	" "	
MANHATTAN 3 NNW	39 14	96 36		4.70	3.00	1.85		9.55	7:00A	A. C. CHAPMAN	1" X 6" VICTOR	
MANHATTAN 5 SE	39 07	96 29		4.80	2.00	3.70		10.50	7-8 A	LESTER HINTON	3/4" X 5 1/2"	
MANHATTAN 7 E	39 10	96 26		3.15	.96	3.54		7.65	8:00A	SHERMAN NEWELL	STD. 8"	
MANHATTAN 7 1/2 NW	39 14	96 41		4.68	2.39	1.70		8.77	8:00A	WM. YATES JR. & W. J. SYORE	8" TAYLOR	
MANHATTAN 8 SW	39 05	96 40		*	*	9.75		9.75		WILLIAM TOY	3/4" X 5 1/2"	
MANHATTAN 8 1/2 SE	39 06	96 25	3.90	1.70	2.20	4.40		12.20	7:00P	TOM LUMB	1" X 6" VICTOR	
MANHATTAN 15 W	39 09	96 50		5.50	1.25	2.00		8.75		WILLEY SYLVESTER	3/4" X 5 1/2"	
MAPLETON 6 SW	37 56	94 56	1.00	3.00	1.00	1.50		6.50	PM	LESTER HUNT	" "	
MARION 6 NW	38 25	97 04		4.20	8.83	3.80		16.83	AM	EZRA SCHIMPF	" "	
MARION 8 SW	38 17	97 08		5.00		4.00		9.00		D. C. EILZEN	" "	
MARION 8 E	38 22	96 52		*	*	14.00+		14.00+		GEORGE THYE	" "	
MARION 10 NW	38 28	97 07		3.80	7.10	4.60		15.50		ALBERT JANZEN	" "	
MARQUETTE	38 33	97 52			4.50	5.00		9.50		CITY HALL	HOME MADE	
MARQUETTE 1 1/4 E	38 33	97 51			4.50	5.00		9.50		VICTOR ABERG	46 OZ. TIN CAN	
MARQUETTE 2 1/2 SW	38 32	97 53		.50	4.50	4.30		9.30		EARL BOGGS	3/4" X 5 1/2"	
MARQUETTE 3 N	38 36	97 53		TOTAL FOR PERIOD				7.75E		LLOYD CRIST	" "	
MARQUETTE 4 1/2 SE	38 29	97 49			4.00	3.80		7.80		MRS. HAYWOOD	" "	
MARQUETTE 7 S	38 28	97 53			3.40	2.70		6.10		MRS. HALLINGS	" "	
MARYSVILLE 5 N	39 55	96 40	T	3.65	1.75	.75		6.15	AM	W. V. COCKERILL	1" X 12" GLASS TUBE	
MATFIELD GREEN	38 10	96 34	4.00		6.50	1.90		12.40		MARY L. GOLDEN	1" X 6" VICTOR	
MATFIELD GREEN	38 10	96 34		3.00	5.00	3.00		11.00		C. J. MC GRAU	6" DIA. GLASS JAR	
MATFIELD GREEN 5 W	38 09	96 40	2.45		5.00	1.70		9.15		FRANK DEERING	1" X 6" VICTOR	
MAYETTA	39 20	95 44		2.13	1.00	2.25		5.38		CHARLES COX	3/4" X 5 1/2"	
MAYETTA 2 SE	39 20	95 41		TOTAL FOR PERIOD				7.00E		A. J. SALTS	" "	
MCALLASTER 15 SE	38 51	101 14	.04	.07	.22	.24		.57	8:00A	UNKNOWN	" "	
MCPHERSON 4 N	38 27	97 39			4.25	3.00		7.25	AM	MR. OLSON	1" X 6" VICTOR	
MCPHERSON 5 NW	38 25	97 44			3.50	3.50		7.00	AM	JOE STRAKA	3/4" X 5 1/2"	
MCPHERSON 8 N	38 27	97 33			3.50	4.50		8.00	AM	MR. SUNDEEN	" "	
MCPHERSON 10 S	38 14	97 40			1.90	3.25		5.15		FLAMING	1" X 6" VICTOR	
MEADE 8 SW	37 14	100 28					1.50	1.50		JERRY GOLLIHER	3/4" X 5 1/2"	
MELVERN	38 30	95 38		TOTAL FOR PERIOD				10.32		WALTER MARSHALL	1" X 6" VICTOR	
MELVERN 6 NNE	38 35	95 36		5.85	7.00	3.75		16.60	AM	MRS. D. E. WILSON	ST. SIDED 5 GAL.	
MELVERN 7 E	38 30	95 31		9TH-----12TH				12.20		JESS FANNING	3/4" X 5 1/2"	

TABLE 6
SUPPLEMENTAL PRECIPITATION DATA
STORM OF JULY 9-13, 1951

LOCATION	LAT.	LONG.	AMOUNTS						OBS. TIME	REPT. BY	TYPE OF GAGE
			9	10	11	12	13	TOTAL			
MENTOR	38 44	97 36	.65	*	6.10	3.65		10.40		D. A. MAGNUSON	1" X 6" VICTOR
MENTOR 3 1/2 ENE	38 46	97 32		1.00	5.00	4.50		10.50	AM	HAROLD HEDSTROM	UNKNOWN
MENTOR 5 E	38 44	97 30		1.00	5.50	5.00		11.50+	AM	HERB RINGQUIST	3/4" X 5 1/2"
MICHIGAN VALLEY	38 42	95 31		9TH-----12TH				12.00E		MRS. HAROLD SUPPLE	5 GAL. STONE JAR
MICHIGAN VALLEY 1 SE	38 41	95 30	2.80	4.10	4.60	.31		11.81	7-9A	ALLEN	UNKNOWN
MICHIGAN VALLEY 4 NW	38 43	95 34		3.00	3.50	4.00		10.50	NOON	FRED BOND	"
MILFORD	39 10	96 55	*	*	11.50			11.50		POSTMASTER	3/4" X 5 1/2"
MILFORD 1 SE	39 09	96 54	*	*	12.00			12.00		MR. BERGREN	"
MILFORD 3 SSW	39 07	96 55	4.00E	5.50	2.50			12.00E		MR. SCHWITZER	"
MILLER	38 38	96 00		4.40	3.40	3.80		11.60	PM	C. C. HOGLUND	1" X 6" VICTOR
MILLER 2 3/4 S	38 36	96 00		5.15	4.60	3.91		13.66		FRED HOLMES	3/4" X 5 1/2"
MILO 1/2 N	39 11	97 58		TOTAL FOR PERIOD				10.35		WILL CRAMB	"
MILTONVALE	39 20	97 27		TOTAL FOR PERIOD				7.50		ALBERT JOHNSON	"
MILTONVALE 3 NW	39 22	97 30	1.25	3.75	2.75			7.75		ALBERT BEANREGARD	"
MINNEAPOLIS	39 08	97 42	.45	3.70	2.00	.40	T	6.55	6AM	CRIM Q. THOMPSON	1" X 6" VICTOR
MINNEAPOLIS 8 ENE	39 10	97 34		TOTAL FOR PERIOD				7.87		O. E. HARDESTY	HOMEMADE
MINNEAPOLIS 10 NNW	39 16	97 46		.80	5.70	3.80		10.30	7PM	ARTHUR JOHNSON	1" X 6" VICTOR
MINNEAPOLIS 15 NW	39 17	97 54	.75	5.00	4.85		1.20	11.80		ANDREW KOSAR	3/4" X 5 1/2"
MINNEAPOLIS 17 NE	39 17	97 28		TOTAL FOR PERIOD				9.50		MRS. FRANK SHROYER	"
MINNEAPOLIS 30 ENE	39 15	97 10		5.00	3.50	5.50	.50	14.50		ALFRED LENHART	"
MONT IDA	38 13	95 23		9TH-----14TH				9.00E		J. YODER	"
MONTEZUMA	37 36	100 27		T	.10	.40	.40	.90	6:30A	A. J. BRUCKER	"
MONTROSE	39 47	98 05	.05	1.66	1.13	3.00		5.84		KENT R. SLAUGHTER	1" X 6" VICTOR
MORGANVILLE 4 NE	39 31	97 10		4.00	3.00	1.75		8.75		BYRON HANSON	3/4" X 5 1/2"
MORGANVILLE 5 WSW	39 26	97 18		4.50	2.50			7.00		W. T. ROENICK	"
MORLAND 1 1/2 W	39 21	100 07		2.20	4.20			6.40		HENRY SCHMID	"
MORROWVILLE	39 50	97 10		4.40	2.00	1.00		7.40	8:30A	GEO. THOMAS	"
MORROWVILLE 4 1/2 NNW	39 54	97 11		3.75	1.00	1.50		6.25	5-6A	LEWIS CUMMINGS	HOMEMADE
MORROWVILLE 6S	39 45	97 09		4.00	2.00	2.00		8.00	7AM	EARL CRAFT	3/4" X 5 1/2"
MOUND CITY 10 NW	38 13	94 58	2.00	1.75	2.25	2.75	4.00	12.75	AM	F. D. KNIGHT	"
MOUND RIDGE	38 13	97 31			2.13	1.90		4.03	AM	ZERGGER	COLLECTOR ON ROOF
MOUND RIDGE 7 ENE	38 14	97 23			3.00	3.30		6.30		PETE CLAUSSEN	3/4" X 5 1/2"
NARKA 1 1/2 N	39 58	97 25	.35	5.51	.84	1.07		7.77		FRANK ZACH	STD. 8"
NATOMA 3 N	39 15	99 01		5.50	2.10			7.60		W. FORTMILLER	1" X 6" VICTOR
NATOMA 3 1/2 SE	39 10	99 00	.25	5.60	1.00	T		6.85		GEORGE O. GREENE	3/4" X 5 1/2"
NATOMA 5 NNE	39 15	98 59	.35	.03	5.30	2.28		7.96		E. H. KREFT	1" X 6" VICTOR
NATOMA 9 N	39 19	99 01		TOTAL FOR PERIOD				9.30		O. SARVER	"
NATOMA 9 E	39 13	98 51	.20	*	7.50	.23		7.93		DEAN ELLIOT	3/4" X 5 1/2"
NAVARRE 1 1/2 W	38 48	97 08	*	7.00	*	6.00		13.00		UNKNOWN	"
NEAL	37 51	96 05	2.00	2.50	2.25		.50	7.25		E. R. MAHAFFA	ST. SIDED CAN
NEAL 5 N	37 55	96 05	*	*	9.00			9.00		B. W. SHEPARD	HOG TROUGH ST SIDED
NEOSHO FALLS	38 01	95 33	.70	2.80	2.75			6.25		OSCAR ZINK	3/4" X 5 1/2"
NESS CITY	38 27	99 54	.10	T	2.40	.50		3.00	7AM	HENRY BORGER	1" X 6" VICTOR
NETAWAKA 1 NW	39 37	95 45		TOTAL FOR PERIOD				10.00		ALVA OMON	3/4" X 5 1/2"
NEW CAMBRIA 4 N	38 56	97 30	T	4.00	4.05			8.05		GLEN ALLEY	"
NEWMAN	39 05	95 27		1.50+	6.25		.25	8.00E		HOMER THOMASON	"
NEWTON 6 S	37 57	97 20			1.40	.65		2.05		J. F. SCHAEFFER	"
NEWTON 10 E	38 04	97 10		9TH-----14TH				6.00E		WALDO REMPLE	MISC.
NEWTON 13 N	38 15	97 25		TOTAL FOR PERIOD				6.00E		J. W. FREY	GAL. FRUIT CAN
NILES 2 E	38 58	97 26		TOTAL FOR PERIOD				9.20		O. E. BILGER	3/4" X 5 1/2"
NORTON	39 50	99 54	.50	2.48	1.51	.03		4.52		H. P. WOERTENDYKE	"
NORTONVILLE	39 25	95 20	.50	1.65	2.38	2.60		7.13		CITIZENS STATE BANK	UNKNOWN
NORWAY 1/2 E	39 42	97 46	.25	2.25	2.35	1.10		5.95		J. K. MELHUS	3/4" X 5 1/2"
NORWOOD 1 1/2 N	38 43	95 16		3.50	5.00+	3.50		12.00+		MRS. F. FERGUSON	"
NORWOOD 2 ESE	38 41	95 14		2.60	5.00	2.60		10.20		J. H. DOUGHERTY	"
NORWOOD 2 1/2 SE	38 41	95 13		2.70	6.00	2.90		11.60		W. E. SMITH	"
OAK HILL	39 15	97 21		4.75	4.25	4.00		13.00	8:30P	WILL H. HARDER	"
OAK HILL	39 15	97 21	2.00	1.70	3.30	3.20		10.20		D. O. FOLSOM	"
OAK HILL 4 NW	39 17	97 23		3.60	3.70	3.70		11.00		F. T. KITCHENER	"
OAK HILL 5 N	39 19	97 20		4.50	3.75	3.75		12.00	AM	CLARENCE MODERN	"
OAK HILL 5 E	39 15	97 15		3.35	4.25	4.10		11.70	AM	J. C. LLOYD	"
OBERLIN	39 50	100 31	T	.15	1.16	1.84		3.15	6PM	S. P. WORCESTER	"
OBERLIN 7 N	39 56	100 30	T	1.20	1.30			2.50	8AM	L. DAVID	1 GALLON CAN
OKETO	39 57	96 36		3.30	1.05		.20	4.55	9AM	J. H. MOORE	1" X 6" VICTOR
OKETO 4 W	39 57	96 39		.30	3.05	1.05	.08	4.48	9AM	HENRY HEGLAR	"
OKETO 6 E	39 57	96 29		*	4.50	.30		4.80	AM	G. F. MILLER	3/4" X 5 1/2"
OLATHE 4 N	38 57	94 50			3.00	3.50		6.50	6AM	GALE G. EASLY	"
OLATHE 5 W	38 53	94 55		TOTAL FOR PERIOD				7.50		EARNEST SMITH	STRAIGHT SIDED TROUGH
OLATHE 5 1/2 SE	38 49	94 45	.41	.61	3.45	2.74	T	7.21		U.S. NAVY GARDNER AIR BASE	UNKNOWN
OLIVET	38 28	95 45		2.50	6.00	3.50		12.00		LOUIS WEIMER	"
OLPE	38 16	96 10		3.62	7.00+	4.10		14.72+		OWEN BOLCH	"
OLPE	38 16	96 10		9TH-----14TH				15.00E		DELBERT STEVENSON	3/4" X 5 1/2"
OLPE 4 1/2 S	38 11	96 10		9TH-----14TH				13.00E		MRS. EMANUEL KLUMPE	"
OLPE 5 WNW	38 18	96 16		4.90	7.00+	4.00		15.90+		JOHN OWENS	"
OLPE 8 E	38 16	96 02		1.70	6.80	3.00		11.50		GEORGE ADAMS	"
OLPE 8 SW	38 11	96 17		3.00	9.25	3.00	.25	15.50		MRS. CECIL FARTHING	"
OLPE 8 WSW	38 13	96 19		TOTAL FOR PERIOD				13.50E		FRANK MOCKRY	3/4" X 5 1/2"
OLSBURG 2 SSW	39 26	96 37	*	*	9.00			9.00		RUBEN G. GUSTAFSON	1" X 6" VICTOR
ONAGA	39 30	96 10	*	*	4.50			4.50		OTTO BRUNKOW	3/4" X 5 1/2"
ONAGA 8 1/2 SSW	39 23	96 13		2.50	1.30	3.70		7.50	7AM	PAUL HARTWICK	"
OSBORNE	39 26	98 42	.35	2.95	3.15	.45		6.90		C. N. STORER	"
OSBORNE	39 26	98 42	1.20	3.60	3.40			8.20		SAM WOOLEY	STD. 8"
OSBORNE 1 E	39 26	98 39	.40	3.20	2.57			6.17		LESLIE COLWELL	1" X 6" VICTOR
OSBORNE 2 SE	39 25	98 40	.80	3.70	3.00			7.50		REX HASDON	3/4" X 5 1/2"
OSBORNE 5 ENE	39 27	98 36	.75	4.00	3.50			8.25		CHARLES KASEN	COFFEE CAN
OSBORNE 5 SSW	39 21	98 44		4.50	1.50	.50		6.50		PAUL BLISS	3/4" X 5 1/2"
OSBORNE 7 1/2 E	39 26	98 33	.20	4.50	2.58			7.28		O. H. MARY	1" X 6" VICTOR
OSBORNE 14 S	39 13	98 40		7.50	1.00	2.25		10.75		DALE APPLIGATE	3/4" X 5 1/2"
OTIS 3 1/2 NNW	38 35	99 05		TOTAL FOR PERIOD				4.50		MRS. FRANK TUZICKA	QUART CAN
OTTAWA 2 S	38 35	95 15	.15	3.25	5.00	*	2.56	10.96	7AM	C. A. BIEDERMAN	ST. SIDED GALLON CAN

TABLE 6
SUPPLEMENTAL PRECIPITATION DATA
STORM OF JULY 9-13, 1951

LOCATION	LAT.	LONG.	AMOUNTS					OBS. TIME	OBS.	TYPE OF GAGE	
			9	10	11	12	13				TOTAL
OTTAWA 5 NNW	38 40	95 18		2.38	5.40	3.29		11.07	7:30A	V. I. CROTTS	3/4" X 5 1/2"
OVERBROOK 4 W	38 47	95 38		2.40	3.80	4.40		10.60		ERNEST MEYERS	"
OZAWKIE	39 13	95 26	T	1.25	2.25	3.00		6.50		MRS. TEAFORD	"
PALCO 6 SW	39 11	99 48		.60	1.70	.30		2.60		F. ATCHISEN	"
PALCO 12 N	39 26	99 35			.20	4.30	5.45	9.95	6AM	E. E. STEWART	1" X 6" VICTOR
PALMER 2 1/2 NE	39 40	97 07		TOTAL FOR PERIOD				8.50		L. MEYER	"
PALMER 3 1/2 W	39 37	97 12		4.50	2.50	.90	.30	8.20	7AM	CHARLES HANSEN	3/4" X 5 1/2"
PALMER 4 1/2 N	39 42	97 09		4.50	1.00	2.80		8.30	7-8A	W. W. LAEFFLER	"
PALMER 8 1/2 SE	39 34	96 59	.10	5.15	2.00	1.00		8.25		TED HOGAN	1" X 6" VICTOR
PAOLA 6 NE	38 36	94 47		TOTAL FOR PERIOD				8.00E		RALPH COLER	UNKNOWN
PAOLA 13 W	38 35	95 07		TOTAL FOR PERIOD				9.90E		A. F. KNITTEL	3/4" X 5 1/2"
PARKER	38 21	95 00		TOTAL FOR PERIOD				6.00E		G. W. GUISANBERRY	1 LB. COFFEE CAN
PARKER 5 1/2 NE	38 23	94 53	1.50	2.00	1.00	2.50		7.00E		ROY STROUP	3/4" X 5 1/2"
PARKER 6 SE	38 17	94 55	*	2.20	2.00	1.90	.20	6.30		ORA HODGSON	"
PARKER 6 1/2 SE	38 16	94 54	*	*	*	6.00E		6.00E		L. T. TROUTMAN	"
PARKERVILLE	38 46	96 39		4.00	6.00	5.20		15.20		R. D. OWEN	SYRUP PAIL
PARKERVILLE 4 SE	38 43	96 36		4.50	3.50	2.50		10.50	AM	DAVE PICKOLET	3/4" X 5 1/2"
PARTRIDGE 4 SE	37 56	98 02		.16	.14		.12			W. PEIRCE	CENT. SCIENTIFIC CO.
PAWNEE	37 42	94 48		4.00	3.80	2.00		9.80E		D. S. MCCrackEN	3/4" X 5 1/2"
PAXICO	39 04	96 10		3.50	3.50	5.00		12.00	AM	BEN GOTZACKEN	"
PAXICO 1 W	39 04	96 11		2.00	3.00	4.00		9.00	PM	LEON MATHIES	1" X 6" VICTOR
PAXICO 4 SE	39 00	96 07		*	*	11.50		11.50		SAM CLARK	ST. SIDED 5 GAL.
PAXICO 7 N	39 10	96 09		4.50	4.50	.50		9.50		J. V. VANHOLE	3/4" X 5 1/2"
PEABODY 4 3/4 W	38 10	97 12			3.00	3.00		6.00		MRS. K. MUSTOE	"
PEABODY 4 SSE	38 06	97 05	.80	.15	2.80	2.50		6.25		MRS. ROY ELLIOTT	1" X 6" VICTOR
PENOEKEE	39 21	100 00	.15	.27	2.20	2.90		5.52	7AM	C. COLBURN	"
PEORIA 2 N	38 37	95 09	1.50	5.25	2.75	.50		10.00E		J. N. BURRUSS	3/4" X 5 1/2"
PERRY	39 05	95 24	1.00	2.00	4.50	5.50		8.00E		DON RICE	"
PIEDMONT	37 38	96 22	1.35		2.25	2.35	.20	6.15	7AM	L. E. GLOSCO	1" X 6" VICTOR
PIEDMONT 1 1/2 E	37 38	96 20		9TH-----14TH				6.00E		MRS. V. W. CONYERS	UNKNOWN
PIEDMONT 3 1/2 WNW	37 40	96 25	1.00	1.20	3.50		5.70			C. P. MCMILLEN	1" X 6" VICTOR
PIEDMONT 6 N	37 42	96 23		TOTAL FOR PERIOD				7.00E		H. H. DENCHFIELD	3/4" X 5 1/2"
PIQUA 3 WSW	37 54	95 34	1.50	.65	1.25	.50		3.90		WILL HANSLER	HOMEMADE
PLAINVILLE 8 1/2 E	39 14	99 08	.28	3.80	4.50	1.80		10.38		L. R. NEWLIN	1" X 6" VICTOR
PLEVNA 2 N	38 01	98 20	.10	.20	.20		.35	0.85		F. G. DAVIDSON	3/4" X 5 1/2"
POMONA	38 37	95 27	*	8.40	1.40	3.60		13.40		N. V. HUDELSON	"
POMONA 1 NE	38 38	95 26	.38	3.40	9.83	3.60		13.21		W. O. CAIN	8" CONTAINER
POMONA 2 S	38 35	95 27		*	*	11.40		11.40		J. D. R. DENNIS	3/4" X 5 1/2"
POMONA 4 NE	38 40	95 24		3.25	4.25	3.40		10.90	NOON	H. L. BACHELOR	"
PORTERVILLE 5 NNW	37 45	95 05		TOTAL FOR PERIOD				8.00E		BERT BENNETT	5 GAL. BUCKET
PORTIS	39 34	98 42	.18	1.85	1.40	2.59		6.02	NOON	PORTIS POSTMASTER	"
PORTIS 9 W	39 34	98 52			4.10	3.00		7.10		C. R. BOWES	8" PIPE
POTWIN	37 57	97 02			1.15	.60	.60	2.35	AM	S. E. ANDERSON	1" X 6" VICTOR
POTWIN 5 N	38 00	97 01	.05		2.20	2.11		4.36		A. C. CLAUSSEN	"
POWHATTAN	39 45	95 38		4.50	2.50	1.00		8.00		EDWARDSON	"
PRAIRIE CENTER 2 ESE	38 52	94 56			3.25	3.50		6.75	AM	GEORGE DANA	ST. SIDED BUCKET
PRAIRIE CENTER 4 SSW	38 50	95 02		4.50	*	3.00		7.50		ALBERT FINLEY	3/4" X 5 1/2"
PRAIRIE CENTER 4 SSW	38 50	95 01		1.50	2.50	3.50		7.50E		CHAS. D. ROGERS	"
PRAIRIE VIEW	39 50	99 34			*	5.00E		5.00E		JAKE UTTMAN	"
PRATT 3 NNW	37 41	98 42		.63	1.28			1.91	7AM	UNKNOWN	STD. 8"
PRESMOTT 2 SSE	38 02	94 40	2.50	1.00	1.50	1.60	2.25	8.85E		J. L. SOUTHERLAND	3/4" X 5 1/2"
PRESTON 2 N	37 48	98 33	.30		.13	.02	.15	0.60		BEN JORNS	1" X 6" VICTOR
QUENEMO 2 1/2 SE	38 34	95 30	*	*	9.91			9.91		UNKNOWN	UNKNOWN
RAMONA	38 35	97 04		4.10	7.05	4.00		15.15	AM	OSCAR APPLEGATE	1" X 6" VICTOR
RANDOLPH 5 1/2 NE	39 31	96 40			8.00+	1.62		9.62+	AM	LUKE EDOFE	"
RANDOLPH 7 NW	39 30	96 48		TOTAL FOR PERIOD				9.15		H. OLANZER	FRUIT JUICE CAN
RANDOLPH 7 NNW	39 32	96 44		4.00	1.75	2.75		8.50	PM	CHAS. SCHWARTZ	1" X 6" VICTOR
READING 3 W	38 31	96 00	5.00	5.00	3.00	2.00		15.00		MRS. ALBERT HOAG	UNKNOWN
READING 5 W	38 32	96 03		8.00	4.50	3.50		16.00		JESS BARFIELD	3/4" X 5 1/2"
READING 6 SW	38 28	96 03		7.00+	4.00	MSG.		11.00+		MRS. C. E. JONES	ST. SIDED BOILER
READING 7 SSW	38 26	95 59		2.90	5.00	5.10		13.00	NOON	JAKE SATTLER	3/4" X 5 1/2"
REAGER 3 NE	39 53	100 03		.20	1.40	2.60		4.20		LES WARREN	"
REAMSVILLE 5 ENE	39 57	98 47		1.00	1.50	1.70		4.20		LEE BUCK	"
REDFIELD	37 51	94 53		TOTAL FOR PERIOD				8.00		T. H. TURNER	3 GAL. 6" DIA. JAR
REECE 3 S	37 45	96 28	3.25		2.20	.75	.50	6.70	AM	MISS ALTHEA HAMMER	3/4" X 5 1/2"
RENO 1 E	39 03	95 07	.30	2.65	4.10	.75		7.80		MR. BARNHARD	"
REPUBLIC	39 56	97 50		TOTAL FOR PERIOD				7.80		E. F. JOHNSON	"
REPUBLIC 2 3/4 WNW	39 56	97 52		1.85	3.15	1.37		6.37	6AM	DON CHARLES	STD. 8"
REXFORD	39 28	100 44			1.50	2.70		4.20	9AM	REXFORD STATE BANK	6" DIA. COLL. 2" CYL.
RICE 3/4 SE	39 35	97 33	.65	1.86	*	2.35		4.86		ORVILLE DOGEN	STD. 8"
RICE 11 WSW	39 30	97 45		3.50	1.75			5.25		TED ELSTROM	3/4" X 5 1/2"
RICHLAND 4 N	38 56	95 32		9TH-----12TH				11.00		W. M. FERREL	"
RICHLAND 5 N	38 58	95 30		9TH-----12TH				7.25		JACK SCHWEMINER	"
RICHMOND	38 25	95 16		*	5.90	3.40		9.30		A. O. SIGLER	1" X 6" VICTOR
RICHMOND 4 E	38 25	95 10		1.75	6.75+	1.00		9.50E		MRS. K. A. CUNNINGHAM	3/4" X 5 1/2"
RICHMOND 7 W	38 23	95 23		9TH-----12TH				10.00		LELAND LOGAN	ST. SIDED CAN
RICHTER	38 36	95 23		3.50	6.75	2.75		13.00E		S. T. FISHER	6" X 6 3/4" CAN
RILEY 7 SW	39 13	96 56		5.00	3.80	4.00		12.80	AM	HARRY DORNBERGER	3/4" X 5 1/2"
ROBINSON 5 NNE	39 53	95 22		9TH-----14TH				7.75		MR. JOHNSON	"
ROSE 2 1/2 WSW	37 47	95 44		9TH-----14TH				6.00		W. J. PRINGLE	"
ROSE 4 E	37 46	95 36		9TH-----14TH				6.00		H. A. KANNARD	"
ROXBURY	38 32	97 25	T.	6.75	3.50			10.25		R. CHRISTIANSEN	"
ROXBURY 5 W	38 33	97 30		5.20	3.76	.70		9.66		C. E. NELSON	"
ROXBURY 5 SE	38 30	97 23		5.00	5.00			10.00E		GEORGE MYERS	"
ROXBURY 6 WSW	38 30	97 31		5.25	3.65			8.90		C. G. ELGIN	1" X 6" VICTOR
RULETON 15 NNW	39 32	101 55		.09	.21	2.80		3.10		FLOYD M. KEMP	STD. 8"
RUSSELL	38 54	98 51		TOTAL FOR PERIOD				3.00		MRS. GEORGE RUGG	3/4" X 5 1/2"
RUSSELL	38 54	98 51	.03		.75	2.65		3.43		MRS. ETHEL BRANDENBURG	"
RUSSELL 2 S	38 53	98 51		TOTAL FOR PERIOD				5.00		PAT CROWE	"
SABETHA	39 54	95 48		.38	1.52	.95		2.85		FARMERS STATE BANK	2 1/2" X 6 1/2"

TABLE 6
SUPPLEMENTAL PRECIPITATION DATA
STORM OF JULY 9-13, 1951

LOCATION	LAT.	LONG.	AMOUNTS					TOTAL	OBS. TIME	REPORTED BY	TYPE OF GAGE
			9	10	11	12	13				
SAFFORVILLE 3 N	38. 27	96. 23		3.50	6.00	3.00		12.50	6AM	JEFF GRIFFITH	3/4" X 5 1/2"
ST. FRANCIS 4 S	39. 44	101. 46	T	T	1.70	3.60		5.30	AM	DELMONT PRICE	"
ST. FRANCIS 7 NW	39. 51	101. 54	.10		.30	1.40		1.80		KENNETH M. ZIMBELMAN	"
ST. GEORGE 1 NW	39. 13	96. 26		1.60	1.75	4.78		8.13		EARL TORREY	"
ST. JOHN 1/2 W	38. 00	98. 46	.08	.15	.85	.60	.20	1.88	AM	COLEN E. HOOVER	UNKNOWN.
ST. MARY 6 N	39. 17	96. 04		2.85	1.75	4.75		9.35		MORRIS COLEMAN	"
SALEM	39. 53	98. 29	.50	2.25	1.50			4.25		CHARLES DUTTON	3/4" X 5 1/2"
SALEM 8 S	39. 45	98. 30		2.65	1.65			4.30		JOHN SINK	STD. 8"
SALINA	38. 50	97. 36		TOTAL FOR PERIOD				7.50		F. A. YOUNG	UNKNOWN
SALINA	38. 50	97. 36		9TH-----12TH				5.80		CHARLES H. ROESER	3/4" X 5 1/2"
SALINA	38. 50	97. 37	.20	4.60	4.24			9.04		J. B. CANNING	"
SALINA	38. 50	97. 36	.10	.26	4.35	5.20		9.91		I. R. RICKLEFS	1" X 6" VICTOR
SALINA 3/4 N	38. 52	97. 37	.22	.20	3.90	4.70	.65	9.67		ROBERT KELLEY	"
SALINA 4 E	38. 50	97. 32		1.20	4.60	4.50		10.30		PANGHAM	3/4" X 5/2"
SALINA 4 N	38. 55	97. 36		*	*	8.50+		8.50+		HUMBARGER	"
SALINA 5 NE	38. 53	97. 32	.20	4.50	*	5.00+		9.70+		SYDNEY VIDRIKSEN	"
SALINA 7 NNW	38. 55	97. 39		.50	4.00	5.00		9.50	7AM	R. V. KNOLLES	"
SALINA 8 NE	38. 55	97. 29	.85	*	*	9.80		10.65		SHANK	"
SALINA 8 ESE	38. 47	97. 29	.90	*	4.80	3.65		9.35		A. W. SUNDRGREEN	"
SALINA 8 N	38. 58	97. 37		9TH-----12TH				7.80		V. H. TROW	1" X 6" VICTOR
SALINA 8 1/2 NNW	38. 57	97. 40		.14	5.20	3.10		8.44		VERNON S. MC CALL	"
SCANDIA	39. 48	97. 47	*	2.37	1.00	1.25		4.62		MRS. F. H. RICHARDS	"
SCOTT CITY 8 ESE	38. 26	100. 45			.05			.05	6PM	JOHN C. DAUBERT	STD. 8"
SCOTT CITY 10 NW	38. 34	101. 04		.28	.07	.04		.39	7PM	BERNARR H. NELSON	STD. 8"
SCOTT CITY 12 NE	38. 34	100. 46	.21	.52				.73		BURDETT PATTON	3/4 X 5 1/2"
SCOTT CITY 14 NW	38. 39	101. 02	.24					.24		ALBERT DIRKS	STD. 8"
SCRANTON 3 SE	38. 45	95. 42	*	*	*	11.50		11.50		G. E. EVERETTOWE	1" X 6" VICTOR
SCRANTON 4 SE	38. 45	95. 41		4.00	2.87	4.13		11.00E		M. P. JORGENSON	10" CAN
SELDEN	39. 32	100. 34			2.05	2.70		4.75	8AM	FRED STROHWIG	STD. 8"
SENECA	39. 50	96. 04	.09	2.46		1.20	1.29	5.04		MR. CIGNA	1" X 6" VICTOR
SEVERY	37. 37	96. 14		TOTAL FOR PERIOD				7.00E		F. H. OLSEN	3/4" X 5 1/2"
SEVERY 3 1/2 NW	37. 40	96. 17	.75		1.38	.63	2.13	4.89		MRS. G. H. BUSS	"
SHALLOW WATER 4 1/2SSW	38. 19	100. 56		.05	.24	.03		0.32	6PM	W. F. PILE	STD. 8"
SHARON SPRINGS 6 SE	38. 49	101. 39		.06	.21	.23	.03	0.53	7AM	KINDSWATER	3/4" X 5 1/2"
SHARON SPRINGS 15 SE	38. 45	101. 33		.12	.16	T		0.28	7AM	SCHUMAN	ST. SIDED CAN
SHARPE 1 NE	38. 17	95. 40		.93	5.85+	1.60	1.02	9.40+		G. W. HESS	UNKNOWN
SHIELDS 2 NW	38. 37	100. 27			1.10		.20	1.30	7AM	R. J. TILLOTSON	3/4" X 5 1/2"
SHIELDS 12 NNW	38. 46	100. 29			.80			1.00	6:30A	KERMIT JOHNSON	"
SKIDDY 2 SSW	38. 51	96. 48		3.50	5.00	5.50		14.00E		MRS. NEYER	"
SMITH CENTER 7 NNE	39. 51	98. 45	T	1.45	1.30	1.20		3.95	8AM	CHARLES LIBBY	"
SMOLAN	38. 44	97. 41		*	7.00	3.75		10.75	8AM	E. E. MAGNUSON	5 GAL. PAINT CAN
SOLDIER 1 NE	39. 32	95. 57		9TH-----14TH				7.00E		S. B. THOMAS	3/4" X 5 1/2"
SOLDIER 5 S	39. 28	95. 56		11TH-----14TH				4.50E		MR. OSBORNE	FRUIT JAR
SOLOMON 2 N	38. 57	97. 23		1.00	5.00	4.00		10.00		LANGDON	TIN CAN
SPEARVILLE 7 1/2 SE	37. 45	99. 41		4.70	1.50	.85		7.05	6AM	WILLIAM TEOAT	1" X 6" VICTOR
SPEED	39. 40	99. 26			4.10	1.80		5.90	7AM	W. STUDLEY	3/4" X 5 1/2"
SPRING HILL 5 E	38. 44	94. 45		TOTAL FOR PERIOD				7.00E		V. M. BECK	STRAIGHT SIDED BKT.
STERLING	38. 12	98. 12		.47	1.72	1.10		3.29		STERLING BULLETIN	UNKNOWN
STICKNEY 3 1/2 NE	38. 41	98. 47	.02	.15	1.25	1.10	1.05	3.57		F. T. WOODWARD	1" X 6" VICTOR
STILWELL 1 1/2 S	38. 44	94. 40		TOTAL FOR PERIOD				7.00E		JOHN PFANES	3/4" X 5 1/2"
STILWELL 4 N	38. 49	94. 40			4.30	3.00+		7.30+		FRED STIFTER	"
STOCKDALE	39. 18	96. 39		2.80	3.60	2.30		8.70	7:30A	RAY SPRINGER	"
STOCKDALE 7 E	39. 18	96. 31		TOTAL FOR PERIOD				9.75		ROY CHAPMAN	"
STOCKTON 6 NE	39. 31	99. 12	2.60	4.00	2.30	1.80	.40	11.10		EDWARD J. RIFFIE	"
STOCKTON 7 WNW	39. 30	99. 23		1.90	4.50	2.60		9.00		GEORGE GAINS	"
STOCKTON 10 W	39. 27	99. 27	.25	3.10	2.65	1.15	.10	6.25		MERL GRIEBEL	"
STRONG CITY 1 1/4 NE	38. 24	96. 32			5.10	4.60	3.20	12.90		J. E. DANFORD	"
STRONG CITY 2 1/2 E	38. 24	96. 30		3.90	5.25	3.00		12.15	8AM	FRANK FREY	1 GAL. ZEREX CAN
STRONG CITY 7 N	38. 29	96. 33			6.00	3.20		9.20		D. E. PARK	1" X 6" VICTOR
STUTTART	39. 48	99. 26			3.00	2.00		5.00	9AM	RAILROAD AGENT	3/4" X 5 1/2"
SUMMERFIELD	40. 00	96. 20		.75	1.75	1.50		4.00		E. R. LINDENBERG	"
SUN CITY 1 1/2 NW	37. 24	98. 55			.80	.60	1.20	2.60	AM	IRL SHUTTS	"
SUN CITY 4 N	37. 27	98. 55				.15	1.90	2.05		ARCHIE FREEMAN	"
SYLVAN GROVE 3 1/2 ESE	39. 00	98. 20		TOTAL FOR PERIOD				6.50		DAN TRAPP	"
SYLVAN GROVE 7 S	38. 55	98. 24	.50		1.75	.90		3.15		FRED HAMEIER	UNKNOWN
TALMAGE 1/2 S	39. 01	97. 15	2.25	*	3.80	4.80		10.85		ALGA GLIFF	1" X 6" VICTOR
TALMAGE 2 WNW	39. 02	97. 17		9TH-----14TH				12.00E		MOREHOUSE	3/4" X 5 1/2"
TALMAGE 3 E	39. 02	97. 12		3.10	3.00		5.40	11.50		K. E. CAVENDER	"
TALMAGE 6 ESE	39. 00	97. 10		3.80	3.30	5.00	1.20	13.30	AM	KUNTS	"
TAMPA	38. 33	97. 09		1.70	6.70	2.60		11.00		WILLIAM STORY	"
TAMPA	38. 33	97. 09		1.90	6.20	2.50		10.60	7AM	CONNIE RAUCHMAN	"
TESCOTT 3 S	38. 58	97. 53		MSG.	4.75	2.25		7.00+		W. D. GRASSIE	"
TESCOTT 4 E	39. 01	97. 48	.20	6.50	1.50			8.20		MRS. A. C. PERRY	"
TETERVILLE 4 SE	38. 01	96. 23		9TH-----14TH				9.00E		GEORGE WILBERSON	UNKNOWN
THAYER 2 1/2 SW	37. 28	95. 30		2.00	.25	.45	.45	3.15		H. M. WOOD	"
TIPTON	39. 20	98. 28		TOTAL FOR PERIOD				5.30		REV. WM. ENGELKE	3/4" X 5 1/2"
TIPTON	39. 20	98. 28		3.00	4.00	1.50		8.50		JOHN I. PFEIFFER	"
TIPTON 2 S	39. 18	98. 28		7.00	3.00			10.00		A. F. GASPER	5 GAL. PAINT BKT.
TIPTON 6 1/2 NNW	39. 26	98. 28		5.00+	5.00+			10.00+		WALDO NEWGIST	UNKNOWN
TIPTON 8 SSW	39. 14	98. 32		3.66	*	6.25		9.91		GEORGE HABBIE	3/4" X 5 1/2"
TORONTO 4 ESE	37. 47	95. 53	1.60	1.80	1.70	.80	1.15	7.05		HENRY C. BURKLE	"
TORONTO 6 SW	37. 45	96. 01		TOTAL FOR PERIOD				6.00E		FRED JAMISON	CAN
TROY 1 E	39. 47	95. 05	*	2.15	.65	.30		3.10		UNKNOWN	UNKNOWN
ULYSSES 12 SW	37. 29	101. 27		.33	.09	T	.08	0.50		E. A. KEPLY	12" TAYLOR
ULYSSES 10 1/2 SE	37. 28	101. 13			.35	.15	.15	0.65		MRS. CLYDE SMITH	3/4" X 5 1/2"
UNIONTOWN 1 N	37. 51	94. 58	*	4.00	1.00	1.50		6.50		J. KIRKPATRICK	"
UPLAND	39. 05	97. 01		3.70	2.50	5.35		11.55	AM	ELMER HOYT	"
VALENCIA 2 S	39. 03	95. 53		3.50	4.25			7.75	6PM	CHARLES WIERGEVER	"
VERSPER 3 N	39. 05	98. 17	.15	4.50	1.70	.25		6.60		PAUL NIELSON	"
VERMILLION 1 1/2 S	39. 41	96. 16		1.60	1.50	2.75		5.85		DALE DANIALS	"

