THE 1973 MISSISSIPPI RIVER BASIN FLOOD: COMPILATION AND ANALYSES OF METEOROLOGIC, STREAMFLOW, AND SEDIMENT DATA

Report prepared jointly by the U.S. Geological Survey
and the National Oceanic and Atmospheric Administration

U.S. DEPARTMENT OF THE INTERIOR • U.S. DEPARTMENT OF COMMERCE

GEOLOGICAL SURVEY PROFESSIONAL PAPER 937

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FOREWORD

The U.S. Geological Survey and the National Weather Service have a long history of cooperation in monitoring and describing the Nation's water cycle—the movement of water as atmospheric moisture, as precipitation, as runoff, as streamflow, as ground water, and finally, through evaporation, its return to the atmosphere to begin the cycle over again. The cooperative effort has been a natural dovetailing of technical talent and responsibility: the National Weather Service as the Federal agency responsible for monitoring and predicting atmospheric moisture and precipitation, for forecasting riverflow, and for issuing warnings of destructive weather events; and the U.S. Geological Survey as the primary agency for monitoring the quantity and quality of the earthbound water resources, including both ground water and surface water.

This report represents another step in the growth of our cooperative efforts. In some ways, this closer working arrangement has been spurred by five major flood disasters that have struck the Nation in the last 6 years. In August 1969, the remnants of Hurricane Camille caused flooding of the James River and other streams in central Virginia that left 152 people dead or missing. In February 1972, the failure of a coal-waste dam sent a flood wave down the Buffalo Creek Valley of West Virginia, leaving 118 people dead or missing. On June 9, 1972, extremely heavy rains over the eastern Black Hills of South Dakota produced record-breaking floods on Rapid Creek and other streams, leaving 237 dead and 8 missing. Beginning on June 18, 1972, the remains of Hurricane Agnes produced floods in the eastern United States from Virginia to New York that killed 117 people in what has been called the worst natural disaster in American history. Most recently, the spring 1973 floods on the Mississippi River produced a record 88 days of floodflow at Vicksburg, Miss., and 77 days at St. Louis, Mo.; inundated more than 12 million acres of land; and damaged over 30,000 homes.

These disasters have underlined the need to know more about the force and flow of floodwater and have given impetus to further cooperation between the U.S. Geological Survey and the National Weather Service to combine their respective studies and information about flood events into single, unified reports. Hopefully, this documentation of the 1973 Mississippi River basin flood will aid the understanding of such flood disasters and will help improve human preparedness for coping with future floods of a similar catastrophic magnitude.

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GLOSSARY

Albedo. The ratio of the amount of radiation reflected by a body to the amount incident upon it, commonly expressed as a percentage.

Bed material. The sediment mixture of which the moving bed is composed.

Concentration of sediment, by weight. The ratio of the weight of dry solids in a water-sediment mixture to the weight of the mixture in milligrams per litre.

Depth-integrating sediment sampler. An instrument that is moved vertically at an approximately constant rate between the water surface and a point a few inches above the streambed. It collects a representative water-sediment mixture at all points along the sampling vertical.

Dew point (or dew point temperature). The temperature to which a given parcel of air must be cooled at constant pressure and constant water-vapor content in order for saturation to occur.

Discharge-weighted concentration. The dry weight of sediment in a unit volume of stream discharge, or the ratio of the discharge of dry weight of sediment to the discharge by weight of water sediment mixture.

Fine material. That part of the total stream sediment load composed of sizes not found in appreciable quantities in the bed material; normally the silt and clay sizes (less than 0.062 mm).

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

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

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

Front. The interface or transition zone between two airmasses of different density.

Jet stream. Relatively strong winds concentrated within a narrow stream in the atmosphere.

K Index. A measure of the airmass moisture content and stability,

$$K = (T_{850} - T_{500}) + T_{d,\,850} - (T_{700} - T_{d,\,700}),$$

T and T_d are temperature and dew point respectively in degrees Celsius (°C); subscripts denote pressure levels.

Lifted Index. Difference in °C between the observed 500-mb temperature and the computed temperature which a parcel characterized by the mean temperature and dew point of the 50-mb thick surface layer would have if it were lifted from 25 mb above the surface to 500 mb.

Moist tongue. An extension or protrusion of moist air into a region of lower moisture content.

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

Occluded cyclone. Any cyclone within which there has developed an occluded front.

Occluded front (occlusion). A composite of two fronts, formed as a cold front overtakes a warm front or quasi-stationary front. This is a common process in the late stages of cyclone development.

Particle size. The diameter of a particle measured by settling, sieving, micrometric, or direct measurement methods.

Particle size distribution. The relative amount of a sediment sample having a specific size, usually in terms of percent by weight finer than a given size, D percent.

Point-integrating sediment sampler. An instrument designed to collect a representative sample of the water-sediment mixture at a selected depth in a stream vertical over a specific time period.

Precipitable water. The total atmospheric water vapor contained in a vertical column of unit cross-sectional area extending from the surface up to a specified pressure level, usually 500 mb.

Recurrence interval. Frequency of flooding is normally expressed by the Geological Survey in terms of recurrence interval in years. This designation indicates that a flood of a given magnitude will be exceeded once in an average interval of time. For example, a 50-year flood discharge will be exceeded on the average of once in 50 years; in terms of probability, there is a 2-percent chance that such a flood will occur in any year.

Ridge. An elongated area of relatively high atmospheric pressure.

Saturation. The condition in which the partial pressure of water vapor is equal to its maximum possible partial pressure under the existing environmental conditions.

Sediment. Solid particles usually derived from rocks or earth material that have been or are being transported laterally or vertically from one or more places of origin.

Sediment discharge. The average quantity of sediment carried past any cross section of a stream per unit of time. The term may be qualified as, for example, suspended-sediment discharge, bedload discharge, bed-material load discharge, or total sediment discharge.

Sediment yield. The total sediment outflow from a watershed or past a given location in a specified period of time. It includes stream bedload as well as suspended load and is usually expressed in tons per year.

Showalter Index. A measure of the local static stability of the atmosphere. It is determined by raising an air parcel from 850 mb dry-adiabatically to saturation, then saturation-adiabatically to 500 mb. At 500 mb the environment temperature minus the parcel temperature and expressed as a nondimensional numeral is the index.

Sounding. A single complete radiosonde observation of the upper atmosphere.

Squall line. Any non-frontal line or narrow band of active thunderstorms; a mature instability line.

Suspended sediment. Organic and inorganic particulate matter that moves in suspension in streamflow and is maintained in suspension by the upward components of turbulent currents or by colloidal suspension.

Trough. An elongated area of relatively low atmospheric pressure.

Vapor pressure. The pressure exerted by the molecules of a given vapor; in meteorology, this term is used exclusively to denote the partial pressure of water vapor.

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By EDWIN H. CHIN of the National Weather Service, National Oceanic and Atmospheric Administration, and JOHN SKELTON and HAROLD P. GUY of the U.S. Geological Survey

ABSTRACT

The severe 1973 spring flood in the Mississippi River basin had its beginnings in the mild, wet fall and winter of 1972. Many tributary streams and reservoir levels were well above normal throughout the basin when heavy spring rains began to fall. Frequent and prolonged warm rains associated with extratropical cyclones and frontal activities fell over large areas of the Mississippi basin in March and April 1973. The cumulative effect of these rainfalls led to the 1973 Mississippi River basin flood, characterized by its long duration, high volumes of runoff, and large coincident tonnage of sediment transported.

New records for consecutive days above flood stage were set for most main-stem gaging stations from southern Iowa to Louisiana. For example, the Mississippi River remained above flood stage for a record number of consecutive days at St. Louis, Mo. (77 days), Chester, Ill. (97 days), Thebes, Ill. (95 days), Memphis, Tenn. (63 days), and Vicksburg, Miss. (88 days). The total sediment discharge to the Gulf of Mexico during March through June was approximately 240 million tons, including 15 million into Lake Pontchartrain.

The 1973 main-stem flood stages were the highest ever observed in the reach of the Mississippi extending approximately 370 mi (595 km) upstream from Cape Girardeau, Mo. At St. Louis, Mo., for example, the maximum stage of 43.23 ft (13.177 m) exceeded the stage of 41.32 ft (12.594 m) that was observed in June 1844, and the flood peak of April 1785 that may have reached 42 ft (12.80 m).

Peak stages and discharges far exceeding the estimated values for the 100-year flood occurred in April 1973 on many tributaries in Wisconsin, Iowa, Illinois, and Missouri. Most tributary streams throughout the Mississippi River basin experienced some degree of flooding during March-May 1973, contributing to the outstanding main-stem flooding which continued into June.

Described in this report are the meterological setting of the flood, an account of the general characteristics of associated precipitation, and an analysis of a sample of significant precipitation events with return periods exceeding 100 years. The storm of April 19–21, 1973, with precipitation centered in northern Missouri, is analyzed as a case study. An estimation of evapotranspiration based on relevant meteorological factors indicates a probable reduction of such loss during the flood episode.

This report also contains summaries of stream stages, discharges, and flood volumes for gaging stations where outstanding flood events occurred and includes sediment data where available. The recurrence interval of the event is shown for many of the peaks and volumes. Also included are flood-profile data for the main stem and selected tributary streams.

INTRODUCTION

The Mississippi basin flood in the spring of 1973 was exceptional in its duration, magnitude, and areal extent. Flooding began along portions of the Upper Mississippi River in early March as a result of much heavier than normal precipitation, and by April 3 the main stem was above flood stage along its entire course below Cairo, Ill. All major tributaries experienced continuous flooding with parts of 10 States affected to some extent—Minnesota, Wisconsin, Iowa, Illinois, Missouri, Tennessee, Kentucky, Arkansas, Mississippi, and Louisiana (fig. 1). More than 12 million acres (30 million ha) of land were inundated during the worst of the flooding, and 28 deaths were attributed to the floods. Fifty thousand people were evacuated from their homes and total damages were estimated by the Corps of Engineers to be over $400 million. It was not until May that the history-making floods began to recede.

The Mississippi River rises in northern Minnesota and flows southward for about 2,470 mi (3,970 km) into the Gulf of Mexico. The main stem, together with its tributaries, extends over 31 States, and the drainage basin of 1,243,700 mi^2 (3,221,200 km^2) covers 41 percent of the land area in the conterminous United States. In order for widespread flooding to occur over a basin drained by a river system of such extent and capacity, extraordinary precipitation events must occur at critical locations in the system. The precipitation events relevant to the flood and their associated meteorological situations are analyzed in a later section of the report, and comparisons are made with climatological precipitation

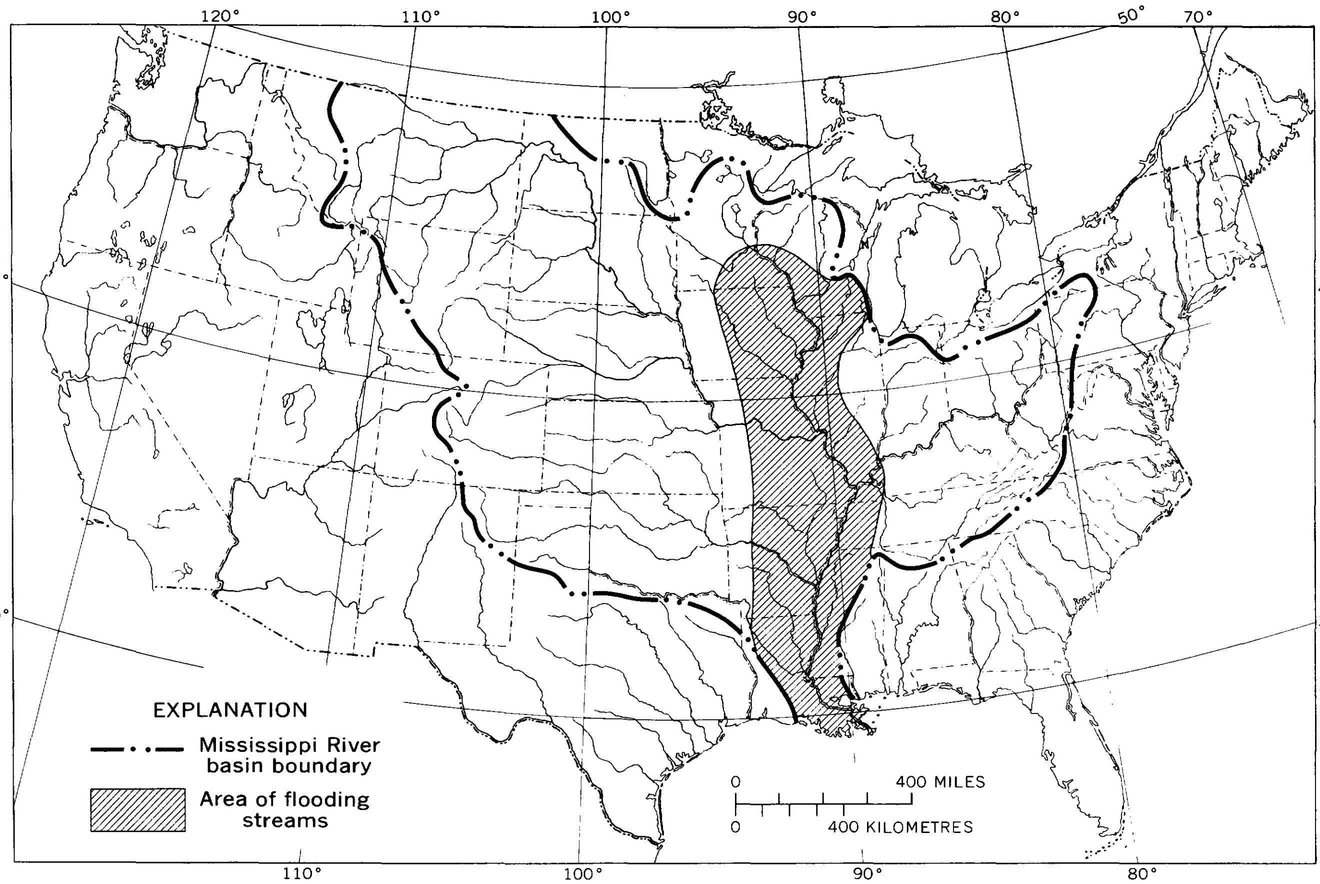


FIGURE 1.—The Mississippi River basin, showing general area of flooding streams, spring 1973.

events of various return periods. A case study of cyclone and frontal systems associated with tropical maritime airmass intrusion into the "heartland" of the basin is also presented later in the report. Estimation of water loss over the basin in March and April 1973 is made.

The Mississippi basin as a whole received above normal precipitation in every month except one from October 1972 through February 1973. As a consequence, tributary flooding over a part of the basin had been in progress prior to the onset of the main-stem flooding in early March 1973. The contributions of the antecedent precipitation, the snowmelt factor, and the unusually prolonged and sometimes heavy storm rainfalls that began in March 1973 are assessed in a later section.

The floods on the main stem of the Mississippi River and its major tributaries are described in some detail in this report. Upstream from Winona, Minn., the main-stem flooding was minor; recurrence intervals of peaks were less than 10 years. However, from approximately 420 mi (676 km) above Cairo, Ill., to Cape Girardeau, Mo., the maximum 1973 flood stages set alltime high records. Further downstream, the main stem reached its highest stages since 1937.

National Weather Service forecasts and warnings of record and near-record flooding were timely and accurate during the record-breaking period. The forecast for the record crest of April 28 on the Mississippi River at St. Louis was made at a time when major levee failures were occurring upstream, producing additional complications in the forecast problem. As a result of these forecasts and warnings, protective measures were taken throughout the flood areas that have been estimated to have averted over $500 million in additional losses. Undoubtedly, the warnings also prevented the loss of many lives.

An outstanding facet of the 1973 flood was the high volume of flow in the Mississippi River and many of its tributaries for an extended period of time. At Vicksburg, Miss., the average runoff for the Mississippi River from October 1972 through June 1973 was much greater than any comparable period since records have been collected.

The record Mississippi River crests in late April 1973 were preceded by headwater floods on many tributary streams only a few days earlier. Such almost simultaneous events created lakes of water that could not drain from the land. These backwater areas allowed the relatively heavy sediment loads of the tributaries to partly settle out, thus helping to assure relatively low concentrations of suspended sediment in the Mississippi River main stem. However, backwater floods also caused much damage, particularly in the flat Mississippi Delta region.

An important feature of most floods is that of sediment erosion, transport, and deposition, and the 1973 flooding was no exception. The main categories of visually apparent sediment damages during the flood were scour and deposition on roads, culverts, and bridges, streambank erosion, erosion and deposition on agricultural land, and deposition in structures and on furnishings. Erosion of the uplands by raindrop splash and overland runoff was caused by precipitation and fresh exposure of the land surface, whereas stream channel erosion was caused by flow intensity and perhaps some manmade channel controls.

This flood serves to illustrate that a flood plain is really an enlarged part of the associated river or stream. Those who are engaged in any activity on or near flood plains need to be aware that the risk of devastating floods in these areas, even though small in any given year, is nevertheless a very real risk. Manmade controls in the form of reservoirs, diversions, and levees can reduce but never completely erase the threat.

PURPOSE AND SCOPE

This report is one of a continuing series of joint flood reports undertaken by the Department of the Interior, U.S. Geological Survey, and the Department of Commerce, NOAA, National Weather Service. The cooperative effort represents a natural dovetailing of technical talent and responsibility. The National Weather Service is the agency responsible for monitoring and predicting atmospheric moisture and precipitation, for forecasting river stage, and for issuing warnings of destructive weather events. Therefore, its contribution to this report is in the area of meteorological events related to the flood. The Geological Survey is the primary agency for monitoring the quantity and quality of the terrestrial water resources, including both ground water and surface water. Therefore, its contribution is in the area of documenting the flood itself, the magnitude and frequency of the flood peaks and volumes, and the fluvial sediment data. The compilation of this information in one report will serve as a ready reference for this major event and hopefully will be of value in future water-management planning.

Basic precipitation data collected by the National Weather Service are published routinely by NOAA Environmental Data Service in the Climatological Data series and the Hourly Precipitation Data series each month and are readily available through the National Climatic Center in Asheville, N.C. Therefore, when treating precipitation in this report the emphasis is on utilizing these data to arrive at coherent information, such as daily isohyetal patterns and significant precipitation events associated with the flood. The daily surface weather maps and the 500 mb (millibar) charts included in this report should provide a basic frame of reference of the meteorological setting for the flood. More specific analyses of meteorological events relevant to the flood are presented in the text.

Likewise, detailed streamflow and sediment data collected by the Geological Survey are published routinely in State reports, and again this report utilizes these data to assemble coherent information about the flow and sediment characteristics of the flood. Additional flood information is contained in files and publications of district offices of the Geological Survey in each State.

Flood data for 72 sites, including 24 sites having sediment data, are shown near the end of this report. The time period chosen for reporting flood information was March through May 1973 for tributary streams and main-stem stations on the Upper Mississippi River because the outstanding flood peaks and volumes occurred during this period. However, the base period was extended through June 1973 to include the periods of significant flood runoff for some stations, mostly in the Lower Mississippi basin.

A tabulation of daily mean discharge is provided for many stations. For many sites on tributary streams, the stage, discharge, and sediment data are shown at selected times during significant flood events so that more accurate flood hydrographs can be drawn than would be possible by using only the daily mean values.

Flood-volume-duration data are presented for a number of sites where continuous streamflow records were available. These data can be useful in the planning, design, construction, and operation of projects that include the storage of flood waters. The recurrence intervals of the flood volumes and peak discharges are also shown.

ACKNOWLEDGMENTS

The meteorological and rainfall analyses contained in this report are mainly based upon National

Weather Service data or products and therefore represent the collective effort of many professional people. The author of the NOAA portion of this report is especially grateful to Mr. John F. Miller, Chief, Water Management Information Division, for his interest in this work and his many helpful comments. Sincere thanks are also extended to Mr. Francis K. Schwarz of that same division and to Dr. Charles N. Hoffeditz of the Hydrologic Research Laboratory for their valuable discussions.

Much of the flood and sediment data appearing in this report were collected and reported as part of cooperative programs between the U.S. Geological Survey and the States of Minnesota, Wisconsin, Iowa, Illinois, Missouri, Tennessee, Kentucky, Arkansas, Mississippi, and Louisiana. Much additional data were furnished by the St. Paul, Rock Island, St. Louis, Kansas City, Memphis, Little Rock, Vicksburg, and New Orleans districts of the U.S. Army Corps of Engineers. Other Federal and State agencies, municipalities, and corporations also provided some data.

CONVERSION OF ENGLISH UNITS TO INTERNATIONAL SYSTEM OF UNITS

For use of those readers who may prefer to use metric units rather than English units, the conversion factors for the terms used in this report are listed below:

Multiply English units	*By*	*To obtain metric units*
Inches (in.)	25.4	Millimetres (mm).
Feet (ft)	0.3048	Metres (m).
Yards (yd)	0.9144	Metres (m).
Miles (mi)	1.609	Kilometres (km).
Nautical miles (nmi)	1.85	Kilometres (km).
Knots (kn)	1.85	Kilometres per hour (km/hr).
Acres	4,047	Square metres (m^2).
Acres	0.4047	Hectares (ha).
Square miles (mi^2)	2.590	Square kilometres (km^2).
Acre-feet (acre-ft)	1,233	Cubic metres (m^3).
Acre-feet (acre-ft)	1.233×10^{-3}	Cubic hectometres (hm^3).
Cubic feet per second (ft^3/s)	0.02832	Cubic metres per second (m^3/s).
Gallons (gal)	3.785×10^{-3}	Cubic metres (m^3).
Degrees Fahrenheit (°F)	5/9 (F −32)	Degrees Celsius (°C).

METEOROLOGICAL SETTINGS OF THE FLOOD EPISODE

ANTECEDENT PRECIPITATION

To provide some background for the flood event, antecedent precipitation since late fall 1972 will be briefly examined. Precipitation for October 1972 was more than twice the normal in parts of the southern Plains and the Lower Mississippi Valley. Cairo, Ill., had 7.05 in. (179 mm) of rain in October 1972, which was 4.17 in. (106 mm) above normal. November 1972 was another wet month for the Ohio River Valley, the Lower Missouri River Valley, and coastal Louisiana. But, for other areas of the basin, it was nearly normal. December precipitation over the Mississippi basin was near normal or above, except for the relatively dry southern Plains. January precipitation was twice its normal in the Central Great Plains and below normal in the Ohio Valley but was about normal in other parts of the Mississippi basin (Environmental Data Service and Statistical Reporting Service, 1973).

The amount of precipitation in the 3-month period prior to March 1, 1973, and this amount as a percentage of normal precipitation are shown in figures 2 and 3. It is evident that the winter season precipitation over the whole Mississippi basin averaged out close to the climatic normal. Since, in considering antecedent events, the immediate past should be given most weight, the precipitation map for February 1973 is also shown in figures 4 and 5. For about 90 percent of the basin area, February was a rather dry month; and considerable areas in the Missouri and Mississippi River headwater region, Arkansas River basin, and Ohio River basin had less than 50 percent of normal precipitation.

Due to the heavier than normal precipitation in late fall 1972, some sections of the Mississippi River system did not fall to their normal low levels in the winter of 1972. Heavy rainfall and flooding occurred in the Cumberland and Lower Ohio tributaries in December. In January 1973, above-normal streamflow conditions persisted in large areas of the Missouri basin and the Middle Mississippi basin. Here, the term "above (below) normal" applies to streamflows within the highest (lowest) 25 percent of record for a specific month. But this area of above-normal flow in the midsection of the country reduced considerably after a dry February.

Another relevant factor that should be examined is snowmelt. During the latter part of February 1973, there was some reduction of the snow cover over the headwater regions of the Mississippi and

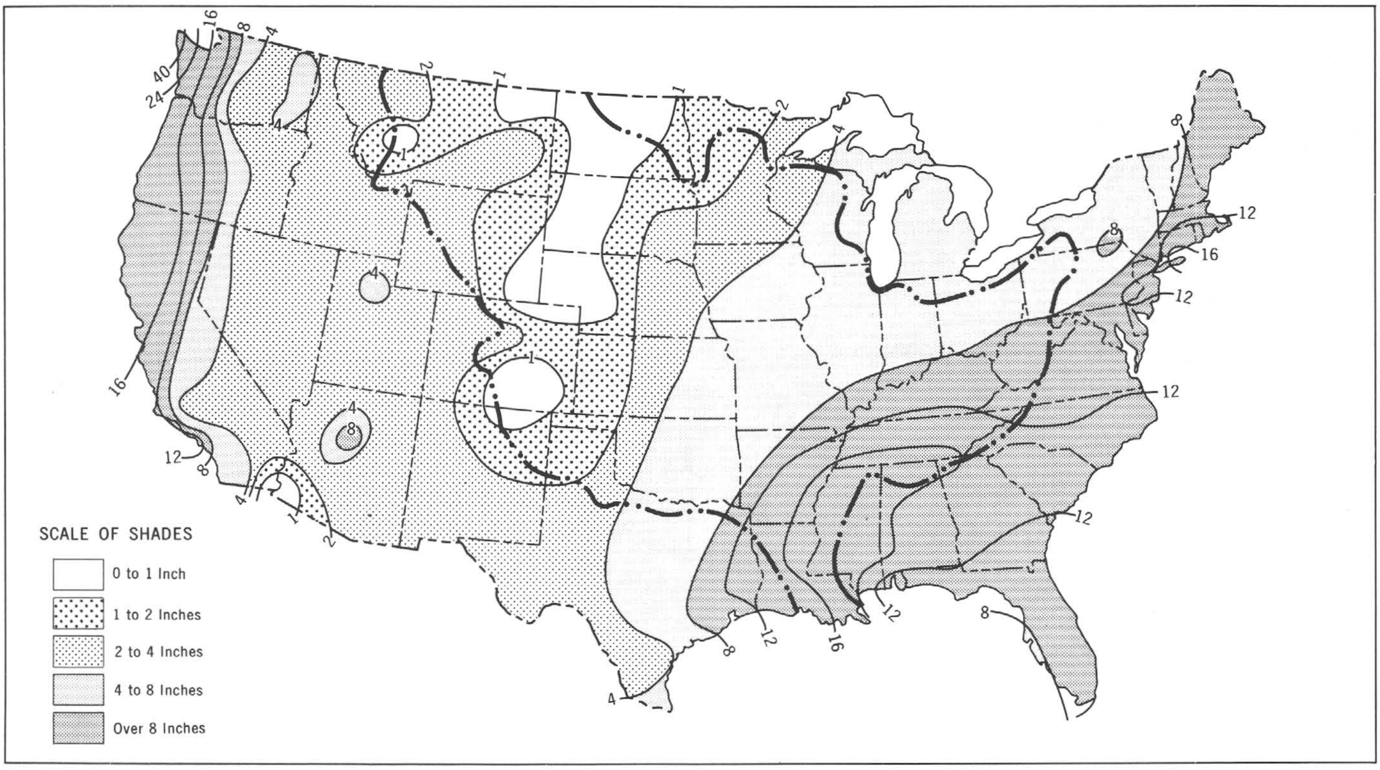


FIGURE 2.—Total winter precipitation in 3-month period prior to March 1973.

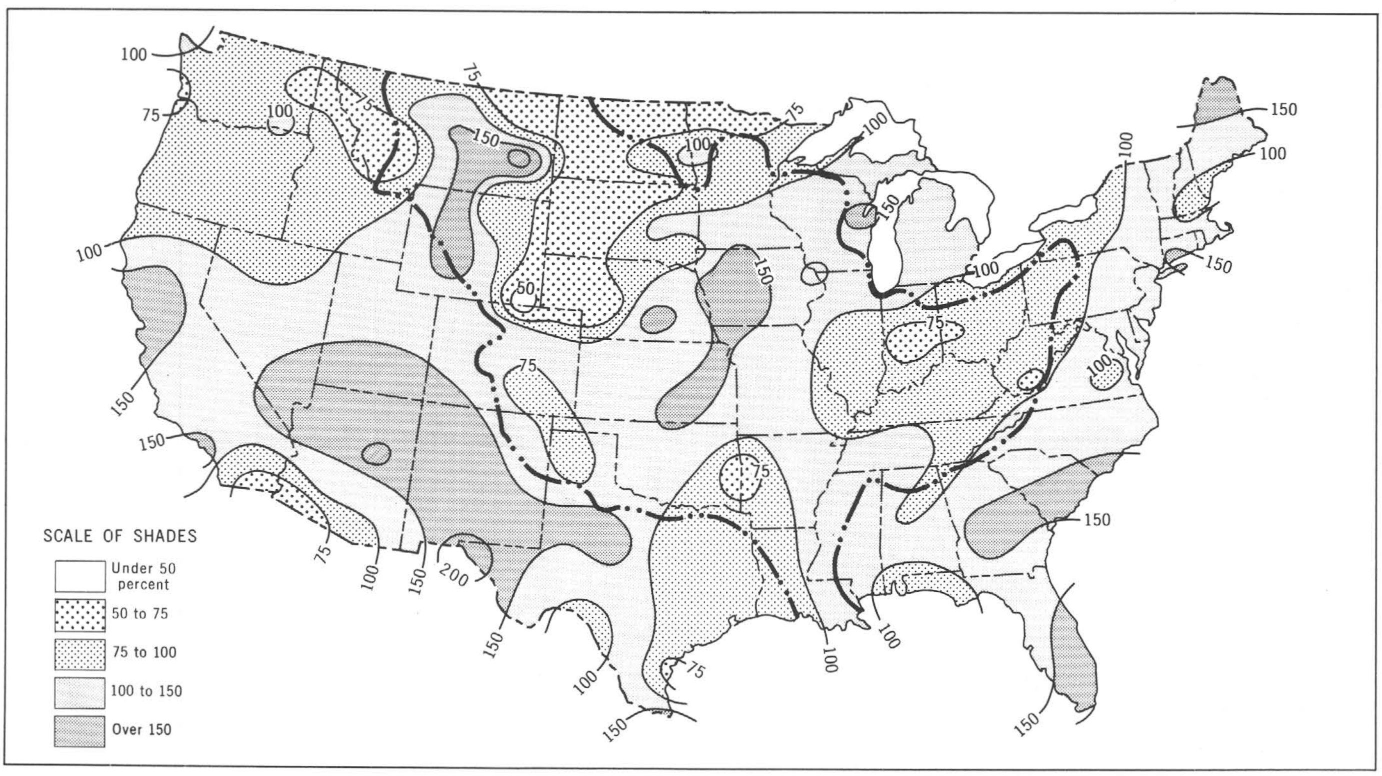


FIGURE 3.—Total winter precipitation in 3-month period prior to March 1973 as a percentage of normal winter precipitation.

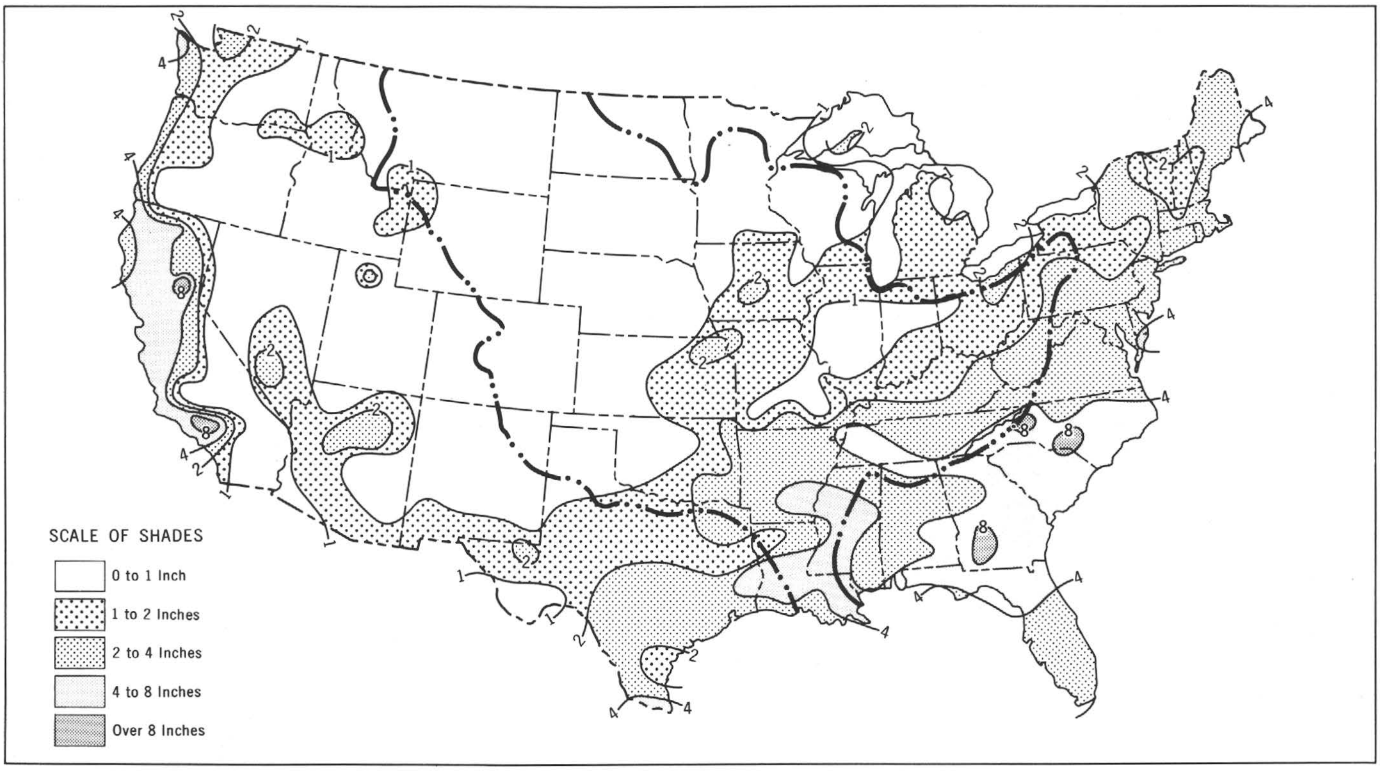


FIGURE 4.—Total precipitation in February 1973.

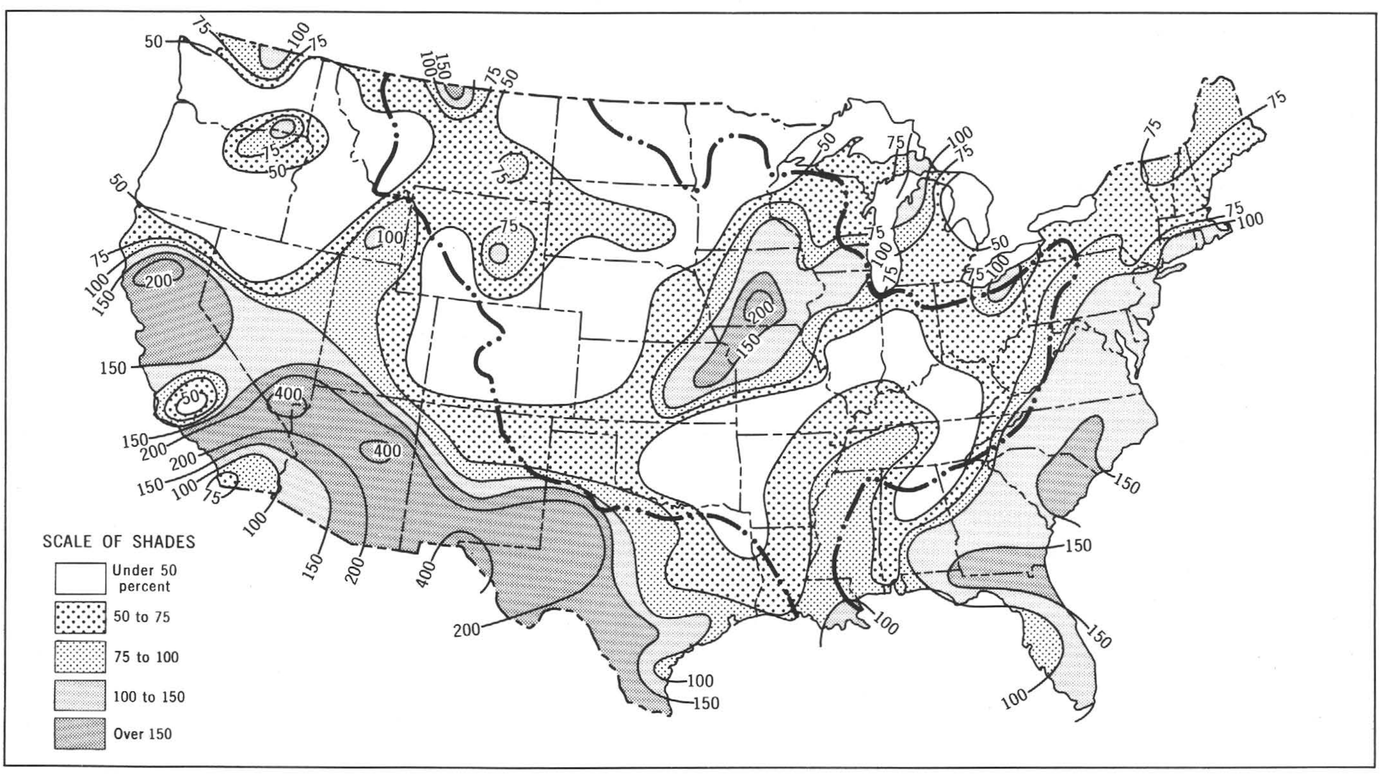


FIGURE 5.—Total precipitation in February 1973 as a percentage of normal February precipitation.

Missouri Rivers (Environmental Data Service and Statistical Reporting Service, 1973). The snow cover at the beginning of March 1973, which could have provided subsequent snowmelt runoff to the Mississippi River, was both limited in extent and depth (fig. 6). The water equivalent of snow depends on its density, which in turn depends on the "age" of the snow on the ground and the onsite meteorological conditions since its fall. Using the climatological maximum observed water-equivalent data of record in Weather Bureau Technical Paper No. 50 (Miller and Paulhus, 1964), a liberal estimate for the water equivalent for snow cover in the Minnesota-Wisconsin area for March 1–15 seems to be one-fourth of the snow depth. This means that the 1-inch isopleth of snow depth in figure 6 could be considered as an approximate 0.25-inch isohyetal in case of total melting. In the first weeks of March, the mean temperatures over Minnesota and Wisconsin were more than 12°F (6.7°C) above normal, partially as a result of occasional warm moist air intrusion from the south. The snow cover there receded further northward (fig. 7b), providing limited runoff to the Middle Mississippi River flow. But, when compared with concurrent and subsequent heavy precipitation, such as the 2.8 inches (71 mm) at LaCrosse, Wis., from March 5 to 11 or the 1.65 inches (42 mm) in a single day on March 11 at Winona, Minn., the snowmelt factor becomes overshadowed.

The snowmelt contribution to runoff in the Rocky Mountain States can be inferred from the water supply projection for March 1, 1973 (National Weather Service, 1973). It shows that the runoff from the mountainous headwater regions for the Missouri, Platte, and Arkansas Rivers, when averaged, is only slightly above the 1953–67 average. These projections were based on both antecedent precipitation and possible contributions from snowmelt, including normal precipitation subsequent to the date of the outlook. When compared with the very heavy precipitation that fell on the Great Plains in March 1973, snowmelt in the Rockies also could not be a major factor in the initiation of the flood.

From the foregoing discussions, it seems that the antecedent events did contribute towards the initiation of the flood in the sense that higher streamflow conditions prevailing in the Middle Mississippi basin and parts of the Missouri basin at the beginning of March 1973 provided a high flood potential. But such contribution was not a necessary prerequisite in view of the extraordinary precipitation over the basin March and April 1973. Without the antecedent conditions, a major flood would still have occurred. Henceforth, our attention will be directed

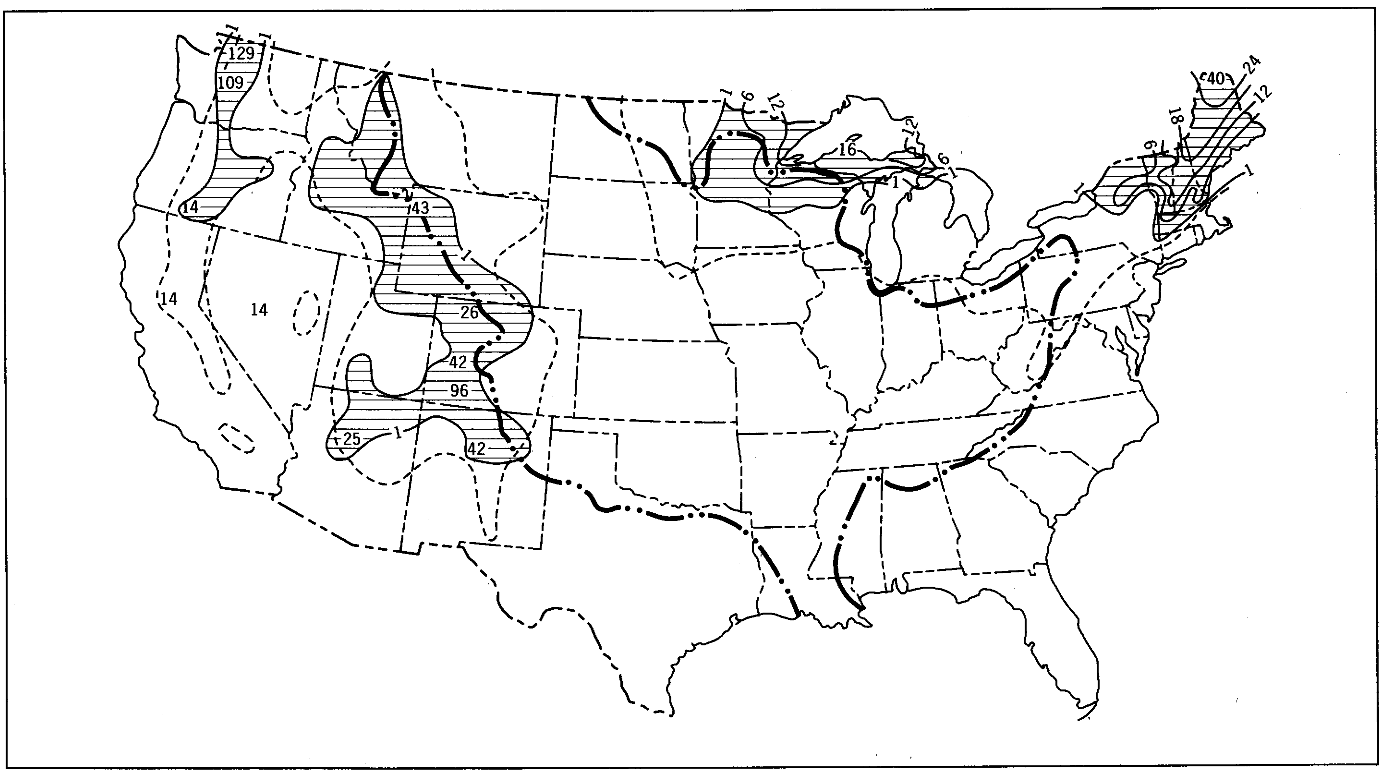


FIGURE 6.—Depth of snow on ground, March 5, 1973.

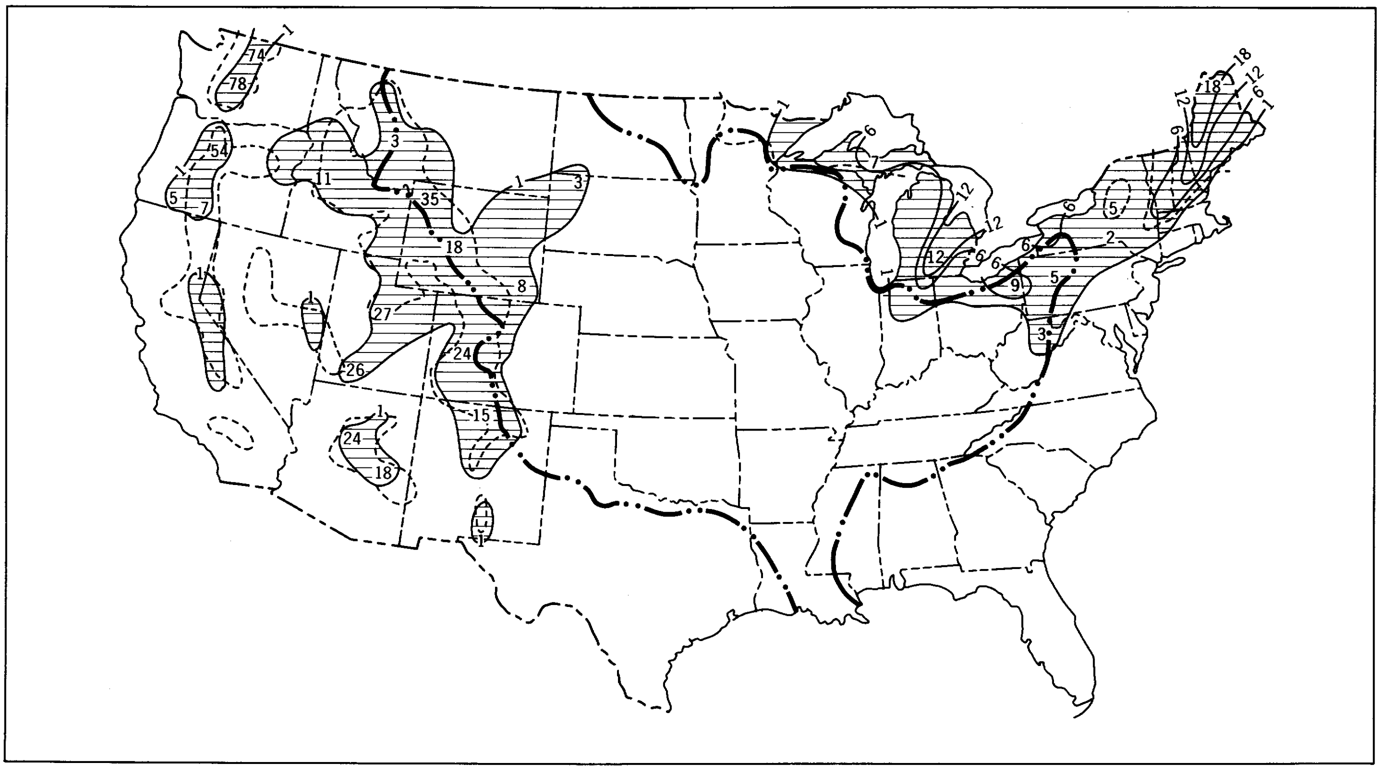


FIGURE 7.—Depth of snow on the ground, March 19, 1973.

to meteorological events after the beginning of March 1973.

For convenience, the flood episode (from a meteorological standpoint) can be considered to have begun in early March, when, on March 8, flooding was first reported along the Mississippi main stem in the Grafton-Alton area in Illinois, and to have ended in late May, when, on May 25, after establishing a new record of 77 days above flood stage at St. Louis, Mo. (exceeding by 19 days the 1844 record), the Mississippi River fell below flood stage. The choice of dates is motivated by the necessity to set a clearly defined time boundary for our study and admittedly is somewhat arbitrary. Flood events over some tributaries need not coincide with this interval. In view of the timelag involved between precipitation or the lack of it and the response of streamflow for a major river system such as the Mississippi, the proper time interval to consider for the meteorological setting should be from March to mid-May, with emphasis on the months of March and April 1973, since these were the wet months.

METEOROLOGICAL EVENTS ASSOCIATED WITH THE FLOOD

To portray the mean flow in the lower troposphere during the flood episode, the mean 700-mb contours, their departure from normal, and the mean 700-mb geostrophic windspeed for March and April 1973 are shown in figures 8 and 9; surface temperature anomalies are also shown in figures 10 and 11. The figures are an integral part of this section and should be examined together with the discussion. Specific reference to a figure will generally be omitted unless deemed necessary.

The mean 700-mb contour pattern for March 1973 (fig. 8*A*) was characterized by a blocking high north of eastern Siberia, another over the British Isles, a broad double trough over southwestern and central United States, and a ridge over the eastern seaboard. This placed the whole Mississippi basin, except the high headwater region of the Missouri River, under a trough-to-ridge mean contour pattern at 700 mb. Synoptic experience has long established that the area east of the upper mean trough is characterized by mean velocity and mass convergence (divergence) below (above) the level of nondivergence. The axis of maximum 700-mb windspeed over North America for March normally extending over the Northern United States was located much farther south along the gulf coast. The attending stronger than normal southerly flow shown in the March contour pattern facilitated the frequent intrusion of warm moist maritime airmass into the basin and caused the surface temperature to rise above normal (fig. 10).

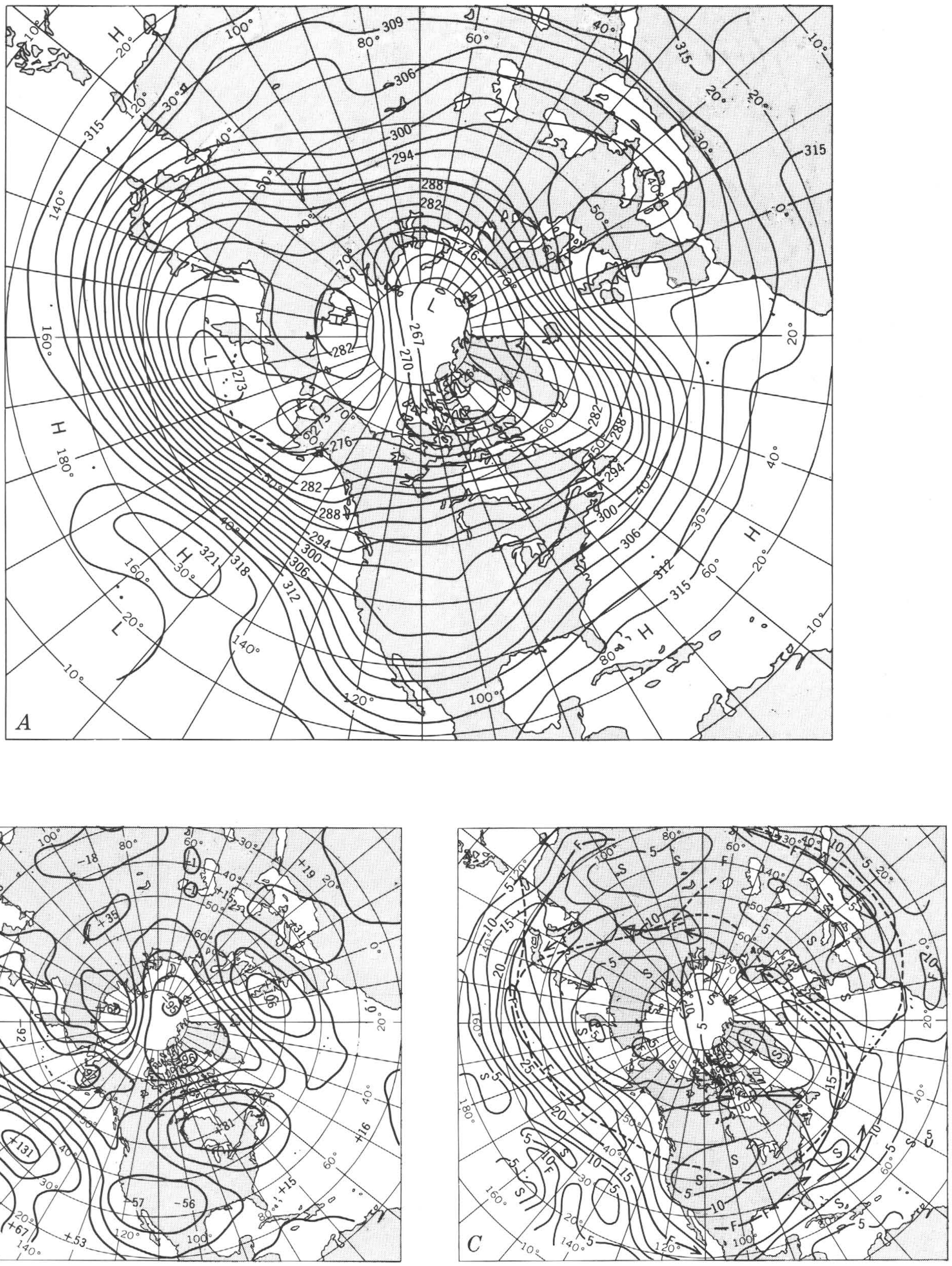


FIGURE 8.—*A*, Mean 700-mb contours in decametres for March 1973. *B*, Departure from normal of mean 700-mb height in metres for March 1973. *C*, Mean 700-mb geostrophic windspeed for March 1973.

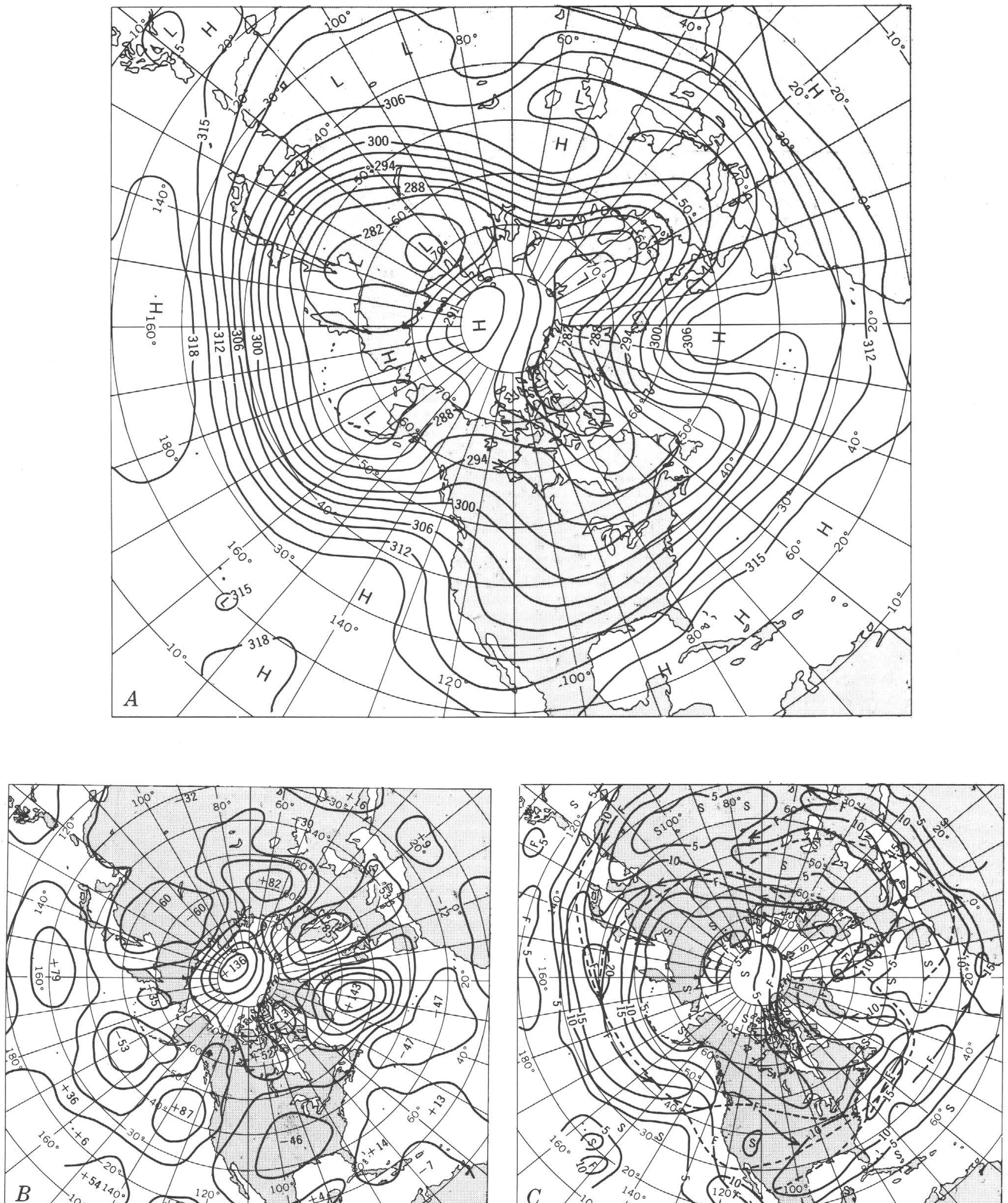


FIGURE 9.—*A*, Mean 700-mb contours in decametres for April 1973. *B*, departure from normal of mean 700-mb height in metres for April 1973. *C*, Mean 700-mb geostrophic windspeed for April 1973.

March 1973 was an extremely wet month (figs. 12 and 13). The entire Mississippi basin, except the mountainous headwater region of the Missouri River, received above normal precipitation. The southern part of the Great Plains, the midsection of the Upper Mississippi River, and the Tennessee-Carolina border region received from two to four times the normal precipitation for March. Southwestern Kansas had at least six times the normal precipitation in March. Dodge City, Kans., received more than seven times its normal rainfall of 1.16 inches (29 mm); while Topeka, in northeastern Kansas also received more than four times its expected rainfall of 2.01 inches (51 mm). Persistent heavy rainfall over the midsection of the country in March and to a lesser extent in April set new monthly records for many stations (table 1).

The mean 700-mb contours for April 1973 show that the blocking High formerly over the British Isles had retrograded to an area south of Greenland (see fig. 9). Over North America, a broad, deep single trough replaced the double trough of March. It was oriented northeast-southwest, extending from the Hudson Bay to south of Baja California. Compared with March, the April 700-mb mean contour west of the deep trough was more meridional; this was associated with the frequent cold air outbreaks

TABLE 1.—*Record and near record monthly precipitation*[1] *in the Mississippi River basin in the spring of 1973*

Station	Monthly amount (in.)	Departure (in.)	Remarks
Peoria, Ill	6.95	+4.10	Wettest March.
Springfield, Ill	7.89	+5.01	Wettest March since 1898.
Sioux City, Iowa	4.02	+2.56	Wettest March.
Dodge City, Kans	8.84	+7.68	Wettest March since 1874.
Topeka, Kans	8.44	+6.43	Wettest March since 1888.
Columbia, Mo	10.09	+7.44	Wettest March since 1890.
Grand Island, Nebr.	5.57	+4.30	Wettest March.
Norfolk, Nebr	5.96	+4.51	Wettest March since 1871.
Tulsa, Okla	11.94	+9.51	Wettest March since 1888.
Sioux Falls, S. Dak.	3.52	+1.98	Wettest March since 1917.
Knoxville, Tenn	10.24	+5.51	Do.
Madison, Wis	5.04	+3.20	Wettest March.
	7.11	+4.54	Second wettest April on record.
Havre, Mont	.03	−.57	Driest March.
Little Rock, Ark	14.20	+9.27	Wettest April on record
Memphis, Tenn	9.44	+4.81	Third wettest April on record.
Milwaukee, Wis	7.31	+4.78	Wettest April on record.
Moline, Ill	11.30	+8.13	Do.

[1] Obtained from Environmental Data Service and Statistical Reporting Service (1973).

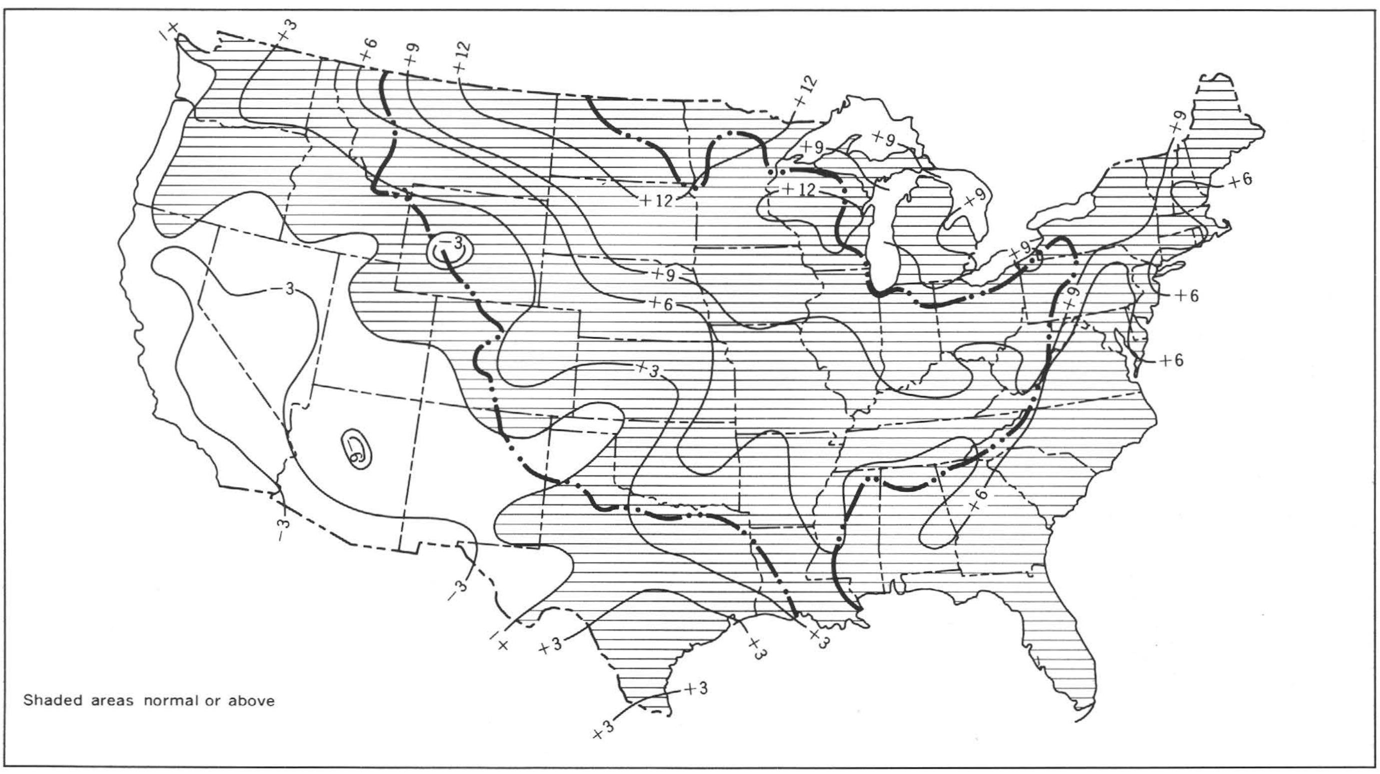


FIGURE 10.—Temperature departure, March 1973, from 30-year mean March temperature.

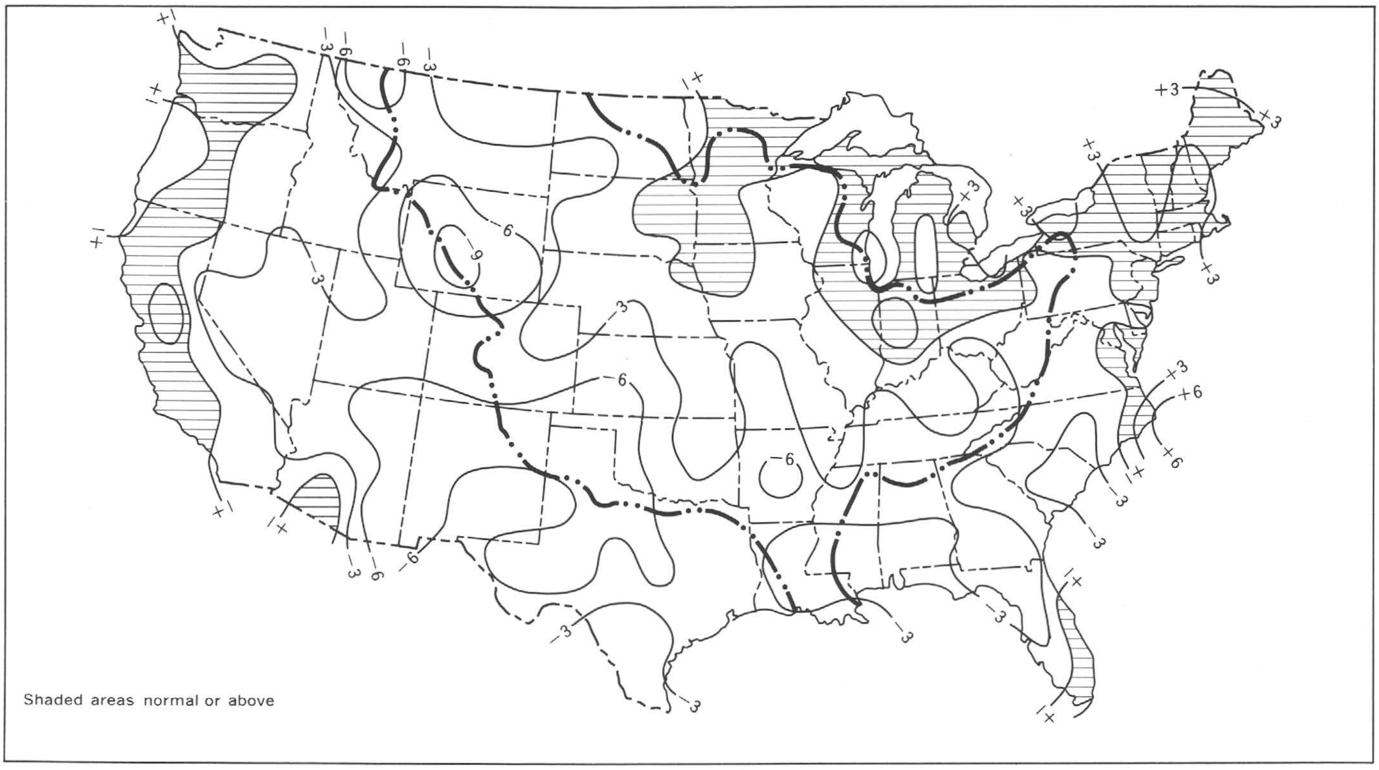


Figure 11.—Temperature departure, April 1973, from 30-year mean April temperature.

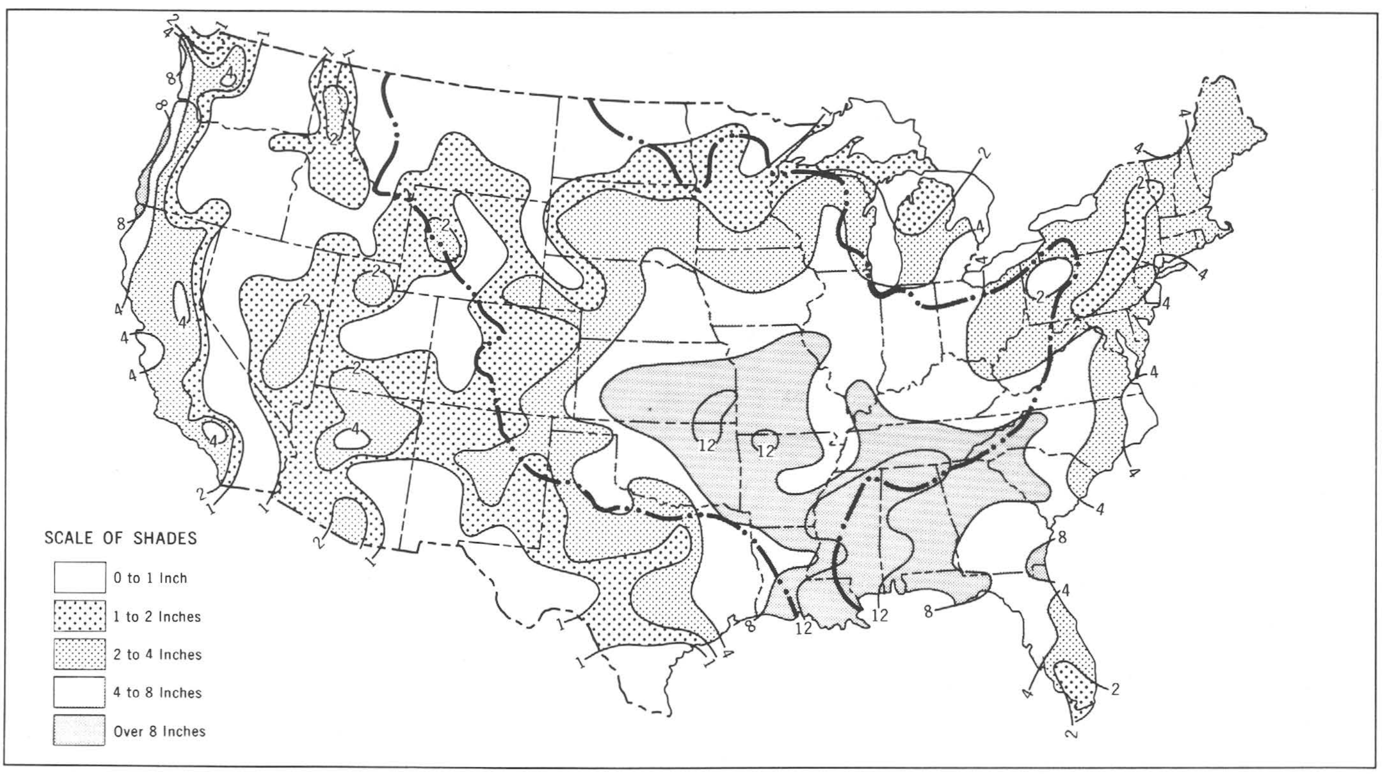


Figure 12.—Total precipitation in March 1973.