TABLE 6
 SUPPLEMENTAL PRECIPITATION DATA
 STORM OF JULY 9-13, 1951

LOCATION	LAT.	LONG.	AMOUNTS					TOTAL	OBS TIME	REPORTED BY	TYPE OF GAGE
			9	10	11	12	13				
VILETS 3 1/2 NNW	39 46	96 21	.24	1.50	1.25	1.60	4.59		H. VAN DORN	1" X 6" VICTOR	
VIRGIL	37 59	96 01	.25	3.00	2.50	2.50	8.25		D. W. JOHNSON	TIN CAN	
VOLLAND	38 57	96 24		1.38	5.05	3.90	3.83 14.16		OTTO KRATZER	1" X 6" VICTOR	
VOLLAND 1 NE	38 57	96 23		6.50	4.30	4.75	15.55	7AM	GEORGE THIERER	3/4" X 5 1/2"	
VOLLAND 5 1/2 NW	38 59	96 29		5.00+	3.65	3.75	12.40+		ROGERS	"	
WABAUNSEE 2 ESE	39 08	96 18		5.50	3.00	.50	9.00		REX FOLTZ	"	
WABAUNSEE 4 1/2 ESE	39 06	96 16		MSG.	5.00	2.00	7.00+		HATFIELD	"	
WAKARUSA 1 1/2 S	38 52	95 42		1.50	2.70	2.70	.90 7.80	7AM	GORDON VOGLER	1" X 6" VICTOR	
WAKEENEY 6 1/2 WNW	39 05	100 00	.41	.08	1.18	.32	1.99		LEO MALLINOWSKY	STD. 8"	
WAKEFIELD 3 SE	39 11	96 58		5.50	5.25	1.50	12.25		CLARENCE CARPENTER	3/4" X 5 1/2"	
WAKEFIELD 5 W	39 12	97 06		TOTAL FOR PERIOD			14.10		M. D. CARLSON	"	
WAKEFIELD 8 1/2 WSW	39 10	97 09		4.80	4.20	3.00	12.00		E. J. KOETICH	"	
WALDO 3 E	39 08	98 45	.15	4.60	.30	1.10	6.15		JOE LUDER	1" X 6" VICTOR	
WALKER 4 1/2 SSE	38 49	99 03	.30	T	1.25	1.00	2.55		B. J. WAGNER	"	
WASHINGTON 2 1/2 NNE	39 52	97 02		4.30	1.80		6.10	6-8A	F. GAYDUSEK	3/4" X 5 1/2"	
WASHINGTON 6 N	39 55	97 03		2.25	2.50	1.50	6.25		MRS. BEN DOEBELE	"	
WASHINGTON 7 ESE	39 47	96 56	*	*	*	5.50	5.50		A. J. BOLINGER	GALLON BUCKET	
WASHINGTON 11 NNE	39 58	97 01	.50	2.00	1.00	1.00	.25 4.50		SOPHIA BAKER	"	
WATERVILLE	39 41	96 44	.50	2.10	2.00	1.10	5.70	AM	ART GEYER	COLLECTOR ON ROOF	
WATERVILLE 5 1/2 N	39 46	96 44		4.70	1.60	.50	6.80		ORVILLE SCHELLER	"	
WATERVILLE 6 1/2 S	39 35	96 45		3.75	3.25		7.00	AM	ROLAND ROEPKE	HOMEMADE	
WATHENA	39 45	94 57		.50	1.55	.72	2.77		A. B. MEYER	3/4" X 5 1/2"	
WAVERLY 3 ENE	38 25	95 33		*	8.50		8.50		GEORGE BROWLES	"	
WAVERLY 4 S	38 20	95 36		8.00	2.00	MSG.	10.00+		CLYDE RICKMAN	"	
WAVERLY 5 SW	38 20	95 40		9TH-	- - -	-12TH	10.00		L. B. SHAFFER	ST. SIDED CAN	
WAVERLY 5 S	38 20	95 37		3.00	7.00	1.50	11.50		E. J. BENNET	ST. SIDED JAR	
WAVERLY 7 S	38 17	95 35		3.00	4.30	2.00	.50 9.80		SADIE CRUMB	3/4" X 5 1/2"	
WAVERLY 10 S	38 15	95 35		9TH-	- - -	-12TH	10.00E		H. R. NIELSON	CAN	
WAYNE 2 NE	39 44	97 31		.30	1.50	3.50	1.80 7.10	AM	FRANK KRASNY	3/4" X 5 1/2"	
WEBBER 6 WNW	39 57	98 09		TOTAL FOR PERIOD			5.15		L. W. FOWLER	"	
WEBBER 7 WSW	39 54	98 09		.50	2.50	1.50	4.50		CLAYTON QUIET	"	
WEBSTER 11 NW	39 31	99 35	.90	.30	2.30	1.30	.50 5.30		F. L. NICKOL	"	
WELDA	38 10	95 18		2.50	3.00	1.50	1.50 8.50		W. POOS	ST. SIDED CAN	
WESTMORELAND 5 SE	39 21	96 19		3.70	*	3.00	6.70		ANGUIL BLOOM	"	
WESTMORELAND 6 WNW	39 25	96 30		*	7.50	.70	8.20		RAYMOND PARKS	3/4" X 5 1/2"	
WESTMORELAND 7 NNE	39 29	96 26		*	4.00	3.50	7.50		J. KOLMAN	"	
WESTMORELAND 9 SSE	39 17	96 29	1.50	2.70	1.10	2.90	8.20		MARY ZOELLER	1" X 6" VICTOR	
WESTMORELAND 11 SW	39 18	96 33		3.79	1.90	1.29	6.98	AM	L. R. DRESSER	3/4" X 5 1/2"	
WESTMORE	39 37	95 49		1.15	2.00	1.75	4.90		CHARLES MAGER	1" X 6" VICTOR	
WHEATON 4 1/2 S	39 26	96 18		1.50	2.50	2.00	6.00	8AM	E. W. RIESEN	3/4" X 5 1/2"	
WHITE CITY	38 48	96 44		4.60	5.50	3.55	.70 14.35	8AM	WILLIAM BLYTHE	1" X 6" VICTOR	
WHITE CITY 1 S	38 47	96 44		6.00	5.00	4.00	15.00E	PM	CHARLES WALKER	3/4" X 5 1/2"	
WHITE CITY 1 1/2 NW	38 49	96 45		4.60	5.20	4.00	13.80		ELMER DICKMANN	"	
WHITE CITY 3 NE	38 50	96 42		5.00	5.25	4.50	14.75	PM	TED ALLEN	"	
WHITE CITY 5 E	38 48	96 38		4.20	5.70	5.30	15.20	7AM	W. M. HETTENBACK	"	
WHITE CITY 5 SW	38 47	96 48		4.25	5.00+	4.50	13.75+	7AM	ANDREW CLARK	"	
WHITE CITY 7 SSW	38 44	96 47		4.50	5.00	5.00E	14.50E		UNKNOWN	"	
WHITE CITY 8 WSW	38 48	96 52		*	*	15.00E	15.00E		HERPICH	"	
WHITEWATER	37 57	97 08		TOTAL FOR PERIOD			5.00E		MRS. O. W. MEYER	1" X 6" VICTOR	
WHITING 1 W	39 35	95 39	.09	*	3.33	T	3.42		FOREST PARKER	STD. 8"	
WILBURTON 4 SE	37 01	101 45		.20		.46	.66		JOHN ROWLAND	STD. 8"	
WILLIAMSBURG 3 1/2 NE	38 30	95 26		9TH-	- - -	-12TH	12.00E		W. G. RANSON	ST. SIDED STOCK TANK	
WILLMINGTON 8 W	38 45	96 05		9TH-	- - -	-12TH	14.00E		V. CONVERSE	5-GAL. PAINT BUCKET	
WILSEY 4 N	38 42	96 40	5.20	7.00	6.30		18.50		HOWARD STROUTS	3/4" X 5 1/2"	
WILSON	38 49	98 28		1.40	3.70		5.10	7AM	E. D. KLUBER	"	
WILSON 1 1/2 N	38 51	98 28		T	1.00	1.50	1.00	3.50		PAUL WHITMER	"
WINCHESTER	39 20	95 16	.67	.88	2.03	2.69	6.27		CHARLES FORSYTH	ALKA SELTZER BOTTLE	
WINDOM	38 23	97 55		4.00	3.70		7.70		J. A. COCHRANE	1" X 6" VICTOR	
WINDOM 3 1/2 N	38 27	97 55		*	* 9.33		9.33		D. V. HALBERT	3/4" X 5 1/2"	
WINIFRED	39 46	96 28		*	4.25	1.40	5.65		L. S. ROMBECK	"	
WINKLER 5 1/2 WNW	39 30	96 56		5.30	2.20	2.10	9.60		FRED RICHTER	1" X 6" VICTOR	
WINONA 7 SW	39 01	101 22		.66	.23		.89	8AM	UNKNOWN	"	
WOMER	39 58	98 43			2.75	2.50	5.25	AM	R. R. FLINT	GLASS JAR 2" X 6"	
WOODBINE	38 48	96 57	.18	4.42	5.00	3.26	.72 13.58	8AM	FRED FUGERABUND	1" X 6" VICTOR	
WOODBINE 1 NW	38 48	96 59		4.33	5.23	3.70	13.36		B. H. OESTERREICH	3/4" X 5 1/2"	
WOODBINE 4 W	38 48	97 03		*	*	15.00E	15.00E		MELVIN IHDE	5-GAL. PAINT BCKT.	
WOODBINE 8 W	38 48	97 07		3.65	5.00	5.00	13.65+	AM	ISSIT	3/4" X 5 1/2"	
WOODBINE 13 W	38 48	97 13		5.00	5.00	0.80	10.80	7AM	JOE BAUMON	"	
WOODBINE 22 W	38 48	97 22		4.75	4.50	2.75	12.00		UNKNOWN	"	
WOODSTON	39 27	99 06		.40	3.20	3.00	6.60	7AM	KENNETH ORR	1" X 6" VICTOR	
WOODSTON 5 SW	39 24	99 11	2.00			2.67	4.50 9.17	8AM	F. TAYLOR	"	
WOODSTON 6 1/2 NNW	39 32	99 07		.60	4.40	2.00	7.00		OSCAR GRIMES	3/4" X 5 1/2"	
YATES CENTER	37 53	95 44		10TH-	- - -	-14TH	5.00E		J. C. STREET	STD. 8"	
YATES CENTER 5 NE	37 56	95 40	1.40	1.60	2.20	1.60	.50 7.30		H. E. WAITE	3/4" X 5 1/2"	
YATES CENTER 7 NNW	37 58	95 47		3.00	3.00	3.00	1.00 10.00		JOHN MOLSON	FRUIT JAR	
YATES CENTER 9 NNE	38 00	95 42	1.60	2.20	3.60	3.00	10.40		C. F. LUKENS	3/4" X 5 1/2"	
YATES CENTER 11 N	38 03	95 46		2.00	3.00	5.40	10.40		CHARLES PECK	UNKNOWN	
ZURICH 1 E	39 14	99 26	.60	2.00	2.00	1.50	4.30	6AM	W. W. SMEE	3/4" X 5 1/2"	
ZURICH 5 SE	39 10	99 27	.50	.20	1.40	1.10	3.20	8AM	F. A. HALDMANS	"	

MISSOURI

AMORET 3 1/2 NNW	38 18	94 36		2.40	2.00	.70	5.10	AM	O. H. ROGERS	3/4" X 5 1/2"
BELTON	38 49	94 32		5.50	3.50		9.00	AM	T. H. KEENEY	"
BRONAUGH 1 1/2 E	37 42	94 27	.35	1.90	.08	.39	2.72	AM	J. G. SAATOFF	1" X 6" VICTOR
BUTLER 7 NE	38 18	94 12		TOTAL FOR PERIOD			6.00		ROY STEINER	3/4" X 5 1/2"
CAMERON	39 45	94 14	.28	.01	.93	.31	.22 1.75		CITY OF CAMERON	UNKNOWN
GARDEN CITY 1 1/2 E	38 34	94 10		1.30	2.00	1.65	4.95		M. L. BIRD	1" X 6" VICTOR
GRAIN VALLEY 5 NE	39 03	94 07		3.30	2.90	1.20	7.40		J. R. KIRBY	3/4" X 5 1/2"
HOLT	39 27	94 20		1.25	1.50	1.25	4.00		H. C. MUSBACH	TUBE 3" X 11 1/4"
JERICO SPRINGS	37 37	94 02	1.30	5.00	*	1.60	7.90	AM	W. C. GRANT	3/4" X 5 1/2"
LIBERTY	39 15	94 25		1.30	1.60	1.30	4.20		MRS. J. MILLER	"

TABLE 6
SUPPLEMENTAL PRECIPITATION DATA
STORM OF JULY 9-13, 1951

LOCATION	LAT.	LONG.	AMOUNT					TOTAL	OBS TIME	REPORTED BY	TYPE OF GAGE
			9	10	11	12	13				
LONE JACK 4 NNE	38 56	94 09	.90		3.60	T		4.50		C. W. JENKINS	3/4" X 5 1/2"
MILO	37 46	94 18		3.13	.56	.31		4.00	AM	E. S. LEVCUGH	"
ODESSA 5 1/2 W	39 00	94 03	1.50		3.00			4.50	AM	MRS. J. FORD	NO. 2 1/2 CAN
PAPINSVILLE 1 SW	38 04	94 13	*	*	2.85	.83	.60	4.28	4PM	H. STENCK	1" X 6" VICTOR
SHELL CITY 2 NW	38 02	94 08	.40	1.83	.42	.46	.07	3.18	PM	R. MAUS	STD. 8"
STOCKTON	37 42	93 48		TOTAL FOR PERIOD				7.00		W. CARLISLE	NO. 3 CAN
WESTON	39 25	94 54	.12	.50	1.48	1.70		3.80		RUSSEL	1" X 6" VICTOR
NEBRASKA											
AYR	40 26	98 26	*	*	4.00			4.00E		POSTMASTER	UNKNOWN
BLUE HILL	40 20	98 26	1.05	1.80	1.32			4.17	9AM	B. H.'S POWER & LIGHT	STD. 8"
CAMPBELL	40 18	98 44		2.95	1.45	1.25		5.65	7AM	F. ABLE	3/4" X 5 1/2"
CARLETON	40 18	97 41		1.50	.50			2.00		R. FRANK	"
CHESTER	40 00	97 37		2.50	1.00	.50		4.00E		PORT OF ENTRY	"
COWLES	40 10	98 26		3.25	*	*	5.50	8.75E		ELEVATOR OPERATOR	UNKNOWN
DAYKIN	40 19	97 17		.50	2.25	.87		3.62	AM	BILL STEWART	3/4" X 5 1/2"
DAYKIN 7 ESE	40 18	97 10		*	2.00	.50		2.50E		L. JARCHOW	"
DILLER	40 06	96 55		.90	1.90	1.00		3.80		S. C. HUTCHINSON	"
DILLER 7 N	40 12	96 55		1.00	.15	.10		1.25		J. ARNTT	"
ELLIS	40 13	96 53		.50	1.75	.75		3.00	AM	A. GIERLAS	"
ENDICOTT	40 04	97 05		1.10	1.90	.85		3.85		C. HALL	BRASS CYLINDER
FAIRBURY 4 1/2 S	40 04	97 11		2.30	4.50	2.00		8.80	AM	EMIL BRUNKOW	3/4" X 5 1/2"
FAIRBURY 6 SW	40 06	97 17		3.70	1.00	.40		5.10	AM	W. A. JANKER	"
FAIRBURY 6 S	40 02	97 10		3.25	1.50	.75		5.50		F. O. JONES	ALKA SELZER BOTTLE
FRANKLIN 7 SSW	40 01	99 00	*	*	3.50			3.50		UNKNOWN	3/4" X 5 1/2"
GLADSTONE 1/2 W	40 09	97 19		1.25		2.55		3.80		T. DUX	"
JANSEN	40 11	97 05		.83	1.88	.90		3.61		P. J. THIESSES	1" X 6" VICTOR
LIBERTY 4 1/2 NNW	40 08	96 30		.75	.75	.50		2.00	6PM	O. G. NORRIS	3/4" X 5 1/2"
MOUNT CLARE	40 11	98 14		4.80	1.50			6.30		MRS. F. SCHOTT	"
NORMAN	40 29	98 47		.69	1.36	1.07		3.12	8AM	H. BAIKSTEIR	STD. 8"
ODELL	40 02	96 48		*	2.00	1.00		3.00	8AM	R. BRINSON	3/4" X 5 1/2"
PLYMOUTH	40 18	96 59		2.25				2.25	AM	L. J. KOEPPF	1" X 6" VICTOR
REYNOLDS	40 03	97 20		*	4.55	1.50		6.05	6AM	T. ROGGE	3/4" X 5 1/2"
ROSELAND	40 28	98 33		.65	1.70	1.00		3.35	7AM	H. MUNGER	"
RUSKIN	40 09	97 52		3.60	2.10	1.02		6.72		N. E. JANASON	1" X 6" VICTOR
STEELE CITY 1/2 E	40 02	97 00		*	3.00	.60		3.60		L. H. PAYNE	3/4" X 5 1/2"
SUPERIOR 8 N	40 09	98 05		1.90	2.25	1.30	.60	5.45		MRS. F. BRAUN	"

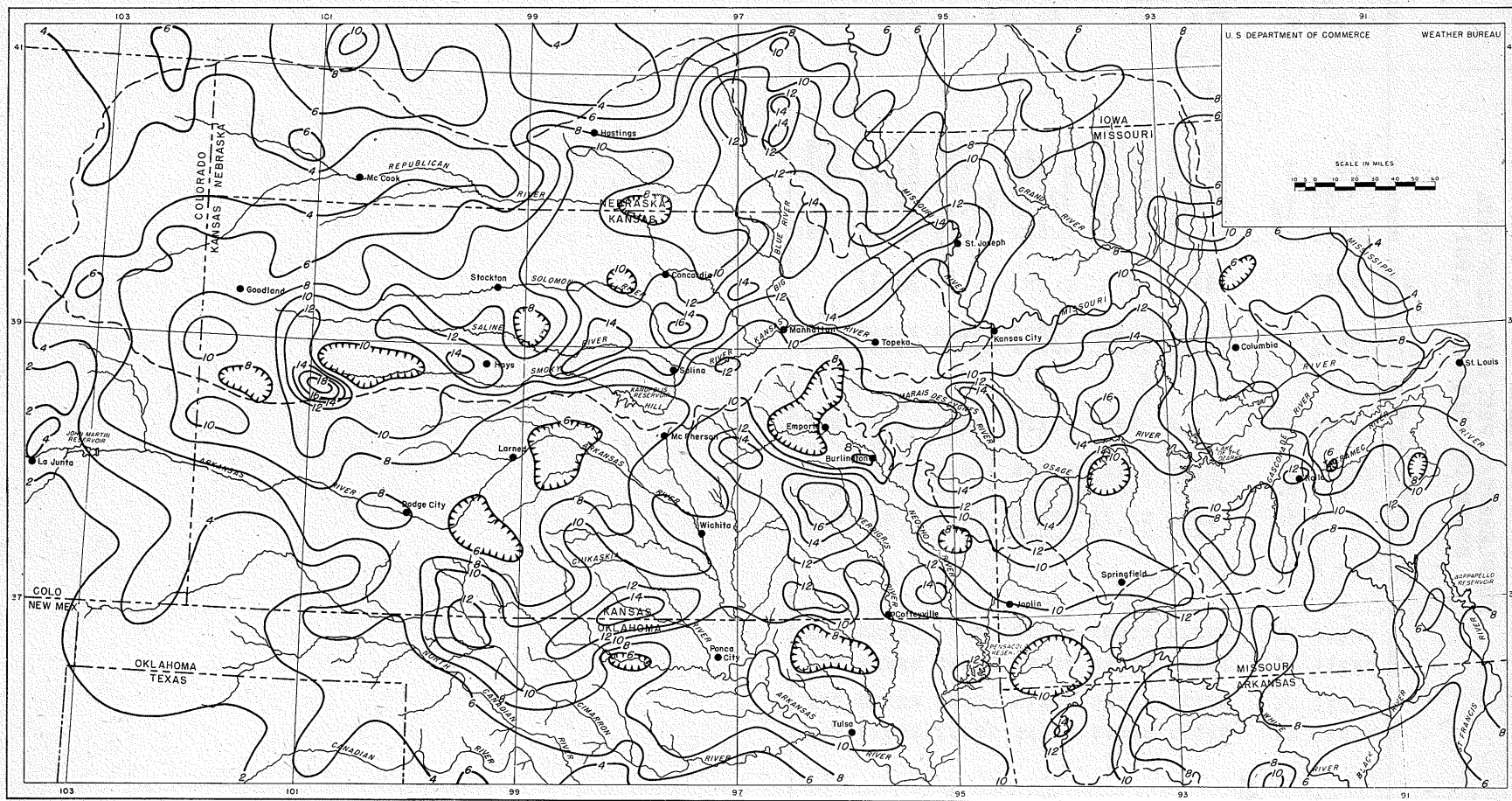


Figure 5.--Total precipitation for June 1951

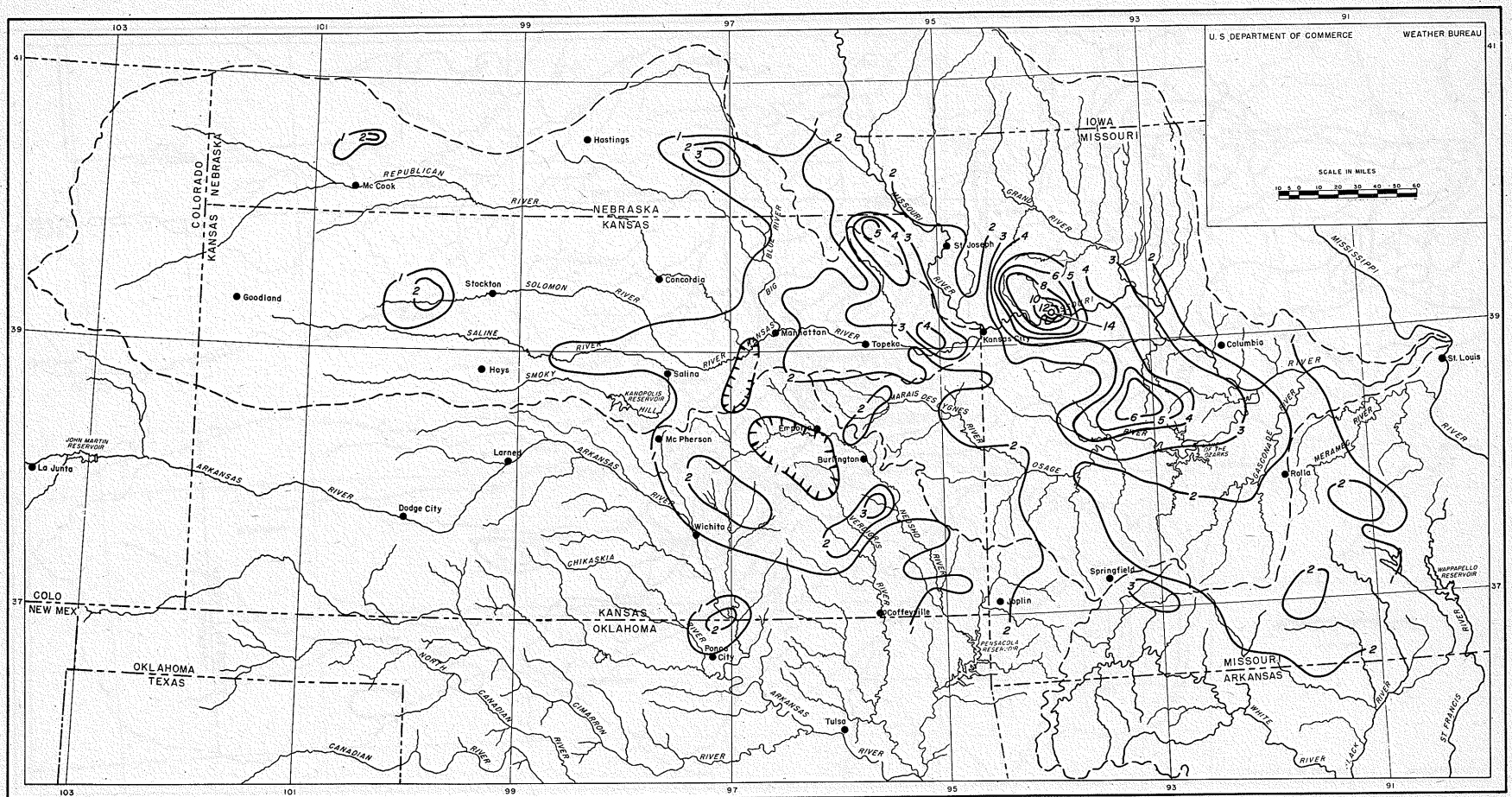


Figure 6.--Total precipitation, July 1-8, 1951

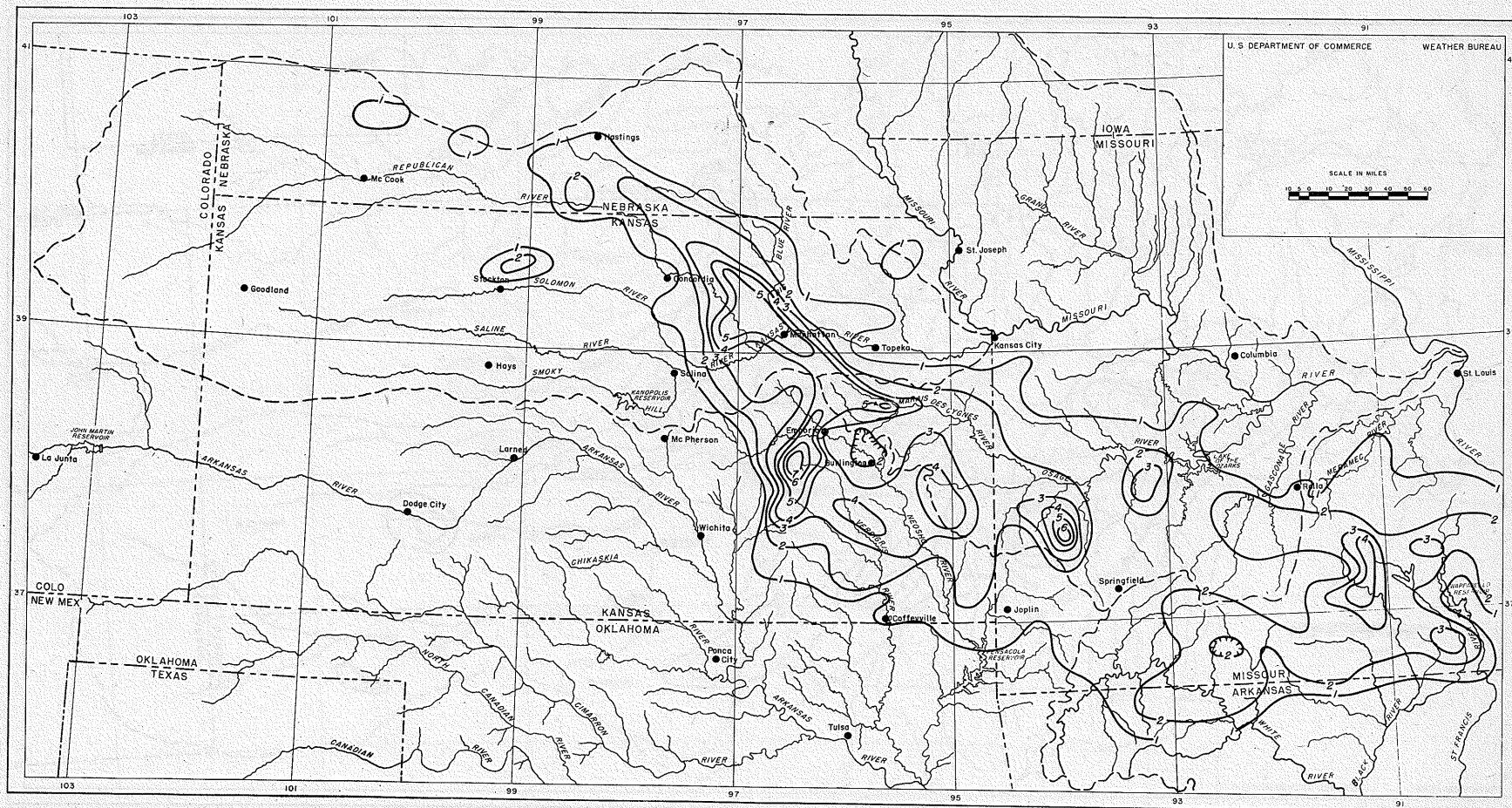


Figure 7.--24-hour precipitation, noon July 9 to noon July 10, 1951

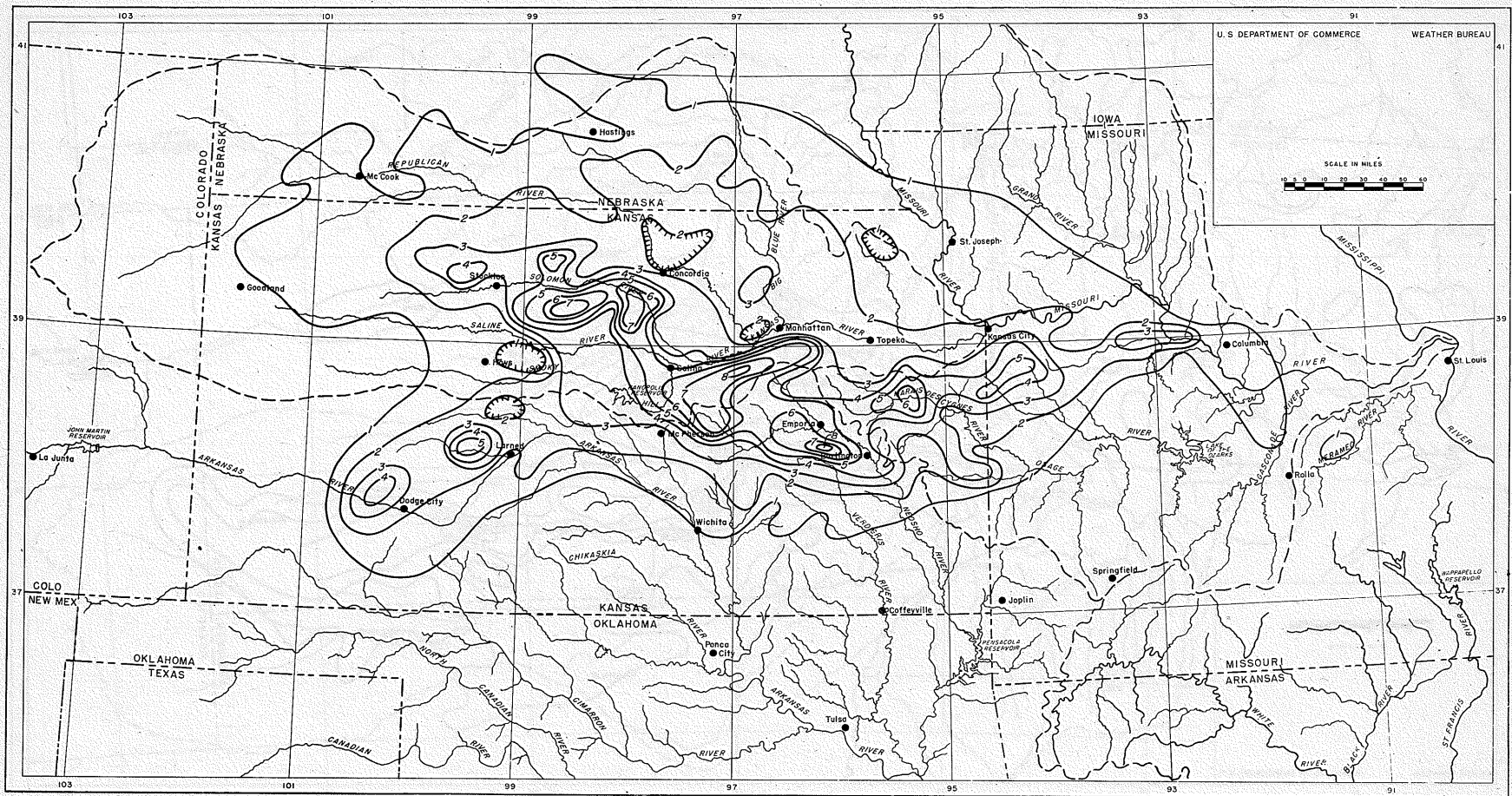
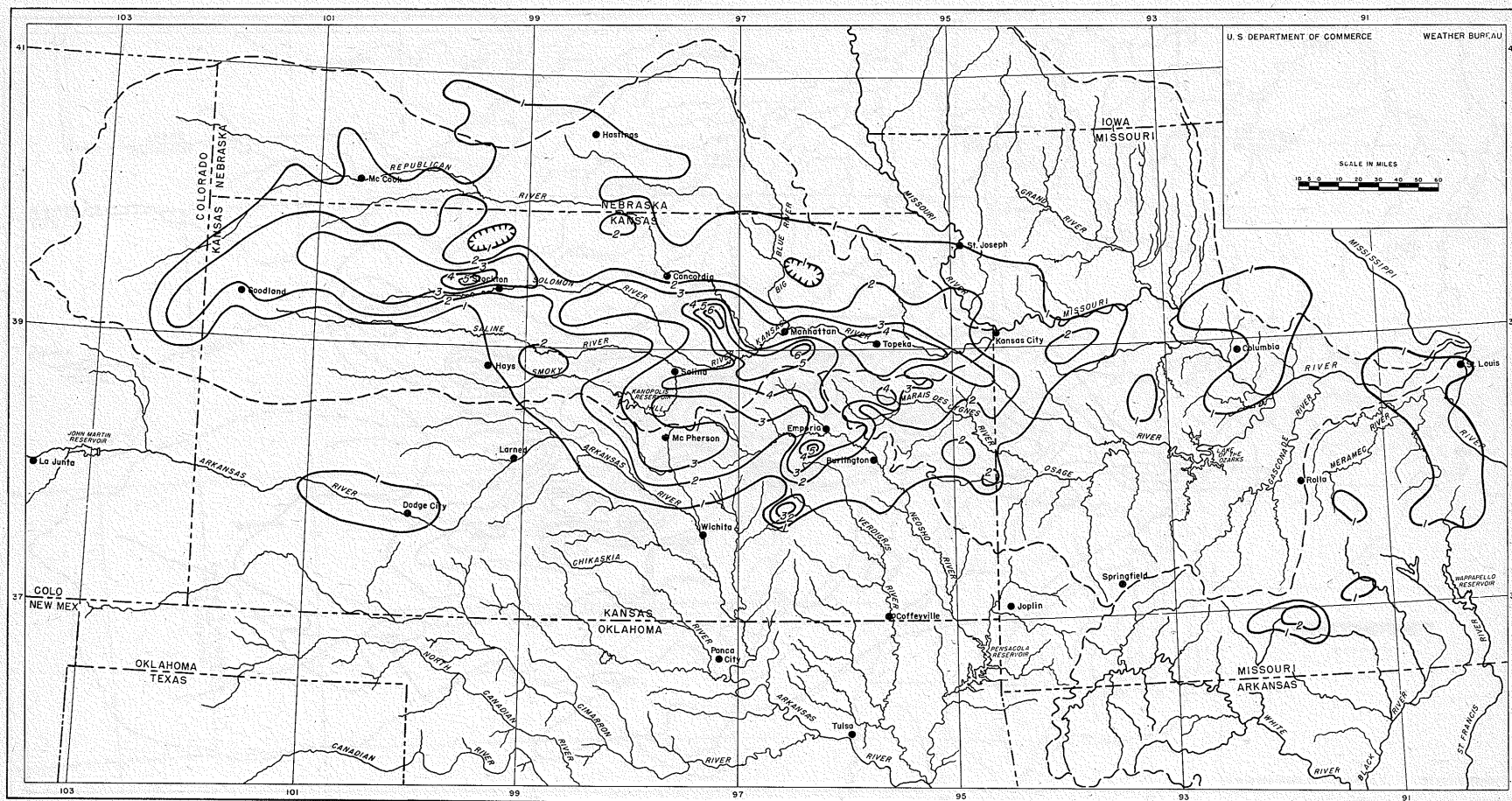


Figure 8.--24-hour precipitation, noon July 10 to noon July 11, 1951



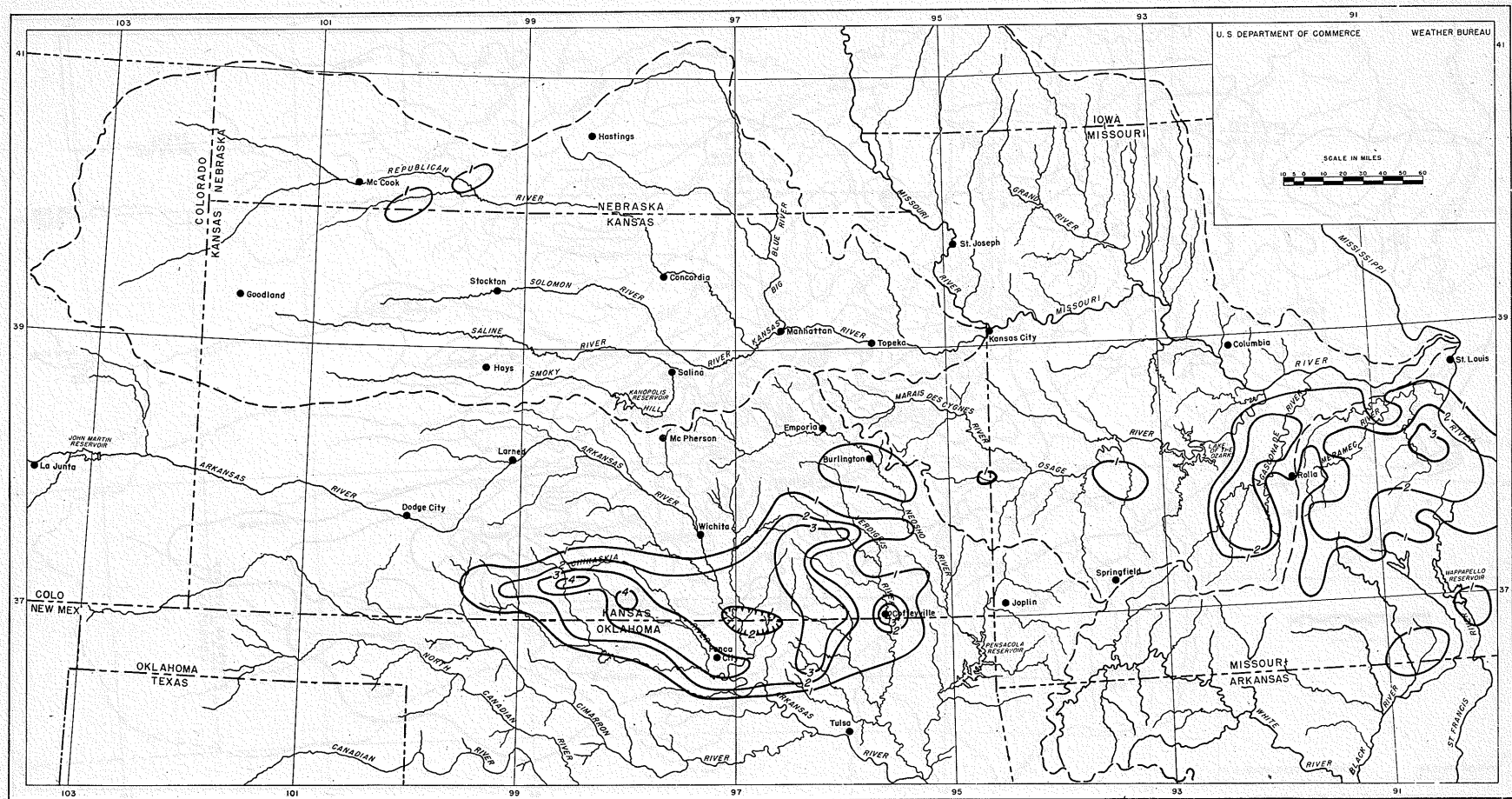


Figure 10.--24-hour precipitation, noon July 12 to noon July 13, 1951

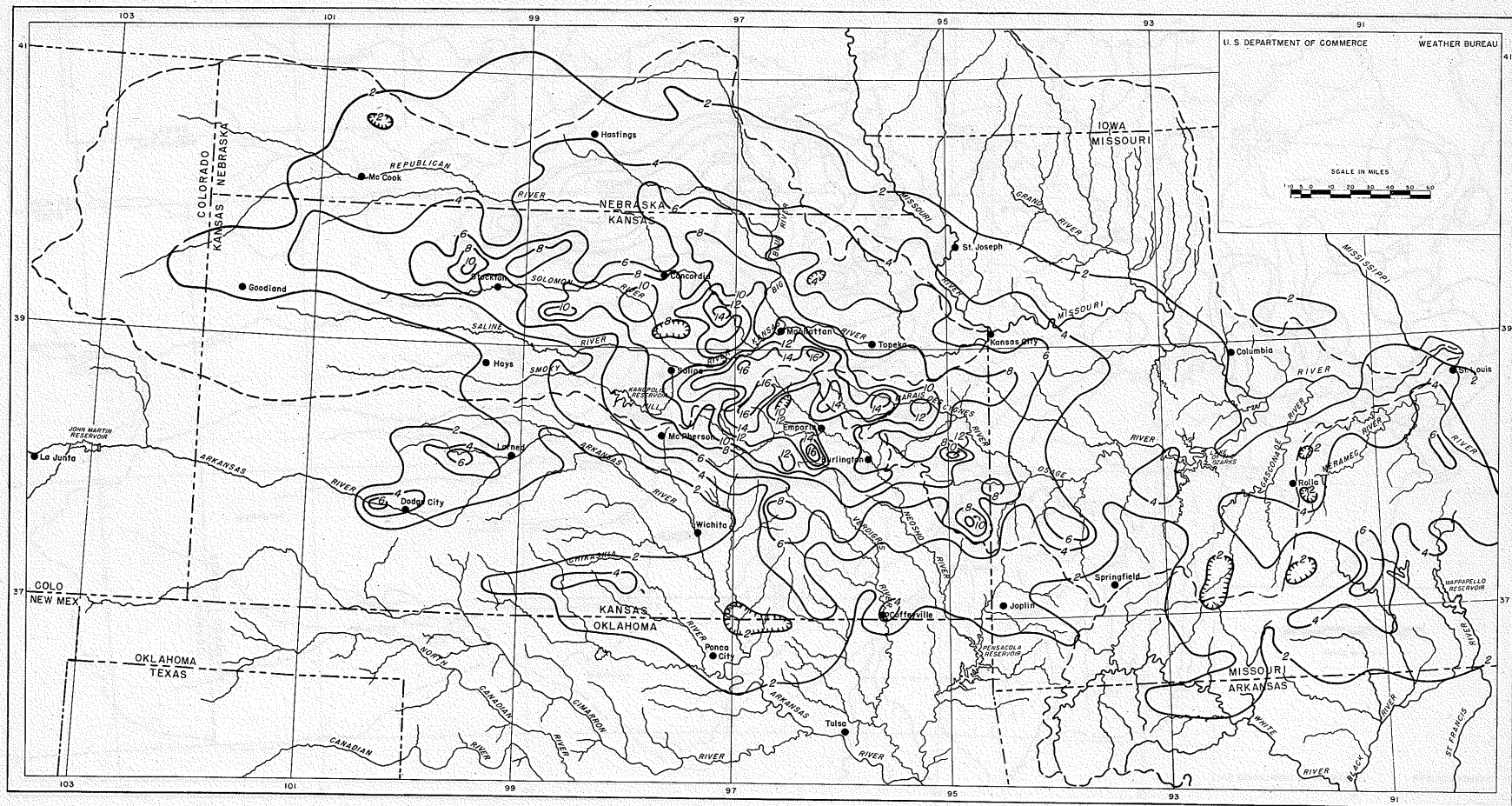


Figure 11.--Total precipitation for storm of July 9-13, 1951

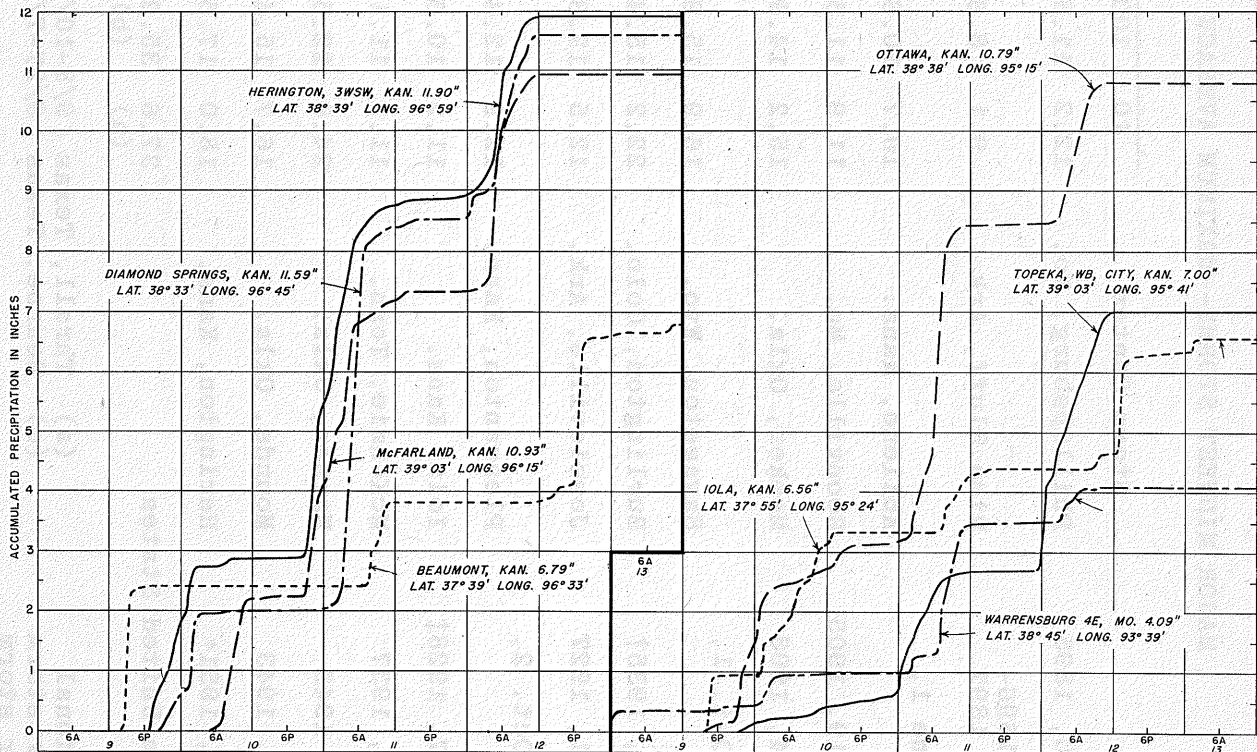
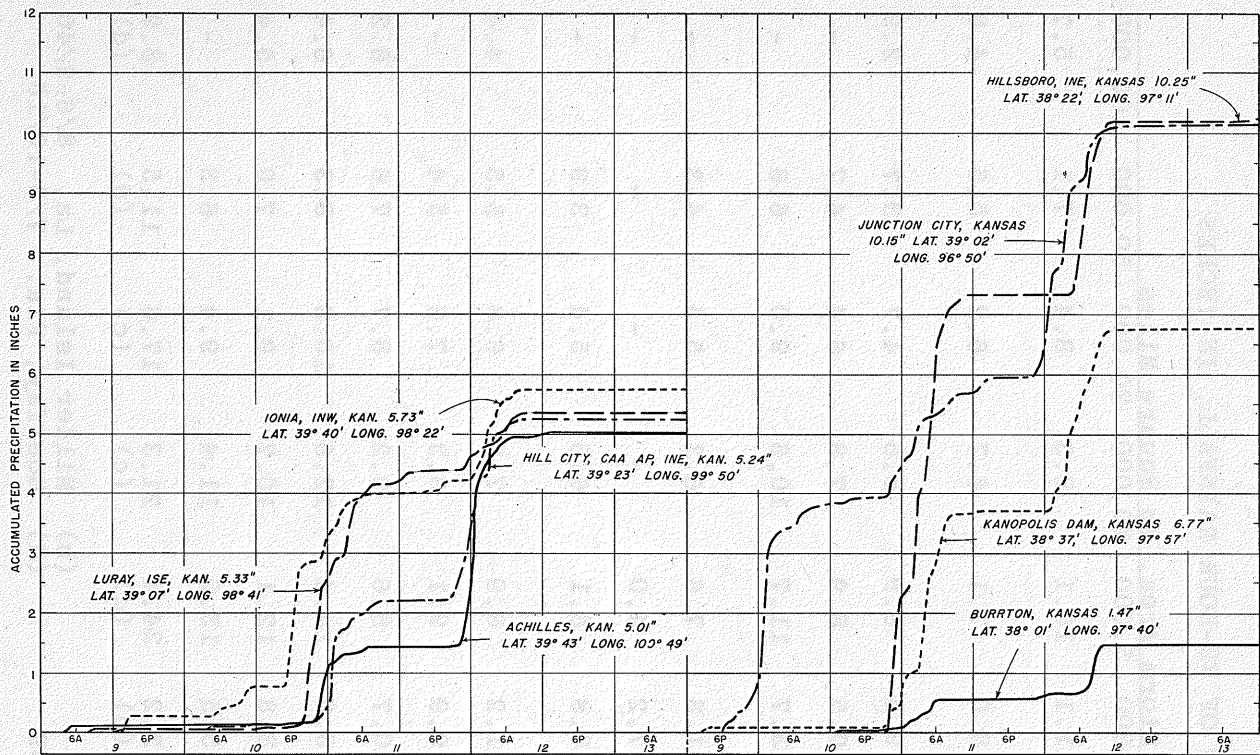


Figure 12.--Representative mass rainfall curves for storm of July 9-13, 1951

TABLE 7

MAJOR MIDWEST STORMS--MAXIMUM AVERAGE DEPTH OF 72-HOUR RAINFALL, IN INCHES

Date	Storm Center	Storm Area, in Square Miles							
		10	100	1,000	5,000	10,000	20,000	50,000	100,000
Dec. 16-20, 1895	Phillipsburg, Mo.	12.2	11.8	11.1	10.1	9.3	8.4	7.1	5.7
Dec. 31, 1896- Jan. 3, 1897	Pine Bluff, Ark.	9.1	8.8	8.0	7.1	6.7	6.2	5.5	4.8
May 25-June 1, 1903*	Abilene, Kans.	10.7	10.6	9.5	6.9	5.6	4.7	3.7	2.9
Sept. 12-19, 1905	Boonville, Mo.	11.9	11.5	10.5	8.9	7.8	6.4	4.7	-
Oct. 19-24, 1908	Meeker, Okla.	15.2	14.9	13.7	11.7	10.6	9.0	6.6	-
Sept. 27-Oct. 1, 1923	Savageton, Wyo.	16.9	15.9	11.8	7.6	6.3	5.5	4.3	-
May 30-31, 1935†	Burlington, Colo.	22.2	15.4	7.2	4.0	-	-	-	-
Apr. 17-21, 1927	Jessieville, Ark.	12.5	12.3	10.8	8.1	6.6	5.4	3.9	-
Sept. 28-Oct. 2, 1927	Pleasanton, Kans.	12.9	12.4	11.2	8.9	7.8	6.8	5.5	4.4
Nov. 15-17, 1928‡	Iola, Kans.	11.2	10.6	9.9	9.1	8.3	7.2	5.4	-
Jan. 5-25, 1937	McKenzie, Tenn.	11.2	11.1	10.7	9.6	9.2	8.7	7.6	6.2
May 6-12, 1943	Warner, Okla.	24.9	22.5	18.0	14.4	12.6	10.8	8.3	6.4
May 13-20, 1943	Mounds, Okla.	16.7	15.4	13.8	12.1	10.7	9.1	7.0	5.4
July 9-12, 1951*	Herington, Kans.	18.0	17.5	15.5	13.0	11.4	9.4	6.3	-
Maximum in United States		37.6 (a)	35.2 (b)	32.2 (b)	24.4 (c)	21.3 (c)	17.6 (c)	11.5 (d)	8.9 (d)

* Provisional
† 24-hour storm
‡ 60-hour storm

(a) Thrall, Texas 9/8-10/21
(c) Hearne, Texas 6/27-7/1/1899

(b) Miller Island, La. 8/6-9/40
(d) Bonifay, Fla. 7/5-10/16

FLOODS OF JUNE-JULY 1951

The excessive rainfall during June and July 1951 resulted in frequent periods of severe flooding in much of the area covered by this report. Even in June and early July, severe and frequent flooding occurred in many areas in the Kansas, Marais des Cygnes and Neosho River Basins. In some of the tributary basins, such as the Delaware and the upper Blue Rivers in Kansas, the June crests were higher than subsequent July crests. The Kansas River exceeded flood stages on June 9-10 and again during the period June 22-July 3. At Topeka the stage of 28.9 feet on June 30 was the highest recorded since the peak of 32.7 feet in 1903. The Blue River in Missouri, flowing through the Blue Valley industrial district of Kansas City, Mo., reached a stage of 38.1 feet on July 11 at the Bannister Road Bridge gage. This was only 0.9 foot lower than the all-time record of 39.0 feet established November 17, 1928. The Osage at Osceola, Mo., reached a crest of 36.0 feet on July 6, the third highest of record and 0.9 foot higher than in the subsequent flood of July 19, 1951. Cottonwood River, a tributary to the Neosho, reached a stage of 29.1 feet on June 30 at Emporia, Kans. This was only 0.4 foot below the all-time record which was exceeded by the subsequent peak of July 11, 1951. The third largest flood of record was experienced at Independence, Kans., on the Verdigris River, July 1, 1951. The Mississippi River at St. Louis reached flood stage of 30 feet on June 29 and was above this stage continuously for 32 days. Serious flooding was experienced along 2,000 miles of the principal streams.

Friday, July 13, 1951, can rightfully be designated as the single day of greatest flood destruction in Midwestern United States history. It had been immediately preceded by 72 hours of the heaviest rainfall ever experienced. This, following the excessive rainfall of the previous month, resulted in the greatest flood in more than 100 years over a large area in northern and eastern Kansas and portions of Missouri and neighboring states. On this date the Kansas River crested at all official gaging stations from Manhattan to Bonner Springs, Kans. The Marais des Cygnes, Neosho and Verdigris Rivers were at, or near, crests at all points in Kansas. Even at Cape Girardeau, Mo., on the Mississippi, 600 miles downstream from the storm center, the crest was within 3 feet of the crest observed eleven days later. Throughout this flood period the high-water marks of the 1844 flood along the Kansas River were not exceeded, but all recorded

gage heights previous to 1951 were exceeded by 4 to 6 feet along the Kansas River, by 2 to 4 feet along the Marais des Cygnes, by 3 to 4 feet along the Cottonwood, and by 4 to 9 feet along the Neosho River.

All of the above statements are general in nature. The accompanying tabular and graphic features of this report present more comprehensive data. Table 8 contains daily river stages with supplemental observations for 100 key points in the flooded area (see Fig. 2). These data were obtained from official river gage stations operated by the Weather Bureau, Corps of Engineers, and the Geological Survey, in cooperation with the states of Kansas, Oklahoma, Missouri, and Nebraska. In a majority of cases the operation is a joint endeavor with federal agencies participating within the limits of their delegated responsibilities. Table 2, previously indicated, lists the ten major floods in order of magnitude at 30 key stations in the area. Related data such as drainage area, zero elevation, and period of record are also shown in this table. Figures 13-19 contain stage graphs for June and July at key stations in each of the major tributary or subdivisions in the area. These show the magnitude and time of occurrence of river stage events throughout the months of June and July 1951. High water profiles, Figures 20-27, graphically compare the 1951 flood with previous floods and give factual data with respect to elevation, gradient and river mileage.

Runoff data are not presented in this report since the collection and publication of this type of important data is the function of the U. S. Geological Survey, Surface Water Division. Very complete information on this hydrologic phase of the flood may be found in the official publication of that agency.

In order to compare and confirm the over-all magnitude of the June-July 1951 floods, a few runoff observations are cited. The average annual runoff of the Kansas Basin at Topeka, Kans., is about 3,420,000 acre-feet as compared with the June 1951 runoff of 3,860,000 and the July 1951 runoff of 6,810,000 acre-feet. Similarly, the average annual runoff of the Neosho Basin at Parsons, Kans., is 1,770,000 acre-feet as compared to 658,000 in June and 3,405,000 in July of 1951. It may be seen the July 1951 runoff was in both cases, approximately twice the annual average.

TABLE 8
DAILY RIVER STAGES JUNE - JULY 1951

Date	REPUBLICAN RIVER Bloomington, Nebr. (WG)		REPUBLICAN RIVER Concordia, Kans. (WG)		REPUBLICAN RIVER Clay Center, Kans. (WG)		REPUBLICAN RIVER Wakefield, Kans. (WG)		REPUBLICAN RIVER Junction City, Kans.		
	June	July	June	July	June	July	June	July	June	July	
1	3.1	4.1	5.0	5.0	10.6	12.5	5.0	6.8			
2	3.4	3.8	5.2(1)	5.0	11.4	11.8	5.1	6.4		7.4	
3	3.4	3.7	7.8	4.9	17.5(1)	11.5	10.0(1)	6.1	4.0	5.3	
4	3.2	3.5	6.4	4.7	14.4	11.1	8.2	5.7	6.2		
5	3.0	3.3	5.6	4.5	12.7	10.9	6.8	5.4			
6	3.0	3.2	4.9	4.3	11.6	10.7	6.4	5.2			
7	3.3	3.0	6.5(2)	4.1	12.9	12.1	7.6	5.2			
8	3.0	3.0	8.3	3.9	17.7(2)	10.1	10.5(2)	4.9	7.5		
9	5.9(1)	2.9	8.5	3.8	17.8	9.9	10.8	4.6	10.7(1)		
10	5.6	2.9	7.0	3.7	14.8	14.5	8.8	11.6	8.2	11.2	
11	4.6	3.4	8.2	10.3	13.0	20.7	7.4	14.1	5.2	14.8	
12	4.5(2)	5.9(4)	7.1	10.2(4)	14.8	21.2(6)	8.8	15.8(5)	5.8	18.0(6)	
13	5.2	5.8	6.1	11.1(5)	13.1	21.9	7.4	15.8	5.0	18.3	
14	4.5	6.2	7.1	10.2	12.7	20.8	6.6	14.7	4.0	16.7(7)	
15	4.0	6.6	6.5	8.9	14.9(3)	19.8	9.3	14.2	6.5	16.4	
16	4.0	6.1	6.2	9.0	12.5	16.8	7.1	10.7	5.5	14.2	
17	3.9	5.7	5.8	7.2	12.3	15.9	6.5	9.7		10.8	
18	3.7	4.8	5.0	6.8	11.3	14.5	5.8	8.1		8.5	
19	3.4(3)	5.6(5)	4.7	6.4	10.9	15.3(7)	5.4	9.3		6.5	
20	4.7	5.8	5.4	5.4	10.6	12.9	5.1	7.3			
21	4.0	4.9	8.0	6.9	14.9	12.6	12.1(3)	6.2	5.0(2)		
22	4.0	4.4	8.1	6.6	20.0(4)	13.9	13.1(4)	7.4	11.8		
23	4.1	3.8	10.0(3)	6.5	20.1	14.8	13.1	8.3	13.3(3)		
24	5.7	4.0	8.6	5.5	15.4	13.4	12.0	7.1	13.3		
25	5.6	3.4	7.5	4.5	15.4	13.0	9.7	6.1	9.5		
26	5.6	3.9	7.6	4.4	15.3	12.7	9.0	5.3	6.8		
27	5.0	3.6	7.2	4.6	15.4	12.0	10.1	5.6	8.0(4)		
28	4.6	3.2	7.5	4.1	16.3(5)	11.4	11.4	5.0	7.6(5)		
29	4.3	4.3	6.6	4.2	15.8	11.1	10.4	4.7	11.3		
30	4.4	3.6	6.1	4.1	13.9	11.7	8.0	5.5	8.8		
31		3.6		4.2		11.0		5.4			
(1) Crest,	5.90	1:30 p.m.	(1) Crest,	10.23	7 p.m.	(1) Crest,	17.56	noon	(1) Crest,	11.00	4 a.m.
(2) Crest,	6.25	noon	(2) Crest,	9.34	7 p.m.	(2) Crest,	18.26	8 p.m.	(2) Crest,	9.50	noon
(3) Crest,	5.64	7:30 p.m.	(3) Crest,	10.02	3 a.m.	(3) Crest,	14.92	7 a.m.	(3) Crest,	12.55	noon
(4) Crest,	6.10	1:30 p.m.	(4) Crest,	10.90	noon	(4) Crest,	20.20	5 p.m.	(4) Crest,	13.68	3 p.m.
(5) Crest,	6.47	1 p.m.	(5) Crest,	11.23	2 p.m.	(5) Crest,	16.79	4 p.m.	(5) Crest,	16.00	noon
(6) Crest,			(6) Crest,			(6) Crest,	22.20	6 p.m.	(6) Crest,		
(7) Crest,			(7) Crest,			(7) Crest,	15.48	2 a.m.	(7) Crest,		

Date	SMOKY HILL RIVER Russell, Kans. (G)		SMOKY HILL RIVER Ellsworth, Kans. (G)		SMOKY HILL RIVER Lindsborg, Kans. (WG)		SMOKY HILL RIVER Salina, Kans.		SMOKY HILL RIVER Abilene, Kans.		
	June	July	June	July	June	July	June	July	June	July	
1	4.3	9.3	4.4	13.5	15.4	20.0	15.9	20.0(2)	14.0	24.8	
2	5.6	8.2	10.9	10.1	15.5	19.8	14.0	19.6		24.2	
3	9.4	7.7	9.3	8.9	11.3	19.9	13.9	19.1		23.7	
4	8.0	7.4	10.4	8.5	11.0	19.4	13.6	19.1		24.0	
5	5.4	7.2	7.5	8.0	11.1	19.6	13.4	18.8		23.9	
6	14.1(1)	7.1	7.5	7.7	11.0	19.9	13.4	18.6		23.4	
7	16.0(2)	(3)6.9	22.3(1)	7.4	20.2	19.9	15.3	18.6	20.9	22.4	
8	11.8	6.9	20.4(2)	7.2	12.1	19.8	18.9(1)	18.5	25.4	21.5	
9	8.9	6.8	13.3	7.1	12.2	19.9	14.0	18.5	25.1(1)	20.1	
10	10.0	6.8	9.5	6.9	11.3	19.9	13.9	18.6(3)	25.7	19.4	
11	7.3	6.4	10.5	11.4	11.5	22.6(2)	13.8	20.2(4)	25.2	22.4	
12	9.4	10.6	7.7	17.0(8)	11.5	28.1(3)	13.7	23.3	25.5	26.5(4)	
13	7.0	10.8	10.3	18.7	11.5	28.9(4)	13.8	24.1(5)(6)	25.9	28.4(5)	
14	9.6	8.2	8.4	12.5	13.1	21.1(5)	13.9	23.4	26.1	29.4(6)	
15	12.6(4)	7.2	13.3(3)	8.9	12.3	21.3(6)	14.5	22.8	25.1	28.5	
16	8.5	6.6	14.2	7.8	11.6	22.2(7)	14.0	21.8	24.4	27.2	
17	6.0	6.2	8.3	6.9	11.5	22.4(8)	13.8	21.0	23.3	26.4	
18	5.3	6.1	6.2	6.4	11.5	22.4	13.7	20.9(7)	22.2	25.5	
19	5.2	5.8	5.6	6.1	14.3	21.5	13.7	21.0	20.3	24.9	
20	4.6	5.7	5.3	5.8	17.4	20.8	20.9		18.8	24.2	
21	5.2	5.5	20.3(4)	5.6	17.6	17.8	15.9	20.4	19.5	23.6	
22	12.7	5.6	11.8	5.5	13.5	15.4	16.9	16.4	23.7	22.9	
23	18.8(5)	7.8	16.9(5)	5.7	13.8	15.1	15.7	15.1	24.3	21.8	
24	15.8	8.2	22.1(6)	(7)9.3	11.0	14.9	14.3	15.0	24.5	19.9	
25	13.6	6.3	19.7	7.8	17.1	14.7	13.9	14.8	24.6(2)	18.7	
26	9.0	6.0	16.0	6.3	18.1	14.5	16.2	14.8	24.4	18.0	
27	7.7	6.0	10.1	6.0	18.7	16.0	17.0	14.8	25.2	18.5	
28	8.4(6)	5.8	9.1	6.0	18.7	17.0	17.5	15.6	26.2(3)	19.3	
29	11.7	5.7	13.8	5.7	21.2(1)	16.9	17.7	16.2	25.8	20.5	
30	12.2	5.6	14.0	5.5	21.6	17.1	19.3	16.2(8)	25.5	21.2	
31		6.4		7.8		17.0		16.2		20.4	
(1) Crest,	5.00	1 a.m.	(1) Crest,	22.52	4 a.m.	(1) Crest,	21.95	11:30 p.m.	(1) Crest,	25.90	6 p.m.
(2) Crest,	17.40	3 a.m.	(2) Crest,	20.76	2 a.m.	(2) Crest,	27.20	6 p.m.	(2) Crest,	24.55	2:30 p.m.
(3) Crest,	15.00	10 p.m.	(3) Crest,	16.30	11 p.m.	(3) Crest,	29.32	4 p.m.	(3) Crest,	26.25	1 p.m.
(4) Crest,	14.80	1 a.m.	(4) Crest,	21.08	10:30 a.m.	(4) Crest,	26.50	6 p.m.	(4) Crest,	28.70	8:30 p.m.
(5) Crest,	19.74	3 a.m.	(5) Crest,	17.80	11 a.m.	(5) Crest,	21.10	6 p.m.	(5) Crest,	24.10	11:30 a.m.
(6) Crest,	12.60	11 p.m.	(6) Crest,	22.13	6 a.m.	(6) Crest,	21.70	6 p.m.	(6) Crest,	23.70	8:30 p.m.
(7) Crest,			(7) Crest,	21.10	6 p.m.	(7) Crest,	22.30	6 p.m.	(7) Crest,	21.00	6:30 p.m.
(8) Crest,			(8) Crest,	19.87	7 p.m.	(8) Crest,	22.38	8 a.m.	(8) Crest,	16.20	4 p.m.

(WG) Record collected in cooperation with U. S. Geological Survey
(G) Record furnished by U. S. Geological Survey

TABLE 8
DAILY RIVER STAGES JUNE - JULY 1951

Date	SMOKY HILL RIVER Enterprise, Kans.(WG)		SOLOMON RIVER Alton, Kans.(WG)		SOLOMON RIVER Kirwin, Kans.(WG)		SOLOMON RIVER Beloit, Kans.(WG)		SOLOMON RIVER Minneapolis, Kans.	
	June	July	June	July	June	July	June	July	June	July
1	18.0	30.7	4.1	6.8	6.5	5.5	13.3	27.1		26.9
2	16.5	30.3	6.7	6.0	4.9	5.4	18.2	24.0		27.1
3	15.6	30.0	4.9	5.7	4.5	5.3	23.1	16.5		28.6
4	19.3	30.0	3.7	6.0	4.2	6.7	25.6(1)	14.9		26.7
5	20.5	29.9	3.2	5.3	4.1	5.3	19.6	14.1	20.0	18.0
6	20.7	29.7	6.8	4.7	5.3	4.0	12.7	15.6	22.2	16.0
7	27.5	29.0	16.4(1)	4.4	8.0	4.7	22.0	13.9	25.1(1)	
8	29.7(1)	27.7	13.8	4.0	7.0(1)	4.8	27.1	13.1	22.6	
9	29.3	25.7	12.2	7.2	9.5	4.8	31.7(2)	12.6	24.6	
10	29.6(2)	27.1	6.4	5.3	5.9	4.7(5)	31.4	13.9(7)	26.7	14.7
11	29.5	30.5	7.1	15.9(7)	5.2	19.6(6)	29.2	26.9	31.0	26.1(4)(5)
12	29.4	32.1(6)	11.7	24.7(8)	5.0	20.0(7)	25.4	35.5	31.6(2)	33.2(6)
13	29.6	33.6	9.6		5.8	19.0(8)	20.5	39.2(8)	31.4	33.5(7)
14	30.0	33.5(7)	8.0(2)		7.0	15.0	20.5	37.8	30.2	33.9
15	30.1(3)	33.4	13.0		6.3	12.2	18.2	33.7	27.1	33.0
16	30.0	32.4	6.6		6.4	8.4	18.9	28.8	22.3	32.5
17	29.5	31.5	5.3		8.2	7.1	21.4(3)	26.4	18.1	32.2
18	28.5	30.9	4.6		5.8	6.8	16.7	24.3	31.3	31.9
19	26.8	30.4	4.5		5.2	6.6	15.2	22.0	19.0	31.2
20	23.6	30.0	4.1		4.9	6.2	13.1	20.4	16.3	28.5
21	22.9	29.5	4.2		8.1	6.1	14.5(4)	17.9	24.4	25.3
22	27.8	29.0	17.0(3)		19.7(2)(3)	8.0	24.9	18.2	28.5	22.6
23	30.2(4)	28.2	21.4(4)		17.5(4)	9.1	31.9(5)	20.4	31.3	22.8
24	30.2	25.6	13.8		12.8	8.6	35.0	23.7	29.3	21.4
25	30.2	23.1	9.4		10.8	8.4	34.0	25.9(9)	31.5	21.1
26	30.1	22.1(8)	7.5		7.3	6.9	29.7	24.7	31.8	22.7
27	30.3	22.2	7.8		6.7	6.2	26.4	22.2	32.2(3)	26.8(8)
28	31.2(5)	22.8	16.7(5)		6.2	6.0	24.3	17.7	31.8	26.9
29	31.3	23.6	13.4(6)		5.7	6.1	23.7	16.5	31.4	24.5
30	31.1	24.7(9)	8.4		6.1	6.2	26.6(6)	21.6	29.6	18.3
31		24.7				6.3		19.8		18.5

(1) Crest, 29.74 4 a.m. (1) Crest, 18.51 8 p.m. (1) Crest, 15.07 6 p.m. (1) Crest, 25.55 8 a.m. (1) Crest
(2) Crest, 29.57 7-10 a.m. (2) Crest, 16.65 mdt. (2) Crest, 19.75 6:30 a.m. (2) Crest, 32.16 6 p.m. (2) Crest
(3) Crest, 30.10 5 p.m. (3) 19.70 noon (3) Crest, 18.67 7 p.m. (3) Crest, 22.21 noon (3) Crest
(4) Crest, 30.24 10 a.m. (4) Crest, 22.26 3:30 a.m. (4) 16.90 6 p.m. (4) 15.90 6 p.m. (4) 30.90 noon
(5) Crest, 31.40 5 p.m. (5) Crest, 17.19 4 a.m. (5) 10.50 mdt. (5) Crest, 35.42 4:30 p.m. (5) Crest, 33.40 9 p.m.
(6) Crest, 33.88 10 p.m. (6) Crest, 13.55 6 a.m. (6) Crest, 20.42 4:30 a.m. (6) Crest, 27.31 11 p.m. (6) Crest, 33.86 10 p.m.
(7) Crest, 33.96 2 p.m. (7) 22.10 8 p.m. (7) 19.40 7 p.m. (7) 15.00 6 p.m. (7) Crest, 34.14 10 p.m.
(8) 21.90 11 a.m. (8) Crest, 27.10 8 p.m. (8) 17.80 7 p.m. (8) Crest, 39.30 4 a.m. (8) Crest, 27.24 6:30 p.m.
(9) 24.90 5 p.m. (9) Crest, 26.00 5 a.m. (9) Crest

Date	SOLOMON RIVER Niles, Kans.(WG)		SALINE RIVER Wilson, Kans.(WG)		SALINE RIVER Tescott, Kans.(WG)		KANSAS RIVER Ogden, Kans.(WG)		KANSAS RIVER Manhattan, Kans.	
	June	July	June	July	June	July	June	July	June	July
1	13.0	28.7	5.2	12.3	11.6	29.1(5)	13.0	20.3	14.4	24.4
2	13.0	28.2	7.6	10.4	15.4	29.2	11.2	18.6	12.2	22.2
3	19.6	28.2		10.5	22.6(1)	29.1	14.5	17.4	12.6	20.6
4	21.3	28.2		10.7	18.4	28.8	14.2	16.9	17.7	19.6
5	22.2	27.9	5.9	9.2	17.6	25.9	12.9	16.5	16.4	19.1
6	22.3	23.8	7.4	8.5	16.2	21.6	12.7	16.2	16.6	18.9
7	26.6	18.2	18.8(1)	7.8	27.5	19.2	16.3	15.8	19.0	19.0
8	27.6	17.6	11.1	7.3	29.7	18.8	16.9	14.6	21.5	18.3
9	27.9(1)	17.4	11.8	7.0	29.8(2)	17.4	18.6(1)	13.8	22.9(1)	17.1(4)
10	27.8	16.7(7)	14.5(2)	7.2	29.7	16.6	17.6	18.8(5)	21.5	21.2
11	28.3	27.5	8.4	7.1(5)(6)	29.4	29.0	16.4	23.5	18.9	26.4(5)
12	28.8	30.4(8)	7.9	21.0(7)	29.0	29.5	16.1	28.0(6)(7)	18.0	30.5
13	29.2	30.9	10.0	18.5(8)	25.6	30.0(6)	16.1	30.4	18.6	32.0(6)
14	29.3(2)	31.7(9)	12.1	15.9	19.0	29.6	15.6		17.8	29.9(7)
15	29.1	31.4	9.1	12.2	22.1	29.3	16.5		19.0	29.8(8)
16	28.7	30.9	11.0	10.2	24.1	29.1	17.1		21.0	27.9
17	28.0	30.4	8.1	9.2	24.7	28.9	16.8		21.3	25.4
18	23.6	29.9	7.2	8.1	22.7	28.0	16.4	19.4	19.5	23.9
19	21.1	29.4	6.6		20.0	23.6	15.6	17.0	17.9	22.5
20	20.6(3)	28.7	6.3		15.7	19.8	14.3	15.7	16.5	21.5
21	30.2(4)	28.1	9.2		24.3	18.3	13.4	15.2	16.1	20.3
22	29.4(5)	27.1	17.7		28.8(3)	17.4	17.7	15.1	23.2	19.2
23	29.3	25.1	21.9(3)	12.2	29.1	17.4	20.0	14.9	24.8	19.2
24	29.3	23.9	20.9	10.1	29.4	18.1	21.5(2)	14.1	25.1(2)	18.5
25	29.5	23.4	18.7	9.8	29.6(4)	22.1	20.1	12.9	24.3	16.9
26	29.4	22.4	13.1	11.8	29.4	24.0	18.5(3)		22.3	15.1
27	30.0(6)	23.8	13.0	9.5	29.4	22.5	18.4		22.8	15.5
28	30.3	25.6	14.3	7.7	29.4	22.0	18.7		23.7	14.6
29	30.0	26.6	21.9(4)	7.2	29.1	21.2	22.3(4)		26.2(3)	14.4
30	29.5	25.8	17.9	7.1	28.9	17.8	21.6		25.9	14.6
31		20.3		8.4		16.3				15.0

(1) Crest, 27.92 7 a.m. (1) Crest, 20.09 1:30 a.m. (1) Crest, 22.57 9 a.m. (1) Crest, 18.62 7 a.m. (1) Crest, 23.00 noon
(2) Crest, 29.30 2 a.m. (2) Crest, 15.95 2 a.m. (2) Crest, 29.77 9 a.m. (2) Crest, 21.51 10 a.m. (2) Crest, 25.22 1 p.m.
(3) 19.80 mdt. (3) Crest, 22.06 9 a.m. (3) Crest, 29.08 4 p.m. (3) 18.20 6 p.m. (3) Crest, 26.80 6 p.m.
(4) Crest, 31.00 10 a.m. (4) Crest, 21.88 8 a.m. (4) Crest, 29.56 8 a.m. (4) Crest, 23.05 1:30 a.m. (4) 16.10 5 p.m.
(5) Crest, 29.52 11 p.m. (5) 16.00 5 p.m. (5) Crest, 29.20 10 p.m. (5) Crest, 22.10 6 p.m. (5) Crest, 30.40 3 p.m.
(6) Crest, 30.54 8 p.m. (6) Crest, 21.80 11:30 p.m. (6) Crest, 30.06 4 a.m. (6) Crest, 30.20 6 p.m. (6) Crest, 33.40 3 a.m.
(7) 19.40 6 p.m. (7) 20.40 6 p.m. (7) Crest, 30.53 10 p.m. (7) Crest, 29.50 7 p.m.
(8) Crest, 31.45 noon (8) 18.10 6 p.m. (8) Crest, 29.84 7:30 a.m.
(9) Crest, 31.76 6 a.m.

(WG) Record collected in cooperation with U. S. Geological Survey

TABLE 8
DAILY RIVER STAGES JUNE-JULY 1951

Date	KANSAS RIVER Wamego, Kans. (WG)		KANSAS RIVER Topeka, Kans. (WG)		KANSAS RIVER Lecompton, Kans. (WG)		KANSAS RIVER Lawrence, Kans.		KANSAS RIVER Bonner Springs, Kans. (WG)	
	June	July	June	July	June	July	June	July	June	July
1	8.8	21.3	11.5	27.8	9.4	23.4	24.5	8.6	25.0(3)	
2	7.8	17.9	11.2	24.4	9.2	21.2	8.5	22.2	8.5	23.9
3	7.4	15.2	9.7	20.4	8.2	16.7	17.7	8.1	19.0	
4	13.5	13.5	13.7	18.3	8.9	15.5	16.7	7.6	16.7	
5	13.3	13.0	16.7	17.1(4)	13.6	13.6(5)	15.0	15.3	11.9	14.1
6	13.4	13.1	16.0	20.1	13.2	17.9	14.8	18.7	12.1	18.5
7	14.7	13.5	17.3	20.3	14.0	18.4(6)	15.2	18.9(5)	12.4	19.4
8	17.4	13.6	20.3	17.9	16.7	15.9	17.1	17.3	15.2	18.3
9	18.3(1)	13.2(5)	22.3	17.3	18.0	13.9	18.1	15.4	16.6	15.0
10	17.9	14.0(6)	22.6(1)	16.9(5)	18.6	13.5(7)	18.4(1)	15.1	16.9	13.7(4)
11	14.1	22.5	19.1	28.6(6)	16.0	21.7(8)	16.8	21.0	15.9	20.3(5)
12	12.3	25.9(7)	16.3	32.0(7)	13.5	25.5	14.9	26.3(6)	13.2	28.0
13	13.1	27.5(8)	16.1	36.2(8)	12.8	30.1(9)	14.2	30.4(7)	11.8	35.5(6)(7)
14	12.3	26.5	16.0	35.5	13.2	29.4	14.6	29.8	12.2	38.4(8)
15	13.0	25.6	15.6	33.5	12.9	27.4	14.2	28.3	11.6	35.7
16	16.1	24.0	20.0	32.8	17.2	26.8	17.4	27.3	15.3(1)	32.0
17	17.1(2)	21.5	20.3	29.9	16.4	25.0	16.8	25.5	15.2	30.2
18	15.5	19.4	20.9	26.4	17.0	22.1	17.2	22.9	15.5	26.4
19	12.4	17.9	17.0	23.5	14.1	20.5	15.3	20.8	14.5	22.2
20	11.4	17.4	14.8	22.4	12.3	18.0	14.1	18.4	12.5	18.8
21	11.6	14.5	15.3	19.7	12.0	16.3	13.8	17.2	11.3	17.1
22	19.2	12.7	24.2	17.9	20.8	14.6	19.0	16.0	15.0	14.5
23	21.3(3)	13.3	27.6	16.8	24.3(1)	13.3	25.2(2)	15.0	22.0	13.2
24	21.4	12.9	27.6(2)	18.0	23.9	14.5	25.4	15.7	25.1(2)	13.7
25	21.2	10.5	26.1	15.7	22.0	12.8	22.9	14.6	24.6	13.0
26	19.0	8.7	25.8	13.6	22.3(2)	11.3	22.0(3)		22.6	11.2
27	18.9	9.3	25.5	13.5	22.8	10.5	23.7		23.8	10.0
28	20.5	8.2	24.8	12.6	22.0(3)	10.4	23.0		24.2	10.3
29	21.8	7.9	26.7	11.6	22.6	9.6	22.7		23.5	9.2
30	22.8(4)	7.8	28.6(3)	11.3	23.5(4)	9.4	24.5(4)		24.2	8.8
31		8.4		11.7		9.3				8.6

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|-----------------------------|----------------------------|-------------------------|-------------------------|-----------------------------|
| (1) Crest, 19.00 7 p.m. | (1) Crest, 22.60 7 a.m. | (1) Crest, 24.35 4 a.m. | (1) Crest, 18.40 6a-9p | (1) Crest, 16.00 4 p.m. |
| (2) Crest, 17.53 8 p.m. | (2) Crest, 27.67 4 a.m. | (2) Crest, 23.37 6 p.m. | (2) Crest, 25.60 mdt. | (2) Crest, 25.30 3 p.m. |
| (3) Crest, 21.58 5 a.m. | (3) Crest, 28.92 8:20 p.m. | (3) 21.80 6 p.m. | (3) Crest, 23.80 mdt. | (3) Crest, 25.05 6 a.m. |
| (4) Crest, 22.88 12:30 a.m. | (4) Crest, 20.72 9 p.m. | (4) Crest, 23.51 7 a.m. | (4) Crest, 24.50 mdt. | (4) 14.50 6 p.m. |
| (5) 11.60 7 p.m. | (5) 22.90 6 p.m. | (5) Crest, 18.50 mdt. | (5) Crest, 19.00 6 a.m. | (5) 23.90 6 p.m. |
| (6) 19.50 7 p.m. | (6) 30.20 6 p.m. | (6) Crest, 18.48 4 a.m. | (6) Crest, 26.50 3 a.m. | (6) 38.10 6 p.m. |
| (7) 27.00 7 p.m. | (7) 35.10 6 p.m. | (7) 15.50 6 p.m. | (7) Crest, 30.40 8a-11p | (7) Crest, 38.58 11:30 p.m. |
| (8) Crest, 27.56 5:30 a.m. | (8) Crest, 36.34 6:30 a.m. | (8) 25.00 6 p.m. | | (8) 37.50 6 p.m. |
| | | (9) Crest, 30.23 4 p.m. | | |