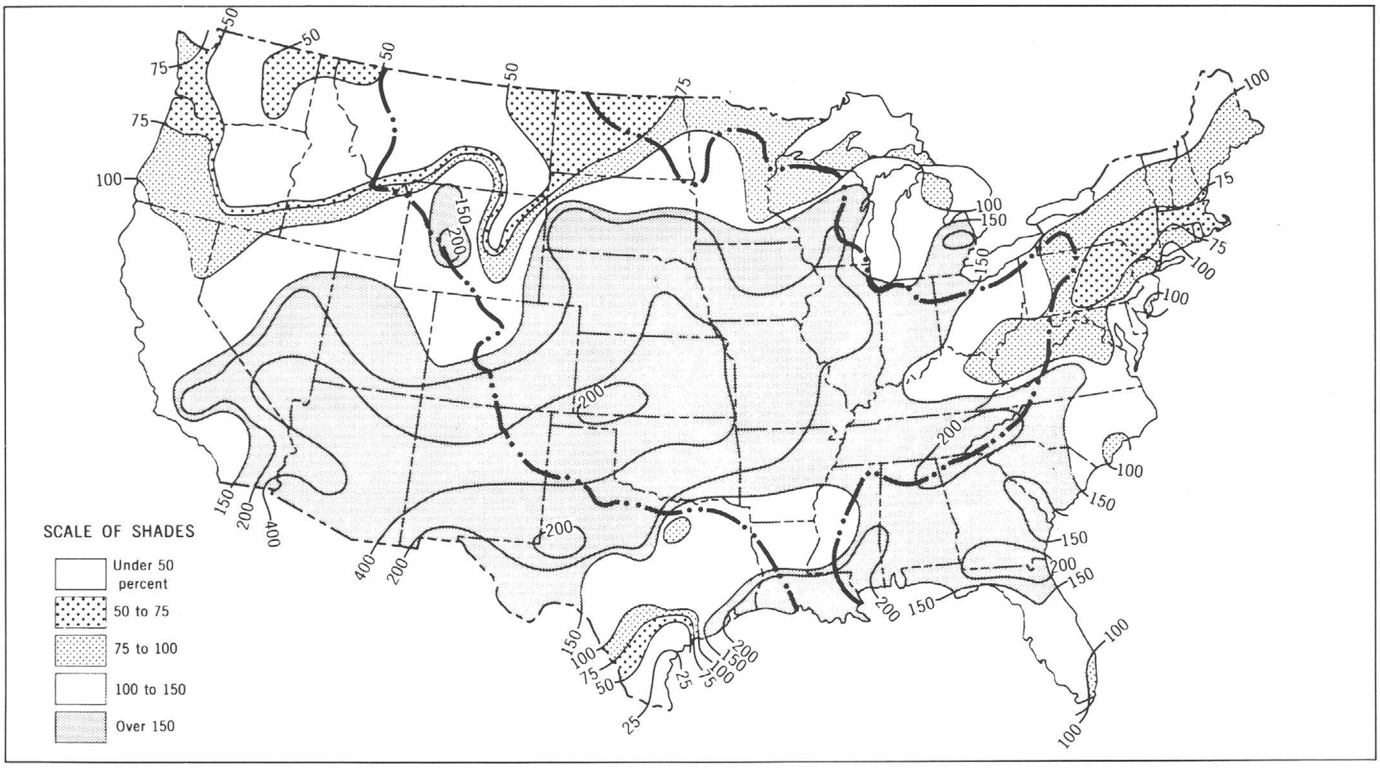


FIGURE 13.—Total precipitation in March 1973 as a percentage of normal March precipitation.

from Canada causing the mean monthly surface temperature to plunge below normal over much of the basin (see fig. 11). However, to the east of the trough the contour pattern became more zonal. The southern axis of maximum 700-mb wind remained in the same position as in March, while the secondary northern axis had moved southward from northern Canada to Central United States.

If March can be described as extremely wet over the whole basin, then April can be described as very wet over part of the basin (figures 14 and 15). Northwest Minnesota, the Dakotas, and Nebraska had well below normal precipitation. But parts of the Middle Mississippi Valley above Canton, Mo., the Lower Mississippi Valley below Memphis, Tenn., and the northern Great Plains had more than twice the normal precipitation. A snowstorm starting on April 19 dumped several feet of snow on Montana and Wyoming. Nearly 20 inches (508 mm) fell in sections of Iowa between April 8 to 10. Northeast Missouri, southeast Iowa, northern Illinois, Arkansas, Mississippi, and Louisiana all had more than 8 inches (203 mm) of rain in April. Much of this fell in the stormy week of April 16–22, setting the stage for the record-breaking flood crest to appear on the Mississippi River main stem.

The average sky cover and the percentage of possible sunshine for March and April 1973 are shown in figures 16–19. It should be noted that these two parameters, though negatively correlated, do not follow a simple complementary relationship. Comparisons with climatological normals for a sample of stations are shown in table 2. It is evident that for the Mississippi basin as a whole the average sky cover was larger and the mean percentage of possible sunshine was smaller than normal in the spring of 1973. For example, Des Moines, Iowa, had an average sky cover of 7.9 (6.7) in March (April) 1973, compared to a normal of 6.6 (6.2). Des Moines also had about half the normal percentage of possible sunshine in March 1973. This made that month the second least sunny month of record in 75 years. Topeka, Kans., had less than half its normal hours of sunshine in March. The possible effect of these on the amount of water loss will be discussed in a later section.

A climatological index that gives a measure of the degree to which the weather has been abnormally dry or wet is the Palmer Index, based on the water balance concept (Palmer, 1965). Basically, climatological analysis of the long record for a station is made to determine the roles of evapotranspiration, moisture gain, moisture loss, and runoff. Then, a precipi-

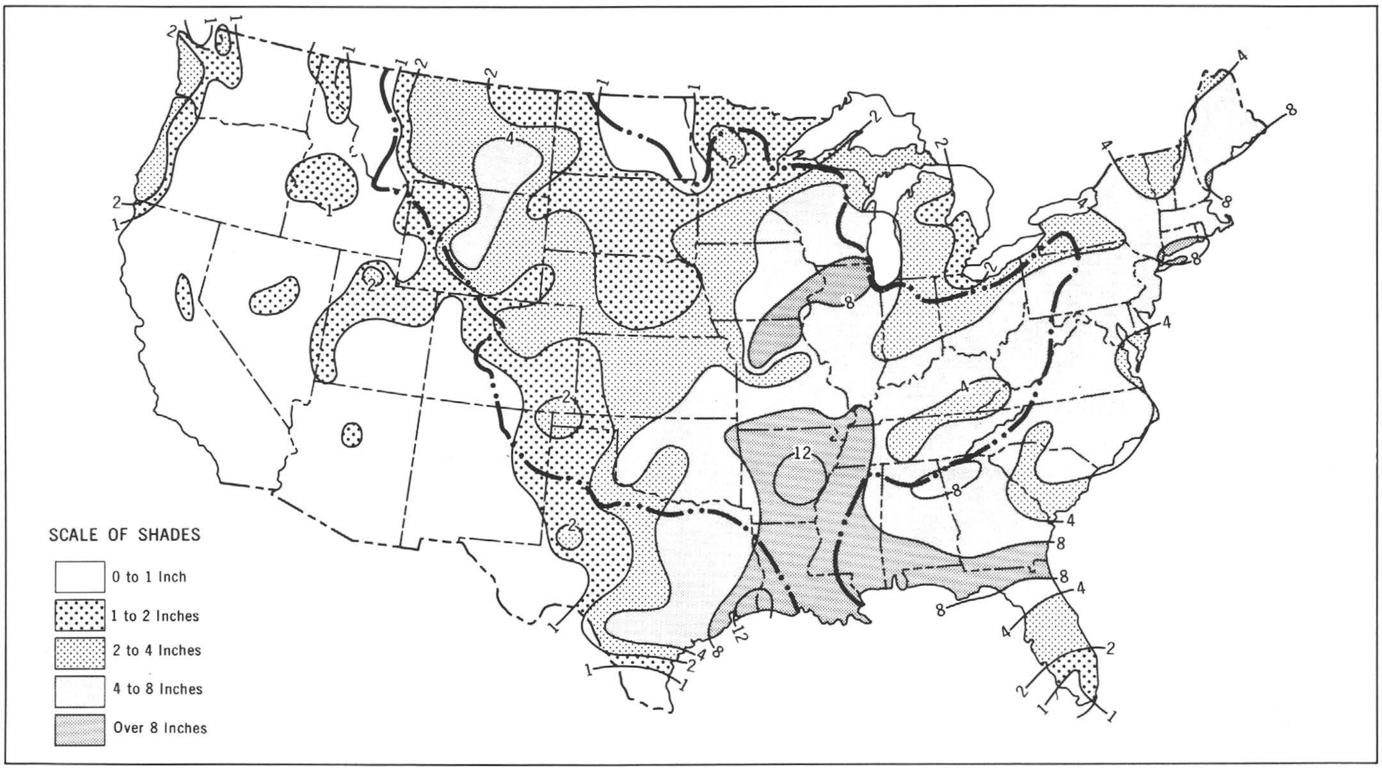


FIGURE 14.—Total precipitation in April 1973.

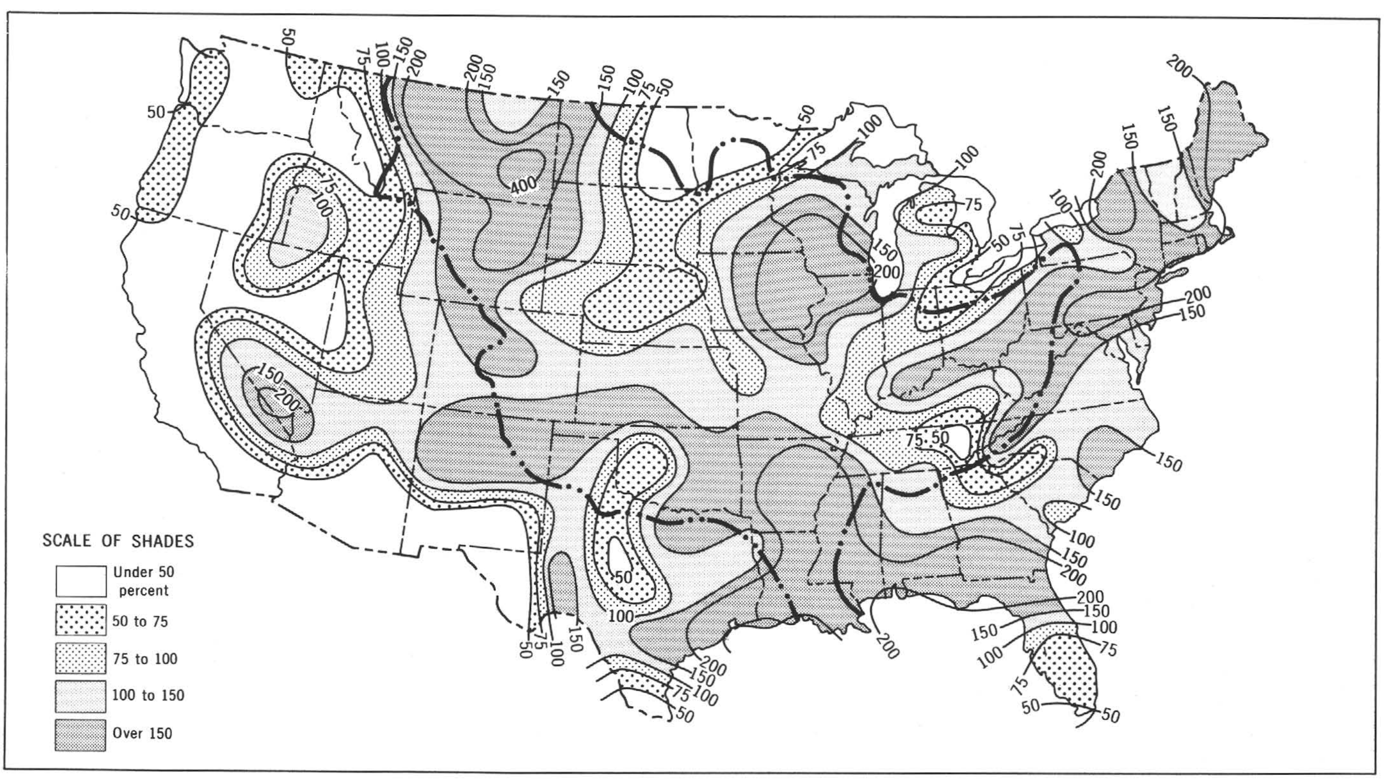


FIGURE 15.—Total precipitation in April 1973 as a percentage of normal April precipitation.

tation amount is computed that balances the net requirement. The actual precipitation minus this computed precipitation is then converted to the current Palmer Index through weighting with antecedent moisture conditions. Maps of this index over the United States at the end of March and April 1973 are shown in figures 20 and 21 (Environmental Data Service and Statistical Reporting Service, 1973). At the end of March, large areas in the Great Plains and along the Mississippi main stem had Palmer Index greater than four, which indicates that actual rainfall far exceeded balance requirements and abnormally wet conditions existed. Twenty days later, this area was further expanded. However, there was a high degree of similarity in the index patterns between these two times. Due to the considerable weight given to antecedent moisture conditions, the Palmer Index is a relatively conservative quantity. Its variation is slow and devoid of the high frequency fluctuations of the isohyetal patterns.

HIGHLIGHTS FOR SELECTED WEEKS

In this section, the general weather situations for several selected weeks in which significant precipitation events occurred are presented. Examination of some of these events themselves are done in later sections.

MARCH 5–11

Much of the basin during this week was under a trough-to-downstream ridge pattern at 500 mb. A succession of Lows incipient in Southwestern United States moved across the Midwest to the Great Lakes region and became occluded. At 7:00 a.m. e.s.t., March 7, a storm was centered over Wisconsin. A cold front extended from the storm center, through the Ohio Valley and Tennessee Valley, to New Orleans and brought widespread rain to the eastern half of the United States, with local thunderstorms and showers occurring ahead of the front. On March 9, a frontal wave appeared over the Lower Mississippi Valley; by 7:00 a.m. e.s.t., March 10, the Low was centered over Oklahoma-northeastern Texas. The associated warm front extended from the Low in the northeast direction up to Lake Ontario. This system brought much rain to the southern Great Plains and the Ohio and Tennessee Valleys. On March 11, the occluded storm center was at the northwest corner of Missouri, with the cold front approximately parallel to the Mississippi stem. Rainfall was heavy over a wide area west of the stem and over the Ohio Basin and the State of Mississippi. Marble Hill, in southeast Missouri, had 4.75 in. (121 mm) on March 11. For the whole week, precipitation exceeding 2 in. (51 mm) covered areas along almost the entire stretch of the Mississippi main stem, the Lower Ohio and Lower Tennessee Valleys, and over large parts of the Arkansas River Valley. There was little time delay for runoff to reach the river system. Some low-lying areas along the Mississippi River main stem, like Grafton and Alton, Ill., first reported flood flow on March 8, signifying the beginning of the long Mississippi flood of spring 1973.

MARCH 12–18

A 500-mb ridge was over the midsection of the country at the beginning of the week. By 7:00 a.m.

TABLE 2.—*Average sky cover and percentage of possible sunshine for selected stations in the Mississippi basin, March and April 1973, versus climatological normals* [1]

Station	Average sky cover				Percentage of possible sunshine			
	March		April		March		April	
	73	Normal	73	Normal	73	Normal	73	Normal
Little Rock, Ark	7.0	6.5	6.9	6.2	66	56	69	60
Moline, Ill	7.7	6.5	7.2	6.1	40	55	49	57
Indianapolis, Ind	7.9	6.7	8.3	7.0	39	51	28	56
Des Moines, Iowa	7.9	6.6	6.7	6.2	28	55	55	58
Topeka, Kans	8.3	6.1	5.5	6.1	28	59	54	60
Louisville, Ky	7.7	6.5	8.1	6.1	45	51	33	55
Shreveport, La	7.2	6.2	6.8	6.1	41	56	42	59
Minneapolis, Minn	7.9	7.0	6.7	6.5	43	53	53	58
St. Louis, Mo	7.7	6.5	7.6	6.0	41	55	37	60
Billings, Mont	6.7	7.1	8.0	6.8	78	50	40	60
Omaha, Nebr	8.4	6.4	5.8	6.2	30	58	57	60
Bismarck, N. Dak	7.1	6.8	7.3	6.4	61	58	63	61
Columbus, Ohio	8.1	6.7	8.2	6.3	33	49	30	52
Tulsa, Okla	7.4	5.8	6.3	6.1	45	58	58	62
Pittsburgh, Pa	8.1	7.1	8.0	7.0	42	48	32	49
Huron, S. Dak	7.9	7.1	6.6	6.2	39	56	59	62
Chattanooga, Tenn	8.2	6.0	6.9	5.5	35	53	44	60
Madison, Wis	7.9	6.5	7.4	6.2	39	52	41	56

[1] Normals were interpolated from Environmental Data Service (1968).

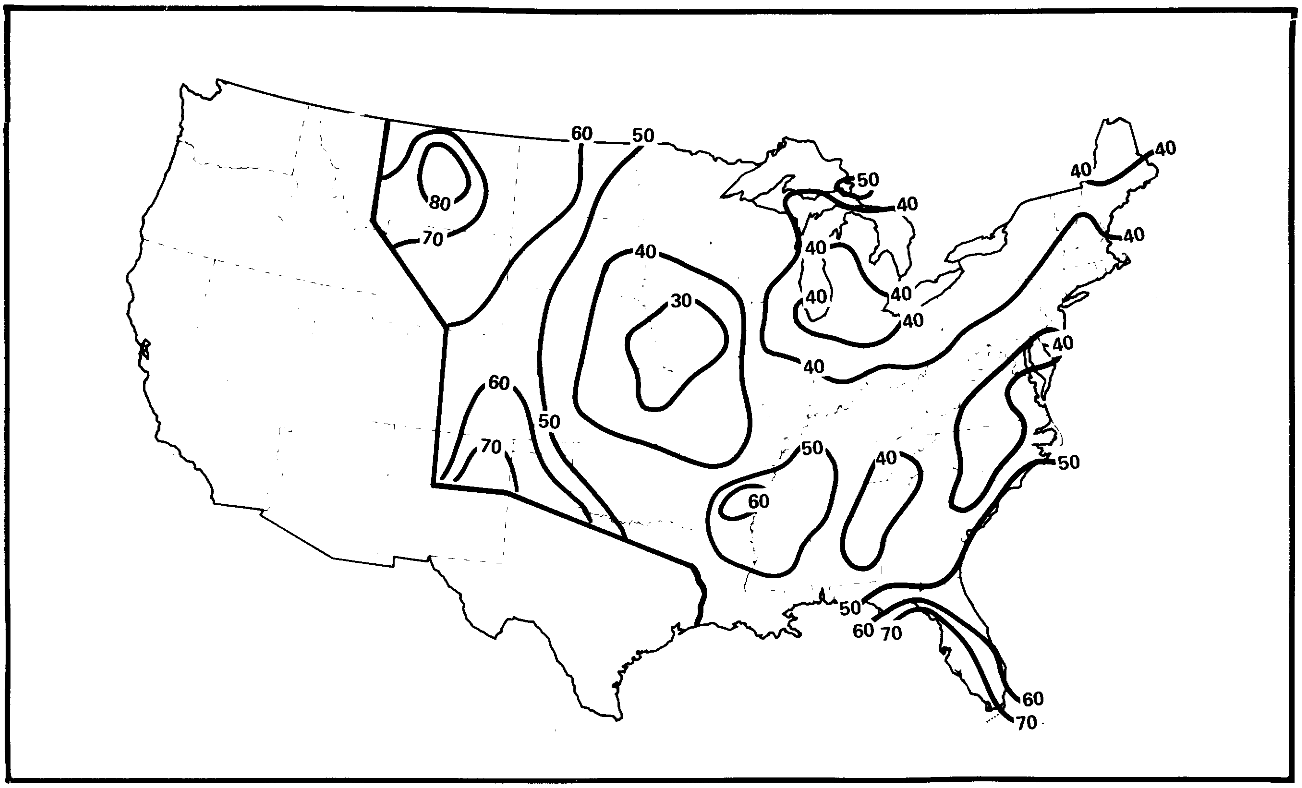


FIGURE 16.—Mean percentage of possible sunshine, March 1973.

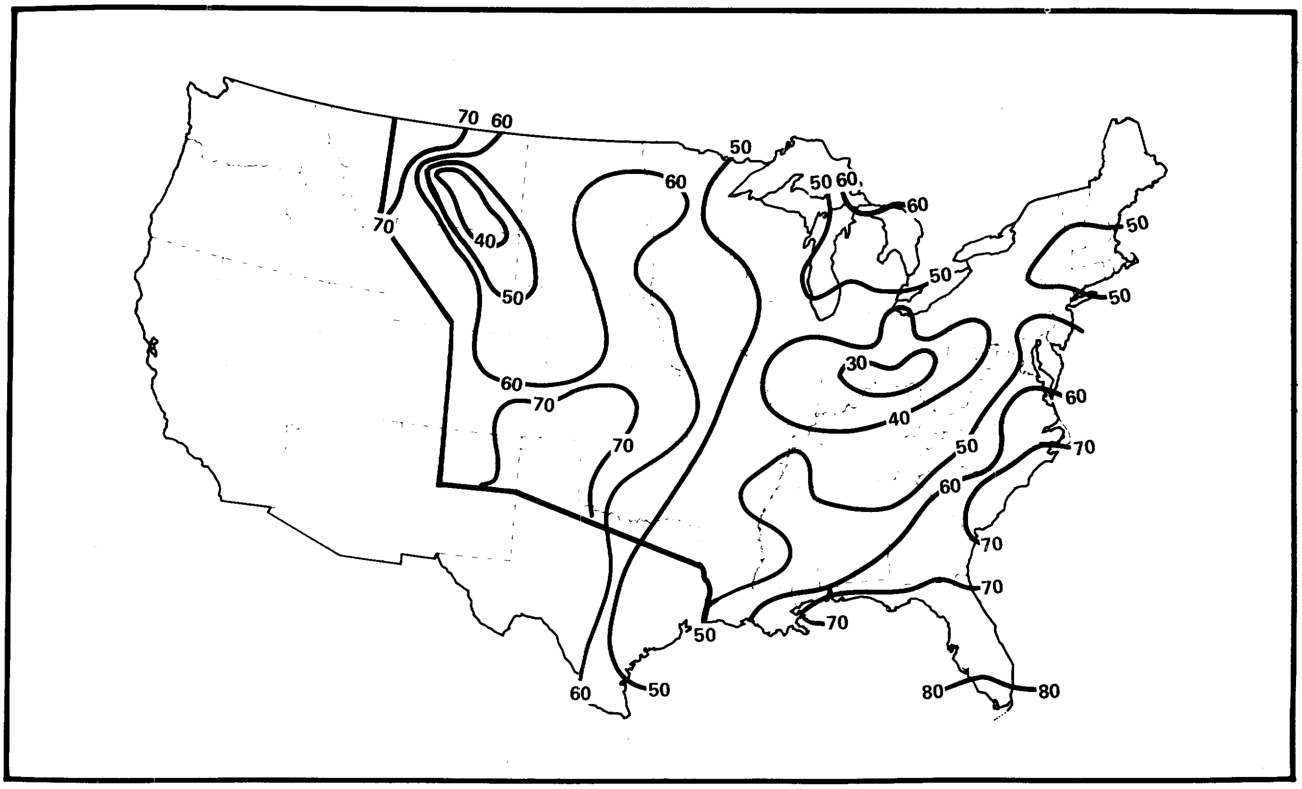


FIGURE 17.—Mean percentage of possible sunshine, April 1973.

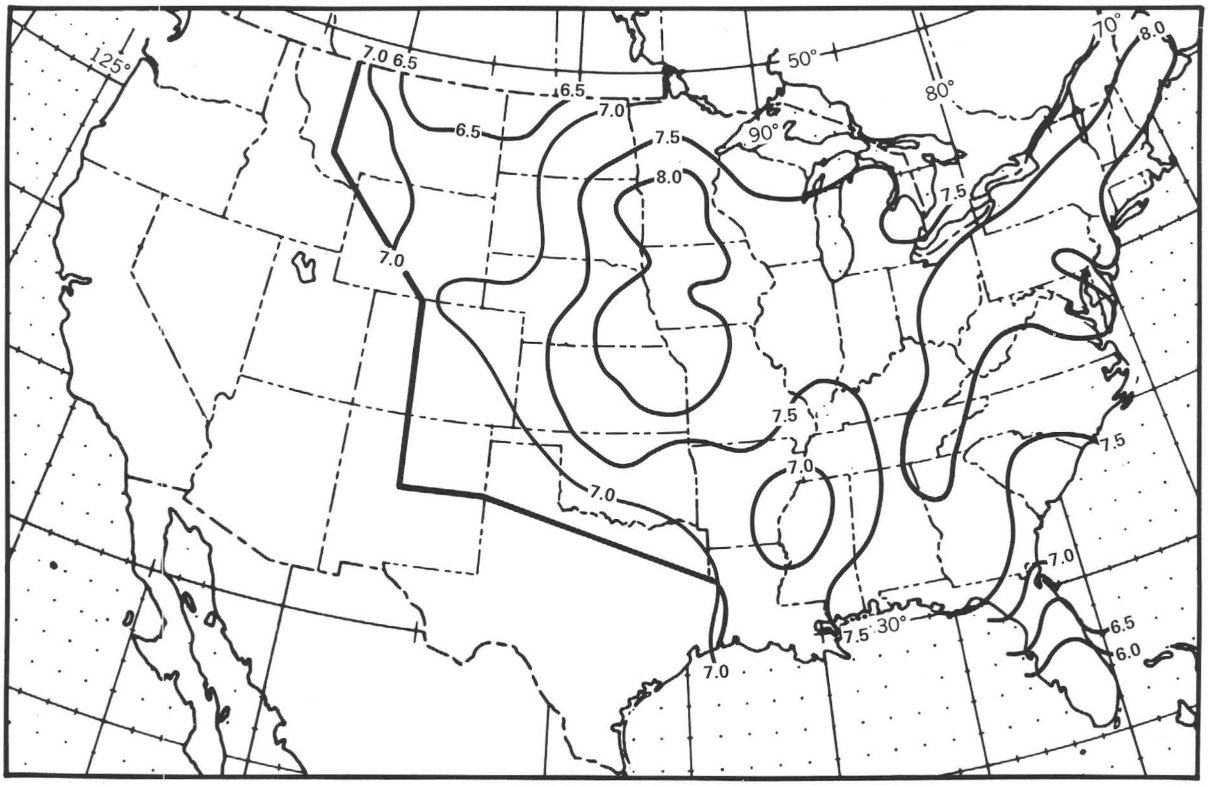


FIGURE 18.—Mean sky cover, sunrise to sunset, March 1973.

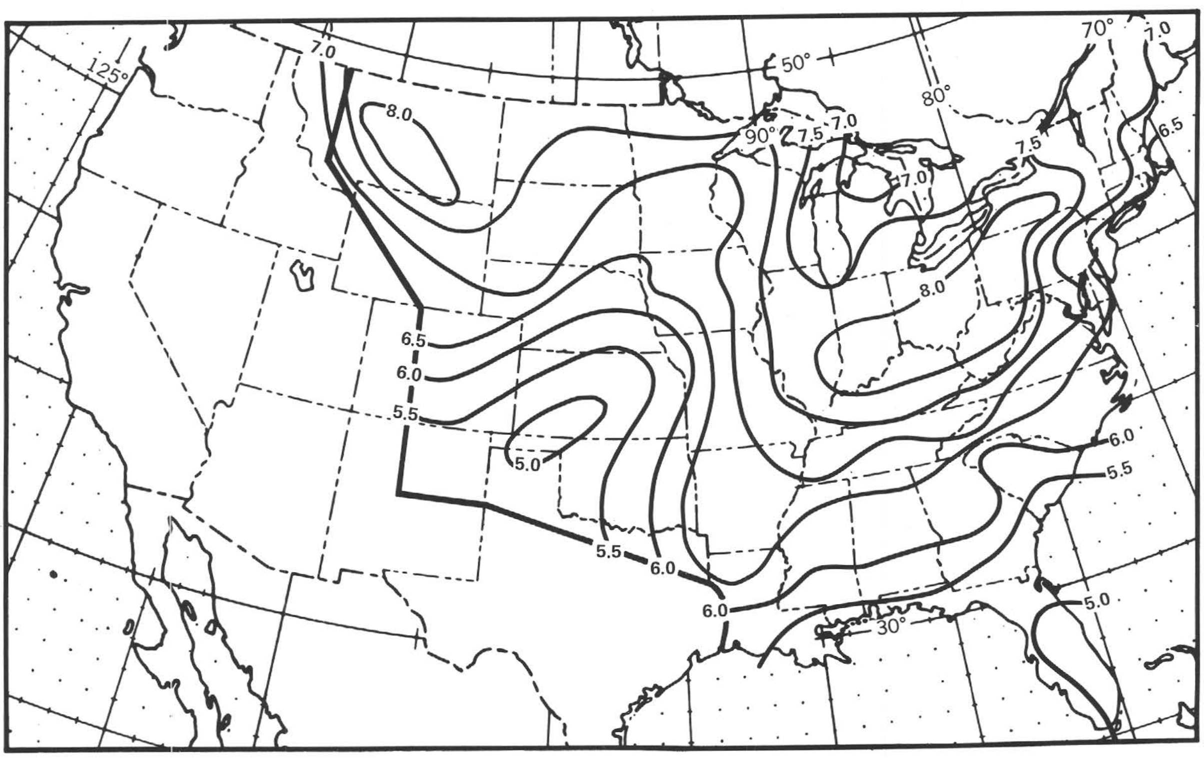


FIGURE 19.—Mean sky cover, sunrise to sunset, April 1973.

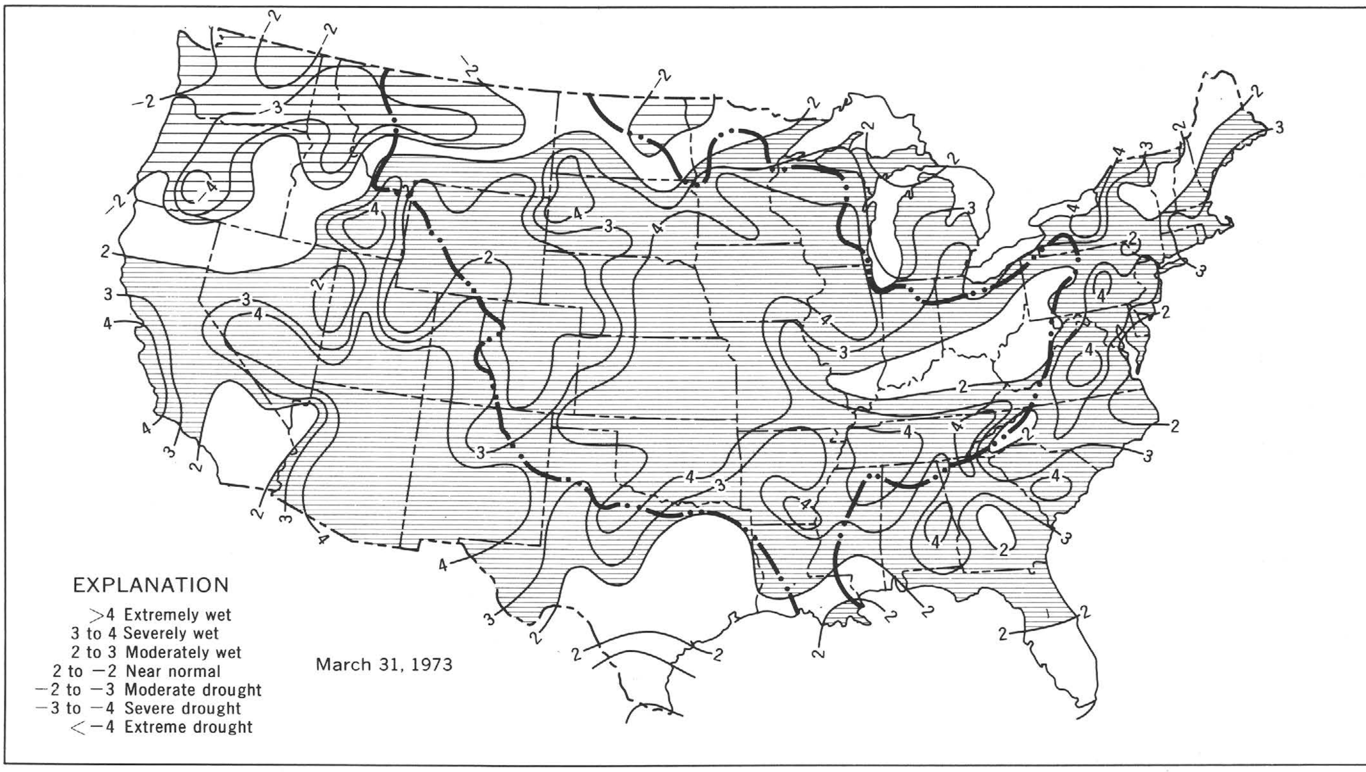


FIGURE 20.—Palmer Index on March 31, 1973.

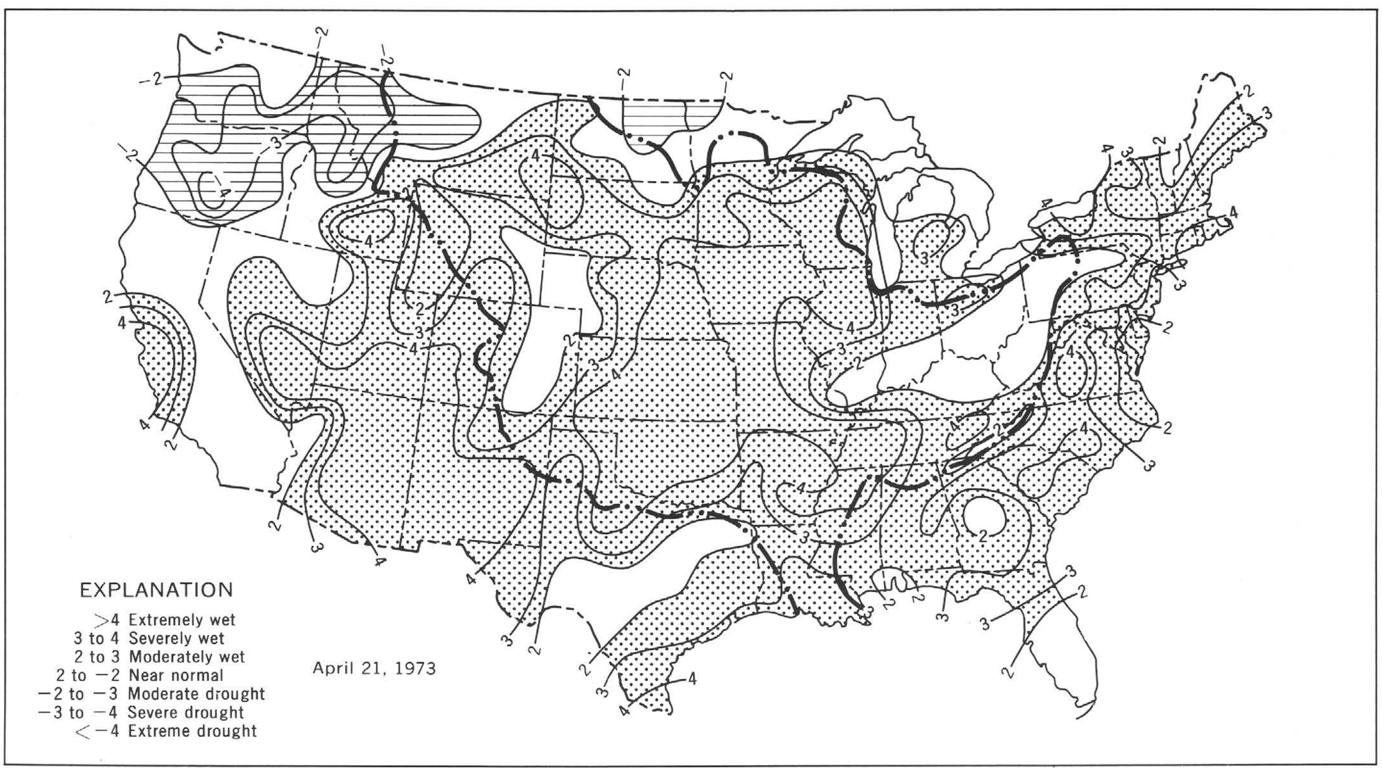


FIGURE 21.—Palmer Index on April 21, 1973.

e.s.t., March 14, because of the wave progression, the Southeastern United States was situated under the 500-mb trough to downstream ridge pattern. This condition persisted through the 16th, coinciding approximately in line with the existence of a surface quasi-stationary front oriented from Louisiana through Tennessee and toward the northeast. These synoptic scale features provided a favorable setting for the precipitation events to come.

An incipient Low formed to the lee of the southern Rockies on March 12. By the morning of March 13, the surface Low had a large circulation along the eastern slopes of the Rockies. It deepened rapidly while moving northeastward. Its central pressure was less than 976 mb when located over Nebraska at 7:00 a.m. e.s.t., March 14. This storm dominated the circulation pattern over the Plains. Violent thunderstorms were triggered with the inflow of warm moist tropical air across the Mississippi Valley. Twenty-one tornadoes were sighted from Texas to Illinois on March 13–14. A blizzard raged across Wyoming and the Dakotas. Cheyenne, Wyo., had 13 in. (330 mm) of snow driven by wind gusts up to 60 mph (96.54 km/hr). It dumped 4 ft (1,219 mm) of snow over the Black Hills and 14 inches (356 mm) on Rapid City, S. Dak. Rain fell over the Plains and the Upper Mississippi Valley. This storm moved to the Great Lakes region and became occluded on March 15.

But, during the evening of March 15, a second Low developed over Louisiana from a wave along the front extending from the occlusion over the Great Lakes, through the Southeastern States, to the Lower Mississippi Valley. This wave developed into a cyclone and moved northeast towards central Tennessee. By the morning of March 16, this Low was over central Kentucky, and another Low developed along the front in Mississippi. The associated frontal system remained quasi-stationary across the Southeastern States. Persistent southwesterly inflow brought warm moist maritime air into the Tennessee and Ohio River basin. Rain was widespread over the whole Eastern United States on March 15 and 16, with heavy rains throughout central Louisiana, northern Mississippi and Alabama, Tennessee, southern Kentucky, and up to the western regions of the Carolinas. Hamilton 3S, Ala., had 9.06 inches (230 mm); Fulton 3W, Miss., had 9.15 inches (232 mm); and Coldwater, Tenn., had 6.70 inches (170 mm) on March 16 alone. By the end of this week, major flooding through the Tennessee River and other rivers in the Southeastern States was in progress.

On March 16, the two Lows combined and continued to intensify while moving to the northeast. By 7:00 a.m. e.s.t., March 17, it was located over Lake Erie with a central pressure of 981.3 mb and was occluded. The associated cold front had progressed to the Atlantic coast, bringing moderate rain to the Coastal States. By the morning of March 18, the Low had moved to the New England-Quebec border, and its circulation pattern indicated a much reduced low-level moisture inflow.

APRIL 16–22

The average 500-mb circulation was characterized by a deep trough over the west fringe of the basin and a strong ridge over the Eastern United States. The persistent Bermuda High was present at the surface over the western Atlantic, reaching the eastern seaboard. This led to a strong southerly wind over the Central Mississippi Valley, which brought in large quantities of moisture-laden tropical air from the Gulf. The intruding warm air and the cold polar air coming down from western Canada met over the Central States. The frontal zone formed by April 19 had a nearly meridional orientation, and its eastward progression was very slow bringing continuous heavy rain to the midsection of the country. Thunderstorms and tornadoes were also frequent over the Midwest in the latter part of the week.

A more detailed account of the storm of April 19–22 is presented in a separate section.

PRECIPITATION EVENTS IN THE MISSISSIPPI BASIN DURING THE SPRING OF 1973

A recurrent feature of the precipitation events during March and April 1973 is the repeated accumulation of precipitation over large areas in the basin, as can be inferred from daily isohyetal maps (pls. 1–3). Weekly precipitation totals and cumulative departures from the normals covering a period from the end of February to late May for 44 stations are shown in table 3. This sample includes a few stations that, strictly speaking, are located outside the Mississippi drainage basin. For example, Meridian, Miss., and Jackson, Miss., are located in the gulf coast drainage of the Pascagoula River and the Pearl River, respectively. But both stations are close to the Mississippi basin proper and are first-order NWS observing stations and, therefore, are included in the table. Total monthly precipitation for March and April 1973 are shown in figures 12–15, respectively. The cumulative percentage departures of precipitation amounts from the normals for January to May 1973 for a sample of stations along the Mississippi River and its major tributaries are shown in figures 22 and 23. These departures up to February were generally small. However, almost all stations in major tributary drainages started to show positive precipitation departure trends in March.

Several major precipitation occurrences in this generally wet interval can be distinguished from table 3. For example, the heavy precipitation in the week ending on March 11 over the Midwest and the Corn Belt signifies the initiation of the flood episode.

A wave cyclone with a quasi-stationary front over Southeastern United States brought intense rainfall over a belt stretching from northern Louisiana, through parts of Missisippi, Alabama, Tennessee, and Kentucky, and up to parts of the Carolinas and Virginia on March 14–17. This storm was responsible for the widespread flooding in the Tennessee Valley and other southeast basins. The heavy rain over the eastern Great Plains and the Gulf States in the week ending March 25 aggravated the flooding of the Lower Missouri and Lower Mississippi Valleys. The very heavy rainfall in the week ending April 22 of 4 in. (102 mm) or more over areas draining into almost the whole Mississippi River main stem up to the Wisconsin border aggravated the major flooding already in progress and was partly responsible for the record-breaking crest passing St. Louis on April 28. The associated weather situations of some of these precipitation events have been presented in a previous section.

Many stations in the basin experienced record or near-record monthly precipitation in March or April 1973, as shown in table 1. Some notable precipitation events for selected stations in the basin during the flood episode and their comparisons with climatology are shown in table 4. Precipitation amounts used in the comparison were interpolated from Weather Bureau Technical Paper No. 40 (Hershfield, 1961) and No. 49 (Miller, 1964). Number of days in month with 0.01 in. (0.25 mm) or more rain was obtained from the Climatic Atlas of the United States (Environmental Data Service, 1968) and Weather Bureau Technical Paper No. 57 (Miller and Frederick, 1966), respectively.

A comparison between tables 1 and 4 will illustrate the characteristics of a majority of precipitation events associated with the flood episode. For example, Springfield, Ill., had the wettest March since 1898, but as would be expected its greatest 1-hour (24-hour) rainfall in March 1973 was considerably smaller than the 1-year 1-hour (24-hour) rainfall of 1.3 (2.7) in. (33 mm, 69 mm). Topeka, Kans., had the wettest March since 1888, but the observed heaviest 24-hour rainfall was only 1.32 in. (34 mm) compared with the 1-year return period value of 2.8 in. (71 mm). Both stations had 18 days with rain in March, which is an unusually high number. Tulsa, Okla., also had the wettest March back to 1888, with an observed rainfall of 11.94 in. (303 mm), yet the greatest observed 24-hour rainfall in that month was 2.07 in. (53 mm), considerably smaller than the 1-year recurrence rainfall of 3.4 in. (86 mm). However, the number of 19 rainy days is remarkably large when compared with a climatic normal of 8 days. Dodge City, Kans., experienced the wettest March back to 1874, with total monthly rainfall of 8.84 in. (225 mm) and a positive departure of 7.68 in. (195 mm). The maximum 24-hour rainfall in March 1973 was 2.54 in. (65 mm), approximately equal to the 2-year rainfall. When one considers that the probability is 0.75 that at least once in the next 2 years a 24-hour rainfall of similar or greater amount could occur, this amount is hardly very unusual. What is again notable is that there were 17 rainy days in the month compared with a climatological normal of less than 7 days. These examples serve to illustrate the phenomenon that, for many stations located in the Great Plains and in the Middle Mississippi basin, the record monthly rainfalls during the flood episode were not necessarily accompanied by record-breaking individual precipitation events. Instead, they manifested the cumulative effects of a succession of cyclone and front passages, each of which might have brought along moderate to heavy precipitation.

However, several notably heavy precipitation events are worth mentioning. Winona 5E, Miss., recorded a 24-hour rainfall of 9.07 in. (230 mm) ending 6:00 a.m. c.s.t., March 16. This was an event with a return period exceeding 100 years. Victory, Tenn., had 10.4 in. (264 mm) in 48 hours, and Belvidre, Tenn., had 7.36 in. (187 mm) in 24 hours on March 15–16. These also exceeded the respective 100-year recurrence amounts. Many other significant precipitation events occurring in the Southeastern United States outside of the Mississippi basin in mid-March 1973 were documented in a separate report in this same series.

Radio Station KWIX, Moberly, Mo., recorded a 6-hour rainfall of 7.1 in. (180 mm) and a 24-hour rainfall of 9.5 in. (241 mm) ending early morning on April 21, 1973. These amounts exceeded the respec-

TABLE 3.—*Weekly precipitation totals and cumulative departures from normal, in inches, February 26–May 20, 1973*

Station	For week ending: March 4		March 11		March 18		March 25		April 1		April 8		April 15		April 22		April 29		May 6		May 13		May 20	
	Total	Cumulative departure	Total	Cumulative departure	Total	Cumulative departure	Total	Cumulative departure	Total	Cumulative departure	Total	Cumulative departure	Total	Cumulative departure	Total	Cumulative departure	Total	Cumulative departure	Total	Cumulative departure	Total	Cumulative departure	Total	Cumulative departure
Fort Smith, Ark	2.1	1.2	2.4	2.8	0.8	2.8	2.8	4.8	0.3	4.3	1.7	5.2	1.9	6.2	2.7	7.9	0.6	7.4	1.8	8.1	0.2	7.1	T	5.9
Little Rock, Ark	1.6	.5	2.7	2.2	1.8	3.0	1.8	3.7	.6	3.2	1.1	3.1	1.2	3.1	7.3	9.2	4.7	12.8	2.0	13.6	.4	12.7	0.3	11.8
Cairo, Ill	.5	—.1	2.6	1.6	1.1	1.6	1.1	1.5	1.1	1.4	1.0	1.3	.3	.6	4.7	4.3	.9	4.3	2.7	6.1	2.1	7.3	.1	6.4
Moline, Ill	.7	.3	2.3	2.2	.7	2.4	.8	2.6	2.3	4.3	.7	4.3	2.2	5.8	7.4	12.5	.1	11.9	3.1	14.2	1.1	14.4	T	13.5
Peoria, Ill	.3	—.1	2.3	1.7	1.4	2.5	.9	2.7	2.4	4.4	.2	3.8	1.0	3.9	2.3	5.3	.3	4.6	.8	4.4	1.5	5.0	T	4.0
Evansville, Ind	.6	—.1	2.2	1.3	1.8	2.2	1.2	2.3	1.2	2.4	.9	2.3	.1	1.4	4.0	4.5	.4	4.0	1.2	4.3	1.9	5.3	T	4.4
Indianapolis, Ind	.2	—.4	1.2	.2	1.0	.5	1.1	.8	1.3	1.2	.4	.7	.4	.3	1.7	1.1	.2	.4	.2	—.3	.8	—.4	T	—1.3
Burlington, Iowa	.3	0	2.2	1.7	.5	1.6	1.0	1.9	2.0	3.2	.7	3.1	1.4	3.7	4.2	7.1	.2	6.5	2.0	7.6	.8	7.5	0	6.6
Des Moines, Iowa	.1	—.2	1.0	.4	.7	.7	1.0	1.2	1.6	2.3	1.3	1.7	1.9	3.0	.8	3.2	T	2.6	2.4	4.4	1.1	4.7	0	3.8
Sioux City, Iowa	.3	0	.5	.2	1.3	1.2	1.7	2.6	.4	2.6	.1	2.3	.2	2.0	.1	1.6	.5	1.5	.9	1.8	.3	1.4	T	.7
Dodge City, Kans	.3	.1	2.9	2.8	.4	2.9	2.6	5.2	2.7	7.6	.2	7.5	.4	7.5	.9	8.0	1.6	9.1	.1	8.6	.3	8.2	0	7.5
Goodland, Kans	.4	.2	.1	.1	.3	.2	.8	.7	1.3	1.7	.4	1.8	T	1.4	.2	1.2	1.1	1.9	1.6	3.0	.2	2.7	T	2.2
Topeka, Kans	1.6	1.3	2.4	3.3	.7	3.6	2.7	5.8	1.7	7.0	.2	6.6	2.2	8.1	.5	7.8	T	6.8	2.8	8.7	1.4	9.1	0	8.1
Wichita, Kans	2.2	1.9	3.5	5.1	.2	5.0	2.0	6.6	1.6	7.7	.4	7.6	.6	7.6	1.1	8.1	.5	8.0	1.6	8.9	.1	8.1	T	7.2
Lexington, Ky	1.1	.2	.5	—.3	1.8	.4	1.2	.5	.6	0	1.9	.8	.2	0	.9	—.1	2.6	1.6	.8	1.6	1.6	2.4	.8	2.3
Louisville, Ky	.9	0	1.1	.1	2.1	1.1	1.5	1.5	.8	1.3	1.8	2.1	.2	1.4	1.4	1.9	2.1	3.1	.4	2.6	1.8	3.5	.1	2.7
New Orleans, La	2.0	1.0	3.1	3.1	.5	2.3	5.5	6.5	1.1	6.3	3.2	8.4	T	7.3	7.0	13.2	.3	12.4	.2	11.6	2.0	12.6	.4	12.0
Shreveport, La	.9	—.1	.9	0	1.1	.2	2.3	1.5	T	.5	1.5	.9	1.5	1.3	.5	.7	3.9	3.5	.2	2.7	1.1	2.7	0	1.6
Minneapolis, Minn	T	—.3	.5	—.1	.4	0	.2	—.2	.2	—.4	.2	—.6	.8	—.2	.4	—.2	—.2	—.5	1.7	.7	.3	.4	T	—.3
Jackson, Miss	1.1	—.2	1.1	—.3	.6	—1.0	2.7	.4	.6	—.2	1.7	.3	.2	—.6	5.8	4.1	1.7	4.8	1.2	5.0	2.0	6.0	.1	5.2
Meridian, Miss	1.4	0	2.8	1.4	2.7	2.6	3.0	4.2	4.4	7.2	2.3	8.1	.1	6.9	3.6	9.2	3.0	11.0	.7	10.6	3.0	12.7	.1	11.9
Columbia, Mo	1.2	.7	3.6	3.9	1.1	4.5	2.2	6.0	2.0	7.3	.7	7.3	1.8	8.4	1.1	8,7	T	7.9	1.4	8.4	.6	8.0	T	7.0
Kansas City, Mo	1.3	1.0	1.5	2.1	1.3	2.9	3.1	5.4	1.9	6.6	.2	6.0	1.6	6.8	.5	6.5	T	5.6	3.4	8.1	1.1	8.3	T	7.3
St. Louis, Mo	.9	.3	2.4	2.2	.7	2.3	.7	2.2	.9	2.3	1.7	2.1	1.3	2.5	2.3	3.9	T	3.0	.4	2.5	2.6	4.3	T	3.5
Billings, Mont	0	—0.2	0.1	—0.3	0.3	—0.2	1.0	0.5	0.2	0.4	0.4	0.5	0.2	0.4	1.2	1.3	0.5	1.5	0.8	2.0	T	1.6	0.1	1.3
Miles City, Mont	0	—.1	T	—.2	T	—.3	.1	—.3	T	—.5	T	—.7	T	—.9	3.7	2.5	.5	2.7	.4	2.8	.1	2.6	T	2.2
Grand Island, Nebr	.4	.2	1.3	1.3	.4	1.4	2.0	3.1	1.4	4.1	.2	3.9	.3	3.7	.7	3.5	.4	3.3	.6	3.2	.2	2.6	0	1.7
Lincoln, Nebr	.6	.3	1.2	1.1	.6	1.3	.2	1.1	2.0	2.7	.3	2.5	1.0	3.0	.9	3.3	.2	2.9	1.1	3.3	1.4	4.0	.1	3.3
Norfolk, Nebr	.2	0	1.1	.8	.8	1.3	2.0	2.9	1.2	3.7	.1	3.3	.2	3.0	.4	2.9	.7	3.1	.4	2.9	.2	2.4	T	1.6
N. Platte, Nebr	.3	.2	.1	.1	.8	.7	.6	1.1	.7	1.5	.2	1.3	.1	1.0	.5	1.0	.6	1.1	.4	.9	T	.3	T	—.4
Omaha, Nebr	2.2	1.9	1.2	2.8	.5	3.0	1.9	4.6	1.6	5.8	.3	5.6	1.4	6.4	.3	6.1	.3	5.8	1.0	6.1	2.5	7.8	T	7.0
Bismarck, N. Dak	T	—.1	.2	0	.4	.3	T	.1	T	—.1	.2	—.1	T	—.3	.4	—.2	.2	—.3	T	—.6	.1	—.9	T	—1.3
Cincinnati, Ohio	.9	.3	1.0	.6	1.7	1.4	1.5	1.9	1.0	1.8	1.4	2.3	.4	1.9	2.2	3.3	1.7	4.2	.2	3.5	.8	3.4	.8	3.4
Columbus, Ohio	.9	.3	.3	0	1.6	.9	.4	.5	1.1	.8	1.0	1.0	.8	1.0	.6	.8	1.3	1.3	.1	.5	.4	0	.7	—.2
Dayton, Ohio	.3	—.2	1.3	.5	1.6	1.5	.8	1.5	.8	1.5	1.0	1.7	.5	1.4	.9	1.6	.9	1.7	.5	1.4	1.2	1.8	.8	1.8
Oklahoma City, Okla	.2	—.1	2.8	2.4	.2	2.2	3.0	4.7	.6	4.8	.8	5.0	.8	5.1	.7	5.0	T	4.2	.5	3.8	T	2.7	0	1.5
Tulsa, Okla	3.3	2.8	3.2	5.6	.3	5.4	3.2	8.0	2.7	10.0	1.1	10.3	2.5	11.9	2.2	13.1	1.4	13.5	2.9	15.4	T	14.2	0	13.0
Pittsburgh, Pa	.5	—.1	.5	—.3	2.5	1.5	.2	1.0	.7	.9	1.2	1.3	.3	.9	.2	.4	2.5	2.2	.3	1.8	1.5	2.5	.7	2.3
Sioux Falls, S. Dak	T	—.3	1.3	.7	1.1	1.5	.8	1.9	.3	1.8	T	1.4	.6	1.5	.3	1.2	.2	.8	1.2	1.4	T	.7	T	—.1
Chattanooga, Tenn	1.4	.1	3.2	2.1	7.5	8.3	.6	7.6	1.1	7.4	1.1	7.3	T	6.2	.6	5.8	3.4	8.3	.2	7.6	1.0	7.8	1.3	8.3
Memphis, Tenn	1.0	—.1	2.3	1.2	2.2	2.3	1.0	2.1	1.1	2.0	.5	1.3	.6	.7	5.4	5.0	2.9	6.9	2.3	8.2	1.8	9.0	T	8.0
Nashville, Tenn	1.4	.2	2.4	1.5	4.0	4.3	1.7	4.8	.4	4.0	1.3	4.2	.2	3.5	2.5	5.2	2.9	7.2	1.1	7.4	.8	7.4	.2	6.8
La Crosse, Wis	.1	—.2	2.8	2.2	1.9	3.7	T	3.1	.5	3.1	1.3	3.8	3.0	6.2	1.0	6.5	1.5	7.4	2.2	8.9	1.2	9.3	T	8.5
Madison, Wis	.3	0	3.6	3.2	.9	3.7	T	3.3	1.2	4.0	.7	4.2	1.3	4.9	2.7	7.0	.6	6.9	2.4	8.6	1.5	9.4	.4	9.1

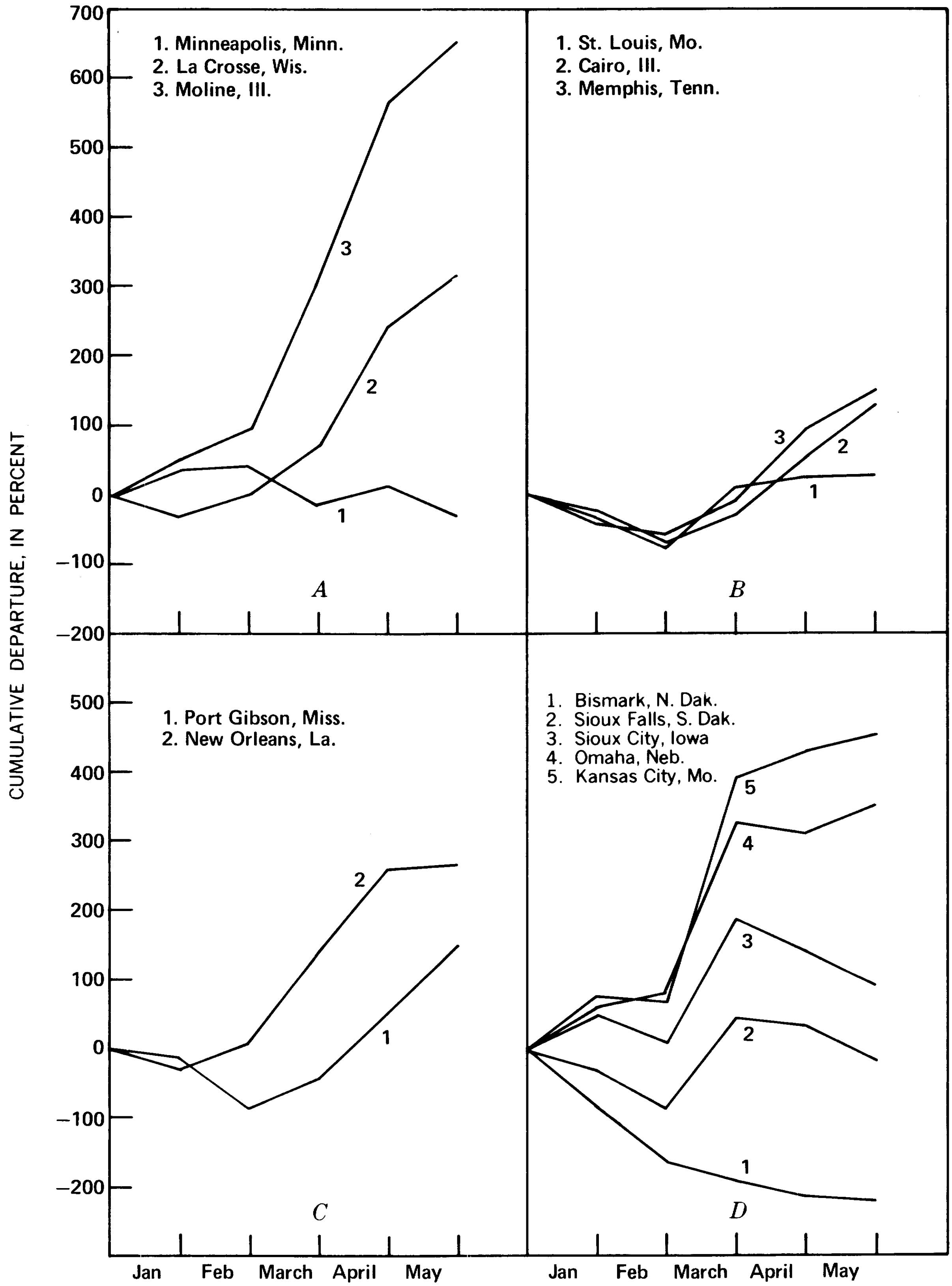


FIGURE 22.—Cumulative percentage departures of precipitation amounts from station normals, January to May 1973.

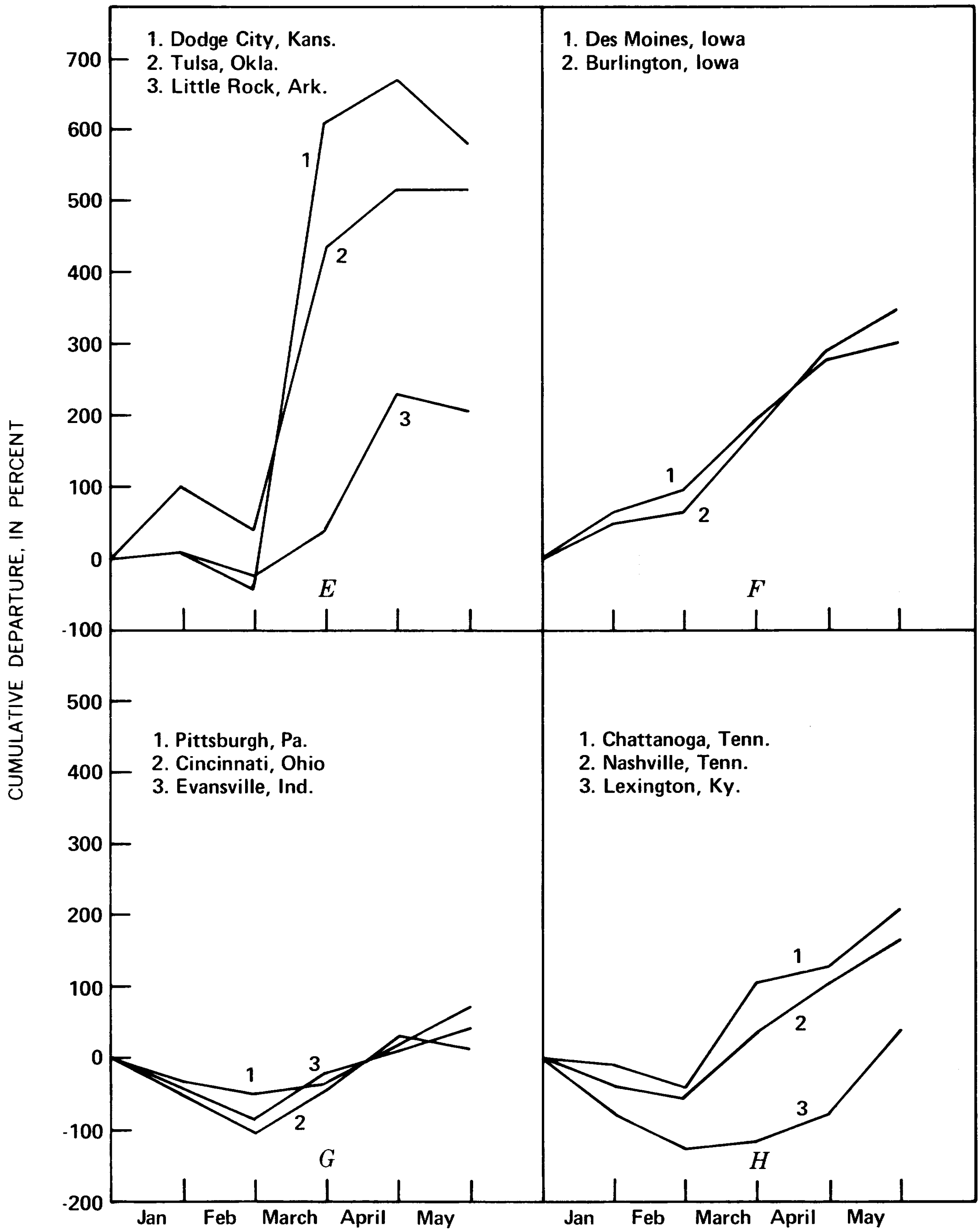


FIGURE 23.—Cumulative percentages departures of precipitation amounts from station normals, January to May 1973.

tive 100-year values and were significant. The corresponding 24-hour probable maximum precipitation for Moberly, Mo., is 20.1 in. (511 mm) (Riedel and others, 1956). The observed precipitation reached 47 percent of the probable maximum precipitation.

The maximum 1-hour rain at radio Station KWIX, Moberly, Mo., on April 21 was about equal to the 1-year recurrence value (table 4) despite the very sig-

TABLE 4.—*A sample of precipitation events in the Mississippi basin in March and April 1973*

Station	Latitude North	Longitude West	Elevation (ft)	Duration (hr)	Observed rainfall: Time of ending (CST)	Observed rainfall: Amount (in.)	Amount (in.) for specified return period (yr.)[1]: 1	10	100	Number of days in month with rain: ≥0.01 inch: Observed	≥0.01 inch: Normal[2]	≥0.5 inch: Observed	≥0.5 inch: Normal[3]
Arkansas													
Eudora	33°07′	91°16′	135	24	8:00 a.m. Mar. 16	5.89	3.6	6.2	8.7	11	10.4	8	4.5
Little Rock	34°44′	92°14′	257	1	11:00 p.m. Apr. 22	1.53	1.6	2.6	3.7	17	10.2	8	4.2
St. Charles	34°23′	91°08′	200	24	8:00 a.m. Apr. 20	9.18	3.5	6.0	8.3	9	9.7	6	4.1
Illinois													
Moline	41°27′	90°31′	582	1	7:00 p.m. Apr. 21	1.38	1.3	2.2	3.1	15	11.0	5	2.5
				24	7:00 p.m. Apr. 21	5.81	2.7	4.8	6.6				
Springfield	39°50′	89°40′	588	1	8:00 p.m. Mar. 10	.48	1.3	2.2	3.1	18	12.0	6	2.3
				24	3:00 a.m. Mar. 7	1.82	2.7	4.7	6.5				
Iowa													
Keosauqua	40°44′	91°58′	625	24	6:00 p.m. Apr. 21	4.20	2.8	4.8	6.8	12	10.5	7	2.6
Kansas													
Cimarron	37°48′	100°21′	2,625	24	7:00 a.m. Mar. 24	3.10	1.9	4.0	3.9	13	6.5	5	0.8
Dodge City	37°46′	99°58′	2,582	24	12:00 p.m. Mar. 10	2.54	2.1	4.1	6.0	17	6.5	4	.8
Topeka	39°04′	95°38′	877	24	1:00 p.m. Mar. 4	1.32	2.8	5.2	7.6	18	8.2	9	1.6
Kentucky													
Hickman 1E	36°34′	89°10′	375	24	5:00 p.m. Apr. 19	5.22	3.2	5.1	6.9	15	12.0	7	3.4
Paducah Sewage Plant	37°06′	88°36′	325	1	3:00 p.m. Apr. 19	1.6	1.3	2.2	3.1	12	12.1	6	3.2
				24	12 M. Apr. 20	3.5	3.1	4.9	6.8				
Louisiana													
Morgan City	29°41′	91°11′	5	1	8:00 p.m. Apr. 17	3.1	2.2	3.4	4.4	7	7.0	3	3.4
				24	12:00 p.m. Apr. 17	8.5	4.4	8.9	13.2				
Mississippi													
Fort Adams	31°05′	91°33′	70	1	10:00 a.m. Apr. 16	2.55	1.9	3.1	4.1	10	8.5	5	4.1
				24	6:00 p.m. Mar. 24	6.63	4.2	7.9	11.0	16	10.0	6	4.3
Grenada Dam	33°48′	89°46′	283	24	8:00 a.m. Mar. 16	7.38	3.6	6.2	8.5	16	11.0	8	4.8
Jackson	32°19′	90°05′	330	24	3:00 p.m. Apr. 16	4.98	3.8	6.8	9.6	10	9.0	4	4.0
Winona 5E	33°29′	89°38′	390	24	6:00 a.m. Mar. 16	9.07	3.7	6.2	8.5	11	11.0	9	4.8
Missouri													
Columbia	38°49′	92°13′	887	24	11:00 p.m. Mar. 10	1.79	2.9	5.1	7.3	17	11.0	7	2.3
Madison	39°28′	92°13′	974	24	7:00 a.m. Apr. 21	9.00	2.9	5.0	7.2	9	11.1	5	2.7
Moberly Radio KWIX	39°24′	92°26′	850	1	2:00 a.m. Apr. 21	1.5	1.4	2.4	3.4	11	11.0	4	2.8
				6	2:00 a.m. Apr. 21	7.1	2.1	3.7	5.4				
				24	5:00 a.m. Apr. 21	9.5	2.9	5.1	7.2				
				24	12:00 p.m. Apr. 22	11.7		9.2	13.0				
Nebraska													
Grand Island	40°58′	98°19′	1,841	24	8:00 a.m. Mar. 24	1.31	2.0	4.0	6.0	17	7.2	4	0.8
Oklahoma													
Poteau	35°04′	94°38′	572	24	6:00 p.m. Apr. 23	4.95	3.4	6.4	9.3	14	9.9	5	4.0
Tulsa	36°11′	95°54′	668	24	10:00 p.m. Mar. 24	2.07	3.4	6.1	8.9	19	8.0	7	2.1
Wichita MT WL REF	34°44′	98°43′	1,665	24	9:00 p.m. Mar. 30	3.55	2.8	5.6	8.5	6	6.0	3	1.1
South Dakota													
Sioux Falls	43°34′	96°44′	1,418	24	4:00 p.m. Mar. 14	1.08	2.1	4.0	5.9	12	8.2	2	0.8
Tennessee													
Belvidere	35°08′	86°11′	985	1	1:00 a.m. Mar. 16	1.35	1.37	2.3	3.2	16	13.2	5	4.7
				24	11:00 a.m. Mar. 16	7.36	3.2	5.2	7.1				
Chattanooga	35°02′	85°12′	665	24	3:00 p.m. Mar. 16	6.53	3.2	5.2	7.1	16	13.6	6	4.9
Knoxville	35°49′	83°59′	980	24	6:00 p.m. Mar. 16	4.85	2.9	5.0	6.9	16	13.0	4	5.2
Victory	35°06′	87°51′	830	24	1:00 p.m. Mar. 15	6.48	3.3	5.4	7.3	18	12.5	10	4.4
				48	3:00 p.m. Mar. 16	10.40		6.3	8.9				
Wisconsin													
Clinton 2N	42°37′	88°52′	920	24	6:00 p.m. Apr. 21	4.39	2.4	3.9	5.6	14	11.9	5	1.9
Madison	43°08′	89°20′	858	24	4:00 a.m. Mar. 7	2.52	2.4	4.0	5.9	13	11.1	3	1.3
Milwaukee	42°57′	87°54′	672	24	10:00 p.m. Apr. 21	3.04	2.3	3.8	5.5	17	11.2	3	1.2

[1] Interpolated from Environmental Data Service and Statistical Reporting Service (1973) for durations up to 24 hours and from Mason (1952) for durations exceeding 24 hours.
[2] Interpolated from Environmental Data Service (1968).
[3] Interpolated from Miller (1964).

nificant 6- and 24-hour observed rainfall. The accompanying weather situation was a case of thunderstorms imbedded within a quasistationary squall line, which in turn was associated with the cyclone scale weather system. These thunderstorms, fed by the convergent inflow of moist air, regenerated and maintained a precipitation rate exceeding 1 in./hr (inch per hour) for 5 hours within a 6-hour period ending 2 a.m., April 21.