Date	KANSAS RIVER Kansas City, Mo. (C) (23rd Street)		LITTLE BLUE RIVER Hanover, Kans.		BLUE RIVER Beatrice, Nebr.		BLUE RIVER Barnston, Nebr. (WG)		BLUE RIVER Marysville, Kans.	
	June	July	June	July	June	July	June	July	June	July
1	13.8	32.0	4.5	12.6	7.8	9.9	5.5	10.7		
2	18.7	31.8	9.4(1)	8.9	16.1	9.2	15.0	10.0	19.2	
3	19.1	28.9	13.4	7.8	20.8	8.5	25.8	8.7	36.2	
4	19.7	24.4	14.0	7.5	27.0(1)	8.2	25.4(1)	8.1	37.4	
5	22.6	24.3	15.0	6.8	24.6	8.1	27.2	7.3	39.0(1)	
6	20.9	27.0	8.6	6.6		13.0	25.0	13.1(6)	39.0	(5)
7	20.8	28.5	8.7	6.4	17.6	18.5(6)	24.7(2)	24.4(7)	39.1	35.7(6)
8	22.5	27.4	9.7	6.1	14.5	9.8	22.9	16.2	38.7	35.8
9	24.4	27.1	10.9	5.7	11.5	8.6	15.1	8.5	29.3	
10	24.0	27.8	7.7	5.9(4)	9.6	8.1	11.1	7.7		(7)
11	23.5	28.9	6.4	18.6	9.9	14.4	10.3	19.4		37.2(8)
12	21.9	36.1(1)	7.0	21.2(5)	10.3	16.5(7)	14.7	24.3(8)		38.3(9)
13	21.0	41.9*(2)	6.3	21.6	9.5	15.0	10.2	23.8		37.8
14	20.8	51.2*(3)(4)	7.9	19.4	12.1	11.8	12.0	15.4		32.0
15	19.9	48.0*	12.2	15.6	15.7(2)	10.2(8)	25.8(3)	12.3	38.4(2)	
16	23.5	42.0*(5)	9.4	12.1	14.9	9.6	22.4	10.6	38.8	
17	22.0	37.8	7.3	9.9		8.7	11.3	9.4		
18	22.0	32.8	6.7	8.0	8.6	11.1	8.8	15.8		
19	21.1	28.6	6.0	8.5	11.9	8.6	15.8	10.8		
20	22.0	24.7	7.7	8.1	14.3	8.1	14.6	8.1		
21	22.1	21.1	9.6	6.8	14.8(3)	7.7	18.2	7.2	33.2	
22	24.5	18.4	14.0(2)	9.3	13.4(4)	7.7	17.9	7.4	35.3(3)	
23	31.8	17.7	15.4	8.9	15.1	7.7	23.2(4)	7.1	37.2	
24	32.4	17.4	15.2	7.2	13.2	7.3	20.2	6.4	36.5	
25	32.4	16.9	10.3	6.3	10.0	6.1	12.5	6.1		
26	32.0	14.4	17.3	5.8	14.1	5.7	22.2(5)	5.7	36.2(4)	
27	31.6	12.9	19.9	6.1	16.2(5)	6.1	24.5	5.8	38.6	
28	31.7	12.8	21.4(3)	5.4	15.2	6.1	21.0	5.9	37.0	
29	31.6	12.5	20.0	5.7	10.1	5.2	13.4	6.0	28.7	
30	31.8	12.0	17.4	5.7	10.0	5.1	10.9	5.7		
31		11.5		5.2		5.4		5.7		

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|--|--------------------------|-------------------------|----------------------------|-------------------------|
| (1) 38.80 6 p.m. | (1) 13.00 5 p.m. | (1) Crest, 28.30 9 a.m. | (1) Crest, 27.48 mdt. | (1) Crest, 39.50 3 p.m. |
| (2) 49.80 6 p.m. | (2) Crest, 15.50 3 p.m. | (2) Crest, 16.90 6 p.m. | (2) Crest, 25.60 3:30 p.m. | (2) 40.20 8 p.m. |
| (3) 50.50 6 p.m. | (3) Crest, 22.10 1 a.m. | (3) Crest, 14.80 3 a.m. | (3) Crest, 25.47 11 a.m. | (3) 37.70 8 p.m. |
| (4) Obs. crest 51.30 4 a.m. highwater mark 49.0 | (4) 14.00 9 p.m. | (4) 15.80 mdt. | (4) Crest, 23.48 2:30 a.m. | (4) Crest, 39.30 5 p.m. |
| (5) 39.80 6 p.m. | (5) Crest, 22.30 11 p.m. | (5) 17.20 6 p.m. | (5) Crest, 24.87 11 p.m. | (5) 32.70 6 p.m. |
| * All readings above 39.0 high due to bridge obstruction | | (6) Crest, 18.51 6 a.m. | (6) 22.70 6 p.m. | (6) Crest, 36.87 9 p.m. |
| | | (7) Crest, 17.66 6 p.m. | (7) Crest, 24.54 3 a.m. | (7) 26.25 6 p.m. |
| | | (8) 14.50 6 p.m. | (8) Crest, 24.44 1:30 a.m. | (8) Crest, 38.10 noon |
| | | | | (9) Crest, 39.35 4 p.m. |

(WG) Record collected in cooperation with U. S. Geological Survey
(C) Record furnished by Corps of Engineers

TABLE 8
DAILY RIVER STAGES JUNE - JULY 1951

Date	MISSOURI RIVER Napoleon, Mo. (C)		MISSOURI RIVER Lexington, Mo. (C)		MISSOURI RIVER Waverly, Mo. (WG)		MISSOURI RIVER Miami, Mo. (C)		MISSOURI RIVER Glasgow, Mo. (C)	
	June	July	June	July	June	July	June	July	June	July
1	9.5	21.2	16.4	27.1	13.3	26.8	11.5	25.8	17.4	32.7
2	10.1	21.0	17.2	27.0	13.6	26.7	11.4	25.6	17.0	33.2
3	15.9	19.3	23.4	25.8	19.0	26.1	16.2	25.3	20.1	33.0
4	16.0	16.6	23.7	23.6	19.4	24.1	18.7	24.0	24.8(1)	32.3
5	17.1	18.5	24.7	25.1	20.3	24.0	18.8	23.0	24.6	30.6
6	17.2	19.2	24.8	26.1	21.2	25.0	19.8	23.1	25.0	29.8
7	15.0	21.0	22.4	27.7(2)	19.2	26.7	18.4	24.5	24.4	30.2
8	16.0	21.1	23.0	27.8	19.4	27.1(1)	17.8	25.4	22.9	31.4
9	18.0	21.0	24.8(1)	27.7	20.9	26.8	19.0	25.6	23.9(2)	32.2
10	17.9	18.3	24.8	25.7	21.2	25.9	19.8	25.5	24.9(3)	32.6
11	17.1	17.6	24.1	25.0	20.3	24.4	19.5	24.5	24.9	32.5
12	16.0	22.8	22.9	28.4	19.2	25.9	18.5	24.4	24.0	31.8
13	15.5	24.4	22.1	29.1	18.5	27.6	17.6	26.1	22.7	31.6
14	14.9	26.1(2)	21.5	31.7	17.7	28.2(2)	16.7	26.8	21.8	32.4
15	14.2	26.7	20.8	33.2(3)	17.1	27.9	16.5	28.1	21.0	33.2
16	14.6	26.0	21.4	32.7	16.7	27.6	16.0	28.9	20.3	35.5
17	17.2(1)	25.0	23.8	31.5	20.0	26.8	19.5	28.8	22.5	36.7(4)
18	15.1	24.0	21.7	30.3	18.2	25.7	18.5	28.0	23.2	36.0
19	14.2	22.6	20.7	28.8	17.1	24.6	17.2	26.9	21.4	34.7
20	14.4	21.3	20.9	27.4	17.0	23.7	16.6	26.0	20.6	33.4
21	14.5	18.6	21.0	25.1	17.5	22.6	17.9	25.0	21.4	32.0
22	17.6	16.3	24.4	23.0	20.4	21.1	21.0	23.7	24.0	30.6
23	19.3	14.8	25.6	21.6	22.2	19.8	22.2	22.1	25.8	29.6
24	20.9	15.1	26.9	21.8	23.9	19.5	24.0	21.1	27.2	28.4
25	21.1	15.0	27.1	21.6	25.2	19.2	24.8	20.4	28.5	27.2
26	20.0	13.2	26.2	20.0	25.5	18.3	25.2	19.5	29.9	25.9
27	20.0	11.7	26.1	18.7	25.2	17.0	24.8	17.4	30.7	23.6
28	20.7	11.1	26.9	18.1	25.9	16.2	25.1	16.0	31.1	21.4
29	21.5	10.9	27.3	17.7	26.2	16.1	25.5	15.5	31.8	20.3
30	21.2	10.3	27.0	17.2	26.4	15.3	25.6	14.6	32.3	19.6
31		10.1		17.0		15.1		14.2		18.9

(1) Crest, 17.30 4 a.m. (1) Crest, 25.00 6 p.m. (1) Crest, 27.25 1 a.m. (1) Crest, 24.90 11 a.m.
(2) Crest, 26.85 1-5 a.m. (2) Crest, 28.00 noon (2) Crest, 28.20 1 p.m. (2) Crest, 25.00 6 p.m.
(3) Crest, 33.30 11 a.m. (3) Crest, 25.10 10 p.m.
(4) Crest, 36.70 6 a.m.

Date	MISSOURI RIVER Boonville, Mo. (WG)		MISSOURI RIVER Jefferson City, Mo.		MISSOURI RIVER Gasconade, Mo. (C)		MISSOURI RIVER Hermann, Mo. (WG)		MISSOURI RIVER St. Charles, Mo.	
	June	July	June	July	June	July	June	July	June	July
1	12.2	29.2	14.0	28.3	14.4	32.9	14.0	30.7	18.4	34.3
2	12.0	29.2	13.5	28.7	14.3	33.3	13.5	31.1	18.2	35.2
3	13.5	29.0	14.1	29.1	13.8	33.5	13.0	31.2	17.9	35.9
4	18.2	28.3	19.2	29.3(1)	18.0	33.6	15.8	31.3(1)	17.7	36.0
5	18.8	27.5	20.7	28.9	21.9	33.4	20.0	31.2	22.6	36.3(1)
6	19.3	26.5	20.7	28.4	21.9	32.8	20.1	30.7	24.8	36.0
7	19.8	26.5	20.9	27.9	22.4	32.3	20.6	30.3	24.8	35.9
8	18.5	27.5	19.4	28.1	21.3	32.0	20.0	30.0	25.2	35.2
9	19.1	28.4	20.2	28.7	23.2	32.0	21.3	30.0	24.6	35.1
10	20.2	28.4(1)	21.3	29.4	22.9	32.2	21.4	30.3	25.8	35.1
11	20.0	28.2	21.6	29.7	23.1	32.6	21.8	30.6	25.9	35.2
12	19.3	28.4	21.4	30.0(2)	23.7	32.8	22.1	30.8	26.2	35.7
13	18.4	27.9	20.2	30.1	23.0	33.3	21.8	31.2(2)	26.8	35.9
14	18.0	28.0	19.7	29.9	21.7	33.4	20.7	31.2	25.8	36.2
15	17.4	28.7	18.4	29.9	20.6	33.0	19.7	30.9	24.7	36.1
16	17.4	29.5	18.2	30.2	20.0	33.0(1)	18.9	30.8	23.7	35.9
17	18.3	32.0(2)	18.1	31.5	19.6	33.1(2)	18.5	30.9	23.2	35.8
18	20.0	32.6	20.3	33.8(3)	20.9	34.3	19.6	31.9	23.2	35.9
19	18.2	32.0	18.9	34.0	21.2	35.4	20.1	33.0(3)	24.6	36.8
20	17.5	30.8	17.7	33.1	20.9	35.0	18.8	32.8	24.3	37.3(2)
21	17.9	29.4	17.8	31.9	19.8	34.1	18.5	32.0	23.2	36.9
22	20.1	28.2	19.5	30.6	21.0	33.0	19.5	31.0	23.3	36.1
23	21.9	27.7	21.9	29.3	24.0	32.0	22.0	30.1	24.9	35.7
24	23.5	25.2	23.5	27.8	26.4	31.2	24.5	29.2	27.3	34.3
25	24.5	23.8	24.1	26.2	27.8	30.0	25.7	28.2	28.8	33.4
26	25.7	22.3	24.6	24.6	29.2	28.6	26.8	27.2	29.8	32.5
27	26.5	20.2	25.4	22.6	30.2	26.8	27.8	26.0	31.0	31.6
28	27.0	17.9	26.2	20.4	30.8	24.5	28.5	24.0	31.7	30.3
29	27.7	16.8	27.2	17.9	31.5	22.3	29.1	22.0	32.6	28.2
30	28.8	16.2	27.7	16.8	32.0	19.9	29.7	19.9	33.4	25.5
31		15.5		15.9		18.0		18.2		23.3

(1) Crest, 28.40 4 a.m. (1) Crest, 29.40 9 a.m. (1) 33.80 4 p.m. (1) Crest, 31.30 7 a.m. (1) Crest, 36.40 noon
(2) Crest, 32.82 11 p.m. (2) Crest, 30.20 6 p.m. (2) 33.40 4 p.m. (2) Crest, 31.25 3 p.m. (2) Crest, 37.30 8 a.m.
(3) Crest, 34.20 6 p.m. (3) Crest, 33.05 9 a.m.

(WG) Record collected in cooperation with U. S. Geological Survey
(C) Record furnished by Corps of Engineers

TABLE 8
DAILY RIVER STAGES JUNE - JULY 1951

Date	GRAND RIVER Gallatin, Mo. (WG)		GRAND RIVER Chillicothe, Mo.		GRAND RIVER Sumner, Mo. (WG)		GRAND RIVER Brunswick, Mo.		LAMINE RIVER Clifton City, Mo. (WG)	
	June	July	June	July	June	July	June	July	June	July
1	5.2	7.9	9.2	14.8	10.5	31.1	7.5	23.7	2.3	19.1
2	8.4	7.8	9.4	12.4	10.9	27.6	7.3	23.4	2.3	6.6
3	12.7	7.1	19.4	11.1	23.3	21.4	11.5	22.7	2.4	5.0
4	9.5	6.9	16.1	10.6	24.7	15.3	15.2	21.1	2.2	16.7(6)
5	7.0	7.7	13.4	13.7	20.5	14.2	14.8	19.0	2.2	21.0
6	5.4	24.1	11.2	26.6	15.1	26.6	15.3	19.4	2.1	23.0
7	5.0	26.3(2)	9.5	28.9(2)	12.2	29.9	14.4	20.8	2.2	28.8(7)
8	5.7	26.5	8.9	28.7	10.8	31.1	13.1	22.2	2.2	24.8
9	6.9	12.3	12.8	27.8	11.8	31.6(2)	13.8	22.6	15.2(1)	11.8
10	6.3	8.7	13.2	18.2	16.8	31.4	14.8	22.9(1)	10.9	7.1
11	5.0	8.6	11.3	12.8	14.7	28.8	14.5	22.1	4.2	15.1
12	4.5	12.6	9.4	18.6	11.7	27.2	13.4	21.2	7.3	15.8
13	6.5	10.1	10.5	17.2	10.8	26.6	12.3	22.0	20.5(2)	24.3(8)
14	5.1	8.9	10.8	15.5	11.9	23.8	11.6	22.6	5.9	12.3
15	5.0	7.6	9.0	12.2	11.4	17.6	11.2	22.9	12.6	5.9
16	5.8	6.8	9.1	10.8	10.2	14.3	10.6	25.5	6.5	4.7
17	7.0	7.2	12.9	13.7	15.6	16.7	13.4	26.1(2)	12.0	4.1
18	4.9	10.0	10.5	15.2	14.3	19.2	13.5	25.3	4.9	3.7
19	4.3	7.5	9.4	13.0	10.9	18.4	12.0	24.3	4.0	3.6
20	4.0	6.5	8.1	10.4	9.6	13.7	11.2	23.0	3.9	3.3
21	13.5	6.0	9.6	9.4	13.0	11.8	11.9	21.5	6.7	3.1
22	17.9	5.9	26.8	9.1	29.3	10.8	15.6	19.9	3.9	3.0
23	20.2(1)	5.6	27.6	18.8(3)	30.4	24.8(3)	17.5	18.3	4.7	4.0
24	14.4	7.4	26.0	14.1	31.3	24.3	19.0	17.4	17.9	3.4
25	11.6	6.0	22.7	10.7	31.3	21.8	20.7	16.5	22.7(3)	2.7
26	10.4	5.5	16.5	9.7	30.4	17.8	22.5	15.5	8.5	2.6
27	18.4	5.2	25.6	8.4	30.5	12.9	22.6	13.4	17.1	2.5
28	19.8	5.1	28.2(1)	8.1	31.1	10.8	22.9	11.6	16.5(4)	2.4
29	18.6	5.0	28.1	7.7	32.0	10.2	23.4	10.7	32.2(5)	2.4
30	10.8	4.8	23.2	7.5	32.3(1)	9.6	23.5	10.1	26.4	2.3
31		4.7		7.3		9.3		9.5		2.2

(1) Crest, 20.30 9 a.m.
(2) Crest, 27.50 11 p.m.

(1) Crest, 23.30 mdt.
(2) Crest, 29.00 3 a.m.
(3) Crest, 19.50 1 a.m.

(1) Crest, 32.40 4 a.m.
(2) Crest, 31.90 10 p.m.
(3) Crest, 25.50 noon

(1) Crest, 23.00 4 a.m.
(2) Crest, 26.10 7 a.m.

(1) Crest, 19.00 8 p.m.
(2) Crest, 21.00 4 a.m.
(3) Crest, 23.00 11 a.m.
(4) 24.90 p.m. reading
(5) Crest, 32.50 5 a.m.
(6) Crest, 22.00 mdt.
(7) Crest, 28.90 7:30 a.m.
(8) Crest, 24.40 8 a.m.

Date	THOMPSON RIVER Trenton, Mo. (WG)		MARAIS DES CYGNES RIVER Queenemo, Kans.		MARAIS DES CYGNES RIVER Ottawa, Kans.		MARAIS DES CYGNES RIVER Osawatomie, Kans.		MARAIS DES CYGNES RIVER La Cygne, Kans.	
	June	July	June	July	June	July	June	July	June	July
1	6.3	6.8		30.8(4)	2.0	21.7		34.2(2)		30.7
2	8.1	6.4		22.0	1.9	19.9		34.3		30.3
3	9.3	6.1		3.7	1.8	5.8		31.5		30.2(2)
4	9.3	6.1			1.7	4.9				30.1
5	8.4	10.2			1.6	3.8				26.6
6	7.0	12.9(4)			1.6	6.6		20.0		24.8
7	6.1	7.9	10.0	23.7	8.5	13.2		21.1		25.9(3)
8	6.6	6.8	27.0	32.1(5)	16.3	20.6(2)		24.8	17.6	24.2
9	10.3	6.3	30.3(1)	23.5	24.2(1)	21.0	28.8	36.1(3)(4)	24.5	24.6(4)
10	9.5	5.9	27.5	25.2	22.0	19.5(3)(4)	30.7	29.2	27.3	26.4
11	7.6	5.7	9.5	38.3(6)	7.4	29.5(5)(6)	28.0	33.6(5)	27.6	29.2
12	7.4	6.9		39.0(7)	3.5	41.8(7)(8)		47.9(6)(7)	25.3	32.8(5)
13	6.8	6.8		38.2	3.8	40.6		50.0(8)		36.2(6)
14	7.0	5.8		35.3	2.8	35.3		45.7		35.0(7)
15	6.0	5.5		31.0(8)	2.5	31.0		41.4		32.7(8)
16	9.5	5.4		14.9	3.6	27.0(9)		37.5		31.8
17	8.2	10.1	8.6	16.8	5.0	12.8		35.7	20.2	31.1
18	6.6	7.4		16.8	2.6	11.7		30.9		30.4
19	6.0	5.9		8.7	2.2	5.0				29.7(9)
20	7.8	5.4			2.8	3.9				25.6
21	10.5	5.2			2.1	3.5			16.3	14.0
22	11.7(1)	8.9			2.1	3.2				
23	10.6	9.9			3.7	9.0				
24	12.7	6.8	21.1(2)	22.2	11.7	13.2	22.0	24.0	23.7	22.0
25	8.6	5.9	25.6	13.1	19.6	10.1	26.3		25.1	22.5
26	10.3(2)	5.5	15.7	7.3	12.6	3.4	30.0		26.9	18.7
27	11.4(3)	5.4	23.2(3)		23.8	3.0	32.3		29.0	
28	11.4	5.2	16.1	8.5	16.9	4.7	33.2(1)		29.8	
29	10.4	5.1	21.6		18.3	2.7	32.1		30.4	
30	8.1	5.0	27.3		21.5	2.5	33.8		31.0(1)	
31		4.9				2.2				

(1) Crest, 14.40 5 p.m.
(2) Crest, 13.42 2 p.m.
(3) Crest, 15.10 1 p.m.
(4) Crest, 13.40 4 a.m.

(1) Crest, 30.49 10 a.m.
(2) Crest, 26.90 9 p.m.
(3) Crest, 28.30 8 a.m.
(4) Crest, 30.90 3 a.m.
(5) Crest, 32.30 2 a.m.
(6) Crest, 40.35 2:30 p.m.
(7) Crest, 39.85 4 p.m.
(8) 24.50 6 p.m.

(1) Crest, 24.80 noon
(2) Crest, 22.00 6 p.m.
(3) 23.70 noon
(4) 26.40 7 p.m.
(5) 36.90 1 p.m.
(6) 40.50 7:30 p.m.
(7) 41.30 mdt.
(8) Crest, 42.10 1:30 a.m.
(9) 18.60 6 p.m.

(1) Crest, 33.40 11 a.m.
(2) Crest, 34.40 11 p.m.
(3) Crest, 26.20 11 a.m.
(4) 25.90 7 p.m.
(5) 37.90 7 p.m.
(6) 50.20 7 p.m.
(7) Crest, 50.30 9:30 p.m.
(8) 48.40 7 p.m.

(1) Crest, 31.10 noon
(2) Crest, 30.30 5 p.m.
(3) Crest, 36.19 8 a.m.
(4) 24.20 6 p.m.
(5) 33.40 6 p.m.
(6) Crest
(7) 34.00 6 p.m.
(8) 32.40 6 p.m.
(9) 29.20 6 p.m.

(WG) Record collected in cooperation with U. S. Geological Survey

TABLE 8
DAILY RIVER STAGES JUNE - JULY 1951

MARAIS DES CYGNES RIVER Trading Post, Kans. (WG)			OSAGE RIVER Osceola, Mo. (WG)		OSAGE RIVER Lakeside, Mo. (UE)		OSAGE RIVER St. Thomas, Mo. (UE)		POTTAWATOMIE CREEK Garnett, Kans. (WG)	
Date	June	July	June	July	June	July	June	July	June	July
1	3.2	30.3(4)	5.5	27.9	55.8	62.6	8.3	29.1	3.2	25.0
2	2.9	29.0	4.7	29.5	55.5	62.9	8.6	29.6	3.1	7.1
3	2.8	28.2(5)	4.4	30.9	55.6	63.1	5.0	30.4	3.1	5.0
4	2.7	28.2(6)	4.1	30.6	55.7	63.1	3.0	31.0	2.9	5.0
5	2.6	27.7	4.1	31.6	55.5	63.1	7.0	31.3	2.9	5.3
6	2.5	26.7	3.1	35.5(2)	55.2	63.8	7.5	32.5	3.0	4.7(6)
7	3.2	26.4	4.2	35.4	55.0	64.4	7.4	34.0	4.5	19.8(7)
8	15.2	26.0	6.0	32.9	55.6	64.3	10.2	34.9	6.2	8.6
9	20.5	25.0(7)	11.3	30.8	54.8	64.1	12.7	35.0	15.2	5.0(8)
10	22.9	24.8	12.0	30.8	55.0	63.8	11.2	34.8	3.6	23.3
11	23.3	26.9	12.3	31.3	55.2	63.8	11.2	34.5	5.2	29.4(9)
12	23.6(1)	29.3	12.6	30.9	55.4	63.7	11.3	34.4	4.1	30.8
13	19.0	35.7	14.5	30.2	55.9	63.7	11.1	34.7(1)	6.4	29.0
14	5.9	38.0(8)	12.8	29.0	56.2	63.5	11.0	35.0	3.9	18.8
15	3.8	35.6	11.9	28.9	56.5	63.0	10.8	34.5	3.6	6.8
16	5.6	32.3	8.3	30.4	56.8	62.5	9.4	34.0	8.0	5.2
17	18.9(2)	30.4	9.5	32.8	57.5	62.0	7.2	33.6	5.7	19.2
18	13.4	29.1	11.1	34.4	58.0	61.8	2.9	32.9	3.8	10.4
19	5.2	28.1	10.7	35.0(3)	58.3	61.8	8.9	32.5	16.1(1)	5.0
20	3.8	27.2	8.6	35.1	58.3	61.9	10.8	32.2	6.7	4.4
21	17.1	24.6	7.7	34.2	58.2	62.0	11.0	31.9	5.0	4.1
22	9.1	14.1	11.6	33.2	58.0	61.9	11.0	31.7	5.2(2)	3.8
23	7.1(3)	4.0	15.7	31.9	58.2	61.7	11.2	31.6	10.3	17.6
24	22.5	16.3	20.4(1)	30.5	59.2	61.4	14.6	30.9	27.3(3)	21.8
25	24.3	19.3	17.5	28.9	59.9	61.0	18.7	29.9	18.3	4.5
26	24.6	18.7	17.0	27.1	60.2	60.8	21.7	28.5	9.1	5.8
27	26.3	9.3	19.0	24.5	60.3	60.5	22.4	26.8	19.8(4)	4.1
28	26.9	3.8	18.4	21.5	60.3	60.3	22.5	24.5	10.0	3.8
29	27.7	4.4	19.7	18.4	60.9	60.1	23.2	21.1	18.9	3.6
30	29.1	3.5	23.9	15.1	61.8	60.1	26.7	15.4	27.4(5)	3.5
31		3.2		8.5		60.0		13.5		3.3

(1) Crest, 23.59 7:45 a.m. (1) Crest, 20.40 9:45 a.m. (1) Crest, 35.20 9 p.m. (1) Crest, 16.20 9 a.m.
(2) Crest (2) Crest, 36.04 6 p.m. (2) Crest, 22.80 4 p.m.
(3) 15.20 6 p.m. (3) Crest, 35.10 10:30 p.m. (3) Crest, 27.51 2 a.m.
(4) Crest, 30.39 5 a.m. (4) Crest, 21.80 12:30 a.m.
(5) 28.00 noon (5) Crest, 28.44 5 p.m.
(6) Crest, 28.16 noon (6) 4.40 6 p.m.
(7) 24.50 6 p.m. (7) Crest, 19.80 9 a.m.
(8) Crest, 38.12 3 a.m. (8) 4.80 6 p.m.
(9) Crest, 32.30 10:30 p.m.

GASCONADE RIVER Jerome, Mo. (WG)			MISSISSIPPI RIVER Keokuk, Ia. (UE)		MISSISSIPPI RIVER Hannibal, Mo.		MISSISSIPPI RIVER Grafton, Ill.		MISSISSIPPI RIVER St. Louis, Mo. (WG)	
Date	June	July	June	July	June	July	June	July	June	July
1	3.1	17.9	9.0	8.5	13.0	12.6	16.0	18.6	20.3	32.3
2	3.1	19.9(1)	8.3	8.3	12.6	12.4	15.6	18.9	18.9	32.7
3	2.9	18.0	8.1	9.0	12.3	12.6	15.1	19.4	17.8	33.1
4	3.0	9.9	8.3	10.0	12.1	13.0	14.9	19.8	17.0	33.8
5	2.8	7.4	9.9	11.8	12.6	13.8	14.8	20.4	18.6	34.4
6	2.8	10.6	10.7	12.1	13.4	14.6	15.0	21.0	22.3	34.8
7	3.0	11.2	11.2	11.9	14.0	14.9	15.4	21.6	23.3	35.0
8	3.0	8.5	11.5	11.8	14.2	14.7	15.6	22.1	24.0	35.3
9	3.2	7.1	12.5	11.7	14.8	14.6	15.8	22.3	23.7	35.6
10	3.4	6.9	12.6	11.9	15.2	14.4	15.8	22.3	25.0	35.5
11	3.8	14.8	12.3	12.8	15.2	14.6	16.1	22.3	25.2	35.6
12	3.9	11.6	12.1	13.9	15.2	15.3	16.2	22.6	25.7	36.0
13	3.6	11.3	11.9	14.5	15.0	16.1	16.3	23.0	26.3(1)	36.4
14	3.9	13.7	11.0	15.0(1)	14.6	16.8	16.3	23.6	26.1	37.0
15	4.1	10.1	10.2	15.0	13.8	17.2	16.1	24.4	25.1	37.5
16	3.8	7.1	9.4	14.5	13.4	17.3(1)	15.8	25.0	23.8	38.0
17	4.0	6.0	9.0	14.0	13.0	17.1	15.9	25.4	23.1	38.4
18	4.3	5.5	8.3	13.6	12.6	16.6	15.0	25.7	22.1	38.5
19	3.8	5.0	7.9	13.2	12.2	16.2	15.0	26.0	21.8	38.6
20	3.4	4.6	7.4	12.8	12.0	15.8	15.5	26.6	22.5	39.4
21	4.3	4.3	6.9	12.5	11.6	15.6	15.0	27.4(1)	20.5	40.1
22	3.6	4.0	8.7	12.6	11.8	15.6	15.2	27.4	19.5	40.2(2)
23	4.4	4.3	9.9	13.0	13.3	17.0	15.4	27.2	20.8	39.9
24	5.6	4.3	8.6	12.3	13.2	17.3	15.8	27.0	24.6	39.5
25	7.9	3.7	8.7	11.2	12.7	16.3	15.9	26.4	26.3	38.7
26	5.5	3.6	8.3	10.6	12.4	15.9	15.9	25.5	27.4	37.7
27	4.9	4.0	8.7	10.2	13.2	13.8	16.0	24.3	26.5	36.6
28	4.3	4.0	8.2	10.1	13.6	13.6	16.8	22.9	29.7	35.1
29	6.5	4.0	8.3	10.2	13.2	13.4	17.7	20.9	30.7	33.2
30	16.8	4.3	8.4	9.9	12.8	13.4	18.2	19.0	31.5	30.5
31		3.7		9.4		13.2		17.3		27.5

(1) Crest, 20.08 4 a.m. (1) Crest, 15.10 mdt. (1) Crest, 17.34 7 a.m. (1) Crest, 27.50 7 p.m. (1) Crest, 26.42 4 p.m.
(2) Crest, 40.28 2:30 a.m.

(WG) Record collected in cooperation with U. S. Geological Survey
(UE) Record furnished by Union Electric Company

TABLE 8
DAILY RIVER STAGES JUNE-JULY 1951

Date	MISSISSIPPI RIVER Chester, Ill. (WG)		MISSISSIPPI RIVER Cape Girardeau, Mo.		DES MOINES RIVER Ottumwa, Ia. (WG)		ILLINOIS RIVER Morris, Ill.		ILLINOIS RIVER Peoria, Ill.	
	June	July	June	July	June	July	June	July	June	July
1	20.3	30.7	25.2	34.2	3.8	7.1	6.5	6.3	11.9	12.2
2	19.2	31.3	24.6	34.9	4.0	7.6	7.0	6.3	11.7	12.1
3	18.2	32.0	23.8	35.5	5.8	9.3	6.6	5.9	11.6	12.0
4	17.4	32.7	23.1	36.1	9.6	12.9(2)	6.7	5.9	11.5	11.8
5	16.7	33.3	22.2	36.7	10.3	12.2	6.4	5.7	11.4	11.8
6	19.5	33.7	23.0	37.1	11.0	11.4	6.2	5.8	11.2	11.6
7	22.0	34.1	25.7	37.5	11.7(1)	11.6	6.3	5.7	11.2	11.2
8	22.8	34.4	27.0	37.6	12.1	11.0	6.4	5.7	11.4	10.9
9	23.2	34.7	27.7	38.0	11.9	9.8	6.0	10.9	11.4	11.9
10	23.4	35.2	27.8	38.8	11.6	8.3	6.9	14.8	11.4	13.2
11	24.0	35.2	28.3	38.9	11.7	7.2	6.8	14.8	11.4	14.9
12	24.7	35.5	28.8	38.9	10.7	6.3	6.8	14.3	11.3	17.3
13	25.2	36.0	29.3	39.1	8.8	6.4	6.2	13.6	11.3	18.8
14	25.7(1)	36.8	29.7	39.7	7.6	6.4	5.7	12.7	10.9	19.5
15	25.0	37.0	29.7(1)	40.1	6.8	6.4	5.9	11.7	11.2	19.6(1)
16	24.3	37.4	29.0	40.3	6.7	6.3	5.7	10.9	11.3	19.6
17	23.3	38.0	28.2	40.6	6.3	6.7	5.7	9.7	11.3	19.5
18	22.4	38.3	27.4	41.0	6.1	6.4	5.6	9.4	11.4	19.1
19	21.5	38.3	26.6	41.1	6.6	5.8	5.5	8.4	11.4	18.8
20	21.5	38.3	26.3	41.1	6.3	5.3	6.0	7.8	11.2	18.3
21	21.9	38.6	26.6	41.1	6.1	5.0	5.6	7.3	11.4	17.7
22	20.0	39.1	25.7	41.5	8.3	4.8	7.2	8.1	11.4	17.5
23	19.7	39.3(2)	24.8	41.7	8.5	4.6	6.6	7.0	11.4	17.6
24	21.7	39.2	25.8	41.8(2)	7.6	4.8	6.4	6.8	11.5	17.1
25	24.3	38.9	28.0	41.7	7.3	5.1	6.6	6.5	12.0	16.7
26	26.0	38.3	29.7	41.5	6.8	5.3	6.5	6.3	12.0	16.2
27	27.4	37.4	31.0	41.0	6.8	4.8	6.1	6.0	11.5	15.9
28	28.0	36.3	31.8	40.4	7.1	4.2	6.2	6.1	11.4	15.7
29	28.8	35.0	32.5	39.5	6.5	3.7	6.5	6.3	11.8	15.3
30	29.7	33.4	33.3	38.4	6.6	3.4	6.6	6.2	12.3	14.8
31		31.0		37.0		3.1		6.3		14.4

(1) Crest, 25.72 5 a.m. (1) Crest, 29.74 6 p.m. (1) Crest, 12.63 6:30 p.m. (1) Crest, 19.60 7 a.m.
(2) Crest, 39.28 7 a.m. (2) Crest, 41.80 noon (2) Crest, 13.15 noon

Date	ILLINOIS RIVER Havana, Ill.		ILLINOIS RIVER Beardstown, Ill.		MERAMEC RIVER Steelville, Mo. (WG)		MERAMEC RIVER Sullivan, Mo.		MERAMEC RIVER Valley Park, Mo.	
	June	July	June	July	June	July	June	July	June	July
1	11.6	12.7	11.1	14.0		15.3	2.7	13.1	0.5	10.5
2	11.3	12.8	10.8	14.8		6.9	2.6	15.1	0.3	14.2
3	11.1	12.9	10.4	15.4		5.1	2.5	6.4	0.0	15.4
4	10.9	13.0	10.1	15.7		5.0	2.5	5.2	-0.2	16.2
5	10.7	13.1	9.8	16.0		4.1	2.5	4.6	-0.4	11.5
6	10.5	13.1	9.6	16.0	2.4	4.8	2.4	4.9	-0.4	11.3
7	10.4	13.0	9.4	15.8	2.4	5.4	2.3	5.6	0.7	11.3
8	9.9	12.8	10.2	15.5	2.4	4.5	2.4	5.0	1.1	12.2
9	9.7	13.2	10.4	15.1	4.6	4.1	2.6	4.4	1.3	12.3
10	9.7	13.5	10.3	15.1	4.0(e)	4.5	3.5	6.2	1.7	12.0
11	9.6	14.0	10.2	15.2	3.5(e)	12.5(1)	2.9	10.1	2.5	12.3
12	10.0	15.0	10.2	15.5	3.0	9.9	3.6	15.1	2.9	14.6
13	10.1	15.9	9.3	15.9	3.4	7.9	3.4	15.9	4.8	17.3
14	10.0	16.5	9.1	16.4	3.0	20.2(2)	3.2	19.5(1)	4.3	19.6(1)(2)
15	9.2	16.7	10.3	16.9	2.8	7.2	2.8	19.4	4.3	23.5(3)
16	8.6	16.7	10.1	17.3	2.6	5.5	2.7	7.3	2.8	25.5(4)(5)
17	8.4	16.7	10.0	17.5	2.9	4.8	2.6	7.0	2.7	24.7
18	8.2	16.7	9.7	17.8	2.9	4.4	2.6	5.2	1.3	20.1
19	8.0	16.7	9.4	18.0	2.7	4.1	2.6	4.7	0.7	14.5
20	7.9	16.5	9.1	18.0	2.6	3.9	2.6	4.4	1.1	14.7
21	8.0	16.3	11.0	18.0	2.6	3.7	2.6	4.2	1.9	15.4
22	8.8	16.3	10.2	18.1	2.7	3.5	2.6	4.0	0.6	15.6
23	9.1	16.7	10.0	18.7	3.0	3.4	2.8	3.8	0.1	15.3
24	9.4	16.8	10.3	19.2	3.7	4.1	3.4	4.8	1.7	15.0
25	9.5	16.7	10.5	19.0	4.6	3.5	6.3	4.0	3.3	14.4
26	9.6	16.7	10.6	18.7	3.7	3.3	4.4	3.6	7.8	13.6
27	10.3	16.7	11.1	18.4	4.1	3.2	4.2	3.5	8.8	12.5
28	11.4	16.5	11.2	18.3	3.6	3.1	4.0	3.4	7.1	11.3
29	12.4	15.8	12.7	17.9	3.8	3.1	4.0	3.3	7.6	9.8
30	12.6	15.2	13.5	17.3	5.4	3.4	5.8	3.2	8.3	7.7
31		14.8		16.7		3.3		3.6		6.2

(e) Estimated (1) Crest, 19.50 10:15 a.m. (1) 25.50 1 p.m.
(1) Crest, 13.20 2 p.m. (2) 20.90 5 p.m.
(2) Crest, 20.43 8:45 a.m. (3) 24.90 5 p.m.
(4) 25.50 noon (4) 25.50 noon
(5) 25.40 5 p.m.

(WG) Record collected in cooperation with U. S. Geological Survey

TABLE 8
DAILY RIVER STAGES JUNE - JULY 1951

Date	BOURBEUSE RIVER Union, Mo. (WG)		OHIO RIVER Cairo, Ill.		ARKANSAS RIVER Wichita, Kans. (WG)		ARKANSAS RIVER Tulsa, Okla. (WG)		ARKANSAS RIVER Muskogee, Okla. (G)	
	June	July	June	July	June	July	June*	July*	June	July
1	1.9	6.1	25.4	34.1	4.4	12.9(2)	6.4	10.0		23.2
2	1.8	10.8	25.1	35.1	4.1	11.4	5.5	13.1		24.9
3	1.7	5.6	24.7	36.0	3.9	10.4	4.8	14.5		28.4
4	1.6	3.5	24.5	36.6	3.7	12.2	4.4	15.4(3)		29.6
5	1.5	3.0	25.1	37.2	3.7	10.2	4.2	14.0		30.7(2)
6	1.5	3.1	24.4	37.8	5.0	9.9	4.2	12.4		29.3
7	1.5	7.1	23.8	38.4	5.6	9.3	4.3	11.9		27.9
8	1.4	6.0	25.4	38.7	8.5	8.1	5.4	10.2		27.4
9	1.4	4.0	26.7	38.7	8.0	6.0	7.9	8.0	12.4	25.8
10	1.4	4.4	28.0	38.8	8.5	4.7	9.6(1)	7.1	15.0	24.7
11	1.5	9.0	28.3	39.1	8.1	4.1	8.8	6.4	17.2	24.5
12	2.2	7.2	28.5	39.2	7.3	6.9	6.8	6.9	16.6	24.6
13	2.5	8.9	28.8	39.0	6.8	9.9	6.6	6.2	15.0	26.0
14	2.6	12.4	29.2	38.9	6.7	10.8	6.8	8.1	14.2	25.9
15	2.3	16.7(1)	29.5	38.9	6.7	11.3	6.7	12.0	15.2	26.6
16	2.0	19.0	29.7	39.1	7.0	11.5	8.0	13.2	14.9	29.8
17	1.9	4.3	29.5	39.5	6.7	12.5(3)	6.4	14.0(4)	16.0	30.9(3)
18	2.2	3.6	29.4	39.8	6.7	11.7	5.8	12.6	14.1	31.1
19	2.2	3.1	29.0	40.1	6.7	10.2	5.9	9.1	13.5	30.7
20	2.9	2.9	28.9	40.3	5.3	6.2	5.5	8.0	14.2	28.7
21	2.1	2.7	29.5	40.4	4.6	5.4	5.6	7.4	13.2	28.1
22	1.8	2.5	30.1	40.4	4.5	3.8	7.4	6.5	13.8	26.9
23	2.2	2.4	29.8	40.3	6.4	3.9	7.7	5.3	16.7	26.3
24	2.0	2.3	29.5	40.3	7.9	6.2	8.6	4.6	17.3	26.0
25	2.0	2.3	30.1	40.2	8.2	5.4	9.6	4.2	18.6	25.9
26	5.7	2.2	30.8	40.3	7.9	4.4	11.6	5.8	19.4	22.5
27	3.5	2.2	30.9	40.5	7.7	3.7	12.4(2)	6.1	21.3(1)	20.9
28	2.8	2.0	30.8	40.6	7.8	3.5	11.9	4.8	21.8	20.4
29	3.3	2.4	31.6	40.5	8.3	3.1	8.7	4.2	21.9	18.1
30	3.0	2.0	32.8	39.1	12.4(1)	3.0	9.1	3.9	19.9	14.8
31		1.9		38.1		2.7		3.5		13.3

(1) Crest, 19.78 11:30 p.m.

(1) 12.80 1:30 p.m.
(2) Crest, 13.40 1 a.m.
(3) Crest, 12.51 noon

* Gage heights are means for day
(1) Crest, 10.00 9 p.m.
(2) Crest, 12.86 2 a.m.
(3) Crest, 15.70 3 p.m.
(4) Crest, 14.18 2 p.m.

(1) Crest, 22.25 6 p.m.
(2) Crest, 30.90 10 a.m.
(3) Crest, 31.42 11 p.m.

Date	NEOSHO RIVER Council Grove, Kans (WG)		NEOSHO RIVER Emporia, Kans.		NEOSHO RIVER Neosho Rapids, Kans.		NEOSHO RIVER LeRoy, Kans.		NEOSHO RIVER Burlington, Kans.	
	June	July	June	July	June	July	June	July	June	July
1	8.8	9.6		18.4		27.6(3)	3.7	25.2	8.3	26.4
2	8.7	9.0				26.2	3.9	24.8	8.2	34.4(4)
3	8.6	8.9				24.7(4)	3.9	27.5	8.2	33.2
4	8.6	9.0				23.1	3.4	26.6	8.0	32.0
5	8.6	8.8				19.2	3.3	25.8	7.9	30.7
6	8.6	8.9(1)				16.9	3.4	24.6	7.8	25.8
7	28.3	10.6			6.0	20.3	4.2	24.5	8.9	28.5(5)
8	10.4	9.0	26.5		17.9	15.7	11.2	23.6	16.9	25.6
9	10.9	8.8(2)	16.8		24.7(1)		18.2	15.3	24.3	13.8
10	9.4	24.0(3)	9.0	(2)(3)	22.0	9.3(5)	21.4	10.4	28.2(1)	13.2
11	9.1	32.6(4)(5)(6)		28.8(4)		28.2(6)	23.0	25.2	28.2	30.5
12	9.0	32.9(7)(8)(9)		27.2(5)	19.0	32.1(7)	23.1	34.3(3)	25.7	41.5(6)
13	8.8	10.7		27.4(6)(7)		31.3(8)	19.7	33.1	18.4	41.0
14	8.8	10.9		24.6(8)		29.0(9)	7.1	30.3	9.6	36.0
15	17.2	10.0		10.8	4.9	26.0	6.0	27.7	9.3	34.3
16	10.4	9.7	23.1(1)	8.0		24.2	11.2	26.2	14.5	32.9
17	9.2	9.4			17.4	22.2	15.4	25.4	20.5(2)	31.7
18	8.9	9.3				17.0	13.9	24.7	14.7	29.8
19	8.8	9.3					6.8	20.2	9.4	16.0
20	8.8	9.3					6.2	8.2	8.8	11.2
21	8.8	9.3					4.8	7.1	8.7	10.4
22	9.1				3.7		4.9	6.4	8.4	9.8
23	10.1	9.1	16.5			13.6	6.4	10.5(4)	9.7	19.3
24	15.5	9.0			19.4(2)	17.7	22.6(1)	23.3	26.9(3)	27.2
25	9.4	8.8			18.3		23.5	19.0	25.8	20.7
26	9.0	8.8					18.9	12.5	20.9	15.3
27	8.8	10.9					14.9	11.1	16.5	12.4
28	8.8	9.0					8.3	8.6	11.2	13.2
29	9.4						10.4	6.1	10.6	13.0
30	14.5	8.8	15.3		16.5		23.1(2)	5.0	23.9	10.0
31		8.7						5.2		8.9

(1) Crest, 13.95 5 p.m.
(2) 8.80 7 p.m.
(3) Crest, 31.60 noon
(4) 20.70 1 a.m.
(5) 25.60 7 p.m.
(6) Crest, 35.50 8:30 a.m.
(7) 19.10 1 a.m.
(8) Crest, 34.00 8:45 a.m.
(9) 20.20 7 p.m.

(1) 24.00 7 p.m.
(2) 16.50 1 p.m.
(3) 22.00 7 p.m.
(4) Crest, 29.40 3:30 p.m.
(5) 28.90 7 p.m.
(6) Crest, 25.50 7 p.m.
(7) Crest, 29.00 noon
(8) 18.70 7 p.m.

(1) Crest, 24.82 1:30 a.m.
(2) Crest, 19.62 9 a.m.
(3) Crest, 27.57 5 a.m.
(4) Crest, 24.99 8:30 p.m.
(5) 15.28 1 p.m.
(6) Crest, 34.30 10 p.m.
(7) 31.42 7 p.m.
(8) 29.28 7 p.m.
(9) 27.10 7 p.m.

(1) Crest, 24.18 7 p.m.
(2) Crest, 25.60 8 p.m.
(3) Crest, 34.55 11 a.m.
(4) 21.32 7 p.m.

(1) Crest, 28.75 4 p.m.
(2) Crest, 20.75 1 p.m.
(3) Crest, 27.27 1 p.m.
(4) Crest, 34.50 5 a.m.
(5) Crest, 28.55 1 p.m.
(6) Crest, 41.53 6 a.m.

(WG) Record collected in cooperation with U. S. Geological Survey

TABLE 8
DAILY RIVER STAGES JUNE - JULY 1951

Date	NEOSHO RIVER Ioia, Kans.		NEOSHO RIVER Chanute, Kans.		NEOSHO RIVER Erie, Kans.		NEOSHO RIVER Parsons, Kans. (WG)		NEOSHO RIVER Oswego, Kans.	
	June	July	June	July	June	July	June	July	June	July
1	8.3	19.2		25.1	3.1	25.0	9.2	24.8	5.8	21.1
2	8.2	18.3		26.0(1)	2.0	25.1	9.0	25.2	5.5	22.2
3	8.1	18.0		25.2	1.8	26.0	8.9	25.3	5.6	22.1
4	8.0	21.0(3)		25.2	1.4	26.6	8.8	25.7	5.5	22.1
5	8.0	20.6		27.3(2)	1.4	27.2	8.7	26.0	5.4	22.4
6	8.0	19.8		27.8(3)	1.3	25.5	8.6	26.2	5.3	22.7
7	8.2	18.9		26.4	1.3	25.9	8.8	26.1	5.0	22.8
8	9.6	17.8		25.5	3.0	25.8	10.9	26.2	6.0	22.8
9	11.0	16.7	11.5	24.6(4)	6.1	25.3	12.5	26.4	7.8	22.8
10	13.2	10.4(4)	14.8	23.4(5)	13.0	25.3	15.0	26.8	10.0	23.4
11	14.4	18.8(5)	16.5	24.8	15.0	25.6	16.9	26.9	11.9	24.1
12	16.4(1)	21.6(6)	18.6	25.6(6)	16.5	25.0	18.6	26.8	14.5	24.2
13	15.8	33.1(7)	21.4	38.4(7)	19.3	34.0(1)	19.9	26.8	15.3	24.2
14	9.8	29.0	17.6	36.5	19.5	33.9	21.3	39.6(1)	15.5	30.0(2)
15	9.5	24.9		32.0(8)	7.2	28.4	19.3	38.2	17.0(1)	31.8
16	10.0	22.3		30.0	3.5	26.0	10.5	33.4	7.0	29.2
17	10.5	21.5		28.6	8.0	24.8	12.3	30.7	7.1	27.2
18	11.0	20.0	11.8	27.7	10.4	24.2	13.5	29.5	8.3	26.1
19	9.2	19.0		26.4	10.0	23.6	14.7	28.8	10.0	25.4
20	9.4	10.9		25.0	4.4	22.9	12.5	28.0	8.3	24.8
21	8.7			13.7	7.2	16.0	12.9	27.0	7.8	24.1
22	9.0				4.6	11.5	12.6	26.3	9.6	23.2
23	9.2		10.3		8.0	5.7	16.3	20.4	12.1	21.8
24	14.2		20.0	14.4	20.0	10.8	18.2	12.5	12.3	8.9
25	16.6		22.8	18.3	22.0	16.8	22.4	17.0	16.6	11.6
26	16.1		22.6	16.5	22.0	17.5	23.3	19.3	18.5	14.4
27	12.4		20.2		21.5	9.6	23.5	18.7	19.2	15.1
28	10.0		11.3		17.0	7.8	23.1	13.2	19.3	9.4
29	10.4		11.2		8.5	6.6	17.1	11.9	17.0	7.4
30	17.3(2)		22.0		22.0	6.4	23.0	11.8	18.9	6.7
31						5.0		10.2		6.6

(1) Crest, 16.92 1 p.m.
(2) Crest, 19.50 11 p.m.
(3) Crest, 21.20 1 p.m.
(4) 17.65 7 p.m.
(5) 20.10 6 p.m.
(6) 32.80 8:30 p.m.
(7) Crest, 33.26 4 a.m.

(1) 26.20 7 p.m.
(2) Crest, 28.10 8 p.m.
(3) 27.30 7 p.m.
(4) 24.30 6 p.m.
(5) 24.10 6 p.m.
(6) 27.40 4 p.m.
(7) Crest, 38.60 noon
(8) 30.45 7 p.m.

(1) Crest, 35.10 2 p.m.

(1) Crest, 40.20 1 p.m.

(1) Crest, 17.00 7 a.m.
(2) Crest, 32.50 10 p.m.

Date	GRAND RIVER Langley, Okla. (WG)		COTTONWOOD RIVER Cottonwood Falls, Kans.		COTTONWOOD RIVER Emporia, Kans.		VERDIGRIS RIVER Independence, Kans. (WG)		VERDIGRIS RIVER Claremore, Okla. (WG)	
	June*	July*	June	July	June	July	June	July	June*	July*
1		18.4		14.1	3.4	28.8	9.0	45.0(7)	10.5	38.7
2		21.1		10.7	3.2	26.1	6.3	45.6	8.4	41.4
3		23.7		5.1	3.1	25.1	4.3	40.5	7.3	43.1
4		22.8		5.1	3.0	23.6	4.2	37.6	6.3	44.2
5		23.0		6.8	2.8	19.3	3.8	36.9	5.9	45.9
6	7.8	22.7			2.7	20.2	3.7	33.2	5.8	46.9(2)
7	8.2	21.8	6.4		5.9	19.4	4.3	27.9	6.5	46.6
8	8.0	20.8	6.5		18.5	7.9	12.4	20.2	7.2	45.8
9	7.8	20.5	10.8		21.5	8.2	19.7(1)	18.9	10.3	45.0
10	6.9	20.1	8.6	7.8(1)	23.0(1)	9.3(4)	16.4	21.4	15.8	42.5
11	9.3	22.6		15.1(2)(3)	23.8	21.9(5)(6)	10.0	33.2(8)	17.9	37.9
12	10.9	26.3		17.7(4)(5)	15.1	31.6(7)	13.3(2)	33.4	14.3	35.8
13	11.8	26.7		16.5(6)	5.1	30.4(8)	18.9	41.5(9)	13.7	36.2
14	13.5	26.6		13.9(7)	4.9	28.6(9)	10.5	44.2	17.4	37.0
15	13.3	27.7		10.5	4.8	25.8(10)	5.9	42.4	13.6	38.4
16	13.2	28.8			11.0	24.7	5.7	38.6	8.0	39.3
17	11.4	33.1(1)			5.9	22.1	13.7	33.8	7.3	40.4
18	9.5	34.0			4.1	10.6	12.4	25.3	10.6	42.0
19	8.4	31.1			3.9	7.0	5.8	18.4	12.1	43.6
20	9.3	27.9			3.4	5.4	5.7	17.8	8.4	44.0(3)
21	11.2	26.1			3.0	5.0	10.9	17.4	13.8	41.5
22	12.5	26.4			3.4	4.2	13.0	16.8	23.8	32.9
23	14.4	26.4			8.7	10.8	22.4(3)	15.0	26.6	25.4
24	13.9	25.9			17.2(2)	18.6	21.5	12.2	27.5	19.4
25	9.4	24.3			16.3	14.0	31.7(4)	13.3	26.2	13.5
26	11.8	22.0			14.8	12.7	32.9	14.0	25.7	12.4
27	15.1	20.3			6.7	11.7	28.1	14.7	28.4	15.9
28	15.1	16.0			5.5	11.4	18.0	14.9	30.2(1)	14.2
29	16.1	11.5	5.2		11.8	6.2	8.5(5)	15.8	27.3	13.2
30	16.8	11.5	15.7		22.0(3)	4.4	38.0(6)	16.6	29.7	12.6
31		11.3				4.0		17.8		11.9

* Gage heights are approximate means for day
(1) Crest, 36.25 mdt.

(1) 13.90 7 p.m.
(2) 18.50 7 p.m.
(3) Crest, 19.80 10 a.m.
(4) 17.70 1 p.m.
(5) 17.80 7 p.m.
(6) 15.40 7 p.m.
(7) 12.10 7 p.m.

(1) Crest, 24.00 8 p.m.
(2) Crest, 17.50 1 p.m.
(3) Crest, 29.10 6 p.m.
(4) 17.05 1 p.m.
(5) 30.25 1 p.m.
(6) Crest, 33.40 6 p.m.
(7) 31.30 7 p.m.
(8) 29.30 7 p.m.
(9) 26.65 7 p.m.
(10) 25.18 7 p.m.

(1) Crest, 20.10 10:30 a.m.
(2) Crest, 19.90 10 p.m.
(3) Crest, 23.25 1 p.m.
(4) Crest, 33.70 11 p.m.
(5) 22.90 1 p.m.
(6) 35.20 1 a.m.
(7) Crest, 46.60 8 p.m.
(8) Crest, 34.36 4:30 p.m.
(9) Crest, 44.30 10:30 p.m.

* Gage heights are means for day
(1) Crest, 30.45 11 p.m.
(2) Crest, 46.95 noon
(3) Crest, 44.16 7 a.m.

(WG) Record collected in cooperation with U. S. Geological Survey

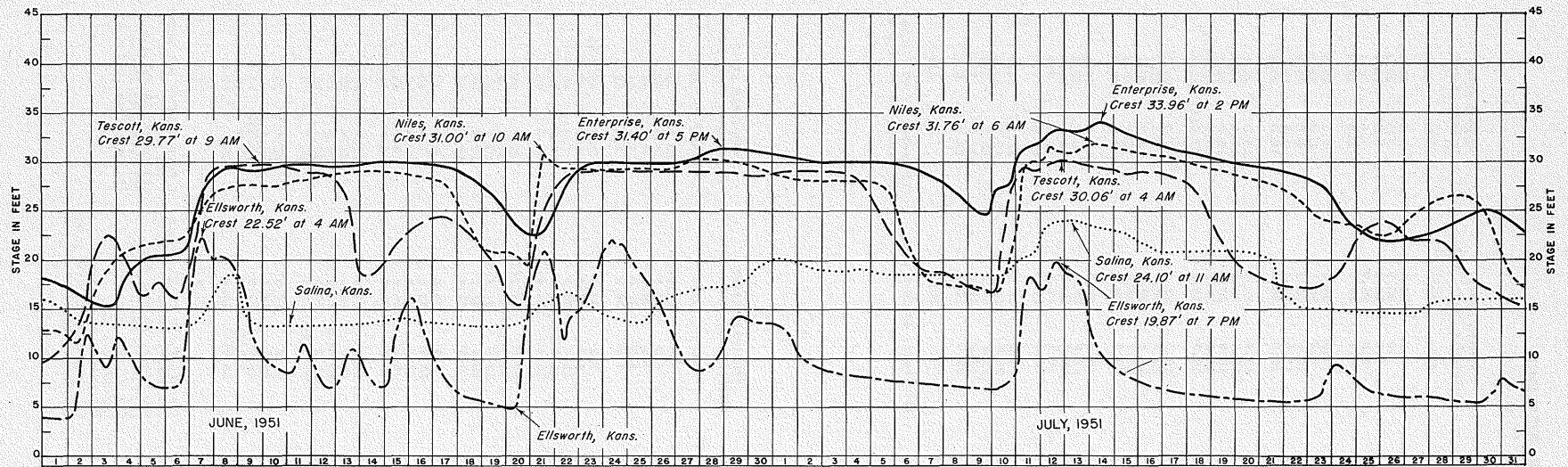


Figure 13.--River stage graphs, Smoky Hill-Solomon-Saline Basins, June-July, 1951