Dimensionless temporal patterns of four storms are shown in figure 24. Each storm duration was bounded at each end by at least 2 hours with no rain. The 6-hour and 24-hour storm rainfall at radio Station KWIX, Moberly, Mo., as well as the 48-hour rainfall at Victory, Tenn., exceeded their respective 100-year values (table 4). The other two storms occurred in Arkansas and Mississippi, respectively, around March 24, 1973. They yielded fair amounts of rain but did not reach significance. It is interesting to note that for storms number 1–3 less than 20 percent of the rain fell in the initial 50 percent of the duration. However, the storm rainfall over Victory, Tenn., in mid-March 1973 had 60 percent of the amount concentrated in the initial 30 percent of the duration. Without the antecedent moderate but continuous rain normally characterizing weather situations in the warm sector, the heavy shower was triggered at Victory, Tenn., by the cold front passage from the west in the early afternoon of March 14, and rainfall continued as the front stagnated. Then the rainfall intensity reduced as the front moved out of western Tennessee on March 16.

AREAL PRECIPITATION

In addition to the areal precipitation distribution represented graphically by the isohyetal analyses, a few numerical values are illustrative. For example, the Southwest Climatic Division in Kansas, with an area of 12,076 mi^2 (square miles) (31,277 km^2), had an average precipitation depth of 7.06 in. (179 mm) in March 1973, compared with the 30-year (1941–70) March normal of 0.96 in. (24 mm). This positive departure was 3.76 times the corresponding standard deviation and amounted to an additional 4.84 billion m^3 (cubic metres) of water. The Northwest Prairie Climatic Division in Missouri, which covers an area of 14,310 mi^2 (37,063 km^2) in the confluence region of the Missouri and Mississippi Rivers, had 30-year (1941–70) monthly mean precipitation values of 2.83 and 3.89 in. (72 and 99 mm) for March and April respectively. However, the matching observed average precipitation in 1973 was 8.83 and 5.97 in. (224 and 152 mm). The March positive departure represented 5.65 billion m^3 of water over this confluence region. Areal average rainfalls for both divisions in March 1973 were greater than any corresponding amount in their respective 30-year records. The average precipitation depth over the Tennessee River Basin in March and April 1973 was 11.37 and 5.80 in. (289 and 147 mm) respectively compared with the 75-year mean values of 5.61 (142 mm) for March and 4.48 (114 mm) for April. Its positive departure in March alone was equivalent to more than 530 billion ft^3 (15 billion m^3) of water.

SEASONAL STRATIFICATION OF PRECIPITATION EVENTS

In the foregoing discussion it was mentioned that the cumulative effect of individually rather insignificant precipitation events closely following one another could lead to a total event of great significance. Here, it should be pointed out that seasonal stratification of precipitation events could substantially affect their recurrence probabilities and, consequently, their associated significance qualifications. Because the same amount of precipitation falling in different seasons could result in very different runoffs for a watershed of moderate or large size, the question of seasonal stratification is a relevant one. For example, the maximum 10-day precipitation over Dodge City, Kans., in March 1973 was 5.2 in. (132 mm). Since the 5-year 10-day value is 6.1 in. (155 mm) derived from annual precipitation data (Miller, 1964), 5.2 in. (132 mm) in 10 days might seem to be not far from normal. However, the precipitation climatology of western Kansas indicates that much of its rainfall usually occurs in the period from May to September. For a 10-day rainfall of such magnitude to fall in March is extremely rare. The record of 61 years (1912–72) at Dodge City shows a highest maximum 10-day rainfall in March of only 3.66 in. (93 mm), with a mean of 0.98 in. (25 mm) and a standard deviation of 0.78 in. (20 mm).

Even if one extends the time period of consideration into 6 months, from November 1 through April 30, the maximum observed 10-day precipitation in these 6-month intervals over the 61 years is only 4.07 in. (103 mm), and the mean is 1.99 in. (51 mm). Using Gumbel's method in fitting these data with a Fisher-Tippett type I distribution, it can be shown that the probability of a 10-day precipitation of 5.2 in. (132 mm) occurring in any of those 6-month periods would be less than 0.01. As a consequence of this and similar exceptional events in the vicinity, flooding was reported in progress along the Upper Arkansas River near Dodge City, Kans., in March 1973. In this analysis, even though the requirements of large sample size and relative independence of the maxima were still satisfied, the resultant probability should be considered as only an estimate.

STORM COMBINATIONS

One of the techniques useful in the simulation of possible extreme flood conditions is to produce hypothetical floods by combining two or more past storms

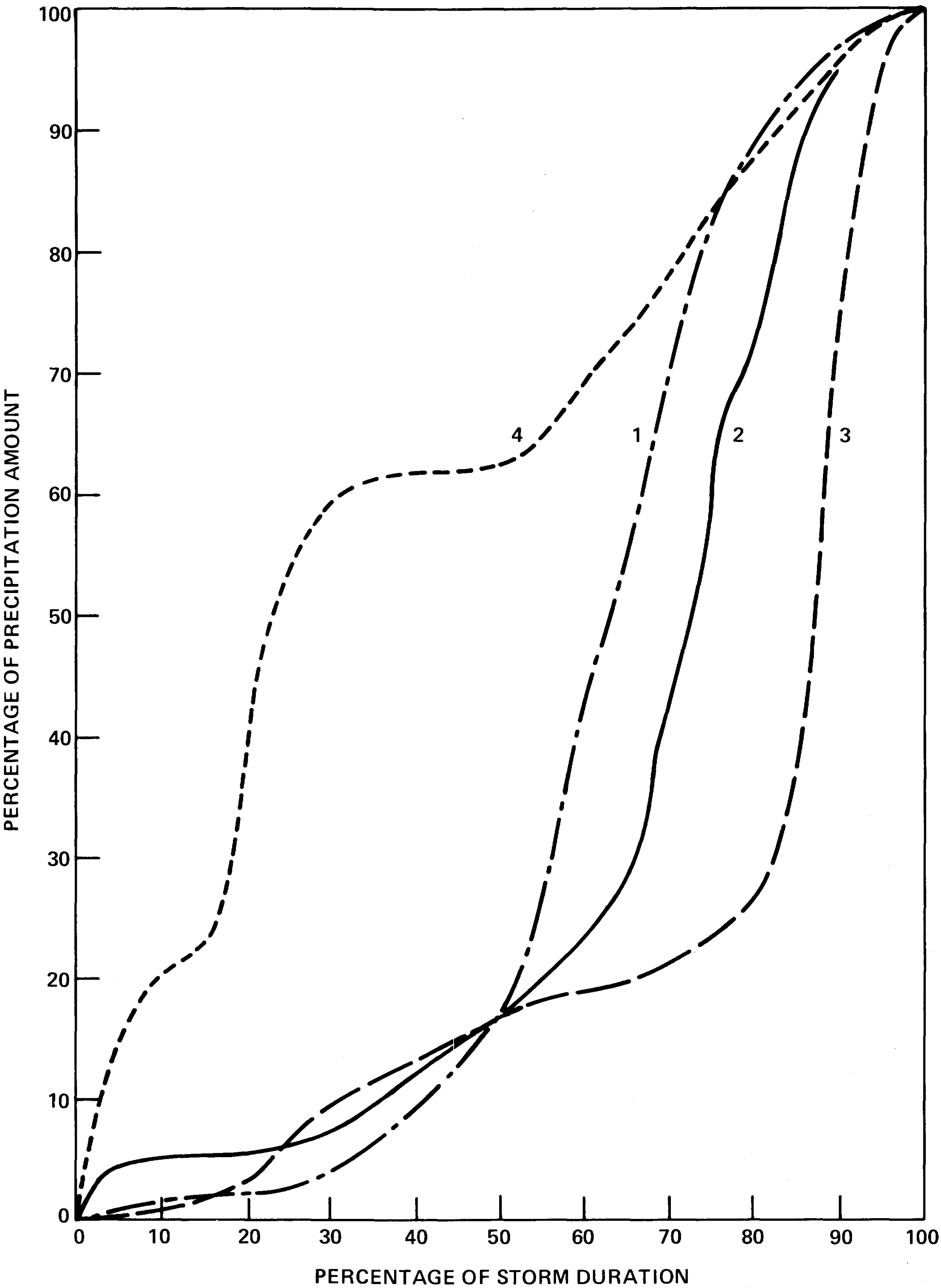


FIGURE 24.—Dimensionless temporal patterns of four storms over the basin.

that actually occurred in widely separated time periods into a sequence interrupted by a period of no precipitation to allow for the evolution of synoptic conditions in a meteorologically reasonable manner. Transposition of isohyetal patterns may also be done to achieve a more hydrologically critical placement of the rain.

In the Mississippi basin flood episode, spring 1973, many stations and many large areas experienced prolonged rainy spells. Again, using the Northeast Prairie Climatological Division of Missouri as an example, it had the following rainy periods in March 1973: March 1–7, 9–11, 13–14, 17, 19–21, 24–26, 28–31 (Environmental Data Service 1973a). There was only 1 clear day in each of the periods March 1–11 and March 24–31. For the month as a whole, there were at most 2 clear days following one storm before another storm started to dump rain over the same region. A clear day is defined here as a day with less than 10 percent of the stations in the Division reporting 24-hour rainfall of 0.01 in. (0.25 mm) or more. It is evident that nature had provided a very efficient storm combination by tightly packing them one after another. This same situation happened over many other areas in the basin. These long sequences of storms can be used fruitfully as building blocks in future simulations of storm combinations for appropriate areas.

THE STORM OF APRIL 19–22, 1973, OVER THE CENTRAL MISSISSIPPI BASIN

The storm of April 19–22, 1973, with its precipitation center in northeastern Missouri, brought heavy rain to wide areas either along or close to the Upper Mississippi and the Lower Missouri Rivers, and contributed materially to the buildup of the record-breaking high crest passing St. Louis, Mo., and the Lower Mississippi main stem in late April and early May 1973. For this reason, it was chosen for a more detailed study.

STORM HISTORY

At 6:00 a.m. c.s.t., April 18, 1973, an incipient Low was located in east-central Colorado. By 6:00 p.m. c.s.t. the next day, it had become a well organized cyclone with its center over Nebraska. Its central pressure had fallen below 984 mb, and frontogenesis also had been in progress. Meanwhile, the eastern half of the United States, because of a strong Bermuda High off the Atlantic coast, had a predominantly southerly wind extending at least to 700 mb. The 850- and 700-mb charts for 6:00 p.m. c.s.t., April 19, displayed a conspicuous lag of the thermal trough with respect to the contour trough over the Great Plains region (figs. 25–28), indicating cold (warm)

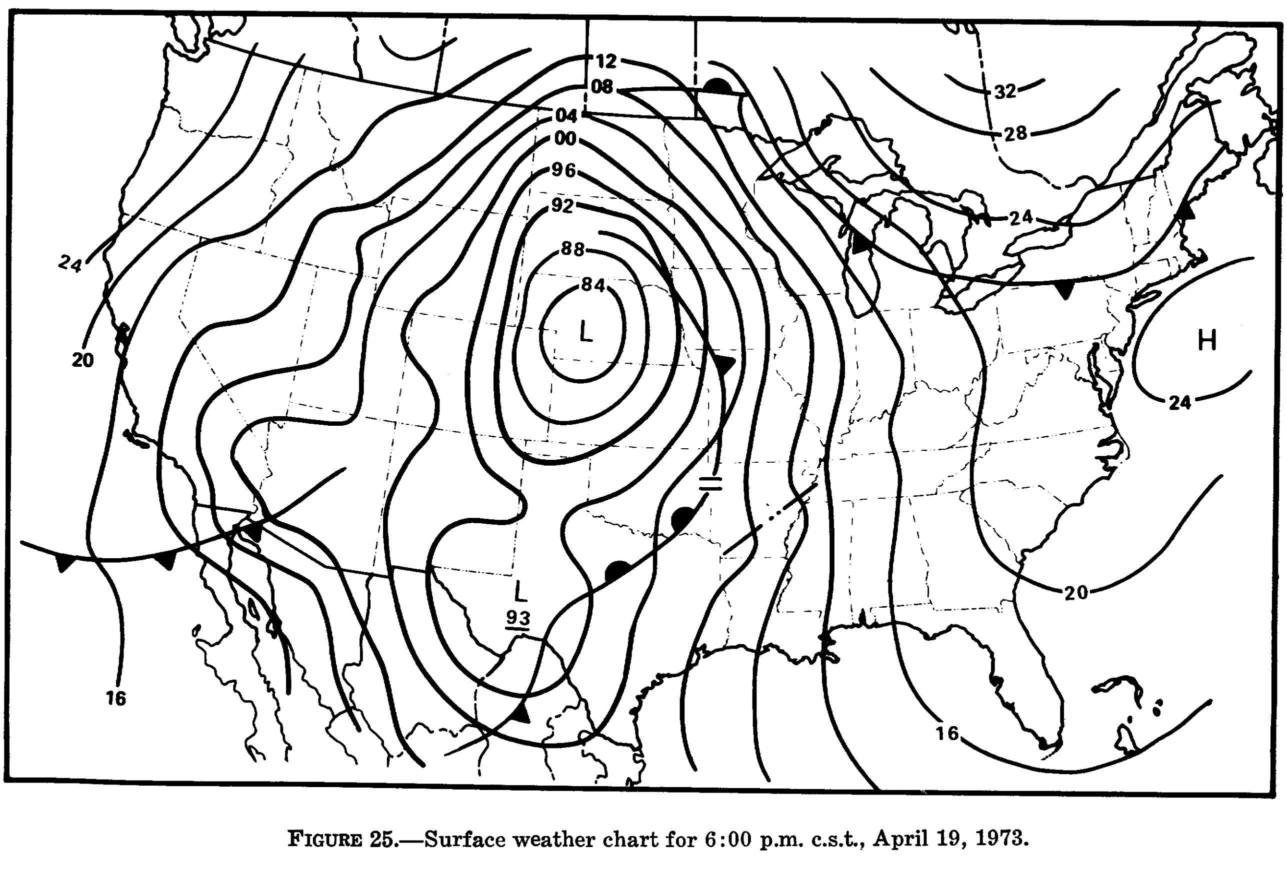


Figure 25.—Surface weather chart for 6:00 p.m. c.s.t., April 19, 1973.

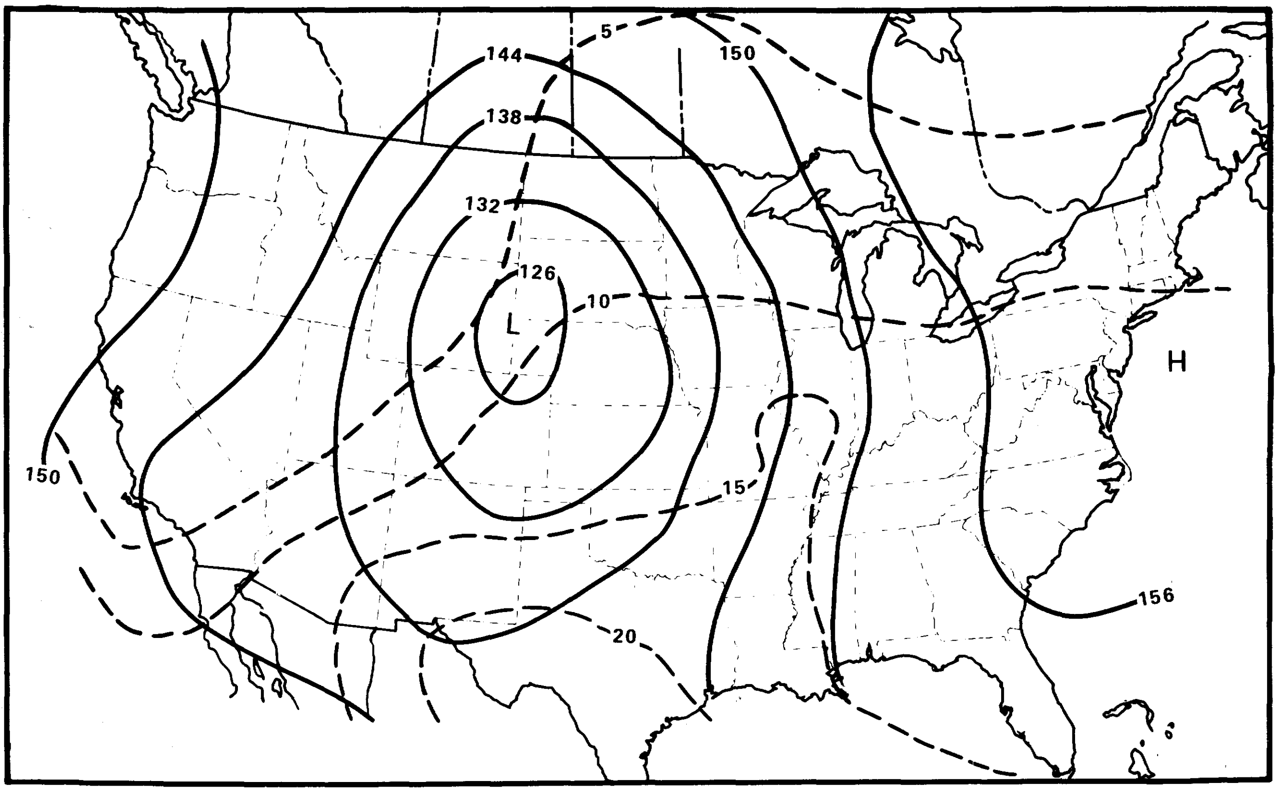


FIGURE 26.—850-mb chart for 6:00 p.m. c.s.t., April 19, 1973.

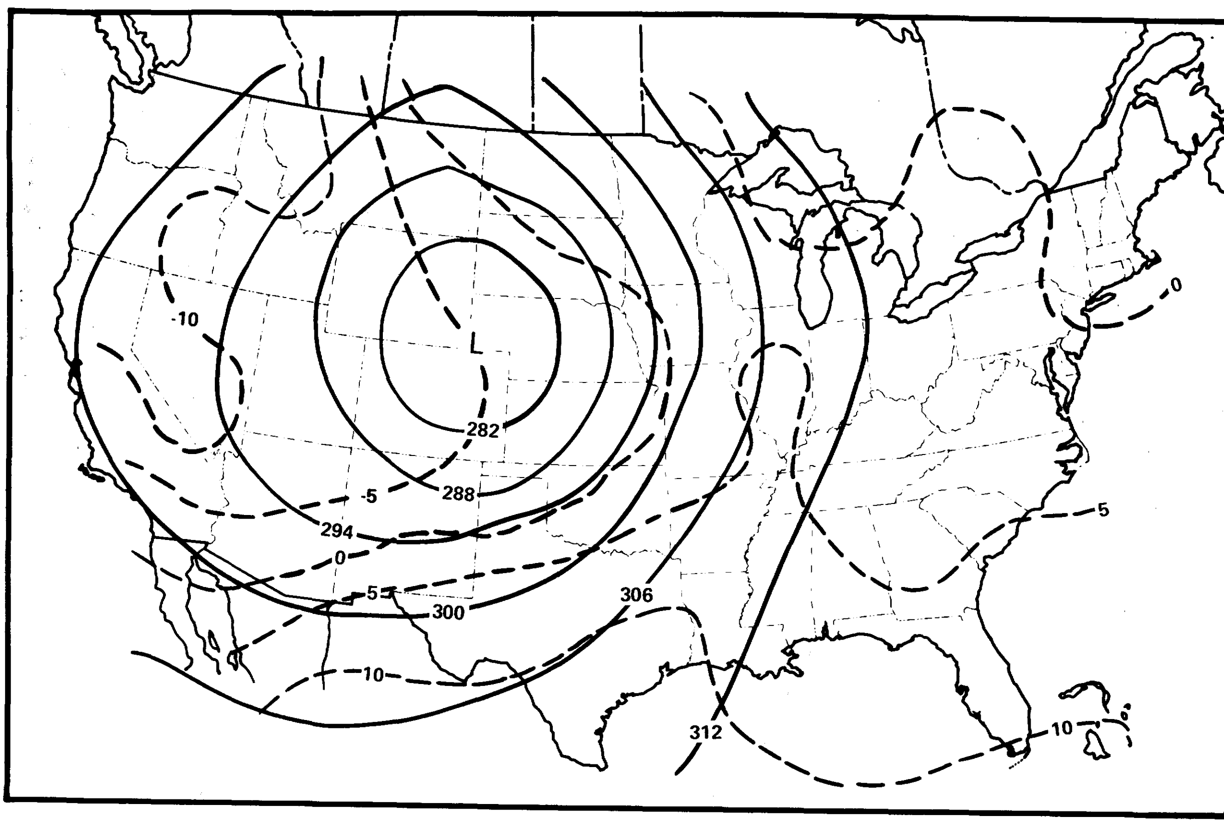


FIGURE 27.—700-mb chart for 6:00 p.m. c.s.t., April 19, 1973.

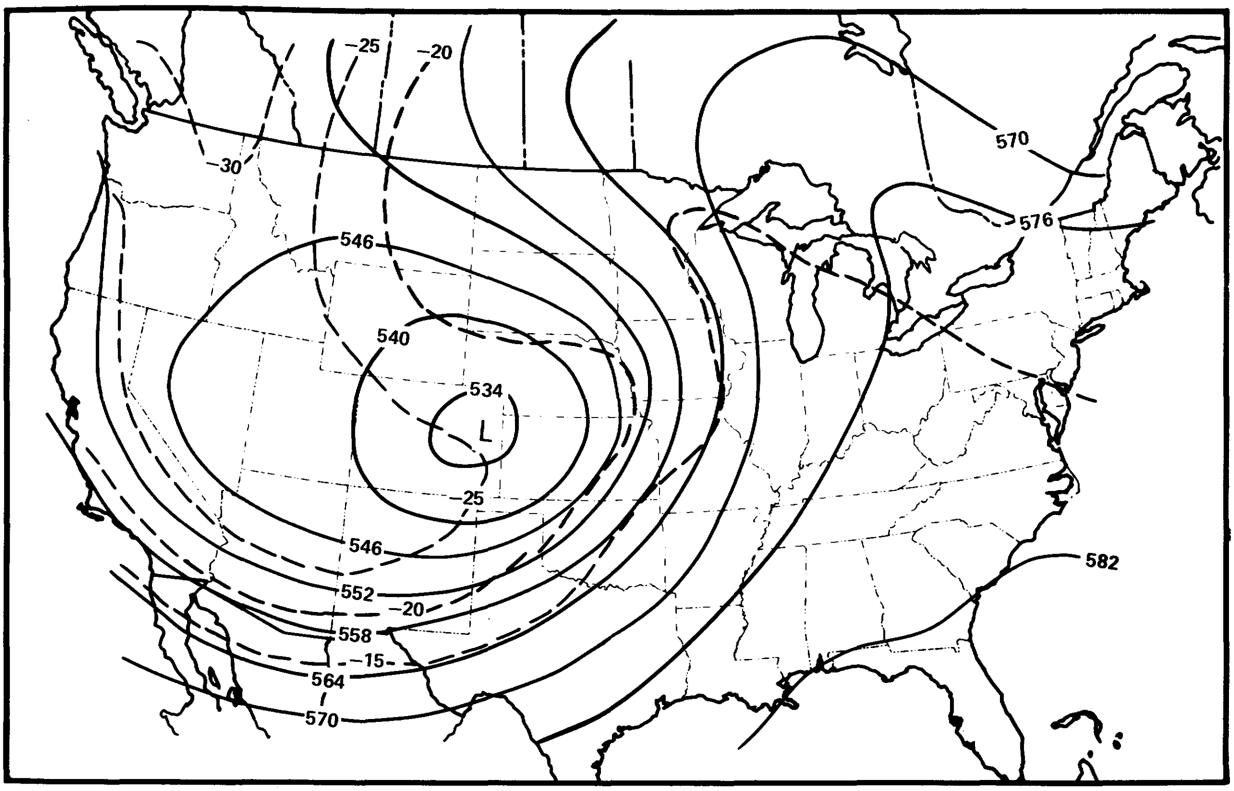


FIGURE 28.—500-mb chart for 6:00 p.m. c.s.t., April 19, 1973.

advection behind (ahead of) the contour trough. The whole basin, except the Upper Mississippi Valley and a part of the Ohio Valley, where a shortwave ridge was passing through, was underneath a 500-mb trough-to-ridge flow pattern (fig. 28).

Meanwhile, the weather system rapidly developed. By 3:00 a.m. c.s.t., April 20, a meso-High was in existence just behind the cold front in eastern Iowa. An instability line, possibly associated with weak frontal wave perturbations, began to appear over northern Missouri. By 6:00 a.m. c.s.t., April 20, the Low was over the Dakotas. The frontal zone marking the boundary between the tropical maritime airmass to the east and cold polar airmass to the west became well established throughout the central Basin. The cold front extended from the Low center in the Dakotas through Minnesota, Iowa, and Missouri and then changed into a stationary front through Oklahoma to Texas. In the Central Mississippi Valley, wind was still predominantly from the south or southeast at the surface and veered with height. By 3:00 p.m. c.s.t., the instability line over northern Missouri had developed into a squall line and strong thunderstorm activities began. The front below Iowa was now classified as a warm front, but movement was very minor. This squall line remained quasistationary about 70 mi (112.6 km) to the east of the front in northeastern Missouri for about 9 hours. The strong temperature gradient, the persistent convergent inflow of warm moist air, and the high instability along the quasistationary front and squall line also provided an environment favorable to the growth of severe storms of much smaller scale. Nine confirmed tornadoes were sighted on April 19, 16 tornadoes on April 20, and 3 on April 21 in Missouri alone. Many funnel clouds and tornadoes were also observed in Illinois and Iowa during this period. Numerous windstorms and hailstorms were also induced by the large-scale cyclone system. Hailstones with diameters reaching 2 in. (51 mm) fell in Henry County, Iowa, on April 19. A windstorm with gusts up to 85 mph (137 km/hr) hit western Iowa the same day, causing property losses and injuring five people.

The surface analysis and 850-, 700-, and 500-mb analyses for 6:00 a.m. and 6:00 p.m. c.s.t., April 20, 1973, are shown in figures 29–36. The 850-mb data (not shown in figures) clearly illustrates that the saturated (or nearly saturated) state of the air over the basin was due to the continuous intrusion of the warm moist maritime airmass into the Mississippi Valley from the Gulf of Mexico, indicated by the shape of the isotherm pattern. At 6:00 p.m. c.s.t., April 20, southerly winds at 850 mb reached a speed of about 50 knots (92.6 km/hr) over Little Rock, Ark., 45 knots (83.4 km/hr) over Monett, Mo., and 30 knots (55.6 km/hr) over Peoria, Ill., indicating moisture convergence over Missouri and Illinois. The antecedent rising motion in the warm intruding air, plus the apparent moisture convergence factor, led to an 850-mb relative humidity of 95 percent over Little Rock, Ark., and to complete saturation over the latter two stations.

The 700-mb analysis of 6:00 p.m. c.s.t., April 20 (fig. 35), shows the same predominantly southerly inflow of warm moist air into the Mississippi basin but with wind direction shifted slightly towards the west. The warm advection over the valley along the main stem Mississippi River extended through a very deep layer, up to 300 mb. The associated rising motion within this deep moist layer brought about widespread condensation and formed a cloud lane extending from Louisiana and eastern Texas up to Wisconsin.

PARCEL TRAJECTORIES LEADING INTO THE BASIN

To facilitate the identification of the airmass source region(s) and the visualization of the antecedent three-dimensional air movement, a set of past air parcel trajectories at three levels valid at 6:00 p.m. c.s.t., April 20, are shown in figure 37. Solid (dashed) lines in figures 37 and 38 denote ascending (descending) trajectory. The three-digit numbers at origin points indicate the initial pressure levels in millibars. The numbers in parentheses specify the K indices.

The K index is a measure of the airmass moisture content and static stability and is given by:

$$K=(T_{850}-T_{500})+T_{d,\,850}-(T_{700}-T_{d,\,700}) \qquad (1)$$

Here, T is temperature in degrees Celsius; T_d, the dew point temperature; and the subscripts denote pressure levels. The larger the K index of the airmass, the more unstable it is. A K index of 25 for Peoria, Ill. (fig. 37), indicates that airmass thunderstorms are possible. For comparison, a K index greater (less) than 35 (20) is associated with numerous (no) thunderstorms.

For example, the air parcel arriving at Peoria, Ill., at 700 mb at 6:00 p.m. c.s.t., April 20, originated at about lat 28°N., long 95°W. in the Gulf of Mexico at pressure level 782 mb 24 hours ago. During this period, it traveled northward and slowly rose to 700 mb. The pressure level at which the parcel was located 6 hours ago was 731 mb, as labeled on this particular trajectory. The synoptic scale rising motion

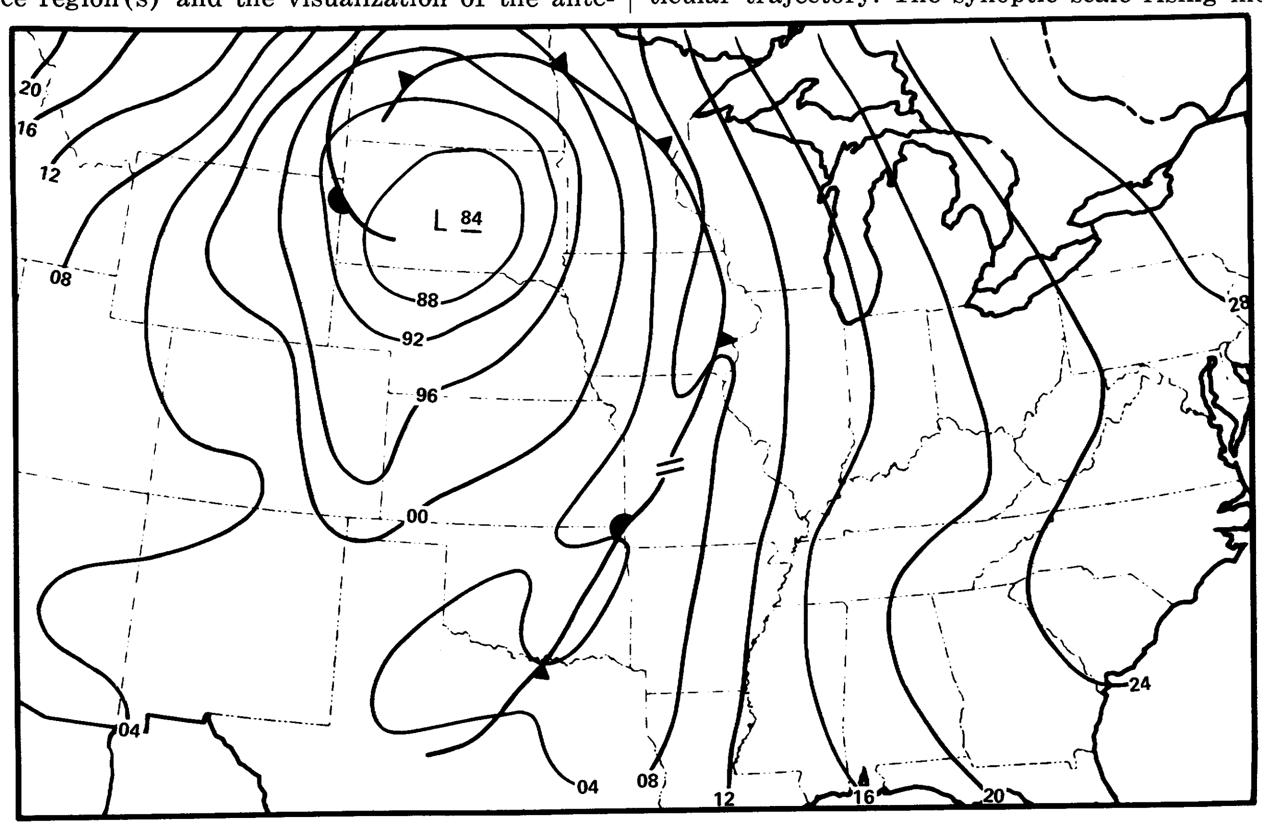


FIGURE 29.—Surface weather chart for 6:00 a.m. c.s.t., April 20, 1973.

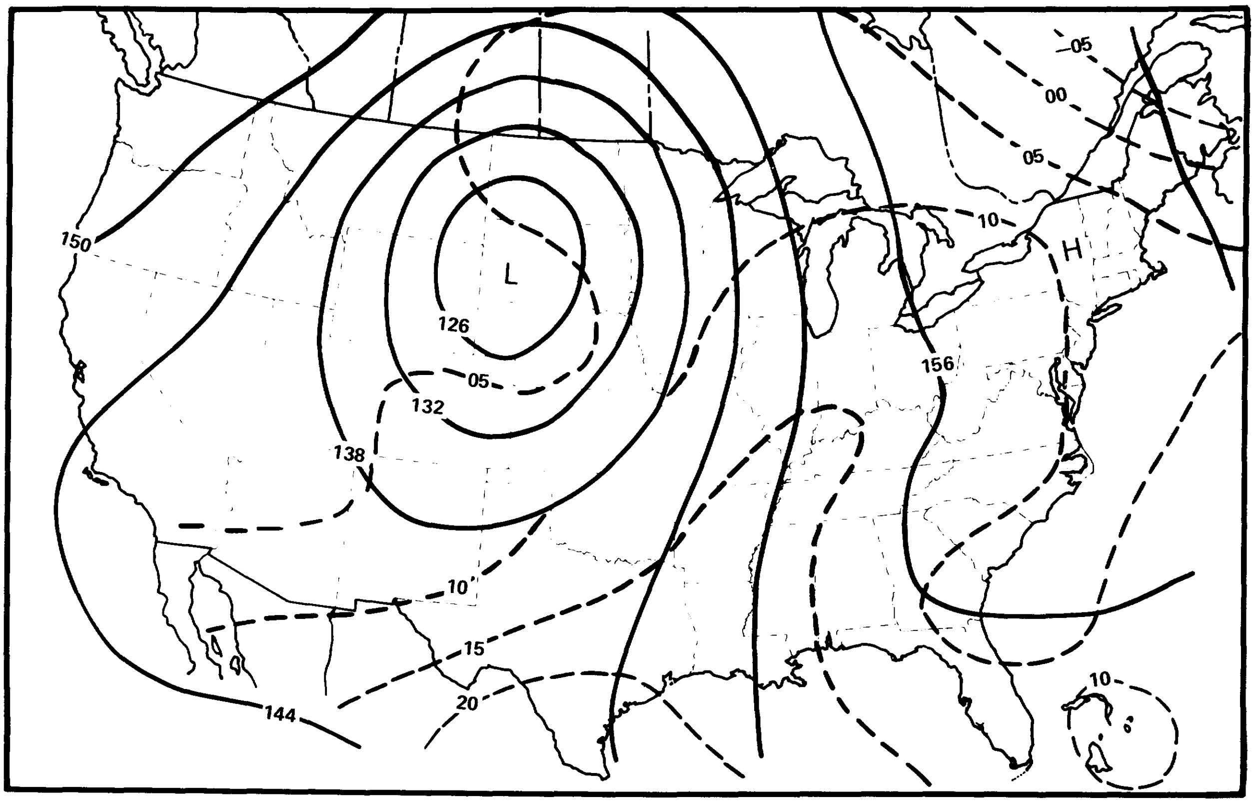


FIGURE 30.—850-mb chart for 6:00 a.m. c.s.t., April 20, 1973.

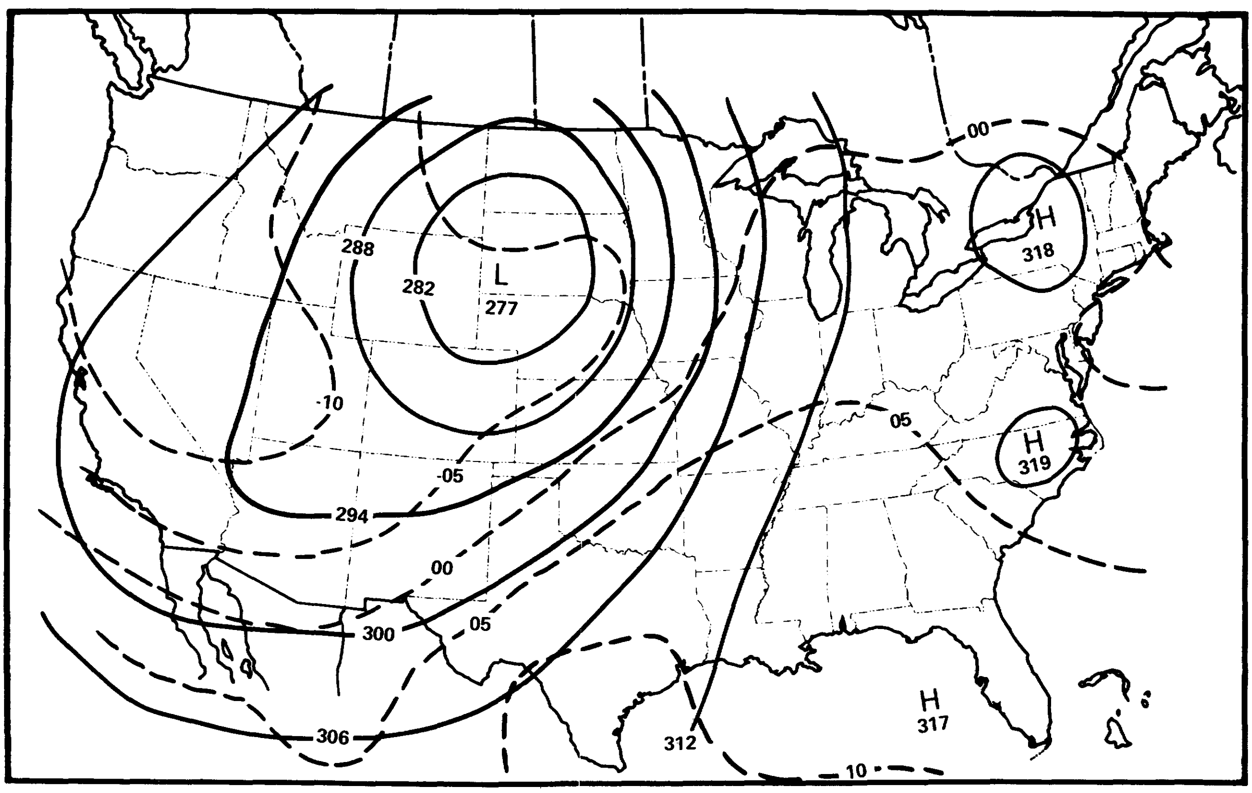


FIGURE 31.—700-mb chart for 6:00 a.m. c.s.t., April 20, 1973.

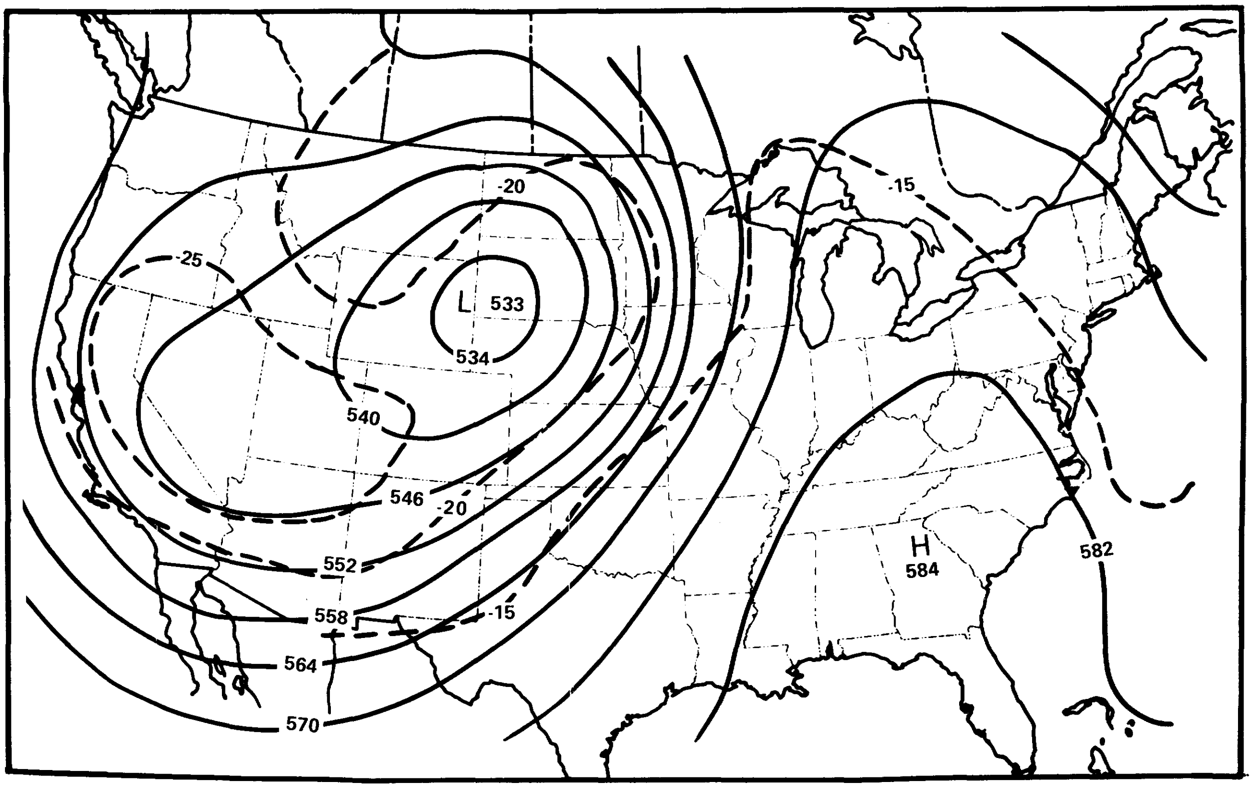


FIGURE 32.—500-mb chart for 6:00 a.m. c.s.t., April 20, 1973.

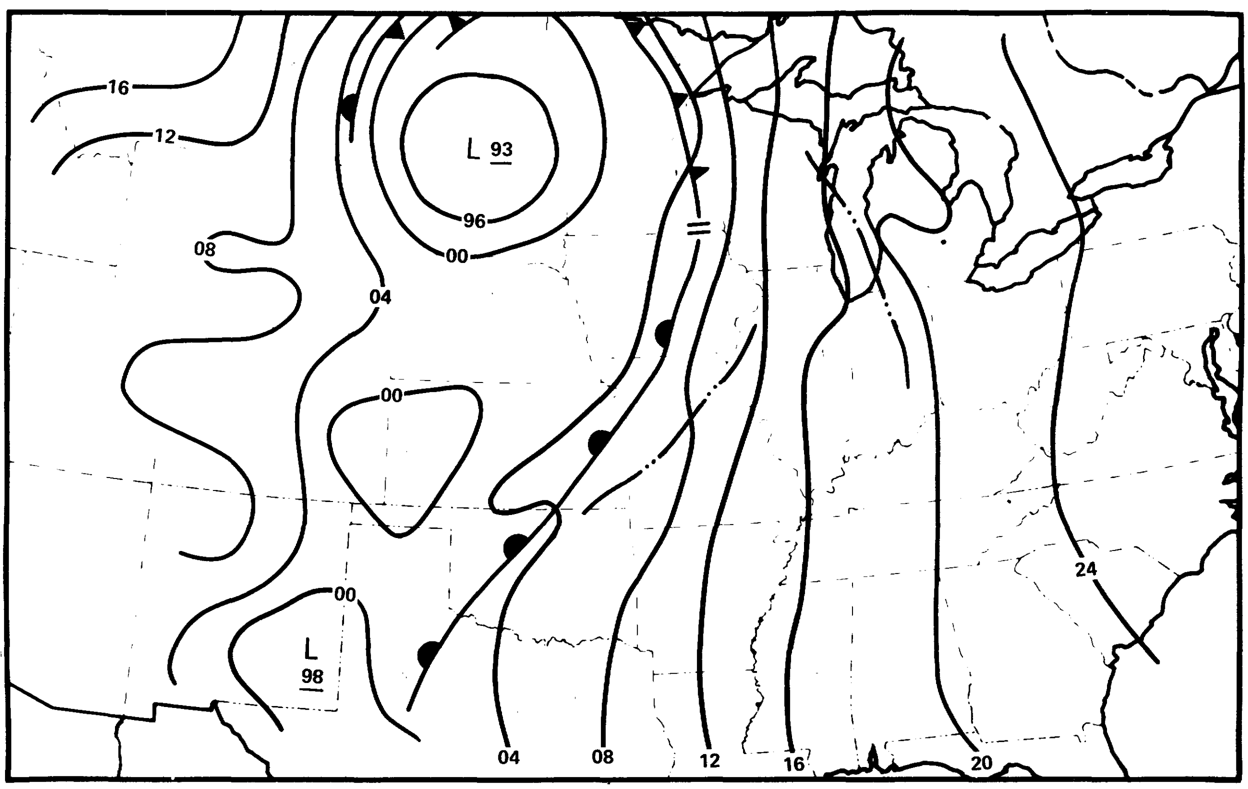


FIGURE 33.—Surface weather chart for 6:00 p.m. c.s.t., April 20, 1973.

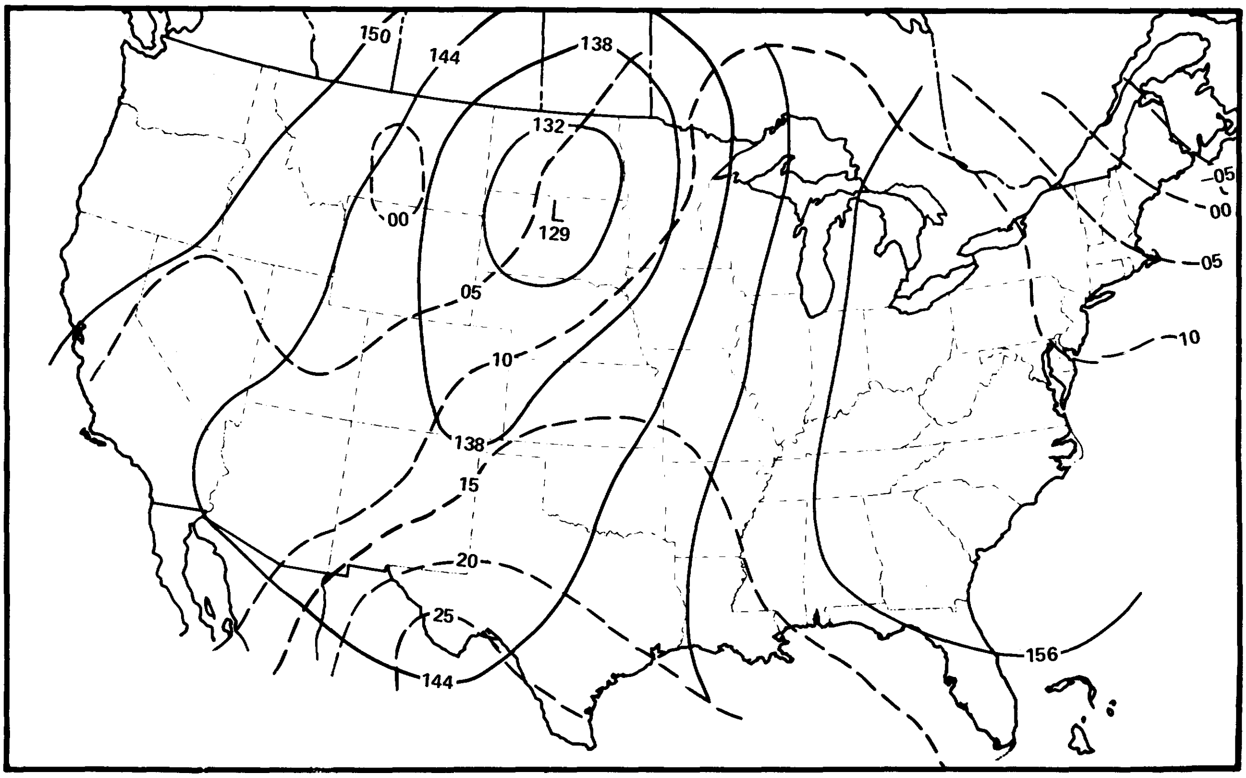


FIGURE 34.—850-mb chart for 6:00 p.m. c.s.t., April 20, 1973.

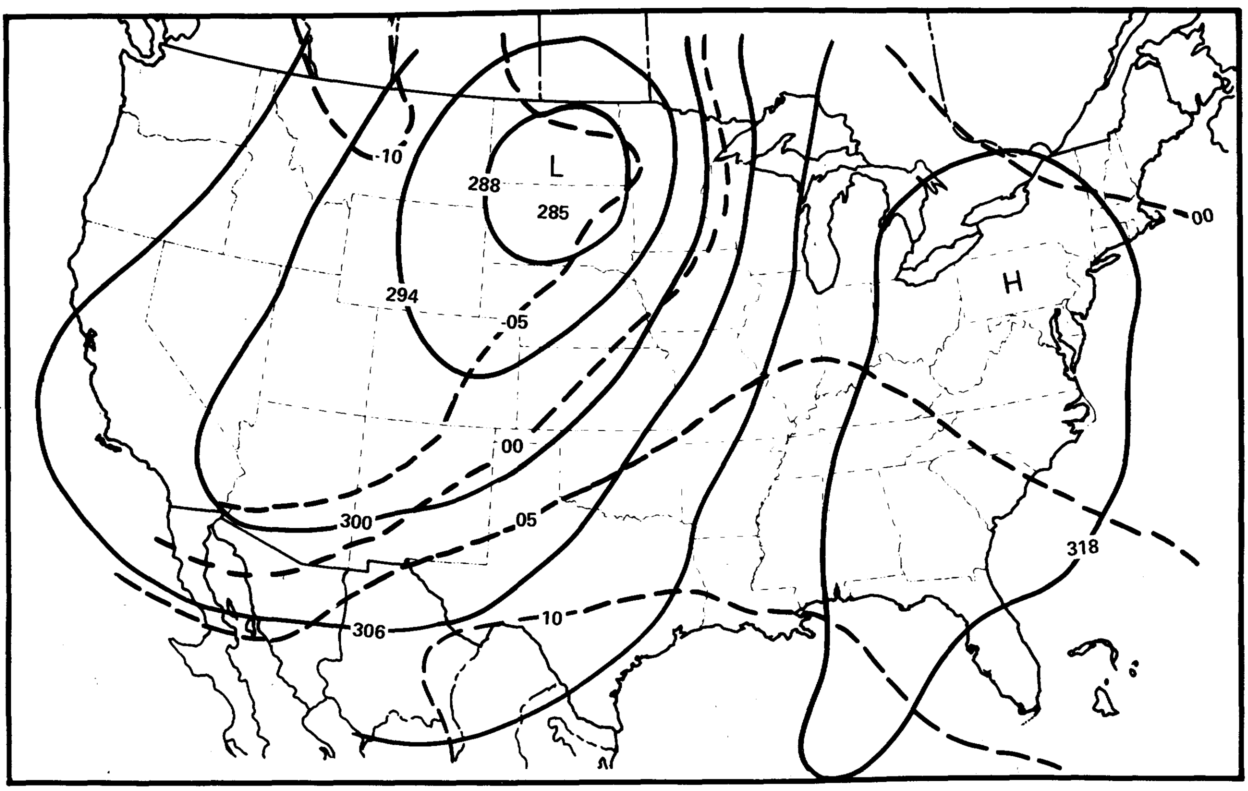


FIGURE 35.—700-mb chart for 6:00 p.m. c.s.t., April 20, 1973.

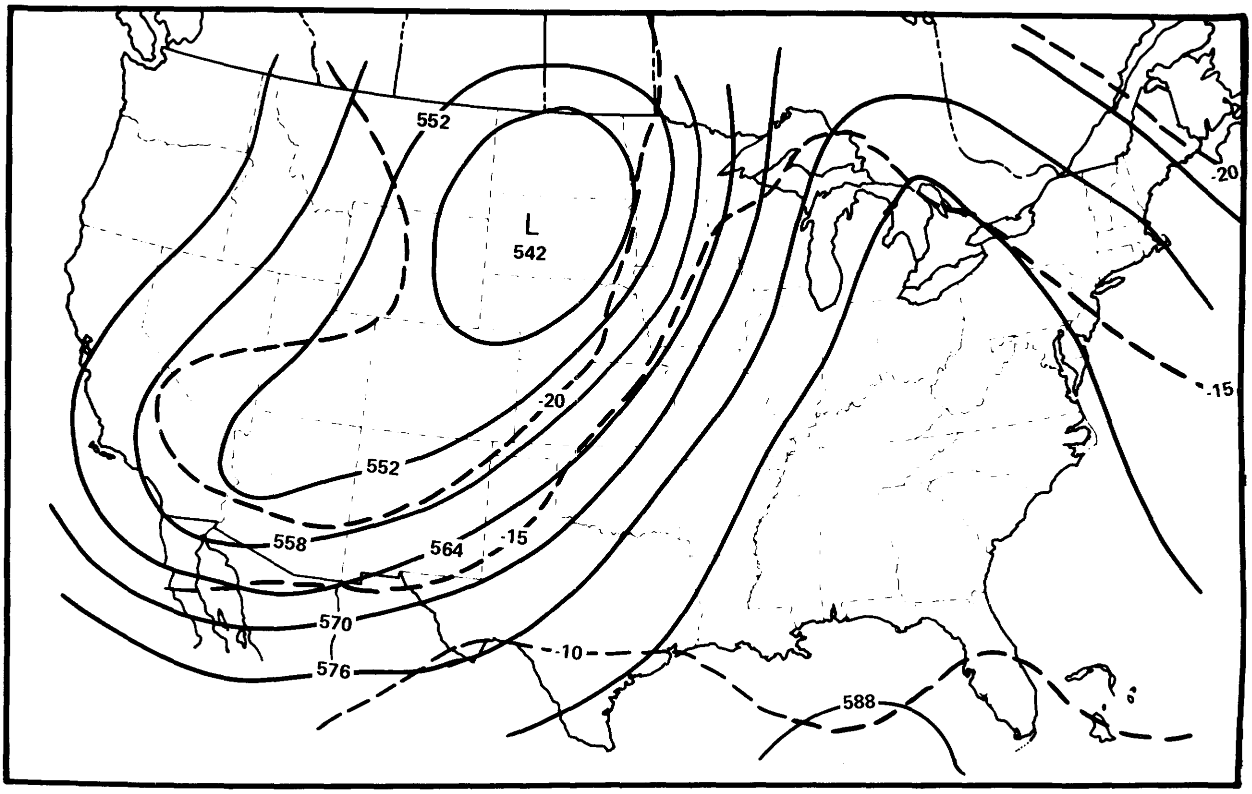


FIGURE 36.—500-mb chart for 6:00 p.m. c.s.t., April 20, 1973.

was 140×10^{-5} mb sec^{-1}. Figure 38 shows that the 24-hour trajectory of a parcel arriving at 850 mb over Peoria, Ill., can be traced back to just off the Louisiana coast at the 878-mb level. On figure 39, solid lines are used to depict all surface trajectories without regard to vertical displacements; also shown is the position of fronts on the surface. For Peoria, Ill., the surface air parcel originated in the southeastern corner of Alabama 24 hours earlier. It is evident that southerly flow was predominant in the basin through a deep layer prior to 6:00 p.m. c.s.t., April 20. At the surface, there was convergence along the front, and the flow was southeasterly. This gradually changed to south by west at 700 mb. For comparison, the 24-hour trajectories for 700-mb at 6:00 p.m. c.s.t., April 5, are also shown in figure 40. April 5 was a day of fine weather with no appreciable precipitation over the Mississippi basin. The contrast with figure 37 is illuminating.

It can be estimated from figure 39 and the mean sea surface temperature distribution for April 1973 (not shown) that the surface air parcels arriving in the Central Mississippi Valley in the evening of April 20 were located 2 days before off the east coast of Florida, where the water temperature was in excess of 75°F (23.9°C). Such a warm source region is necessary to support the observed high dew point of 62°F (16.7°C) characterizing the air flowing into northeastern Missouri. Lott and Myers (1956), in their study of the trajectories of a number of flood-producing storms in the Mississippi basin, also found that such storms are associated with an inflow of tropical air originating over a relatively warm sea surface.

The 12-hour net vertical displacements of air parcels reaching 700 mb at 6:00 a.m. c.s.t., April 21, 1973, are shown in figure 41. Rising motions associated with the intrusion of the maritime tropical airmass prevailed in the whole Central Mississippi Valley, while sinking motion prevailed in the western Great Plains.

These trajectories were calculated by the operational National Weather Service Three-Dimensional Trajectory Model (Reap, 1972). Briefly, trajectories were traced backwards from a selected terminal point to origin point using the terminal point wind at the verification time, t, to arrive at a first-guess upwind position at a previous time, $t-\delta t$, or

$$X_2(t-\delta t) = X_1(t) - U_1(t)\,\delta t \qquad (2)$$

$X_2(t-\delta t)$ is the first-guess upwind position along the x axis; $U_1(t)$, the wind component at the terminal

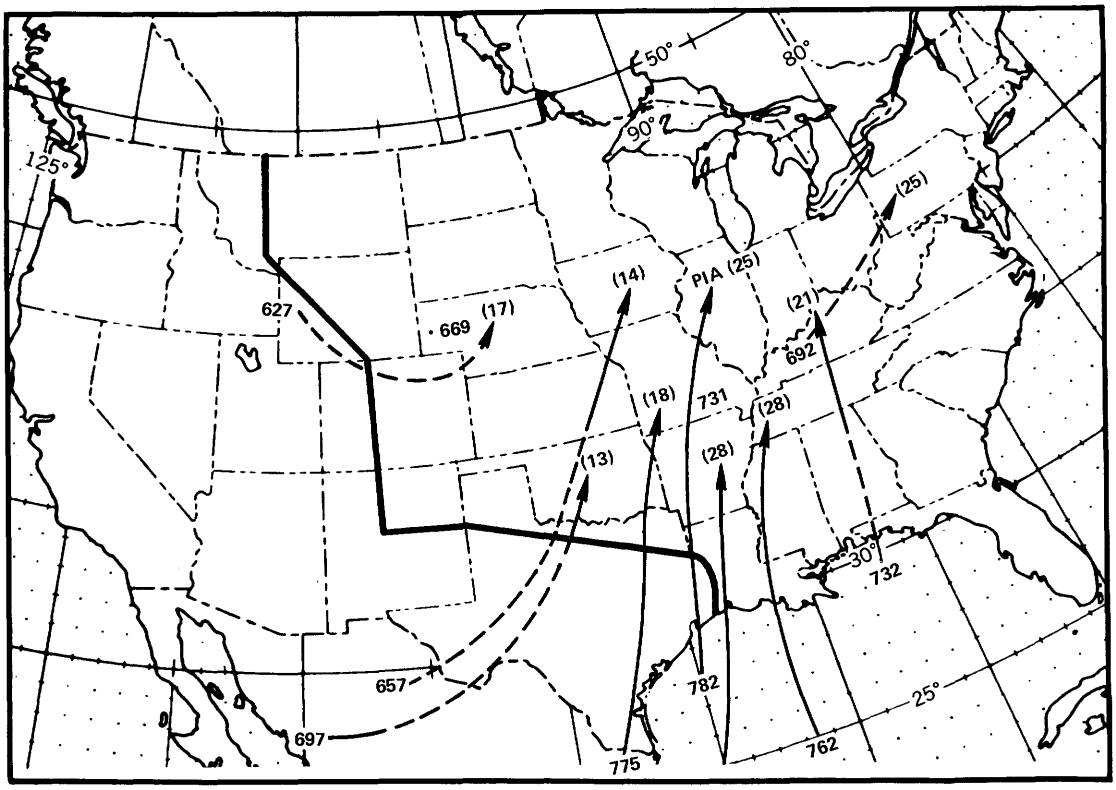


FIGURE 37.—Map showing 24-hour trajectories ending at 700-mb at 6:00 p.m. c.s.t., April 20, 1973.

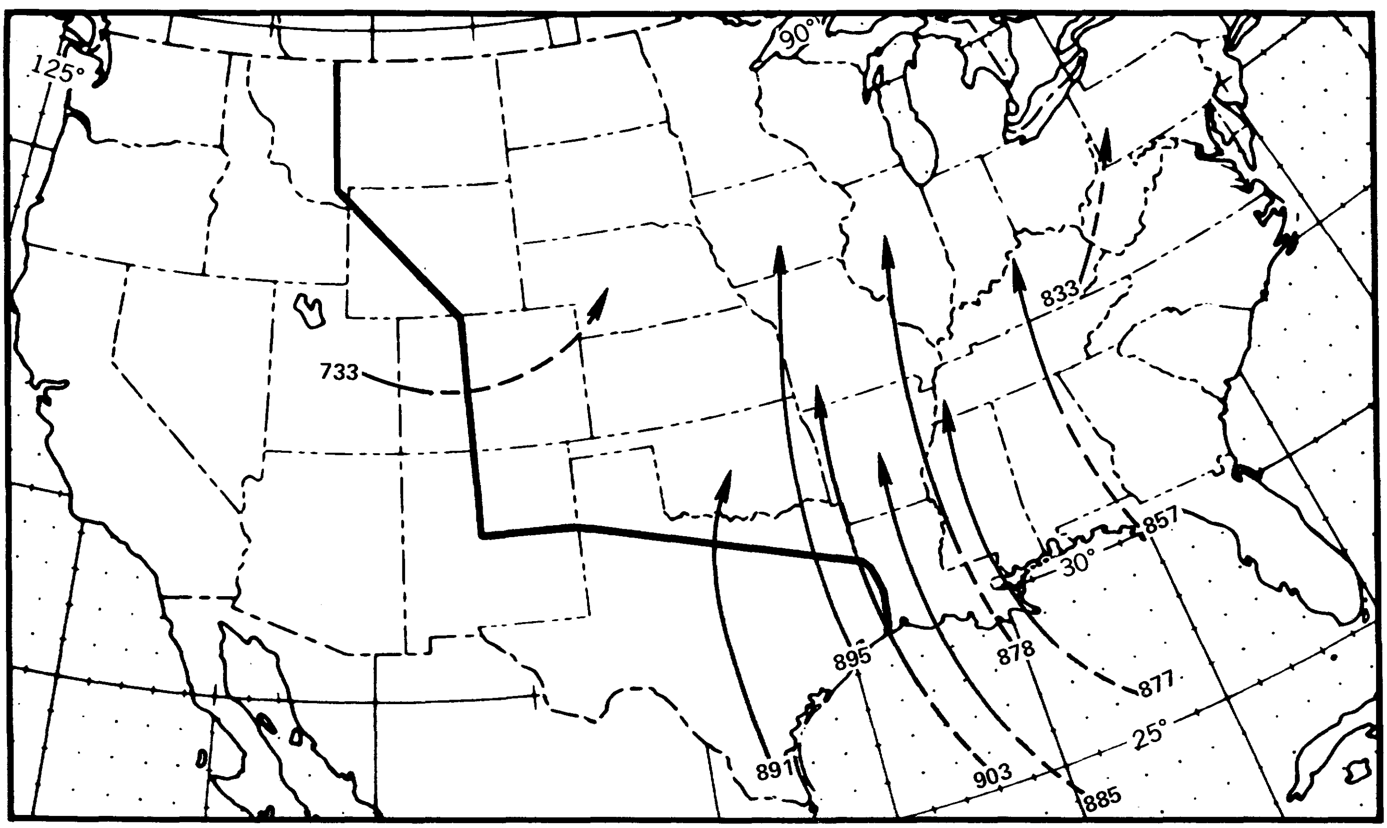


FIGURE 38.—Map showing 24-hour trajectories ending at 850-mb at 6:00 p.m. c.s.t., April 20, 1973.

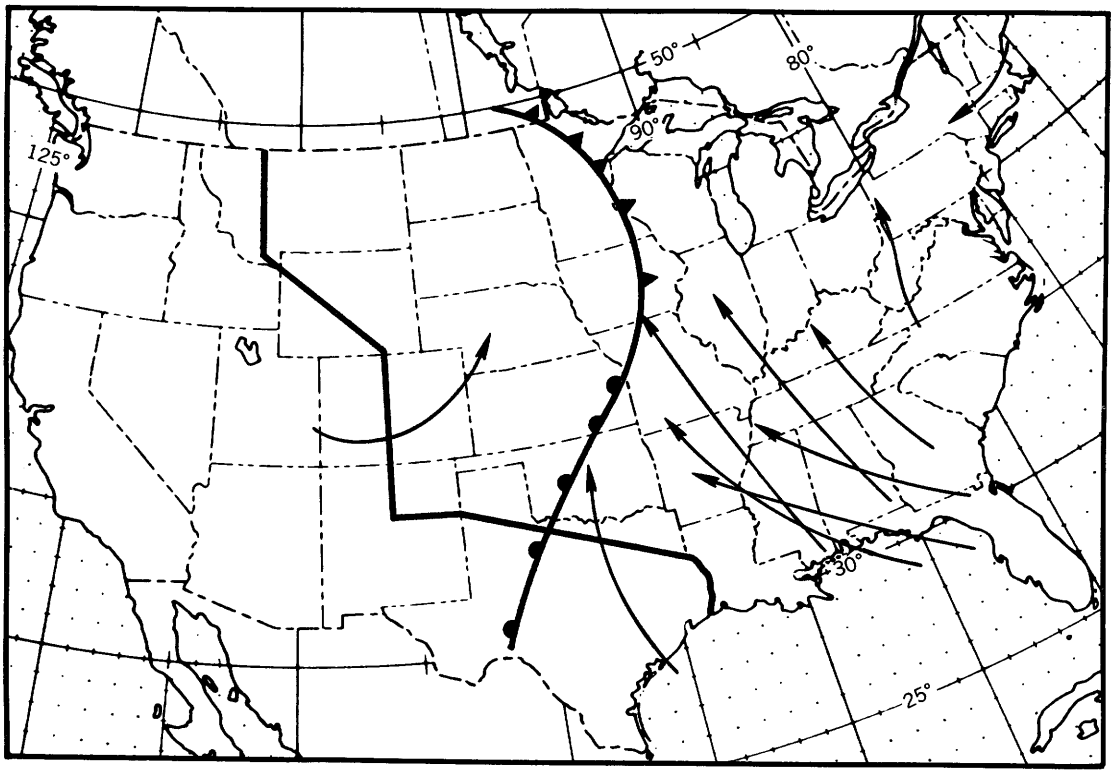


FIGURE 39.—Map showing 24-hour surface trajectories ending at 6:00 p.m. c.s.t., April 20, 1973.