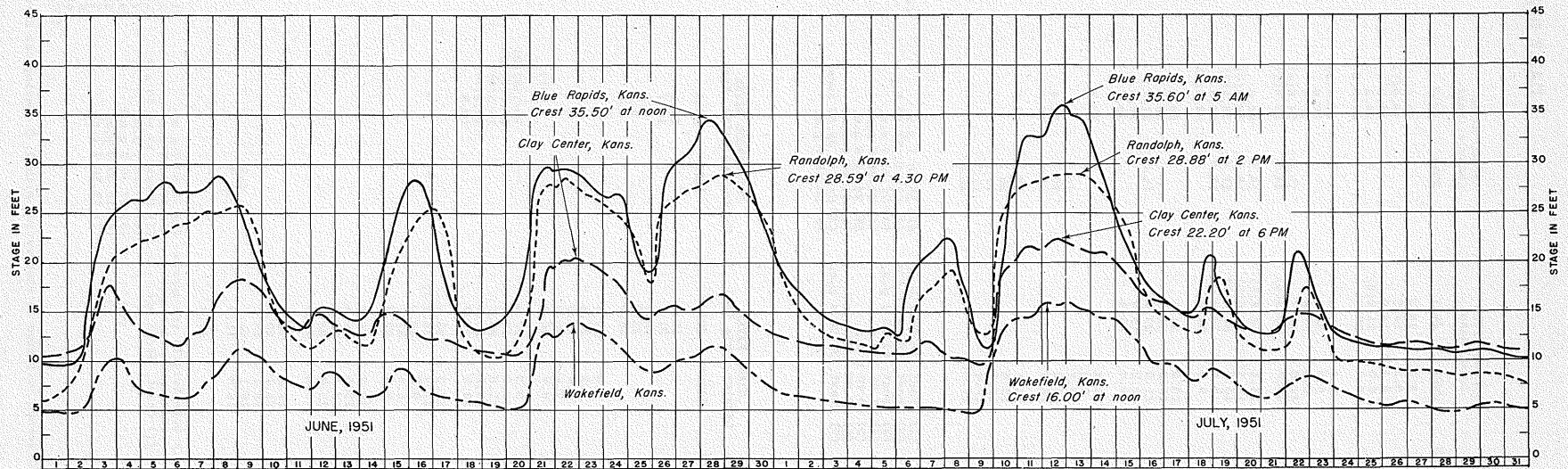


Figure 14.--River stage graphs, Republican and Blue Basins, June-July, 1951

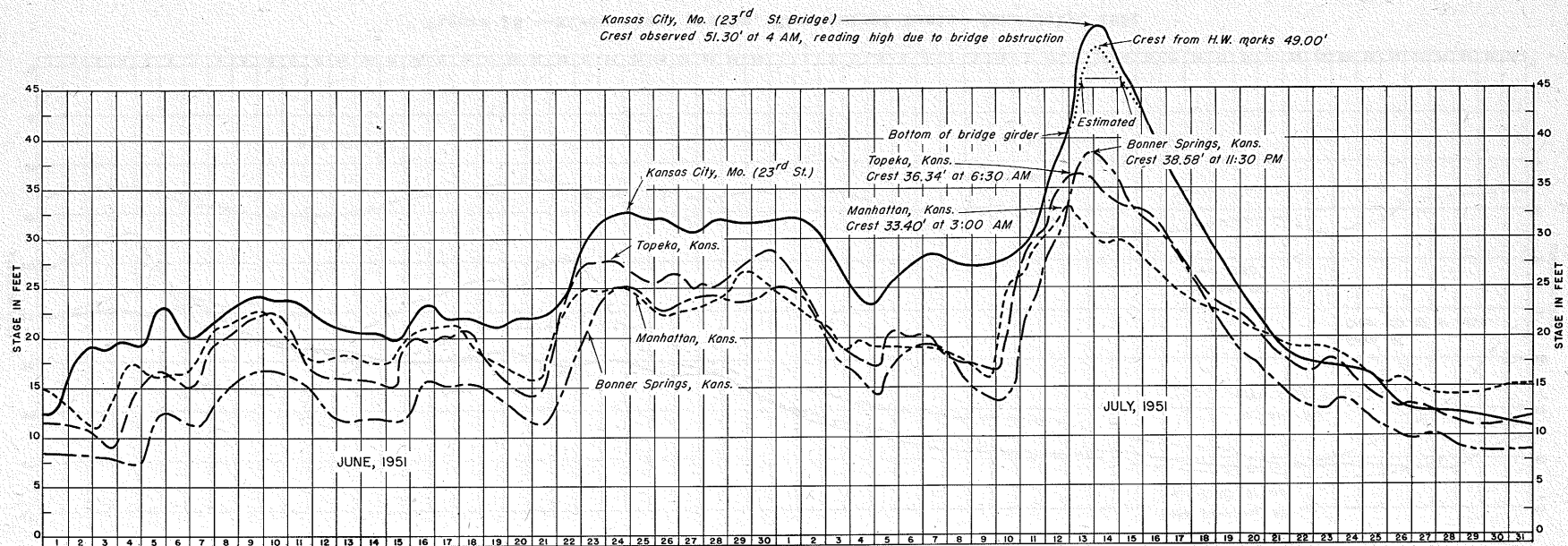


Figure 15.--River stage graphs, Kansas River, June-July, 1951

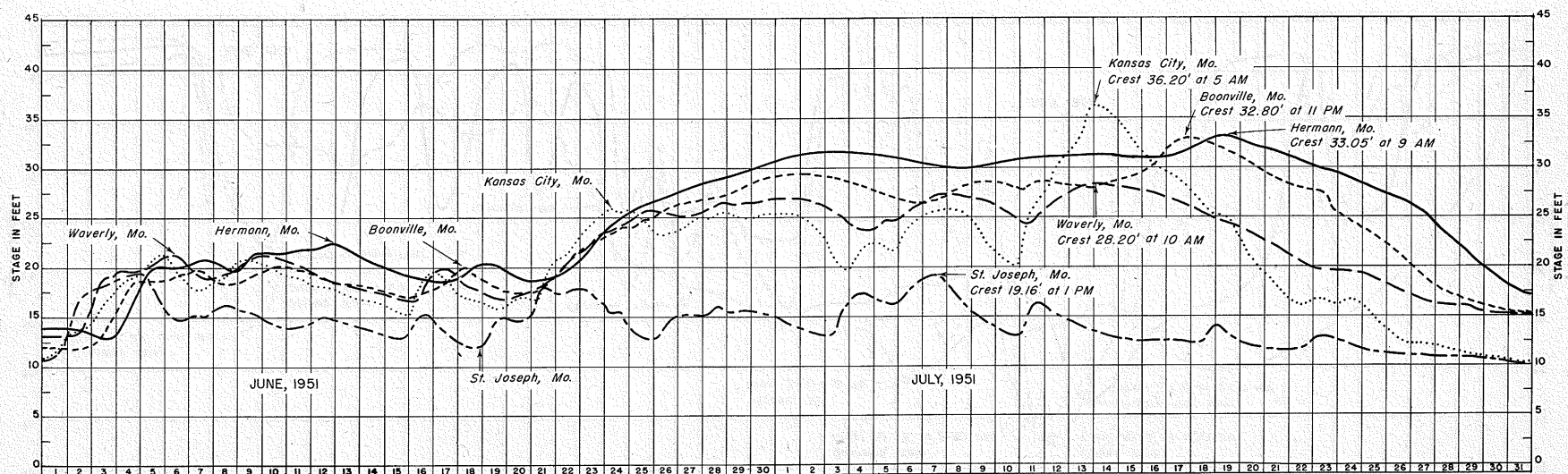


Figure 16.--River stage graphs, Missouri River, June-July, 1951

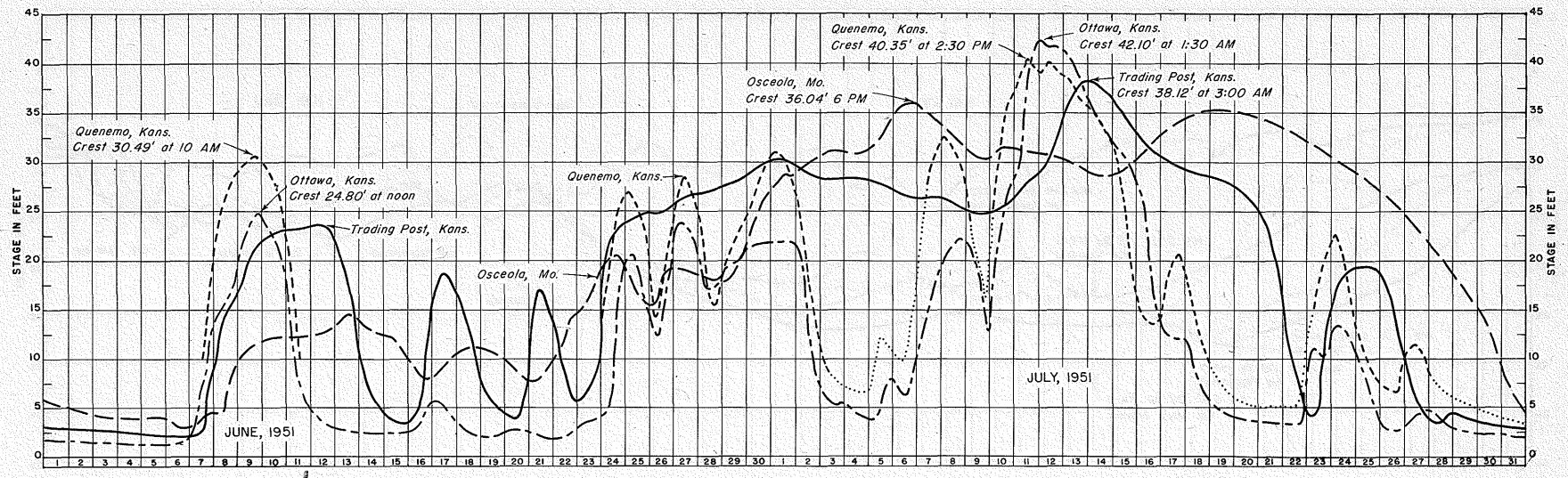


Figure 17.--River stage graphs, Marais des Cygnes-Osage Basin, June-July, 1951

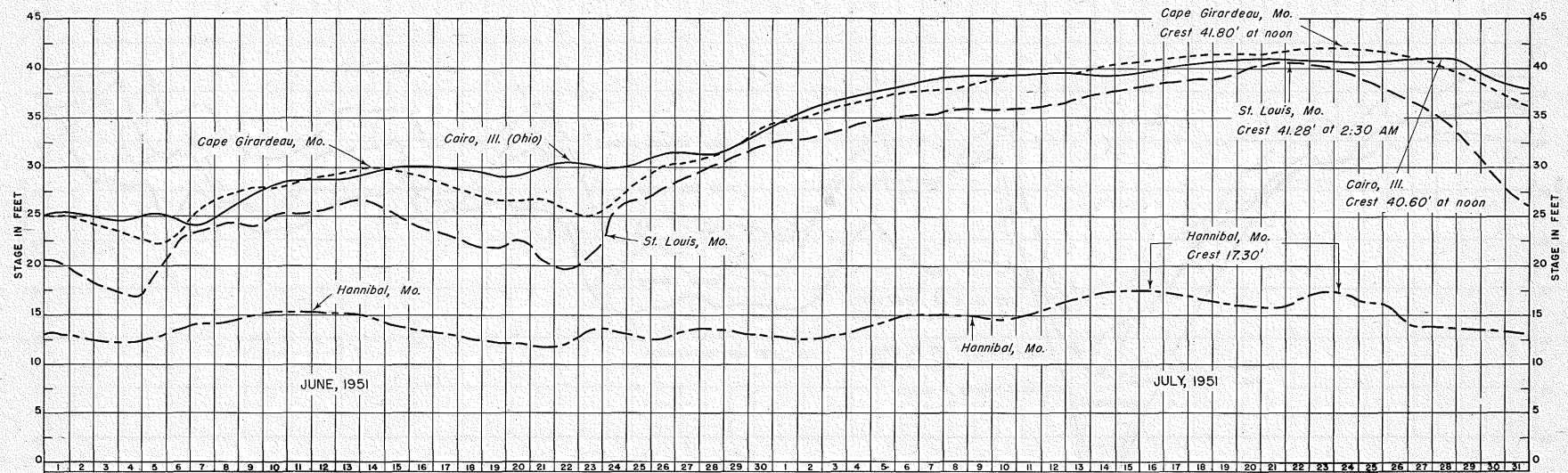


Figure 18.--River stage graphs, Mississippi Basin, June-July, 1951

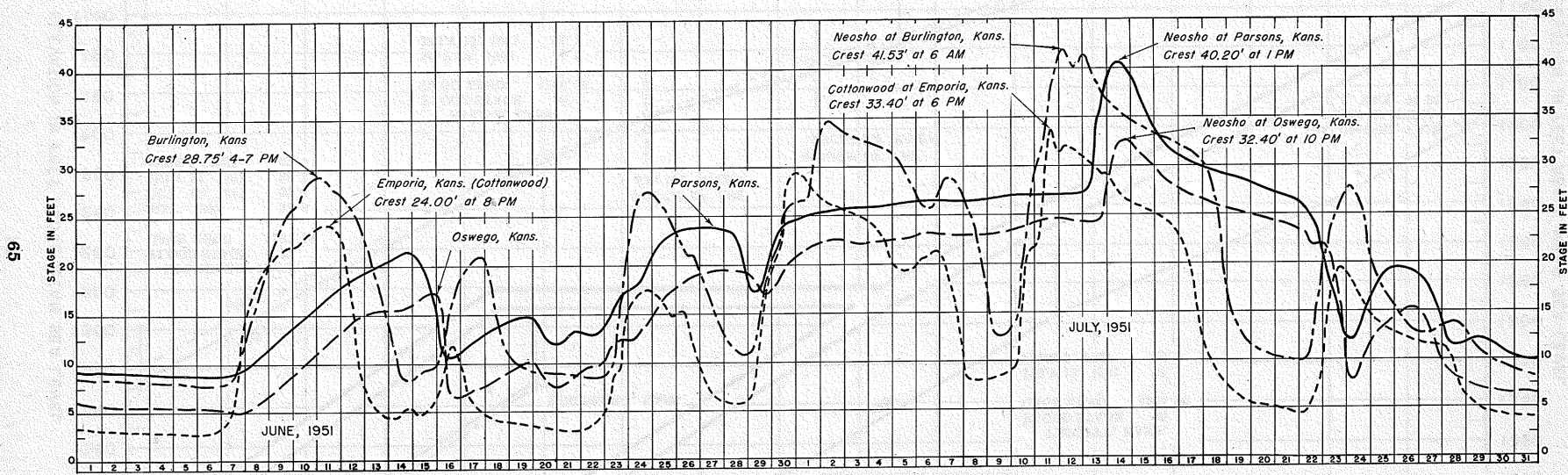


Figure 19.--River stage graphs, Neosho Basin, June-July, 1951

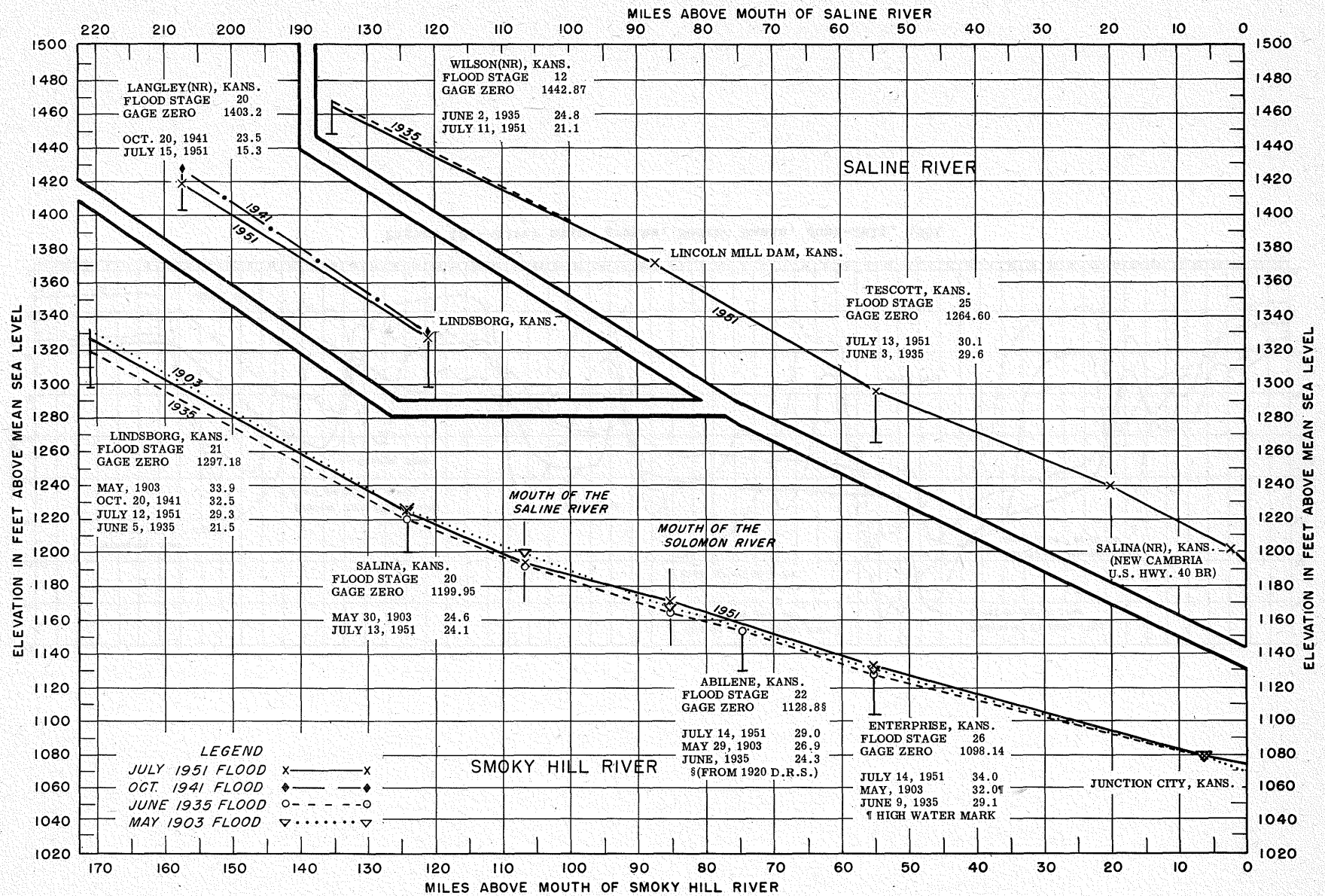


Figure 20.--High water profile of Smoky Hill River Basin

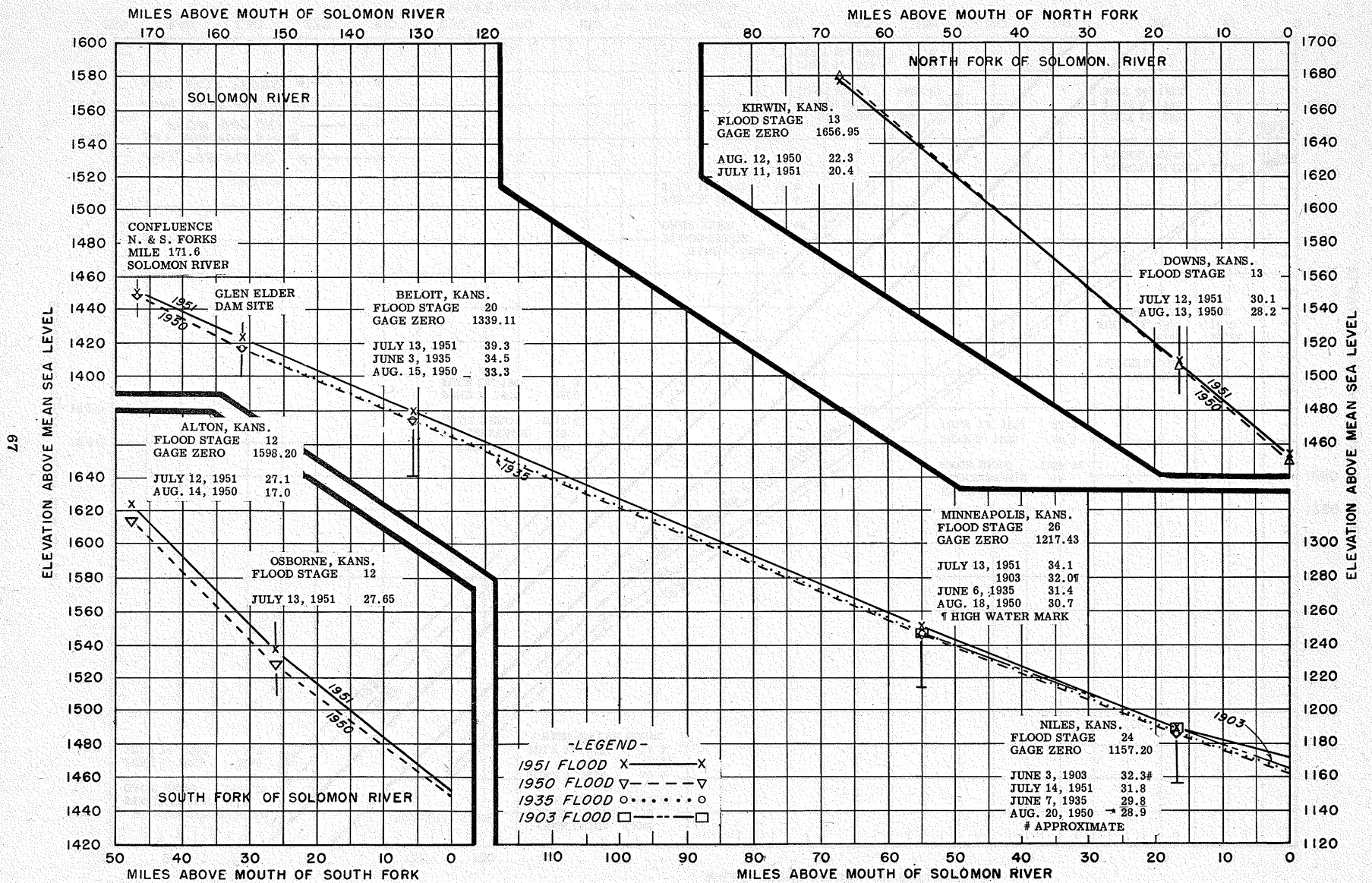


Figure 21.--High water profile of Solomon River Basin

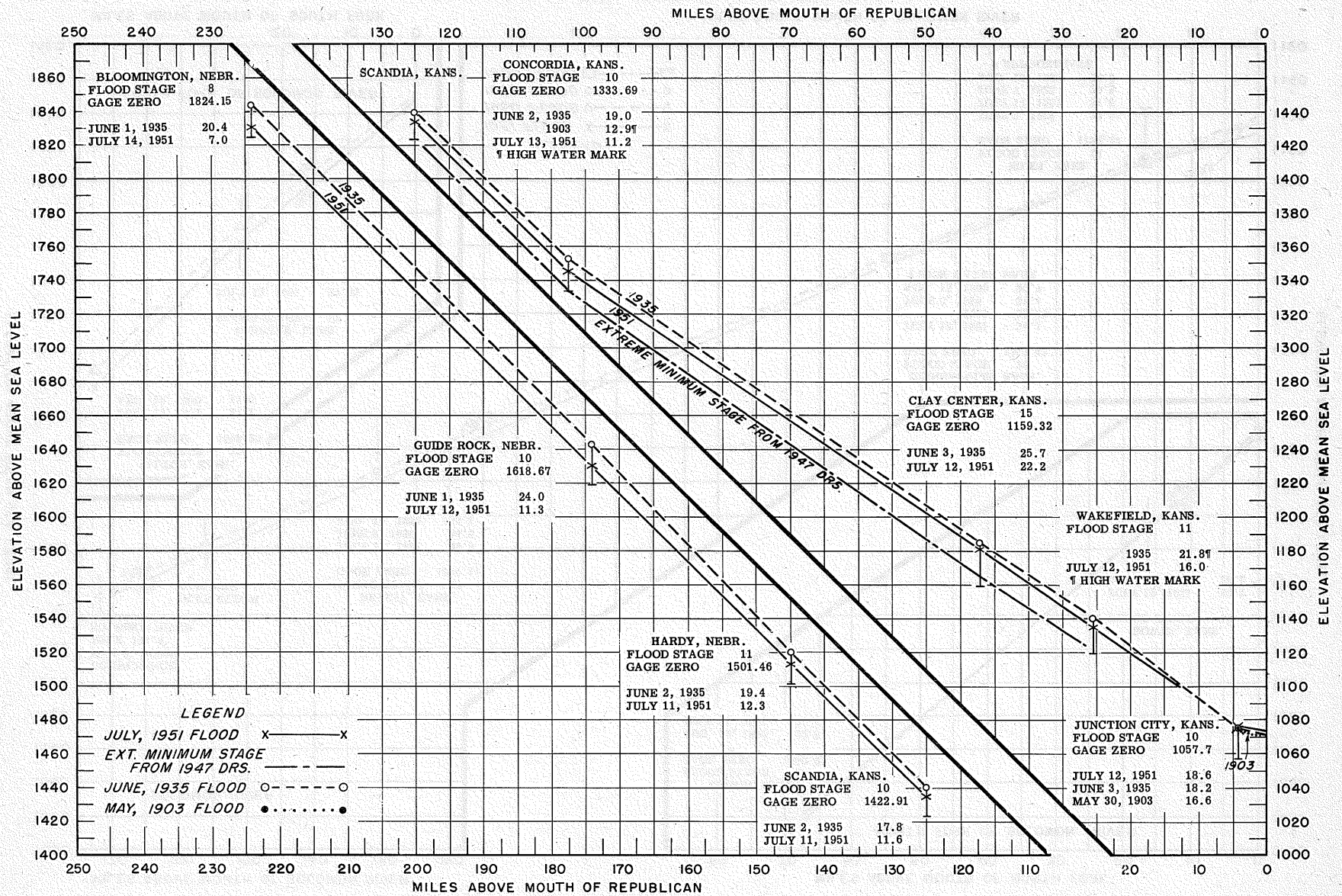


Figure 22.--High water profile of Republican River Basin

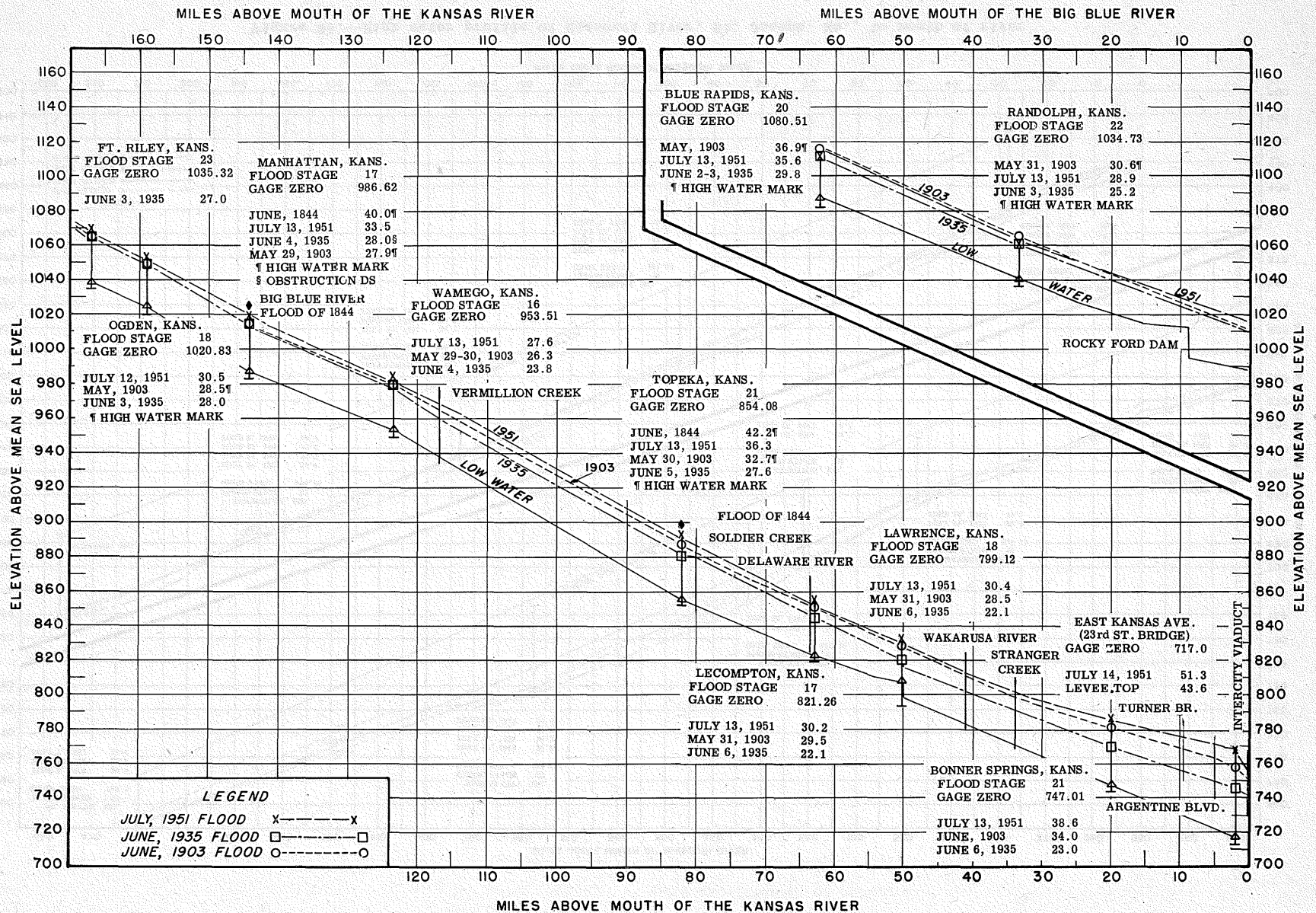


Figure 23.--High water profile, Kansas and Big Blue Rivers

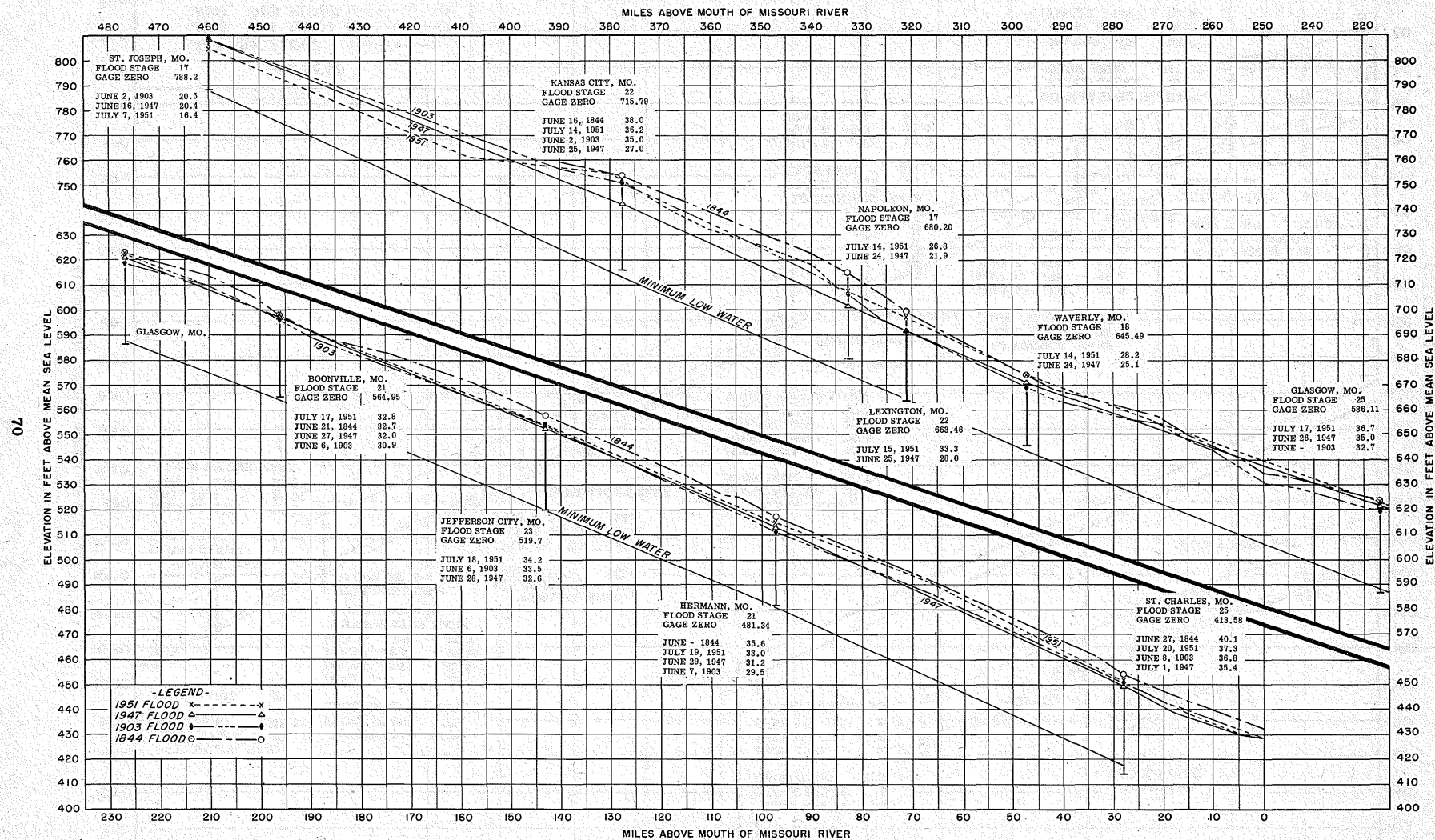


Figure 24.--High water profile of Missouri River, St. Joseph, Mo., to mouth of river

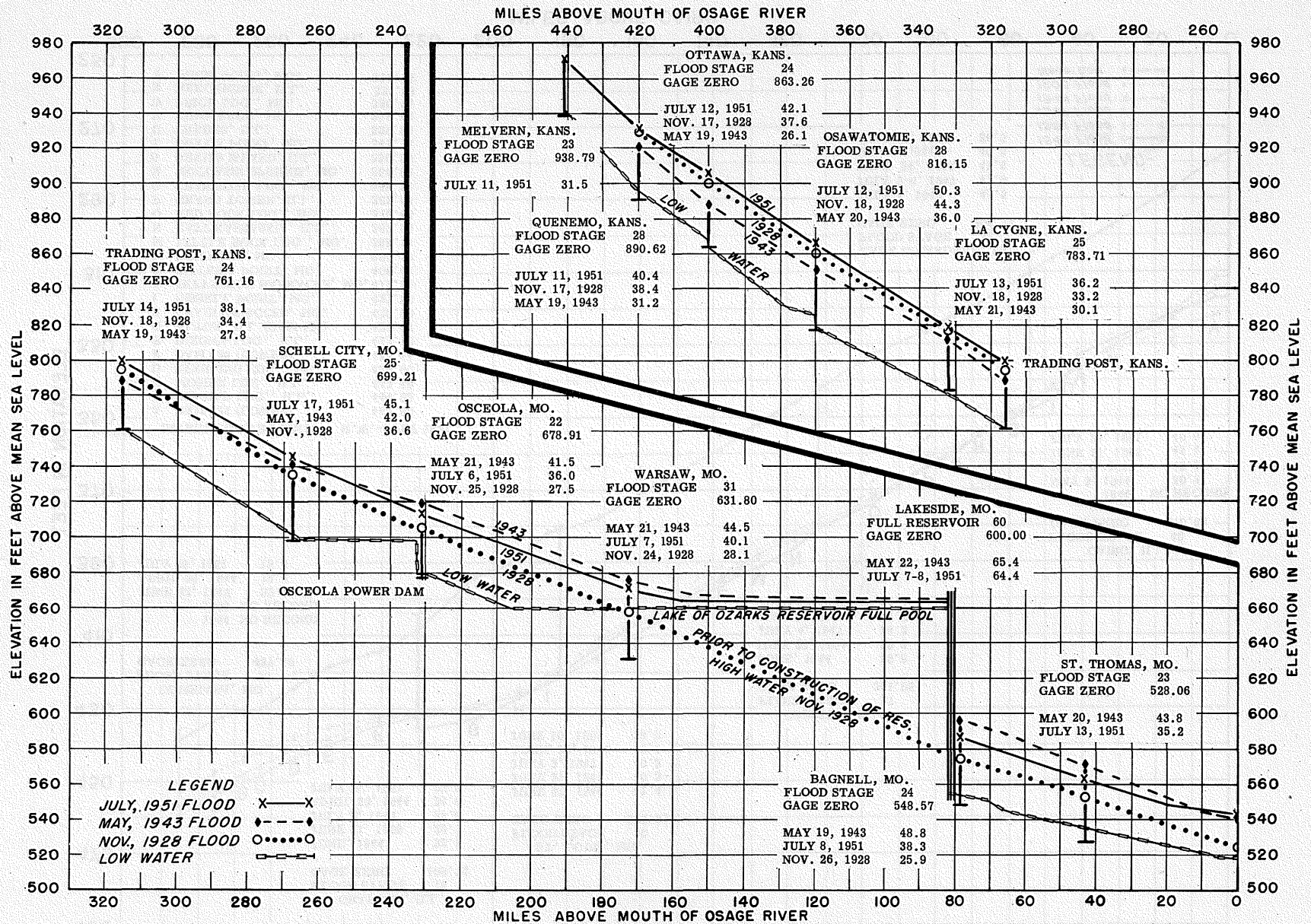


Figure 25.—High water profile of Osage River, Melvern, Kans., to mouth of river

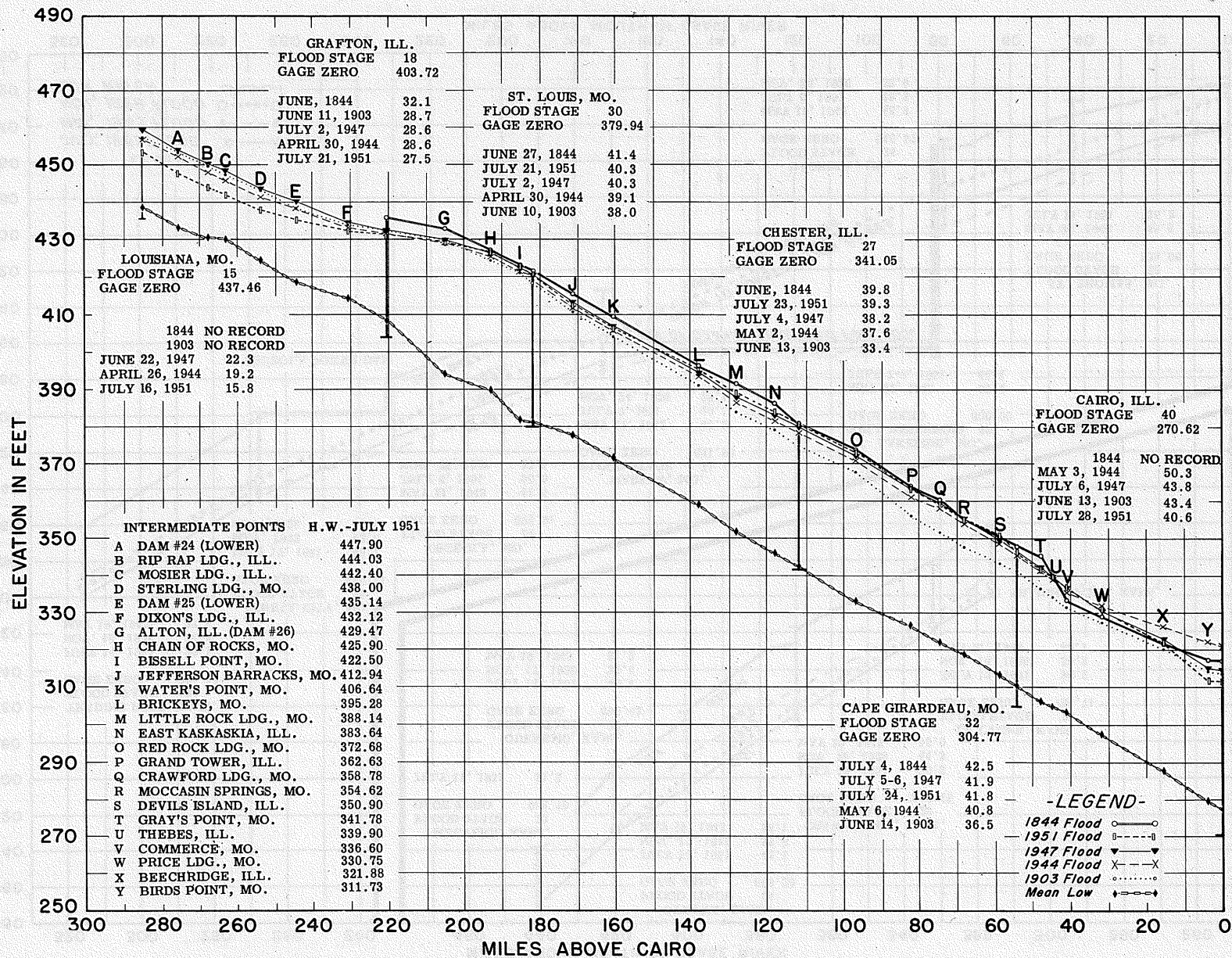


Figure 26.--High water profile of Mississippi River, Louisiana, Mo., to Cairo, Ill.

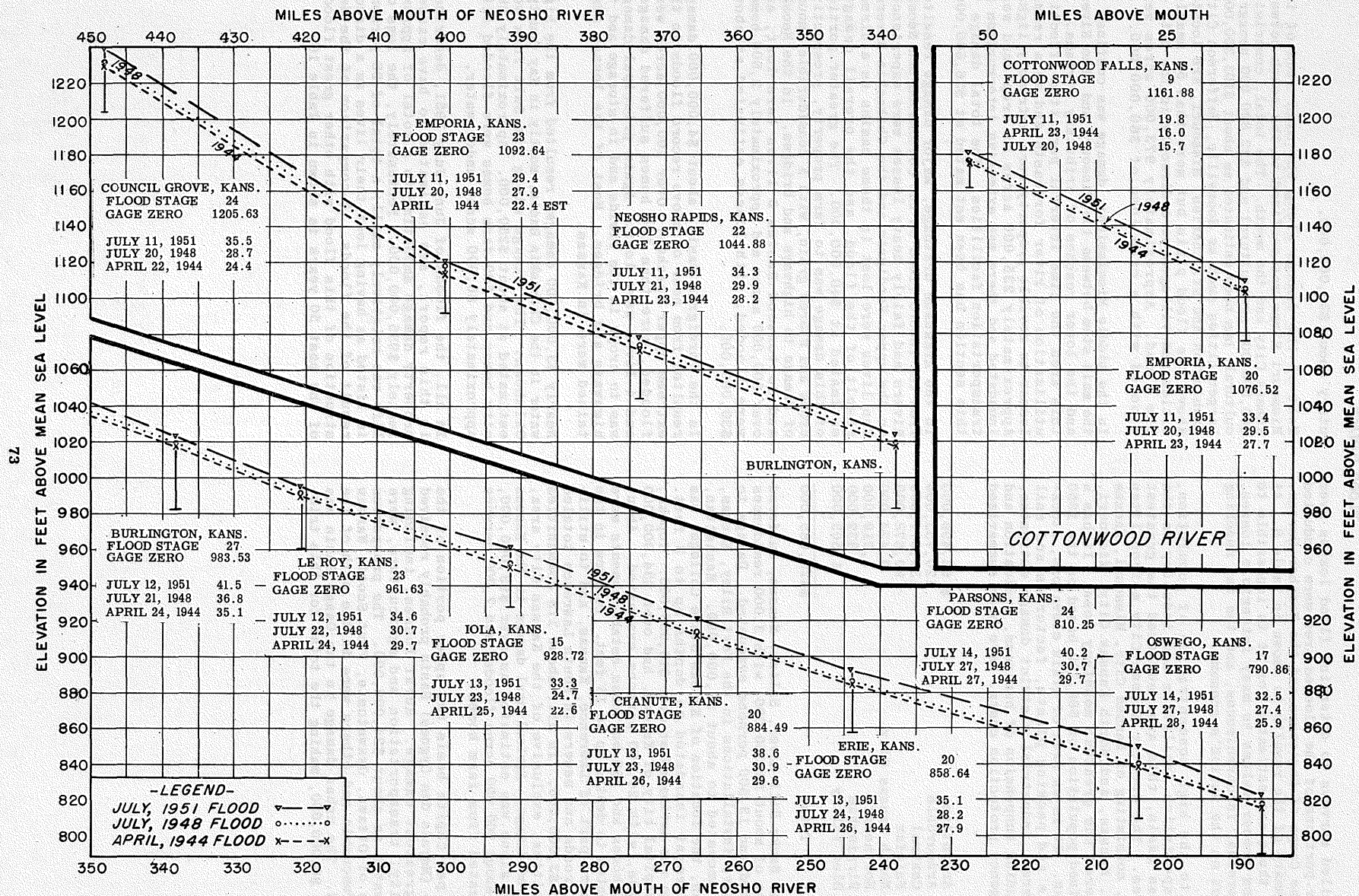


Figure 27.--High water profile of Neosho River Basin

FLOOD DAMAGE

Detailed surveys to determine flood losses over major portions of the flooded area were conducted by the Corps of Engineers and the Weather Bureau. A summary of the results is shown in Table 9. At best these are estimates for it is impossible to assess proper values to many intangible losses, to personal inconveniences, and the far reaching effect on the nation's economy.

Due to the high concentration of population, transportation facilities and industry in the Kansas Basin, this area suffered the greatest losses. The Greater Kansas City metropolitan area, consisting of Kansas City, Missouri, Kansas City, Kansas, and North Kansas City, Missouri, suffered the greatest monetary loss. It has a combined population of 586,700 based on the 1950 census. It is an area of grain elevators, stockyards and packing plants, factories and rail centers. Industrial district damage estimates, including suspension of business, evaluation and emergency protection costs, have been summarized as:

Argentine	\$ 62,499,000
Armourdale	120,753,000
Central	139,077,000
Fairfax	90,678,000
North Kansas City	9,424,000
Northeast	1,319,000
Birmingham	832,000
Blue Valley	1,503,000
Total	\$426,085,000

On the Smoky Hill River, Salina, Kansas, suffered a loss of about \$3,250,000, with 3,000 residences flooded and 13,500 persons evacuated. Damage to military installations in the Fort Riley, Kansas, area amounted to about \$7,000,000. Manhattan, Kansas, the location of Kansas State College, was 60 percent inundated to depths up to 8 feet. Damage was estimated at over \$13,000,000. Topeka, the capital city of Kansas, had over \$34,000,000 damages, with 24,000 persons evacuated. About 6,950 homes and 530 business establishments were inundated to depths up to 15 feet. Damages in the northern part of Lawrence, Kansas, and to utilities, roads and sewers in south Lawrence totaled about \$3,000,000. In all, about 115 communities and cities, exclusive of the Kansas City area, suffered damage. Agricultural damage in the Kansas Basin alone was estimated as over \$93,000,000, with about 900,000 acres flooded and 7,000 persons evacuated from farm homes.

On a per capita basis the upper portion of the Osage (Marais des Cygnes) Basin probably received the greatest damage. Rural losses, including utility, transportation and agriculture, were estimated as about \$24,000,000. The prosperous towns of Ottawa, Osawatomie, Fort Scott, Warsaw and Tuscumbia and others were in the path of the flood. The urban damage in the Osage Basin was about \$6,000,000, making the total for this trib-

utary about \$30,000,000.

Most of the damage along the main stem of the Missouri River was confined to the reach between Kansas City and the mouth. The total, comprising \$80,500,000 agricultural and \$22,800,000 nonagricultural, has been estimated as about \$103,300,000. Larger cities such as Boonville, Jefferson City, Washington and St. Charles, Missouri, are located above the flood plain but more than 50 smaller cities and villages were directly in the path of the flood. Approximately 973,000 acres were flooded with a crop loss of \$60,000,000.

In the middle Mississippi, damage was confined to the main stem between the Missouri and Ohio Rivers and the lower reaches of tributary streams. In this area the time interval permitted effective utilization of river forecasts and as a result losses to movable property were extremely light. Approximately 235,000 acres of crop land were inundated and there was extensive interruption of transportation facilities. The total damage to this section has been estimated at \$26,600,000.

In the Arkansas drainage, major damage resulted from the record flood on the Cottonwood and Neosho Rivers and fairly heavy losses were experienced on the upper Verdigris and the Chikaskia Rivers. Ten lives were lost in these basins as a direct result of the flood, and the overall damages estimated at \$40,000,000. The greater portion of this damage was to farm property, prospective crops and stored grain, with a considerable amount of damage to highways and bridges. In the Neosho and Cottonwood Basins 3 lives were lost, and over 300,000 acres and approximately 2,500 homes were flooded, with losses estimated at about \$30,000,000.

In the Verdigris Basin, about \$4,000,000 damage resulted from near or above record floods in the extreme upper reaches. Over 100,000 acres were flooded, more than 100 homes suffered damage, and 4 lives were lost. Again principal damage was to crops in the fields and in storage and to highways and bridges. Most of the losses sustained were in Kansas.

Nearly \$3,000,000 damages resulted from the high water in the Chikaskia Basin, mostly in Kay County, Oklahoma. The damage along the Salt Fork was estimated at about \$250,000. Approximately 280 city homes and 600 farm homes were flooded with approximately 80,000 acres under water.

In all, the floods of June-July 1951, described in this report, are estimated to have caused property damage amounting to a total of approximately \$935,000,000. Fortunately, the loss of life was relatively small; a total of 28 persons is listed as having lost their lives as a direct result of the floods. A comparison of the destruction of this flood with other great floods of the past 50 years is shown in Table 10.

TABLE 9 - SUMMARY OF FLOOD DAMAGE

STREAM BASINS	Acres Inundated		Estimated damage in dollars				Lives Lost
	Total	Crop	Rural	Urban	Indirect	Total	
Kansas River Basin							
Main Stem	154,000	148,700	\$ 46,229,000	\$ 278,943,000	\$ 204,722,000	\$ 529,894,000	0
Minor tributaries	98,000	92,600	9,149,000	170,000	326,000	9,645,000	0
Smoky Hill	129,200	121,900	12,269,000	6,243,000	2,438,000	20,950,000	5
Saline	91,000	86,900	6,323,000	417,000	1,099,000	7,839,000	0
Solomon	171,200	160,600	13,852,000	1,485,000	1,140,000	16,477,000	0
Republican	110,300	105,200	9,898,000	7,000	522,000	10,427,000	0
Big Blue	138,400	125,400	14,465,000	674,000	2,251,000	17,390,000	4
(1)					112,444,000	112,444,000	
Total Kansas Basin	892,200	841,000	112,185,000	287,939,000	324,942,000	725,066,000	9
Osage River Basin							
Main Stem	211,900	179,800	12,740,000	5,264,000	2,839,000	20,843,000	1
Tributaries	179,300	159,600	8,221,000	52,000	600,000	8,873,000	3
(1)					3,046,000	3,046,000	
Total Osage Basin	391,200	339,400	20,961,000	5,316,000	6,485,000	32,762,000	4
Missouri River Basin (Rulo to mouth)							
Main Stem (Rulo to Kansas City)	24,700	22,400	2,682,000	406,000	408,000	3,496,000	0
Main Stem (Kansas City to mouth)	517,000	457,700	68,843,000	1,226,000	7,688,000	77,757,000	5
Tributaries (2)	430,500	365,500	22,919,000	339,000	1,629,000	24,887,000	0
(1)					6,275,000	6,275,000	
Total Missouri Basin (Rulo to mouth)	972,900	845,600	94,444,000	1,971,000	16,000,000	112,415,000	5
Sub-Total Missouri Basin (3)	2,256,300	2,026,300	227,590,000	295,226,000	347,427,000	870,243,000	18
Mississippi River Basin							
Main Stem	333,900	104,300	11,291,000	4,431,000	691,000	16,413,000	0
Illinois	19,500	7,700	855,000	534,000	3,000	1,392,000	0
Kaskaskia	147,900	64,800	5,894,000	100,000		5,994,000	0
Meramec	5,500	2,900	283,000	221,000		504,000	0
Total Mississippi Basin	506,800	179,700	18,323,000	5,286,000	694,000	24,303,000	0
Arkansas River Basin							
Chikaskia-Salt	98,000	95,000	2,910,200	305,000	10,000	3,225,200	0
Verdigris	160,000	154,600	2,937,350	804,650	140,000	3,882,000	4
Neosho-Cottonwood	300,000	238,300	17,389,300	12,289,700	584,100	30,263,100	3
Arkansas & other trib.	8,600	8,600	1,745,100	1,072,900	489,900	3,307,900	3
Total Arkansas Basin	566,600	496,500	24,981,950	14,472,250	1,224,000	40,678,200	10
Grand Total	3,329,700	2,702,500	\$ 270,894,950	\$ 314,984,250	\$ 349,345,000	\$ 935,224,200	28

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

(2) Excluding the Kansas and Osage River Basins.

(3) Values shown for Missouri Basin were summarized from Interim Report on Storms and Floods, May-July 1951, issued October 1951 by Corps of Engineers, Kansas City District.

TABLE 10

COMPARATIVE DAMAGE, MAJOR FLOODS IN THE UNITED STATES

<u>Date</u>	<u>Basin</u>	<u>Total Damage</u>	<u>Lives Lost</u>
May-June, 1903	Kansas, Lower Missouri and Upper Mississippi	\$ 40,000,000	100
March 1913	Ohio and tributaries	147,000,000	467
Spring of 1927	Mississippi Valley	284,118,000	313
May-June 1935	Republican, Kansas & Lower Missouri Rivers	28,000,000	110
Mar-Apr. 1936	Rivers in Eastern United States	270,000,000	107
Jan-Feb. 1937	Ohio and Lower Mississippi River Basins	418,000,000	137
Apr-June 1943	Maumee, Wabash, Upper Mississippi, Missouri, White, and Arkansas River Basins	172,500,000	60
Apr-June 1944	Upper Mississippi, Missouri, Arkansas, Red, Lower Mississippi Basins and east Texas Streams	82,000,000	17
May-July 1947	Lower Missouri-Middle Mississippi River Basins	235,000,000	29
May-June 1948	Columbia Basin	112,000,000	37
June-July 1951	Missouri, Mississippi, Arkansas	935,000,000	28

FLOOD SCENES

The foregoing portions of this report have been statistical in nature, and confined to the presentation of factual data associated with the phenomenal event. Many of the readers and users of this information personally may have observed the raging water and experienced the devastation of property. To them the following series of photographs, Plates 1 to 11, will serve as a grim reminder. To them, to others geographically removed from the area, and to posterity, the photographs will illustrate the destruction of the floods better than can be described in words.

FIGURE 1

The foregoing portions of this report have been prepared in detail and contained in the preceding pages of this report. It is believed that the present report will be of interest to those who are concerned with the general problem of the control of the spread of disease. The following sections of this report are intended to provide a more detailed description of the methods used in the study and the results obtained. It is hoped that this information will be of value to those who are interested in the control of the spread of disease.



PLATE 1

A. New Channel (shown by arrow) on Smoky Hill River Northeast of Junction City, Kans., June 21, 1951.
(Courtesy, Topeka Daily Capital)

B. Railroad yards and Depot, Manhattan, Kans.
(Official Photograph, U. S. Corps of Engineers)





PLATE 2

A. Pottawatomie Avenue and Second Street, Manhattan, Kans., July 1951.

(Official Photograph, U. S. Corps of Engineers)

B. View of Topeka Waterworks (facing northeast), Topeka, Kans., Kansas River, July 13, 1951. River Stage, 36.2 feet.

(Courtesy, Topeka Daily Capital)





PLATE 3

- A. View showing clean up and extent of damage in business district of North Topeka, Kans., which was submerged to a depth of 18 feet. *(Courtesy, St. Louis Post Dispatch)*
- B. Topeka, Kans. (looking northeast), July 13, 1951. Kansas Avenue Bridge in left center. River stage near crest of 36.3 feet. *(Courtesy, Topeka Daily Capital)*

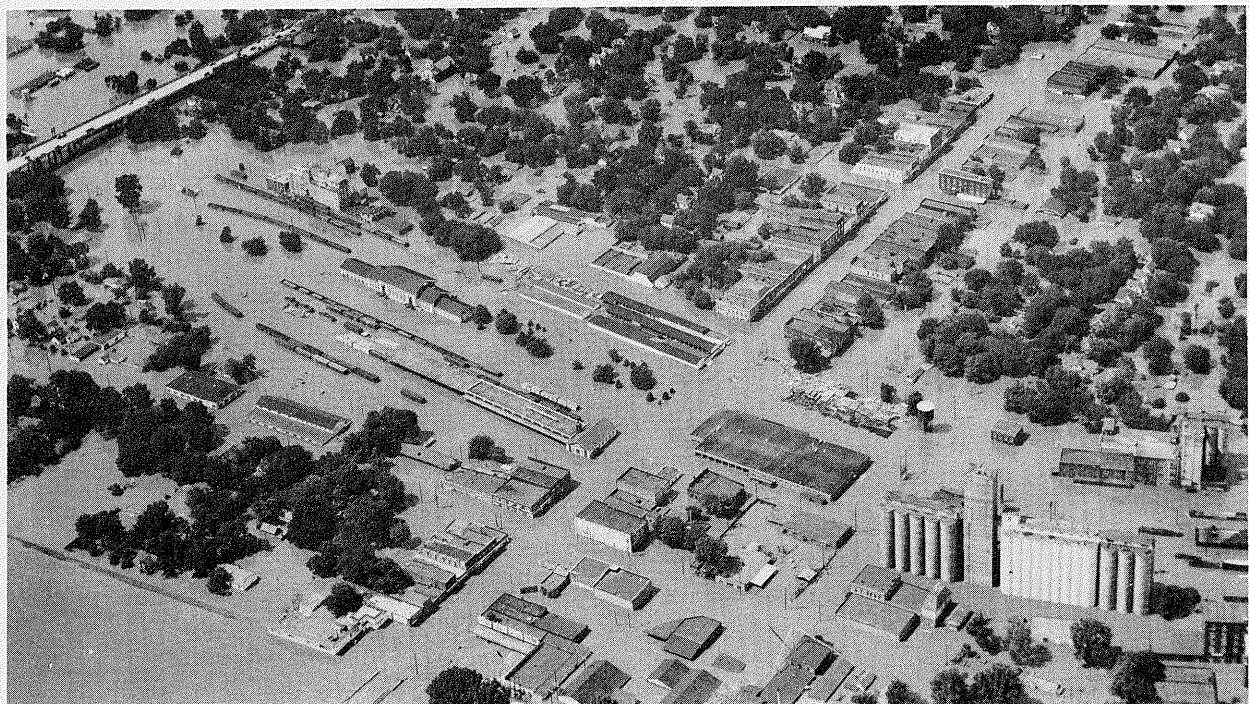




PLATE 4

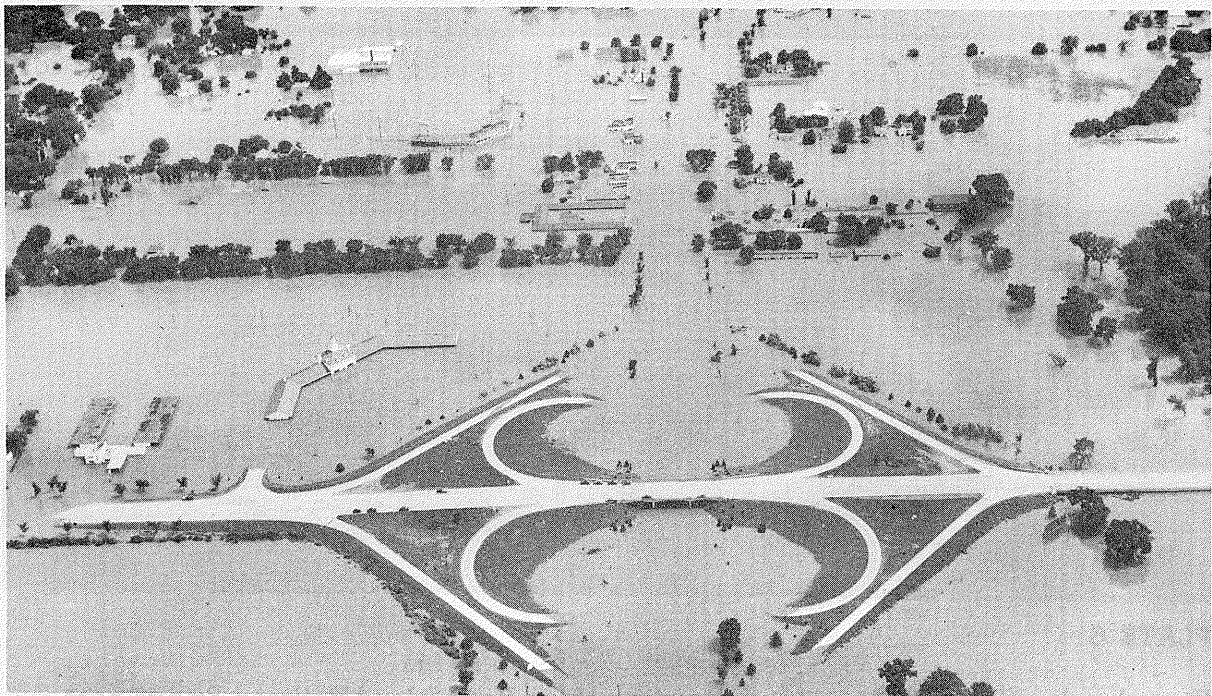
- A. View of Kansas Avenue in North Topeka, Kans. (east side of street, looking south), at crest of flood, July 13, 1951.**
- B. West side of Kansas Avenue in North Topeka, Kans., July 13, 1951.**
(Courtesy, Topeka Daily Capital)





PLATE 5

- A. View of Kansas Avenue Bridge (left) and Sardou Avenue Bridge (upper right), North Topeka, Kans., July 13, 1951**
- B. View of Cloverleaf Intersection of Highways 24, 40, and 75, north of Topeka, Kans., July 1951.**
(Courtesy, Topeka Daily Capital)



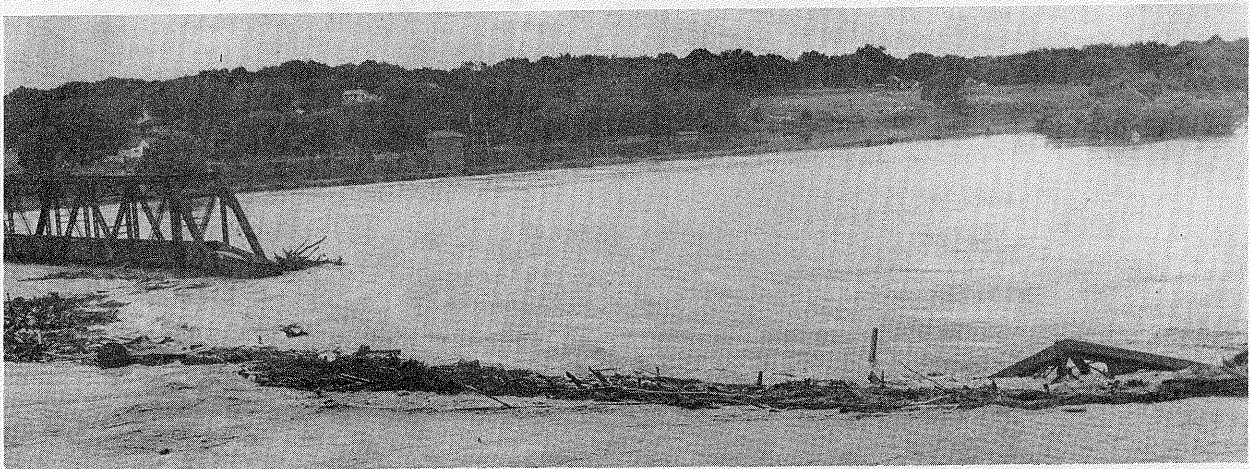
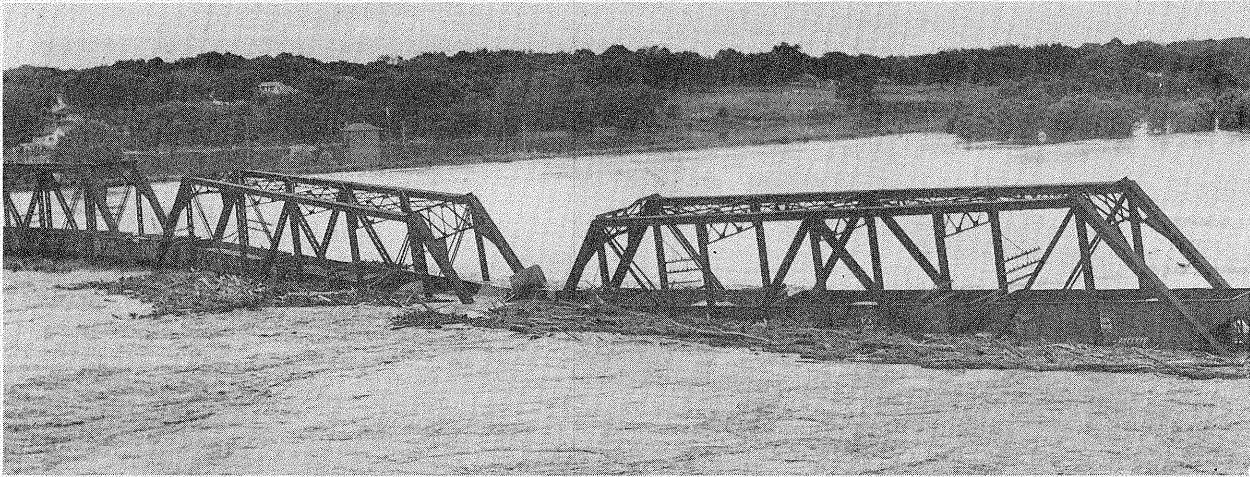


PLATE 6

View showing three stages in the destruction of the Rock Island Railroad Bridge near Topeka, Kans., July 12, 1951.

(Courtesy, Topeka Daily Capital)



PLATE 7

- A. View of damage to oil refinery storage tanks in the Argentine District, Kansas City, Kans., July 1951.
- B. View showing high water line (visible on venetian blinds, second story windows), Kansas City, Kans., July 1951. *(Courtesy, St. Louis Post Dispatch)*





PLATE 8

- A.** View of water pouring back into Kansas River over floodwall, Kansas City, Kans., Third and Pacific, July 1951. *(Official Photograph, U. S. Corps of Engineers)*
- B.** View of Missouri Pacific railroad yards in Armourdale District, Kansas City, Kans., July 1951. *(Courtesy, St. Louis Post Dispatch)*





PLATE 9

- A. View of Armourdale District (in background), Kansas City, Kans. Tanks floated from near 18th Street Trafficway.
- B. View showing railroad yards, where cars were moved to safety ahead of raging floodwaters. Oil refinery fire in rear. Kansas City, Mo., July 14, 1951.





PLATE 10

- A.** Westbound lane of U. S. 40 by-pass east of St. Charles, Mo. (Missouri River).
(Courtesy, St. Louis Post Dispatch)
- B.** Neosho River at U. S. 54 Highway Bridge, west of Iola, Kans., July 13, 1951, at
approximate stage of 33.5 feet. *(Courtesy, Iola Register)*

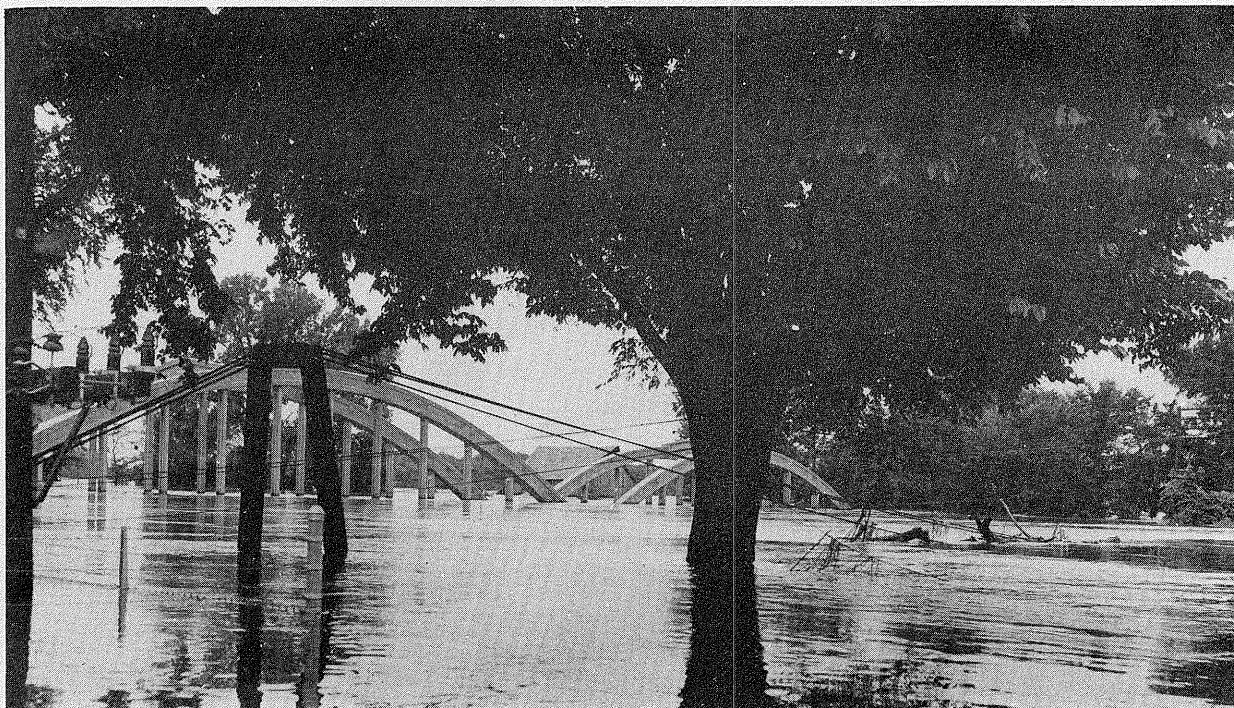




PLATE 11

- A. Mississippi River, St. Marys, Mo., near curve of State Highway No. 25, south part of town, July 21, 1951. Chester, Ill., river gage read 38.6 feet.
- B. Mississippi River, Cape Girardeau, Mo., July 15, 1951. River stage 40.1 feet. View southeast showing Frisco R. R. Station. (*Official Photograph, U.S. Corps of Engineers*)





PLATE II
A. *Staphylococcus aureus* strain 8091. Culture on agar plate, 24 hours.
B. *Staphylococcus aureus* strain 8091. Culture on agar plate, 48 hours.
C. *Staphylococcus aureus* strain 8091. Culture on agar plate, 72 hours.



METEOROLOGICAL ANALYSIS

Large-scale aspects*. In June 1951 the most pronounced and significant feature of the large-scale circulation over and near North America was the unusually strong ridge in the eastern Pacific at all levels of the atmosphere up to at least 40,000 feet. A well-defined trough, downstream from the ridge, extended from south-central Canada through the southwestern United States. The accompanying northwesterly and northerly flow from the Gulf of Alaska and northwestern Canada to Montana, Wyoming, and Colorado brought surge after surge of abnormally cold air into the northern Rocky Mountain area and the Great Plains States. The cold surges extended generally to southern Kansas, while over Texas and Oklahoma the flow was from the south and southwest, bringing warm moisture-laden air from the Gulf of Mexico. The recurring interaction of these contrasting streams of air was accompanied by the unusually heavy rains in the Great Plains. In late June and early July the strong ridge in the eastern Pacific reached its peak intensity, cold air continued to pour into the central United States as far as the southern border of Kansas, and the pronounced northward stream of warm moisture-laden air from the Gulf of Mexico also persisted.

Between July 7 and 10, prior to the onset of the concentrated heavy rains over Kansas, a cold High moved off the South Atlantic Coast, warmed gradually as it became almost stationary, and produced generally high pressure westward to Arkansas and Louisiana. While the High strengthened slightly, a rather weak Low persisted in New Mexico throughout the period, resulting in an intensification of the east-west pressure gradient through Texas and Oklahoma on the 9th and 10th which continued through the 12th. The accompanying very strong northward flow of warm, moist air into the heavy rain area is shown at the surface in Figure 28, and its extent in depth to nearly 15,000 feet in the north-south cross sections (Figure 29), and on the constant-pressure charts (Figure 30). The general flow of the maximum moisture is shown by the pronounced moist tongue extending from Texas to Kansas on the isentropic chart (Figure 31).

A second cold High moved into the Northern Plains on July 10, raising pressures over the states to the north and east of Kansas during the 10th and 11th. A generally westward flow was established between these high pressures and the low pressures over New Mexico, bringing cold air into Nebraska and northern Kansas. The high pressure to the northeast forced the warm current from the south to flow into the cold air, thus creating an intense center of warm air advection, upward motion, and heavy precipitation over Kansas during these days. (See Figure 12.)

The apparent factors that contributed to the formation of the heavy rainfall were: (1) the strong inflow of moist Gulf air into the region, (2) the energy associated with the temperature contrast between the warm and cold air over the region, (3) the strong warm air advection, (4) the instability of the warm air, (5) the fact that the front remained nearly stationary over the area for several days and was reinforced by the moving in of another front from the north. Also important may have been the change of curvature from anticyclonic to straight or slightly cyclonic at the surface, 850 mbs, 700 mbs, and other dynamic indications. The variations in these factors during the storm period are described in the following discussion.

Frontal Movements. On July 2 a cold front (Front A), which had entered the northwesternmost corner of the North American continent from the Pacific, lay just east of Alaska. For the next seven days

the front moved slowly south-southeastward, until, at 090630Z* it had crossed most of Kansas and was oriented in an eastnortheast-west southwest direction, just cutting the southeastern corner of Kansas. (See Figure 32.) On the 6th another front similar to the first entered from the Pacific, and at the same time a third front, moving down from the Arctic, entered the Continent. In the course of the next two days both these fronts moved southward, the Pacific front in advance, but the Arctic front moved faster. By 090630Z, the two fronts had consolidated at the Canadian border into a single front (Front B).

Through July 9 the principal movement of the front in southeastern Kansas (Front A) was a pivoting clockwise about a point near Wichita. The pivoting motion continued until 101230Z when the front was oriented in an eastsoutheast-westnorthwest direction (see Figure 29). A wave-like perturbation formed by 101830Z just west of Dodge City, with the front on both sides of it now moving southward. The perturbation gradually settled southward during the 11th and was dissipated by 111830Z. The portion of the front in eastern Colorado now continued to move southward through 111230Z, while farther east the front merely oscillated. During the 12th, the front was quasi-stationary, but by 130030Z it had moved south of Kansas. Although the wave-like perturbation which appeared on the 10th never developed, some of the heaviest rains occurred shortly after its formation.

The combined Pacific and Arctic front (Front B) which lay at the Canadian border on the 9th, first moved into northwestern Kansas at 100630Z. It continued to move southeastward, passing Concordia by 101230Z. The front retreated slightly, however, in the following six hours and after remaining stationary for the six hours between 101830Z and 110030Z, the front again retreated somewhat. Then, from 110630Z until 111830Z it advanced slowly to a position diagonally across central Kansas. During the 12th the front, becoming more and more diffuse, continued to move southward until 121830Z, when it could be considered a part of Front A. The main bursts of rain occurred on the nights of the 10th-11th and 11th-12th at the time when the second front was drifting across central Kansas.

A comparison of the north-south cross section for 110300Z with that for the 120300Z (Figure 29) shows that Front A advanced but little during the 24-hr period, while Front B moved up behind it, reinforcing the cold air mass. In spite of the reinforcement, however, Front A became less steep during the 24 hours.

At the 850-mb and 700-mb levels, Front A, oriented east-west through Missouri and Kansas, remained stationary during the period of heaviest rain (the nights of the 10th-11th and 11th-12th), and gradually underwent frontolysis near the 700-mb surface. At 110300Z the approaching cold front (Front B) extended from north-central Iowa west-southwestward to southwestern Nebraska at 850 mbs (Figure 30). During the next 24 hours it moved slowly southward at this level and at 120300Z stretched from extreme eastern Iowa through northwestern Missouri into north-central Kansas. At the 700-mb level, the approaching cold front, which stretched from Lake Superior to central South Dakota at 110300Z, moved southward during the next 24 hours, to a position that lay on a line from central Wisconsin to west-central Nebraska.

The cross section from International Falls, Minn., to Brownsville, Tex., for 110300Z (Figure 29) shows the slope of Front A to be 1:110; the slope of Front B, moving down behind it, was 1:150. On the 12th the slope of both fronts became more shallow - 1:130 and 1:170, respectively. Front A

*The first paragraph of this section is based on the analyses reported by Clem, LeRoy H., The Weather and Circulation of June 1951, MWR, Vol. 79, pp. 125-128, and Oliver, Vincent J., MWR, Vol. 79, pp. 143-146.

*This notation means 0630 Greenwich Mean Time on July 9, 1951.

was undergoing frontolysis above 9,000 feet as Front B moved up close behind it. Approximately twelve hours after the time of the second cross section the two fronts merged. However, some of the heaviest bursts of rain occurred before the fronts merged.

Moisture. Calculation of the amount of moisture entering the storm area during the maximum 24-hour rainfall period indicated that a precipitable water total of, roughly, 11 inches entered the area. About 4 inches of this, on the average, fell over 20,000 square miles for an over-all efficiency of about 36 per cent.

According to analysis of the winds, the air from which the precipitation fell came almost entirely from over the northwestern part of the Gulf of Mexico. At the 700-mb level at 110300Z all trajectories computed for that level were from the Gulf, except that for Omaha, which came from western Texas. All trajectories were from the Gulf at 111500Z with the exception of that for Dodge City, which came from the Pacific. The isentropic chart for the 312° potential temperature surface at 110300Z (Figure 31) shows a broad moist tongue over Texas, Oklahoma, and most of Kansas. Since the primary front at the ground level was at the southern border of Kansas at this time, the moist tongue was obviously overriding the front. Where the cross section for 110300Z crosses the rain area, the axis of the moist tongue is at about the 10,000-ft level. A dry tongue, which lay between St. Cloud and International Falls at about 10,000 feet, remained stationary through 120300Z, but became less dry. The moist tongue was centered over eastern Kansas at 5,000 feet at 120300Z. Ft. Leavenworth was most moist on the average for that layer. The rate of inflow of moisture may be judged from the strong southerly winds in Texas and Oklahoma in Figure 30.

The 700-mb chart for 120300Z gives evidence of an increase in moisture at Oklahoma City and Big Springs. The stations showing the greatest amounts of moisture were North Platte, Nebr., and Ft. Leavenworth. Ft. Worth, however, had dried out significantly. At 500 mbs (Figure 33), although North Platte and Rapid City showed an increase in moisture, the air over eastern Kansas had dried out somewhat, and the air to the south was even drier than it had been. With this decrease in moisture inflow, the rains over Kansas tapered off and ended.

Rain-producing mechanisms. No pronounced cyclonic development was associated with the rainfall. Twelve-hour pressure change maps for every six hours from 100030Z to 130030Z show only small changes in the surface pressures over Kansas. The greatest 12-hour pressure fall at any station on any map was three millibars. Practically all 12-hour values at all stations were rises.

The soundings for 0300Z on July 11 for Oklahoma City and Omaha (Figure 34) typify the air masses involved in the 1951 Kansas flood. The air over Oklahoma City was typical summer mTK air. There is a subsidence stable-layer based at 795 mbs, with the air drying out above (S air). At Omaha, the air at the surface represented the air mass behind Front B - cPK air, with slightly more moisture than average. Above the cPK lay mPK, the air between Fronts A and B. Above the mPK can be found mT air. Some idea of the thermal energy available may be gained from the contrast of the air masses in lower layers.

Warm air advection was present over the rain area at 850 and 700 mbs at 110300Z with the warm air coming in from the southwest. The temperature gradient in the warm air was 1 C° per 22 miles at 850 mbs. At 700 mbs the gradient in the warm air was 1 C° per 70 miles, that between the fronts

was 1 C° per 40 miles, that in the coldest air was 1 C° per 30 miles. At 500 mbs there was little or no advection over the rain area. In the 24 hours following, the heights rose on all pressure surfaces - 850 mbs, 700 mbs, 500 mbs. Ridges became more intense; Lows filled. Following the warm air advection over Kansas at 850 mbs, the temperature gradient over the rain area increased to 1 C° per 30 miles, but the wind component across the isotherms decreased and the advection also decreased. The temperatures had risen to the south of Front B at 700 mbs (a gradient of 1 C° per 60 miles). The warm air advection, though still pronounced, was somewhat weaker than 24 hours before. At 500 mbs there was little change in temperature over the rain area, and there was cold air advection over Missouri and eastern Kansas. It will be noted that there was strong warm advection in the lower layers, and that it had an areal maximum over the heavy rain area on both these days. Maps for the 10th showed less warm air advection than those for the nights of heaviest rain. At 130300Z there was cold air advection at 850 mbs and weak warm air advection over the rain area at 700 mbs.

Oklahoma City was chosen for a stability analysis, since it is most representative of the warm air which arrived over the rain area at the time of heavy rain early on the morning of July 11. On the sounding for 101500Z the lifting condensation level (that level at which a surface parcel of air reaches saturation upon being lifted) was 872 mbs. The level of free convection was 680 mbs, with conditional instability at all levels up to about 500 mbs. The positive area in the sounding was larger than the negative, demonstrating the existence of real latent instability. Convective instability in the atmosphere over Oklahoma City below 700 mbs was manifested by decrease of the pseudo wet-bulb temperature line with height more rapidly than the moist adiabat. Values of the pseudo-potential temperature at various pressures were as follows: 967 mbs, 354; 900 mbs, 350; 800 mbs, 339; 700 mbs, 329; 600 mbs, 329; 500 mbs, 333.

The contour lines at 110300Z and 120300Z over Kansas at 850 mbs were generally cyclonically curved. At 700 mbs and 500 mbs at 110300Z the contour lines over the center of the rain area were generally cyclonically curved, while at 120300Z they were anticyclonically curved. At 850 and 700 mbs the contour curvature on both days changed from anticyclonic upstream to cyclonic or less anticyclonic over the rain area, but this change was not evident at 500 mbs. At 100300Z the curvature at both 850 and 700 mbs was much less cyclonic than during the 11th and 12th, and the change from anticyclonic upstream toward cyclonic over the rain area was much less pronounced. At 130300Z there was a weak closed Low at 850 mbs over the rain area, while at 700 mbs there was a weak trough over western Kansas with nearly straight contours over eastern Kansas, so that the change of curvature along the contour lines was from cyclonic toward anticyclonic at that level. At the time of heaviest rain (the night of the 10th-11th), not only were the contours cyclonically curved at all levels from the surface to 500 mbs, but the curvature was at a maximum for the storm period.

The curvature of the trajectories for the air particles at 850 and 700 mbs south of Kansas City for 110300Z was anticyclonic (Figure 35). Those trajectories to the north of Kansas previously had anticyclonic curvature, but acquired cyclonic curvature in the last 12 to 18 hours. On charts for 111500Z and 120300Z, too, (Figure 36) the trajectories showed a general tendency from anticyclonic curvature upstream toward more cyclonic curvature over the rain area.

Several other factors possibly associated with

the development of upward velocities should be mentioned. (1) Carr has suggested that a dynamic factor associated with the movement of high-speed winds from the ridge upstream into the area of weaker geostrophic winds in the trough downstream may have been important in the development of horizontal convergence and upward motion. (2) Although there were strong southerly winds at 850 mbs at 110300Z and thereafter (averaging 30 mph) blowing normal to Front A, the front remained stationary at that level. These circumstances imply large-scale upward motion over the rain area. (3) Observations showed strong cross-contour wind flow toward lower pressure during the period of heavy rain in the warm air at 850 mbs on both the 11th and 12th (Figure 30). On the 11th this condition was general right up to the front. (4) A shear zone can be found on the isentropic chart (see Figure 31) between the strong westerly winds over South Dakota and the southerly and south-westerly winds over Texas and Oklahoma. There is some indication of the formation of a small anticyclonic eddy along the shear line over eastern Kansas at the time of the heavy rain on the morning of the 11th, as evidenced by light easterly winds at Ft. Leavenworth, Kans., at 110300Z.

Transposition Limits. The heavy rainfall over eastern Kansas in July 1951 was due to the concurrence of various meteorological factors that could have happened just as easily in other parts of Kansas or in surrounding states. It is, of course, important for future planning in any of the surrounding regions to know whether or not the flood could have occurred there or whether the flood could have been intensified. Accordingly, transposition limits have been estimated based on methods developed for hydrometeorological studies by the Weather Bureau during the past 15 years.

As a first step in establishing the limits, the records were searched for all major summer type storms which have occurred between the Rockies and the Appalachians with characteristics similar to those of the July 9-13, 1951, storm. Specifically, the characteristics were: (1) absence of pronounced orographic effects, (2) a general east-west orientation of the frontal system and rainfall pattern, (3) no marked wave action or occlusion of a wave during and after the storm period, (4) storm duration of 2 days or longer, (5) storm precipitation of 7 inches or more at the center, (6) a polar High situated to the north of the storm center during the rainfall, and (7) southward movement of the frontal system at the end of the rain period.

The storms meeting the above requirements, their location and date of occurrence are shown in Figure 37. Since a major portion of the rainfall during the July storm fell in nocturnal thunderstorms, the distribution of nocturnal thunderstorms

and their frequencies were used as an additional guide. Study of the moisture inflow indicated that modifications would occur if the synoptic situation existed at elevations much higher than that at which the storm actually occurred.

Using these guides, the final transposition limits (Figure 37) were outlined as follows:

To the west, transposition was limited to the 3000-ft contour. Although this is somewhat higher than the elevation at the center of the storm as it occurred, fairly heavy rain fell during the storm at elevations of 2000 feet. Up to the 3000-ft contour the slope is relatively gentle and, it is believed, there would be little or no orographic effect on the storm mechanism. This limit was set even though storms synoptically similar were observed farther west in Colorado and New Mexico at higher elevations. However, in examination of the isohyetal pattern of the Colorado storm, it is quite evident that topography was an important contributor to the rainfall. In the case of the New Mexico storm, much of the rainfall fell in the outlined transposition limits. However, the main center to the west was on a slope of the Rockies where orography played an important part. The 3000-ft contour also coincides closely with the western boundary of the area showing a high frequency of nocturnal thunderstorms.

Northern limits were set along a line connecting Duluth, Minn., and Rapid City, S. Dak. This line coincides with the northern limits of high frequency of nocturnal thunderstorms and also outlines the northern limits of observed storms of this type.

Eastern limits were set at the 85th meridian. East of this line there would be a tendency for the inflow wind to be forced over the Appalachian Mountain chain, thus influencing the storm characteristics.

Southern limits have been set tentatively at the 500-ft contour. This line is to the south of all observed storms and the area of high thunderstorm frequency. The exact location of the southern limit is academic, since considerably larger storms of other types have occurred to the south.

Rotation of the storm axis should be limited to 20 degrees in either sense.

There are other storms, transposable to eastern Kansas, with rainfall amounts greater than those in the July 1951 storm, for example, the storm of May 6-12, 1943, in eastern Oklahoma. Also, it should be noted that the maximum possible storm, as defined in hydrometeorology, would be greater than any observed storm in the area, including that in 1951.

METEOROLOGICAL COMPARISON WITH THE FLOODS OF JUNE 1903 AND JUNE 1844

This section is devoted to a reconstruction of the meteorological conditions which prevailed prior to and during the great flood of June 1844 in Kansas. Some observations on the similarities and differences between this storm and that of May 1903 and the recent July 1951 disaster are also included.

A comparison of river gage records for the three floods indicates that the 1844 flood was the largest of record at almost all stations along the Kansas River and the Missouri River below Kansas City, Mo. The following table shows the flood-crest heights at Topeka, Kans., Kansas City, Hermann and St. Louis, Mo., for each of the three major floods.

	Flood Stage	June 1844	June 1903	July 1951
Topeka, Kans.	21 ft	42.2*	32.7*	36.3
Kansas City, Mo.	22	38.0*	35.0	36.2
Hermann, Mo.	21	35.5*	29.5	33.0
St. Louis, Mo.	30	41.4*	38.0	40.3

* From reliable high-water marks

Some general comparison of relative magnitude of the rainfall causing the three floods may be made from the following tabulation of total storm rainfall and the antecedent rainfall for the 28 days

	<u>Storm Dates</u>	<u>Storm Rainfall</u>	<u>Antecedent Rainfall Dates</u>	<u>Antecedent Rainfall</u>
Ft. Leavenworth, Kans.	June 7-14, 1844	7.77 inches	May 10-June 6, 1844 inc.	5.77 inches
	May 25-31, 1903	3.50	Apr. 27-May 24, 1903	7.75
	July 9-13, 1951	5.74	June 11-July 8, 1951	12.67
Ft. Scott, Kans.	June 7-14, 1844	4.13	May 10-June 6, 1844 inc.	14.34
	May 25-31, 1903	2.25	Apr. 27-May 24, 1903	6.19
	July 9-13, 1951	4.21	June 11-July 8, 1951	10.08

The normal 28-day rainfall in the eastern Kansas area for the May-June period is approximately 4.5 inches. This may be compared with the antecedent rainfall shown above.

Weather reports in the storms of June 1844. Since weather reporting has changed radically in the last 100 years, a few words concerning the observations in 1844 might be in order.

Weather reports for the 1844 storm are taken from Surgeon General's Office records and from records made by voluntary observers for the Smithsonian Institution. Observations were made four times a day--sunrise, 9 a.m., 3 p.m., and 9 p.m. (all local time). Barometric readings with attached thermometer observations were taken at some stations, while all took temperature, cloudiness, wind direction and force, and 24-hour precipitation observations. The wet bulb was observed at sunrise and 3 p.m. only. Fortunately, barometers had been sent to the military posts in 1841, and a standardized thermometer had been in use since 1843.

Wind force was based on estimated observations and present weather was obtained by indirect means, mainly from the times of beginnings and endings of precipitation.

Many additional observations are available for stations in New England, the Middle Atlantic States, and along the Gulf Coast east of Texas. However, since they add little to the mid-western analysis, they are not included. All stations between Detroit and the Rocky Mountains are included. A two-week series of weather maps (four maps per day) was analyzed from which four maps, Figure 38, showing the flood-producing storm are shown.

Although a rather limited view of the synoptic situation is obtained, past experience of similar storm types, together with the knowledge of subsequent events within the available network, has increased confidence in the analysis.

Synoptic situation -- June 1844. On June 5, 1844, a weak slow-moving cold front was situated along a line extending, approximately, from Milwaukee, through Des Moines, to Dodge City. This front passed Ft. Leavenworth on the morning of the 6th, retreated northward in the afternoon and moved southward again late in the evening as a small stable wave passed by. A heavy thunderstorm accompanied this latter passage. In all probability most of northern Kansas and Missouri received moderate showers as a result of this front.

On the afternoon of the 8th the front passed rapidly northward again as a vigorous wave formed outside our network and moved in a direction slightly north of east. This wave occluded north of Lake Ontario on the 9th. Meanwhile, the cold-front portion of the wave again induced heavy showers throughout Kansas, western Missouri, and northern Oklahoma.

A major polar outbreak followed a secondary cold

prior to the storm. The tabulation is limited to Ft. Scott and Ft. Leavenworth, Kans., since these were the only stations taking observations in all three storms.

front behind the occluding storm. This second cold front passed Sault Ste. Marie at noon on June 9, 1844. A wave, meanwhile, forming on the original cold front near the Kansas-Oklahoma border, was blocked by this extensive mass of polar air to the north and northeast. For the following four days the occlusion of this wave and its very slow movement produced continuous heavy rain in northern Kansas. The weather maps illustrate the events of this period.

Storm and flood of 1903 and 1951 contrasted with 1844. All three storms were frontal in nature. (Figures 39 and 28 show surface weather maps for the storms of 1903 and 1951, respectively.) In the 1844 and 1903 storms an extensive cold High blocked normal development of a wave that formed (probably) in the Kansas-Oklahoma area. In both cases the blocking High followed a secondary cold front to the rear of an occluding system east of the Great Lakes. In 1844, moreover, blocking was complete, and the wave went into occlusion over eastern Kansas. In 1903, on the other hand, blocking was not complete, and the Low moved slowly eastward out of the Missouri Valley. Undoubtedly, this circumstance partly accounts for the fact that the flood in 1903 was smaller. The inflow air mass was slightly less moist in the 1903 storm, the 12-hr representative reduced dewpoint being 69° F, while in the 1844 storm it was 71° F. Of course, the reliability of the 1844 dewpoint readings is somewhat less than for the subsequent storms.

Air mass contrast across the major front was considerably less in the 1951 storm than in either of the other storms. This might be expected in view of the later date of occurrence. The storm in 1903 had slightly more surface air mass contrast than the 1844 storm.

The 1951 storm differs from the two preceding in that no low pressure center of consequence was associated with the rain. In fact, a surface pressure rise took place, quite in contrast to the pressure fall in the Kansas area during the 1844 storm. The same sequence of a weak front becoming stationary over the Kansas area, followed by another front ahead of a large cold anticyclone, obtained, however. This second slowly moving cold front was responsible for the heaviest rains of the 1951 storm as compared with the occluding mechanism in the 1903 and 1844 storms. The inflow warm air mass was more moist than either of the other two storms, the 12-hr reduced dewpoint being 73° F. The cold front finally moved into central Oklahoma on the 13th, bringing eastern Kansas under the influence of the polar High.

To summarize:

In so far as we are able to recognize long-continuing heavy rain situations from surface pressure and frontal patterns, the 1844 storm seems the most favorable of the three. It combines a slow-moving low and high moisture content, factors that have been found to be associated with heavy rain in many regions.

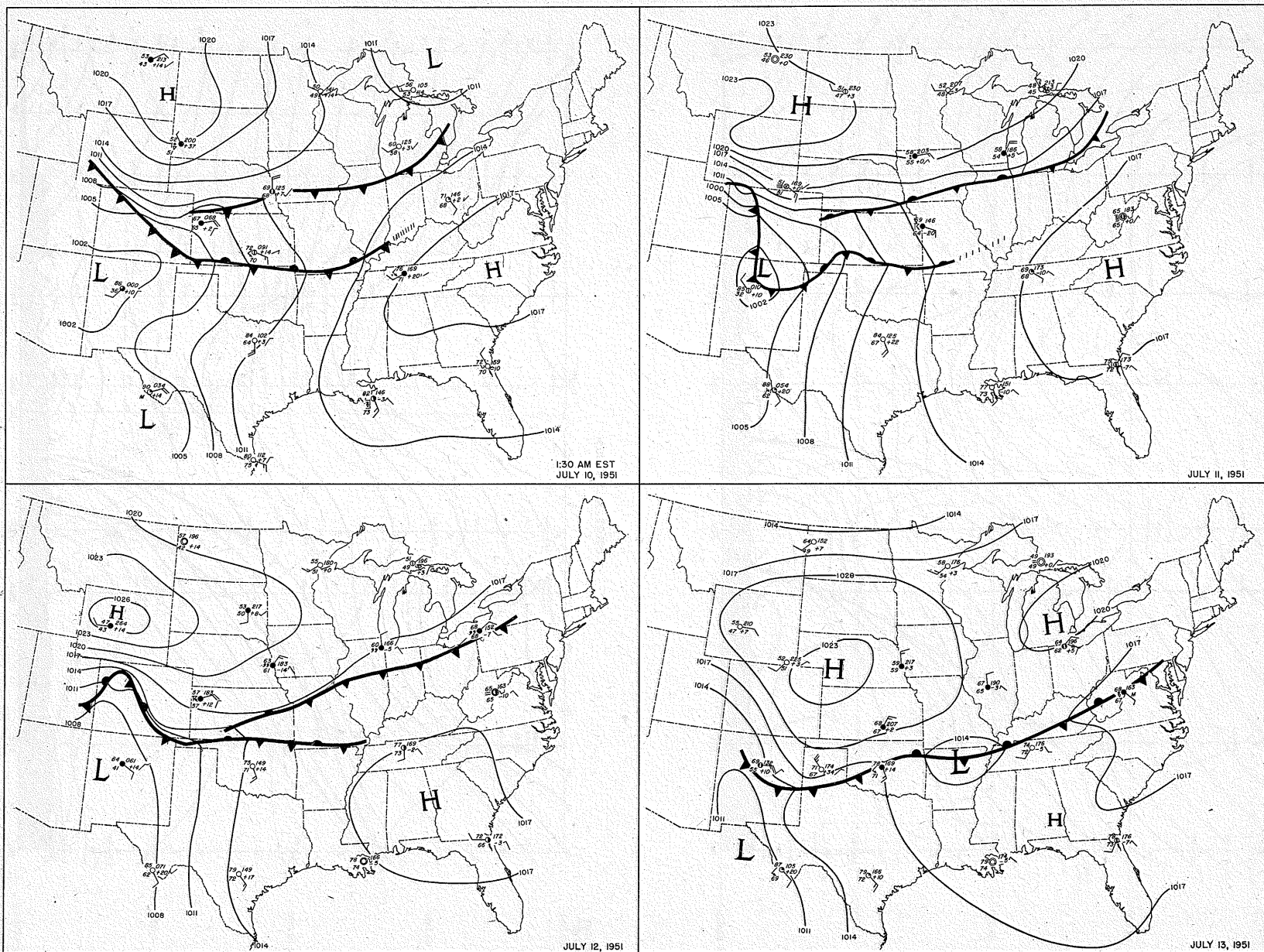


Figure 28.--Surface Weather Maps for Storm of 1951

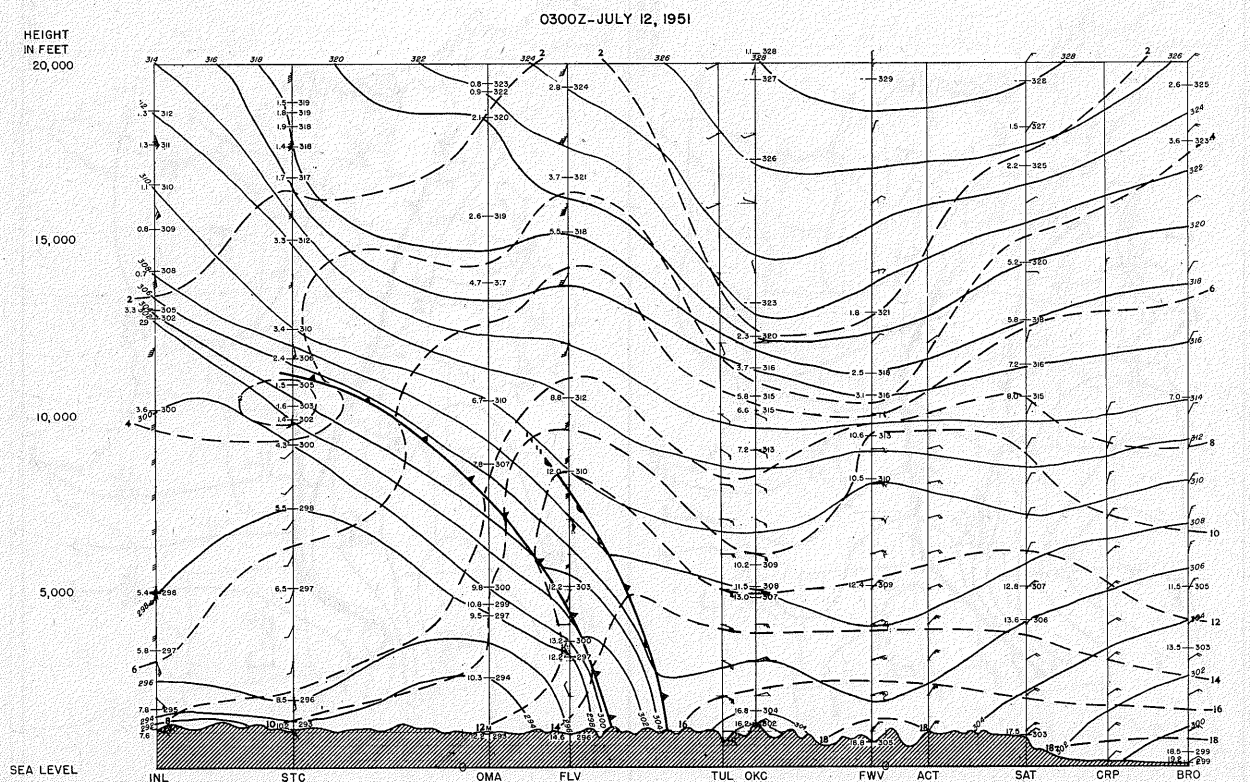
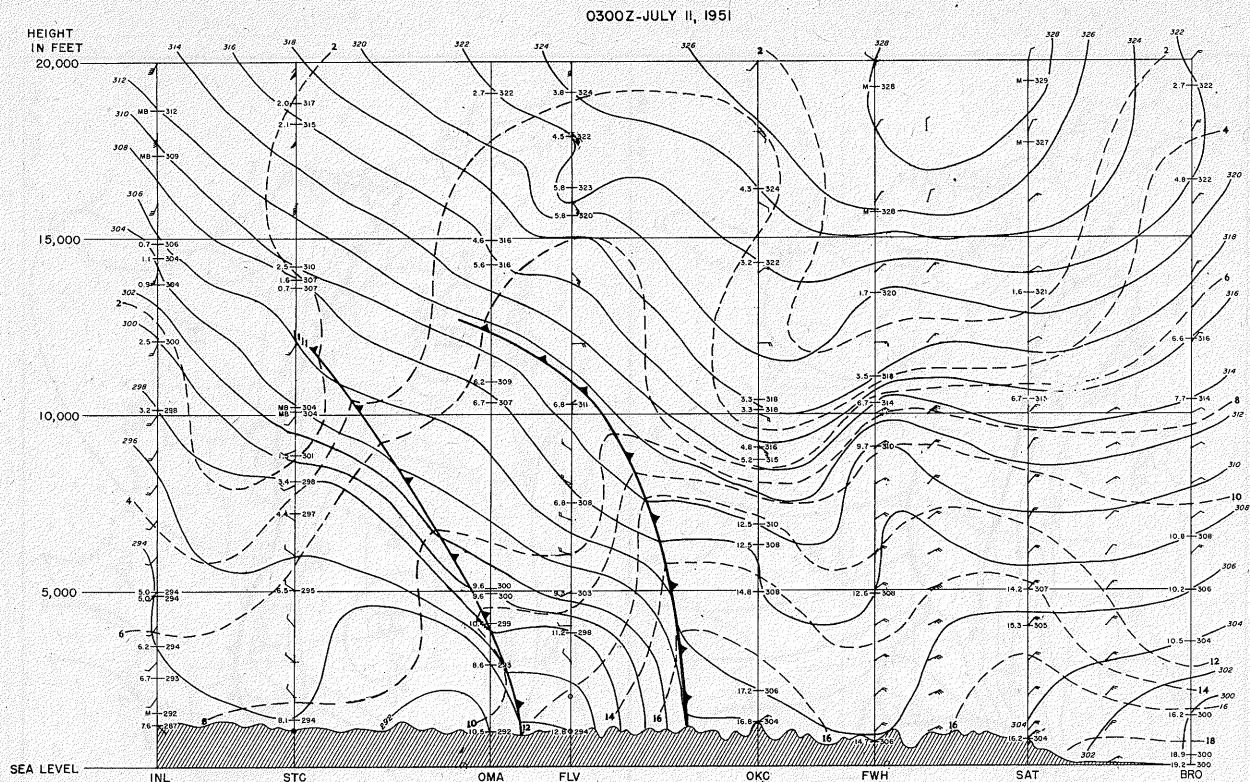


Figure 29.--North-South Atmospheric Cross Sections

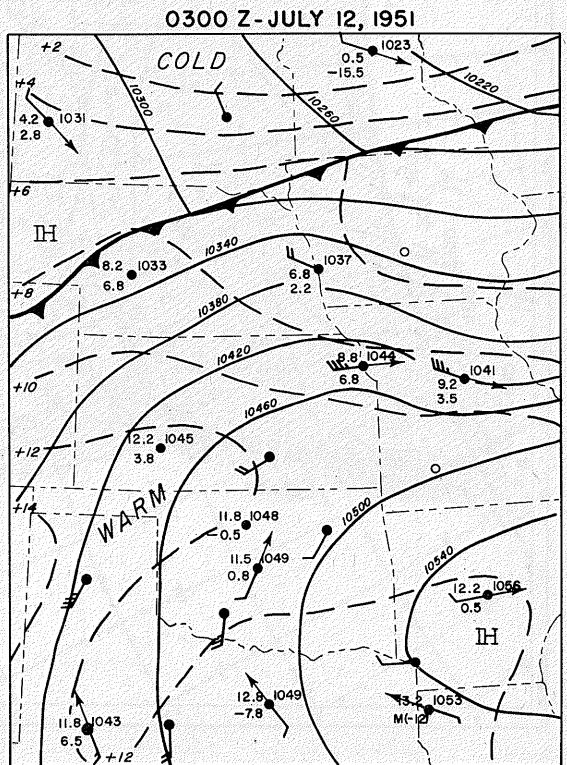
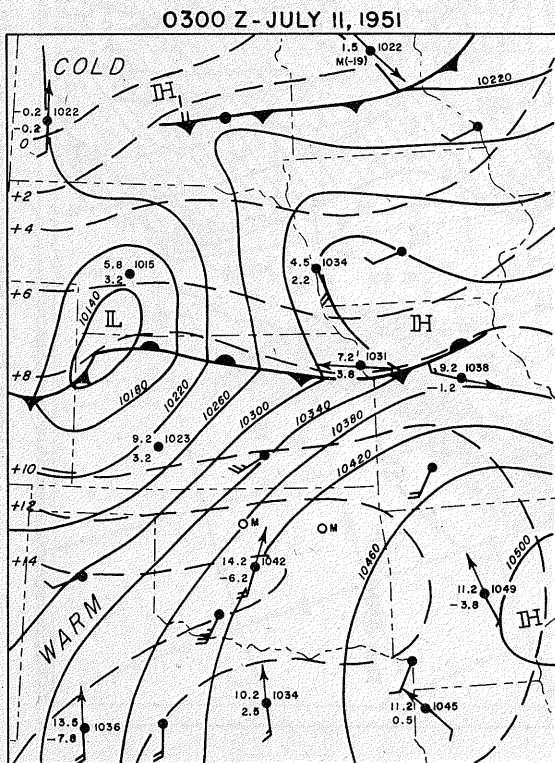
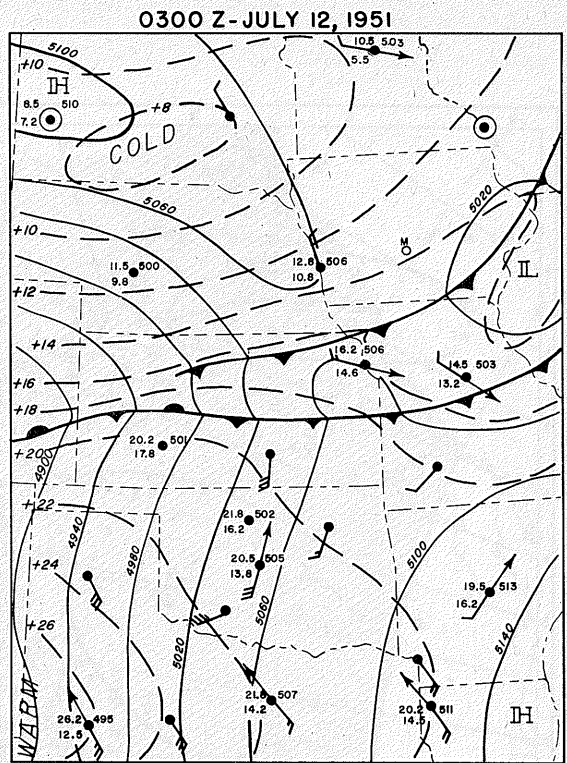
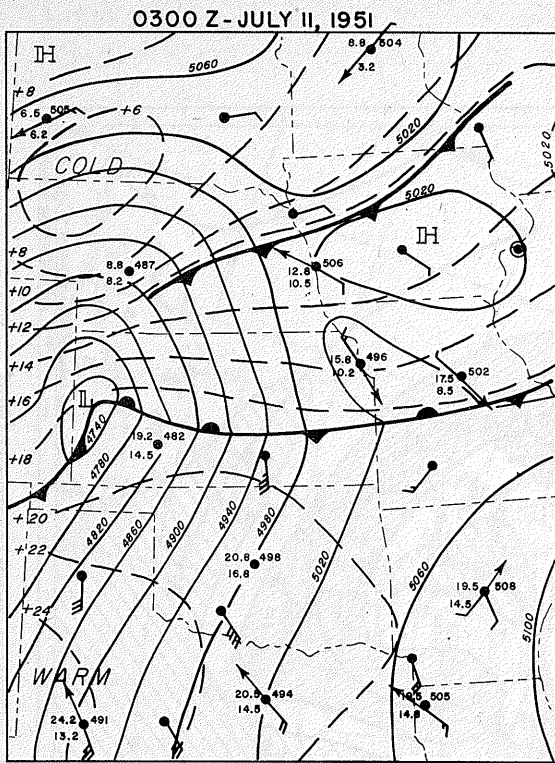


Figure 30.--850-MB (upper) and 700-MB (lower) Constant Pressure Charts.