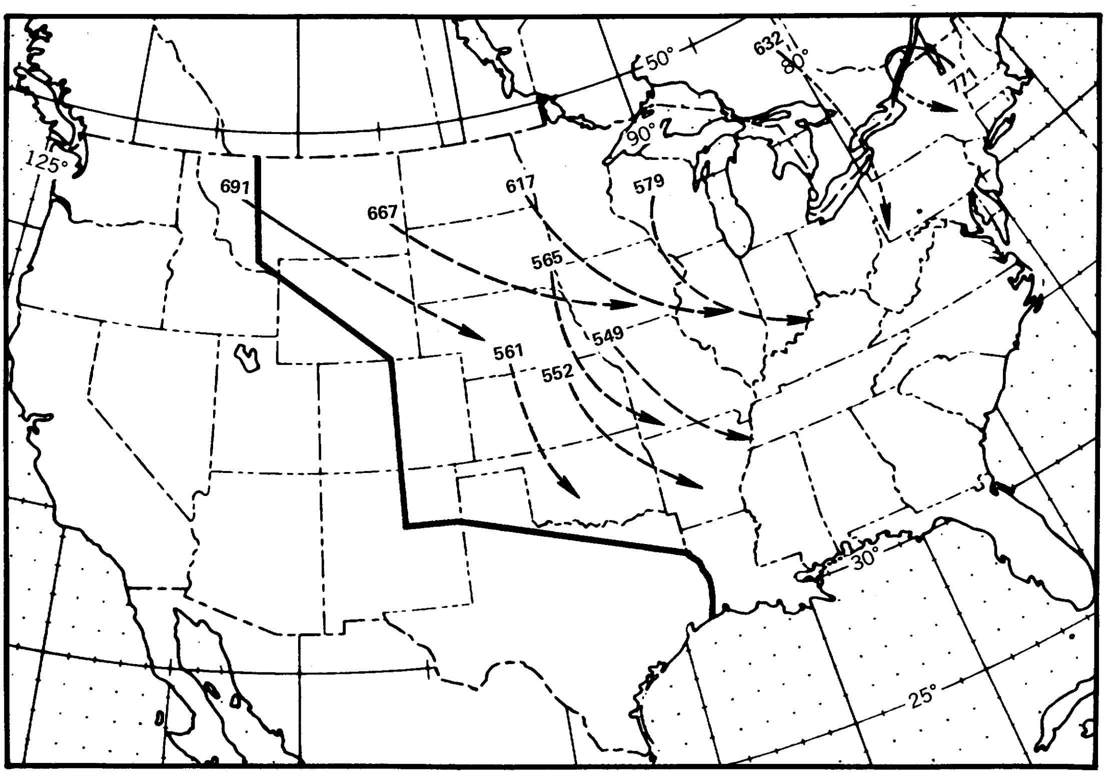


FIGURE 40.—Map showing 24-hour trajectories ending at 700-mb at 6:00 p.m. c.s.t., April 5, 1973.

point, $X_1(t)$; δt equals 2 hours. An improved second-guess upwind location is given by

$$X_3(t-\delta t) = X_1(t) - \tfrac{1}{2}[U_2(t-\delta t) + U_1(t)]\delta t \quad (3)$$

where $U_2(t-\delta t)$ is the interpolated value of U at the first guess point. Successive iteration of (3) is performed by replacing $U_2(t-\delta t)$ by $U_3(t-\delta t)$, and so forth, until the computed positions converge within prescribed limits. The winds used are forecast winds generated by the operational National Meteorological Center Six-Layer Primitive Equation Model. In essence, the trajectories are calculated through a process of "reverse advection."

ASSOCIATED SYNOPTIC CONDITIONS

A few pertinent synoptic conditions at 6:00 a.m. c.s.t., April 20, are summarized in figure 42. The polar jet axis (J) and the low-level jet axis (LJ) were obtained from 300-mb and 850-mb isotach analyses, respectively. The polar jet (low-level jet) represented windspeeds of 70–110 (35–60) knots at the 300- (850-) mb level. The extent of the moist air tongue was inferred from the surface dew-point temperature and the 850-mb dew-point depression and adjusted by the average relative humidity from surface to 500 mb. A dry layer was in the middle troposphere, as shown by the 6:00 a.m. c.s.t., April

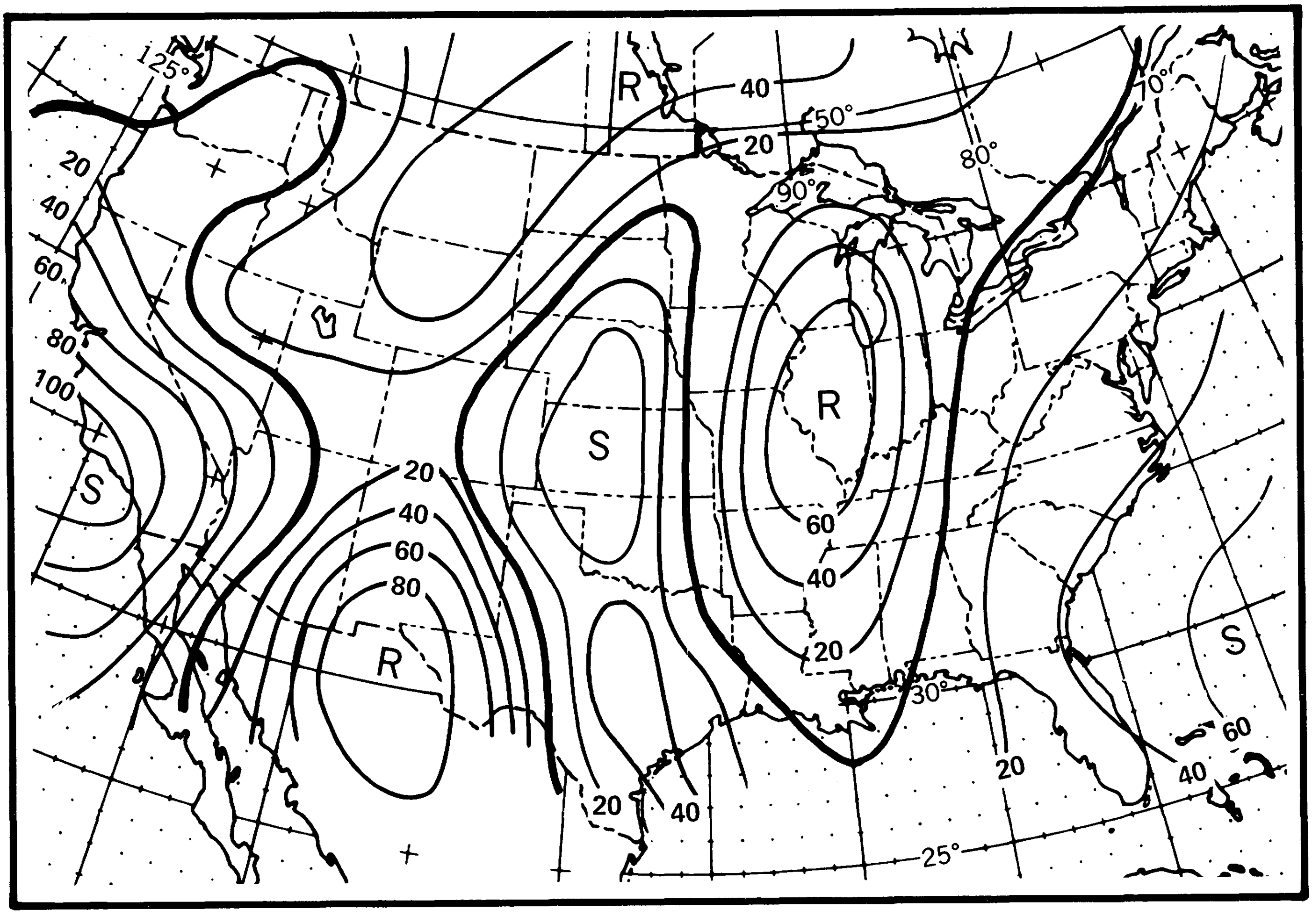


FIGURE 41.—Map showing 12-hour net vertical displacement of air parcels reaching 700-mb at 6:00 a.m. c.s.t., April 21, 1973.

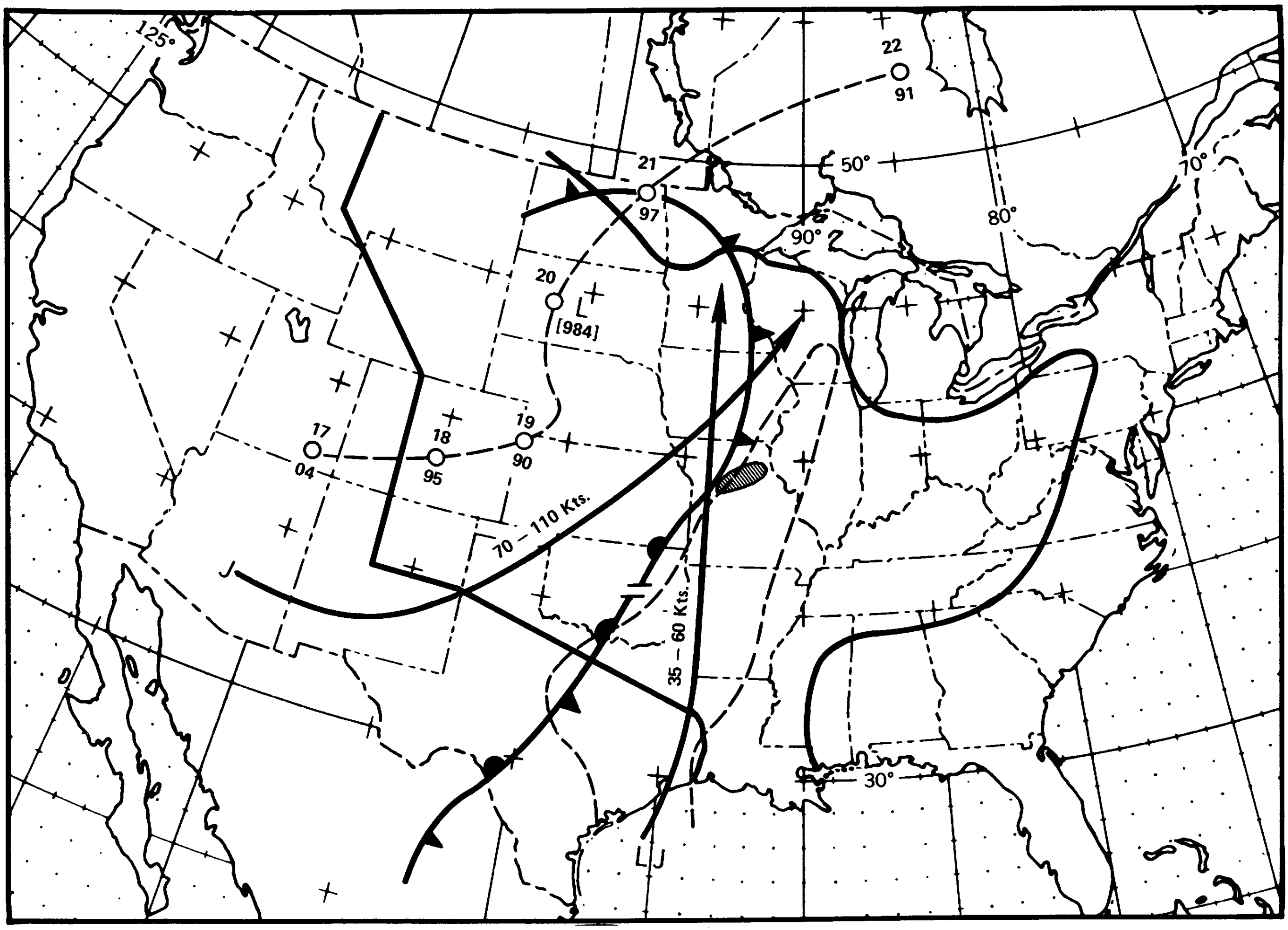


FIGURE 42.—Some synoptic features at 6:00 a.m. c.s.t., April 20, 1973, before the inception of a small line in northern Missouri.

20, sounding at Little Rock, Ark. (fig. 44). The wind there veered with height and reached 53 knots (98 km/hr) at 500 mb. It is known that severe storms are most likely to break out near the intersection of the projections of the two jet axes and near the west side of the moist air tongue. A squall line developed over northern Missouri 9 hours later. Heavy rainfall around Moberly, Mo., began about 7:00 p.m. c.s.t.

Analyses for precipitable water and lifted index valid for 6:00 a.m. c.s.t., April 21, are shown in figure 43. It can be seen that the basin was covered by relatively moist and unstable air with a lifted index less than four.

The 12-hour persisting dew-point temperature ending 6:00 a.m. c.s.t., April 21, at Columbia, Mo., was 62°F (16.6°C) and should represent to a good measure the low-level moisture inflow into the storm because of the prevailing southerly wind. For comparison, the maximum 12-hour persisting dew-point temperature of record there in April was 69°F (18.8°C) (Environmental Data Service, 1968).

PROXIMITY SOUNDINGS RELATED TO THE STORM

The sounding for Little Rock, Ark., at 6:00 a.m. c.s.t., April 20, 1973 (fig. 44), showed an almost saturated surface layer extending to 850 mb, or about 1.5 km. Above 850 mb, the air became slightly less moist; then, it became very dry about 729 mb. This sounding had a Showalter Index of −6, indicating strong local static instability. Little Rock, Ark., was located in the moist tongue at that time (see fig. 42). The presence of an overlying dry layer is quite common during the stage of tropical maritime airmass intrusion into the basin and before widespread precipitation develops.

A station in the rawinsonde network reasonably close to the precipitation center at Moberly, Mo., is Peoria, Ill., 180 miles (290 km) to the northeast.

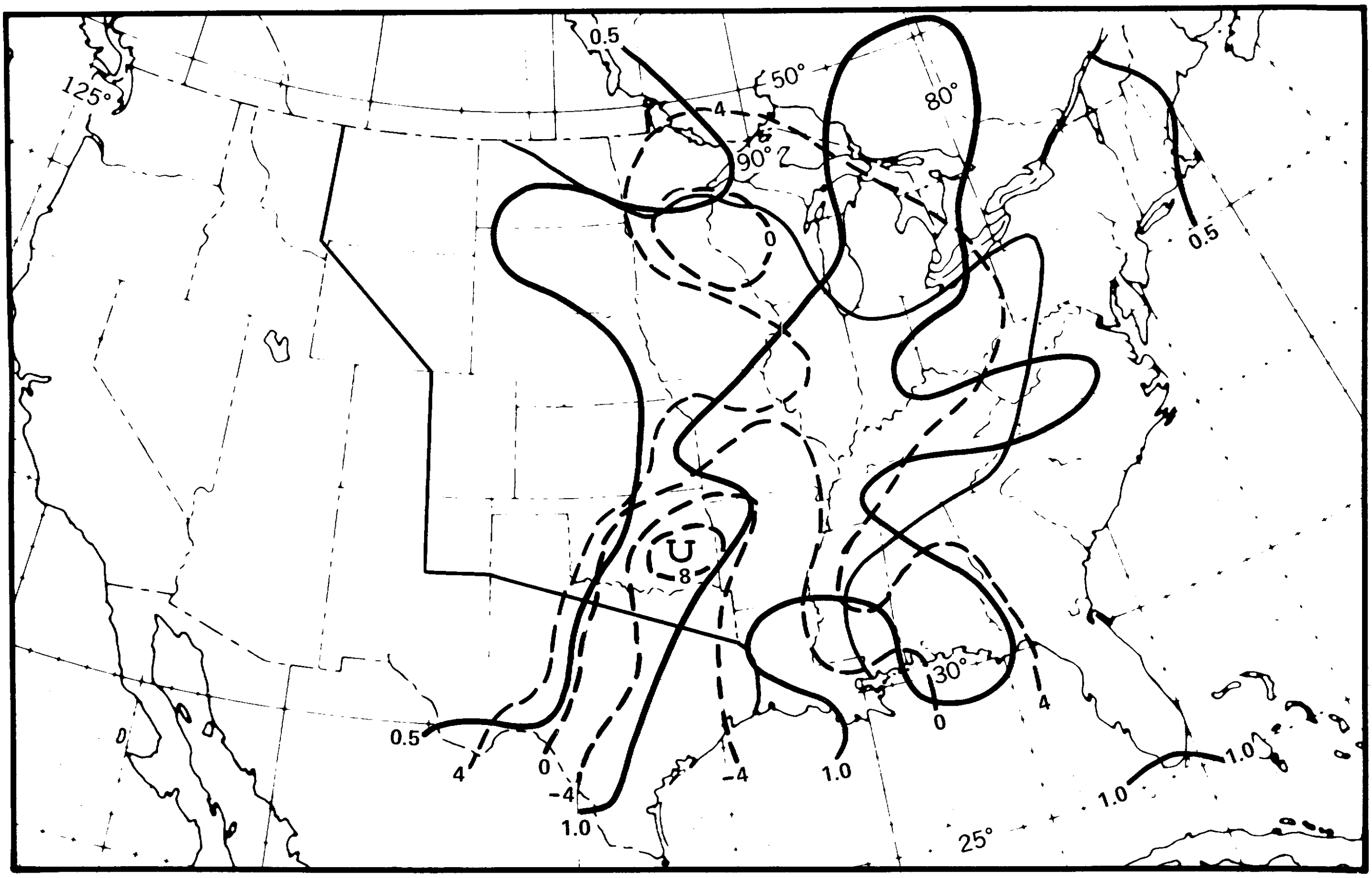


FIGURE 43.—Analysis of precipitable water from surface to 500 mb and lifted index for 6:00 a.m., c.s.t., April 21, 1973.

The sounding for Peoria at 6:00 p.m., c.s.t., April 20, is shown in figure 45. It shows a potentially unstable and moist surface layer extending to 850 mb, with an average relative humidity of 80 percent. This was capped by a relatively shallow stratus deck about 500-m thick. Above this lay a dry layer about 1,700 m in depth. Above the dry layer were cumulonimbus storm clouds extending from 650 mb up to 300 mb (the sounding was plotted up to 400 mb), approximately through a depth of 5.5 km. Total precipitable water was evaluated to be 1.44 in. (37 mm) compared to a corresponding climatological mean for April of 0.556 in. (14 mm) with standard deviation 0.292 in. (7 mm). In considering the precipitation potential of storm clouds, the relevant parameters are cloud thickness and temperatures at cloud base and top. These factors, as revealed by figure 45, provide favorable conditions for precipitation to occur if coupled with a convergent motion field at low levels. The cloud-base temperature of $-2°C$ still allows an adequate in-cloud liquid water content. The considerable cloud depth of 5.5 km furnishes a convenient setting for collection processes to proceed. A cloud top at a temperature of $-40.1°C$ insures the presence of ice crystals there. At 500 (450) mb, where the cloud temperature was $-11°C$ ($-18°C$), saturation with respect to water corresponded to a supersaturation of 11 (15) percent over ice.

The number of atmospheric ice nuclei active per unit volume could be expressed as approximately proportional to exp (ΔT); here, ΔT is the degree of supercooling. At a temperature of $-18°C$ at the 450-mb level of this sounding, a reasonable estimate was that, on the average, active ice nuclei were present at a concentration of one in several tens of litres of atmosphere. With the existence of an environmental supersaturation of 15 percent, ice crystals would begin to be nucleated through the three-phase process. Once these ice particles reached a threshold size, accretion of supercooled water droplets through riming and aggregation of other ice crystals could proceed.

An actual cloud cover photograph for 12:00 m. (1800 G.m.t.), April 20, obtained by NOAA satellite, is shown in figure 46. The cloud band extending over the whole Mississippi stem generally coincided with

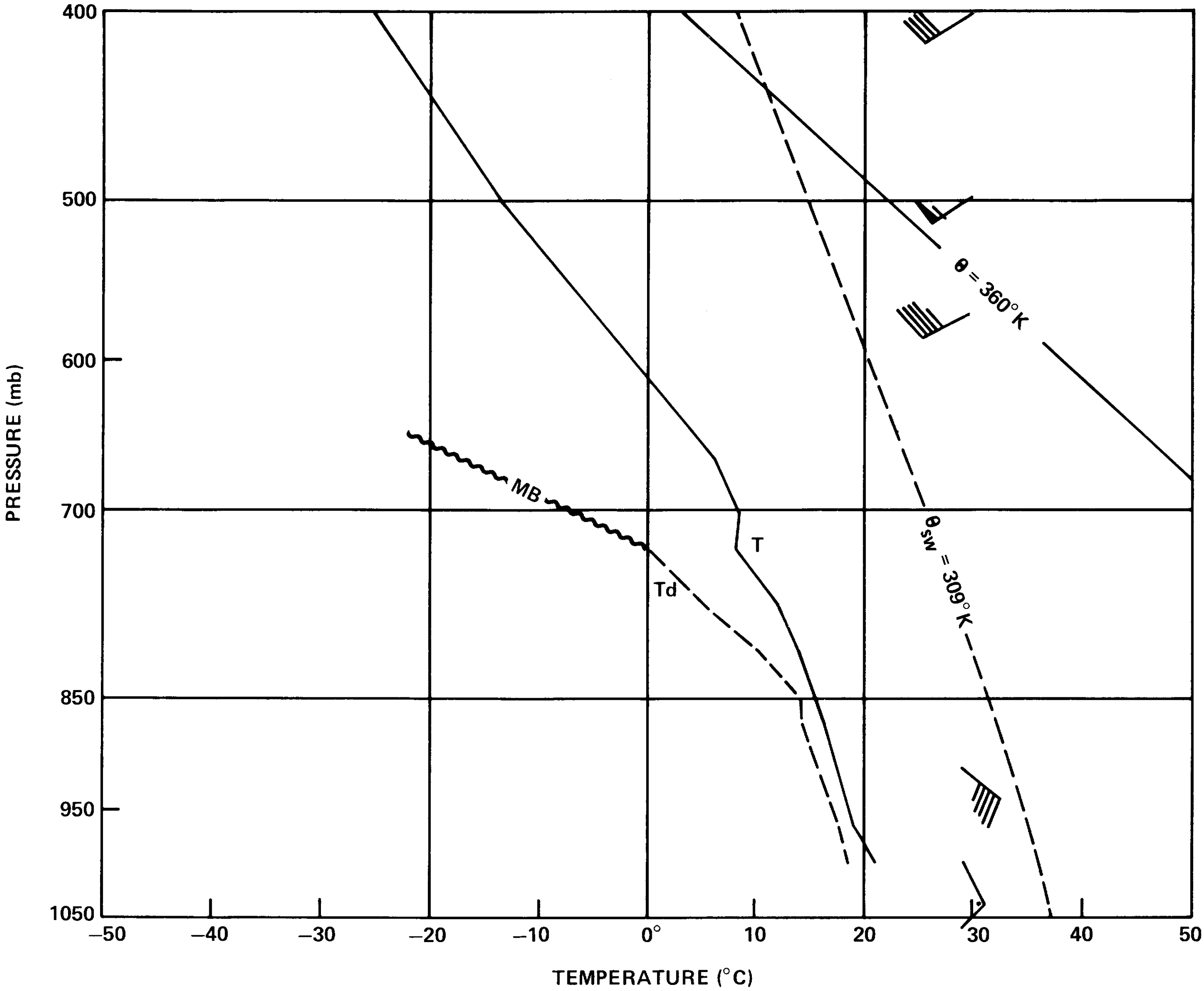


Figure 44.—Sounding for Little Rock, Ark., at 6:00 a.m., c.s.t., April 20, 1973.

regions of frontal activity, while the clear area to the west was associated with subsiding cold air mass.

POLAR JET AXIS AND PRECIPITATION CENTER

The relationship between polar jet stream and precipitation pattern has long been a topic of interest to many investigators. Smith and Younkin (1972) proposed a composite model relating the progression of the polar jet stream to areas of heavy precipitation in Central United States. They found that a valid model was the "digging" of the jet as it progressed eastward, and the most common area for heaviest rainfall was situated with its western edge about 250 n.mi. (nautical miles) (463 km) in advance of the jet position at the beginning of the 12-hour rainfall measurement period. In our study of the April 19–22 storm, the precipitation center in northern Missouri, together with the jet axes obtained from 300-mb isotach analysis, is shown in figure 47. The precipitation was accumulated in a 12-hour period from 6:00 p.m. c.s.t., April 20, to 6:00 a.m. c.s.t., April 21, 1973. The corresponding jet axis at the beginning of this period was marked "b" in figure 47. The western edge of the 4-in. (102 mm) isohyetal center was about 280 miles (450 km) ahead of axis b. The jet axis, instead of progressing as envisioned by Smith and Younkin's model, actually oscillated and stayed within a narrow belt from Texas to Iowa during a 24-hour period.

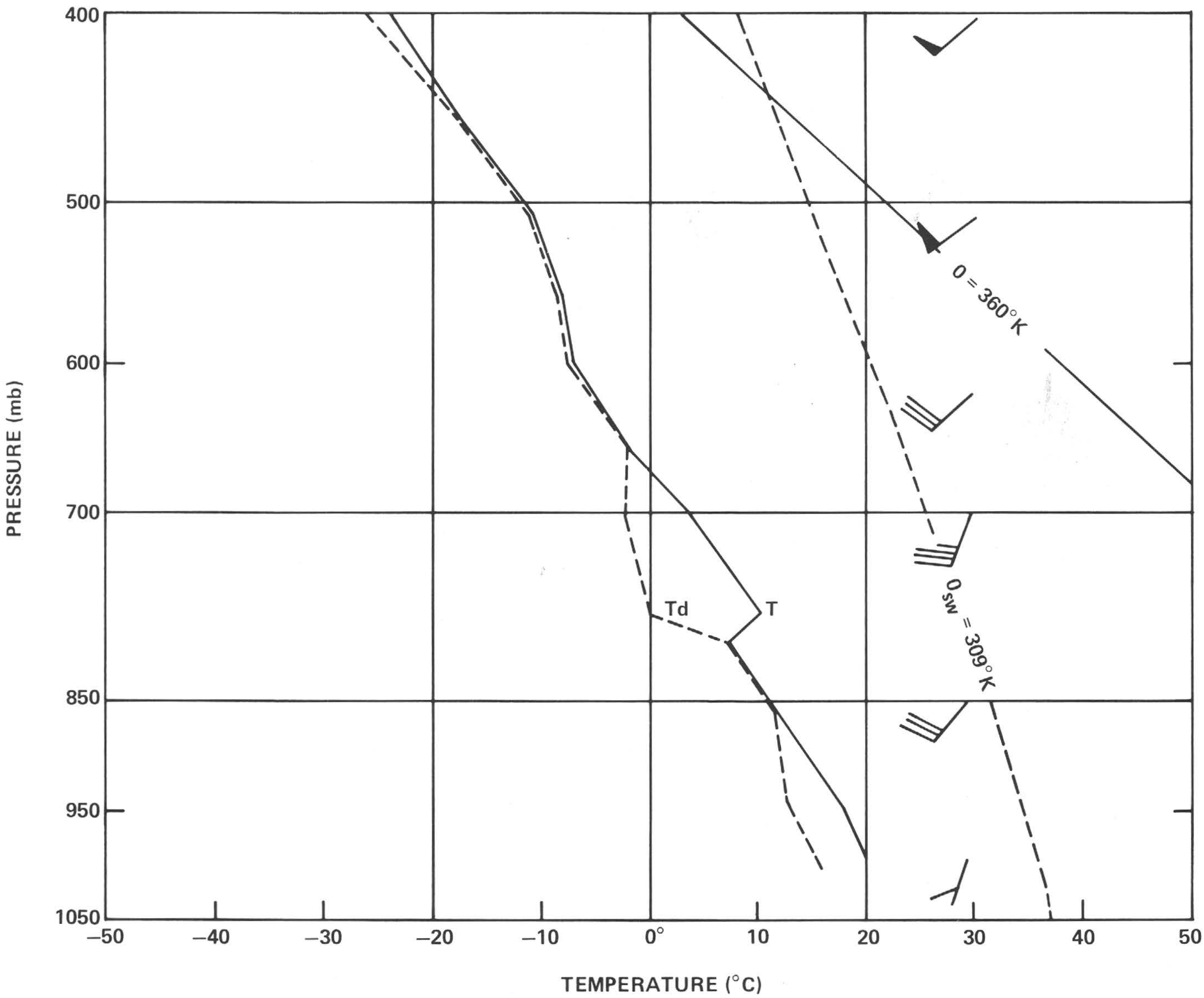


FIGURE 45.—Sounding for Peoria, Ill., at 6:00 p.m., c.s.t., April 20, 1973.

The presence of the jet axis implies the existence of a region in the vicinity with large vertical wind shear and high baroclinicity. A quasistationary jet, in turn, means that this region is subjected to persistent large upper tropospheric divergence and strong midtropospheric vertical motion and therefore is favorable for cyclone development and consequent precipitation.

PRECIPITATION CENTERED AT MOBERLY, MO., AND IN OTHER LOCATIONS

Isohyetal analysis for the precipitation center in northern Missouri is shown in figure 48. Mass rainfall curves for Moberly Radio KWIX and three other recording gages are shown in figure 49. The isohyetal pattern had a northeast-southwest orientation approximately parallel to that of the quasistationary squall line and the front. Recorder traces at Higbee 7S, which is 15 mi (24 km) to the southwest of Moberly, shows that the most intense rate there was 1.75 in. (44 mm) in 30 minutes, between 10:00 and 10:30 p.m. c.s.t. on April 20. Across the pattern, precipitation amounts dropped off sharply. Columbia, Mo., located 30 mi (48 km) south of Moberly, received just 0.15 in. (4 mm) of rain in the 12-hour period ending 6:00 a.m. c.s.t., April 21.

Between 8:00 p.m. c.s.t., April 20, and 2:00 a.m. c.s.t., April 21, Moberly Radio KWIX received 7.1 in. (180 mm) of rain at an average rate of 1.2 in. (30 mm) per hour. Because the lifetime of an individual

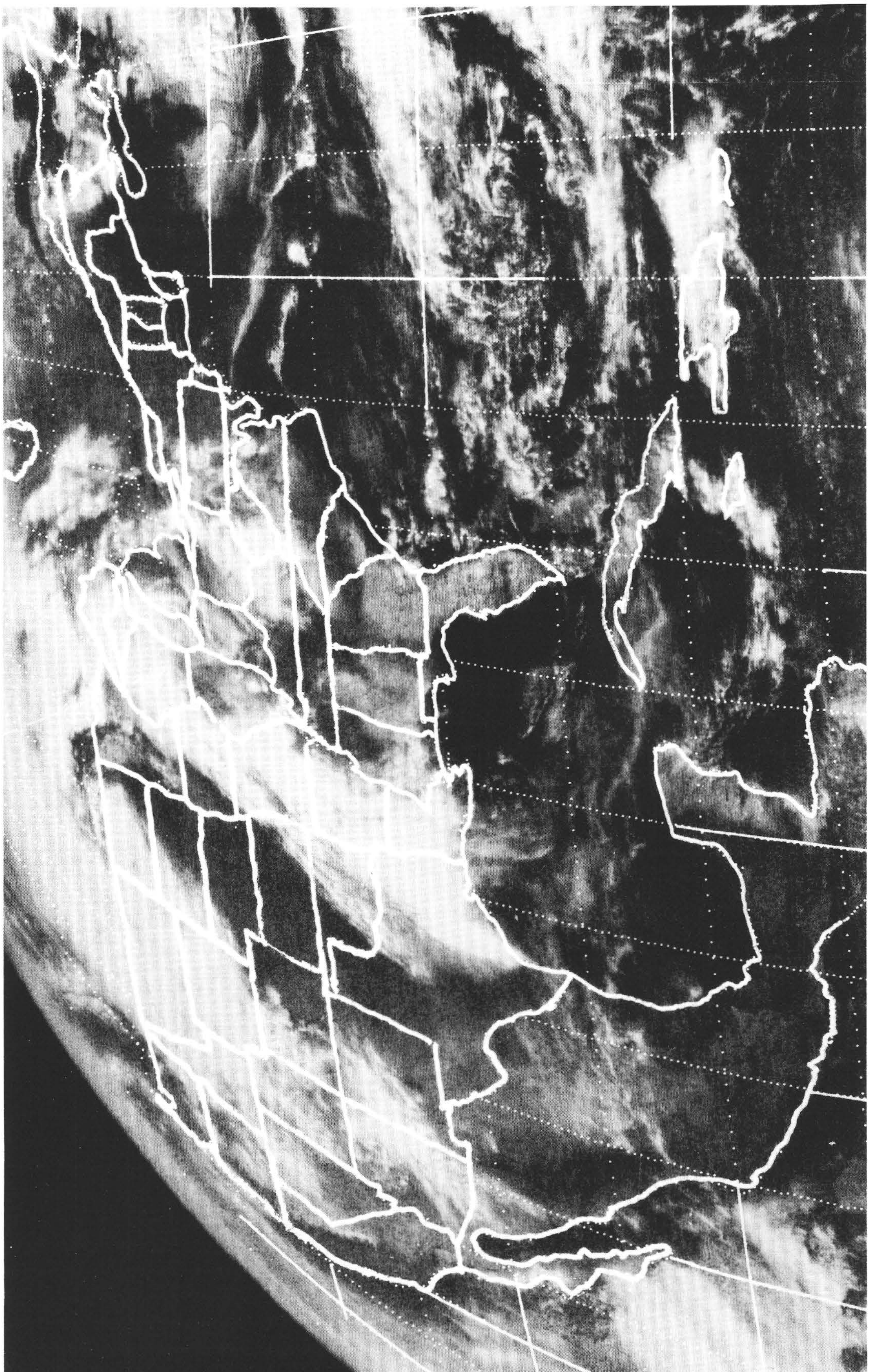


FIGURE 46.—U.S. cloud cover, April 20, 1973, 1800 G.m.t. from NOAA satellite photograph.

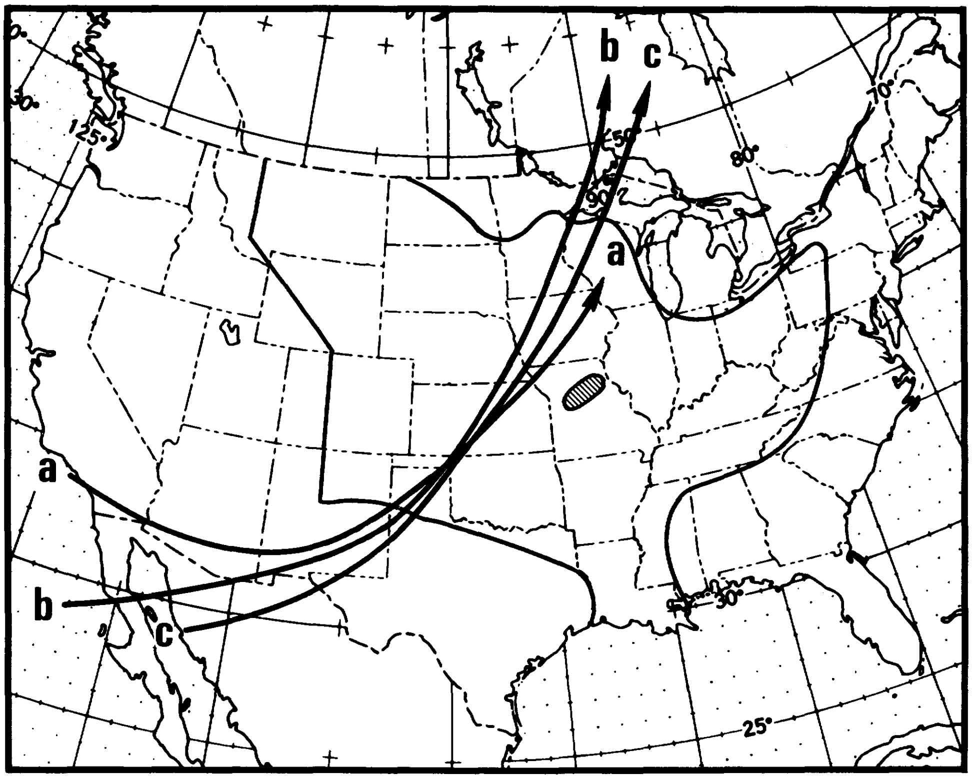


FIGURE 47.—Position of jet axis at (a) 6:00 a.m. c.s.t., April 20, 1973, (b) 6:00 p.m., April 20, 1973, (c) 6:00 a.m. c.s.t., April 21, 1973. Precipitation center in northern Missouri with more than 4 inches in 12 hours ending 6:00 a.m. c.s.t., April 21, 1973, also shown.

convective cell is on the order of half an hour, to maintain such a persistent rain shower for 6 hours, new cells must be generated as the old ones decay. The spreading out of the cold and gusty downdraft from the raining mature cell had the effect of a local cold front, lifting incoming warm air from the south to condensation and releasing its potential instability to trigger further vertical growth into a full-blown new cell.

A complete depth-area-duration analysis for this storm has not been made at this time. A comparison between the observed point rainfall at Moberly Radio KWIX and the maximum average depths of rainfalls for 10 mi^2 (26 km^2) areas and various durations for past significant storms over an area within 200 mi. (322 km) from Moberly, Mo., however, is presented (table 5). A significant storm is defined here as one with the 6-hour maximum average depth of rainfall over 10 mi^2 (26 km^2) exceeding 7 in. (178 mm). These were compiled from historical files of the U.S. Army Corps of Engineers together with National Weather Service update data. All the storms listed were extratropical cyclones not associated with hurricane passage. It is evident that the amount of rainfall of the Moberly storm was frequently exceeded in comparison, but it is most interesting to observe that it is exceptional for a storm to occur there in the spring season with such magnitude.

A comparison of this storm with the Illinois model 12-hour storm is presented in table 6. This is justified on the grounds that Missouri and Illinois are in the same general climatic regime. The Illinois model storm is a statistical composite for the characteristics of 12-hour periods of maximum rainfall in the 10 most severe rainstorms occurring in Illinois mostly in the summer during a 10-year period (Huff and Changnon, 1964). For the Moberly storm, its 12-hour features from 7:00 p.m. c.s.t., April 20, to 7:00 a.m. c.s.t., April 21, 1973, were used in this comparison. The winds aloft associated with the Moberly storm were more southerly and stronger. The higher positive departure of the dew point is a reflection of the greater variability of dew points in the spring season as compared with the predominantly summer season data of the Illinois storm. The synoptic scale dew-point departure and the inflow wind field measure the water vapor convergence into the storm and will affect the amount of precipitation. But precipitation amount is also dependent on the temporal and spatial distribution of the mesoscale storm vertical velocities which are not routinely measured. During the life cycle of the Moberly storm, the transient updraft profile could be such that a considerable proportion of the condensed liquid water was carried to the cloud-top divergence field and eventually reevaporated without further participation in the precipitation process. This offers a plausible explanation for its apparent lower precipitation efficiency compared with that of the Illinois model storm. It is interesting to note, however, that for both cases maximum rain occurred around midnight, when diurnal heating effect was completely overshadowed by storm dynamics.

Moberly, Mo., with an elevation of 850 ft (259 m) above mean sea level, is situated on a gentle ridge that separates the drainage basins between the Mississippi and Missouri Rivers. The surrounding regions are relatively flat. The steepest terrain gradient is towards the southeast, where the elevation changes at an average slope of less than 1/1,000. Hence, it seems unlikely that orography could have had any significant effect in the distribution of storm precipitation in this case.

In addition to the heavy rain in northern Missouri, the storm also brought widespread heavy precipitation over the basin, as can be verified by the isohyetal maps (pls. 1–3). The northern Plains region,

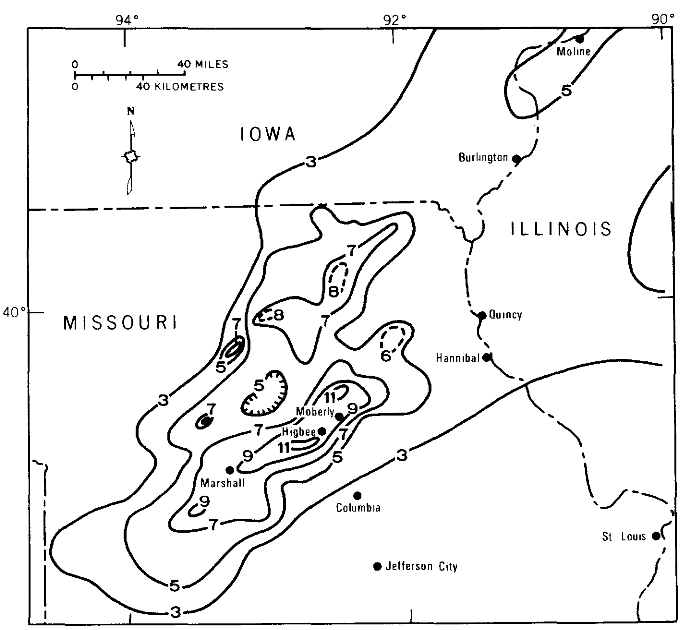


FIGURE 48.—Total storm rainfall April 19–22, 1973, near storm center at Moberly, Mo., showing area with 2 inches or more rain.

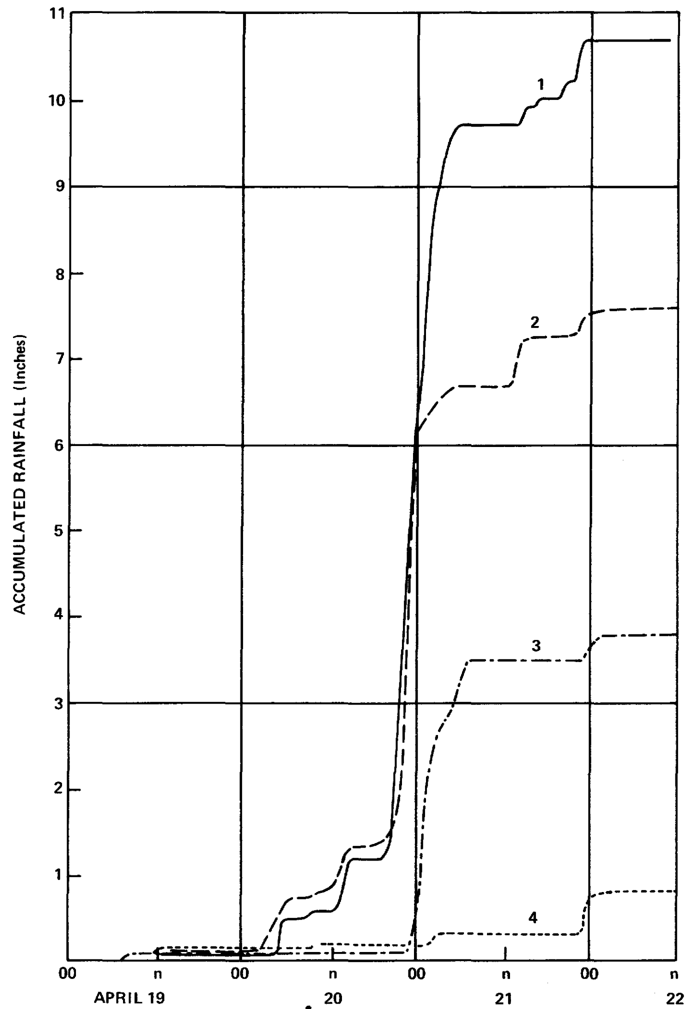


FIGURE 49.—Mass curves of rainfall for (1) Moberly Radio KWIX, (2) Higbee 7S, (3) Hannibal Waterworks, and (4) Columbia WSO for April 19–22, 1973.

which was generally under the cold airmass, received heavy rain from April 19 to April 21; Shonkin 7S, Mont. (47°32′ N., 110°35′ W.), had 3.10 in. (79 mm) of rain on April 20; Bowman 11SE, N.D. (46°02′ N., 103°18′ W.), had 1.78 in. (45 mm) on April 19; Faith 2W, S. Dak. (45°02′ N., 102°05′ W.), had 2.24 in. (57 mm) on April 19. These three amounts represent the greatest 1-day precipitation in April 1973 for Montana, North Dakota, and South Dakota, respectively. However, the heaviest precipitation occurred in the warm sector region under the intruding tropical maritime airmass. For example, Clinton 2N, Wis. (42°37′ N., 88°52′ W.), recorded 4.39 in. (112 mm) of rain on April 21. Keosauque, Iowa (40°44′ N., 91°58′ W.), had 4.20 in. (107 mm) on the same day. St. Charles, Ark. (34°23′ N., 91°08′ W.), had 9.18 in. (23 cm) on April 20; Hickman 1E, Ky. (36°34′ N., 89°10′ W.), had 5.22 in. (133 mm)

TABLE 5.—*Comparison of past significant storm rainfalls* [1] *within a 200 mile radius of Moberly, Mo.,*[2] *with the observed rainfall at Moberly Radio KWIX in the storm of April 19–22, 1973*

Date of storm	Area	Precipitation center	Maximum average depth (in.) for 10-square-mile area for duration (hr)			
			6	12	24	48
July 6–7, 1898	Iowa, Nebr., Mo	Blanchard, Iowa	7.4	12.5	12.5	---
July 7–8, 1898	Ill., Mo	Edgehill, Mo	8.0	8.0	8.3	---
Aug. 22–26, 1906	Kans., Mo	Warsaw, Mo	7.8	8.5	8.6	9.1
July 13–16, 1907	Nebr., Mo	Nemaha, Nebr	7.8	8.0	10.8	11.1
Sept. 6–9, 1915	Kans., Mo	Moran, Kans	8.1	10.3	10.3	11.2
July 9–12, 1922	Ill., Iowa, Mo., Kans	Grant City, Mo	10.8	12.1	12.2	12.5
Sept. 11–26, 1926	Kans., Nebr., Iowa, Mo	Neosho Falls, Kans	13.4	13.7	13.9	13.9
Aug. 7–8, 1927	Kans., Mo	Caplinger Mills, Mo	7.6	7.8	7.8	---
June 28–29, 1933	Iowa, Ill., Mo	Gorin, Mo	7.5	8.2	9.0	---
June 3–4, 1943	Mo., Kans	Ballard, Mo	9.0	10.1	10.9	---
June 25–26, 1944	Ill., Iowa, Wis	Oxford Junction, Iowa	9.9	9.9	11.0	---
Aug. 1–2, 1944	Mo	Begnell, Mo	8.2	8.7	9.1	---
July 16–18, 1946	Iowa, Mo	Jerome, Iowa	8.7	9.2	10.0	---
Aug. 12–15, 1946	Kans., Mo	Cole Camp, Mo	10.6	11.0	15.0	19.0
June 2–7, 1947	Iowa, Mo	Browning, Mo	7.1	7.2	7.5	8.2
June 18–23, 1947	Ill., Iowa, Mo., Kans	Holt, Mo	11.5	11.5	11.5	12.6
July 17–20, 1965	Mo., Kans., Iowa, Nebr	Ridgeley, Mo	11.7	13.1	17.7	19.9
Apr. 19–22, 1973	Mo., Ill., Iowa	Moberly Radio KWIX, Mo	[3] 7.1	[3] 8.5	[3] 9.5	[3] 10.8

[1] Obtained from U.S. Army Corps of Engineers and updated with National Weather Service data.
[2] Only major storms with precipitation centers within 200 miles from Moberly, Mo., storm durations longer than 24 hours, and maximum average precipitation depths for 10 square miles in 6 hours exceeding 7 inches are included.
[3] Observed rainfall in inches at maximum station.

TABLE 6.—*Comparison of the April 20–21, 1973, storm near Moberly, Mo., with the Illinois model 12-hour severe rainstorm*

Parameter	Moberly storm	Illinois model
Squall line orientation, degrees	220–040	255–075
Orientation of surface isohyetal pattern, degrees	245–065	265–085
850-mb wind; degrees, knots	210, 40	245, 30
700-mb wind; degrees, knots	215, 50	255, 30
500-mb wind; degrees, knots	220, 70	270, 30
Surface dew point, departure from normal, °F	+18	+9
Starting time of rain, c.s.t	7:00 p.m.	7:00 p.m.
Time of maximum rain, c.s.t	10:00 p.m.	9:30 p.m.
	2:00 a.m.	3:30 a.m.
Maximum 12-hour point rainfall, inches	8.5	9.4

on April 19: Covington 1W, Tenn. (35°34′ N., 89° 40′ W.), had 5.62 in. (143 mm) on April 20; and La Porte, Ind. (41°36′ N., 86°43′ W.), had 2.95 in. (65 mm) on April 22. All these represent the greatest 1-day precipitation in the month of April 1973 for these States. It is evident that April 19–22 was indeed a very stormy period. Areas receiving 2 in. (51 mm) or more precipitation during the 7-day period April 16–22, 1973, are shown in figure 50. The critical placement of heavy precipitation in the Central Mississippi Valley along the main stem contributed materially to the subsequent record flood crests passing down the Mississippi River. The Low finally moved to northeast Canada by 7:00 a.m. e.s.t., April 22. But the diffused remains of a foot-dragging frontal zone extending from Texas to New England lingered on, along which frontogenesis was soon to start again.

ESTIMATION OF WATER LOSS IN THE MISSISSIPPI BASIN IN SPRING 1973

The transformation of liquid water from the surface into water vapor in the atmosphere constitutes a vital link in the hydrologic cycle. Atmospheric water vapor is being replenished continuously either by direct evaporation from soil and free water surface or by transpiration through leaves of vegetation. This return flow is the reverse process of precipitation and will determine to a large extent the part of the total precipitation available for runoff and ground-water recharge over a time and space scale appropriate to the Mississippi basin flood of spring 1973. It is no accident that major floods are not as frequent in the Mississippi Valley in the summer, which is the season of maximum water loss. Therefore, in considering the meteorological setting of this flood, a discussion of the water-loss process is justified.

Evapotranspiration is the term used to describe the combined process of evaporation and transpiration. But the former is a physical process, whereas the latter involves plant biological functions and is very difficult to measure. Accordingly, the integrated effects of these two processes as related to the flood episode will be discussed separately for convenience.

The rate of transpiration depends on many factors. A relatively warm air environment, low relative humidity, breezy winds, bright sunlight, and moist soil are factors favorable to the transpiration process. For most plants, highest transpiration occurs during midday and early afternoon and drops off sharply as incident solar radiation becomes unavailable. In

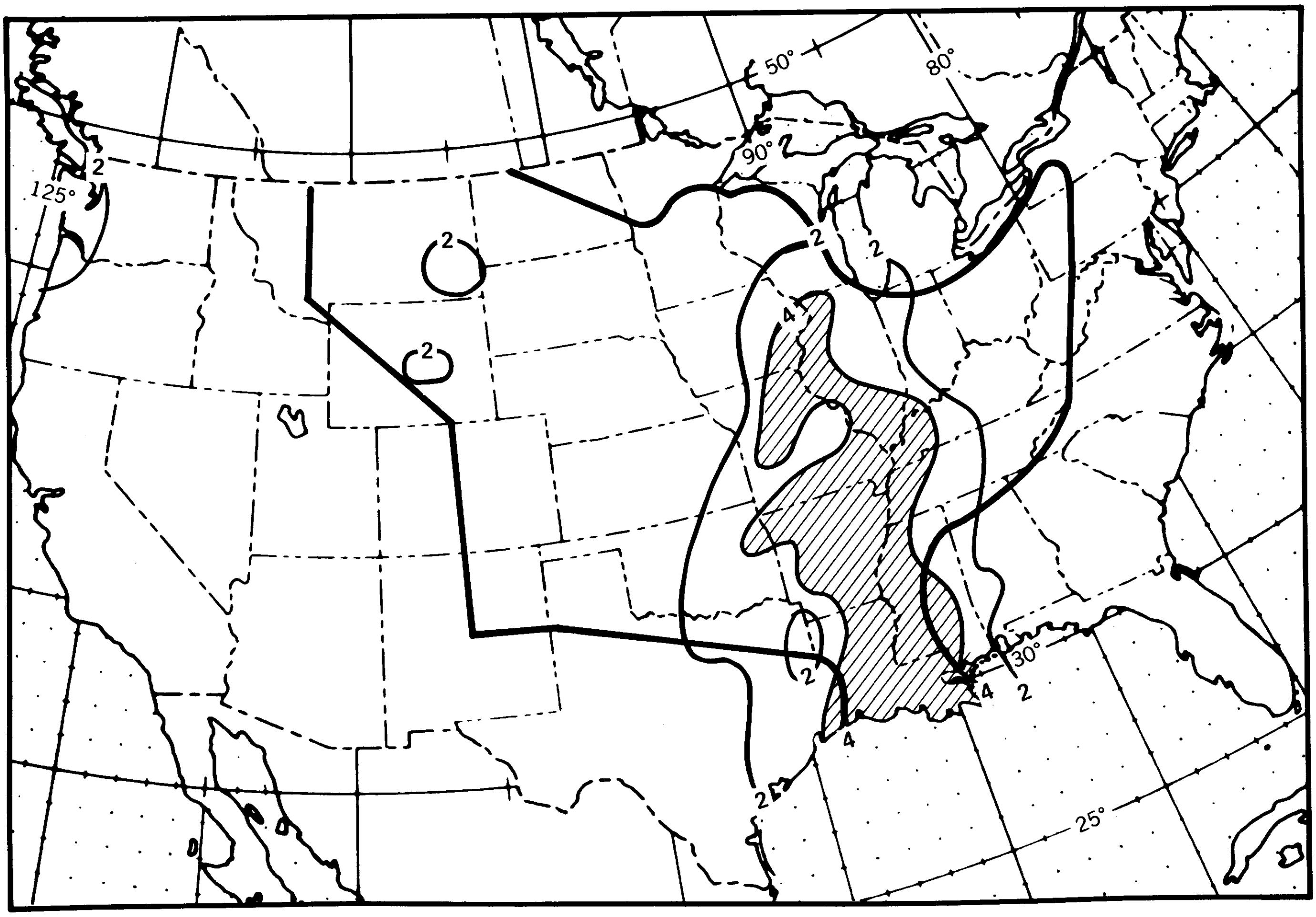


FIGURE 50.—Total rainfall April 16–22, 1973, showing areas with 2 inches or more rain.

March and April 1973, incident solar radiation at the surface over the basin was much less than normal; mean surface temperature over the whole basin averaged above (below) normal in March (April) 1973. There was also excessive soil moisture and higher than normal relative humidity. These conflicting influences on transpiration rate indicated that there was no reason to assume that the transpiration water loss during the flood episode would be very different from other years if vegetation acreage in the basin were essentially the same.

Agricultural land covers a major part of the Mississippi basin; and because of the onset of the flood, spring planting throughout the basin was disrupted and crop acreage was cut sharply below normal (Environmental Data Service and Statistical Reporting Service, 1973). For example, at the end of April 1973, Louisiana had 20 percent corn and 40 percent rice acreage planted compared with 85 percent and 80 percent respectively at the same time the year before. Mississippi had less than 2 percent cotton acreage planted compared with 55 percent the year before. Arkansas had no cotton planted, whereas the normal was 33 percent, and 5 percent rice acreage seeded, whereas the normal was 67 percent. Oklahoma reported 15 percent barley and 9 percent oats headed; in 1972, it was 51 percent and 43 percent respectively. Missouri only had one twenty-third of the corn acreage and 8 percent of the oat acreage of 1972. Kansas had 67 percent oat seeded compared with a normal of 97 percent. Illinois just started corn planting. Indiana had only one-third of the normal acreage of oats seeded. Ohio had oat seeding 30 percent completed compared with a normal of 75 percent. Water was reported standing in many midwestern fields. Farm animals were dying from exhaustion due to not getting adequate rest on the cold wet ground. There were also scattered reports of flood damage to crops already on the ground. A considerable part of low-lying farmland along the Mississippi and its tributaries was still under water toward the end of April. These facts all testified to the drastic reduction of crop acreage in the Mississippi basin at that time. It seems likely as a consequence that the integrated transpiration loss during the flood episode over the basin could be less than normal.

The evaporation process derives its basic driving energy from the radiation balance of the evaporating surface; at the same time, it is a mass transfer process with a rate determined by the vapor pressure gradient near the surface and the windspeed just above. This rate can be described by the following equation by Kohler and Parmele (1967):

$$E=\frac{(Q_{ir}-\epsilon\sigma T_a^4)+E_a[\gamma+4\epsilon\sigma T_a^3/f(u)]}{\Delta+[\gamma+4\epsilon\sigma T_a^3/f(u)]} \tag{4}$$

where:

E = evaporation rate
Q_{ir} = difference between incident and reflected radiation over all wavelength
ϵ = emissivity of water surface
σ = Stefan-Boltzmann constant
T_a = air temperature (at screen height)
γ = psychrometric constant
Δ = $(de_s/dT)_{T_a}$
E_a = $f(u)[e_s-e_a]$
$f(u)$ = wind function
e_s = saturation vapor pressure at air temperature at screen height
e_a = vapor pressure of air at screen height

The wind function is of the form $(a+bu_z)$; a and b are empirical constants; u is total wind movement per day; and z is the anemometer height.

The interpretation of equation (4) is that evaporation has an energy component which is a function of radiation balance and an aerodynamic component which is a function of saturation deficit and wind speed. Data availability does not permit an integration of equation (4) over the time and space domain corresponding to the flood episode. Instead, a general discussion is given.

Average incoming solar radiation received during March and April 1973 for a sample of stations in the basin is shown in table 7.

This was the radiation measured at the surface after depletion due to reflection, back scattering and absorption in the atmosphere but before surface reflection. The integrated surface albedo over the Basin in the spring of 1973 could be slightly smaller than normal due to the less extensive snow cover and the increased soil wetness. However, since the average daily insolation received at the surface was much less than normal, mainly due to the much higher than normal reflection by the more extensive cloud cover, it seems that a slight decrease in surface albedo would not be sufficient to alter the relative magnitudes between the resulting 1973 Q_{ir}'s and climatological Q_{ir}'s. Hence, it is reasonable to infer that the integrated Q_{ir} over the basin would also be considerably less than normal for these 2 months. The average temperature over the 2-month period in the Mississippi basin (figs. 10 and 11) should have been close to or slightly higher than normal. Therefore, in the spring of 1973, the contribution to evaporation in the Basin due to the radiation balance as represented by the first term in the numerator of equation (4) should be smaller than normal. Another important process that should be taken into consideration is the evaporation of rain drops. Once a drop falls through the cloud base, it would be subjected to increased evaporation before it reaches the ground. This problem was investigated by Kinzer and Gunn (1951) among others. The evaporation rate of freely falling water drops depends on the drop radius, the water vapor density gradient from a transition layer at drop surface to that of the environment, the density, viscosity, molecular diffusivity of the ambient air, the vertical velocity of the environmental air and the Reynolds number. Mason (1952) integrated one version of the condensational growth equation by assuming a constant updraft of 10 cm sec^{-1}, a ground temperature of 15°C and a lapse rate of 6.5°C km^{-1}. He was able to show that a small drop with an initial radius of 330μ falling from a cloud base at elevation 1,750 m through subcloud air with 80 percent relative humidity would have shrunk to a radius of 100μ when it reached the ground. This represented an evaporation of more than 97 percent of its original mass. However, this result must be regarded as a very favorable case for evaporation because of the larger surface-to-mass ratio of drizzle droplets compared with rain drops and the assumed updraft. Recent numerical simulations of rain drop evaporation with subcloud layer structure represented by the 6:00 p.m. c.s.t., April 20, 1973, sounding at Peoria, Ill. (fig. 45), a down draft of 1.5 m sec^{-1} and with ventilation effect taken into account, shows that for a rain drop of 1 mm radius initially located at the cloud base at a height of 1,300 m will take about 160 seconds to reach the ground, and the mass loss during descent amounts to 8 percent. The air below the cloud base would also be cooled due to the extraction of its internal energy to provide for a part of the latent heat consumed in drop evapora-

TABLE 7.—*Comparison of daily average solar radiation for March and April 1973 received at the surface with the climatic normal solar radiation* [1]

[Units of solar radiation are langleys per day]

Station	March 1973 average	March normal	April 1973 average	April normal	N [2]
Little Rock, Ark	271	364	323	449	19
Indianapolis, Ind	265	315	310	410	19
Omaha, Nebr	210	350	458	460	39
Bismarck, N. Dak	249	359	404	432	18
Oklahoma City, Okla	289	397	439	475	20
Rapid City, S. Dak	336	385	397	466	22
Nashville, Tenn	292	328	343	439	28
Oak Ridge, Tenn	262	330	328	430	21

[1] Obtained from Environmental Data Service and Statistical Reporting Service (1973).
[2] Number of years of data available in arriving at the normals.

tion. With the very large number of drops of various sizes involved in actual rainfall, the subcloud layer would be brought to saturation or near saturation by this process as the ambient vapor pressure, e_a, increases and approaches a reduced e_s corresponding to the wet-bulb temperature distribution of the subcloud layer. Hence, (e_s-e_a) and consequently the second term in the numerator of equation (4) would tend toward zero or be very small during rainfall. Since for the Mississippi basin as a whole the weather in March and April 1973 was characterized by a succession of prolonged rainfall, surface evaporation rates would be minimized.

Actual monthly total evaporation for a sample of Mississippi basin stations in March and April 1973, together with comparative climatological values, is shown in table 8. The choice of sample stations is dictated mainly by data availability. These data tend to support the aforementioned analysis. For example, 9 stations out of a total of 11 in March and 13 stations out of a total of 14 in April showed lower monthly evaporations than their respective climatic means. Combined as a single sample, a Wilcox pair-sample rank test indicated that if the null hypothesis that there was no substantial difference between the observed and the climatic values were true, then the probability was less than 0.00005 that such a predominantly one-sided departure could have happened by chance.

Some exceptions to the general pattern can be explained by the role of wind. For example, Stuttgart 9 ESE, Ark., which had a slightly higher than normal evaporation in April 1973, experienced a greater monthly total mind movement over the pan than any of the 24 antecedent Aprils in the climatic data set.

Since during the flood episode more than 12 million acres (485,640 sq km) of mostly cropland in the basin were inundated at one time or another, the effect that this increased free water surface would have on the integrated total evaporation should be examined. It is well known that evaporation from a free water surface may be less rapid than that from a moist soil under similar conditions because the soil with its multitude of irregular grains will present a larger evaporating surface. Since the newly formed free water surface covered mainly what should have been plowed and irrigated crop acreage, it seems that the flooding might lead to a lower evaporation loss than before.

When all these factors are considered, a reasonable conclusion is that integrated evaporation over the Mississippi basin seemed to be less than normal in March and April 1973. This is separate from and in addition to the possible reduction in transpiration loss mentioned earlier. These decreases might seem insignificant when compared with the large precipi-

TABLE 8.—*Comparison of evaporation in inches for March and April 1973 with climatic mean monthly evaporation* [1]

Station	March				April			
	E	Departure	Percent change	N [2]	E	Departure	Percent change	N
Blakely Mountain Dam, Ark	2.53	−0.78	−23.6	16	3.61	−0.89	−19.8	19
Stuttgart 9 ESE, Ark	4.64	+.86	+22.7	21	5.62	+.43	+8.3	24
Hope 3 NE, Ark	3.15	−1.10	−25.9	19	3.36	−1.60	−32.2	21
Carlyle Reservoir, Ill	---				4.48	−1.13	−20.1	9
Evansville, Ind	---				3.71	−1.32	−26.2	24
Fall River Dam, Kans	5.27	+.25	+5.0	17	6.43	−.97	−13.1	24
Torento Dam, Kans	3.27	−1.42	−30.2	11	6.28	−.10	−1.6	17
State University, Miss	4.45	−.21	−4.6	22	5.99	−.76	−12.7	24
Lakeside, Mo	---				3.67	−1.26	−25.5	23
Charles Mill Dam, Ohio	---				2.45	−.91	−27.1	23
Fort Supply Dam, Okla	4.45	−1.76	−28.3	17	6.74	−2.49	−27.0	24
Great Salt Plains Dam, Okla	5.25	−.96	−15.4	17	5.32	−2.50	−32.0	24
Hulah Dam, Okla	3.88	−1.50	−27.9	20	6.31	−1.04	−14.1	24
Witra Dam, Okla	3.55	−1.11	−23.8	22	---			
Jefferson City Evaporation Station, Tenn	2.72	−.15	−5.2	23	4.22	−.64	−15.2	24

[1] Obtained from Environmental Data Service (1973b) and historical Climatological Data.
[2] Number of years of data available in arriving at the normals.

tation amounts over the basin in the same period. However, because the soils were already fully saturated during the flood episode, any reduction in water loss would result in more runoff and contribute to the aggravation and prolongation of the flood. The absence of vegetation over large areas of low land tended to further facilitate runoff. This is one example of the feedback effect of hydrometeorological events.

SOME CONCLUDING REMARKS (METEOROLOGY)

The higher than normal streamflow over the northern central part of the basin at the beginning of March 1973 provided a setting for relatively high flood potential. However, the predominant cause of the flood was the frequent occurrence of widespread and persistent rain over the basin during the spring of 1973. These rainfalls were mainly associated with extratropical cyclones and frontal activities. The fundamental mechanism of cyclogenesis was the baroclinic instability of the meandering westerlies. These cyclones had as their basic source of energy the large-scale temperature contrasts between the tropical maritime airmasses frequently intruding into the basin from the gulf and the polar airmasses moving southeastward from Canada. Rainfalls from many such storms generally did not appear as unusual when compared with climatological annual extremes. However, their significance may increase appreciably if precipitation data were stratified by season. On occasions, thunderstorms and squall lines imbedded within the cyclone scale weather systems did produce localized significant individual precipitation, such as those over Victory, Tenn., on March 14–16 and over Moberly, Mo., on April 20–21.

The cyclone scale weather system represents a major response by the atmospheric circulation to the latitudinal net radiation imbalance that results in a surplus (deficit) of radiative heating equatorward (poleward) of about 37° latitude on an annual basis. This geophysical fact makes the poleward energy transport imperative, without which the high (low) latitude region would become progressively colder (warmer) year after year.

In the middle latitudes of the Northern Hemisphere, the required northward energy transport is carried out mainly through the agency of eddy fluxes manifested by cyclone scale weather systems and upper airwaves. A typical extratropical cyclone visiting the Central Mississippi basin in the spring can be represented by the storm of April 19–22, 1973. Associated with this storm was a strong warm tropical airmass intrusion into the basin through a deep layer extending at least above the 850-mb level and a cold polar air outbreak west of the front. At the same time, warm (cold) air was rising (sinking) (fig. 41). This positive correlation between the vertical velocity and temperature represents a conversion of available potential energy into kinetic energy. These storms, in essence, performed at least the functions of northward transport of energy, upward transfer of energy, and the conversion from potential into kinetic energy. Palmen (1961), based on a mean kinetic energy conversion rate of 20 watts m^{-2} for a typical polar front cyclone, estimated that five such cyclones north of lat 32° N. at any one time during the winter in the Northern Hemisphere were needed to achieve a reasonable mean rate of kinetic energy generation through the atmosphere. This is generally in agreement with synoptic observations.

Tracks of sea level cyclone centers in March and April 1973 (Environmental Data Service, 1973b) show that these 2 months were very stormy over the basin. This might seem to suggest that the northward energy flux and the kinetic energy generation over the basin could have been greater than normal during this period. A conceivable antecedent scenario, which would necessitate a more vigorous northward energy transport in the spring of 1973, could have been a farther southward than normal snowline over the northern regions of the continents and a higher (lower) than normal sky cover for the high (low) latitude regions in the preceding summer. But it should be emphasized that it is the net poleward energy transport integrated around a complete latitude circle that compensates for the latitudinal radiational imbalance. Because the Mississippi basin only extends over a 6-percent sector of the latitude circle at 37° N., the question whether the integrated poleward energy transport in spring 1973 was really higher than normal cannot be answered without hemispheric data, including energy transport data by ocean currents in both the Atlantic and the Pacific Oceans.

A recent study by Vonder Harr and Ort (1973) using the net radiation budget of the earth-atmosphere system from satellite measurements and atmospheric energy transport calculated from rawinsonde data indicated that the ocean played a much more important role in poleward energy transport than was formerly realized. For the Northern Hemisphere, the ocean transported 40 percent of the required energy in the region, 0°–70° N. This was the mean annual value so storage could be neglected in the calculation and balance relationships could be used. In view of this substantial role, any consideration of hemispheric poleward energy flux in March and April 1973 demands a detailed knowledge of poleward energy transport by oceans in the same period. The ocean storage of energy must also be known. Such information is not yet available.

The precipitation process is primarily controlled by atmospheric dynamics interacting with cloud microphysics. The extensive and persistent precipitation over the Mississippi basin in the spring of 1973 was, as mentioned earlier, associated with the numerous passages of extratropical cyclones and frontal activities. Spar (1973) carried out numerical experiments with the Mintz-Arkawa general circulation model and found that a sea-surface temperature anamoly of several degrees Celsius in the northern Pacific Ocean either persistent through a season or just 1 month would induce marked changes in the monthly and seasonal precipitation over Eastern United States. However, the magnitude of the sea-surface temperature anomaly required was much greater than that actually observed in the spring of 1973. Power spectrum analysis of meteorological time series by Sawyer (1970) disclosed the existence of large-scale atmospheric fluctuations with a time scale the order of a month. Such long-duration fluctuations in the motion field, as possibly exemplified by a blocking High over the eastern Pacific or a persistent trough over Western United States, would in turn affect the distribution of precipitation. A prolonged wet spell over a large area, such as that which occurred in March and April 1973 over the Mississippi basin, though very rare, could be expected to return in the future at irregular intervals.

A well-known proverb states that a picture is worth a thousand words. For the purpose of completing the documentation of the main features of the meteorological setting during the flood episode, daily isohyetal maps (pls. 1–3) and daily surface and 500-mb charts valid at 7:00 a.m. e.s.t. (1200 G.m.t.) are presented (pls. 4–9). Days on which no significant area in the Mississippi basin received 0.5 in. (13 mm) or more were omitted from plates 1–3, though these lesser amounts may also have contributed to the flood runoff.

DATA AT STREAM-GAGING STATIONS

Gaging station information included in this report was selected on the basis of outstanding peak floods, volumes, stages, or the availability of significant sediment data in drainage basins of all sizes. Figure 51 shows the location of the flood and sediment data collection sites. Detailed discharge data in table 12 (near the end of the report) make it possible to reproduce flood hydrographs for flood-control, sediment, and water-management studies. Some streams had normal discharges during part of the March through May base period; for these streams the periods of normal discharges are omitted and only flood data are presented.

Streamflow data included in table 12 of this report were generally obtained from automatic water-stage recording gages or readings of nonrecording gages by Geological Survey observers. At some gaged sites that are included in this report, the flooding was so severe that the automatic recorders were inundated or destroyed, and it was necessary to obtain flood-stage data from non-automatic temporary gages. Also included are data collected at crest-stage partial-record stations, usually located on streams with small drainage areas, where only peak stages and discharges are collected.

Suspended-sediment concentration and discharge data are included with the streamflow data on a daily basis whenever available in sufficient quantity to construct a continuous record, otherwise it was tabulated on a periodic basis. Particle-size data are listed on a periodic basis. The suspended-sediment data were determined from samples collected in depth-integrating samplers using techniques described by Guy and Norman (1970). For days when the published sediment discharge value differs from the value computed as the product of discharge times mean concentration times 0.0027, the reader can assume that the sediment discharge for that day was computed by the subdivided-day method (Porterfield, 1972). For periods when no samples are collected, daily loads of suspended sediment are estimated on the basis of water discharge and sediment concentrations observed immediately before and after the periods and suspended-sediment loads for other periods of similar discharge.

MAGNITUDE AND FREQUENCY OF FLOOD PEAKS AND VOLUMES

The estimated recurrence intervals (return periods) of spring 1973 flood peaks and volumes are shown in the gaging-station data tabulations (table 12). Detailed flood-frequency reports containing data for numerous gaged sites and methods for estimating frequency data at ungaged sites are available from district offices of the Geological Survey in each State.

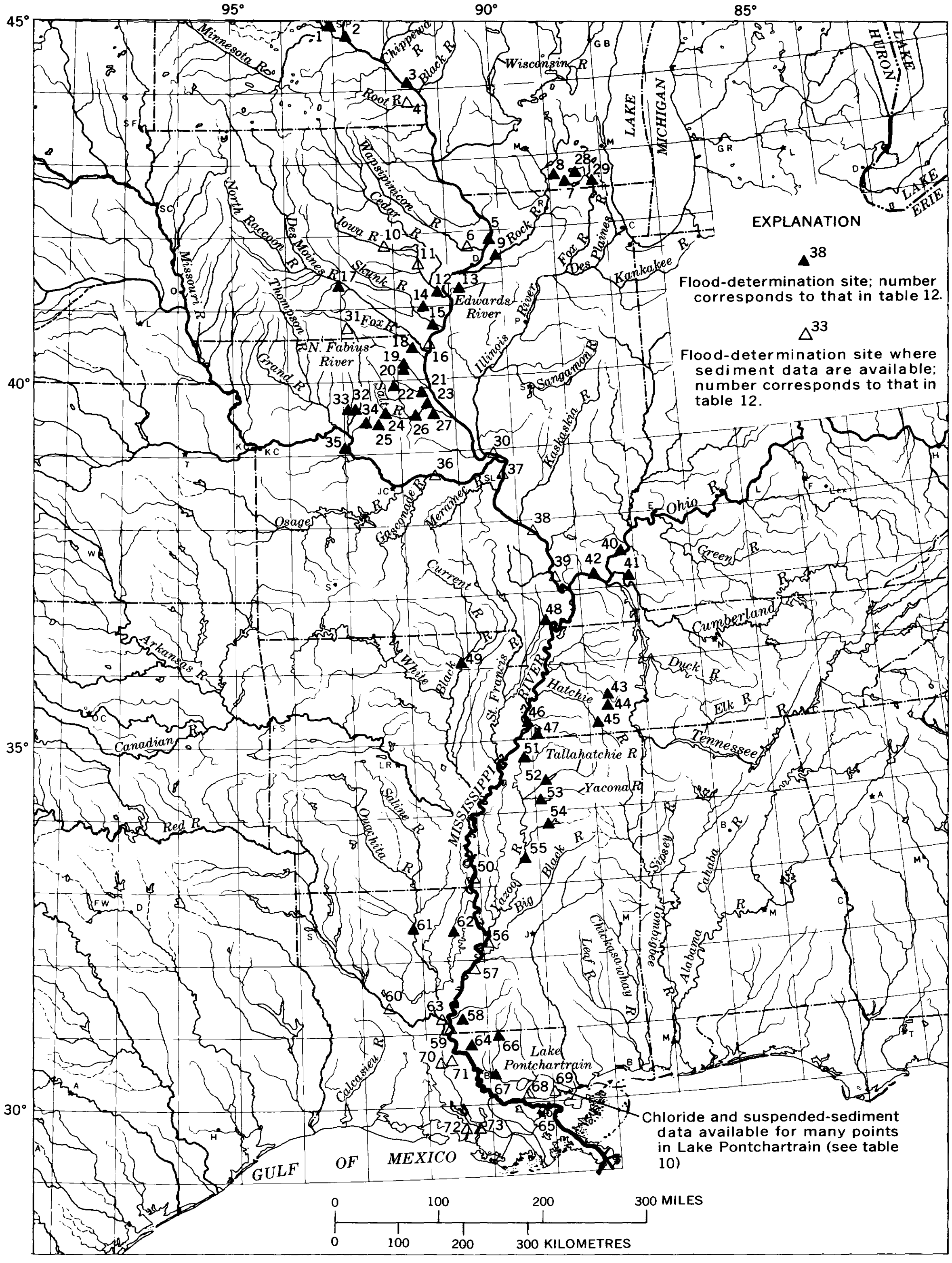


FIGURE 51.—Location of flood determination and sediment data sites in the Mississippi River basin.

For this report, inclusion of peak-flow data for tributary streams was generally limited to those flood peaks having recurrence intervals of 30 years or greater except where new station records for stage or discharge were set or where the data were useful in delineating inflow from major tributaries such as the Ohio River. Data were also included for gaging stations where outstanding volumes of flow were recorded or where sediment data were available.

The flood-frequency estimates for most tributary station data were determined by comparison of the magnitude of the peak-flow rate or volume with station-frequency curve data. The frequency curves for gaging stations had already been determined by computer, mathematically fitting a Pearson Type III distribution to the logarithms of the annual flood data as described by the U.S. Water Resources Council (1967). For a few stations where fitting of the Pearson Type III distribution to flood data proved impractical, graphical methods described by Dalrymple (1960) were used.

Flood-frequency relationships for the Mississippi River are presented in figure 52. Floodflows of the Mississippi River have been affected by manmade changes for many years, but an evaluation of the effects of these changes was not attempted for this report. The graphs shown were developed on the basis of actual flow data; these data include the effects of gradual changes caused by storage and levee systems in the basin. The frequency estimates shown for main-stem stations in table 12 are based on the relationships shown in figure 52.

The recurrence intervals of flood peaks and volumes varied considerably throughout the Mississippi River basin during the 1973 spring floods. In the upper reaches of the basin, especially in Missouri and Iowa, the recurrence intervals of both flood peaks and volumes on many tributary streams were in excess of 100 years. However, in the lower parts of the basin, flood volumes generally had higher recurrence intervals than flood peaks.

Because of considerable regulation and manmade changes on some of the major streams, recurrence intervals are not shown for flood peaks and volumes at all stations listed in table 12. However, comparisons with past peak-flow events were shown in the station manuscripts to provide some insight into the relative magnitude and return period of the event.

THE FLOODS

MISSISSIPPI RIVER MAIN STEM

The 1973 spring flood on the main stem of the Mississippi River had its beginnings in the early fall of 1972. Runoff from many tributaries throughout the basin was above normal from October 1972 through June 1973 producing above average flows on the main stem during the period (figs. 53 and 54). During the winter, flood-control reservoirs filled, fields became saturated, water tables were unusually high, and bankfull stages were common on many major tributary streams in Iowa, Missouri, Wisconsin, and Illinois; thus the stage was set for the devastating main-stem floods in the spring of 1973.

Selected photographs (figs. 55–58) illustrate some of the impacts of main-stem flooding during the spring of 1973. These are representative of thousands of photographs taken during the flooding by State and Federal agencies, newspapers, and private citizens.

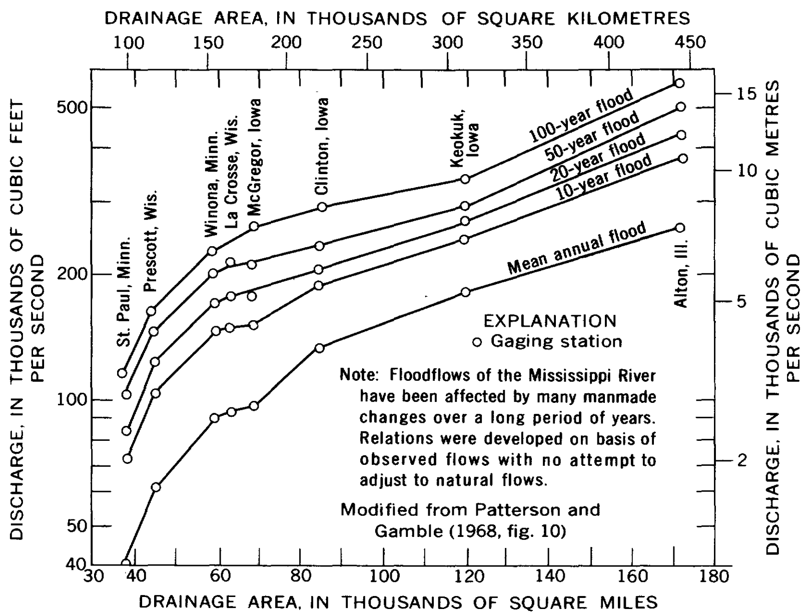
FLOOD PEAKS

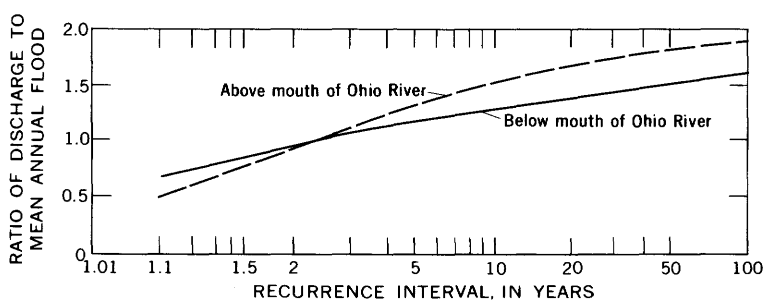
Upstream from Winona, Minn., the Mississippi River was not significantly affected by flooding in 1973. However, discharge records for three main-stem stations in this reach are included so that comparisons with past flood events can be made. Although the main-stem flooding was not severe in this part of the basin (recurrence intervals of peaks ranged from 3 to 7 years), it should be noted that the recurrence intervals of the peaks gradually increased in a downstream direction as tributary inflow became increasingly heavy.

The maximum 1973 flood stages were the highest ever observed in the reach of the Mississippi extending approximately 370 mi (595 km) upstream from Cape Girardeau, Mo. Downstream from Cape Girardeau, the river reached its highest stages since 1937. Flood-crest profiles are shown for the Mississippi River in figures 59–65. Table 9 describes and tabulates the flood elevations used to plot the profiles and provides data on maximum flood elevation prior to 1973. Discharge hydrographs for the 1973 flood are shown for selected Mississippi River gaging stations in figure 66.

The most extensive flooding over the whole Mississippi River basin occurred during April 1973, when more than 12 million acres (30 million ha) of land were flooded and at least 50,000 people were forced from their homes. Flood stages were the highest ever observed at St. Louis, where the river reached its maximum crest of 43.23 ft (13.177 m) on April 28, exceeding the crest stage of 41.32 ft (12.594 m) that was observed at St. Louis on June 27, 1844, and the flood peak of April 1785 that may have reached 42 ft (12.80 m).

It is important to note that the peak stage of April 28, 1973, did not signify the greatest peak discharge of record; the peak discharge of 852,000 ft^3/s





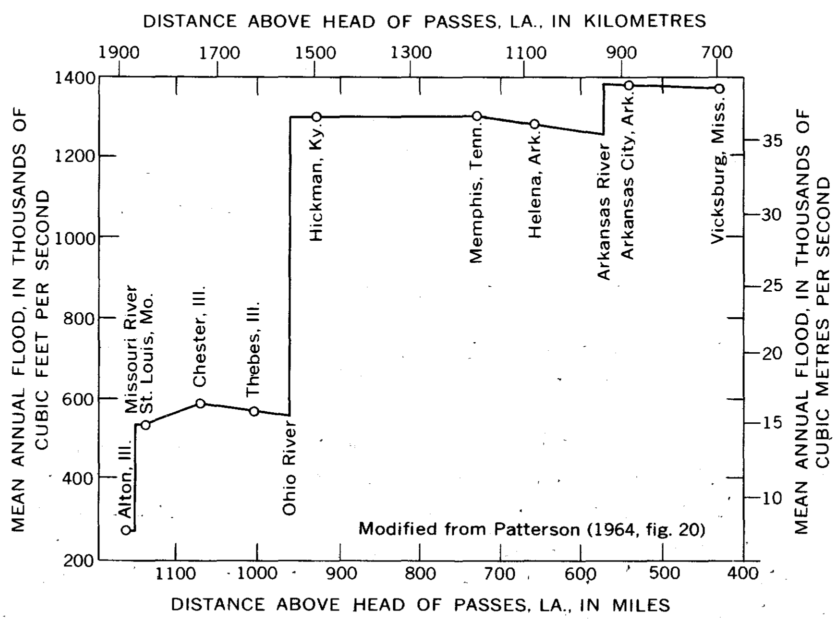


FIGURE 52.—Graphs for determining flood-frequency for the Mississippi River.

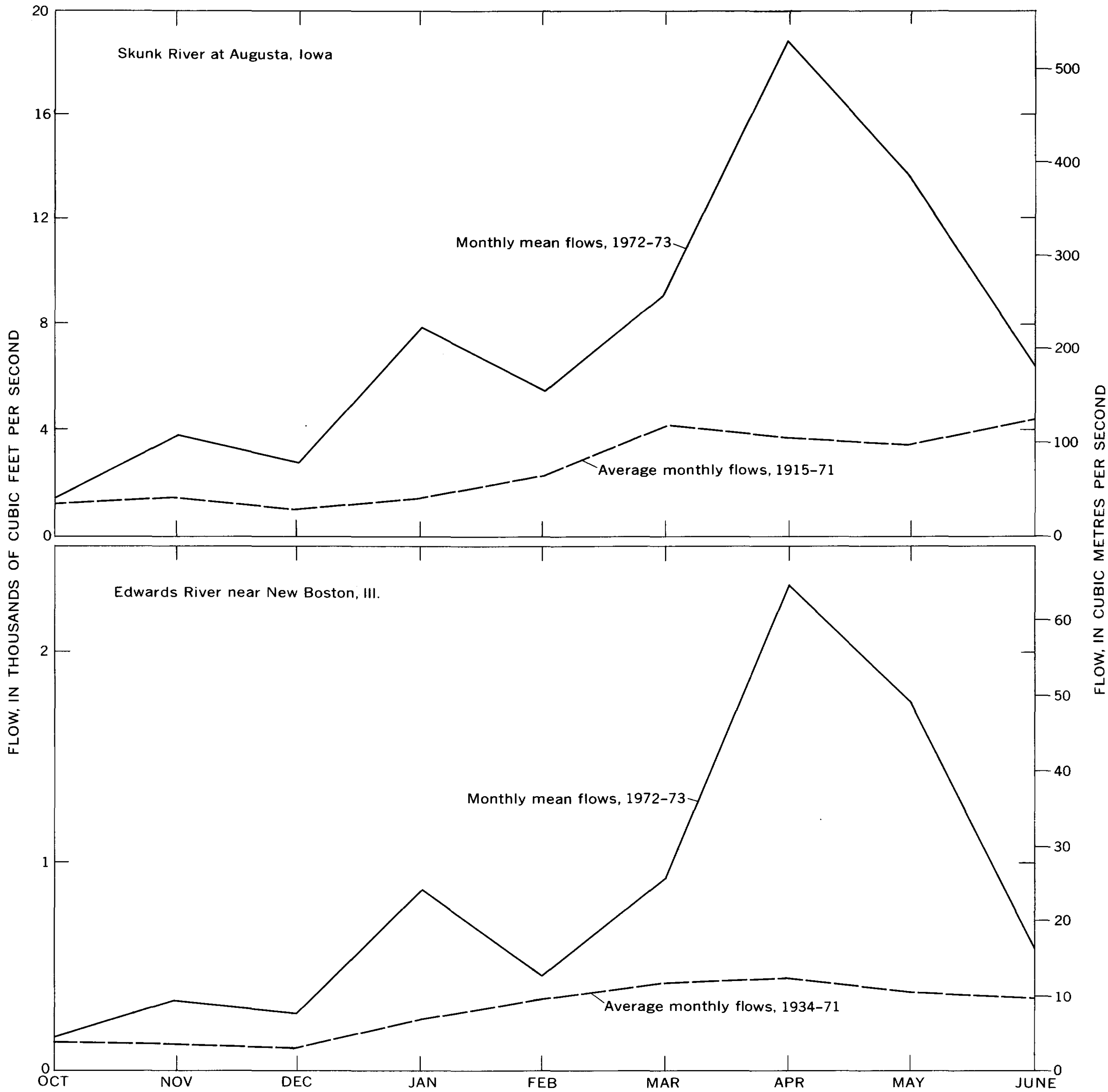


FIGURE 53.—Comparison of monthly mean flows for October 1972–June 1973 with average monthly flows 1917–71; selected stations in the Mississippi River basin.

(cubic feet per second) (24,100 m^3/s) was exceeded during the floods of 1785, 1844, 1883, 1892, 1903, 1909, and 1927. In fact, the flood of 1844, while reaching a 1.9 ft (0.58 m) lower peak stage, produced a 50 percent greater peak discharge (about 1.3 million ft^3/s [36,800 m^3/s]). The primary reason for this apparent inconsistency is the extensive modern levee-floodwall system that has caused an increase in stage of a given discharge at St. Louis. This alteration of the stage-discharge relation has also occurred in many other reaches of the river and is generally caused by man's activity on the flood plain.

Another interesting facet of the 1973 main-stem flood was the number of outstanding flood crests on the river during March through May. Three to four distinct crests were recorded at stations in the upper

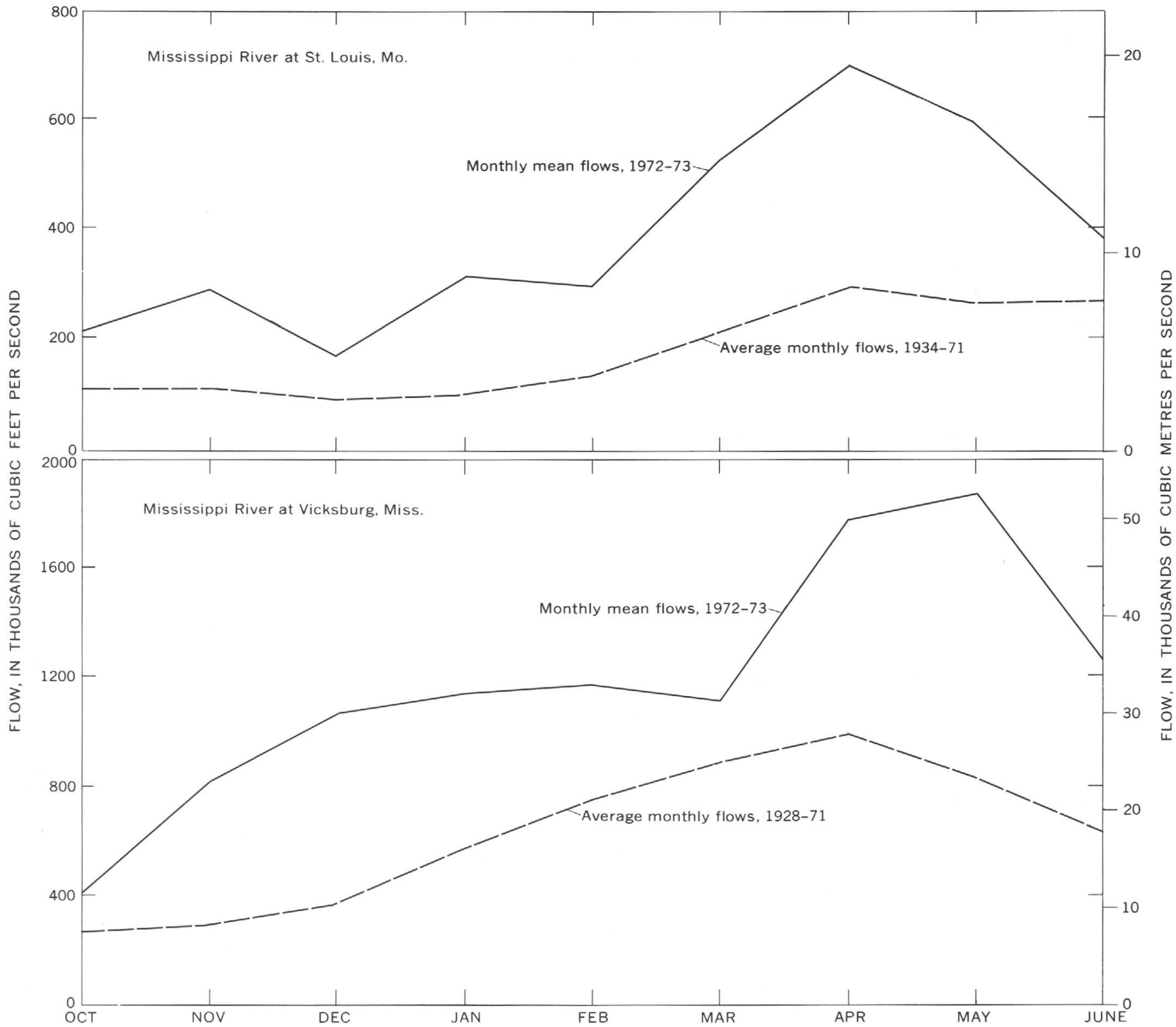


FIGURE 54.—Comparison of monthly mean flows for October 1972–June 1973 with average monthly flows 1917–71; selected stations in the Mississippi River basin.

Mississippi basin, and two were recorded at stations downstream from the Ohio River (see figure 66). The discharge hydrograph for the Mississippi River at St. Louis, for example, shows four distinct crests during this period. All of these peaks were well above flood stage and the last three peaks all ranked sixth or higher when compared to peak-stage data collected since 1861. Thus, three of the six highest peaks of record occurred at St. Louis during a 5-week period. However, these peaks should not be considered as independent events because all of them were the result of a series of storms that occurred in a relatively short period of time.

FLOOD DURATION AND VOLUME

A very important feature of the 1973 Mississippi River flood was the duration of the event on the main stem and the resulting volumes of runoff involved. New records for consecutive days above flood stage were set for most main-stem gaging stations from southern Iowa to Louisiana. The real significance of the new records can be shown at stations where long periods of record are available for comparison. At St. Louis, Mo., for example, the Mississippi remained above flood stage for 77 consecutive days, exceeding by 14 days the record established in 1844. At Chester, Ill., where collection of hydrologic records began in

FIGURE 55.—Effects of Mississippi River flooding, spring 1973.

FIGURE 56.—Effects of Mississippi River flooding, spring 1973.

1927, the river remained above flood stage for an extraordinary 97 consecutive days. At Memphis the river was above flood stage for 63 consecutive days, the longest sustained flood since at least 1872, and at Vicksburg, a new record of 88 consecutive days above flood stage was established. The cumulative

FIGURE 57.—Effects of Mississippi River flooding, spring 1973.

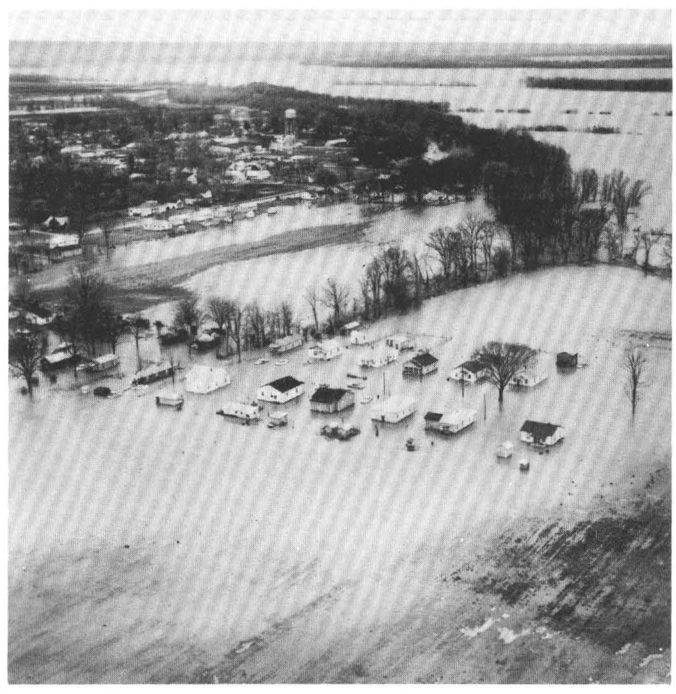


FIGURE 58.—Effects of Mississippi River flooding, spring 1973.

runoff for the Mississippi River at Vicksburg during the first 9 months of the 1973 water year (October 1972–June 1973) was 632 million acre-feet (779 km^3); this exceeds the total flows for the first 9 months of previous flood years; 1927, 561 million acre-feet (691 km^3); 1950, 499 million acre-feet

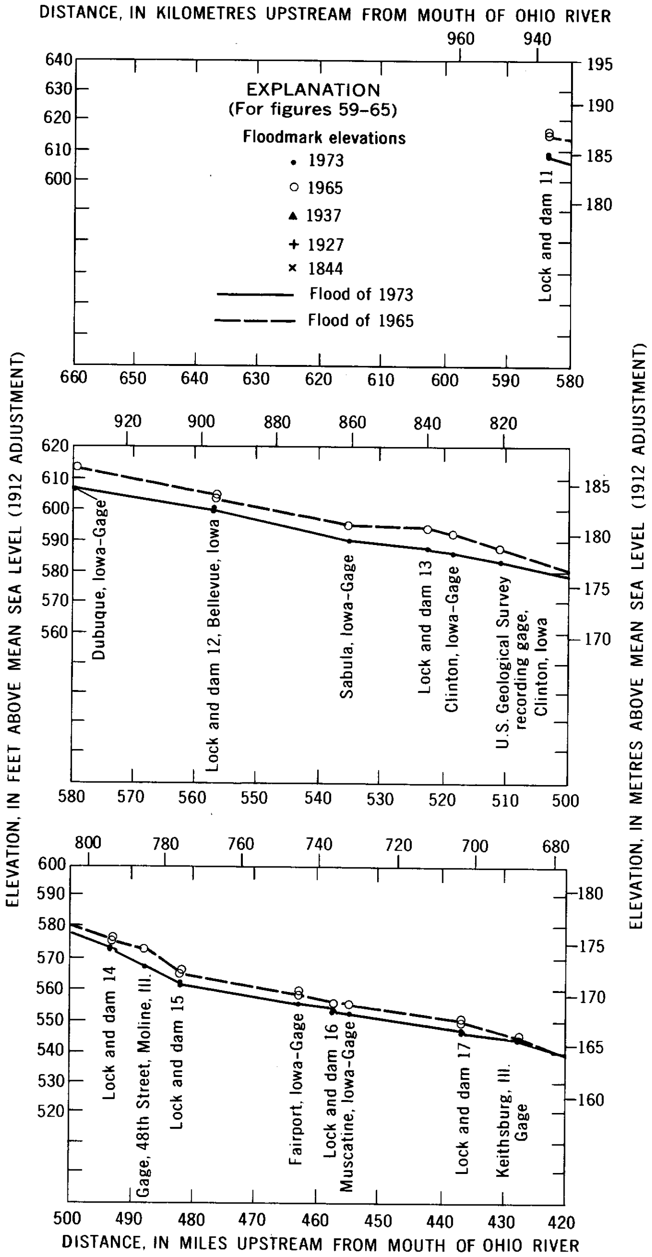


FIGURE 59.—Flood-crest profiles of Mississippi River.

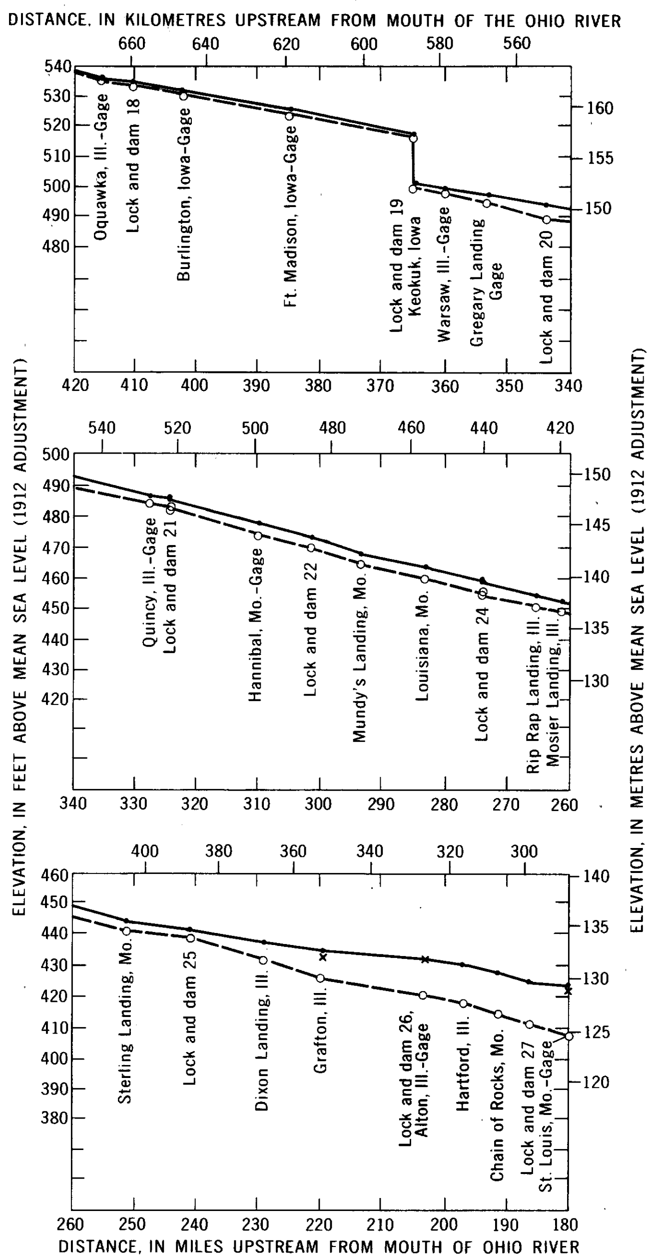


FIGURE 60.—Flood-crest profiles of Mississippi River.

(616 km³); 1945, 463 million acre-feet (571 km³); and 1937, 410 million acre-feet (506 km³). The volumes of flood runoff associated with these events along the main stem have been computed for selected Mississippi River stations and are shown in table 12.

The tremendous volumes of runoff and duration of the flood event caused unusual emergency measures to be taken in the lower reaches of the Mississippi River system. On April 8, 1973, the Bonnet Carre Spillway, about 30 mi (48 km) upstream from New Orleans, was opened for the first time since 1950 to lower the river stage at New Orleans by diverting floodwater from the river through Lake Pontchartrain to the Gulf of Mexico. Late in the month the Morganza Floodway, upstream from Baton Rouge, was opened for the first time since its construction (1953) in order to divert floodwater through the Atchafalaya River to the Gulf of Mexico. These diversions plus those through the Old River Control Structure amounted to about 40 percent of the flow at Vicksburg and relieved pressure on the levees downstream. Hydrologic information collected during the operation of these diversions is shown in table 12.

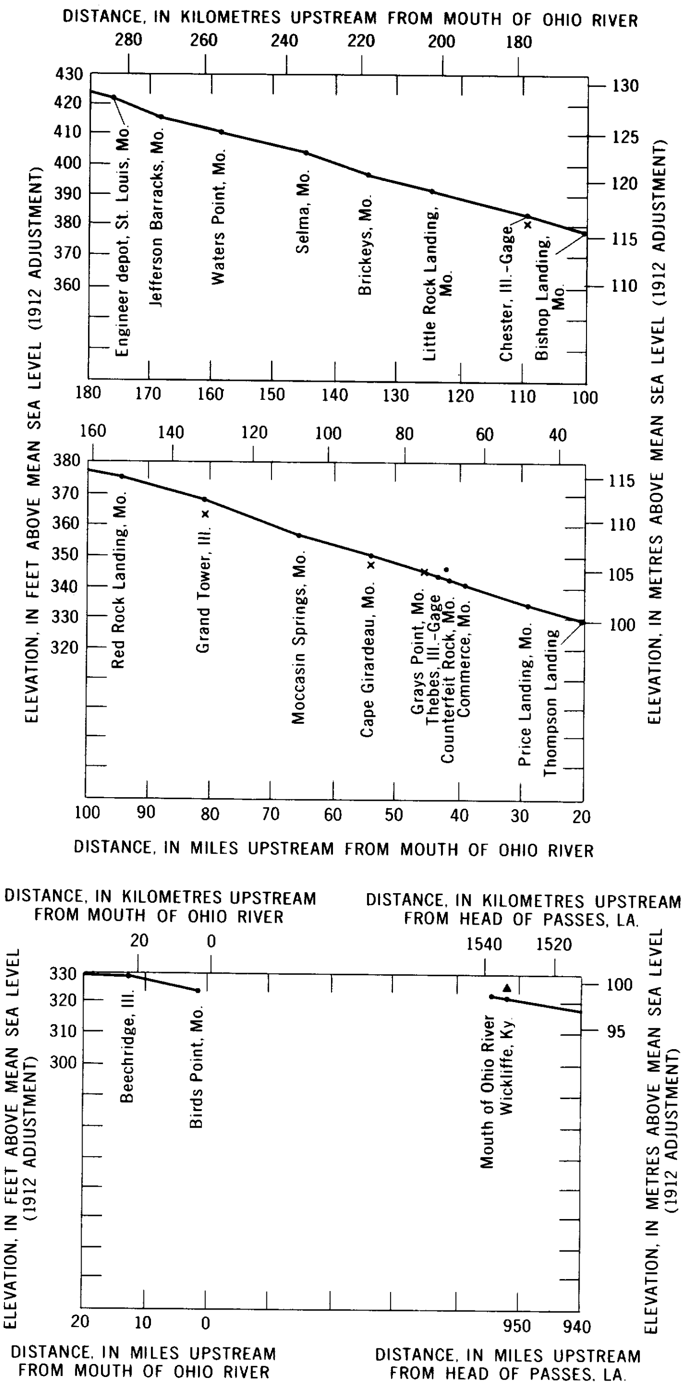


FIGURE 61.—Flood-crest profiles Mississippi River.

SUSPENDED SEDIMENT

The uppermost main-stem suspended-sediment data were collected at Keokuk, Iowa, where daily single-bottle samples were obtained downstream of Lock and Dam 19. Sediment transported at this site was nearly 24 million tons for the period March 1 to June 30, or an average of 196,000 tons per day. The discharge-weighted mean concentration was 342

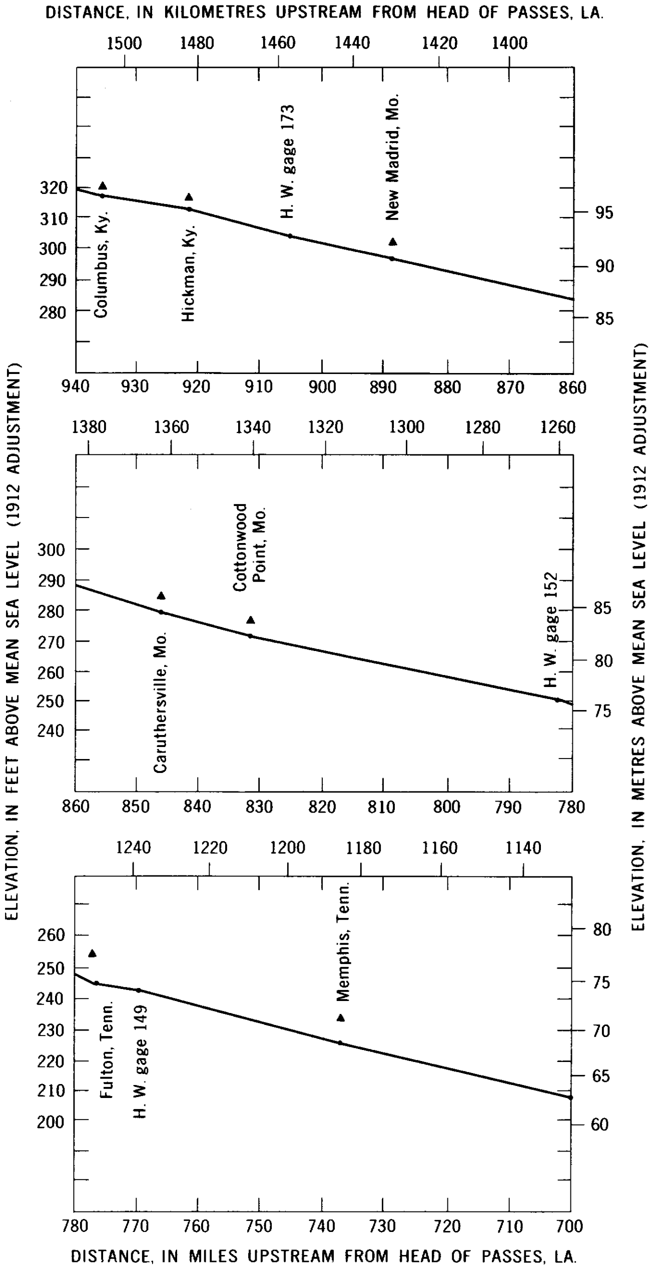


FIGURE 62.—Flood-crest profiles of Mississippi River.

mg/l (milligrams per litre). The maximum daily load was 1,787,000 tons with a mean concentration of 1,930 mg/l on April 24.

At Alton, Ill., the data available (April 5–11) show an average daily load of 145,600 tons and a discharge-weighted mean concentration of 139 mg/l, compared with a mean of approximately 260 mg/l for the same period at Keokuk. The samples on these 7 days averaged 9 percent sand.

At St. Louis, some of the data obtained March 26 to May 9 (daily from April 4–13) show the difference in concentration across the river caused by the

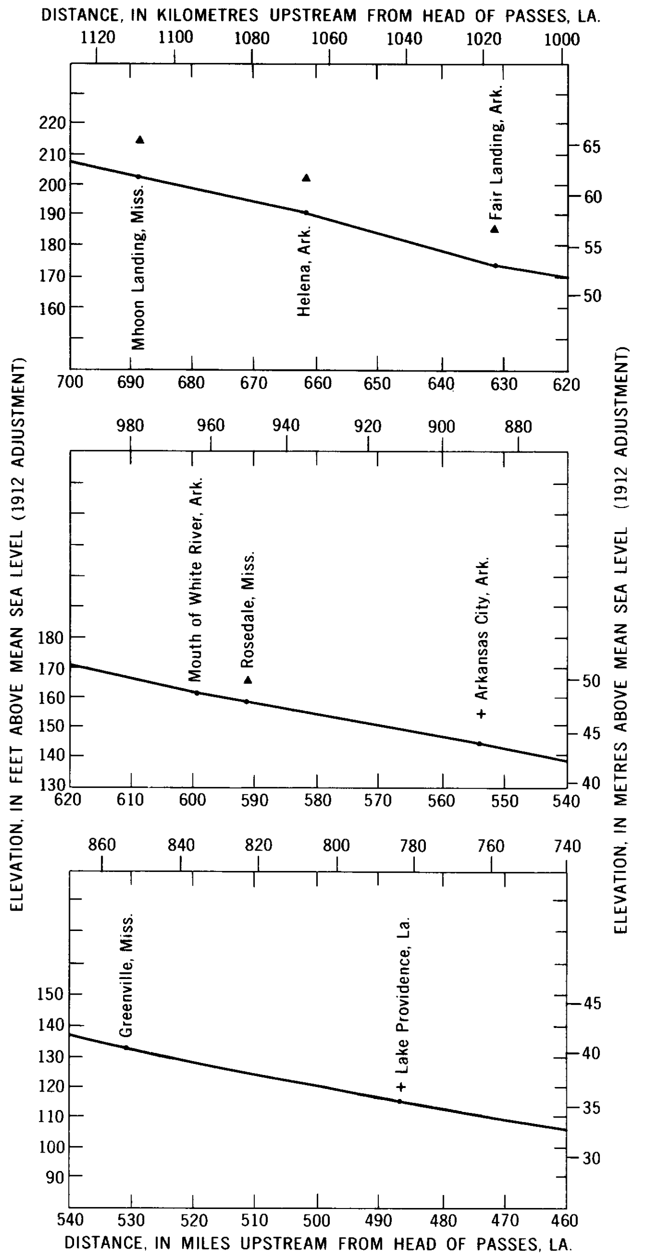


FIGURE 63.—Flood-crest profiles of Mississippi River.

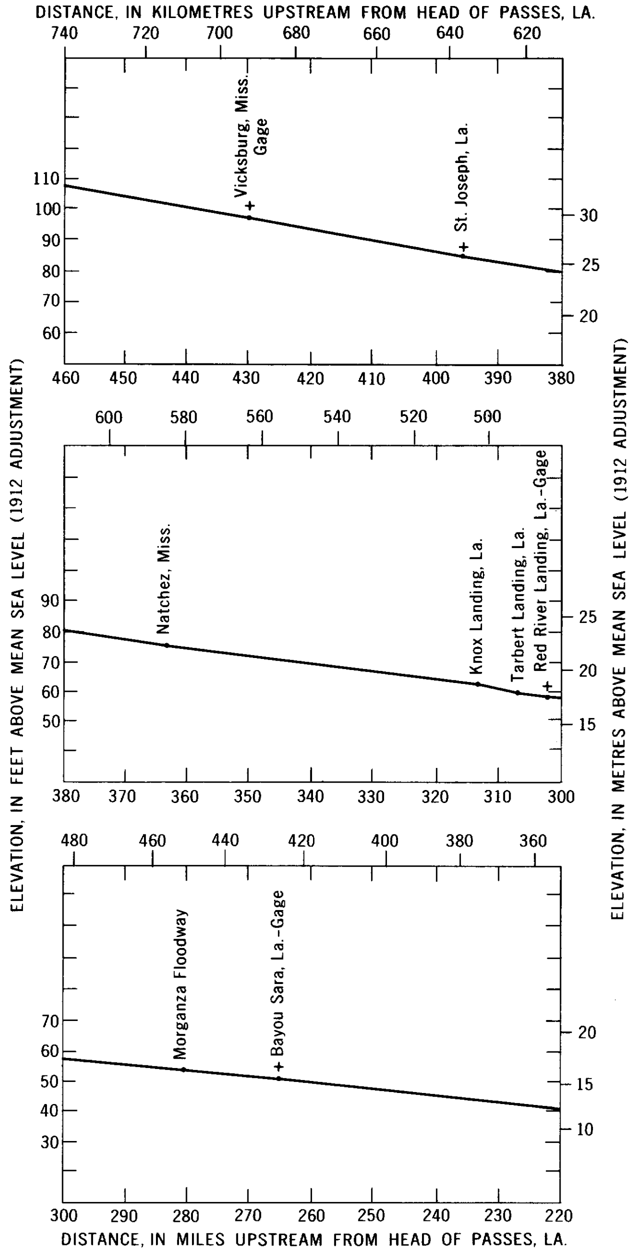


FIGURE 64.—Flood-crest profiles of Mississippi River.

relatively heavier loads discharged upstream by the Missouri River. See table 12. Concentrations for the "Missouri River water" were about double those for the "Mississippi River water." Size analysis of 12 of the 16 observations showed an average of 24 percent sand.

Observations of suspended-sediment on April 5, 7–11 at Chester, Ill., showed a discharge-weighted mean concentration of 501 mg/l and an average of 20 percent sand. At Thebes, Ill., observations April 7–11, 13, showed a discharge-weighted mean concentration of 584 mg/l and an average of 31 percent sand. Thus the concentration of fines is the same (403 mg/l) at each station for this period of time.

Comprehensive water-discharge, suspended-sediment, and bed-material data were obtained March-June at Arkansas City, Ark., Vicksburg, Miss., and Natchez, Miss., by the Corps of Engineers, Vicksburg District. Suspended-sediment samples were generally obtained at four points at each of six verticals across the stream for each measurement. The verticals were positioned near the centroid of each of the six segments of the flow in the cross section and the points were at 11, 32, 54, and 84 percent of

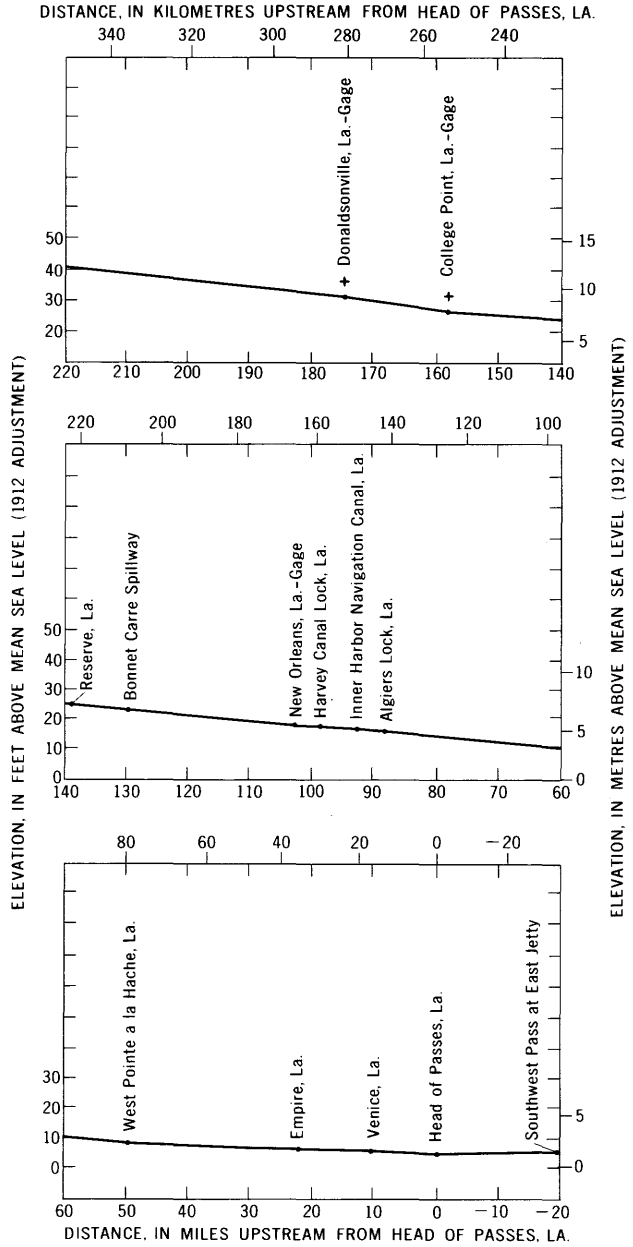


FIGURE 65.—Flood-crest profiles of Mississippi River.

the depth of the respective verticals. Bed-material samples were obtained at each vertical. A summary of these data (table 12) shows the average suspended sediment concentration of the point samples for the right, middle, and left two verticals and the average D_{16}, D_{50}, and D_{84} size of bed material for all verticals for each observation.

At Arkansas City, 17 observations at about 1-week intervals indicate an average suspended-sediment concentration of 241 mg/l (237 mg/l discharge-weighted) which averaged 39 percent sand. The median size of bed material for these observations ranged from 0.012 in. to 0.168 in. (0.31 to 4.28 mm).

At Vicksburg, 28 observations were obtained, 3 of which contain a laboratory error for the sand-sized suspended sediment. The average suspended-sediment concentration for the 25 observations was 272 mg/l (288 mg/l discharge-weighted) which averaged 47 percent sand. The median size of bed material for the 28 observations ranged from 0.019 in. to 0.129 in. (0.48 to 3.27 mm).

At Natchez, 24 observations were obtained, 2 in March, 6 in April, 9 in May, and 7 in June. The average suspended-sediment concentration was 255 mg/l (253 mg/l discharge-weighted) which averaged 49 percent sand. The median size of bed material for the 24 observations ranged from 0.014 in. to 0.019 in. (0.36 to 0.47 mm).

These comprehensive data for Arkansas City, Vicksburg, and Natchez, together with water discharge at stations upstream from Arkansas City and downstream from Natchez, were used to estimate the total suspended-sediment transported past these stations during the March-June flood period. The totals were 122, 146, and 137 million tons for Arkansas City, Vicksburg, and Natchez, respectively. The total at Arkansas City happens to be nearly equal the sum of the Missouri River at Hermann (103 million tons) and the Mississippi River at Keokuk (24 million tons).

Daily suspended-sediment data at Tarbert Landing shows a total transport of 99 million tons in 135 million ft^3/s-days (330 thousand hm^3) of water discharge and thus a discharge-weighted concentration of 272 mg/l for the March-June period.

Because of the water-quality interest pertaining to Lake Pontchartrain, intensive water and suspended-sediment discharge data were obtained for flows of Bonnet Carre Floodway near Norco, La., from April 9 to June 21, the entire flow period. See map of Lake Pontchartrain area, figure 67. These data showed 15.4 million tons moving into the lake in 10.3 million ft^3/s-days (25 thousand hm^3) of flow for a suspended-sediment discharge-weighted mean concentration of 556 mg/l. Particle-size information is not available. Chloride and suspended-sediment concentration data for several dates, generally between April 14 and May 9, and for October 20 and November 1 are given for specific locations in Lake Pontchartrain as indicated in figure 67 and table 10. These data show a general movement and mixing of the water from Bonnet Carre Floodway as chloride concentrations drop and suspended-sediment concentration rises during the spring series of measure-

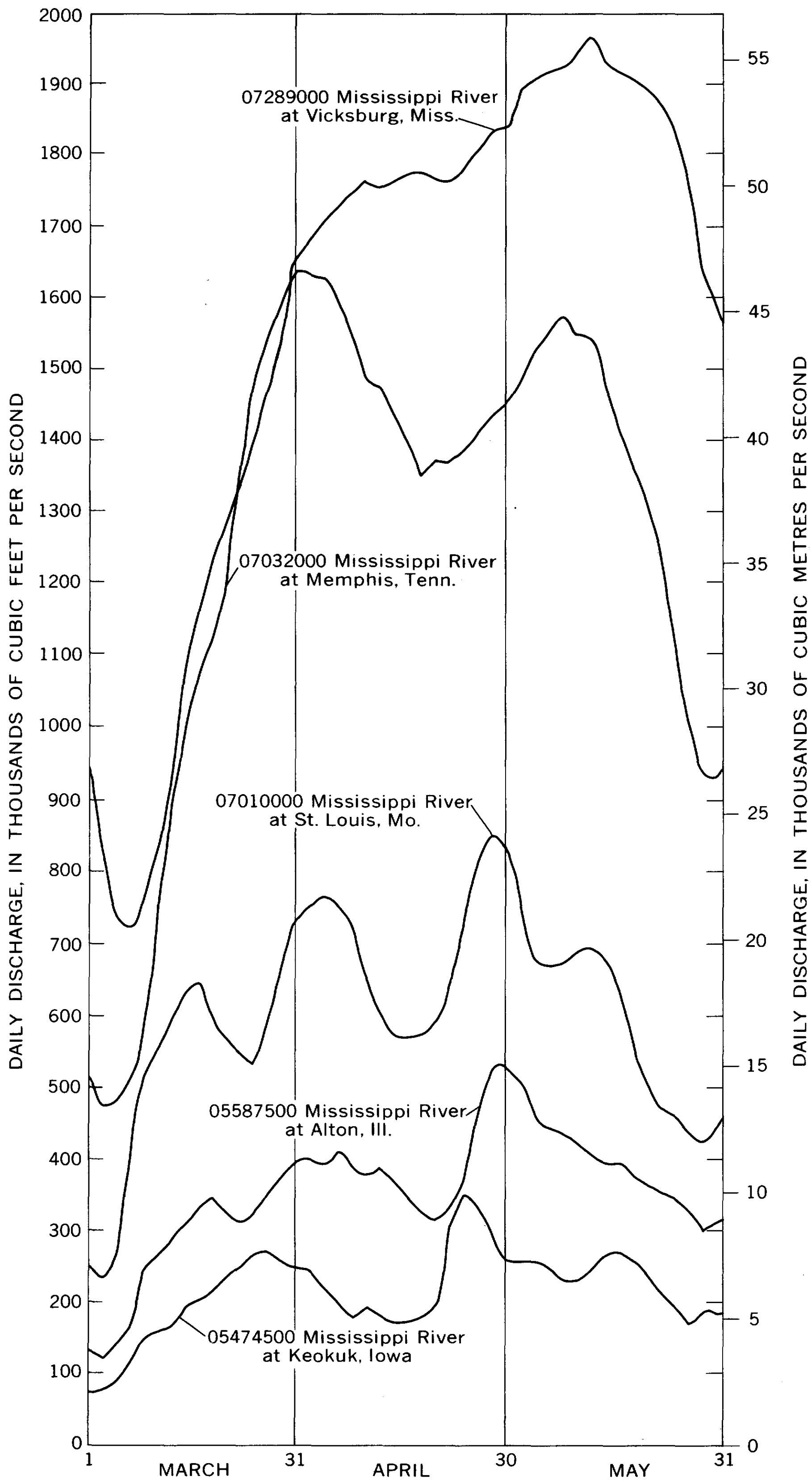


Figure 66.—Discharge hydrographs at selected gaging stations on the Mississippi River, March–May 1973.

TABLE 9.—*Flood-crest elevations on the Mississippi River*

[Based on data furnished by U.S. Army Corps of Engineers except at U.S. Geological Survey gaging stations]

Location	Miles above mouth of Ohio River	Date	Elevation in feet, msl (1912 adjustment)	Date [1]	Elevation in feet (1912 adjustment)
		1973			
Dubuque, Iowa:					
Lock and dam 11, pool	583.1	Mar. 23	608.95	----------------	-----
Lock and dam 11, tailwater	582.9	Mar. 23	608.52	----------------	-----
Gage 30 at Dubuque, Iowa	579.9	Mar. 23	607.30	Apr. 26, 1965	611.66
Bellevue, Iowa:					
Lock and dam 12, pool	556.7	Mar. 24	599.93	----------------	-----
Lock and dam 12, tailwater	556.7	Mar. 24	599.30	----------------	-----
Gage at Sabula, Iowa	535.0	Mar. 24–25	590.97	----------------	-----
Lock and dam 13, pool	522.5	Mar. 25	589.00	----------------	-----
Lock and dam 13, tailwater	522.5	Mar. 25	588.63	----------------	-----
Gage at Clinton, Iowa	518.0	Mar. 25	586.34	----------------	-----
U.S. Geological Survey recording gage at Clinton Iowa	511.8	Mar. 25	583.33	Apr. 28, 1965	587.33
Lock and dam 14, pool	493.3	Mar. 25–26	574.58	----------------	-----
Lock and dam 14, tailwater	493.3	Mar. 26	570.63	----------------	-----
Gage at 48th St., Moline, Ill	487.9	Mar. 25–26	568.04	----------------	-----
Lock and dam 15, pool	482.9	Mar. 26–27	562.10	----------------	-----
Lock and dam 15, tailwater	482.9	Mar. 25	561.33	Apr. 28, 1965	564.98
Gage at Fairport, Iowa	463.5	Apr. 26	555.27	----------------	-----
Lock and dam 16, pool	457.2	Apr. 26	554.07	----------------	-----
Lock and dam 16, tailwater	457.2	Apr. 25	553.64		
Gage at Muscatine, Iowa	455.2	Apr. 25	553.34	Apr. 29, 1965	556.3
Lock and dam 17, pool	437.2	Apr. 25	548.62	----------------	-----
Lock and dam 17, tailwater	437.0	Apr. 25	548.44	----------------	-----
Gage at Keithburg, Ill	428.0	Apr. 25	542.49	Apr. 27, 1965	543.6
Gage at Oquawka, Ill	415.9	Apr. 25	537.84	Apr. 30, 1965	537.4
Lock and dam 18, pool	410.5	Apr. 25	536.42	----------------	-----
Lock and dam 18, tailwater	410.5	Apr. 25	535.92	----------------	-----
Gage at Burlington, Iowa	403.1	Apr. 25–26	532.75	Apr. 30, May 1, 1965	532.45
Gage at Ft. Madison, Iowa	383.9	Apr. 25	525.74	----------------	-----
Keokuk, Iowa:					
Lock and dam 19, pool	364.3	Apr 25–26	518.69	----------------	-----
Lock and dam 19, tailwater and U.S. Geological Survey recording gage	364.2	Apr. 25	500.71	May 1, 1965	499.55
Gage at Warsaw, Ill	359.9	Apr. 26	499.75	May 1, 1965	498.2
Gage at Gregory Landing, Mo	352.9	Apr. 24	497.23	May 1, 1965	495.42
Lock and dam 20, pool	434.2	----------	-----	----------------	-----
Lock and dam 20, tailwater	343.2	Apr. 23	493.00	May 1, 1965	489.92
Gage at Quincy, Ill	327.9	Apr. 25	486.99	----------------	-----
Lock and dam 21, pool	324.9	Apr. 23	486.40	----------------	-----
Lock and dam 21, tailwater	324.9	Apr. 23	485.80	----------------	-----
Gage at Hannibal, Mo	309.9	Apr. 26	477.57	May 1, 1965	474.02
Saverton, Mo.:					
Lock and dam 22, pool	301.2	----------	-----	----------------	-----
Lock and dam 22, tailwater	301.1	Apr. 26	472.90	----------------	-----
Mundy's Landing, Mo	293.0	Apr. 24	468.85	----------------	-----
Louisiana, Mo	282.9	Apr. 24	464.38	----------------	-----
Lock and dam 24, pool	273.5	Apr. 24	459.10	----------------	-----
Lock and dam 24, tailwater	273.2	Apr. 24	458.58	----------------	-----
Rip Rap Landing, Ill	265.0	Apr. 24	453.63	----------------	-----
Mozier Landing, Ill	260.3	Apr. 24	451.80	----------------	-----
Sterling Landing, Mo	250.8	Apr. 25	447.08	----------------	-----
Lock and dam 25, pool	241.5	Apr. 27	444.50	----------------	-----
Lock and dam 25, tailwater	241.2	Apr. 27	444.02	----------------	-----
Dixon Landing, Ill	228.3	Apr. 28	439.82	----------------	-----
Grafton, Ill	218.0	Apr. 28	436.99	June 1844	435.92
Alton, Ill.:					
Lock and dam 26, pool	203.0	Apr. 28	433.15	----------------	-----
Lock and dam 26, tailwater and U.S. Geological Survey recording gage	202.7	Apr. 28	432.15	June 1844	432.10
Hartford, Ill	196.8	Apr. 28	431.20	----------------	-----
Chain of Rocks, Mo	190.4	Apr. 28	429.31	----------------	-----
Lock and dam 27, pool	185.3	Apr. 28	-----	----------------	-----
Lock and dam 27, tailwater	185.1	Apr. 28	426.30	----------------	-----
St. Louis. Mo., U.S. Geological Survey recording gage	180.0	Apr. 28	423.17	June 27, 1844	421.26
Engineer depot, St. Louis, Mo	176.8	Apr. 28	420.78	----------------	-----
Jefferson Barracks, Mo	168.7	Apr. 29	416.39	----------------	-----
Waters Point, Mo	158.5	Apr. 29	410.84	----------------	-----
Selma, Mo	145.8	Apr. 29	404.12	----------------	-----
Brickeys, Mo	136.0	Apr. 29	398.23	----------------	-----
Little Rock, Landing, Mo	125.5	Apr. 29	391.29	----------------	-----

TABLE 9.—*Flood-crest elevations on the Mississippi River*—Continued

Location	Miles above mouth of Ohio River	Date	Elevation in feet, msl (1912 adjustment)	Date [1]	Elevation in feet (1912 adjustment)
		1973			
Chester, Ill., U.S. Geological Survey recording gage	109.0	Apr. 30	384.37	June 30, 1844	380.88
Bishop Landing, Mo	100.8	Apr. 30	379.41	-----	-----
Red Rock Landing, Mo	94.1	Apr. 30	376.72	-----	-----
Grand Tower, Ill	81.9	Apr. 30	369.33	1844	363.29
Moccasin Springs, Mo	66.3	Apr. 30, May 1	358.49	-----	-----
Cape Girardeau, Mo	54.0	May 1	350.37	July 4, 1844	347.30
Grays Point, Mo	46.3	May 1–2	345.68	July 4, 1844	345.14
Thebes, Ill., U.S. Geological Survey recording gage	43.7	Apr. 30	343.43	-----	-----
Counterfeit Rock, Mo	42.3	May 1–2	341.85	-----	-----
Commerce, Mo	39.5	May 1–2	340.03	-----	-----
Price Landing, Mo	28.2	May 1–2	333.85	-----	-----
Thompson Landing, Mo	20.2	May 2	329.90	-----	-----
Beechridge, Ill	13.2	May 2	329.58	-----	-----
Birds Point, Mo	2.0	May 3–4	325.63	-----	-----
Wickliffe, Ky	951.5	Apr. 2	324.82	Feb. 4, 1937	327.30
Columbus, Ky	937.2	Apr. 2	318.86	Jan. 25, 1937	320.92
Hickman, Ky	922.0	Apr. 2	313.83	Feb. 1, 1937	316.23
High Water gage 173	905.0	Apr. 3	305.00	-----	-----
New Madrid, Mo	889.0	Apr. 3	298.78	Feb. 3, 1937	303.45
Caruthersville, Mo	846.4	Apr. 3	277.89	-----	-----
Cottonwood Point, Mo	832.7	Apr. 3	269.73	Feb. 6, 7, 1937	274.58
High Water gage 152	782.0	May 7	250.00	-----	-----
Fulton, Tenn	778.2	May 7	245.91	Feb. 9, 1937	255.86
Memphis, Tenn., Beale St	735.9	May 8	225.35	-----	-----
Memphis, Tenn., Weather Service	734.7	May 8	224.39	Feb. 10, 1937	232.58
Mhoon Landing, Miss	687.5	May 9	202.22	Feb. 10, 1937	214.42
Helena, Ark	663.3	May 10	191.88	Feb. 12–14, 1937	201.91
Fair Landing, Ark	632.5	May 11	174.56	Feb. 12–14, 1937	187.80
Mouth of White River, Ark	599.0	May 11	161.00	-----	-----
Rosedale, Miss	592.2	May 11	158.98	-----	-----
Arkansas City, Ark	554.1	May 12	144.27	Apr. 21, 1927	155.86
Greenville, Miss	531.3	May 12	133.08	-----	-----
Lake Providence, La	487.2	May 14	117.32	Apr. 21, 1927	120.41
Vicksburg, Miss. (USGS gage)	430.4	May 14	99.32	May 4, 1927	102.22
St. Joseph, La	396.5	May 15	84.52	May 4, 1927	86.42
Natchez, Miss	363.3	May 16	73.97	-----	-----
Knox Landing, La	313.7	May 13–15	61.20	-----	-----
Tarbert Landing, La	306.3	May 13	59.30	-----	-----
Gage at Red River Landing, La	302.4	May 13	58.52	May 14–17, 1927	60.94
Gage at Bayou Sara, La	265.4	May 14, 15	50.66	May 15, 1927	55.46
Gage at Donaldsonville, La	175.4	Apr. 9	31.11	May 15, 1927	36.01
Gage at College Point, La	157.4	Apr. 9	27.80	May 15, 1927	32.32
Reserve, La	138.7	May 10	23.40	June 11, 1929	26.00
Gage at New Orleans, La	102.8	Apr. 7	18.47	Apr. 25, 1922	21.27
Harvey Canal Lock, La	98.3	Apr. 7	17.97	-----	-----
Inner Harbor Navigation Canal Lock, La	92.7	Apr. 7	17.12	-----	-----
Chalmette, La	91.0	Apr. 7	16.91	Apr. 25, 26, 1922	17.58
Algiers Lock, La	88.3	Apr. 7	16.10	-----	-----
West Point a la Hache, La	48.7	Apr. 20	9.12	Sept. 9, 1965	15.25
Empire, La	29.5	Apr. 7	7.17	-----	-----
Venice, La	10.7	Apr. 7	6.34	-----	-----
Head of Passes, La	—0.6	Apr. 7	5.13	Sept. 9, 1965	6.57
Southwest Pass at East Jetty, La	—20.2	Apr. 2	5.26	-----	-----

[1] Prior to 1973 at selected sites.

ments. Wave action is considered responsible for suspending notable quantities of fine sand from the bed of the lake. The finest sand (0.0024 in. [0.062 mm]) usually settles from 4.72 to 7.48 in. (12 to 19 cm [centimetres]) per minute in still water depending on temperature (U.S. Inter-Agency Report No. 12, 1957, fig. 2).