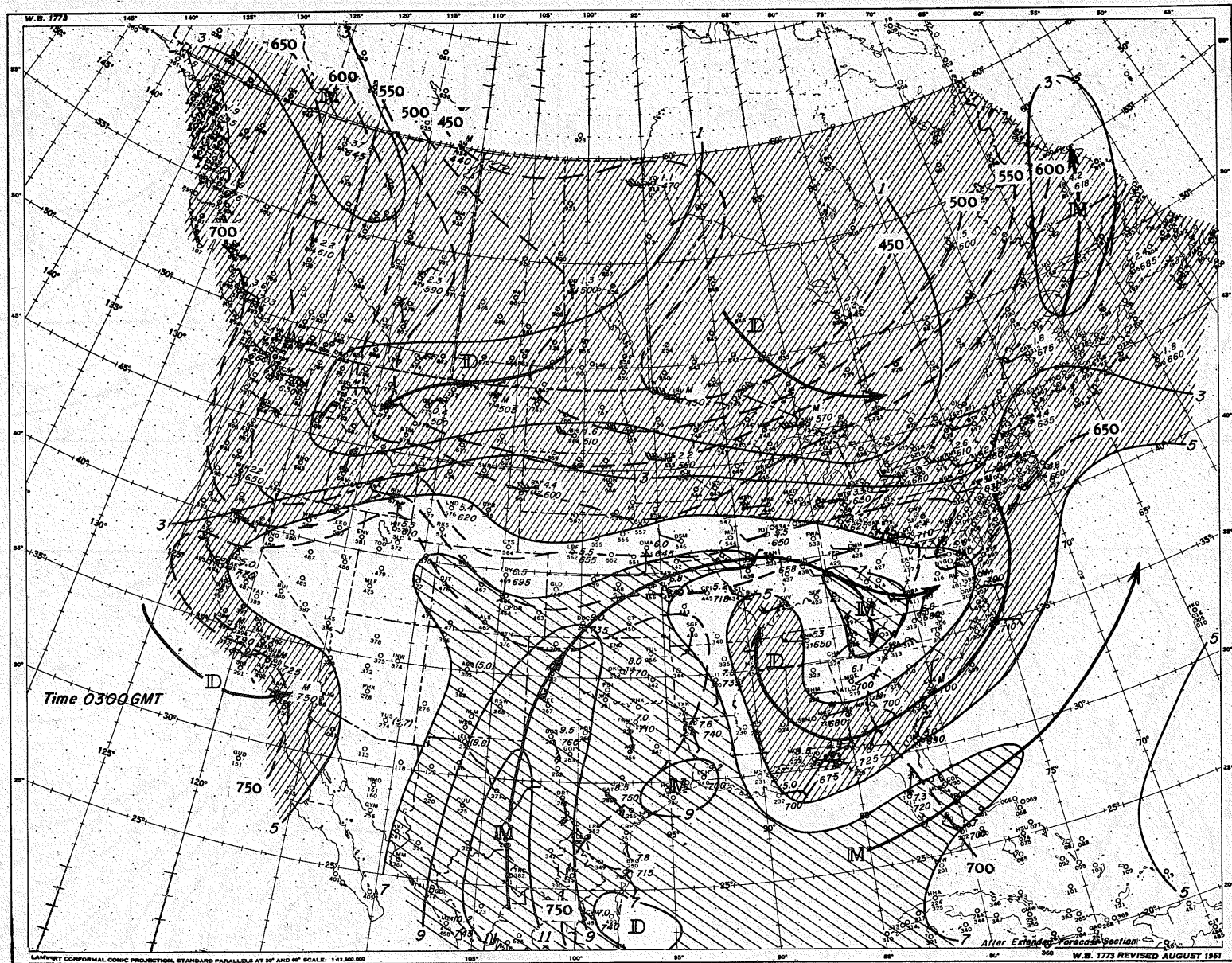


Figure 31.--Isentropic Chart for July 11, 1951 (312° Potential Temperature Surface)

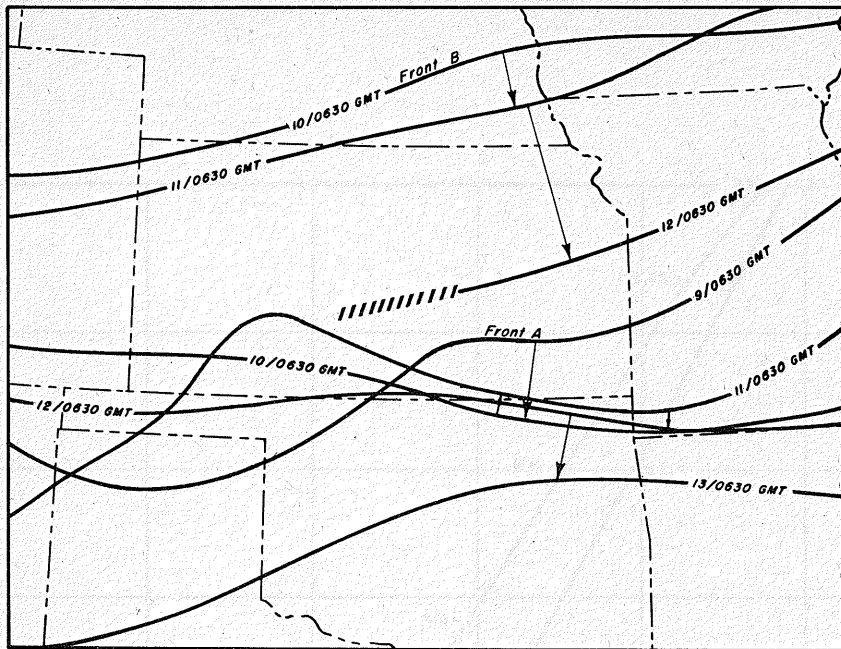


Figure 32.--Successive Surface Frontal Positions

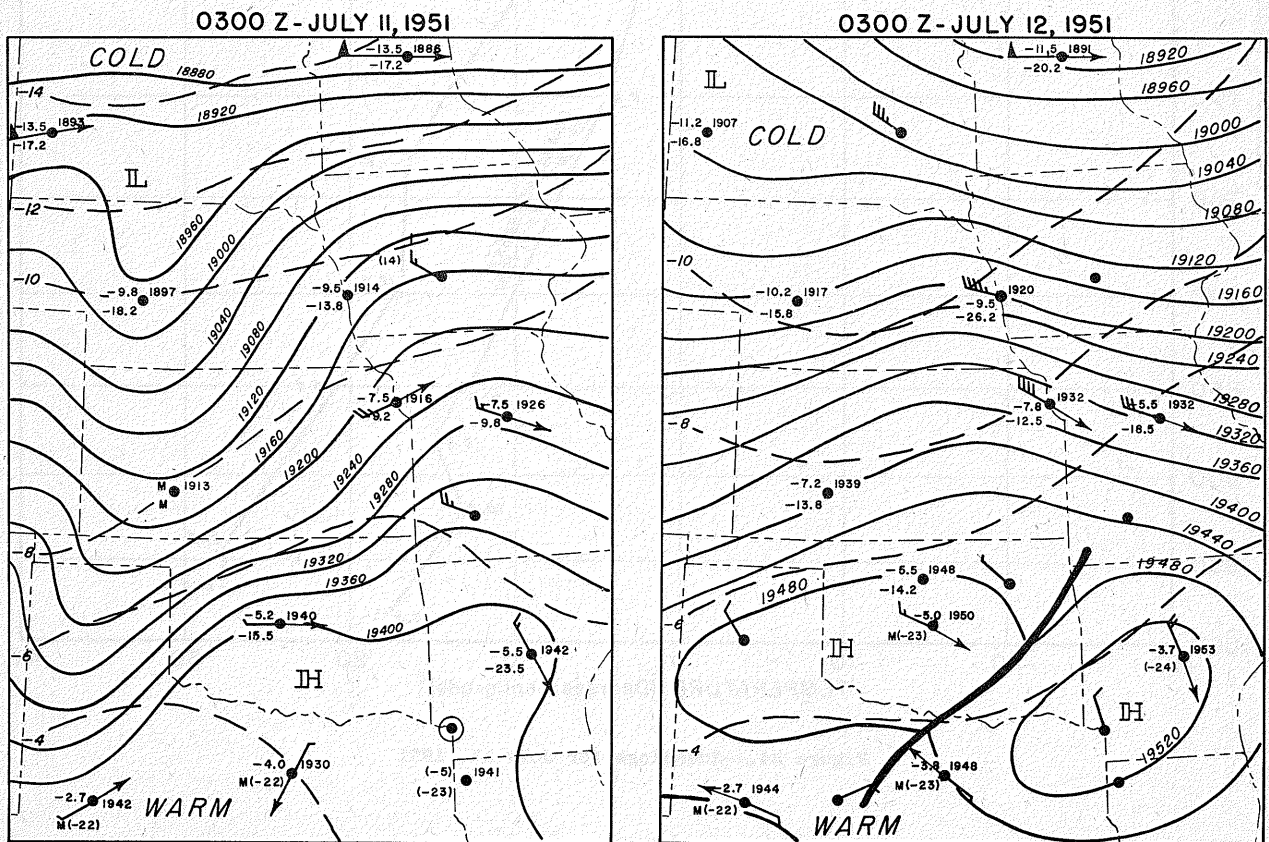


Figure 33.--500-MB Constant Pressure Charts

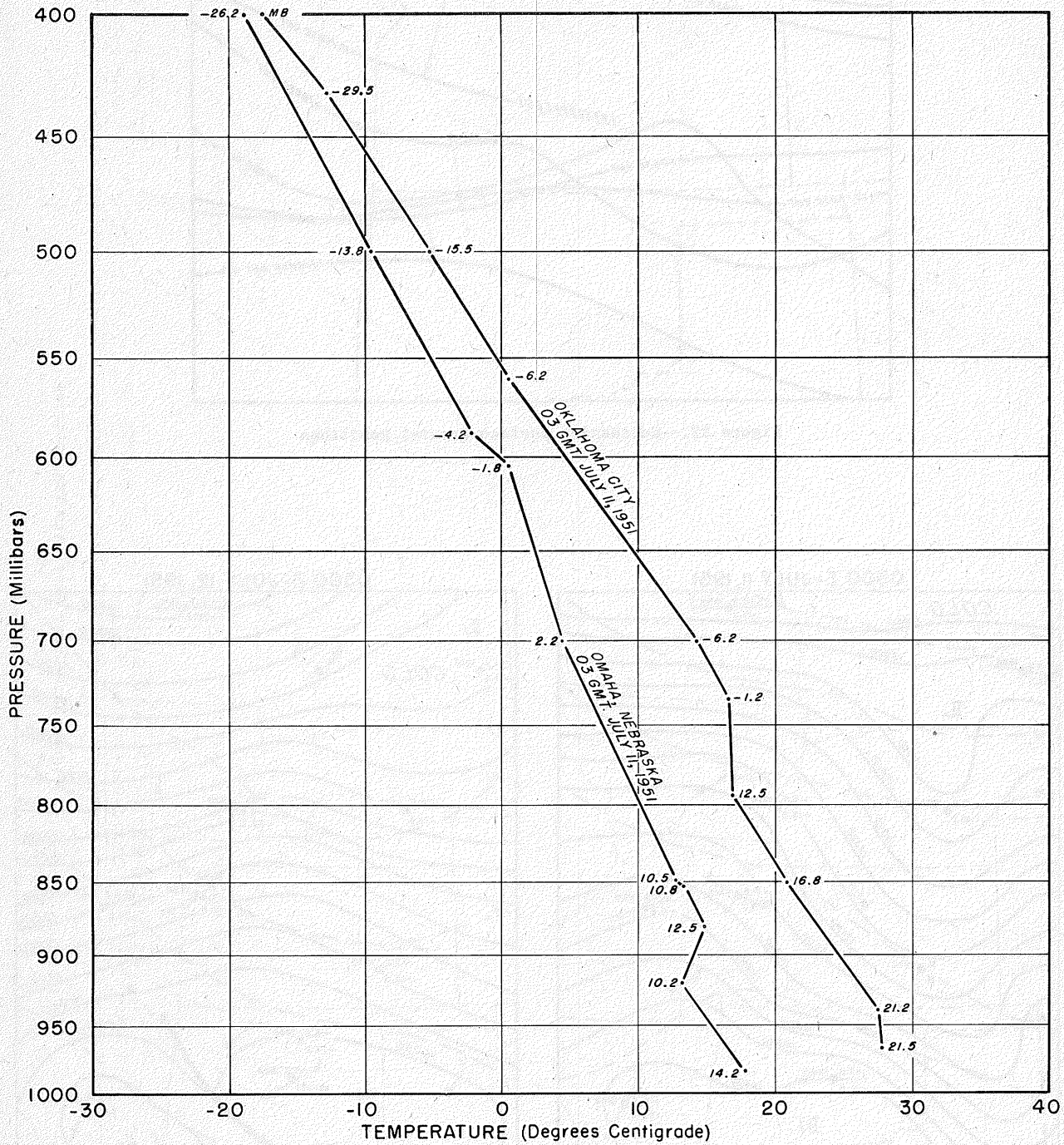


Figure 34.--Soundings for July 11, 1951

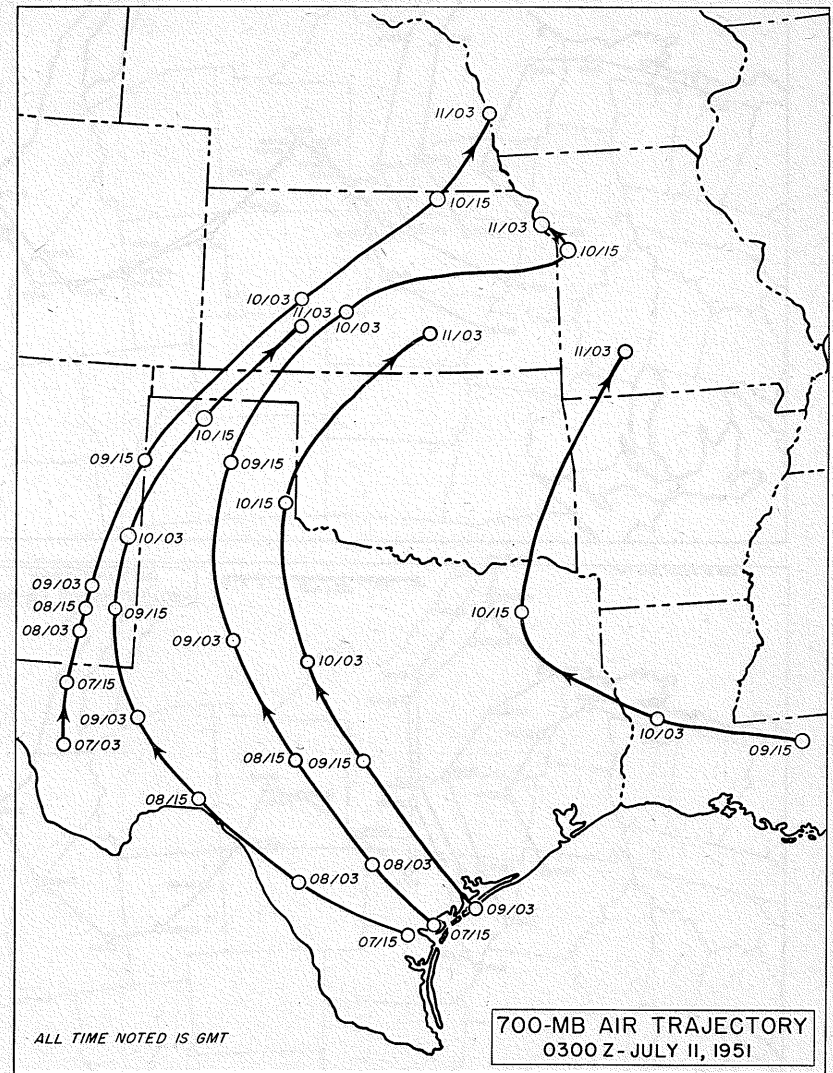
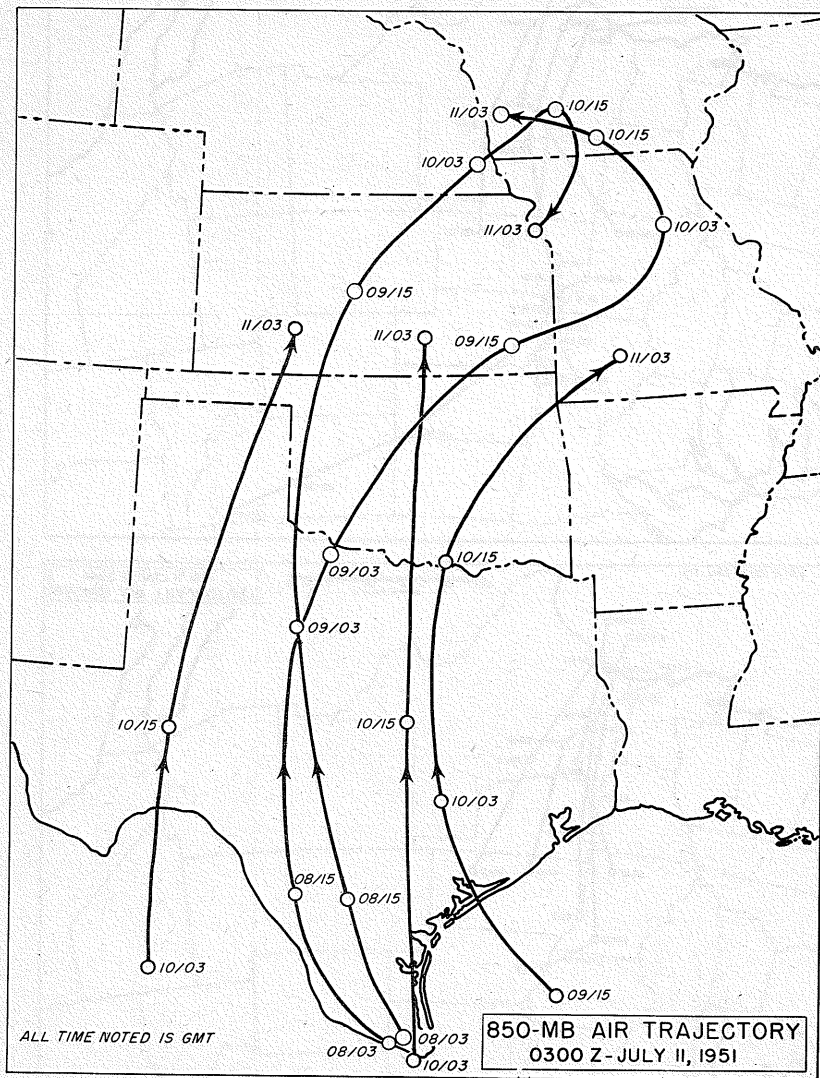


Figure 35.--Upper Level Air Trajectories

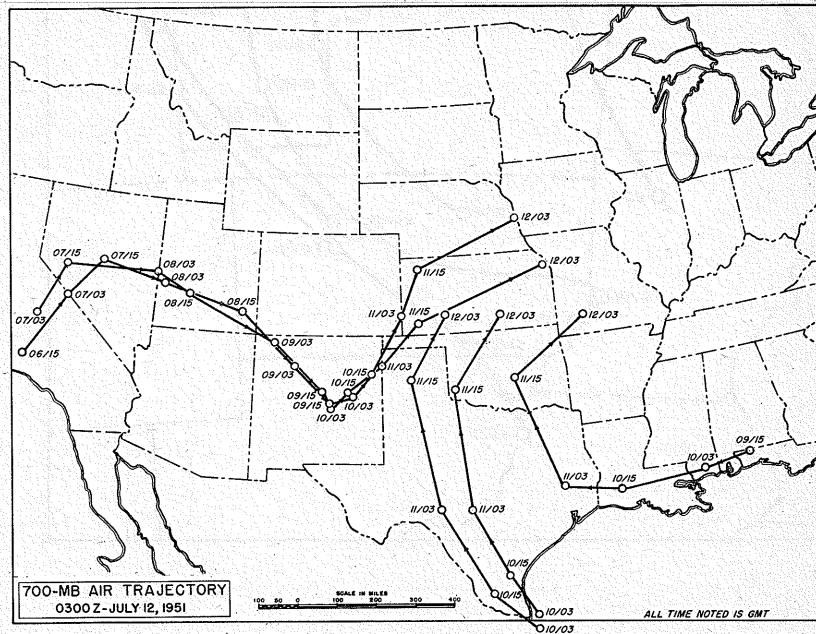
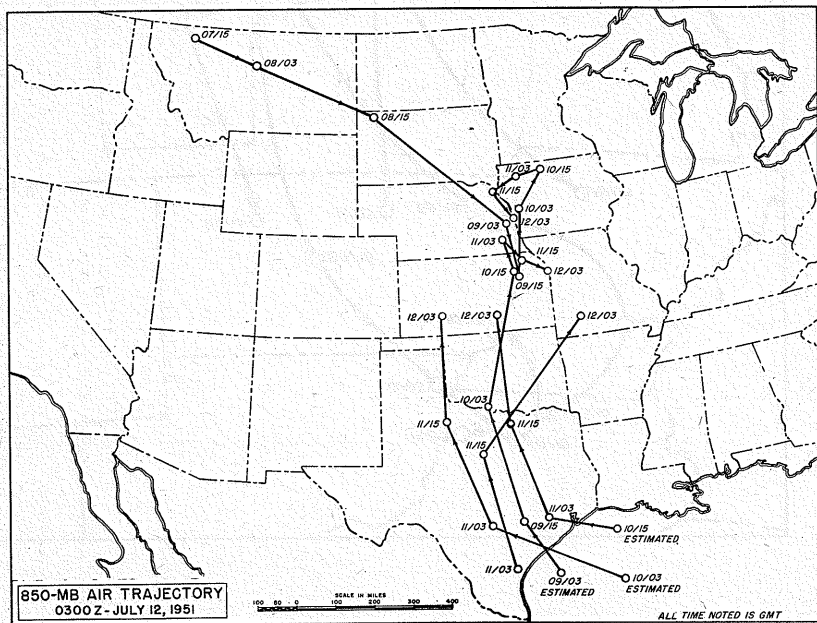
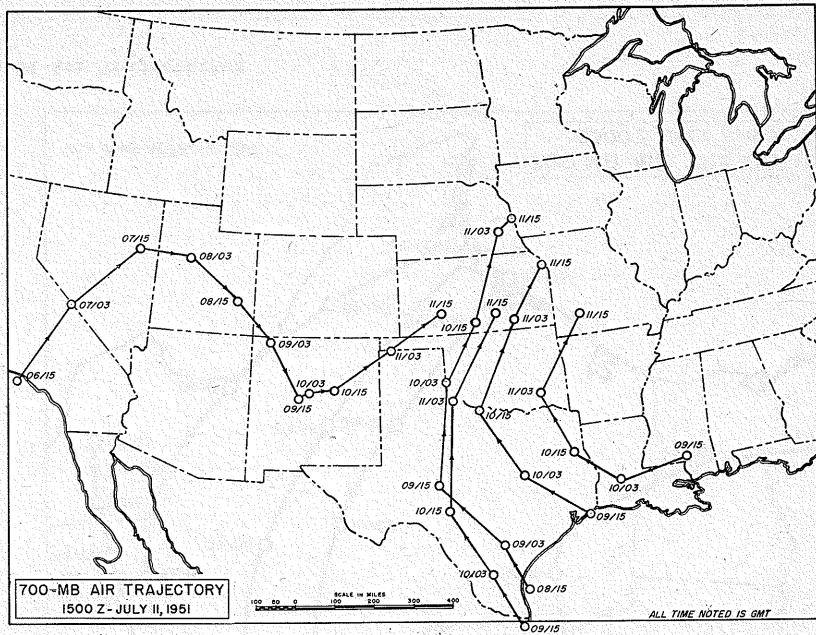
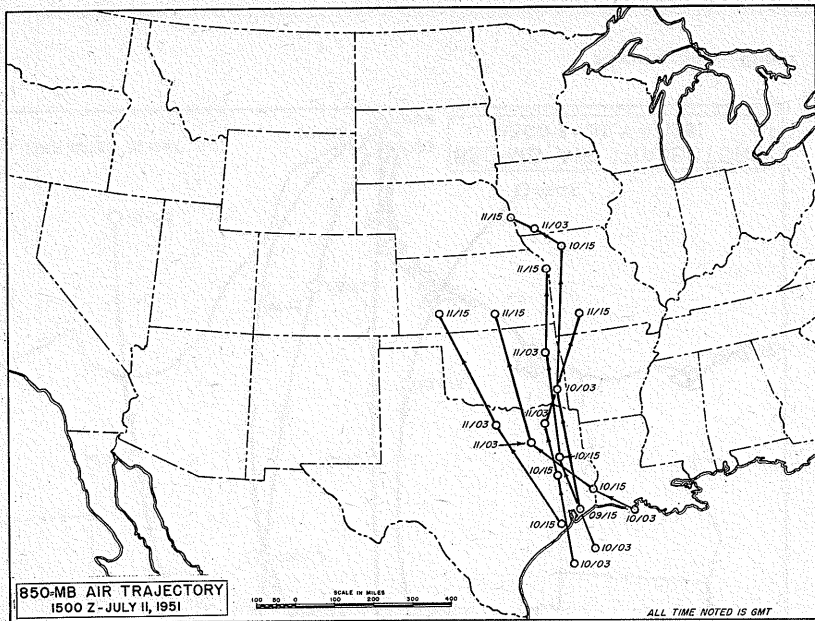


Figure 36.--Upper Level Air Trajectories

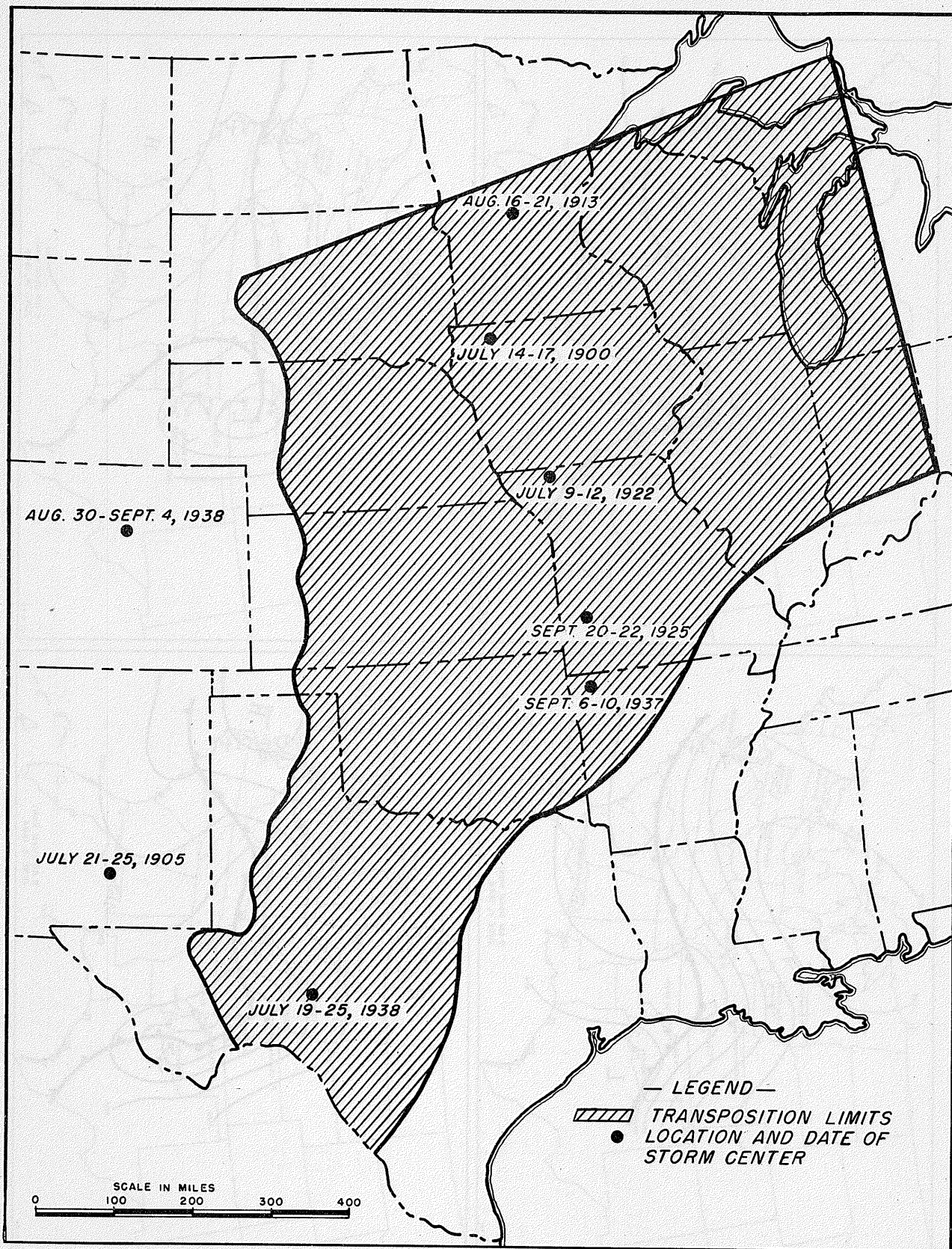


Figure 37.--Prototype Storms and Transposition Limits of July 1951 Storm

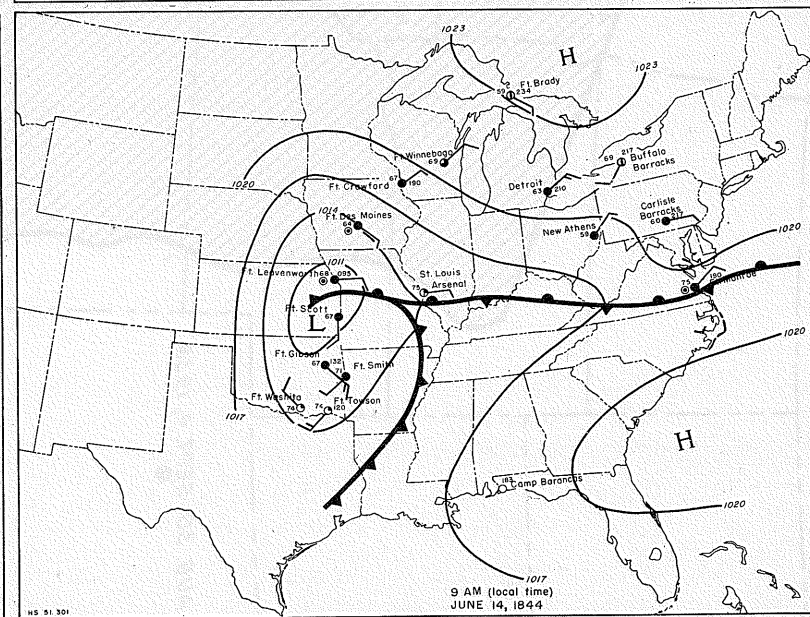
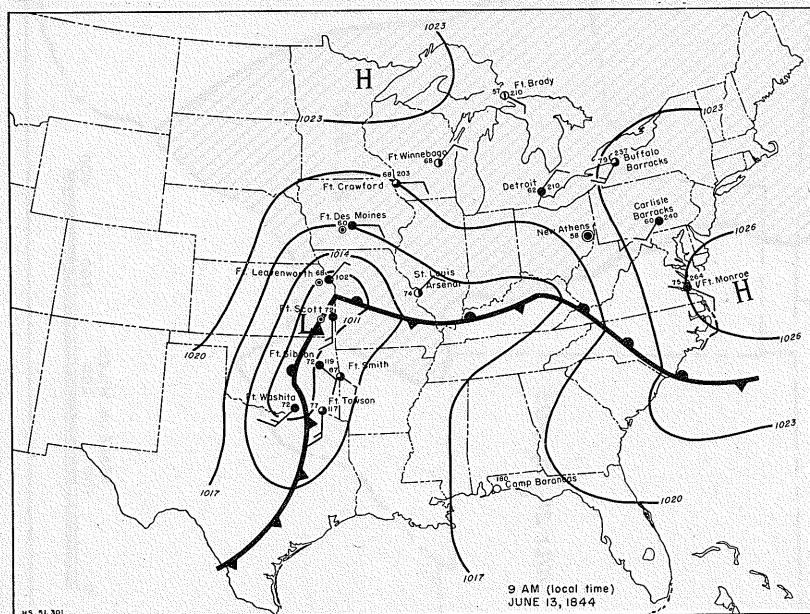
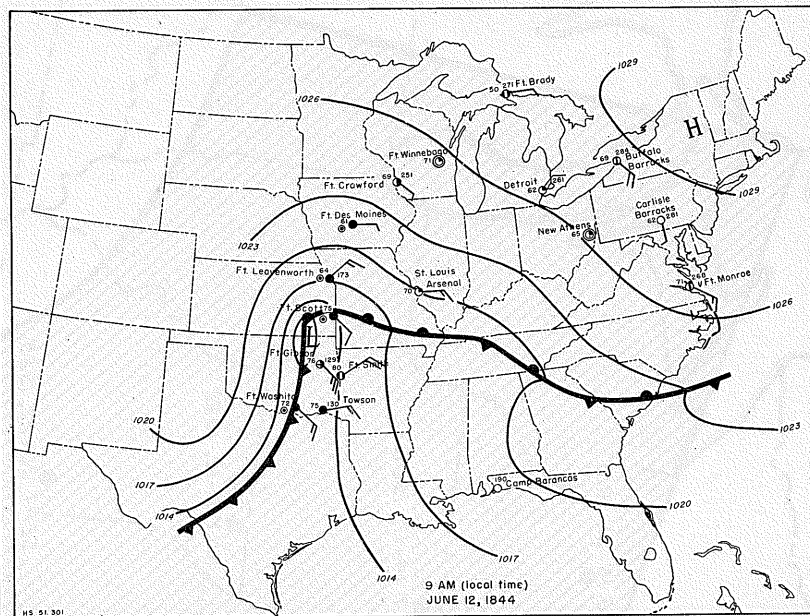
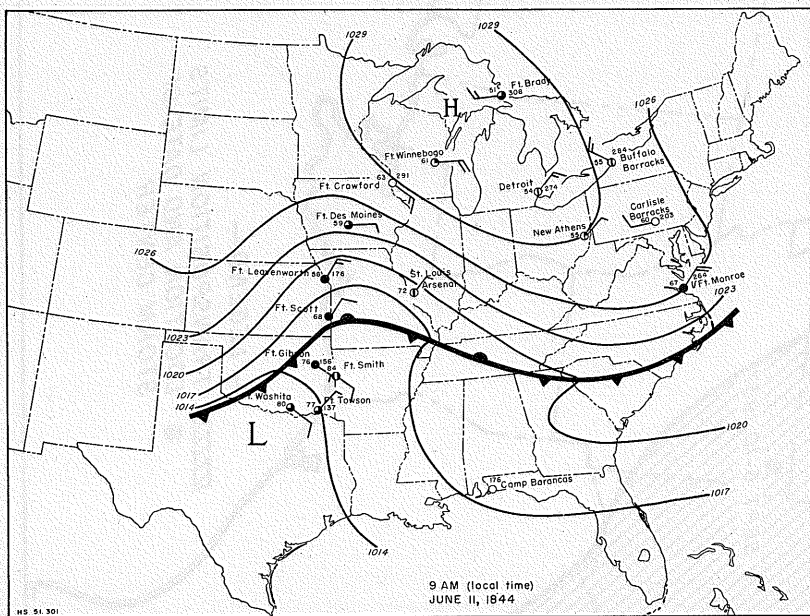


Figure 38.--Surface Weather Maps for Storm of 1844

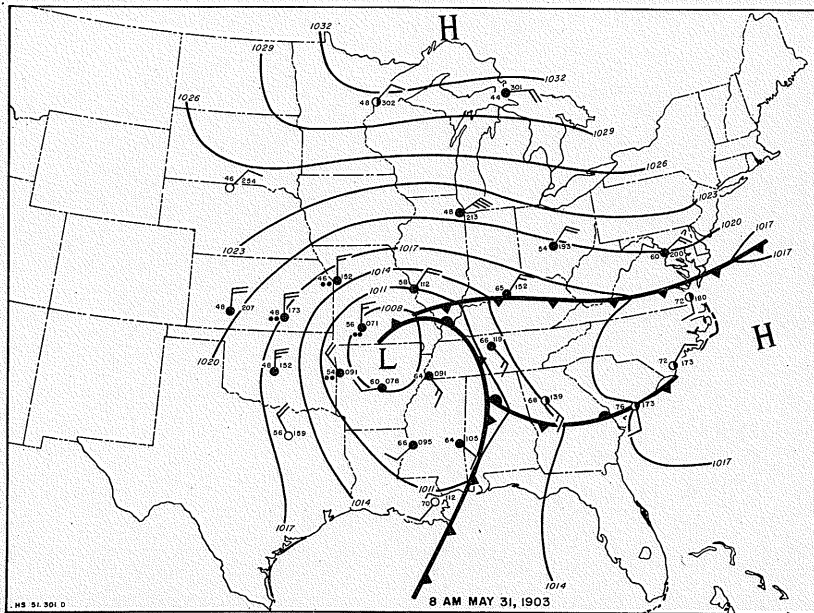
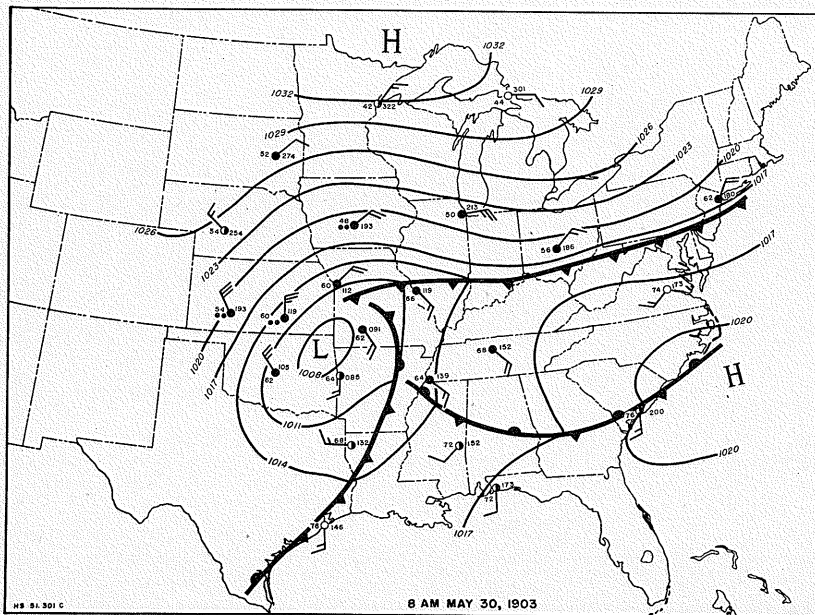
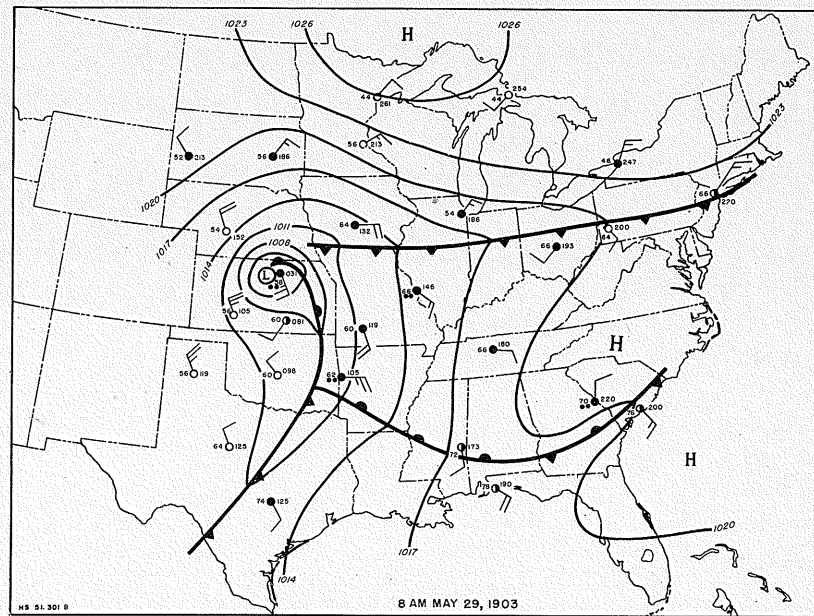
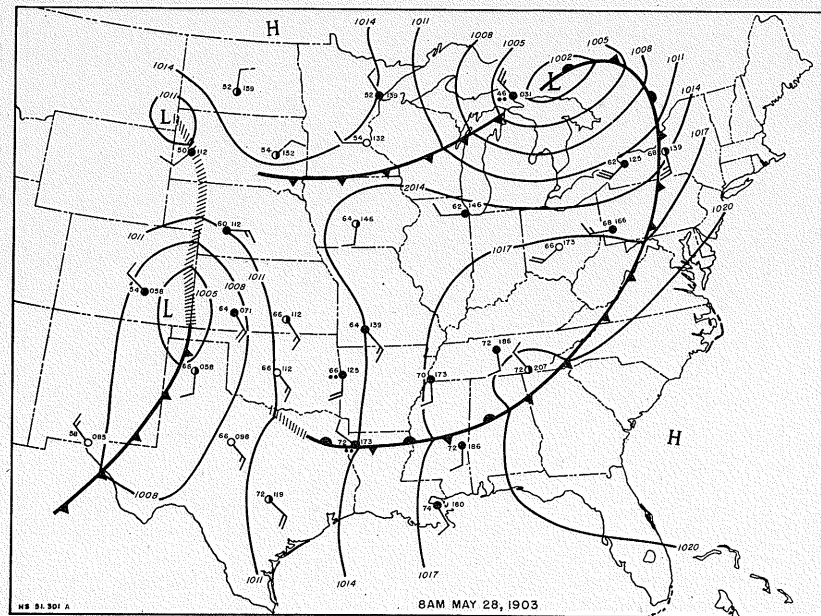


Figure 39.--Surface Weather Maps for Storm of 1903