Daily suspended-sediment loads were computed for New Orleans from April 1 to June 30 on the basis of measurements generally obtained each 2 to 7 days. If the March-April load ratio is the same as at Tarbert Landing, then the March load at New Orleans would be 39 million tons and the total for March to June would be 137 million tons. This load together with the average concentration of the available suspended-sediment samples (about 400 mg/l) suggests that the river may have picked up considerable sediment from the channel between Natchez

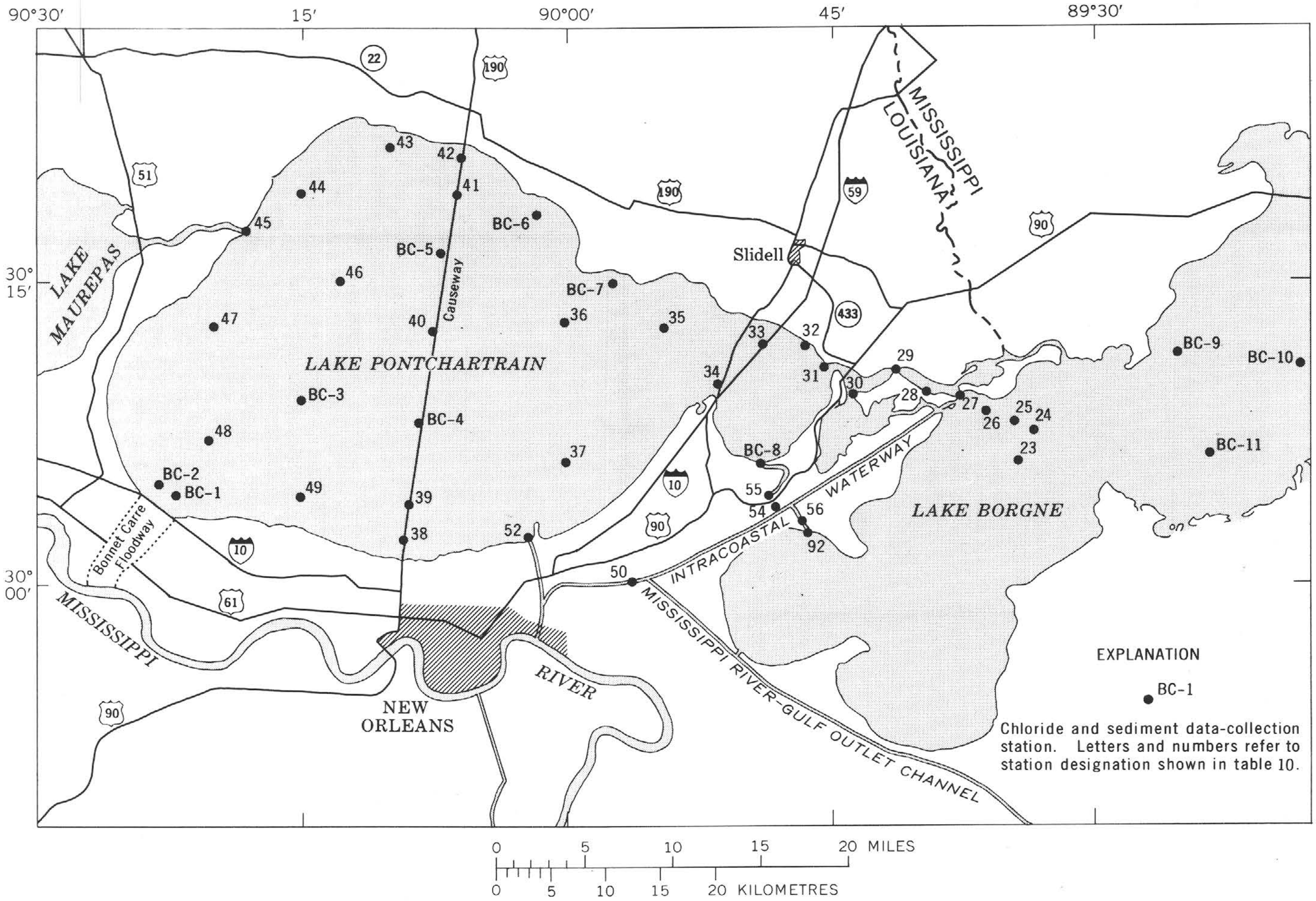


FIGURE 67.—Data collection points in Lakes Ponchartrain and Borgne, La.

and New Orleans considering, as noted previously, that approximately 40 percent of the flow at Vicksburg (and Natchez) was diverted away from the main channel on its way to New Orleans. See data for Old River Outflow Channel, Morganza Floodway, and Bonnet Carre Floodway (table 12).

At Old River Outflow Channel, 16 measurements of flow and suspended sediment between March 5 and June 26 show an average suspended-sediment concentration of 274 mg/l which is nearly identical with the 272 mg/l discharge-weighted mean for March-June at Tarbert Landing. The suspended-sediment averaged 32 percent sand. Based on the average transport rate of 259,000 tons per day for these 16 measurements, the transport in Old River Outflow Channel is estimated at 32 million tons for the March-June period.

Daily flow and suspended-sediment concentration and load data for Morganza Floodway near Krotz Springs, La., are given for April 19 to June 15. The maximum suspended-sediment concentration was 72 mg/l and the average is approximately one-tenth of the probable concentration of the Mississippi at this diversion.

In considering the total flow and sediment movement to the Gulf of Mexico during the flood, it is also necessary to show data for the Atchafalaya River. (Data for the Red River at Alexandria are discussed in the section, "Tributary Streams in Louisiana.") Daily flow and suspended-sediment concentration and load data are given in table 12 for the Atchafalaya River at Krotz Springs, La., which is downstream from the Old River Outflow Channel. This record shows a total transport of 68 million tons for the March-June period and a discharge-weighted mean concentration of 353 mg/l of suspended sediment. Particle-size data are not available. Measurements at 3- to 5-day intervals were made on the Lower Atchafayala River at Morgan City, La., April 18 to June 29 and on Wax Lake Outlet at Calumet, La., April 20 to June 29. These data are inadequate to estimate loads for the entire March-June period.

TABLE 10.—*Chloride and suspended-sediment data, Lake Pontchartrain, La.*

[Data obtained at numerous points (fig. 35) to monitor changes in chloride and suspended sediment as a result of flow through Bonnet Carre Floodway]

Station	Date	Chloride (mg/l)	Suspended sediment	
			Concentration (mg/l)	Percent finer than 0.062 mm
BC–1	4–14–73	18	377	91
	4–15–73	18	613	82
	4–16–73	10	441	87
	4–23–73	21	330	94
	4–27–73	19	305	92
	4–30–73	45	283	96
	5–03–73	16	----	---
	5–06–73	16	262	98
	11–01–73	880	88	100
BC–2	4–14–73	16	339	96
	4–15–73	16	475	98
	4–16–73	16	287	93
	4–23–73	20	105	96
	4–27–73	21	228	98
	4–30–73	22	186	95
	5–03–73	18	150	96
	5–06–73	16	145	96
	11–01–73	780	90	99
BC–3	4–14–73	48	89	99
	4–15–73	220	233	64
	4–16–73	20	210	98
	4–19–73	510	173	97
	4–23–73	730	212	94
	4–27–73	220	209	99
	4–30–73	24	138	98
	5–03–73	18	112	93
	5–06–73	20	111	95
	5–09–73	44	93	99
	11–01–73	1,300	168	100
BC–4	4–14–73	1,100	81	95
	4–15–73	360	104	97
	4–17–73	300	112	94
	4–21–73	36	142	95
	5–03–73	18	210	98
	5–06–73	24	109	98
	11–01–73	1,800	251	100
BC–5	4–14–73	380	91	82
	4–15–73	560	105	90
	4–17–73	1,540	276	99
	4–21–73	1,480	514	91
	4–27–73	600	203	98
	5–03–73	460	147	99
	5–06–73	380	171	99
	11–01–73	1,600	137	100
BC–6	4–15–73	560	139	97
	4–16–73	1,200	304	98
	4–17–73	1,670	281	99
	4–23–73	960	182	98
	4–28–73	380	134	97
	4–30–73	360	136	97
	5–03–73	920	164	98
	5–07–73	130	160	99
	10–30–73	1,600	196	99
BC–7	4–15–73	1,600	260	98
	4–16–73	1,800	361	98
	4–17–73	1,800	277	97
	4–23–73	760	142	98
	4–28–73	660	140	84
	4–30–73	490	139	96
	5–03–73	660	169	97
	5–07–73	540	150	99
	10–30–73	1,900	228	100

TABLE 10.—*Chloride and suspended-sediment data, Lake Pontchartrain, La.*—Continued

Station	Date	Chloride (mg/l)	Suspended sediment	
			Concentration (mg/l)	Percent finer than 0.062 mm
BC–8	4–15–73	1,700	308	98
	4–23–73	84	82	98
	5–03–73	220	98	94
	10–30–73	2,400	169	100
BC–9	4–14–73	960	91	72
	4–19–73	910	94	92
	4–21–73	490	67	83
	4–25–73	400	83	77
	4–28–73	560	74	91
	4–30–73	480	610	87
	5–02–73	540	1,653	90
	5–08–73	62	178	94
BC–10	4–14–73	1,500	114	96
	4–19–73	2,700	83	86
	4–21–73	2,000	96	95
	4–25–73	380	48	95
	4–28–73	720	46	94
	4–30–73	600	76	89
	5–02–73	1,200	85	94
	5–08–73	660	163	95
BC–11	4–14–73	1,700	122	88
	4–19–73	1,300	142	94
	4–21–73	1,900	91	95
	4–25–73	560	69	87
	4–28–73	760	50	100
	5–02–73	770	81	95
	5–08–73	920	56	94
23	4–14–73	520	214	99
	4–19–73	1,800	101	89
	4–21–73	1.700	128	97
	4–23–73	480	75	100
	4–25–73	330	160	96
	4–28–73	680	66	99
	4–30–73	620	70	99
	5–02–73	900	86	96
	5–08–73	650	77	95
24	4–14–73	1,800	97	90
	4–19–73	1,200	94	90
	4–21–73	360	69	90
	4–23–73	560	69	83
	4–25–73	1,600	48	77
	4–28–73	910	136	85
	4–30–73	720	46	92
	5–02–73	340	137	97
	5–08–73	140	82	80
25	4–14–73	1,800	82	98
	4–19–73	920	63	97
	4–21–73	360	312	90
	4–23–73	630	125	97
	4–25–73	280	60	97
	4–28–73	860	256	98
	4–30–73	700	71	97
	5–02–73	460	274	98
	5–08–73	120	173	95
26	4–14–73	1,750	342	97
	4–19–73	760	133	94
	4–21–73	260	78	96
	4–23–73	600	75	93
	4–25–73	260	90	94
	4–28–73	820	131	92
	4–30–73	700	48	88
	5–02–73	510	56	89
	5–08–73	78	56	93
27	4–15–73	1,660	216	97
	4–23–73	540	86	92

TABLE 10.—*Chloride and suspended-sediment data, Lake Pontchartrain, La.*—Continued

Station	Date	Chloride (mg/l)	Suspended sediment: Concentration (mg/l)	Suspended sediment: Percent finer than 0.062 mm
	4–30–73	660	136	87
	5–07–73	240	65	92
	10–30–73	2,500	327	100
28 ----	4–15–73	1,200	120	92
	4–19–73	700	81	93
	4–23–73	680	93	89
	4–30–73	320	69	93
	5–07–73	260	90	96
	10–30–73	2,800	191	97
29 ----	4–15–73	1,520	212	95
	4–19–73	580	128	97
	4–23–73	680	96	94
	4–30–73	840	90	95
	5–07–73	100	68	95
	10–30–73	2,400	254	100
30 ----	4–15–73	1,940	147	93
	4–19–73	760	131	96
	4–23–73	740	164	97
	4–28–73	910	158	97
	4–30–73	850	86	93
	5–03–73	320	96	94
	5–07–73	42	85	99
	10–30–73	2,600	167	99
31 ----	4–15–73	1,920	229	97
	4–19–73	690	98	95
	4–23–73	810	103	91
	4–28–73	730	87	79
	4–30–73	630	65	80
	5–07–73	310	81	90
	10–30–73	2,600	189	98
32 ----	10–30–73	2,600	211	99
33 ----	10–30–73	2,600	203	98
34 ----	10–30–73	2,400	243	99
35 ----	10–30–73	2,100	230	99
36 ----	10–30–73	2,200	266	91
37 ----	10–30–73	2,300	144	90
38 ----	4–14–73	520	1,010	81
	4–15–73	420	764	99
	4–17–73	80	16	76
	4–21–73	62	65	97
	4–27–73	80	173	96
	5–03–73	41	58	92
	5–06–73	31	70	92
	5–09–73	38	100	95
	11–01–73	1,400	113	97
39 ----	4–14–73	260	84	96
	4–17–73	200	102	95
	4–21–73	170	154	97
	4–27–73	78	248	97
	5–03–73	22	156	96
	5–06–73	18	82	96
	5–09–73	22	68	91
	11–01–73	1,800	99	98
40 ----	4–14–73	780	172	94
	--------	860	206	93
	4–17–73	100	184	98
	4–21–73	270	241	96
	5–03–73	270	164	97
	5–06–73	190	155	91
	11–01–73	1,900	233	99
41 ----	11–01–73	1,100	47	91

TABLE 10.—*Chloride and suspended-sediment data, Lake Pontchartrain, La.*—Continued

Station	Date	Chloride (mg/l)	Suspended sediment: Concentration (mg/l)	Suspended sediment: Percent finer than 0.062 mm
42 ----	11–01–73	1,300	116	97
43 ----	4–14–73	180	67	89
	4–15–73	280	167	65
	4–21–73	720	179	92
	4–23–73	720	114	95
	4–27–73	96	28	82
	4–30–73	340	83	74
	5–03–73	500	128	93
	5–06–73	660	221	87
	11–01–73	840	99	95
44 ----	4–14–73	18	33	76
	4–15–73	60	178	62
	4–21–73	18	106	85
	4–23–73	12	51	86
	4–27–73	11	45	86
	4–30–73	12	42	82
	5–03–73	240	104	88
	5–06–73	130	150	78
	11–01–73	220	73	93
45 ----	4–14–73	160	64	72
	4–15–73	180	281	60
	4–16–73	320	344	76
	4–21–73	200	118	71
	4–23–73	120	76	79
	4–27–73	78	79	73
	4–30–73	60	31	68
	5–03–73	270	149	91
	5–06–73	200	111	90
	11–01–73	760	83	96
46 ----	11–01–73	970	79	97
47 ----	4–14–73	460	66	96
	4–15–73	220	79	99
	4–16–73	460	----	---
	4–21–73	180	----	---
	4–23–73	340	----	---
	4–27–73	340	----	---
	4–30–73	50	----	---
	5–03–73	58	113	94
	5–06–73	130	115	86
	11–01–73	860	107	98
48 ----	4–14–73	20	142	100
	4–15–73	18	159	94
	4–16–73	18	336	72
	4–23–73	740	117	83
	4–27–73	21	248	98
	4–30–73	24	105	98
	5–03–73	19	120	95
	5–06–73	20	137	97
	5–09–73	16	137	99
	11–01–73	1,200	184	99
49 ----	4–14–73	42	54	99
	4–15–73	75	63	100
	4–16–73	85	256	98
	4–19–73	22	230	99
	4–23–73	100	166	97
	4–27–73	28	96	97
	4–30–73	36	182	97
	5–03–73	30	63	92
	5–06–73	34	148	96
	5–09–73	16	124	98
	11–01–73	1,100	222	99
50 ----	4–15–73	1,100	152	97
	4–16–73	1,400	98	89
	4–19–73	260	52	98
	4–23–73	200	180	97

TABLE 10.—*Chloride and suspended-sediment data, Lake Pontchartrain, La.*—Continued

Station	Date	Chloride (mg/l)	Suspended sediment concentration (mg/l)	Suspended sediment Percent finer than 0.062 mm
	4-30-73	82	306	92
	5-03-73	36	66	95
	5-07-73	58	108	95
52 ----	4-17-73	310	65	97
	10-30-73	2,200	364	99
54 ----	4-15-73	1,800	333	98
	4-19-73	680	139	98
	4-23-73	100	89	100
	4-30-73	530	131	95
	5-03-73	140	95	95
	5-07-73	28	86	78
55 ----	4-15-73	1,800	322	99
	4-23-73	260	91	99
	10-30-73	2,600	274	99
56 ----	4-15-73	1,800	185	96
	4-19-73	750	----	---
	4-23-73	290	----	---
	4-30-73	680	81	91
	5-07-73	78	95	95
	10-30-73	2,700	274	99
92 ----	10-30-73	2,700	367	87

Even though the concentrations of the available data are somewhat less than at Krotz Springs, the sum of the sediment discharge for Morgan City and Calumet appears to be roughly equal that of the river at Krotz Springs.

TRIBUTARY STREAMS—FLOODING AND SUSPENDED SEDIMENT

The following brief descriptions of tributary flooding are presented on a state-by-state basis, beginning with the State of Minnesota and proceeding in a downstream direction. The authors believe that this type of text presentation will be more convenient for the reader than a basin approach. However, the gaging-station data for streamflow and sediment are shown in the traditional manner in all tabulations; that is, the stations are arranged in downstream order within the basins.

TRIBUTARY STREAMS IN MINNESOTA

Tributary inflow from Minnesota streams was not significant during the 1973 Mississippi River basin floods. Recurrence intervals of recorded flood peaks on these streams ranged from about 2 to 9 years, but most streams experienced only minor rises during the period. The data from these streams are useful in delineating those areas of the Mississippi River basin where tributary inflow did not contribute to the major main-stem flooding downstream but these data are not included in this report.

The only gaging-station data included for this State, in addition to that for main-stem stations on the Mississippi, are for the Root River near Houston where daily suspended-sediment data are available from April 13 to June 30, 1973. The Root River data are typical of many tributaries draining to the Mississippi from Minnesota and Wisconsin. Rapid changes in suspended-sediment transport rate can be noted for many storms—the transport on April 14 was 356 tons (128 mg/l) and on April 16 it was 30,600 tons (1,660 mg/l).

TRIBUTARY STREAMS IN WISCONSIN

Outstanding peak discharges with recurrence intervals exceeding 100 years were recorded on the Fox River and its tributary, Sugar Creek, in the Illinois River basin in extreme southern Wisconsin and on Turtle and Little Turtle Creeks in the Rock River basin. The 1973 flood-crest profiles are shown for Little Turtle Creek and the 100-year flood profile is shown for Turtle Creek in figure 68.

The major impact of this flooding was felt in the Beloit area where the record-breaking flood on Turtle Creek inundated a 40-square block area of Beloit and South Beloit (fig. 69). Factories, stores, homes, and a motel were hard hit. Hundreds of residents were temporarily left homeless, and production was halted or curtailed in several plants.

Elsewhere in the State, 5- to 10-year recurrence interval floods were recorded on Mississippi River tributaries, and effects of the flooding were much less severe.

TRIBUTARY STREAMS IN IOWA

Numerous outstanding tributary floods occurred during March-May 1973 in Iowa. The largest of these floods occurred in late April in the Wapsipinicon, Iowa, Skunk, and Des Moines River basins of southeastern Iowa, at a time when the Mississippi River was approaching its second spring crest. This synchronization of flood events not only caused record stages on the Mississippi River but helped to keep the Mississippi above flood stage in excess of 2 months from Keithsburg, Ill., to the mouth.

A heavy snowstorm during April 8–10 caused an accumulation of 15 to 20 in. (381 to 508 mm) of wet snow in the lower part of the Wapsipinicon River basin and was a primary reason for record flooding 10 days later. Heavy rains accompanied by rapid snowmelt during April 20–22 produced a record flood at the gaging station near DeWitt on April 22; flood stage was exceeded at the DeWitt station for

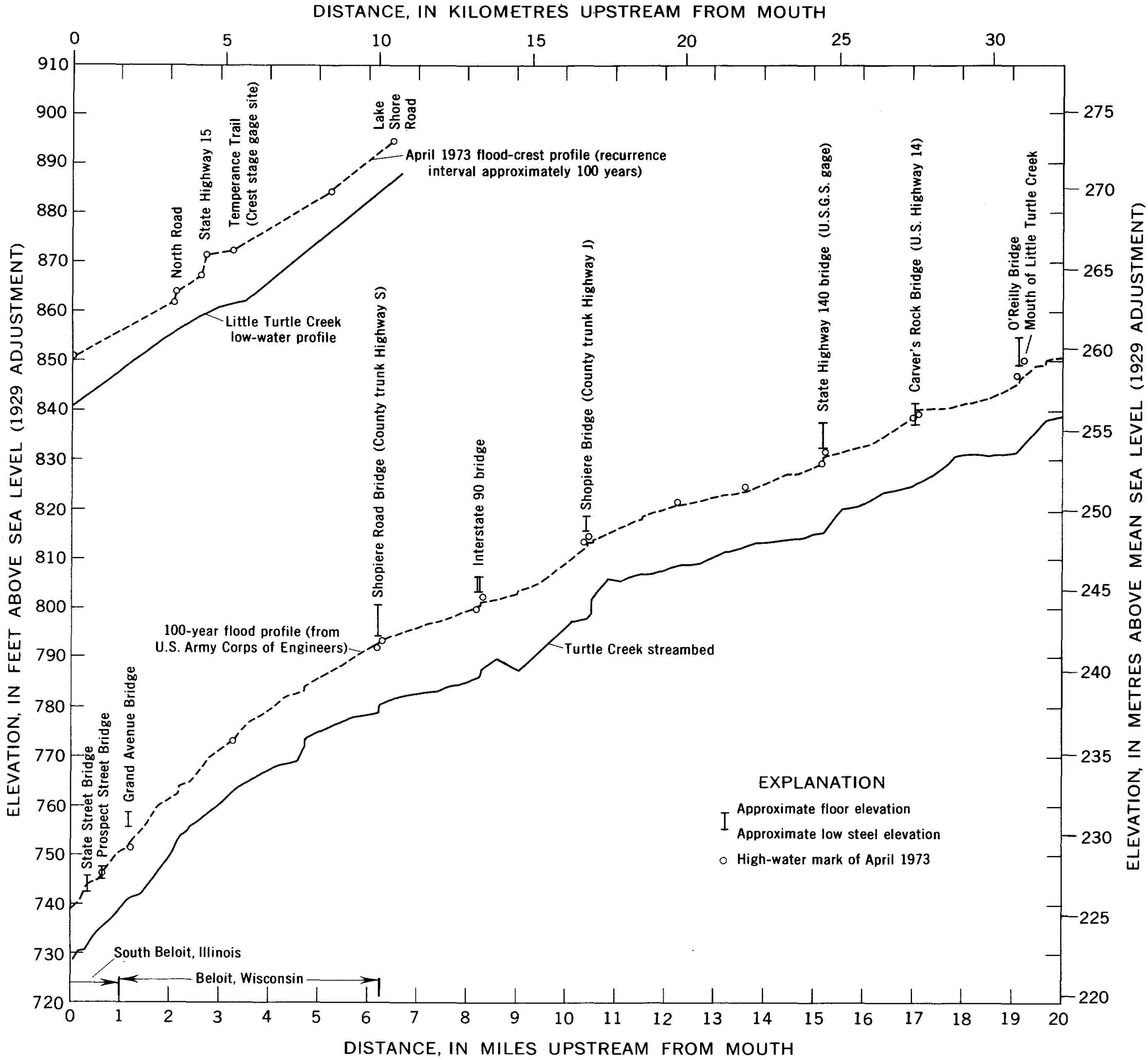


FIGURE 68.—Flood-crest profiles of Turtle and Little Turtle Creeks, Rock and Walworth Counties, Wis.

34 consecutive days (April 16 to May 19), a new record.

The suspended-sediment data for the Wapsipinicon River at DeWitt shows the variability of sediment movement reflecting the availability of sediment for the river to carry. The breakup of ice caused the concentration to reach a mean value of 2,180 mg/l for March 7 at a mean flow of 4,500 ft^3/s (127 m^3/s) for the day. The peak flood day (April 22) had a mean flow of 25,400 ft^3/s (719 m^3/s) and 415 mg/l. The maximum daily sediment transport rate of 52,000 tons was reached on May 28 when the mean flow was 5,700 ft^3/s (161 m^3/s) at 3,390 mg/l, which occurred after many of the farmers had planted their crops.

Excessive runoff from the Iowa River basin began in July 1972. Numerous storms moved across the region during the period July 1972 to February 1973, saturating the basin, causing very high base flows in the streams, and setting the stage for the 1973 spring floods. Flooding occurred at most gaging stations in the basin during March through May

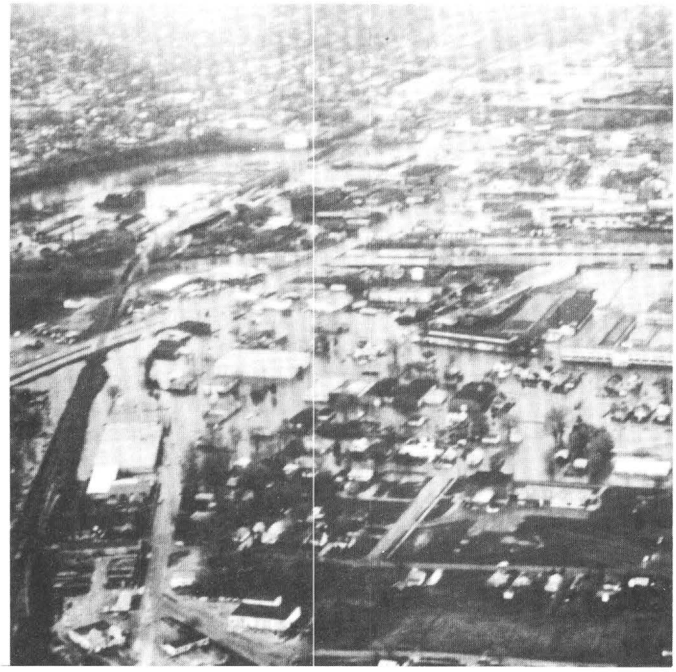


FIGURE 69.—Effects of Turtle Creek flooding at Beloit, Wis., April 21, 1973.

1973, but the only station where an outstanding flood event occurred was near the mouth of the Iowa River at Wapello. Even though the peak discharge at Wapello was reduced approximately 20,000 ft^3/s (566 m^3/s) by the operation of Coralville Reservoir, the peak stage of April 22 exceeded the previously known peak by 1.2 ft (0.37 m).

Daily suspended-sediment data are shown in table 12 for the Iowa River at Marengo and the Iowa River at Iowa City, a few miles upstream and a few miles downstream from Coralville Reservoir, respectively. The data at Marengo are probably typical of rural basins in Iowa for this event, and the data at Iowa City show the effect of the reservoir in trapping sediment. Until April 20 the suspended-sediment concentration was notably lower at Iowa City than at Marengo. Though much of the flow on that day of 15,100 ft^3/s (428 m^3/s) was stored in the reservoir [2,700 ft^3/s (76.5 m^3/s) at Iowa City] the concentration at Iowa City was 780 mg/l compared to 145 mg/l at Marengo. On the 21st the concentration at Iowa City was 1,580 mg/l versus 160 mg/l at Marengo. Small tributary inflow between the dam and Iowa City may have contributed substantially to these concentrations. As occurred on the Wapsipinicon, a heavy sediment load was moved by the Iowa River on May 28 after a period of relatively dry weather when crops could be planted.

During the period April 20–22, intense rains of more than 6.5 in. (165 mm) fell in the lower part of the Skunk River basin. Because the basin had already been saturated by preceding rain storms and snowstorms, flash floods occurred, forcing many families from their homes and causing extensive property damage. Record stages occurred at gaging stations on Big Creek near Mt. Pleasant and Skunk River at Augusta. Flood profiles for Big Creek and Skunk River are shown in figure 70. The peak discharges at the Big Creek and Skunk River stations had recurrence intervals of 90 years and greater than 100 years, respectively. At the Skunk River station, the stage and discharge are believed to be the greatest since at least 1851.

Only the lower part of the Skunk River basin downstream from the confluence of the North and South Skunk Rivers experienced outstanding floods. This was because most of the intense rainfall occurred in the lower reaches of the basin. The time lag between precipitation and peak discharge at the Augusta gaging station was shortened tremendously by the rainfall distribution pattern: during previous floods the peak discharge followed the initial rise by 7 or more days, but the April peak occurred within $2\frac{1}{2}$ days.

In the Des Moines River basin, runoff became excessive in July 1972 and continued through the fall and winter. During March-May 1973, snowmelt and heavy rainfall produced several medium to high floodflow conditions. However, significant flooding was limited to the upper Des Moines River, primarily because of storage in Lake Red Rock. The lake retained a record storage of 1,608,000 acre-feet (1,980 hm^3) of water, nearly 88 percent of capacity and within 2 ft (0.61 m) of full flood-control level. Peak discharges and stages of record were not exceeded, but the volume of floodflow from the basin over an extended period aggravated the flood situation on the Mississippi River.

The suspended-sediment record of the Chariton River near Chariton, Iowa, is probably typical of many tributary streams in south-central Iowa. The maximum daily mean concentration was 2,790 mg/l on May 27 when 10,300 tons were transported in a mean flow of 1,220 ft^3/s (34.6 m^3/s) for the day. At the Marengo and DeWitt stations the peak load occurred on May 28.

TRIBUTARY STREAMS IN ILLINOIS

In Illinois, significant flood peaks and volumes were recorded only on the Rock and Edwards Riv-

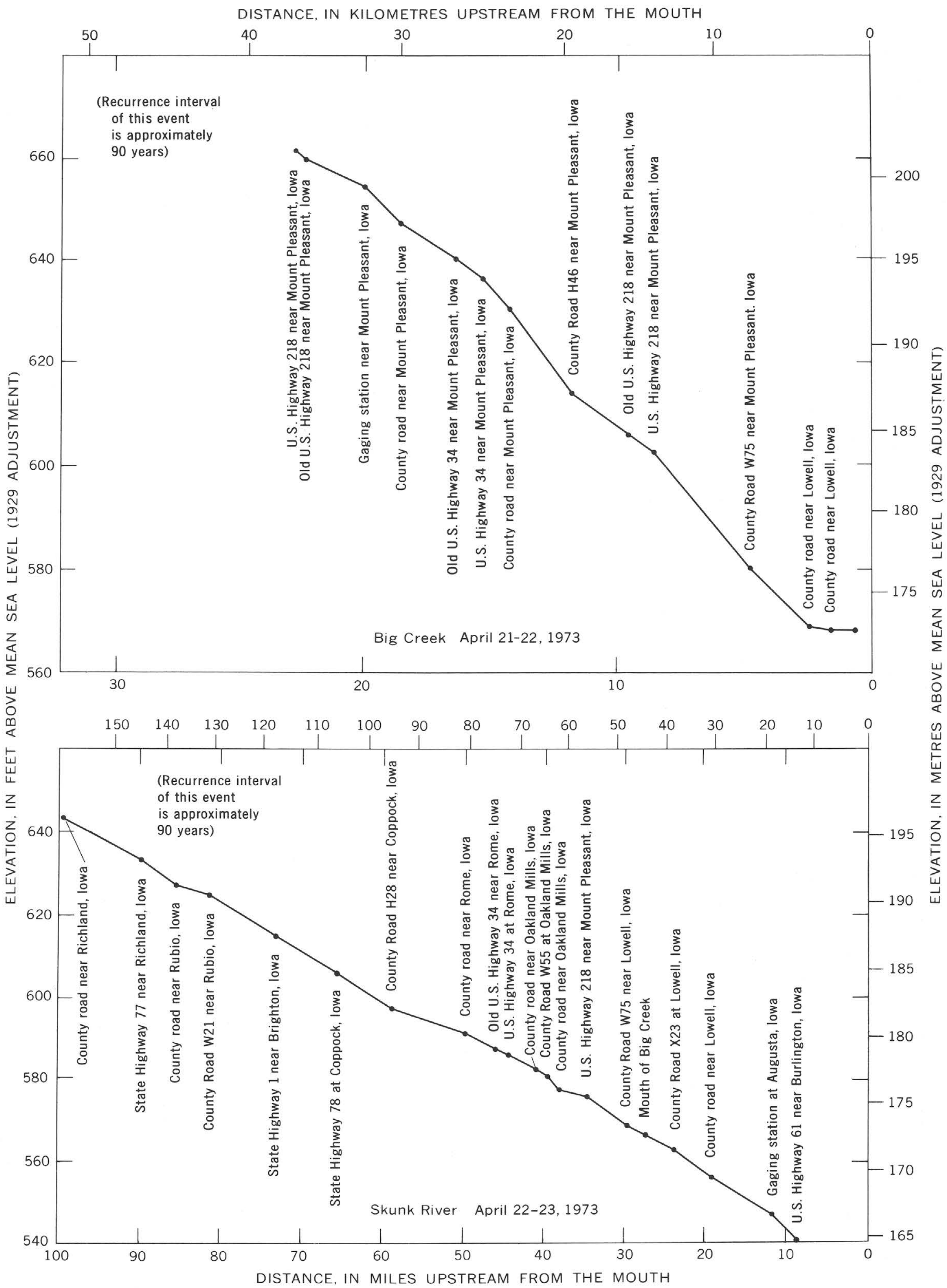


FIGURE 70.—Flood-crest profiles of Big Creek and Skunk River in Iowa.

ers in the northwestern part of the State. At the gaging station on Rock River near Joslin, the recurrence interval of the peak discharge was only 17 years; however, flood volumes for 7-, 15-, and 30-day periods were the greatest in 34 years of record. For Edwards River near New Boston, the recurrence interval of the peak discharge exceeded 100 years; the recurrence intervals of the 1- to 30-day flood volumes also exceeded 100 years and were the largest recorded in 39 years of data collection. Flood-crest profiles for the Rock River are shown in figure 71.

Minor flooding occurred on many tributary streams in northern and central Illinois, especially during April, and contributed to the exceptionally high stages on the Mississippi River main stem.

The major tributaries in the southern part of the State, Kaskaskia River and Big Muddy River, are partly controlled by reservoirs and did not contribute significantly to the Mississippi River flooding.

TRIBUTARY STREAMS IN MISSOURI

In addition to serious backwater flooding from the Mississippi River, severe headwater floods occurred on Mississippi River tributary streams in Missouri during the latter part of April 1973. Streams had been above normal for a considerable period of time prior to the intense April rains that saturated the area, consequently most of the rain that fell was discharged from the area as storm runoff.

During April 21–22, 1973, an unusually severe spring storm moved across central and northeastern Missouri. The resulting headwater flood peaks and volumes were extraordinary in the Fox, North and Middle Fabius, North, Salt, Lower Chariton, and East Fork Chariton River basins of northeastern Missouri. In addition, a record-breaking flood peak was observed during this period on Little River ditch 251 near Lilbourn in southeastern Missouri. Available flood-profile data for the downstream reaches of North Fabius and North Rivers are shown in figure 72.

As shown in table 12, the volumes of flood runoff from these basins for 1-, 3-, 7-, 15-, and 30-day periods have estimated recurrence intervals that are greater than 100 years in many instances; some of the flood volumes were nearly two times greater than the 100-year event. Thus the volume of flood runoff in these basins was just as significant as the extraordinarily high peak flows.

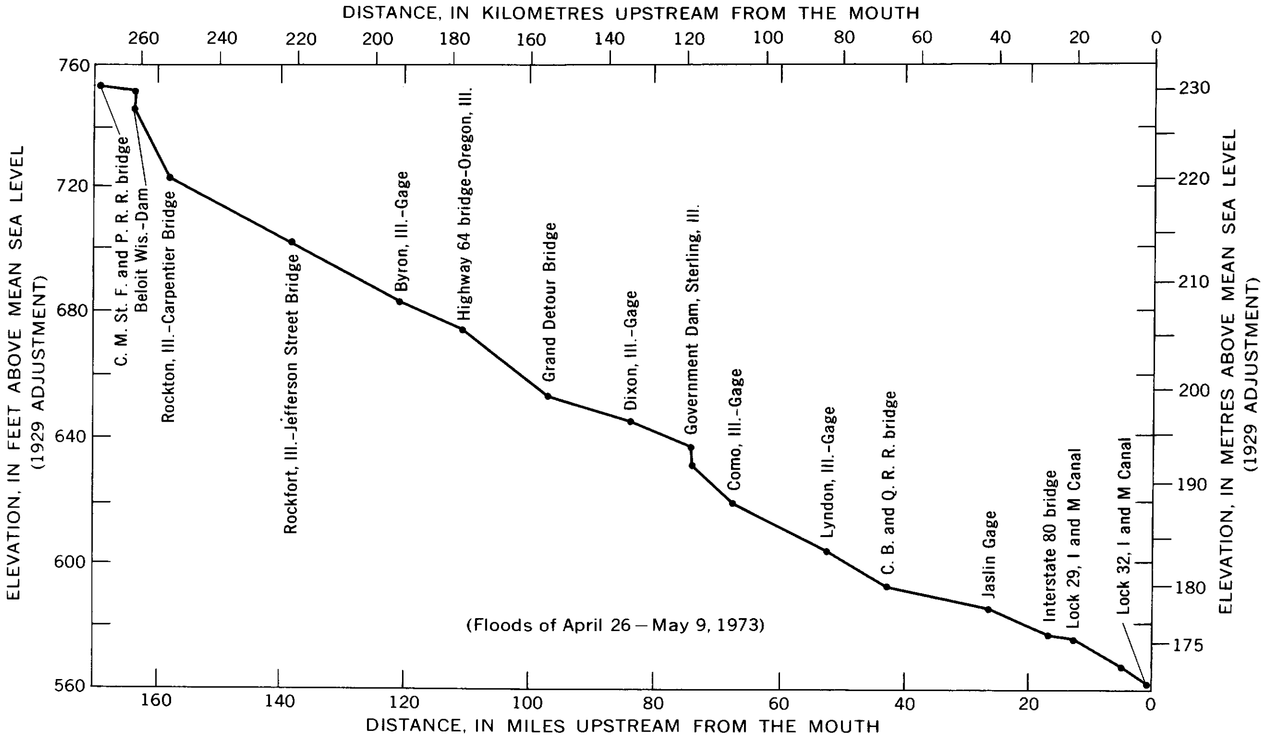
The gaging-station record on South Fork Salt River at Santa Fe was not included in table 12, because this tributary experienced only a moderate rise even though nearby streams reached record stages. This indicates that intense precipitation was not evenly distributed over all parts of the area. In general, though, the entire northeastern parts of the State plus a small area in the southeast were hard hit by flooding during April 20–22.

When compared to historic records at long-time gaging stations, peak discharges and flood volumes were not exceptional on the Missouri River as a whole during March–May 1973. However, the lower reaches of the river received substantial amounts of storm runoff from uncontrolled tributary streams in Missouri, resulting in a peak stage of 33.7 ft (10.3 m) on the gage at Hermann, Mo. This was the second highest stage ever observed, surpassed only by the record stage of 35.5 ft (10.8 m) in 1844, but the peak discharge of 500,000 ft^3/s (14,200 m^3/s) was only the sixth highest; the stage-discharge relationship has been altered by Federal and agricultural levees and by other activities of man on the flood plain. The duration of the flood in the lower reaches of the Missouri River (Hermann, Mo., to the mouth) was significant, as the river remained above flood stage for a record 73 consecutive days during March–May at Hermann and set new records for monthly mean discharges during January through April 1973.

Suspended-sediment data at Hermann show a total of 103 million tons transported past the station from March 1 to June 30. The discharge-weighted mean concentration was 1,376 mg/l for this period. The percentage of sand-sized material in 17 observations during this period ranged from 20 to 78. The 100 million tons transported during this 4-month period is considerably below that measured for several previous floods, partly because of upstream reservoir control and partly because of less runoff from the Missouri basin. The 4 "wet" years of 1949–52 had sediment loads at Hermann for this March–June period of 218, 173, 249, and 170 million tons, respectively.

TRIBUTARY STREAMS IN KENTUCKY

Recurrence intervals of floods peaks in Kentucky ranged from 2 to 5 years, and flood problems were not severe. However, daily discharge data are presented in table 9 for gaging stations on the Ohio and Cumberland Rivers so that the contribution from these extensive river systems can be evaluated and comparisons can be made with flood events of the past.



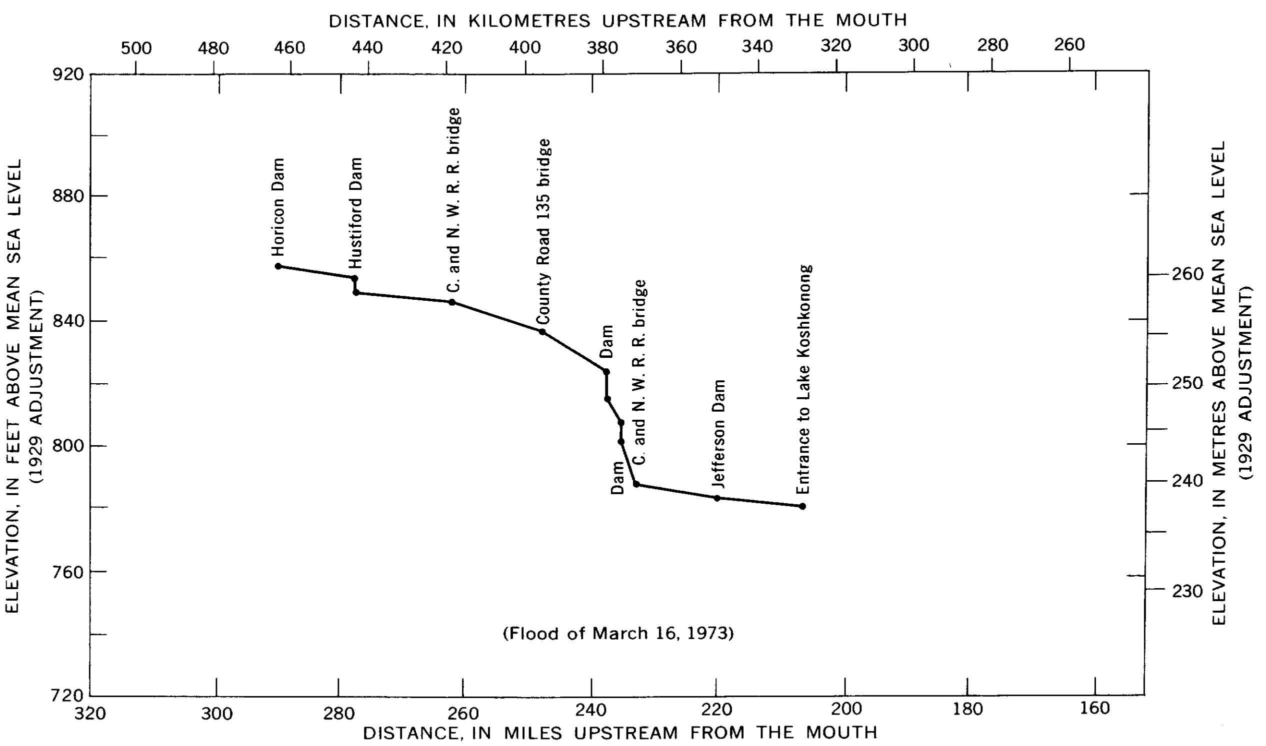


FIGURE 71.—Flood-crest profiles of Rock River, Illinois and Wisconsin.

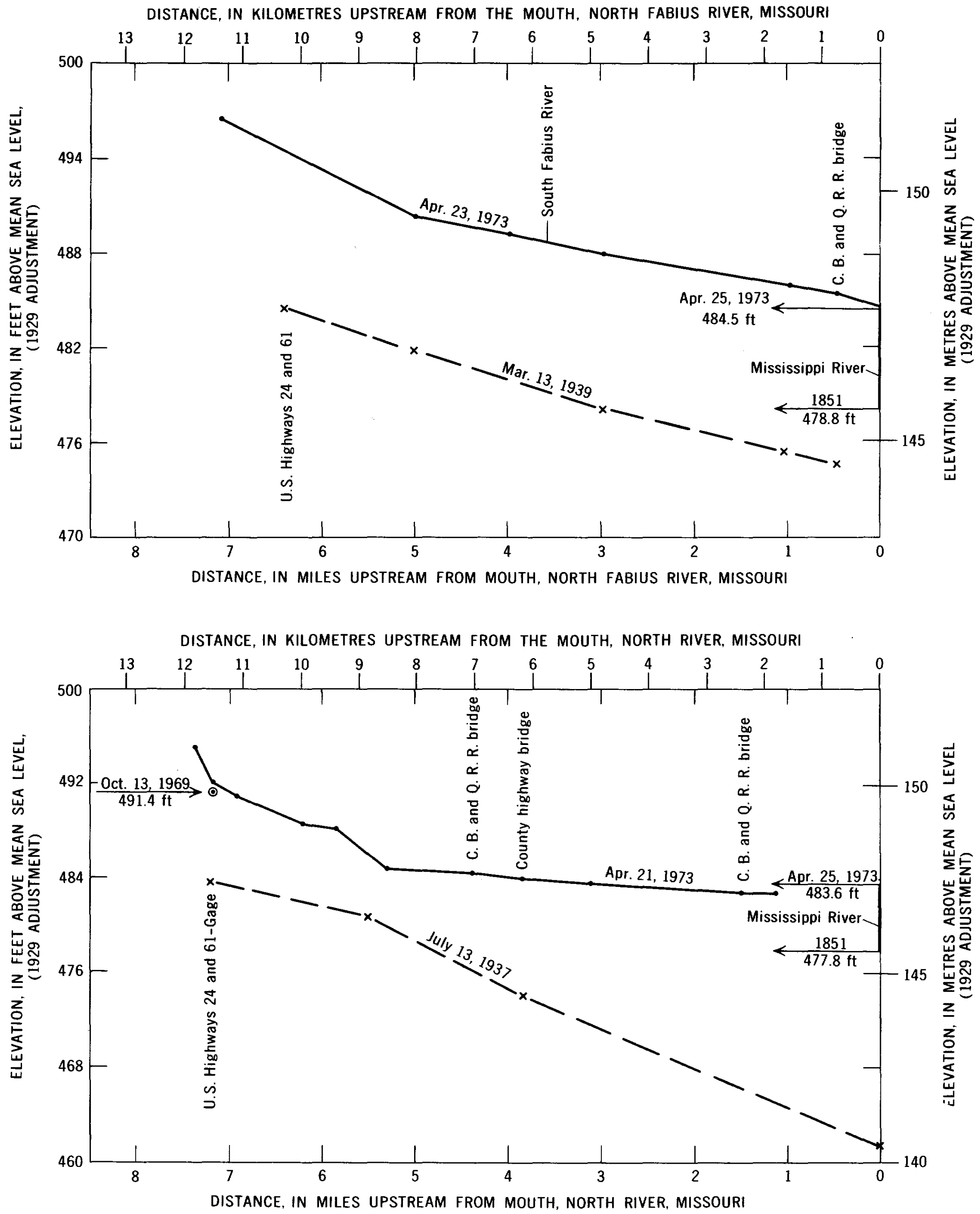


FIGURE 72.—Flood-crest profiles of North Fabius and North Rivers, Missouri.

TRIBUTARY STREAMS IN TENNESSEE

Above-normal rainfall throughout the fall and winter set the stage for excessive runoff in many tributary basins in Tennessee during March and April 1973.

In mid-March a flood peak with recurrence interval of 70 years occurred on the Hatchie River at Bolivar, Tenn. Most of the record peak flow of 61,600 ft^3/s (1,740 m^3/s) originated in northern Mississippi in the headwaters of the drainage basin, where 6 to 8 in. (152 to 203 mm) of rainfall was reported in a 24-hour period.

Flooding occurred along almost all streams tributary to the Mississippi River in western Tennessee during the period, April 19–22, 1973. The most significant peak of this period, 31,200 ft^3/s (884 m^3/s), was recorded on the South Fork Forked Deer River at Jackson on April 21, and it was the second highest since records began in 1930.

Most of the problems caused by the 1973 spring floods in western Tennessee were associated with high stages along the main stem of the Mississippi that caused high stages from backwater in the lower reaches of tributary streams. The principal economic impact was caused by extensive crop damage behind private levees and inside the Mississippi River levee system.

TRIBUTARY STREAMS IN ARKANSAS

During March–June 1973, floodwaters in Arkansas covered thousands of acres and caused millions of dollars in property damage. One of the major causes of damage was backwater in the tributaries near their confluence with the Mississippi River. For instance, the St. Francis River backed up rather than draining normally into the Mississippi, flooding additional thousands of acres of farmland because of the simultaneous main-stem and tributary flooding. Flooding was also extensive along the White River and lower reaches of the Arkansas River.

Even though damage and hardship occurred, the recurrence intervals of peak flows and stages on Mississippi River tributaries in Arkansas were not generally outstanding. The most significant flood crest was recorded on Black River at Black Rock, where the highest peak in 37 years of record (recurrence interval of 20 years) was observed. Most other eastern Arkansas streams experienced peaks with recurrence intervals of 2 to 12 years, and the data are not presented in this report.

TRIBUTARY STREAMS IN MISSISSIPPI

As shown by the station data, the most outstanding flood peaks on tributary streams in Mississippi occurred in late March. However, the long-term effects of the flooding lasted well into June because of the tremendous amounts of backwater in the lower reaches of many of the tributary streams.

One of the primary reasons for the late March flooding was a 10-in. (0.25 m) rainfall that occurred in the upper Yazoo River basin on March 15. Extensive flooding occurred along the Yazoo River, and the excessive runoff filled four large reservoirs in the upper basin, resulting in discharges over the emergency spillways.

Approximately 25 percent of the total agricultural damages that were sustained during the 1973 flood occurred in Mississippi, according to Kassner and Miller (1973). In the Yazoo basin alone, more than 3,590 mi^2 (9,310 km^2) were inundated (fig. 73), including an area of over 900 mi^2 (2,331 km^2) north of Vicksburg that was inundated by Mississippi River backwater. Eighty percent of some of the counties in the region were flooded, and the Yazoo River at Yazoo City did not fall below flood stage until June 26, 1973.

TRIBUTARY STREAMS IN LOUISIANA

The 1973 Mississippi River basin flood became significant in April in Louisiana. Streamflow was above normal at all gaging stations; at the Amite River gaging station near Denham Springs the mean discharge was the highest for April in 35 years of record. Flooding occurred along the Red and Ouachita Rivers for the entire months of April and May. On the Ouachita River at Monroe the peak discharge of 88,900 ft^3/s (2,520 m^3/s) on May 6 was the fourth highest since 1932. In June, tributary flooding subsided, but the Mississippi River remained above flood stage until late in the month.

The most outstanding facet of the tributary flooding in Louisiana was the tremendous volume of flood runoff that was recorded during, and for several months prior to, the March–May base flood period. Accordingly, flood-volume-frequency data for 1-, 3-, 7-, 15-, 30-, 60-, 90-, 120-, and 183-day periods were computed for selected gaging stations in Louisiana.

The results of discharge and sediment measurements are presented in table 12 for four Louisiana floodway sites where floodwater was diverted from the Mississippi during March through June. The diversions were made through these floodways to protect levee systems in the New Orleans area. (See discussion on main-stem flooding.)

Suspended-sediment data for the Red River at Alexandria are available for March 1 to June 30. The discharge-weighted mean concentration was 1,230 mg/l and the transport was 36,200,000 tons for the period. Particle-size data are not available.

WATER AND SEDIMENT DISCHARGE TO LAKE PONTCHARTRAIN AND THE GULF OF MEXICO

Suspended-sediment data were obtained at 24 locations pertinent to the flood area, 18 of which were adequate to report daily values for at least one continuous month in the March–June period, and 6 of which are adequate to indicate only instantaneous conditions. Overall the data are sufficient to give a qualitative indication of the tributary sources

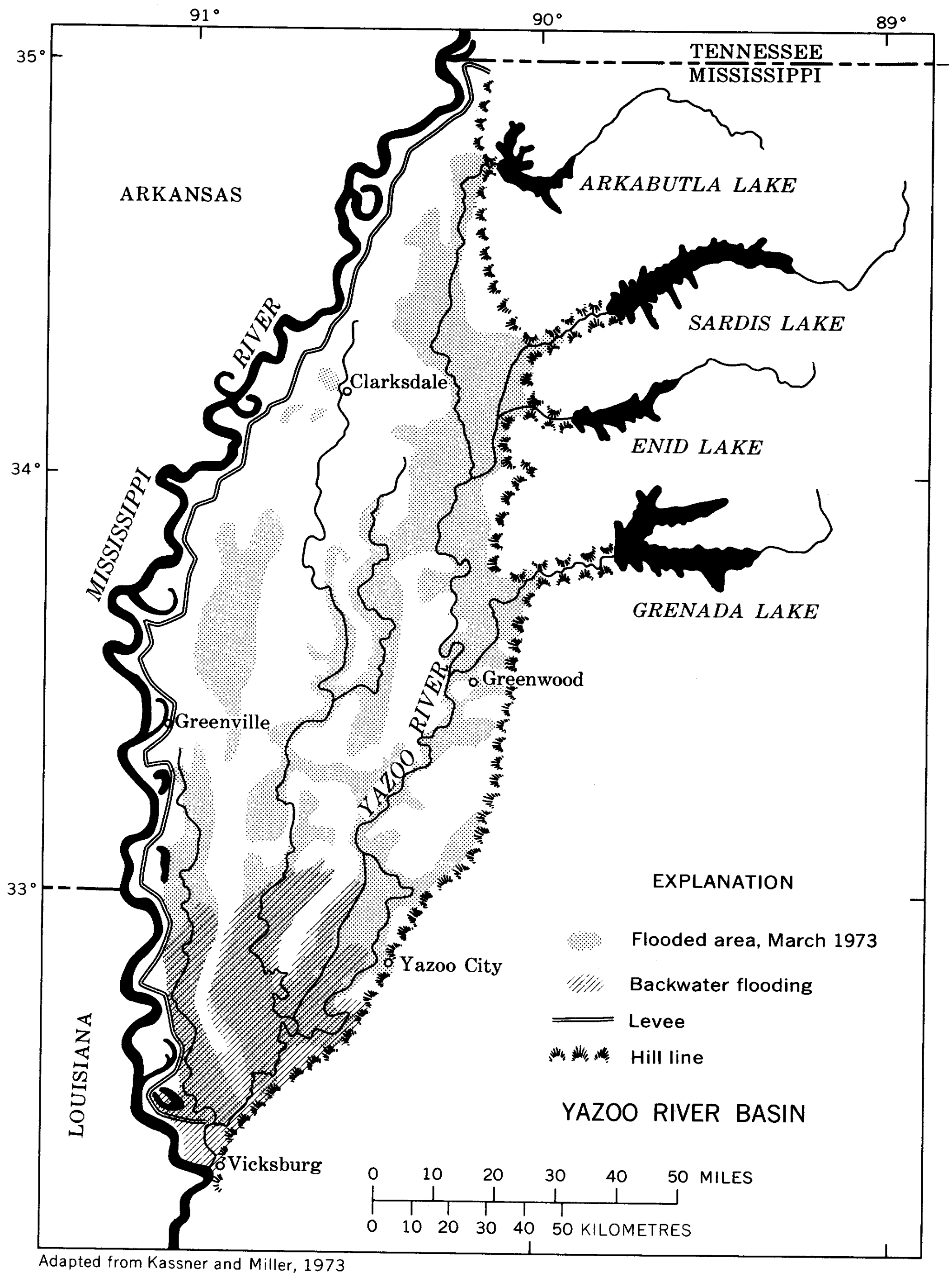


FIGURE 73.—Extent of flooding during March 1973 in the Mississippi River Delta region of northwest Mississippi.

of sediment and its movement to the Gulf. Water discharge, suspended-sediment discharge, and discharge-weighted mean concentration are summarized on a monthly basis in table 11.

Though the sediment loads given in table 11 may seem prodigious at first glance, they are really relatively low for most of the streams when compared to previous flood events. The long duration of the flooding and the large amount of water generally resulted in low concentrations. For example, the average annual sediment yield (Hydrology-Sedimentation Advisory Committee, 1966), for the Wapsipinicon River near DeWitt is about 220 t/mi^2 (84.9 t/km^2) in 227 (ft^3/s-days)/mi^2 [0.21 hm^3/km^2] of water

TABLE 11.—*Summary of sediment and related streamflow data for 1973 Mississippi River flood*

[Blank spaces indicate insufficient data for monthly totals (see table 12)]

Map No. (fig. 51)	Station name	Water discharge, in 1,000 ft³/s days					Sediment discharge, in 1,000 tons					Discharge-weighted sediment concentration, in mg/l				
		March	April	May	June	Total	March	April	May	June	Total	March	April	May	June	Event
4	Root River near Houston, Minn	-----	65	76	38	-----	-----	127	127	26	-----	-----	724	619	253	-----
6	Wapsipinicon River near Dewitt, Iowa	177	219	188	-----	[1] 584	120	136	175	-----	[1] 431	775	230	345	-----	[1] 273
10	Iowa River at Marengo, Iowa	193	244	181	-----	[1] 618	226	260	134	-----	[1] 620	434	395	274	-----	[1] 372
11	Iowa River at Iowa City, Iowa	132	200	268	-----	[1] 600	76	116	67	-----	[1] 259	213	215	93	-----	[1] 160
16	Mississippi River at Keokuk, Iowa	5,746	6,889	6,992	4,456	25,883	5,571	9,516	5,731	3,056	23,874	359	512	304	254	342
30	Mississippi River at Alton, Ill	8,572	11,766	12,021	7,896	40,255	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
31	Chariton River near Chariton, Iowa	15	19	15	-----	[1] 49	21	23	32	-----	[1] 76	533	434	800	-----	[1] 574
36	Missouri River at Hermann, Mo	8,293	10,003	5,954	3,403	27,653	45,730	35,230	14,530	7,206	102,696	2,040	1,300	904	784	1,376
37	Mississippi River at St. Louis, Mo	16,176	20,775	18,120	11,148	66,219	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
38	Mississippi River at Chester, Ill	16,380	21,591	19,375	11,955	69,301	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
39	Mississippi River at Thebes, Ill	16,709	21,930	20,330	12,846	71,815	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
50	Mississippi River near Arkansas City, Ark	-----	-----	-----	-----	-----	[2] 29,000	40,000	33,000	20,400	122,400	-----	-----	-----	-----	237
56	Mississippi River at Vicksburg, Miss	34,400	52,890	57,443	37,320	182,053	[2] 39,000	54,000	35,000	18,000	146,000	429	373	230	172	297
57	Mississippi River at Natchez, Miss	-----	-----	-----	-----	-----	[2] 39,000	43,000	38,000	17,000	137,000	-----	-----	-----	-----	253
59	Mississippi River at Tarbert Landing, Miss	24,162	38,502	42,570	29,298	134,532	28,071	31,110	23,310	16,559	99,050	430	299	203	209	272

TABLE 11.—*Summary of sediment and related streamflow data for 1973 Mississippi River flood*—Continued

Map No. (fig. 51)	Station name	Water discharge, in 1,000 ft³/s days					Sediment discharge, in 1,000 tons					Discharge-weighted sediment concentration, in mg/l				
		March	April	May	June	Total	March	April	May	June	Total	March	April	May	June	Event
60	Red River at Alexandria, La	2,727	2,892	3,243	2,050	10,912	9,393	9,581	9,296	7,928	36,198	1,280	1,230	1,060	1,430	1,230
63	Old River Outflow Channel near Knox Landing, La	-----	-----	-----	-----	-----	-----	-----	-----	-----	32,000	-----	-----	-----	-----	-----
65	Mississippi River at New Orleans, La	[2] 24,000	[2] 34,086	[2] 35,043	[2] 28,520	121,649	[2] 39,000	42,912	36,980	18,496	137,000	602	466	391	240	417
68	Bonnet Carre Flood-Way near Norco, La	0	3,783	5,313	1,180	10,276	0	5,218	9,139	1,069	15,426	-----	511	637	336	556
69	Lake Pontchartrain near New Orleans, La [3]	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
70	Atchafalaya River at Krotz Springs La [4]	12,984	19,231	22,611	16,554	71,380	13,960	17,424	20,528	16,028	67,940	398	366	336	359	353
71	Morganza Floodway near Krotz Springs, La	-----	-----	3,219	-----	-----	-----	-----	283	-----	-----	-----	-----	33	-----	-----
72	Wax Lake Outlet at Calumet, La	-----	-----	7,954	7,982	-----	-----	-----	7,982	3,999	-----	-----	-----	372	186	-----
73	Lower Atchafalaya River at Morgan City, La	-----	-----	18,967	15,393	-----	-----	-----	18,584	10,517	-----	-----	-----	363	253	-----
	To Lake Pontchartrain and to Gulf of Mexico	-----	-----	-----	-----	182,000	51,600	81,100	72,700	34,100	239,500	-----	-----	-----	-----	-----

[1] Period March–May, 1973.
[2] Estimated on basis of periodic measurements or data from nearby stations.
[3] Chloride and suspended-sediment concentrations were obtained at numerous points in Lake Pontchartrain during operation of Bonnet Carre Floodway (see figure 35 and table 11).
[4] Sediment data were collected at Simmesport, approximately 36 miles upstream.

discharge for a mean concentration of 359 mg/l; whereas, the March–May yield was 185 t/mi² (71.4 t/km²) in 251 (ft³/s-days)/mi² [0.237 hm³/km²] for a mean concentration of 273 mg/l. The mean concentration of the Iowa River at Iowa City from 1945 to 1957, prior to Coralville Reservoir, was 649 mg/l (Hydrology-Sedimentation Advisory Committee, 1966), but the flow of the 1973 flood into the reservoir at Marengo had a mean concentration of only 372 mg/l for this event. From March through June 1973 the Missouri River at Hermann, Mo., moved 103 million tons of sediment (1,376 mg/l) toward the Mississippi River. This is considerably less than the March through June average load of 202 million tons for the 4 "wet" years 1949–52.

At scattered points in the Mississippi River basin, the sediment loads were relatively high during the 1973 flood. At Vicksburg, Miss., the mean March–June concentration was 297 mg/l for a total of 146 million tons in 182 million ft³/s-days (445,000 hm³) of water discharge. At New Orleans the 4-month mean concentration was 417 mg/l; and even though nearly 40 percent of the flow was diverted from the river by various floodways upstream, the load was about 137 million tons, which indicates considerable sediment inflow from tributaries between the stations, or enlargement of the channel. The nearly 24 million tons measured for the Mississippi River at Keokuk, Iowa (March–June) was considerably more than the computed average annual load of 9.4 million. The mean concentration of 342 mg/l for the flood period is also considerably more than the com-

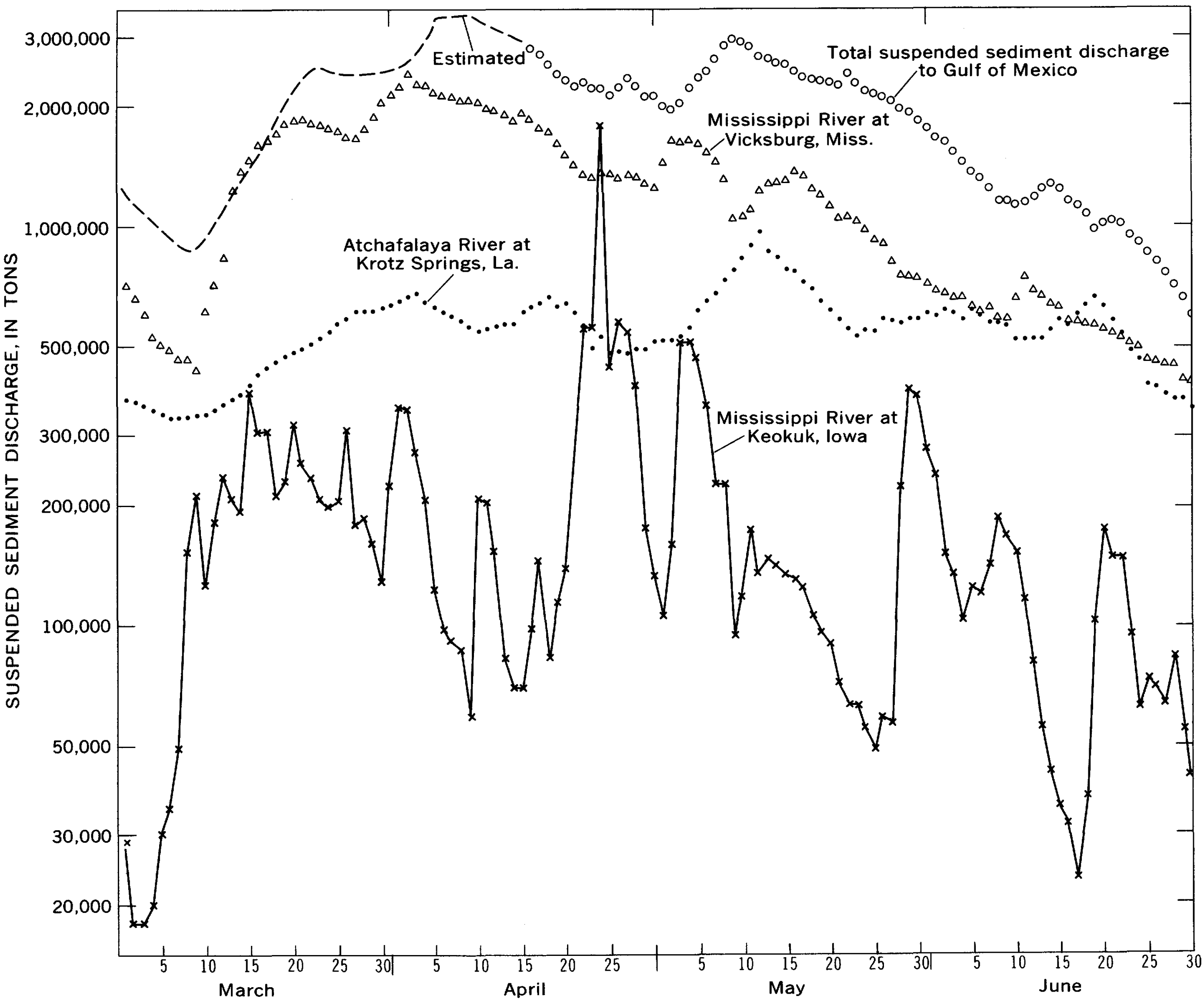


FIGURE 74.—March–June 1973 suspended sediment discharge at selected points in the Mississippi River basin.

puted long-term average of 154 mg/l. The March–June temporal distribution of the sediment load for Keokuk and other selected points in the basin is shown in figure 74 on a daily basis.

The sediment discharge to the Gulf during the flood can be estimated using data collected at the stations Bonnet Carre Floodway near Norco, La. (via Lake Pontchartrain), Wax Lake Outlet at Calumet, La., Lower Atchafalaya River at Morgan City, La., and Mississippi River at New Orleans, La. See figure 74 and tables 11 and 12. Data prior to about April 15 were not obtained at the Calumet and Morgan City stations and therefore estimates of the sediment discharge of the flood March 1 to April 15 were based on data at Vicksburg and the Atchafalaya at Krotz Springs.

The total March through June water discharge of the flood to the Gulf of Mexico was approximately 182 million ft^3/s-days (445,000 hm^3) including 10 million (24,500 hm^3) into and through Lake Pontchartrain. The total sediment discharge during this period was approximately 240 million tons including 15 million into Lake Pontchartrain.

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TABLE 12

TABLE 12.—*Station descriptions and discharge and suspended-sediment data*

This table presents information for gaging stations where outstanding flood events were experienced and where sediment data are available during the spring 1973 flood.
The *map numbers* (in parenthesis at top of each manuscript) are the same as the numbers on the station location map (fig. 51) for each station and will aid in identifying the site.
The *station numbers* immediately follow the map numbers and are nationwide identification numbers used by the U.S. Geological Survey to locate the stations in downstream order. Stations in this table are arranged in downstream order; however, an alphabetical listing with station numbers is provided in the station index.
Location provides an exact geographical reference to the gaged site.
Under *drainage area* is the most recently determined area of the basin based on the most accurate maps available at the time of the determination.
Gage provides a description of the type of gage used to collect the data and gives the datum of the gage.
Bankfull or flood stage shows the approximate elevation of the stream when flooding begins. Where significant, a tabulation of the number of days this stage was exceeded during the spring 1973 floods is included along with a comparison to previous floods.
Maxima provides information on maximum stage and discharge during the flood period. Also included for many stations are suspended-sediment data and recurrence intervals in years for flood peaks smaller than the estimated 100-year peak. Whenever 1973 peaks exceeded the estimated 100-year peak, the statement "discharge exceeded the 100-year flood" is shown. Where applicable, historic flood information is listed for comparative purposes.
Remarks includes statements about regulation in the basin, diversions, cooperation, or other pertinent information.

MISSISSIPPI RIVER MAIN STEM

(1) 05331000 Mississippi River at St. Paul, Minn.

Location.—Lat 44°56′40″, long 93°05′20″, in SE¼NE¼ sec. 6, T. 28 N., R. 22 W., Ramsey County, on left bank in St. Paul, 300 ft (91 m) upstream from Robert Street Bridge, 6 mi (10 km) downstream from Minnesota River, and at mile 839.3 (1,350.4 km) upstream from Ohio River. Auxiliary water-stage recorder 5.6 mi (9.0 km) downstream from base gage.
Drainage area.—36,800 mi² (95,300 km²), approximately.
Gage.—Base gage: Water-stage recorder. Datum of gage is 683.62 ft (208.367 m) above mean sea level, datum of 1929.
Auxiliary gage: Water-stage recorder. Datum of gage is 684.16 ft (208.532 m) above mean sea level, datum of 1912.
Flood stage.—14.00 ft (4.27 m).
Maxima.—March–May 1973: Discharge, 51,800 ft³/s (1,470 m³/s) 4:00 p.m., Mar. 20 [gage height, 11.19 ft (3.41 m)]. Recurrence interval of discharge is 3 years (based on figure 52).
Period of record: 1851–70, 1872 to current year. Maximum discharge, 171,000 ft³/s (4,840 m³/s) Apr. 16, 1965 [gage height 26.01 ft (7.928 m) from floodmark)].
Remarks.—Floodflow not materially affected by artificial storage.

Mean discharge, in cubic feet per second, 1973

Day	March	April	May	Day	March	April	May	Day	March	April	May
1	7,090	33,500	16,700	11	19,400	22,100	26,100	21	51,300	21,700	16,600
2	7,260	32,600	20,700	12	23,500	20,700	25,900	22	50,200	22,200	17,200
3	7,810	31,900	21,800	13	29,400	18,700	25,900	23	48,500	22,200	16,400
4	7,530	30,800	23,100	14	34,200	19,100	26,000	24	46,700	21,200	16,300
5	8,920	29,600	23,400	15	38,000	18,800	24,900	25	44,800	20,500	17,100
6	10,900	28,700	24,600	16	41,700	18,700	23,200	26	43,000	20,200	17,500
7	11,600	27,500	24,400	17	45,600	18,600	21,700	27	41,200	19,100	18,800
8	13,700	26,200	25,000	18	48,800	28,900	20,200	28	39,400	18,800	20,600
9	15,000	24,200	25,800	19	50,600	20,900	19,000	29	37,500	18,000	21,900
10	17,100	22,500	26,100	20	51,600	20,500	17,700	30	34,900	17,700	22,700
								31	33,700	-----	23,300
Monthly mean discharge, in cubic feet per second									31,300	23,200	22,000
Runoff, in acre-feet									.98	.70	.69

MISSISSIPPI RIVER MAIN STEM

(2) 05344500 Mississippi River at Prescott, Wis.

Location.—Lat 44°44′45″, long 92°48′00″, in sec. 9, T. 26 N., R. 20 W., Pierce County, on left bank at Prescott, 200 ft (61 m) downstream from St. Croix River, 300 ft (91 m) south of Chicago, Burlington & Quincy Railroad bridge, 800 ft (244 m) south of bridge on U.S. Highway 10, and at mile 811.4 (1,305.5 km) upstream from Ohio River. Auxiliary water-stage recorder 10.7 mile (17.2 km) downstream from base gage.
Drainage area.—44,800 mi² (116,000 km²), approximately.
Gage.—Base gage: Water-stage recorder. Datum of gage is 649.50 ft (197.968 m) above mean sea level, datum of 1929.
Auxiliary gage: Water-gage recorder. Datum of gage is 650.00 ft (198.120 m) above mean sea level, datum of 1929.
Bankfull stage.—39.00 ft (11.887 m).
Maxima.—March–May 1973: Discharge, 78,300 ft³s (2,220 m/³s) 2:00 p.m. Mar. 20 [gage height, 33.83 ft (10.311 m)]. Recurrence interval of discharge is 4 years (based on figure 30).
Period of record: June 1928 to current year. Maximum discharge, 228,000 ft³/s (6,460 m³/s) Apr. 18, 1965 [gage height, 43.11 ft (13.140 m) from graph based on gage readings)].
Remarks.—Floodflow not materially affected by artificial storage.

Mean discharge, in cubic feet per second, 1973

Day	March	April	May	Day	March	April	May	Day	March	April	May
1	9,900	47,900	29,400	11	28,100	32,500	37,100	21	77,000	32,000	26,700
2	10,900	46,800	30,100	12	31,500	31,500	36,600	22	74,200	32,200	26,400
3	11,600	45,200	30,500	13	36,000	29,800	36,400	23	70,900	32,800	25,900
4	11,800	43,200	31,800	14	43,800	28,800	36,400	24	67,800	33,000	25,300
5	16,100	40,600	33,300	15	53,000	28,400	35,900	25	64,900	32,900	26,300
6	16,400	39,500	34,400	16	61,700	28,800	34,700	26	62,100	32,200	28,300
7	17,900	38,900	35,700	17	68,200	27,400	32,300	27	59,800	31,100	31,900
8	20,400	37,100	36,200	18	73,700	28,900	31,100	28	58,100	30,400	35,300
9	21,900	36,000	35,900	19	76,700	30,700	29,400	29	55,400	29,700	37,500
10	25,600	33,600	36,800	20	78,000	31,100	27,800	30	53,100	29,200	38,400
								31	49,700	-----	38,700
Monthly mean discharge, in cubic feet per second									45,400	34,100	32,700
Runoff, in inches									1.17	.85	.84

TABLE 12.—*Station descriptions and discharge and suspended-sediment data*—Continued

MISSISSIPPI RIVER MAIN STEM

(3) 05378500 Mississippi River at Winona, Minn.

Location.—Lat 44°03′20″, long 91°38′15″, in sec. 23, T. 107 N., R. 7 W., Winona County, on right bank at Winona pumping station in Winona, 9½ miles (15.3 km) upstream from Trempealeau River and at mile 725.7 (1,167.7 km) upstream from the Ohio River. Auxiliary digital water-stage recorder at navigation dam 5A in sec. 9, T. 107 N., R. 7 W., 2.7 miles (4.3 km) upstream.
Drainage area.—59,200 mi^2 (153,300 km^2), approximately.
Gage.—Base gage: Water-stage recorder. Datum of gage is 639.64 ft (194.962 m) above mean sea level, datum of 1929.
Auxiliary gage: Water-stage recorder. Datum of gage is 640.00 ft (195.072 m) above mean sea level, datum of 1912.
Flood stage.—13 ft (3.97 m).
Maxima.—March–May 1973: Discharge, 136,000 ft^3/s (3,850 m^3/s) 0100 hours Mar. 20 [gage height, 14.58 ft (4.444 m)]. Recurrence interval of discharge is 7 years (based on figure 52).
Period of record: June 1928 to current year. Maximum discharge, 268,000 ft^3/s (7,590 m^3/s) Apr. 19, 1965 [gage height, 20.77 ft (6.331 m) from floodmark)].
Remarks.—Floodflow not materially affected by artificial storage.

Mean discharge, in cubic feet per second, 1973

Day	March	April	May	Day	March	April	May	Day	March	April	May
1	17,700	71,400	50,100	11	54,300	53,100	69,600	21	130,000	63,600	50,900
2	19,300	69,000	55,000	12	65,300	51,000	69,300	22	123,000	62,300	47,800
3	22,300	67,000	63,100	13	78,400	49,900	69,200	23	113,000	59,700	47,500
4	26,500	65,100	72,100	14	82,500	45,400	69,100	24	106,000	56,700	46,100
5	27,900	63,000	76,900	15	93,100	46,100	68,000	25	99,600	54,300	44,100
6	31,400	61,800	84,400	16	109,000	51,300	65,200	26	93,200	54,200	45,700
7	36,100	60,000	87,600	17	120,000	53,200	62,300	27	88,000	51,900	46,400
8	42,000	58,000	82,200	18	129,000	58,300	58,800	28	82,900	50,000	54,500
9	45,300	57,100	75,100	19	134,000	59,700	56,000	29	80,500	46,500	59,800
10	47,300	56,300	71,300	20	135,000	60,300	53,200	30	77,400	46,700	63,700
								31	74,400	-----	64,700
Monthly mean discharge, in cubic feet per second									76,900	56,800	62,300
Runoff, in inches									1.50	1.07	1.21

ROOT RIVER BASIN

(4) 05385000 Root River near Houston, Minn.

Location.—Lat 43°46′05″, long 91°35′11″, in sec. 32, T. 104 N., R. 6 W., Houston County, on right bank 1 mile (1.6 km) west of Houston, and 2.5 miles (4.0 km) upstream from South Fork.
Drainage area.—1,270 mi^2 (3,290 km^2), approximately.
Gage.—Water-stage recorder. Datum of gage is 671.86 ft (204.783 m) above mean sea level, datum of 1929.
Bankfull stage.—12 ft (3.7 m), approximately.
Maxima.—March–May 1973: Discharge, 11,700 ft^3/s (331 m^3/s), 4:00 p.m., Apr. 17 [gage height, 10.48 ft (3.194 m)]. Recurrence interval of discharge, 2 years.
Period of record: May 1909 to Sept. 1917, May to November 1929, March 1930 to current year. Maximum discharge, 37,000 ft^3/s (1,050 m^3/s) Apr. 1, 1952 [gage height, 13.90 ft (4.237 m)]; maximum gage height, 18.32 ft (5.584 m) Mar. 2, 1965 (backwater from ice).
Remarks.—Floodflow not affected by artificial storage. Station data included in this report primarily for sediment analysis.

Mean water discharge and suspended-sediment concentration and discharge

March				April				May				June			
Day	Mean discharge (ft^3/s)	Suspended sediment: Mean concentration (mg/l)	Suspended sediment: Discharge (tons/day)	Day	Mean discharge (ft^3/s)	Suspended sediment: Mean concentration (mg/l)	Suspended sediment: Discharge (tons/day)	Day	Mean discharge (ft^3/s)	Suspended sediment: Mean concentration (mg/l)	Suspended sediment: Discharge (tons/day)	Day	Mean discharge (ft^3/s)	Suspended sediment: Mean concentration (mg/l)	Suspended sediment: Discharge (tons/day)
1	660	----	-----	1	1,130	150	458	1	2,210	1,280	8,010	1	1,560	184	775
2	1,610	----	-----	2	1,170	187	591	2	6,350	2,120	36,300	2	1,460	167	658
3	2,600	----	-----	3	1,370	245	906	3	6,620	1.200	21,400	3	1,390	170	638
4	3,930	----	-----	4	1,390	205	769	4	4,480	800	9,680	4	1,410	176	670
5	3,430	----	-----	5	1,230	220	731	5	3,250	485	4,260	5	1,830	228	1,130
6	2,430	----	-----	6	1,140	178	548	6	2,770	345	2,580	6	1,630	538	2,370
7	3,980	----	-----	7	1,070	135	390	7	2,570	290	2,010	7	1,500	295	1,190
8	4,000	----	-----	8	1,040	141	396	8	3.530	495	4,720	8	1,380	217	809
9	2,500	----	-----	9	1,060	160	458	9	5,250	778	11,000	9	1,300	193	677
10	1,950	----	-----	10	1,030	175	487	10	3.410	538	4,950	10	1,230	178	591
11	7,360	----	-----	11	935	154	389	11	2,700	345	2,520	11	1.180	179	570
12	9,430	----	-----	12	982	112	297	12	2,330	258	1,620	12	1,160	230	720
13	4,260	985	11,400	13	988	88	235	13	2,080	175	983	13	1,120	222	671
14	3,810	1,260	13.000	14	1,030	128	356	14	1,920	210	1,090	14	1.090	170	500
15	5.250	1,640	23,200	15	2,370	433	3,170	15	1,790	240	1,160	15	1,050	143	405
16	3,900	1,010	10,600	16	6,860	1,660	30.700	16	1,670	195	879	16	1.070	140	404
17	2,880	610	4,740	17	10,600	1,560	44,600	17	1,570	158	670	17	1,060	149	426
18	2,300	400	2,480	18	5,700	1.030	15.900	18	1,500	168	680	18	1,330	329	1,[illegible]20
19	1,920	350	1,810	19	3,670	700	6,940	19	1,430	200	772	19	1,640	662	2,930
20	1,660	330	1,480	20	2,960	465	5,720	20	1,370	198	732	20	1,720	532	2,470
21	1,510	245	999	21	2,530	440	3,010	21	1,330	180	646	21	1,390	372	1,400
22	1,430	220	849	22	2,240	345	2,090	22	1,350	171	623	22	1,210	237	774
23	1,340	221	800	23	1,990	320	1,720	23	1,340	147	532	23	1,120	177	535

TABLE 12.—*Station descriptions and discharge and suspended-sediment data*—Continued

Mean water discharge and suspended-sediment concentration and discharge—Continued

March				April				May				June			
		Suspended sediment				Suspended sediment				Suspended sediment				Suspended sediment	
Day	Mean discharge (ft³/s)	Mean concentration (mg/l)	Discharge (tons/day)	Day	Mean discharge (ft³/s)	Mean concentration (mg/l)	Discharge (tons/day)	Day	Mean discharge (ft³/s)	Mean concentration (mg/l)	Discharge (tons/day)	Day	Mean discharge (ft³/s)	Mean concentration (mg/l)	Discharge (tons/day)
24	1,280	195	674	24	1,790	280	1,350	24	1,300	162	569	24	1,060	193	552
25	1,250	215	726	25	1,650	225	1,000	25	1,290	150	522	25	1,010	228	622
26	1,280	178	615	26	1,540	200	832	26	1,270	120	411	26	973	188	494
27	1,320	180	642	27	1,440	180	700	27	1,280	298	1,030	27	986	177	471
28	1,250	168	567	28	1,360	180	661	28	1,660	420	1,880	28	969	161	421
29	1,180	140	446	29	1,430	510	1,970	29	2,070	388	2,170	29	932	160	403
30	1,130	148	452	30	1,600	360	1,560	30	2,1[illegible]0	302	1,790	30	905	169	413
31	1,120	148	448	31	----	----	-----	31	1,770	210	1,000	31	----	----	-----
Total	83,990			Total	65,295		126,934	Total	75,640		127,189	Total	37,695		26,009
Monthly mean discharge	2,709			Monthly mean discharge	2,177		4,231	Monthly mean discharge	2,440		4,103	Monthly mean discharge	1,257		867
Maximum	9,430			Maximum	10,600		44,600	Maximum	6,620		36,300	Maximum	1,830		2,930
Minimum	660			Minimum	935		235	Minimum	1,270		411	Minimum	905		403

MISSISSIPPI RIVER MAIN STEM

(5) 05420500 Mississippi River at Clinton, Iowa

Location.—Lat 41°46′53″, long 90°15′04″, in NW¼ sec. 34, T. 81 N., R. 6 E., Clinton County, on right bank at foot of Seventh Avenue in Camanche, 5.0 miles (8.0 km) upstream from Wapsipinicon River, 6.4 miles (10.3 km) downstream from Clinton, 10.6 miles (17.1 km) downstream from dam 13, and at mile 511.8 (823.5 km) upstream from Ohio River. Prior to June 6, 1969, at site 400 ft (122 m) downstream.

Drainage area.—85,600 mi² (222,000 km²), approximately, at Fulton-Lyons Bridge where discharge measurements are made.

Gage.—Water-stage recorder. Datum of gage is 562.68 ft (171.505 m) above mean sea level, datum of 1929. June 1873 to May 31, 1934, staff gage in stone well and June 1, 1934, to Sept. 30, 1939, water-stage recorder 14.8 miles (23.8 km) downstream at Le Claire, at datum 0.07 ft (0.021 m) lower. Oct. 1, 1939, to Sept. 30, 1955, water-stage recorder 10.6 miles (17.1 km) upstream at dam 13, at datum 5.48 ft (1.670 m) higher. Auxiliary water-stage recorder at dam 13 since Oct. 1, 1958. Present gage used as auxiliary gage Oct. 1, 1939, to Sept. 30, 1955.

Flood stage.—16 ft (4.9 m).

Maxima.—March–May 1973: Daily discharge, 207,000 ft³/s (5,860 m³/s) Mar. 25; gage height, 20.65 ft (6.294 m), 11:00 a.m., Mar. 25. Recurrence interval of discharge is 20 years (based on figure 52).

June 1873 to February 1973: Daily discharge, 307,000 ft³/s (8,690 m³/s).

Apr. 28, 1965; gage height, 24.65 ft (7.513 m) Apr. 28, 1965. Maximum stage known since at least 1828 that of Apr. 28, 1965.

Mean stage, in feet and discharge in cubic feet per second in 1973

Day	March		April		May	
	Stage	Discharge	Stage	Discharge	Stage	Discharge
1	9.90	39,000	16.98	148,000	15.65	125,000
2	10.05	40,000	16.49	140,000	15.47	124,000
3	10.37	45,000	16.05	133,000	15.92	129,000
4	10.62	51,200	15.67	127,000	15.67	123,000
5	10.67	51,800	15.25	120,000	15.08	115,000
6	10.64	54,000	14.68	110,000	14.75	112,000
7	11.94	71,600	14.31	106,000	14.77	114,000
8	12.76	80,300	14.10	103,000	15.46	126,000
9	12.13	71,500	14.02	102,000	16.42	143,000
10	11.85	68,500	14.10	103,000	17.40	158,000
11	12.38	79,800	14.11	103,000	18.06	168,000
12	13.70	98,100	14.12	103,000	18.42	173,000
13	14.25	105,000	13.98	102,000	18.59	174,000
14	14.79	114,000	13.80	98,700	18.58	172,000
15	15.31	124,000	13.76	98,200	18.42	168,000
16	15.99	136,000	14.15	106,000	18.11	163,000
17	16.65	146,000	14.93	118,000	17.71	157,000
18	17.30	157,000	15.51	125,000	17.29	150,000
19	17.91	167,000	15.57	125,000	16.88	144,000
20	18.45	175,000	15.47	123,000	16.44	137,000
21	18.98	184,000	15.91	130,000	15.91	129,000
22	19.58	192,000	17.07	145,000	15.42	122,000
23	20.13	200,000	17.95	156,000	14,65	109,000
24	20.44	205,000	18.16	160,000	14.04	101,000
25	20.60	207,000	18.16	162,000	13.80	97,600
26	20.47	203,000	18.06	161,000	13.38	90,700
27	20.11	197,000	17.84	159,000	13.03	86,000
28	19.62	188,000	17.44	153,000	13.07	87,500
29	18.99	178,000	16.90	145,000	13.55	92,800
30	18.30	167,000	16.25	134,000	13.60	92,800
31	17.61	157,000	----	------	13.60	93,800
Mean		127,500		126,600		128,300
Inches		1.72		1.65		1.73
Acre-feet		7,840,000		7,535,000		7,889,000

TABLE 12.—*Station descriptions and discharge and suspended-sediment data*—Continued

Period	Highest mean discharge, in cubic feet per second, for the indicated number of consecutive days 1	3	7	15	30
March–May 1973	207,000	205,000	199,000	182,000	150,000
1874–1972	307,000	304,000	296,000	271,000	224,000
Recurrence interval, in years, for 1973 flood volumes	20	10	10	10	7

WAPSIPINICON RIVER BASIN

(6) 05422000 Wapsipinicon River near DeWitt, Iowa

Location.—Lat 41°46′01″, long 90°32′05″, in SW¼NE¼ sec. 6, T. 80 N., R. 4 E., Clinton County, on left bank 5 ft (1.5 m) upstream from bridge on U.S. Highway 61, 0.9 mile (1.4 km) downstream from Silver Creek, 4.0 miles (6.4 km) south of water tower in DeWitt, 6.2 miles (10.0 km) upstream from Brophy Creek, and 18.2 miles (29.3 km) upstream from mouth.

Drainage area.—2,330 mi^2 (6,030 km^2).

Gage.—Water-stage recorder. Datum of gage is 598.81 ft (182.517 m) above mean sea level.

Flood stage.—10 ft (3.0 m). Flood stage was exceeded continuously from Apr. 16 to May 19, 1973.

Maxima.—March–May 1973: Discharge, 27,000 ft^3/s (765 m^3/s) 11:45 a.m. Apr. 22 [gage height, 12.76 ft (3.889 m)]. Recurrence interval of discharge is 12 years.

June 1934 to February 1973: Discharge, 26,000 ft^3/s (736 m^3/s) June 27, 1944 [gage height, 12.07 ft (3.679 m)]; maximum gage height, 12.30 ft (3.749 m) July 9, 1969.

Date	Hour	Gage height (ft)	Discharge (cfs)	Suspended sediment Concentration (mg/l)	Suspended sediment Discharge (tons/day)
Apr. 20	12:00 p.m.	11.50	10,200	128	3,530
Apr. 21	6:00 a.m.	11.75	11,900	155	4,980
	9:00 a.m.	11.87	11,900	172	5,990
	12:00 m.	12.03	14,500	193	7,560
	3:00 p.m.	12.16	16,000	215	9,230
	6:00 p.m.	12.35	18,800	265	13,500
	9:00 p.m.	12.51	21,800	360	21,200
	12:00 p.m.	12.65	24,600	403	26,800
Apr. 22	6:00 a.m.	12.66	24,800	420	28,100
	11:45 a.m.	12.76	27,000	437	31,900
	6:00 p.m.	12.71	25,800	415	28,900
	12:00 p.m.	12.63	24,200	355	23,200
Apr. 23 [1]	6:00 a.m.	12.51	21,800	305	18,000
	12:00 m.	12.42	20,000	255	13,800
	6:00 p.m.	12.33	18,400	232	11,500
	12:00 p.m.	12.26	17,300	210	9,810

[1] A seven-vertical suspended-sediment sample at 11:40 a.m. contained 76 percent clay, 12 percent silt, and 12 percent sand.

Mean water discharge and suspended-sediment concentration and discharge

March Day	Mean discharge (ft³/s)	Suspended sediment Mean concentration (mg/l)	Discharge (tons/day)	April Day	Mean discharge (ft³/s)	Suspended sediment Mean concentration (mg/l)	Discharge (tons/day)	May Day	Mean discharge (ft³/s)	Suspended sediment Mean concentration (mg/l)	Discharge (tons/day)
1	1,900	182	930	1	4,080	627	6,910	1	5,300	155	2,220
2	2,300	402	2,500	2	4,790	382	4,940	2	8,230	1,370	30,400
3	2,600	682	4,790	3	4,390	265	3,140	3	9,190	638	15,800
4	2,400	229	1,480	4	3,770	160	1,630	4	7,750	283	5,920
5	2,500	161	1,090	5	3,470	137	1,280	5	7,000	204	3,860
6	2,600	173	1,210	6	3,230	101	880	6	5,590	172	2,600
7	4,500	2,180	26,500	7	3,050	109	900	7	5,490	174	2,580
8	5,800	936	14,700	8	2,900	79	620	8	6,250	301	5,080
9	5,400	487	7,100	9	3,430	226	2,090	9	6,650	212	3,810
10	5,000	332	4,480	10	4,560	381	4,690	10	6,890	125	2,330
11	6,130	586	9,700	11	3,800	249	2,550	11	7,320	97	1,920
12	7,260	489	9,600	12	3,530	282	2,690	12	7,860	60	1,270
13	7,470	248	5,000	13	3,680	490	4,870	13	8,530	61	1,400
14	7,770	219	4,590	14	3,730	280	2,820	14	9,170	70	1,730
15	8,200	150	3,320	15	4,120	327	3,640	15	9,010	76	1,850
16	8,300	107	2,400	16	5,130	483	6,690	16	8,430	75	1,710
17	8,640	80	1,870	17	6,240	309	5,210	17	7,810	101	2,130
18	8,870	70	1,680	18	6,740	162	2,950	18	7,070	79	1,510
19	8,810	64	1,520	19	7,330	133	2,630	19	5,660	171	2,610
20	9,050	67	1,640	20	8,540	85	1,960	20	3,900	135	1,420
21	9,290	61	1,530	21	15.500	223	9,330	21	3,270	134	1,180
22	8,990	48	1,170	22	25,400	415	28,500	22	3,110	83	670

TABLE 12.—*Station descriptions and discharge and suspended-sediment data*—Continued

Mean water discharge and suspended-sediment concentration and discharge—Continued

March				April				May			
		Suspended sediment				Suspended sediment				Suspended sediment	
Day	Mean discharge (ft³/s)	Mean concentration (mg/l)	Discharge (tons/day)	Day	Mean discharge (ft³/s)	Mean concentration (mg/l)	Discharge (tons/day)	Day	Mean discharge (ft³/s)	Mean concentration (mg/l)	Discharge (tons/day)
23 ----	8,310	54	1,210	23 -----	20,200	268	14,600	23 -----	2,970	135	1,080
24 ----	7,550	66	1,350	24 -----	15,900	175	7,510	24 -----	2,890	95	740
25 ----	6,450	92	1,600	25 -----	13,000	115	4,040	25 -----	2,850	121	930
26 ----	4,970	128	1,720	26 -----	10,500	137	3,380	26 -----	2,820	142	1,080
27 ----	3,940	126	1,340	27 -----	8,930	73	1,760	27 -----	3,470	227	2,130
28 ----	3,400	102	940	28 -----	7,820	81	1,710	28 -----	5,700	3,390	52,200
29 ----	3,150	96	820	29 -----	6,350	76	1,300	29 -----	5,950	740	11,900
30 ----	2,950	89	710	30 -----	4,760	72	920	30 -----	6,010	362	5,900
31 ----	2,930	210	1,660	31 -----	------	---	------	31 -----	6,070	305	5,000
Total ----	177,430		120,150		218,870		136,140		188,210		174,960
Monthly mean discharge -	5,724		3,876		7,296		4,538		6,071		5,644
Maximum --	9,290		26,500		25,400		28,500		9,190		52,200
Minimum --	1,900		710		2,900		620		2,820		670

Period	Highest mean discharge, in cubic feet per second, for the indicated number of consecutive days: 1	3	7	15	30
March–May 1973 ------------------	25,400	20,400	15,600	11,200	9,260
1935–72 ---------------------------	21,300	20,400	17,200	14,000	11,000
Recurrence interval, in years, for 1973 flood volumes ------------	50	35	20	15	20

ROCK RIVER BASIN

(7) 05431400 Little Turtle Creek at Allens Grove, Wis.

Location.—Lat 42°34′46″, long 88°45′33″, in NE¼ sec. 6, T. 1 N., R. 15 E., Walworth County, at bridge on country road, 0.2 mi (0.3 km) south of Allens Grove.

Drainage area.—41.8 mi² (108.3 km²).

Gage.—Crest stage only.

Bankfull stage.—12.5 ft (3.81 m).

Maxima.—March–May 1973: Discharge, 8,400 ft³/s (238 m³/s) Apr. 21 [gage height, 18.28 ft (5.572 m)]. Discharge exceeded the 100-year flood.

1962 to February 1973: Discharge, 2,440 ft³/s (69.1 m³/s) Feb. 19, 1971 [gage height, 15.55 ft (4.740 m)].

ROCK RIVER BASIN

(8) 05431500 Turtle Creek near Clinton, Wis.

Location.—Lat 42°35′47″, long 88°51′50″, in SE¼ sec. 29, T. 2 N., R. 14 E., Rock County, on left bank 15 ft (5 m) downstream from bridge on State Highway 140, 2.7 mi (4.3 km) north of Clinton, 11 mi (18 km) northeast of Beloit, and 16 mi (26 km) upstream from mouth.

Drainage area.—202 mi² (523 km²).

Gage.—Digital recorder tape punched at 60-minute intervals. Datum of gage is 817.00 ft (249.022 m) above mean sea level (levels by Corps of Engineers).

Bankfull stage.—8.0 ft (2.44 m).

Maxima.—March–May 1973: Discharge, 16,500 ft³/s (467 m³/s) 8:00 a.m., Apr. 21 [gage height, 12.85 ft (3.917 m)]. Discharge exceeded the 100-year flood.

1938 to February 1973: Discharge, 10,700 ft³/s (303 m³/s) in February 1938 [gage height, 12.09 ft (3.685 m) from floodmarks)]

Mean discharge, in cubic feet per second, 1973

Day	March	April	May	Day	March	April	May	Day	March	April	May
1 ----	194	291	1,030	11 -----	432	261	461	21 -----	203	6,400	227
2 ----	296	359	1,030	12 -----	410	315	433	22 -----	176	2,080	289
3 ----	370	335	1,690	13 -----	394	455	384	23 -----	167	1,160	254
4 ----	292	321	818	14 -----	691	560	311	24 -----	162	996	251
5 ----	280	311	604	15 -----	530	537	278	25 -----	158	846	305
6 ----	700	278	560	16 -----	437	568	234	26 -----	151	754	277
7 ----	1,700	261	652	17 -----	424	530	224	27 -----	142	696	342
8 ----	587	260	860	18 -----	381	437	221	28 -----	141	637	525
9 ----	418	258	624	19 -----	349	398	255	29 -----	144	709	447
10 ----	394	272	487	20 -----	302	380	239	30 -----	143	1,060	444
								31 -----	148		348
Monthly mean discharge, in cubic feet per second									365	758	486
Runoff, in inches									2.26	4.55	3.01

TABLE 12.—*Station descriptions and discharge and suspended-sediment data*—Continued

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1973

Date	Hour	Gage height	Discharge	Date	Hour	Gage height	Discharge
Apr. 20	6:00 a.m.	3.78	382	Apr. 22	2:00 a.m.	8.28	2,920
	10:00 a.m.	3.75	371		6:00 a.m.	8.04	2,600
	8:00 p.m.	3.72	360		10:00 a.m.	7.70	2,200
	10:00 p.m.	3.76	375				
	12:00 p.m.	4.53	698		6:00 p.m.	7.09	1,660
Apr. 21	2:00 a.m.	7.22	2,500		12:00 p.m.	6.78	1,450
	4:00 a.m.	8.51	4,030	Apr. 23	6:00 a.m.	6.56	1,310
	6:00 a.m.	10.16	6,470		12:00 m.	6.46	1,250
	8:00 a.m.	12.49	14,700		6:00 p.m.	6.34	1,170
	9:00 a.m.	12.33	13,900		12:00 p.m.	6.23	1,120
	10:00 a.m.	12.01	12,400				
	12:00 m.	11.18	9,160				
	2:00 p.m.	10.45	7,200				
	4:00 p.m.	9.82	5,670				
	6:00 p.m.	9.34	4,620				
	8:00 p.m.	9.03	4,050				
	10:00 p.m.	8.73	3,580				
	12:00 p.m.	8.51	3,260				

Period	Highest mean discharge, in cubic feet per second, for the indicated number of consecutive days 1	3	7	15	30
March–May 1973	6,400	3,210	1,850	1,370	938
1940–71	4,130	3,330	2,160	1,360	744
Recurrence interval, in years, for 1973 flood volumes	>100	>100	50	80	>100

ROCK RIVER BASIN

(9) 05446500 Rock River near Joslin, Ill.

Location.—Lat 41°33′35″, long 90°10′55″, in NE¼ sec. 18, T. 18 N., R. 3 E., Rock Island County, on right bank at downstream side of bridge on State Highway 92, 1.8 miles (2.9 km) east of Joslin, 12 miles (19 km) downstream from Rock Creek, and 27 miles (43 km) upstream from mouth.

Drainage area.—9,551 mi² (24,737 km²), revised.

Gage.—Water-stage recorder. Datum of gage is 564.06 ft (171.925 m) above mean sea level (levels by Corps of Engineers).

Maxima.—March–May 1973: Discharge, 41,500 ft³/s (1,180 m³/s) 11:00 a.m. Apr. 23 [gage height, 17.74 ft (5.407 m)]. Recurrence interval of discharge is 17 years.

1939 to February 1973: Discharge, 46,200 ft³/s (1,310 m³/s) Mar. 22, 1948 [gage height, 14.46 ft (4.407 m)]; gage height, 17.69 (5.392 m) Feb. 23, 1971 (backwater from ice).

Maximum stage known since 1892, that of Apr. 23, 1973.

Mean discharge, in cubic feet per second, 1973

Day	March	April	May	Day	March	April	May	Day	March	April	May
1	9,340	14,900	25,400	11	23,500	17,200	32,100	21	20,600	20,500	21,600
2	10,200	16,100	28,000	12	22,700	17,100	30,900	22	19,700	33,100	21,200
3	11,200	17,400	32,700	13	22,500	17,100	29,900	23	19,100	40,400	20,900
4	11,600	18,100	34,300	14	22,100	17,100	28,900	24	18,400	39,800	20,100
5	11,800	18,000	33,200	15	22,300	17,100	27,900	25	17,800	41,100	19,600
6	12,100	17,500	31,300	16	23,200	17,400	26,500	26	17,500	39,700	19,300
7	14,900	17,200	29,700	17	23,700	17,700	25,300	27	16,900	34,400	19,700
8	20,200	16,600	29,500	18	23,100	18,000	24,000	28	16,200	30,300	20,700
9	24,300	16,400	30,500	19	22,200	18,100	23,000	29	15,300	27,600	21,900
10	24,700	17,000	32,200	20	23,700	17,700	25,300	30	14,800	25,700	22,200
								31	14,200		22,000
Monthly mean discharge, in cubic feet per second									18,310	22,560	26,030
Runoff, in inches									2.22	2.64	3.15

Period	Highest mean discharge, in cubic feet per second, for the indicated number of consecutive days 1	3	7	15	30
March–May 1973	41,100	40,400	37,000	33,100	30,400
1940–72	44,700	41,800	35,800	29,500	24,200
Recurrence interval, in years, for 1973 flood volumes	20	20	25	30	80

IOWA RIVER BASIN

(10) 05453100 Iowa River at Marengo, Iowa

Location.—Lat 41°48′41″, long 92°03′42″, in SW¼NE¼ sec. 24, T. 81 N., R. 11 W., Iowa County, on right bank 10 ft (3 m) downstream from abandoned highway bridge, 0.7 mile (1.1 km) downstream from Big Bear Creek, 0.8 mile (1.3 km) north of Marengo, 4.9 miles (7.9 km) upstream from Hilton Creek, and at mile 139.4 (224.3 km).

TABLE 12.—*Station descriptions and discharge and suspended-sediment data*—Continued

Drainage area.—2,794 mi² (7,236 km²).
Gage.—Water-stage recorder. Datum of gage is 720.52 ft (219.614 m) above mean sea level.
Flood stage.—14 ft (4.3 m).
Maxima.—March–May 1973: Discharge, 16,600 ft³/s (470 m³/s) 6:15 p.m., Apr. 16 [gage height, 17.73 ft (5.404 m)]. Recurrence interval of discharge is 3 years.
October 1956 to February 1973: Discharge, 30,800 ft³/s (872 m³/s) Mar. 31, 1960 [gage height, 19.21 ft (5.855 m)] Maximum gage height, 19.79 ft (6.032 m) July 12, 1969.
Remarks.—Station data included in this report primarily for sediment analysis.

Mean water discharge and suspended-sediment concentration and discharge

Day	March: Mean discharge (ft³/s)	March: Suspended sediment, Mean concentration (mg/l)	March: Suspended sediment, Discharge (tons/day)	April: Mean discharge (ft³/s)	April: Suspended sediment, Mean concentration (mg/l)	April: Suspended sediment, Discharge (tons/day)	May: Mean discharge (ft³/s)	May: Suspended sediment, Mean concentration (mg/l)	May: Suspended sediment, Discharge (tons/day)
1	3,940	801	8,520	5,700	900	13,900	5,090	388	5,330
2	4,460	756	9,100	5,890	258	4,100	5,810	711	11,200
3	4,990	998	13,400	5,760	296	4,600	5,780	432	6,740
4	5,260	842	12,000	5,430	193	2,830	5,770	205	3,190
5	5,300	784	11,200	5,060	308	4,210	5,840	147	2,320
6	5,240	580	8,210	4,650	166	2,080	5,940	117	1,880
7	5,780	839	13,100	4,250	187	2,140	6,330	109	1,860
8	6,040	664	10,800	3,920	173	1,830	7,020	287	5,440
9	6,040	642	10,500	3,640	170	1,670	6,700	266	4,810
10	6,090	398	6,540	2,960	437	3,490	6,560	200	3,540
11	6,780	404	7,400	2,910	417	3,280	6,740	130	2,370
12	7,520	616	12,500	3,650	447	4,410	8,040	88	1,910
13	7,740	1,440	30,100	5,170	635	8,860	8,340	90	2,030
14	7,850	1,050	22,300	6,840	1,900	36,200	7,730	142	2,960
15	8,410	152	3,450	10,900	2,160	61,400	7,130	98	1,890
16	8,490	121	2,770	15,300	600	24,800	6,570	122	2,160
17	8,390	117	2,650	15,600	530	22,300	6,000	153	2,480
18	8,540	75	1,730	15,900	240	10,300	5,010	208	2,810
19	8,520	134	3,080	15,600	170	7,160	4,120	240	2,670
20	8,160	171	3,770	15,100	145	5,910	3,660	242	2,390
21	7,660	88	1,820	14,500	160	6,260	3,400	202	1,850
22	7,240	65	1,270	13,400	165	5,970	3,260	219	1,930
23	6,680	151	2,720	11,600	90	2,820	3,210	219	1,900
24	6,020	218	2,540	10,100	92	2,510	3,070	222	1,840
25	5,170	174	2,430	8,940	126	3,040	2,960	204	1,630
26	4,720	329	4,190	7,930	110	2,360	2,870	214	1,660
27	4,540	326	4,000	7,110	131	2,510	5,570	498	7,490
28	4,440	310	3,720	6,320	194	3,310	8,820	1,100	26,200
29	4,270	327	3,770	5,420	205	3,000	8,400	448	10,200
30	4,060	309	3,390	4,660	232	2,920	7,820	250	5,280
31	4,350	188	2,210	----	----	------	7,330	218	4,310
Total	192,690		226,180	244,210		260,170	180,890		134,270
Monthly mean discharge	6,216		7,300	8,140		8,670	5,835		4,330
Maximum	8,540		30,100	15,900		61,400	8,820		26,200
Minimum	3,940		1,270	2,910		1,670	2,870		1,630

Gage height, water discharge, and suspended-sediment concentration and discharge

Date	Time	Gage height (ft)	Discharge (cfs)	Suspended sediment: Concentration (mg/l)	Suspended sediment: Discharge tons/day
Apr. 14	6:00 a.m.	14.18	6,010	1,200	19,500
	12:00 m.	14.57	6,620	1,950	34,900
	12:00 p.m.	15.60	8,850	2,650	63,300
Apr. 15 [1]	6:00 a.m.	16.19	10,600	3,600	103,000
	12:00 m.	16.24	10,700	2,200	63,600
	6:00 p.m.	16.44	11,400	1,100	33,900
	12:00 p.m.	16.83	12,900	700	24,400
Apr. 16	6:00 a.m.	17.22	14,500	600	23,500
	12:00 m.	17.54	15,800	590	25,200
	6:15 p.m.	17.73	16,700	600	27,100
	12:00 p.m.	17.53	15,700	600	25,400
Apr. 17	12:00 m.	17.45	15,400	530	22,000
	12:00 p.m.	17.61	16,100	370	16,100
Apr. 18	12:00 m.	17.60	16,000	240	10,400
	12:00 p.m.	17.52	15,700	200	8,480
Apr. 19	12:00 m.	17.51	15,600	180	7,580
	12:00 p.m.	17.46	15,400	160	6,650
Apr. 20	12:00 m.	17.33	14,900	145	5,830
	12:00 p.m.	17.39	15,200	145	5,950
Apr. 21	12:00 m.	17.20	14,400	155	6,030
	12:00 p.m.	17.07	13,900	190	7,130
Apr. 22	12:00 m.	16.98	13,500	165	6,010
	12:00 p.m.	16.74	12,600	120	4,080
Apr. 23	12:00 m.	16.48	11,500	90	2,790
	12:00 p.m.	16.28	10,800	90	2,620

[1] One-vertical suspended-sediment sample at 7:00 a.m. contained 29 percent clay, 63 percent silt, and 8 percent sand.

TABLE 12.—*Station descriptions and discharge and suspended-sediment data*—Continued

IOWA RIVER BASIN
(11) 05454500 Iowa River at Iowa City, Iowa

Location.—Lat 41°39′24″, long 91°32′27″, in SE¼SE¼ sec. 9, T. 79 N., R. 6 W., Johnson County, on right bank 25 ft (7.6 m) downstream from Hydraulics Laboratory of University of Iowa in Iowa City, 175 ft (53 m) downstream from University Dam, 0.8 mile (1.3 km) upstream from Ralston Creek, 3.6 miles (5.8 km) downstream from Clear Creek, and at mile 74.2 (119.4 km).

Drainage area.—3,271 m² (8,472 km²).

Gage.—Water-stage recorder. Datum of gage is 29.0 ft (8.8 m) above Iowa City datum, and 617.27 ft (188.14 m) above mean sea level, datum of 1929. June 1, 1903, to July 21, 1906, chain gage 1,200 ft (366 m) upstream at datum 13.05 ft (3.98 m) higher. Nov. 29, 1907, to Oct. 29, 1913, staff gage 200 ft (61 m) upstream at different datum. Oct. 30, 1913, to Nov. 18, 1921, chain gage 2,600 ft (792 m) downstream at datum 10.2 ft (3.11 m) higher. Nov. 19, 1921, to Sept. 30, 1922, water-stage recorder at present site at datum 11.0 ft (3.35 m) higher. Oct. 1, 1930, to Sept. 30, 1934, at present site at Iowa City datum. Oct. 1, 1934 to Sept. 30, 1972, at datum 10.00 ft (3.05 m) higher.

Maxima.—March–May 1973: Discharge, 11,300 ft³/s (320 m³/s) 10:45 a.m., hours May 1, [gage height, 22.04 ft (6.718 m)].
June 1903 to February 1973: Discharge, 42,500 ft³/s 1,204 m³/s) June 8, 1918, [gage height, 19.6 ft (6.0 m)] from graph based on gage readings, site and datum then in use.
Maximum stage known since 1850, about 34 ft (10.4 m) June 1851 [discharge, about 70,000 ft³/s (1,980 m³/s)].
March–May 1973: Sediment concentration, maximum daily, 1,580 mg/l April 21.
Sediment discharge, maximum daily, 20,300 tons (18,400 t) April 21.
October 1943 to February 1973: Sediment concentration, maximum daily, 7,800 mg/l June 13, 1953.
Sediment discharge, maximum daily, 177,000 tons (161,000t) May 23, 1944.

Remarks.—Flow regulated by Coralville Lake [capacity 476,000 ac-ft (587 hm³)] since Sept. 7, 1958. Station data included in this report primarily for sediment analysis.

Mean water discharge and suspended-sediment concentration and discharge

March				April				May			
		Suspended sediment				Suspended sediment				Suspended sediment	
Day	Mean discharge (ft³/s)	Mean concentration (mg/l)	Discharge (tons/day)	Day	Mean discharge (ft³/s)	Mean concentration (mg/l)	Discharge (tons/day)	Day	Mean discharge (ft³/s)	Mean concentration (mg/l)	Discharge (tons/day)
1	5,650	241	3,680	1	4,830	139	1,810	1	10.800	103	3,000
2	6,050	216	3,530	2	3,920	92	974	2	9,690	143	3,740
3	6,000	191	3,090	3	5,960	78	1,260	3	8,080	177	3,860
4	5,600	164	2,480	4	7,570	65	1,330	4	8,080	86	1,880
5	5,510	139	2,070	5	8.530	56	1,290	5	8,980	72	1,750
6	5.610	270	4,090	6	8,780	48	1,140	6	10,200	73	2,010
7	6,250	504	8,510	7	9,180	51	1,260	7	10,700	105	3,030
8	6.000	187	3,030	8	9,130	57	1,410	8	9,640	163	4,240
9	6,030	130	2,120	9	9.180	63	1,560	9	9,580	155	4,010
10	6,170	165	2,750	10	9,040	68	1,660	10	9,460	139	3,550
11	6,790	363	6,650	11	9,050	73	1,780	11	9,690	134	3,510
12	6,680	244	4,400	12	9,080	81	1,990	12	10,200	129	3,550
13	5,980	145	2,340	13	8,220	110	2,440	13	10,200	123	3,390
14	5,080	526	7,210	14	7,350	175	3,470	14	10,100	117	3,190
15	5,160	158	2,200	15	5,440	295	4,330	15	10,100	100	2,730
16	4,150	102	1,140	16	4,090	276	3,050	16	10,000	83	2,240
17	1,650	90	401	17	3.390	198	1,810	17	6,230	202	3,400
18	1,350	81	295	18	2.990	164	1,320	18	8,510	47	1,080
19	1,350	72	262	19	2,320	138	864	19	9,910	38	1,020
20	1,340	63	228	20	2,700	780	5,690	20	9,850	37	984
21	1,330	52	187	21	4,750	1,580	20,300	21	9.920	36	964
22	1,340	48	174	22	3,350	1,120	10,100	22	9,890	36	961
23	1,330	46	165	23	1,920	490	2,540	23	8,990	41	995
24	1,330	44	158	24	4.090	465	5,130	24	8,130	42	922
25	1,400	53	200	25	5,940	705	11,300	25	6,410	40	692
26	1,430	53	205	26	7,830	450	9,510	26	6,340	40	685
27	1,730	41	192	27	9,720	228	5,980	27	7,610	41	842
28	3,430	62	574	28	10,500	157	4,450	28	6,120	113	1,870
29	5,060	219	2,990	29	10.400	116	3,260	29	4,010	85	920
30	7,340	281	5,570	30	10,500	94	2,660	30	4,930	69	918
31	7.820	257	5,430	31	----	----	------	31	5,610	111	1,680
Total	131,940		76,321		199,750		115,668		267,960		67,613
Monthly mean discharge	4,260		2,460		6,660		3,860		8,640		2,180
Maximum	7,820		8,510		10,500		20,300		10,800		4,240
Minimum	1,330		158		1,920		864		4,010		685

IOWA RIVER BASIN
(12) 05465500 Iowa River at Wapello, Iowa

Location.—Lat 41°10′48″, long 91°10′57″, in NW¼SE¼ sec. 27, T. 74 N., R. 3 W., Louisa County, on right bank 30 ft (9 m) downstream from bridge on State Highway 99 at east edge of Wapello, 13.0 miles (20.9 km) downstream from Cedar River, and at mile 16.0 (25.7 km).

Drainage area.—12,499 mi² (32.372 km²).

Gage.—Water-stage recorder. Datum of gage is 538.98 ft (164.281 m) above mean sea level, adjustment of 1912. Oct. 1, 1914 to Apr. 15, 1934, nonrecording gage and Apr. 16, 1934 to Sept. 30, 1972, water-stage recorder at datum 10 ft (3.05 m) higher.

Flood stage.—20 ft (6.1 m). Flood stage was exceeded for 47 days during the 3-month report period.

Maxima.—March–May 1973: Discharge, 92,000 ft³/s (2,600 m³/s) 12:00 p.m., Apr. 22 [gage height, 28.63 ft (8.726 m)].
October 1914 to February 1973: Discharge, 94,000 ft³/s (2,660 m³/s) June 18, 1947. [gage height, 16.14 ft (4.919 m), datum then in use]; maximum gage height, 17.40 ft (5.304 m) July 15 1969, datum then in use.

Remarks.—High flows regulated by Coralville Lake [capacity 476.000 acre-ft (587 hm³)] since Sept. 17, 1958. Recurrence intervals of flood peaks and volumes are not shown because of reservoir effect.

TABLE 12.—*Station descriptions and discharge and suspended-sediment data*—Continued

Mean discharge, in cubic feet per second, 1973

Day	March	April	May	Day	March	April	May	Day	March	April	May
1 ----	13,400	24,700	29,900	11 ----	28,900	24,000	42,200	21 ----	33,500	53,600	22,100
2 ----	13,600	25,200	37,500	12 ----	31,400	22,500	38,500	22 ----	30,900	81,300	21,600
3 ----	15,600	23,200	41,100	13 ----	33,500	22,800	37,500	23 ----	28,200	84,200	21,100
4 ----	15,300	21,700	41,500	14 ----	34,600	23,800	38,500	24 ----	24,300	69,800	20,200
5 ----	15,600	21,000	34,200	15 ----	34,700	24,600	39,500	25 ----	21,200	53,000	19,300
6 ----	17,000	21,400	29,000	16 ----	33,800	25,700	39,000	26 ----	19,400	40,600	17,200
7 ----	22,000	21,200	29,000	17 ----	32,100	27,400	35,700	27 ----	18,200	34,100	19,500
8 ----	25,800	20,900	33,200	18 ----	32,400	30,800	30,200	28 ----	16,700	30,500	27,900
9 ----	27,000	23,100	38,100	19 ----	35,900	35,500	24,300	29 ----	16,900	28,100	31,900
10 ----	26,600	26,300	42,700	20 ----	36,200	36,400	22,700	30 ----	18,000	27,000	33,700
								31 ----	20,500		33,400
Monthly mean discharge, in cubic ft per second									24,940	33,480	31,360
Runoff in acre-feet									1,534,000	1,992,000	1,928,000

Gage height, in feet, and discharge in cubic feet per second, at indicated time, 1973

Date	Hour	Gage height	Q	Date	Hour	Gage height	Q	Date	Hour	Gage height	Q
Apr. 21 -	6:00 a.m.	22.24	41,400	Apr. 22 -	3:00 p.m.	27.31	80,400	Apr. 24 -	6:00 a.m.	26.56	74,100
	6:00 a.m.	23.08	46,600		8:00 p.m.	28.20	88,100		12:00 m.	26.04	69,600
	12:00 m.	23.99	53,200		12:00 p.m.	28.63	92,000		6:00 p.m.	25.56	65,800
	6:00 p.m.	24.81	59,800						12:00 p.m.	25.05	61,700
	12:00 p.m.	25.97	69,100	23 -	4:00 a.m.	28.19	88,000				
					12:00 m.	27.76	84,300	25 -	12:00 m.	23.91	52,600
22 -	6:00 a.m.	26.99	77,700		6:00 p.m.	27.40	81,200		12:00 p.m.	22.94	45,600
	10:00 a.m.	27.53	82,300		12:00 p.m.	26.98	77,600				

Period	Highest mean discharge, in cubic feet per second, for the indicated number of consecutive days: 1	3	7	15	30
March–May 1973	84,200	78,400	60,300	46,200	41,700
1915–72	92,400	80,700	64,300	56,500	49,000
Recurrence interval, in years, for 1973 flood volumes	-----	-----	-----	-----	-----

EDWARDS RIVER BASIN
(13) 05466500 Ewards River near New Boston, Ill.

Location.—Lat 41°11′15″, long 90°58′05″, at quarter corner between secs. 21 and 28, T. 14 N., R. 5 W., Mercer County, on left bank at downstream side of bridge on State Highway 17, 1.5 miles (2.4 km) northeast of New Boston and 5 miles (8 km) upstream from mouth.

Drainage area.—445 mi² (1,153 km²).

Gage.—Water-stage recorder. Datum of gage is 529.92 ft (161.520 m) above mean sea level (levels by Corps of Engineers).

Maxima.—March–May 1973: Discharge, 18,000 ft³/s (510 m³/s) 8:45 a.m., Apr. 22 [gage height, 23.33 ft (7.111 m)]. Discharge exceeded the 100-year flood.

1934 to February 1973: Discharge, 7,280 ft³/s (206 m³/s) Apr. 26, 1950, May 12, 1951; gage height, 21.53 ft (6.562 m) Feb. 21, 1971 (backwater from ice).

Mean discharge, in cubic feet per second, 1973

Day	March	April	May	Day	March	April	May	Day	March	April	May
1 ----	293	1,990	3,140	11 ----	1,770	2,180	2,200	21 ----	586	4,280	685
2 ----	293	1,960	4,120	12 ----	1,650	1,320	1,800	22 ----	546	14,000	685
3 ----	346	1,560	4,230	13 ----	1,220	882	1,500	23 ----	522	8,560	685
4 ----	394	1,000	4,000	14 ----	1,140	752	1,300	24 ----	502	6,960	645
5 ----	440	852	2,500	15 ----	1,480	688	1,150	25 ----	522	5,090	800
6 ----	502	740	1,700	16 ----	1,160	918	1,020	26 ----	600	2,500	1,200
7 ----	1,870	656	1,300	17 ----	849	942	954	27 ----	538	1,700	1,500
8 ----	2,170	606	2,400	18 ----	762	732	900	28 ----	484	1,200	2,000
9 ----	2,860	1,570	2,430	19 ----	678	670	800	29 ----	486	1,000	1,730
10 ----	1,940	2,120	2,770	20 ----	630	678	760	30 ----	502	1,100	930
								31 ----	708		735
Monthly mean discharge, in cubic feet per second									918	2,307	1,696
Runoff, in inches									2.44	5.93	4.51

Period	Highest mean discharge, in cubic feet per second, for the indicated number of consecutive days: 1	3	7	15	30
March–May 1973	14,000	9,840	6,160	4,290	2,910
1935–72	7,280	6,210	4,000	2,310	1,780
Recurrence interval, in years, for 1973 flood volumes	>100	>100	>100	>100	>100

TABLE 12.—*Station descriptions and discharge and suspended-sediment data*—Continued

SKUNK RIVER BASIN
(14) 05473500 Big Creek near Mount Pleasant, Iowa

Location.—Lat 41°00′52″, long 91°34′49″, in NW¼NW¼ sec. 29, T. 72 N., R. 6 W., Henry County, on left bank 12 ft (4 m) downstream from bridge on county highway, 100 ft (30 m) downstream from Lynn Creek, 0.7 mile (1.1 km) downstream from Brandywine Creek, and 3.7 miles (6.0 km) northwest of courthouse at Mount Pleasant.
Drainage area.—106 mi² (275 km²).
Gage.—Waterstage recorder and concrete control. Datum of gage is 630.53 ft (192.186 m) above mean sea level.
Bankfull stage.—17 ft (5.2 m).
Maxima.—March–May 1973: Discharge, 10,500 ft³/s (297 m³/s) 3:00 a.m., Apr. 22 [gage height, 25.58 (7.797 m)], from rating curve extended above 6,200 ft³/s (176 m³/s) on basis of contracted-opening measurement at gage height 18.51 ft (5.642 m) and contracted-opening measurements of 1973 peak flow at sites 2 miles (3 km) upstream [63 mi² (163 km²)] and 6 miles (10 km) downstream [115 mi² (298 km²)]. Recurrence interval of discharge is 90 years.
October 1955 to February 1973: Discharge(6,150 ft³/s (174 m³/s) Sept. 21, 1965 [gage height, 18.51 ft (5.642 m), from floodmarks)], from rating curve extended as explained above. Flood of Aug. 3, 1948 reached a stage of 27 ft [(8.2 m) (discharge not determined)].
Remarks.—Flood-profile data available elsewhere in this report.

Mean discharge, in cubic feet per second, 1973

Day	March	April	May	Day	March	April	May	Day	March	April	May
1	65	1,510	650	11	751	400	170	21	70	4,720	39
2	144	602	2,500	12	402	288	125	22	62	7,680	41
3	184	332	488	13	281	197	101	23	57	815	39
4	166	258	267	14	805	152	85	24	57	354	37
5	169	207	191	15	395	123	72	25	162	260	42
6	259	162	193	16	206	254	61	26	245	196	39
7	937	123	441	17	154	194	53	27	155	152	2,710
8	448	97	730	18	115	143	48	28	119	121	1,690
9	316	1,500	344	19	95	116	47	29	132	105	424
10	458	867	234	20	83	982	41	30	162	94	271
								31	858	-----	193
Monthly mean discharge, in cubic feet per second									275	767	399
Runoff, in inches									2.99	8.07	4.34
Runoff, in acre-feet									16,880	45,630	24,530

Gage height, in feet, and discharge in cubic feet per second, at indicated time, 1973

Date	Hour	Gage height	Q	Date	Hour	Gage height	Q	Date	Hour	Gage height	Q
Apr. 20	12:00 p.m.	3.05	106	Apr. 21	6:00 a.m.	14.44	3,860	Apr. 22	5:00 a.m.	25.39	10,400
	6:00 a.m.	3.02	101		12:00 m.	14.83	4,060		8:00 a.m.	24.37	9,650
	9:00 a.m.	3.64	209		3:00 p.m.	15.18	4,230		12:00 m.	22.01	8,160
	9:30 a.m.	4.31	330		6:00 p.m.	16.11	4,700		4:00 p.m.	18.90	6,290
	10:00 a.m.	6.30	764		7:00 p.m.	17.29	5,320		8:00 p.m.	15.76	4,520
	11:00 a.m.	8.18	1,290		8:00 p.m.	18.69	6,160		10:00 p.m.	13.77	3,530
	1:00 p.m.	9.36	1,670		9:00 p.m.	20.71	7,380		12:00 p.m.	10.90	2,290
	2:00 p.m.	9.31	1,650		10:00 p.m.	22.33	8,350				
	4:00 p.m.	8.62	1,430		11:00 p.m.	23.63	9,130	23	3:00 a.m.	7.91	1,240
	7:00 p.m.	7.70	1,150		12:00 p.m.	24.59	9,800		6:00 a.m.	7.03	986
	9:00 p.m.	9.54	1,750						12:00 m.	5.89	688
	12:00 p.m.	11.74	2,630	22	2:00 a.m.	25.45	10,400		6:00 p.m.	5.15	521
					3:00 a.m.	25.58	10,500		12:00 p.m.	4.73	432
21	2:00 a.m.	13.10	3,190								

Period	Highest mean discharge, in cubic feet per second, for the indicated number of consecutive days 1	3	7	15	30
March–May 1973	7,680	4,460	2,140	1,230	839
1956–72	5,460	3,810	2,100	1,410	1,040
Recurrence interval, in years, for 1973 flood volumes	100	50	30	30	25

SKUNK RIVER BASIN
(15) 05474000 Skunk River at Augusta, Iowa

Location.—Lat 40°45′13″, long 91°16′40″, in NE¼NE¼ sec. 26, T. 69 N., R. 4 W., Des Moines County, on left bank 300 ft (91 m) upstream from bridge on State Highway 394 at Augusta, 2.0 miles (3.2 km) upstream from Long Creek and at mile 12.5 (20.1 km).
Drainage area.—4,303 mi² (11,144 km²).
Gage.—Water-stage recorder. Datum of gage is 521.24 ft. (158.874 m) above mean sea level. Prior to Nov. 15, 1913, nonrecording gage at site 400 ft (122 m) upstream at datum about 0.7 ft (0.2 m) higher. May 27, 1915, to Jan. 14, 1935, nonrecording gage at site 400 ft (122 m) upstream at present datum.
Flood stage.—15 ft (4.6 m).
Maxima.—March–May 1973: Discharge, 66,800 ft³/s (1,890 m³/s) 1:30 a.m., Apr. 23 [gage height, 27.05 ft (8.245 m)]. Discharge exceeded the 100-year flood.

TABLE 12.—*Station descriptions and discharge and suspended-sediment data*—Continued

September to November 1913, October 1914 to February 1973: Discharge, 51,000 ft³/s (1,440 m³/s) Apr. 3, 1960, [gage height, 25.00 ft (7.620 m)].

Remarks.—Peak stage or April 1973 flood occurred within 60 hours after torrential rains in the lower part of the basin. That for the April 1960 flood occurred 7 days after the initial rise in stage. Flood-profile data available elsewhere in this report. Stage and discharge for April 1973 flood are believed to be the greatest since 1851.

Mean discharge, in cubic feet per second, 1973

Day	March	April	May	Day	March	April	May	Day	March	April	May
1	5,400	16,900	10,700	11	13,400	13,400	12,000	21	7,820	33,600	5,510
2	5,550	17,000	23,600	12	14,500	10,600	10,500	22	7,200	60,200	5,040
3	6,180	15,000	25,900	13	11,800	10,500	10,000	23	6,660	62,600	4,740
4	6,560	12,200	24,200	14	12,900	11,300	9,880	24	6,250	49,100	4,420
5	6,460	10,800	20,800	15	12,800	11,300	9,790	25	6,540	34,900	4,360
6	6,550	9,790	14,100	16	11,000	11,400	9,360	26	7,940	22,600	4,530
7	12,300	8,520	13,500	17	10,300	13,300	8,420	27	9,370	16,000	15,700
8	14,100	7,530	16,800	18	9,480	14,100	7,630	28	8,330	12,400	25,800
9	11,100	11,600	17,100	19	8,810	13,900	6,790	29	7,650	9,730	26,400
10	10,200	18,100	14,500	20	8,300	16,500	5,980	30	7,180	8,340	24,600
								31	9,210	-----	23,300
Monthly mean discharge, in cubic feet per second									9,092	18,770	13,420
Runoff, in inches									2.44	4.87	3.60
Runoff, in acre-feet									559,000	1,117,000	825,200

Gage height, in feet, and discharge in cubic feet per second, at indicated time, 1973

Date	Hour	Gage height	Q	Date	Hour	Gage height	Q	Date	Hour	Gage height	Q
Apr. 21	6:00 a.m.	17.45	23,300	Apr. 22	9:00 p.m.	26.95	66,100	Apr. 24	6:00 a.m.	24.63	52,200
	6:00 a.m.	19.17	28,200		12:00 p.m.	27.03	66,600		12:00 m.	24.01	49,100
	12:00 m.	20.48	33,000						6:00 p.m.	23.40	46,000
	6:00 p.m.	21.88	38,800	23	1:30 a.m.	27.05	66,800		12:00 p.m.	22.66	42,400
	12:00 p.m.	23.65	47,300		4:00 a.m.	27.03	66,600				
					8:00 a.m.	26.82	65,300	25	12:00 m.	20.95	34,900
22	6:00 a.m.	25.40	56,800		12:00 m.	26.46	63,200		12:00 p.m.	19.02	27,700
	12:00 m.	26.15	61,300		6:00 p.m.	25.85	59,500				
	6:00 p.m.	26.78	65,100		12:00 p.m.	25.24	55,800				

Period	Highest mean discharge, in cubic feet per second, for the indicated number of consecutive days 1	3	7	15	30
March–May 1973	62,600	57,300	39,900	25,500	20,700
1915–72	50,100	45,700	37,000	25,500	21,000
Recurrence interval, in years, for 1973 flood volumes	>100	>100	>100	>100	>100

MISSISSIPPI RIVER MAIN STEM
(16) 05474500 Mississippi River at Keokuk, Iowa

Location.—Lat 41°23′37″, long 91°22′27″, in SE¼SW¼ sec. 30, T. 65 N., R. 4 W., Lee County, near right bank in tailwater of dam and powerplant of Union Electric Co. at Keokuk, 0.2 mile (0.3 km) upstream from bridge on U.S. Highway 136, 2.7 miles (4.3 km) upstream from Des Moines River, and at mile 364.2 (586.0 km) upstream from Ohio River.

Drainage area.—119,000 mi² (308,000 km²), approximately.

Gage.—Water-stage recorder. Datum of gage is 477.41 ft (145.515 m) above mean sea level (levels by Corps of Engineers; 477.83 ft (145.643 m) above mean sea level, adjustment of 1912; 477.34 ft (145.493 m) above mean gulf level; and 484.65 ft (147.721 m) above Memphis datum. Jan. 1, 1878, to May 1913, nonrecording gage at Galland (formerly Nashville), 8 miles (13 km) upstream; zero of gage was set to low-water mark of 1864, or 496.94 ft (151.467 m) above mean sea level, adjustment of 1912.

Flood stage.—16 ft (4.9 m).

Maxima.—March–May 1973: Daily discharge, 344,000 ft³/s (9,740 m³/s) Apr. 24. gage height, 23.35 ft (71.17 m), Apr. 24. Recurrence interval of discharge is 100 years (based on figure 52).

January 1878 to February 1973: Daily discharge, 327,000 ft³/s (9,260 m³/s) May 1, 1965; gage height, 22.14 ft (6.748 m) May 1, 1965.

Flood of June 6, 1851, reached a stage of 21.0 ft (6.40 m), present site and datum; estimated as 13.5 ft (4.11 m) at Galland [discharge, 360,000 ft³/s (10,200 m³/s)].

Remarks.—Minor flow regulation by powerplant above station, since 1913, and reservoirs and navigation dams above station since about 1935. Discharge computed from records of operation of turbines in powerplant and spillway gates in dam. Flood-volume data are not available for this station.

TABLE 12.—*Station descriptions and discharge and suspended-sediment data*—Continued

Mean water discharge and suspended-sediment concentration and discharge

March				April				May				June			
		Suspended sediment [1]				Suspended sediment [1]				Suspended sediment [1]				Suspended sediment [1]	
Day	Mean discharge (ft³/s)	Mean concentration (mg/l)	Discharge (tons/day)	Day	Mean discharge (ft³/s)	Mean concentration (mg/l)	Discharge (tons/day)	Day	Mean discharge (ft³/s)	Mean concentration (mg/l)	Discharge (tons/day)	Day	Mean discharge (ft³/s)	Mean concentration (mg/l)	Discharge (tons/day)
1	73,600	147	29,000	1	251,000	530	359,000	1	249,000	157	106,000	1	180,000	490	238,000
2	72,000	95	18,000	2	234,000	529	329,000	2	258,000	227	158,000	2	175,000	315	149,000
3	77,300	85	18,000	3	234,000	430	272,000	3	260,000	730	512,000	3	172,000	287	133,000
4	84,000	86	20,000	4	219,000	343	203,000	4	256,000	748	517,000	4	177,000	216	103,000
5	88,400	125	30,000	5	204,000	224	123,000	5	251,000	689	467,000	5	182,000	254	125,000
6	101,000	128	35,000	6	195,000	186	98,000	6	242,000	538	352,000	6	186,000	241	121,000
7	115,000	158	49,000	7	190,000	177	91,000	7	231,000	364	227,000	7	192,000	272	141,000
8	134,000	419	152,000	8	179,000	181	87,000	8	222,000	374	224,000	8	194,000	358	188,000
9	148,000	553	221,000	9	180,000	122	59,000	9	220,000	158	94,000	9	194,000	317	166,000
10	155,000	302	126,000	10	189,000	417	213,000	10	223,000	195	117,000	10	187,000	302	152,000
11	158,000	424	181,000	11	184,000	418	208,000	11	232,000	276	173,000	11	177,000	243	116,000
12	161,000	541	235,000	12	179,000	320	154,000	12	244,000	211	139,000	12	166,000	178	80,000
13	164,000	471	209,000	13	173,000	176	82,000	13	254,000	214	147,000	13	154,000	135	56,000
14	174,000	415	195,000	14	171,000	153	71,000	14	261,000	201	142,000	14	146,000	108	43,000
15	191,000	748	386,000	15	167,000	155	70,000	15	264,000	186	133,000	15	136,000	96	35,000
16	196,000	580	307,000	16	170,000	214	98,000	16	266,000	182	131,000	16	128,000	92	32,000
17	200,000	573	309,000	17	171,000	317	146,000	17	263,000	175	124,000	17	130,000	68	24,000
18	207,000	377	211,000	18	176,000	176	84,000	18	255,000	151	104,000	18	141,000	97	37,000
19	217,000	392	230,000	19	183,000	229	113,000	19	248,000	142	95,000	19	150,000	250	101,000
20	229,000	525	325,000	20	196,000	265	140,000	20	233,000	142	89,000	20	149,000	441	177,000
21	238,000	396	254,000	21	244,000	2,030	1,337,000	21	218,000	121	71,000	21	145,000	380	149,000
22	249,000	345	232,000	22	309,000	654	546,000	22	205,000	116	64,000	22	131,000	420	149,000
23	248,000	307	206,000	23	336,000	616	559,000	23	196,000	119	63,000	23	124,000	277	93,000
24	254,000	289	199,000	24	343,000	1,930	1,787,000	24	186,000	109	55,000	24	121,000	189	62,000
25	266,000	284	204,000	25	342,000	484	447,000	25	174,000	104	49,000	25	114,000	235	72,000
26	265,000	435	311,000	26	329,000	647	575,000	26	165,000	134	60,000	26	110,000	237	70,000
27	267,000	249	180,000	27	310,000	646	541,000	27	189,000	114	58,000	27	114,000	209	64,000
28	263,000	261	185,000	28	290,000	509	399,000	28	185,000	441	220,000	28	98,000	316	84,000
29	258,000	230	160,000	29	273,000	236	174,000	29	182,000	798	392,000	29	93,000	216	54,000
30	248,000	194	130,000	30	258,000	188	131,000	30	179,000	770	372,000	30	90,000	171	42,000
31	245,000	339	224,000	31	--------	----	--------	31	181,000	564	276,000	31	--------	---	--------
Total	5,746,300		5,571,000		6,889,000		9,516,000	Total	6,992,000		5,731,000		4,456,000		3,056,000
Monthly mean discharge	185,400		180,000		229,600		317,000		226,000		185,000		149,000		102,000
Maximum	267,000		386,000		343,000		1,787,000		266,000		517,000		194,000		238,000
Minimum	72,000		18,000		167,000		59,000		165,000		49,000		90,000		24,000

[1] Daily sediment concentrations are values determined from a single-bottle sample taken near midstream.

DES MOINES RIVER BASIN

(17) 05488100 Lake Red Rock near Pella, Iowa

Location.—Lat 41°22′11″, long 92°58′48″, in NE¼NW¼ sec. 19, T. 76, N., R. 18 W., Marion County, at outlet works near right end of Red Rock Dam on Des Moines River, 1.4 miles (2.3 km) upstream from Lake Creek, 4.5 miles (7.2 km) southwest of Pella and at mile 142.3 (229.0 km).
Drainage area.—12,323 mi² (31,917 km²).
Gage.—Water-stage recorder. Datum of gage is at mean sea level (levels by Corps of Engineers).
Maxima.—March-May 1973: Contents, 1,700,000 acre-ft (2.10 km³) 10:00 a.m., May 14 [elevation, 777.95 ft (237.119 m)].
March 1969 to February 1973: Contents, 1,010,000 acre-ft (1.25 km³) Aug. 2, 1969, [elevation, 764.83 ft (233.120 m)].
Remarks.—Reservoir storage began in March 1969. The storage capacity of the reservoir at full flood-control pool level [780 ft (238 m)] is 1,830,000 acre-ft (2.26 km³) that of conservation pool level [725 ft (221 m)] is 90,000 acre-ft (111 hm³).

Elevation, in feet, and contents in acre-feet, 1973

Date	Time	Elevation	Contents	Date	Time	Elevation	Contents
Jan. 31	12:00 p.m.	731.54	160,000	Apr. 30	12:00 p.m.	774.33	1,470,000
Feb. 28	12:00 p.m.	728.09	121,000	May 14	10:00 a.m.	777.95	1,700,000
Mar. 31	12:00 p.m.	764.62	1,996,000	May 31	12:00 p.m.	775.23	1,520,000

FOX RIVER BASIN

(18) 05495000 Fox River at Wayland, Mo.

Location.—Lat 40°23′33″, long 91°35′50″, in NW¼ sec. 31, T. 65 N., R. 6 W., Clark County, on left bank 90 ft (27 m) downstream from bridge on U.S. Highway 136, 0.8 mile (1.3 km) west of Wayland, and 5 miles (8.0 km) downstream from Brush Creek.
Drainage area.—400 mi² (1,036 km²), approximately.
Gage.—Digital water-stage recorder. Datum of gage is 501.52 ft (152.863 m) above mean sea level, datum of 1929.
Flood stage.—15 ft (4.6 m).
Maxima.—March-May 1973: Discharge, 26,400 ft³/s (748 m³/s) 6:00 p.m., Apr. 22 [gage height, 21.71 ft (6.617 m)]. Discharge exceded the 100-year flood.
February 1922 to February 1973: Discharge, 25,000 ft³/s (708 m³/s) June 29, 1933 [gage height, 21.53 ft (6.562 m) from floodmarks].

TABLE 12.—*Station descriptions and discharge and suspended-sediment data*—Continued

Mean discharge, in cubic feet per second, 1973

Day	March	April	May	Day	March	April	May	Day	March	April	May
1	134	4,270	2,820	11	2,480	975	446	21	188	6,200	114
2	219	5,430	5,800	12	1,950	1,130	334	22	179	19,900	112
3	302	2,350	8,260	13	943	1,860	268	23	161	17,500	110
4	302	674	3,870	14	2,910	1,890	223	24	146	4,340	116
5	241	500	654	15	1,460	1,240	194	25	1,500	758	106
6	256	393	492	16	640	1,490	176	26	2,690	528	259
7	1,900	306	1,130	17	370	1,790	159	27	1,960	430	6,440
8	1,680	249	2,790	18	269	1,080	146	28	686	367	6,850
9	679	2,250	2,350	19	216	465	135	29	566	331	6,920
10	718	2,530	705	20	192	841	125	30	422	426	4,300
								31	1,440	-----	1,500
Monthly mean discharge, in cubic feet per second									897	2,750	1,868
Runoff, in inches									2.59	7.67	5.39

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1973

Date	Hour	Gage height	Dis-charge	Date	Hour	Gage height	Dis-charge	Date	Hour	Gage height	Dis-charge
Apr. 20	12:00 m.	4.29	352	Apr. 22	12:00 m.	21.40	23,600	Apr. 24	6:00 a.m.	17.73	7,200
	6:00 p.m.	4.67	424		2:00 p.m.	21.60	25,400		12:00 m.	15.03	4,220
	8:00 p.m.	9.78	1,740		4:00 p.m.	21.69	26,200		3:00 p.m.	10.60	2,030
	10:00 p.m.	12.39	2,730		6:00 p.m.	21.71	26,400		6:00 p.m.	8.35	1,300
	12:00 p.m.	15.02	4,220		8:00 p.m.	21.68	26,100		12:00 p.m.	7.20	990
					10:00 p.m.	21.63	25,700				
21	6:00 a.m.	16.19	5,290		12:00 p.m.	21.57	25,100	25	6:00 a.m.	6.62	845
	12:00 m.	16.66	5,760						12:00 m.	6.23	748
	6:00 p.m.	17.48	6,820	23	6:00 a.m.	21.34	23,100		6:00 p.m.	5.86	662
	12:00 p.m.	18.89	9,320		10:00 a.m.	21.00	20,000		12:00 p.m.	5.55	600
					12:00 m.	20.57	16,800				
22	6:00 a.m.	19.67	12,300		6:00 p.m.	19.75	12,600	26	12:00 m.	5.17	524
	8:00 a.m.	20.02	13,700		12:00 p.m.	18.80	9,100		12:00 p.m.	4.90	470
	10:00 a.m.	21.00	20,000								

Period	Highest mean discharge, in cubic feet per second, for the indicated number of consecutive days				
	1	3	7	15	30
March–May 1973	19,900	14,530	7,150	4,280	2,910
1923–72	15,200	11,300	5,520	3,270	2,340
Recurrence interval, in years, for 1973 flood volumes	100	>100	>100	>100	>100

FABIUS RIVER BASIN

(19) 05497000 North Fabius River at Monticello, Mo.

Location.—Lat 40°06′30″, long 91°42′51″, in SW¼SE¼ sec. 6, T. 61 N., R. 7 W., Lewis County, on right bank upstream from bridge on State Highway 16, 1 mile (1.6 km) south of Monticello, and 19 miles (30.6 km) upstream from Middle Fabius River.

Drainage area.—452 mi² (1,171 km²).

Gage.—Digital water-stage recorder. Datum of gage is 540.73 ft (164.815 m) above mean sea level, datum of 1929.

Flood stage.—22 ft (6.7 m).

Maxima.—March-May 1973: Discharge, 20,700 ft³/s (586 m³/s) 12:00 p.m. Apr. 22 [gage height, 33.03 ft (10.068m)] Discharge exceeded the 100-year flood.

February 1922 to February 1973: Discharge, 17,400 ft³/s (493 m³/s) June 30, 1933 [gage height, 30.8 ft (9.39 m), from floodmarks].

Maximum stage since at least 1874, that of June 30, 1933.

Mean discharge, in cubic feet per second, 1973

Day	March	April	May	Day	March	April	May	Day	March	April	May
1	166	6,700	2,440	11	4,050	1,270	368	21	255	7,790	46
2	261	7,020	6,440	12	2,580	2,850	235	22	243	16,400	45
3	390	2,100	10,100	13	1,080	3,930	178	23	203	17,900	42
4	311	929	3,360	14	3,520	2,490	135	24	195	7,680	40
5	231	677	695	15	2,840	1,660	107	25	3,350	1,130	37
6	278	551	570	16	772	2,610	93	26	6,870	622	132
7	2,560	449	1,640	17	468	2,690	81	27	3,200	465	5,970
8	2,300	375	4,440	18	350	883	69	28	948	375	11,400
9	730	1,350	3,310	19	283	550	61	29	1,080	279	11,100
10	872	1,370	720	20	259	1,800	53	30	678	243	2,190
								31	2,350	-----	515
Monthly mean discharge, in cubic feet per second									1,409	3,171	2,149
Runoff, in inches									3.59	7.83	5.48

TABLE 12.—*Station descriptions and discharge and suspended-sediment data*—Continued

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1973

Date	Hour	Gage height	Dis-charge	Date	Hour	Gage height	Dis-charge	Date	Hour	Gage height	Dis-charge
Apr. 20	6:00 a.m.	7.67	458	Apr. 22	12:00 m.	30.0	16,500	Apr. 24	8:00 a.m.	24.59	9,750
	3:00 p.m.	7.58	435		6:00 p.m.	32.1	19,400		12:00 m.	22.78	7,900
	4:00 p.m.	9.85	1,000		8:00 p.m.	32.5	20,000		3:00 p.m.	20.30	5,910
	6:00 p.m.	15.9	3,250		10:00 p.m.	32.85	20,500		8:00 p.m.	16.68	3,410
	9:00 p.m.	19.6	5,420		12:00 p.m.	33.03	20,700		12:00 p.m.	14.08	2,040
	12:00 p.m.	21.25	6,600								
				23	2:00 a.m.	32.95	20,600	25	6:00 a.m.	12.09	1,260
21	4:00 a.m.	21.75	7,000		4:00 a.m.	32.80	20,400		12:00 m.	11.20	1,000
	8:00 a.m.	21.5	6,800		6:00 a.m.	32.55	20,000		6:00 p.m.	10.64	855
	12:00 m.	22.25	7,420		12:00 m.	31.46	18,400		12:00 p.m.	10.21	745
	6:00 p.m.	23.48	8,580		6:00 p.m.	29.61	16,000				
	12:00 p.m.	25.6	10,900		12:00 p.m.	27.49	13,200	26	12:00 m.	9.70	615
									12:00 p.m.	9.33	522

Period	Highest mean discharge, in cubic feet per second, for the indicated number of consecutive days				
	1	3	7	15	30
March–May 1973	17,900	14,000	7,620	5,130	3,600
1923–72	14,800	12,300	6,510	4,820	3,390
Recurrence interval, in years, for 1973 flood volumes	>100	>100	100	100	80

FABIUS RIVER BASIN

(20) 05498000 Middle Fabius River near Monticello, Mo.

Location.—Lat 40°05′37″, long 91°44′08″, in SE¼ sec. 12, T. 61 N., R. 8 W., Lewis County, on left bank on downstream end of bridge pier on State Highway 16, 2.5 miles (4.0 km) southwest of Monticello, 8 miles (12.9 km) downstream from Radish Branch, and 17 miles (27.4 km) upstream from mouth.

Drainage area.—393 mi^2 (1,018 km^2).

Gage.—Digital water-stage recorder. Datum of gage is 540.46 ft (164.732 m) above mean sea level.

Flood stage.—13 ft. (4.0 m)

Maxima.—March–May 1973: Discharge 17,700 ft^3/s (501 m^3/s) 12:30 a.m. Apr. 23 [gage height, 27.14 ft (8.272 m)]. Discharge exceeded the 100-year flood.

July 1945 to February 1973: Discharge, 16,200 ft^3/s (459 m^3/s) June 7, 1947 [gage height, 26.28 ft (8.010 m)].

Maximum stage since 1930, 26.6 ft (8.11 m), from floodmark, date unknown [discharge, 16,800 ft^3/s (476 m^3/s)]. Flood of June 17, 1945, reached a stage of 23.3 ft (7.10 m), from floodmarks.

Mean discharge, in cubic feet per second, 1973

Day	March	April	May	Day	March	April	May	Day	March	April	May
1	214	4,180	232	11	2,250	1,030	485	21	174	6,580	87
2	298	4,340	1,970	12	2,480	1,770	312	22	167	12,200	85
3	277	4,930	2,990	13	2,060	2,280	228	23	150	15,100	82
4	238	1,940	4,920	14	3,230	2,430	180	24	165	8,970	79
5	226	623	1,720	15	2,300	1,980	150	25	3,070	2,190	79
6	310	432	502	16	1,130	1,910	132	26	4,080	484	145
7	1,650	315	1,520	17	440	2,100	119	27	4,110	329	5,480
8	1,960	247	3,070	18	285	1,170	108	28	3,980	242	6,040
9	1,120	1,040	2,800	19	224	500	101	29	1,160	193	9,040
10	902	1,140	1,190	20	194	761	93	30	639	156	7,230
								31	2,750	------	873
Monthly mean discharge, in cubic feet per second									1,362	2,719	1,679
Runoff, in inches									4.00	7.72	4.93

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1973

Date	Hour	Gage height	Dis-charge	Date	Hour	Gage height	Dis-charge	Date	Hour	Gage height	Dis-charge
Apr. 20	8:00 a.m.	5.59	362	Apr. 22	2:00 p.m.	25.03	13,500	Apr. 23	12:00 p.m.	23.85	11,600
	6:00 p.m.	5.55	352		4:00 p.m.	25.90	15,200				
	8:00 p.m.	6.43	609		6:00 p.m.	26.49	16,400	24	6:00 a.m.	22.77	10,100
	10:00 p.m.	12.18	2,500		8:00 p.m.	26.86	17,100		12:00 m.	21.66	8,860
	12:00 p.m.	16.86	4,820		10:00 p.m.	27.06	17,500		12:00 p.m.	19.30	6,670
					11:00 p.m.	27.11	17,600				
21	4:00 a.m.	18.90	6,320					25	6:00 a.m.	14.40	3,500
	10:00 a.m.	19.72	7,050	23	3:00 a.m.	27.14	17,700		12:00 m.	7.56	948
	8:00 p.m.	19.20	6,580		2:00 a.m.	27.11	17,600		6:00 p.m.	6.94	762
	12:00 p.m.	19.60	6,940		4:00 a.m.	27.02	17,400		12:00 p.m.	6.47	621
					8:00 a.m.	26.61	16,600				
22	6:00 a.m.	21.21	8,410		12:00 m.	25.98	15,400	26	12:00 a.m.	6.02	477
	12:00 m.	23.97	11,800		6:00 p.m.	24.94	13,300		12:00 p.m.	5.73	390

TABLE 12.—*Station descriptions and discharge and suspended-sediment data*—Continued

Period	Highest mean discharge, in cubic feet per second, for the indicated number of consecutive days 1	3	7	15	30
March–May 1973	15,100	12,100	6,610	4,060	3,160
1946–72	14,300	11,000	6,200	4,060	2,920
Recurrence interval, in years, for 1973 flood volumes	>100	>100	>100	>100	>100

FABIUS RIVER BASIN

(21) 05500000 South Fabius River near Taylor, Mo.

Location.—Lat 39°53′49″, long 91°34′49″, in SW¼NW¼ sec. 21, T. 59 N., R. 6 W., Marion County, on right bank at downstream side of highway bridge, 4.5 miles (7.2 km) southwest of Taylor, 5 miles (8.0 km) downstream from Grassy Creek, and 5.3 miles (8.5 km) upstream from confluence with North Fabius River.
Drainage area.—620 mi² (1,606 km²).
Gage.—Digital water-stage recorder. Datum of gage is 482.91 ft (147.190 m) above mean sea level, datum of 1929.
Flood stage.—11 ft (3.4 m).
Maxima.—March–May 1973: Discharge, 16,900 ft³/s (479 m³/s) 3:00 a.m. Apr. 24 [gage height, 18.33 ft (5.587 m)]. Recurrence interval of discharge is 25 years.
October 1934 to February 1973: Discharge, 19,700 ft³/s (558 m³/s) June 8, 1947 [gage height, 19.5 ft (5.94 m)], from rating curve extended above 11,000 ft³/s (312 m³/s).
Flood in 1928 reached a stage of 18.49 ft (5.636 m), from floodmark, present site and datum.

Mean discharge, in cubic feet per second, 1973

Day	March	April	May	Day	March	April	May	Day	March	April	May
1	177	7,280	595	11	4,400	2,770	740	21	315	12,000	82
2	310	6,830	3,730	12	3,910	2,990	413	22	269	13,600	81
3	612	5,130	2,740	13	3,580	3,220	293	23	233	14,000	81
4	618	3,020	1,820	14	6,170	2,440	225	24	315	15,000	74
5	504	1,040	1,100	15	5,160	1,680	184	25	5,650	9,110	74
6	1,410	706	672	16	3,520	2,360	155	26	7,060	2,680	84
7	4,220	563	2,850	17	890	2,980	132	27	7,260	773	8,600
8	3,580	449	4,750	18	471	1,970	116	28	5,400	522	7,100
9	1,980	1,690	4,370	19	349	778	103	29	4,570	361	6,440
10	2,100	2,970	2,460	20	317	483	93	30	2,620	269	5,940
								31	4,460	-----	3,790
Monthly mean discharge, in cubic feet per second									2,659	3,989	1,932
Runoff, in inches									4.94	7.18	3.59

Gage height, in feet, and discharge in cubic feet per second, at indicated time, 1973

Date	Hour	Gage height	Discharge	Date	Hour	Gage height	Discharge	Date	Hour	Gage height	Discharge
Apr. 20	12:00 m.	3.56	476	Apr. 22	12:00 p.m.	16.79	13,800	Apr. 24	12:00 p.m.	15.54	11,800
	10:00 p.m.	3.45	438								
	12:00 p.m.	4.12	710	23	8:00 a.m.	16.33	12,900	25	6:00 a.m.	14.48	10,300
					4:00 p.m.	16.98	14,200		12:00 m.	13.47	9,070
21	2:00 a.m.	10.58	5,920		8:00 p.m.	17.64	15,500		6:00 p.m.	12.46	7,900
	6:00 a.m.	13.99	9,700		12:00 p.m.	18.16	16,500		12:00 p.m.	11.20	6,540
	8:00 a.m.	15.40	11,600								
	12:00 m.	16.65	13,500	24	2:00 a.m.	18.30	16,800	26	6:00 a.m.	8.38	3,860
	4:00 p.m.	17.41	15,000		3:00 a.m.	18.33	16,900		12:00 m.	5.97	1,840
	6:00 p.m.	17.61	15,400		4:00 a.m.	18.29	16,800		12:00 p.m.	4.75	1,010
	8:00 p.m.	17.50	15,200		6:00 a.m.	18.19	16,600				
	12:00 p.m.	16.88	14,000		8:00 a.m.	18.08	16,400	27	12:00 m.	4.31	755
					10:00 a.m.	17.89	16,000		12:00 p.m.	4.04	626
22	6:00 a.m.	16.78	13,800		12:00 m.	17.65	15,500				
	2:00 p.m.	16.57	13,300		6:00 p.m.	16.75	13,700				

Period	Highest mean discharge, in cubic feet per second, for the indicated number of consecutive days 1	3	7	15	30
March–May 1973	15,000	14,200	9,590	5,690	4,640
1936–72	18,800	14,800	9,050	6,080	4,420
Recurrence interval, in years, for 1973 flood volumes	25	100	100	50	>100

NORTH RIVER BASIN

(22) 05500500 North River at Bethel, Mo.

Location.—Lat 39°52′29″, long 92°01′26″, in NE¼NW¼ sec. 33, T. 59 N., R. 10 W., Shelby County, at left abutment on downstream side of bridge on State Highway 15 at Bethel, 2.5 miles (4.0 km) upstream from Messner Branch.
Drainage area.—58 mi² (150 km²), approximately.

TABLE 12.—*Station descriptions and discharge and suspended-sediment data*—Continued

Gage.—Digital water-stage recorder. Datum of gage is 683.37 ft (208.291 m) above mean sea level.
Flood stage.—14 ft (4.3 m).
Maxima.—March–May 1973: Discharge, 4,820 ft³/s (136 m³/s) 5:15 a.m., Apr. 21 [gage height, 19.53 ft (5.953 m)]. Recurrence interval of discharge is 10 years.

April 1930 to July 1936 (fragmentary), August 1936 to February 1973: Discharge, 6,930 ft³/s (196 m³/s) Apr. 5, 1947; gage height, 20.9 ft (6.37 m) Apr. 5, 1947, and Oct. 24, 1957.

Maximum stage since at least 1875, that of Apr. 5, 1947 and Oct. 24, 1957.

Mean discharge, in cubic feet per second, 1973

Day	March	April	May	Day	March	April	May	Day	March	April	May
1	31	1,380	40	11	818	349	28	21	60	3,160	4.0
2	196	509	598	12	420	590	17	22	43	1,700	5.0
3	152	73	199	13	241	309	12	23	32	552	16
4	78	42	50	14	1,150	94	9.8	24	266	93	23
5	62	33	30	15	728	67	8.6	25	1,960	53	26
6	128	26	57	16	89	352	7.6	26	1,580	35	12
7	544	20	412	17	52	368	6.8	27	279	26	749
8	372	16	664	18	38	44	6.0	28	125	22	1,520
9	79	293	141	19	32	25	5.0	29	363	20	214
10	230	298	49	20	58	207	4.3	30	435	17	55
								31	538	-----	24
Monthly mean discharge, in cubic feet per second									361	359	161
Runoff, in inches									7.17	6.91	3.20

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1973

Date	Hour	Gage height	Discharge	Date	Hour	Gage height	Discharge	Date	Hour	Gage height	Discharge
Apr. 20	6:00 a.m.	5.11	20	Apr. 21	6:00 a.m.	19.49	4,790	Apr. 22	6:00 p.m.	13.97	1,690
	12:00 m.	5.11	20		7:00 a.m.	19.34	4,690		12:00 p.m.	12.67	1,320
	6:00 p.m.	5.96	73		8:00 a.m.	19.07	4,500				
	8:00 p.m.	7.14	224		10:00 a.m.	18.31	3,970	23	6:00 a.m.	11.01	902
	10:00 p.m.	11.96	1,140		12:00 m.	17.47	3,420		12:00 m.	8.16	407
	12:00 p.m.	13.83	1,650		6:00 p.m.	15.36	2,260		6:00 p.m.	6.33	178
					12:00 p.m.	14.21	1,780		12:00 p.m.	5.91	136
21	2:00 a.m.	17.28	3,310								
	3:00 a.m.	18.67	4,220	22	4:00 a.m.	14.11	1,740	24	12:00 m.	5.52	90
	4:00 a.m.	19.29	4,650		10:00 a.m.	14.28	1,810		12:00 p.m.	5.29	71
	5:15 a.m.	19.53	4,820								

Period	Highest mean discharge, in cubic feet per second, for the indicated number of consecutive days 1	3	7	15	30
March–May 1973	3,160	1,800	865	561	526
1937–72	4,410	2,170	1,120	805	581
Recurrence interval, in years, for 1973 flood volumes	15	15	15	20	100

NORTH RIVER BASIN

(23) 05501000 North River at Palmyra, Mo.

Location.—Lat 39°49′06″, long 91°31′13″, in SE¼SW¼ sec. 13, T. 58 N., R. 6 W., Marion County, on right bank 100 ft (30 m) upstream from city waterworks dam, 1,000 ft (305 m) upstream from upstream bridge on dual U.S. Highways 24 and 61, 0.5 mile (0.8 km) north of Palmyra, and 7 miles (11.3 km) upstream from mouth.
Drainage area.—373 mi² (966 km²).
Gage.—Digital water-stage recorder. Datum of gage is 464.81 ft (141.674 m) above mean sea level (levels by Corps of Engineers).
Flood stage.—19 ft (5.8 m).
Maxima.—March–May 1973: Discharge, 57,500 ft³/s (1,628 m³/s) 11:00 a.m., Apr. 21 [gage height, 29.70 ft (9.053 m)]. Discharge exceeded the 100-year flood.

December 1934 to February 1973: Discharge, 27,400 ft³/s (776 m³/s) Apr. 11, 1944 [gage height, 22.96 ft (6.998 m), site then in use], from rating curve extended above 15,000 ft³/s (425 m³/s, gage height, 26.57 ft (8.099 m) Oct. 13, 1969.

Maximum stage prior to 1934, about 28.0 ft (8.5 m) from floodmarks, date unknown, at site 1,000 ft (305 m) downstream, present datum.

Remarks.—Water diverted from river above dam by city of Palmyra. Backwater from Mississippi River Apr. 1–5, Apr. 22 to May 23. Discharge for period of backwater from Mississippi River estimated on basis of 8 discharge measurements, elevation of Mississippi River at Hannibal, and records for nearby stations.

TABLE 12.—*Station descriptions and discharge and suspended-sediment data*—Continued

Mean discharge, in cubic feet per second, 1973

Day	March	April	May	Day	March	April	May	Day	March	April	May
1 ----	353	9,200	150	11 ----	5,300	2,120	350	21 ----	385	32,600	65
2 ----	418	1,300	1,500	12 ----	1,770	2,170	200	22 ----	273	15,500	60
3 ----	300	600	950	13 ----	3,820	1,220	180	23 ----	326	2,500	60
4 ----	243	500	1,000	14 ----	8,450	600	160	24 ----	1,300	1,000	58
5 ----	273	400	900	15 ----	2,130	428	140	25 ----	12,000	600	67
6 ----	3,280	321	800	16 ----	791	2,080	120	26 ----	9,510	400	97
7 ----	5,440	248	2,000	17 ----	409	1,270	100	27 ----	3,590	300	9,660
8 ----	1,590	209	2,000	18 ----	300	640	90	28 ----	2,910	200	4,980
9 ----	789	1,530	1,200	19 ----	243	363	80	29 ----	4,510	170	2,260
10 ----	4,280	1,840	800	20 ----	290	285	70	30 ----	2,880	140	1,470
								31 ----	8,130	-----	548
Monthly mean discharge, in cubic feet per second									2,783	2,691	1,036
Runoff, in inches									8.61	8.05	3.20

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1973

Date	Hour	Gage height	Dis-charge	Date	Hour	Gage height	Dis-charge	Date	Hour	Gage height	Dis-charge
Apr. 19	12:00 m.	10.71	357	Apr. 21	7:00 a.m.	24.00	24,000	Apr. 22	6:00 a.m.	22.42	18,100
	12:00 p.m.	10.66	324		8:00 a.m.	26.70	37,700		12:00 m.	21.70	15,900
					9:00 a.m.	28.60	49,800		6:00 p.m.	20.58	-----
20	12:00 m.	10.59	279		10:00 a.m.	29.42	55,500		12:00 p.m.	19.49	-----
	11:00 p.m.	10.56	261		11:00 a.m.	29.67	57,500				
	12:00 p.m.	11.50	1,000		12:00 m.	29.57	56,600	23	6:00 a.m.	17.91	-----
					2:00 p.m.	28.77	51,000		12:00 m.	18.21	-----
21	1:00 a.m.	15.30	4.500		4:00 p.m.	27.80	44,300		12:00 p.m.	18.80	-----
	2:00 a.m.	18.50	9,100		6:00 p.m.	26.85	38,600				
	4:00 a.m.	20.28	12,600		8:00 p.m.	25.60	31,500	24	12:00 m.	17.35	-----
	6:00 a.m.	21.70	15,900		12:00 p.m.	23.75	23,000		12:00 p.m.	18.31	-----

Period	Highest mean discharge, in cubic feet per second, for the indicated number of consecutive days				
	1	3	7	15	30
March–May 1973	32,600	16,900	7,560	4,340	4,050
1936–72	15,900	8,690	5,310	3,520	2,560
Recurrence interval, in years, for 1973 flood volumes	>100	>100	>100	>100	>100

SALT RIVER BASIN

(24) 05506500 Middle Fork Salt River at Paris, Mo.

Location.—Lat 39°29′05″, long 91°59′50″, in NE¼NW¼NW¼ sec. 11, T. 54 N., R. 10 W., Monroe County, on right bank near upstream side of bridge on East Madison Street in Paris, about 600 ft (183 m) downstream from Wabash Railroad bridge, 12.5 miles (20.1 km) upstream from Elk Fork Salt River, and at mile 104.5 (168.1 km) above mouth of Salt River.
Drainage area.—356 mi² (922 km²).
Gage.—Digital water-stage recorder until Apr. 21 (2:00 p.m.) when gage was washed out by high water. Wire-weight gage therafter. Datum of gage is 621.71 ft (189.497 m) above mean sea level.
Flood stage.—12 ft (3.7 m).
Maxima.—March–May 1973: Discharge, 45,000 ft³/s (1,274 m³/s) 10:00 p.m., Apr. 21 [gage height, 33.5 ft (10.21 m), from high-water marks]. Discharge exceeded the 100-year flood.
October 1939 to February 1973: Discharge, 23,100 ft³/s (654 m³/s) Aug. 1, 1958 [gage height, 29.94 ft (9.126 m)].
Remarks.—Water diverted from river upstream from gage by city of Paris.

Mean discharge, in cubic feet per second, 1973

Day	March	April	May	Day	March	April	May	Day	March	April	May
1 ----	293	4,180	144	11 ----	3,420	1,750	1,540	21 ----	546	22,700	42
2 ----	1,430	3,970	1,530	12 ----	3,250	1,900	830	22 ----	361	24,800	44
3 ----	866	3,390	1,500	13 ----	3,060	1,700	158	23 ----	221	10,600	50
4 ----	462	1,200	800	14 ----	3,300	1,300	101	24 ----	980	5,190	58
5 ----	371	306	500	15 ----	2,550	592	81	25 ----	4,790	1,390	88
6 ----	1,010	220	400	16 ----	1,640	1,440	65	26 ----	6,410	295	228
7 ----	2,220	180	2,000	17 ----	538	1,880	54	27 ----	6,460	211	3,340
8 ----	1,830	158	3,480	18 ----	215	1,430	48	28 ----	3,180	168	4,430
9 ----	1,120	1,180	2,620	19 ----	164	472	44	29 ----	926	140	3,240
10 ----	1,650	1,700	2,140	20 ----	291	345	42	30 ----	823	133	2,560
								31 ----	2,560	----	565
Monthly mean discharge, in cubic feet per second									1,837	3,164	1,056
Runoff, in inches									5.95	9.92	3.42

TABLE 12.—*Station descriptions and discharge and suspended-sediment data*—Continued

Gage height, in feet, and discharge, in cubic feet per second, at indicated time; 1973

Date	Hour	Gage height	Discharge	Date	Hour	Gage height	Discharge	Date	Hour	Gage height	Discharge
Apr. 20	6:00 a.m.	4.42	267	Apr. 21	11:00 a.m.	22.46	12,800	Apr. 22	12:00 p.m.	23.4	13,900
	6:00 p.m.	4.34	241		12:00 m.	25.36	16,600				
	8:00 p.m.	4.37	250		1:00 p.m.	27.93	21,800	23	6:00 a.m.	22.1	12,300
	10:00 p.m.	4.81	404		2:00 p.m.	29.68	27,400		12:00 m.	20.4	10,600
	11:00 p.m.	5.36	637		4:00 p.m.	31.6	35,000		6:00 p.m.	18.5	8,850
	12:00 p.m.	10.80	3,480		6:00 p.m.	32.8	40,800		12:00 p.m.	16.8	7,460
					8:00 p.m.	33.35	44,100				
21	1:00 a.m.	14.34	5,740		10:00 p.m.	33.5	45,000	24	12:00 m.	13.5	5,180
	2:00 a.m.	16.45	7,220		12:00 p.m.	33.3	43,800		12:00 p.m.	9.9	2,940
	3:00 a.m.	17.13	7,700								
	4:00 a.m.	17.09	7,670	22	6:00 a.m.	31.1	32,900	25	12:00 m.	6.6	1,240
	5:00 a.m.	16.96	7,570		12:00 m.	28.1	22,300		12:00 p.m.	4.9	440
	7:00 a.m.	17.06	7,650		3:00 p.m.	26.55	18,600				
	9:00 a.m.	18.22	8,600		7:00 p.m.	24.87	15,800				

Period	Highest mean discharge, in cubic feet per second, for the indicated number of consecutive days 1	3	7	15	30
March–May 1973	24,800	19,400	9,360	5,190	3,760
1940–72	18,900	12,400	6,430	4,810	3,170
Recurrence interval, in years, for 1973 flood volumes	>100	>100	>100	>100	>100

SALT RIVER BASIN

(25) 05506800 Elk Fork Salt River near Madison, Mo.

Location.—Lat 39°26′05″, long 92°10′04″, in SW¼NE¼SW¼, sec. 29, T. 54 N., R. 11 W., Monroe County, on left bank 25 ft (8 m) downstream from bridge on County Highway AA, 500 ft (152 m) downstream from Allen Creek, 3.5 miles (5.6 km) southeast of Madison, and at mile 29.8 (47.9 km).

Drainage area.—200 mi^2 (518 km^2).

Gage.—Digital water-stage recorder. Datum of gage is 690.16 ft (210.361 m) above mean sea level (Missouri State Highway Commission bench mark).

Maxima.—March–May 1973: Discharge, 42,300 ft^3/s (1,198 m^3/s) 1:30 p.m., Apr. 21 [gage height, 33.4 ft (10.18 m), from high-water mark in gage house]. Discharge exceeded the 100-year flood.

October 1968 to February 1973: Discharge, 13,900 ft^3/s (394 m^3/s) Oct. 13, 1969 [gage height, 29.19 ft (8.897 m)].

Flood of July 9, 1967, reached a stage of 31.25 ft (9.525 m) from floodmark [discharge, 31,200 ft^3/s (884 m^3/s), revised, by contracted-opening method]. Flood of 1871 reached nearly the same stage, from information by local resident.

Mean discharge, in cubic feet per second, 1973

Day	March	April	May	Day	March	April	May	Day	March	April	May
1	557	4,590	67	11	3,740	1,270	130	21	228	24,100	15
2	1,760	1,140	585	12	800	657	91	22	113	8,550	20
3	448	245	224	13	744	261	56	23	77	1,050	35
4	228	146	104	14	2,000	150	40	24	1,260	230	45
5	392	102	54	15	595	246	35	25	5,840	177	70
6	1,570	77	282	16	157	1,790	30	26	4,580	132	90
7	2,940	60	2,720	17	100	1,070	25	27	398	92	500
8	660	70	2,730	18	75	215	20	28	192	65	1,000
9	203	1,570	299	19	62	137	17	29	1,060	44	500
10	1,710	1,030	173	20	129	216	15	30	697	39	150
								31	2,470	-----	85
Monthly mean discharge, in cubic feet per second									1,154	1,651	329
Runoff, in inches									6.66	9.21	1.90

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1973

Date	Hour	Gage height	Discharge	Date	Hour	Gage height	Discharge	Date	Hour	Gage height	Discharge
Apr. 20	6:00 a.m.	4.92	113	Apr. 21	10:00 a.m.	31.2	29,100	Apr. 22	2:00 p.m.	19.75	6,280
	12:00 m.	4.89	109		12:00 m.	32.8	38,700		6:00 p.m.	17.9	5,040
	4:00 p.m.	4.93	114		2:00 p.m.	33.4	42,300		12:00 p.m.	14.7	3,350
	8:00 p.m.	5.93	292		4:00 p.m.	32.8	38,700				
	12:00 p.m.	11.27	1,890		6:00 p.m.	31.9	33,300	23	6:00 a.m.	10.7	1,620
					8:00 p.m.	30.9	27,500		11:00 a.m.	8.14	661
21	2:00 a.m.	18.10	5,160		12:00 p.m.	28.8	19,400		12:00 p.m.	6.80	265
	4:00 a.m.	21.93	7,990								
	6:00 a.m.	24.45	10,700	22	6:00 a.m.	25.1	11,600	24	12:00 m.	6.60	224
	8:00 a.m.	28.28	18,000		10:00 a.m.	22.4	8,410		12:00 p.m.	6.50	205

TABLE 12.—*Station descriptions and discharge and suspended-sediment data*—Continued

SALT RIVER BASIN

(26) 05507500 Salt River near Monroe City, Mo.

Location.—Lat 39°32′25″, long 91°40′20″, in NE¼NW¼ sec. 22, T. 55 N., R. 7 W., Ralls County, on left bank on downstream side of old bridge pier, 135 ft (41 m) upstream from highway bridge at Joanna, 2,500 ft (762 m) downstream from Indian Creek, 2 miles (3.2 km) upstream from Lick Creek, 8 miles (12.9 km) southeast of Monroe City, and at mile 63.5 (102.2 km).
Drainage area.—2,230 mi² (5,780 km²), approximately.
Gage.—Digital water-stage recorder. Datum of gage is 520.04 ft (158.508 m) above sea level, datum of 1929.
Flood stage.—26 ft (7.9 m).
Maxima.—March–May 1973: Discharge, 102,000 ft³/s (2,889 m³/s) at approximately 1:00 p.m. on Apr. 22 [gage height, 39.1 ft (11.92 m) from high-water marks obtained by levels]. Discharge exceeded the 100-year flood.

October 1939 to February 1973: Discharge, 89,500 ft³/s (2,535 m³/s) Oct. 14, 1969 [gage height, 37.40 ft (11.400 m), from floodmarks].

Flood in June 1928 reached a stage of about 36 ft (11 m), from information by local residents.

Mean discharge, in cubic feet per second, 1973

Day	March	April	May	Day	March	April	May	Day	March	April	May
1	694	31,500	1,440	11	28,400	11,400	4,110	21	2,750	35,500	324
2	6,090	30,300	4,710	12	24,500	10,200	2,050	22	2,290	94,000	358
3	6,470	16,700	7,560	13	13,400	8,610	1,390	23	1,530	67,000	364
4	3,440	9,860	6,620	14	18,200	7,120	1,030	24	3,040	42,000	528
5	3,810	2,930	2,500	15	15,200	5,090	852	25	26,600	25,000	497
6	13,300	2,070	2,150	16	9,660	8,400	723	26	37,700	8,000	1,050
7	30,000	1,720	10,900	17	3,900	12,000	620	27	34,500	3,000	9,330
8	23,700	1,460	21,700	18	1,780	7,770	524	28	20,200	2,000	15,900
9	8,850	6,300	14,500	19	1,300	3,530	449	29	13,000	1,500	12,500
10	10,300	11,900	9,040	20	1,650	2,590	374	30	8,910	1,240	13,300
								31	14,500	----	12,400
Monthly mean discharge, in cubic feet per second									12,570	15,690	5,155
Runoff, in inches									6.50	7.85	2.67

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1973

Date	Hour	Gage height	Discharge	Date	Hour	Gage height	Discharge	Date	Hour	Gage height	Discharge
Apr. 20	12:00 m.	6.29	2,570	Apr. 21	2:00 p.m.	26.53	38,700	Apr. 22	9:00 a.m.	38.8	100,000
	12:00 p.m.	6.18	2,450		4:00 p.m.	27.51	41,200		1:00 p.m.	39.1	102,000
					6:00 p.m.	29.19	45,500		6:00 p.m.	38.9	101,000
21	1:00 a.m.	9.55	6,680		8:00 p.m.	30.97	50,800		12:00 p.m.	37.6	91,000
	2:00 a.m.	14.39	13,300		9:00 p.m.	31.91	53,600				
	3:00 a.m.	18.09	19,600		10:00 p.m.	32.77	57,800	23	6:00 a.m.	36.0	79,500
	4:00 a.m.	20.37	24,100		11:00 p.m.	33.49	61,900		12:00 m.	34.2	66,900
	6:00 a.m.	23.11	30,200		12:00 p.m.	34.19	66,800		5:00 p.m.	32.50	56,400
	8:00 a.m.	24.92	34,700						12:00 p.m.	30.9	50,600
	10:00 a.m.	25.68	36,600	22	1:00 a.m.	34.73	70,600				
	12:00 m.	26.05	37,500		6:00 a.m.	37.7	91,800	24	9:00 a.m.	28.41	43,200

Period	Highest mean discharge, in cubic feet per second, for the indicated number of consecutive days: 1	3	7	15	30
March–May 1973	94,000	67,700	39,200	22,700	18,600
1940–72	66,200	51,500	33,500	21,800	14,500
Recurrence interval, in years, for 1973 flood volumes	>100	100	100	50	50

SALT RIVER BASIN

(27) 05508000 Salt River near New London, Mo.

Location.—Lat 39°36′44′, long 91°24′30″, in NE¼NW¼ sec. 36, T. 56 N., R. 5 W., Ralls County, on left bank 180 ft (55 m) upstream from upstream bridge on dual U.S. Highway 61, 2 miles (3.2 km) north of New London, 8 miles (12.9 km) upstream from Spencer Creek and at mile 35.5 (57.1 km).
Drainage area.—2,480 mi² (6,420 km²), approximately.
Gage.—Digital water-stage recorder. Datum of gage is 477.03 ft (145.399 m) above mean sea level, datum of 1929.
Flood stage.—19 ft (5.8 m).
Maxima.—March–May 1973: Discharge, 107,000 ft³/s (3,030 m³/s) at approximately 11:00 p.m. on Apr. 22 [gage height, 31.8 ft (9.69 m), from high-water mark in gage house]. Discharge exceeded the 100-year flood.

February 1922 to February 1973: Discharge, 79,500 ft³/s (2,251 m³/s) Oct. 14, 1969 [gage height, 30.62 ft (9.333 m)].

Flood of July 14, 1858, reached a stage of 27.6 ft (8.41 m), present site and datum, based on comparison of June 1928 flood crest at stone marker 1 mile (1.6 km) downstream from gage.

TABLE 12.—*Station descriptions and discharge and suspended-sediment data*—Continued

Mean discharge, in cubic feet per second, 1973

Day	March	April	May	Day	March	April	May	Day	March	April	May
1	742	26,800	1,960	11	25,300	13,200	8,210	21	2,600	40,000	634
2	3,680	32,800	5,370	12	21,800	11,700	3,380	22	1,720	98,200	718
3	7,440	26,400	7,770	13	15,000	9,600	2,140	23	1,500	91,000	834
4	4,640	13,900	8,420	14	17,200	8,070	1,610	24	9,940	58,700	571
5	3,840	4,970	4,580	15	16,500	6,080	1,330	25	27,400	39,700	731
6	9,880	2,510	2,780	16	9,390	7,050	1,150	26	36,200	20,200	625
7	26,800	1,890	7,710	17	3,040	12,500	1,030	27	35,400	4,000	8,060
8	30,400	1,540	20,500	18	1,680	9,900	912	28	21,300	2,600	16,100
9	17,500	5,580	19,000	19	1,580	4,920	813	29	13,900	1,950	14,600
10	10,200	13,000	12,300	20	2,910	2,720	708	30	9,540	1,730	13,600
								31	15,200	----	14,100
Monthly mean discharge, in cubic feet per second									13,040	19,110	5,879
Runoff, in inches									6.06	8.60	2.73

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1973

Date	Hour	Gage height	Discharge	Date	Hour	Gage height	Discharge	Date	Hour	Gage height	Discharge
Apr. 20	6:00 a.m.	6.56	3,000	Apr. 21	12:00 m.	21.71	27,100	Apr. 24	12:00 m.	27.53	58,000
	12:00 m.	6.16	2,600		1:00 p.m.	24.63	39,200		6:00 p.m.	26.81	52,700
	6:00 p.m.	5.85	2,300		6:00 p.m.	28.2	63,400		12:00 p.m.	26.12	47,800
	11:00 p.m.	5.72	2,200		12:00 p.m.	29.9	78,800				
	12:00 p.m.	7.17	3,610					25	12:00 m.	24.72	39,600
				22	12:00 m.	31.4	101,000		12:00 p.m.	23.08	32,300
21	1:00 a.m.	11.47	8,660		11:00 p.m.	31.8	107,000				
	2:00 a.m.	15.98	15,000					26	12:00 m.	19.06	20,100
	3:00 a.m.	18.00	18,000	23	11:00 a.m.	30.98	94,500		12:00 p.m.	11.84	9,180
	4:00 a.m.	19.25	20,500		12:00 p.m.	29.23	72,100				
	6:00 a.m.	20.32	23,000					27	6:00 a.m.	7.57	4,010
	8:00 a.m.	20.85	24,600	24	6:00 a.m.	28.35	64,600		12:00 m.	6.92	3,360
	11:00 a.m.	21.33	26,000						12:00 p.m.	6.88	3,320

Period	Highest mean discharge, in cubic feet per second, for the indicated number of consecutive days				
	1	3	7	15	30
March–May 1973	98,000	82,600	50,300	28,000	21,300
1923–72	62,600	50,500	37,200	23,500	16,000
Recurrence interval, in years, for 1973 flood volumes	>100	>100	>100	>100	>100

ILLINOIS RIVER BASIN
(28) 05545100 Sugar Creek at Elkhorn, Wis.

Location.—Lat 42°41′05″, long 88°30′50″, in SW¼ sec. 29, T. 3 N., R. 17 E., Walworth County, at culvert on State Highway 11, 2 miles (3 km) northeast of Elkhorn.
Drainage area.—6.68 mi² (17.30 km²).
Gage.—Crest stage only.
Bankfull stage.—12.0 ft (3.66 m).
Maxima.—March-May 1973: Discharge, 900 ft³/s (25.5 m³/s) Apr. 21 [gage height, 17.47 ft (5.325 m)]. Discharge exceeded the 100-year flood.
1962 to February 1973: Discharge, 225 ft³/s (6.37 m³/s) Apr. 16, 1972 [gage height, 12.57 ft (3.832 m)].

ILLINOIS RIVER BASIN
(29) 05546500 Fox River at Wilmot, Wis.

Location.—Lat 42°30′40″, long 88°10′45″, in SW¼ sec. 30, T. 1 N., R. 20 E., Kenosha County, on right bank 100 ft (30 m) downstream from bridge on County Trunk C, 300 ft (91 m) upstream from Wilmont Dam, 1.0 mi (1.6 km) north of Wisconsin-Illinois State lines, and 6.0 mi (9.6 km) upstream from Fox chain of lakes.
Drainage area.—868 mi² (2,248 km²).
Gage.—Water-stage recorder and concrete dam. Datum of gage is 735.22 ft (224.095 m) above mean sea level. Prior to Sept. 1, 1956, nonrecording gage and concrete dam.
Bankfull stage.—8.00 ft (2.438 m).
Maxima.—March-May 1973: Discharge, 6,560 ft³/s (185 m³/s) 3:00 p.m., Apr. 23 [gage height, 7.65 ft (2.332 m)]. Recurrence interval of discharge is 35 years.
1940 to February 1973: Discharge, 7,520 ft³/s (213 m³/s) Mar. 31, 1960 [gage height, 9.25 ft (2.819 m)].

TABLE 12.—*Station descriptions and discharge and suspended-sediment data*—Continued

Mean discharge, in cubic feet per second, 1973

Day	March	April	May	Day	March	April	May	Day	March	April	May
1	688	1,040	3,530	11	1,900	1,310	2,430	21	1,630	2,280	1,250
2	973	1,280	3,810	12	1,880	1,380	2,190	22	1,520	4,530	1,240
3	1,310	1,380	3,920	13	1,840	1,520	2,020	23	1,410	6,430	1,270
4	1,350	1,400	3,670	14	1,850	1,720	1,880	24	1,310	6,140	1,290
5	1,390	1,420	3,170	15	2,130	2,030	1,770	25	1,250	5,510	1,270
6	1,550	1,400	2,770	16	2,320	2,350	1,670	26	1,190	4,960	1,310
7	1,700	1,340	2,500	17	2,300	2,500	1,570	27	1,130	4,570	1,320
8	1,900	1,260	2,410	18	2,170	2,440	1,450	28	1,040	4,170	1,510
9	2,010	1,250	2,540	19	2,000	2,370	1,320	29	989	3,750	1,800
10	1,960	1,260	2,620	20	1,790	2,150	1,300	30	934	3,500	1,850
								31	966	----	1,760
Monthly mean discharge, in cubic feet per second									1,561	2,621	2,078
Runoff, in inches									2.07	3.37	2.76

Period	Highest mean discharge, in cubic feet per second, for the indicated number of consecutive days: 1	3	7	15	30
March–May 1973	6,430	6,030	5,190	4,290	3,300
1940–71	7,100	6,790	6,100	4,420	3,100
Recurrence interval, in years, for 1973 flood volumes	35	50	35	40	50

MISSISSIPPI RIVER MAIN STEM

(30) 05587500 Mississippi River at Alton, Ill.

Location.—Lat 38°53′06″, long 90°10′51″, in NE¼ sec. 14, T. 5 N., R. 10 W., Madison County, near left bank in downstream end of intermediate lock wall of lock and dam 26 at Alton, 300 ft (91 m) downstream from Missouri & Illinois Bridge & Belt Railroad bridge, 7.7 miles (12.4 km) upstream from Missouri River, and at mile 202.7 (326.1 km) upstream from Ohio River.

Drainage area.—171,500 mi^2 (444,200 km^2), approximately.

Gage.—Digital water-stage recorder. Digital water-stage recorder at auxiliary gage (Hartford), 5.9 miles (9.5 km) downstream. Datum of both gages is at mean sea level (levels by Corps of Engineers).

Flood stage.—421.0 ft (128.3 m). Flood stage was exceeded for 79 consecutive days (Mar. 12 to May 21). Previous record was 32 days (June 9 to July 11, 1947).

Maxima.—March–June 1973: Discharge, 535,000 ft^3/s (15,150 m^3/s) 3:00 p.m., Apr. 29, including undetermined amount of overflow from Missouri River; gage height, 432.15 ft (131.719 m) 12:00 m., Apr. 28. Recurrence interval of discharge is 100 years (based on figure 52).

October 1927 to February 1973: Discharge, 437,000 ft^3/s (12,380 m^3/s) May 24, 1943 [gage height, 429.91 ft (131.037 m)], includes 90,000 ft^3/s (2,549 m^3/s) floodwater overflow from Missouri River.

Flood in June 1844 reached a stage of 432.10 ft (131.704 m), present datum.

Remarks.—Natural flow of stream affected by many reservoirs and navigation dams in upper Mississippi River basin.

Water temperature, stage, water discharge, and suspended-sediment data for given time

Date	Hour [1]	Water temperature (°C)	Stage (ft)	Discharge (1,000 ft³/s)	Suspended sediment: Concentration (mg/l)	Suspended sediment: Discharge (1,000 t/day)	Suspended sediment: Percent sand
April 5	4:45 p.m.	11.5	429.2	400	213	230	6
6	7:10 p.m.	11.0	429.0	409	156	172	8
7	9:10 a.m.	10.0	428.6	399	133	143	8
8	9:30 a.m.	9.4	428.0	384	95	98	10
9	2:30 p.m.	7.5	427.4	385	97	101	13
10	10:00 a.m.	5.0	426.6	376	154	156	9
11	11:20 a.m.	8.5	425.7	382	115	119	11

[1] Time shown is for temperature and suspended-sediment sample.

TABLE 12.—*Station descriptions and discharge and suspended-sediment data*—Continued

Mean gage height, in feet, and discharge, in cubic feet per second, 1973

Day	March		April		May		June	
	Stage	Discharge	Stage	Discharge	Stage	Discharge	Stage	Discharge
1	407.80	126,000	428.18	394,000	430.21	518,000	420.98	319,000
2	407.50	124,000	428.43	399,000	429.18	502,000	420.75	321,000
3	407.28	121,000	428.73	404,000	427.95	475,000	420.18	317,000
4	407.60	123,000	429.00	393,000	427.19	455,000	419.07	305,000
5	408.94	142,000	429.16	400,000	426.91	447,000	418.52	294,000
6	410.39	158,000	429.00	409,000	426.83	443,000	418.41	288,000
7	414.33	163,000	428.63	399,000	426.91	443,000	418.40	284,000
8	417.44	217,000	427.96	384,000	427.06	438,000	418.24	283,000
9	418.85	249,000	427.38	385,000	427.11	428,000	417.80	282,000
10	419.63	269,000	426.60	376,000	427.19	420,000	417.33	280,000
11	420.80	262,000	425.69	382,000	427.26	410,000	416.93	278,000
12	421.94	275,000	424.98	384,000	427.33	404,000	416.57	275,000
13	422.70	288,000	424.31	374,000	427.26	400,000	416.07	270,000
14	423.58	288,000	423.78	363,000	427.05	392,000	415.46	263,000
15	424.40	307,000	423.48	347,000	426.61	387,000	414.83	254,000
16	425.00	315,000	423.56	346,000	425.85	390,000	414.51	248,000
17	425.33	334,000	423.59	336,000	424.75	389,000	414.22	242,000
18	425.15	352,000	423.61	326,000	423.60	376,000	413.52	233,000
19	424.52	342,000	423.68	321,000	422.80	368,000	413.68	237,000
20	423.95	327,000	423.86	318,000	422.15	363,000	415.52	257,000
21	423.37	325,000	424.02	309,000	421.51	358,000	416.40	271,000
22	422.67	322,000	424.94	328,000	420.90	348,000	415.91	272,000
23	422.25	313,000	426.48	353,000	420.69	344,000	415.14	264,000
24	422.05	322,000	428.16	373,000	420.57	341,000	414.09	252,000
25	421.92	323,000	429.48	419,000	420.09	333,000	413.03	240,000
26	422.78	326,000	430.62	464,000	419.47	322,000	412.02	228,000
27	424.38	358,000	431.57	504,000	418.92	310,000	411.52	220,000
28	425.90	357,000	432.11	523,000	418.58	299,000	411.37	216,000
29	426.90	373,000	431.98	527,000	418.99	299,000	410.89	208,000
30	427.46	380,000	431.38	526,000	419.66	307,000	410.03	195,000
31	427.83	392,000	-----	------	420.22	314,000	-----	------
Monthly mean discharge, in cubic feet per second		276,500		392,200		387,800		263,200
Runoff in inches		1.86		2.55		2.61		1.71
Runoff in thousands of acre-feet		17,000		23,340		23,850		15,660

Period	Highest mean discharge, in cubic feet per second, for the indicated number of consecutive days: 1	3	7	15	30
March–June 1973	527,000	525,000	511,000	474,000	428,000
1934–72	434,000	416,000	387,000	365,000	359,000
Recurrence interval, in years, or 1973 flood volumes	>100	>100	>100	>100	>100

CHARITON RIVER BASIN

(31) 06903400 Chariton River near Chariton, Iowa

Location.—Lat 40°57′12″, long 93°15′37″, in SW¼NE¼ sec. 15, T. 71 N., R. 21 W., Lucas County, on right bank 15 ft (4.6 m) downstream from bridge on County Highway S43, 0.4 mile (0.6 km) downstream from Wolf Creek, and 5.0 miles (8.0 km) southeast of Chariton.

Drainage area.—182 mi² (471 km²).

Gage.—Water-stage recorder. Datum of gage is 917.96 ft (279.79 m) above mean sea level (levels by U.S. Weather Bureau from a Corp of Engineers bench mark).

Flood stage.—18 ft (5.5 m).

Maxima.—March–May 1973: Discharge, 2,740 ft³/s (78 m³/s) 6:00 p.m., Apr 16 [gage height, 18.02 ft (5.49 m)]. Recurrence interval of discharge is 2 years.

October 1965 to February 1973: Discharge, 6,320 ft³/s (179 m³/s) Aug. 8, 1970 [gage height, 20.15 ft (6.14 m)].

Flood in March 1960 reached a stage of about 23 ft (7.0 m) [discharge, about 15,000 ft³/s (425 m³/s)].

March–May 1973: Sediment concentration, maximum daily, 2,800 mg/l May 27.

Sediment discharge, maximum daily, 10,400 tons (9,430 t) May 27.

October 1969 to February 1973: Sediment concentration, maximum daily, 3,780 mg/l May 19, 1971.

Sediment discharge, maximum daily, 21,600 tons (19,600 t) Aug. 8, 1970.

Remarks.—Station data included in this report primarily for sediment analysis.

TABLE 12.—*Station descriptions and discharge and suspended-sediment data*—Continued

Mean water discharge and suspended-sediment concentration and discharge

March				April				May			
		Suspended sediment				Suspended sediment				Suspended sediment	
Day	Mean discharge (ft^3/s)	Mean concentration (mg/l)	Discharge (tons/day)	Day	Mean discharge (ft^3/s)	Mean concentration (mg/l)	Discharge (tons/day)	Day	Mean discharge (ft^3/s)	Mean concentration (mg/l)	Discharge (tons/day)
1 ----	151	122	50	1 ----	1,460	934	3,940	1 ----	714	1,160	2,470
2 ----	300	230	186	2 ----	1,410	598	2,280	2 ----	1,560	1,020	4,480
3 ----	337	165	150	3 ----	1,020	295	812	3 ----	947	380	972
4 ----	308	119	99	4 ----	502	188	255	4 ----	1,000	305	824
5 ----	354	208	199	5 ----	192	143	74	5 ----	367	225	223
6 ----	422	533	695	6 ----	123	112	37	6 ----	491	712	1,330
7 ----	1,140	1,160	3,570	7 ----	80	92	20	7 ----	1,160	1,300	4,070
8 ----	541	380	555	8 ----	64	78	13	8 ----	1,110	420	1,260
9 ----	405	308	337	9 ----	75	71	14	9 ----	908	265	650
10 ----	372	310	311	10 ----	60	78	13	10 ----	971	245	642
11 ----	1,360	855	3,140	11 ----	138	249	113	11 ----	388	305	320
12 ----	899	382	927	12 ----	942	598	1,520	12 ----	175	232	110
13 ----	896	326	789	13 ----	1,370	378	1,400	13 ----	119	181	58
14 ----	1,200	640	2,070	14 ----	1,560	300	1,260	14 ----	61	140	23
15 ----	505	465	634	15 ----	1,680	240	1,090	15 ----	37	107	11
16 ----	389	312	328	16 ----	2,250	507	3,080	16 ----	27	102	7.4
17 ----	153	173	71	17 ----	1,870	335	1,690	17 ----	24	72	4.7
18 ----	80	124	27	18 ----	1,370	316	1,170	18 ----	20	70	3.8
19 ----	60	93	15	19 ----	644	225	391	19 ----	19	76	3.9
20 ----	52	73	10	20 ----	295	499	422	20 ----	17	74	3.4
21 ----	49	61	8.1	21 ----	482	605	912	21 ----	15	73	3.0
22 ----	41	53	5.9	22 ----	590	601	1,010	22 ----	19	106	5.4
23 ----	38	52	5.3	23 ----	449	567	687	23 ----	28	280	21
24 ----	37	78	7.8	24 ----	350	352	333	24 ----	90	495	120
25 ----	1,050	430	1,220	25 ----	110	300	89	25 ----	32	660	57
26 ----	1,310	720	2,550	26 ----	56	210	32	26 ----	21	500	28
27 ----	1,180	450	1,430	27 ----	37	143	14	27 ----	1,220	2,800	[1] 10,400
28 ----	893	208	502	28 ----	28	105	7.9	28 ----	1,410	590	2,250
29 ----	204	166	91	29 ----	26	91	6.4	29 ----	875	402	950
30 ----	100	150	40	30 ----	50	165	37	30 ----	680	299	549
31 ----	827	899	3,140	31 ----	----	---	-------	31 ----	279	269	203
Total ----	15,653		23,166.1		19,283		22,722.3		14,784		32,052.6
Monthly mean discharge -	505		747		643		757		477		1,030
Maximum --	1,360		3,570		2,250		3,940		1,560		10,400
Minimum --	37		5.3		26		6.4		15		3.0

[1] A suspended-sediment sample on May 27 at 0810 contained 39 percent clay; 52 percent silt, and 9 percent sand.

CHARITON RIVER BASIN

(32) 06905500 Chariton River near Prairie Hill, Mo.
(Published as "near Keytesville" prior to Oct. 1, 1953)

Location.—Lat 39°32′25″, long 92°47′23″, in NW¼NW¼ sec. 26, T. 55 N., R. 17 W., Chariton County, on right bank on downstream side of road at bridge on State Highway 129, 3.2 miles (5.1 km) northwest of Prairie Hill, 13.5 miles (21.7 km) upstream from Puzzle Creek and at mile 19.6 (31.5 km).

Drainage area.—1,870 mi² (4,840 km²), approximately.

Gage.—Digital water-stage recorder. Datum of gage is 632.05 ft (192.649 m) above mean sea level (levels by Corps of Engineers). Prior to Oct. 1, 1953, nonrecording gage at site 8.2 miles (13.2 km) downstream at datum 13.68 ft (4.170 m) lower. Oct. 1, 1953, to July 2, 1958, nonrecording gage at present site and datum.

Flood Stage.—15 ft (4.6 m).

Maxima.—March–May 1973: Discharge, 31,900 ft^3/s (903 m^3/s) 4:00 a.m., Apr. 23 [gage height, 21.96 ft (6.693 m)]. Discharge exceeded the 100-year flood.

October 1928 to February 1973: Discharge, 25,600 ft^3/s (725 m^3/s) June 8, 9, 1947 [gage height 25.3 ft (7.71 m)], from floodmark, at site and datum then in use.

Remarks.—During 1906 a channel 33.5 miles (53.9 km) long was dug from the Missouri River at the Chariton-Macon County line to replace 290 miles (466.6 km) of natural channel. Channel improvement was extended upstream after 1909.

TABLE 12.—*Station descriptions and discharge and suspended-sediment data*—Continued

Mean discharge, in cubic feet per second, 1973

Day	March	April	May	Day	March	April	May	Day	March	April	May
1 ----	2,130	15,100	3,870	11 ----	10,800	4,160	4,320	21 ----	2,440	23,700	1,890
2 ----	2,660	9,830	16,100	12 ----	7,250	9,580	3,390	22 ----	2,350	29,600	1,920
3 ----	2,830	7,060	18,500	13 ----	6,100	10,700	2,740	23 ----	2,210	30,000	1,840
4 ----	2,830	3,980	18,600	14 ----	9,440	8,750	2,410	24 ----	2,420	23,300	1,860
5 ----	2,810	2,270	12,300	15 ----	6,550	7,720	2,230	25 ----	15,200	15,100	2,510
6 ----	3,510	1,540	5,700	16 ----	4,100	11,400	2,130	26 ----	20,100	5,800	1,910
7 ----	9,550	1,190	9,560	17 ----	3,080	10,200	2,050	27 ----	12,200	2,780	16,000
8 ----	6,600	1,040	15,500	18 ----	2,620	7,370	1,980	28 ----	7,540	1,890	21,900
9 ----	4,880	2,720	9,400	19 ----	2,340	5,780	1,930	29 ----	5,700	1,490	23,500
10 ----	5,190	2,990	5,580	20 ----	2,510	11,100	1,880	30 ----	2,830	1,300	18,700
								31 ----	6,680	-----	9,610
Monthly mean discharge, in cubic feet per second									5,720	8,980	7,800
Runoff, in inches									3.53	5.36	4.81

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1973

Date	Hour	Gage height	Discharge	Date	Hour	Gage height	Discharge	Date	Hour	Gage height	Discharge
Apr. 20	6:00 a.m.	9.99	5,090	Apr. 22	12:00 m.	21.86	30,900	Apr. 25	6:00 a.m.	18.22	17,700
	10:00 a.m.	12.32	8,100		12:00 p.m.	21.84	30,700		12:00 m.	16.81	15,200
	12:00 m.	13.87	10,400						6:00 p.m.	15.18	12,400
	2:00 p.m.	15.33	12,700	23	4:00 a.m.	21.96	31,900		12:00 p.m.	13.31	9,560
	4:00 p.m.	16.56	14,800		12:00 m.	21.84	30,700				
	6:00 p.m.	17.56	16,500		12:00 p.m.	21.44	26,900	26	6:00 a.m.	11.70	7,230
	12:00 p.m.	19.17	19,600						12:00 m.	10.18	5,320
				24	12:00 m.	20,61	23,100		6:00 p.m.	9.21	4,260
21	6:00 a.m.	20.34	22,300		6:00 p.m.	20.16	21,800				
	12:00 m.	20.96	24,200		12:00 p.m.	19.39	20,000				
	6:00 p.m.	21.08	24,800								
	12:00 p.m.	21.34	26,300								

Period	Highest mean discharge, in cubic feet per second, for the indicated number of consecutive days				
	1	3	7	15	30
March–May 1973	30,000	27,800	19,800	14,000	11,200
1931–72	25,200	23,600	19,300	18,900	15,000
Recurrence interval, in years, for 1973 flood volumes	>100	>100	40	20	30

CHARITON RIVER BASIN

(33) 06906000 Mussel Fork near Musselfork, Mo.

Location.—Lat 39°31′26″, long 92°56′59″, in SW¼SW¼SE¼ sec. 32, T. 55 N., R. 18 W., Chariton County, on left bank at downstream side of pier of bridge on State Highway 5, 4.5 miles (7.2 km) southwest of Musselfork, and 1.5 miles (2.4 km) upstream from Long Branch.

Drainage area.—267 mi² (692 km²).

Gage.—Digital water-stage recorder. Datum of gage is 639.25 ft (194.843 m) above mean sea level, datum of 1929.

Maxima.—March–May 1973: Discharge, 23,100 ft³/s (654 m³/s) 6:45 a.m., Apr. 22 [gage height, 22.11 ft (6.739)]. Discharge exceeded the 100-year flood.

October 1948 to December 1951, October 1962 to February 1973: Discharge, 9,500 ft³/s (269 m³/s) July 11, 1969 from loop rating, levee break [gage height, 21.0 ft (6.40 m)]; gage height, 21.58 ft (6.578 m) July 10, 1969.

Mean discharge, in cubic feet per second, 1973

Day	March	April	May	Day	March	April	May	Day	March	April	May
1 ----	220	2,830	159	11 ----	2,510	973	330	21 ----	297	15,500	49
2 ----	592	2,880	1,210	12 ----	2,540	1,950	189	22 ----	230	18,300	148
3 ----	494	2,280	1,890	13 ----	2,350	2,300	136	23 ----	163	8,890	112
4 ----	395	601	2,100	14 ----	2,290	2,020	107	24 ----	227	4,620	228
5 ----	409	324	835	15 ----	2,220	1,750	86	25 ----	2,510	1,580	1,890
6 ----	710	249	503	16 ----	932	1,950	74	26 ----	3,420	428	701
7 ----	2,240	199	1,600	17 ----	331	2,190	65	27 ----	4,180	321	4,160
8 ----	2,340	169	2,140	18 ----	240	1,230	59	28 ----	3,950	260	12,000
9 ----	1,860	349	2,190	19 ----	187	346	53	29 ----	1,590	214	7,430
10 ----	980	640	1,260	20 ----	209	2,030	49	30 ----	599	180	4,260
								31 ----	1,260	-----	1,670
Monthly mean discharge, in cubic feet per second									1,370	2,590	1,540
Runoff, in inches									5.92	10.8	6.64

TABLE 12.—*Station descriptions and discharge and suspended-sediment data*—Continued

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1973

Date	Hour	Gage height	Dis-charge	Date	Hour	Gage height	Dis-charge
Apr. 20	12:00 a.m.	13.30	1,110	Apr. 22	2:00 a.m.	21.89	20,900
	4:00 p.m.	18.34	2,380		4:00 a.m.	22.03	22,300
	6:00 p.m.	19.17	3,610		6:00 a.m.	22.09	22,900
	12:00 p.m.	20.10	6,800		8:00 a.m.	22.07	22,700
					12:00 m.	21.75	19,500
Apr. 21	4:00 a.m.	20.72	10,300		4:00 p.m.	21.36	15,600
	8:00 a.m.	21.16	13,600		8:00 p.m.	21.19	13,900
	12:00 m.	21.57	17,700		12:00 p.m.	20.95	11,700
	2:00 p.m.	21.77	19,900				
	6:00 p.m.	21.67	18,700	Apr. 23	4:00 a.m.	20.73	11,100
	10:00 p.m.	21.63	18,300		8:00 a.m.	20.53	9,900
	12:00 p.m.	21.73	19,300		12:00 m.	20.31	8,580

Period	Highest mean discharge, in cubic feet per second, for the indicated number of consecutive days: 1	3	7	15	30
March–May 1973	18,300	14,200	7,340	4,340	2,700
Recurrence interval, in years, for 1973 flood volumes	>100	>100	>100	>100	100

LITTLE CHARITON RIVER BASIN

(34) 06906300 East Fork Chariton River near Huntsville, Mo.

Location.—Lat 39°27′19″, long 92°34′09″, in NE¼NW¼ sec. 26, T. 54 N., R. 15 W., Randolph County, at downstream side of left pile bent of bridge on County Highway C, 1 mile (1.6 km) downstream from Sugar Creek and 1.5 miles (2.4 km) northwest of Huntsville.

Drainage area.—220 mi^2 (570 km^2).

Gage.—Graphic water-stage recorder. Datum of gage is 656.43 ft (200.080 m) above mean sea level (datum of 1929).

Maxima.—March–May 1973: Discharge, 30,000 ft^3/s (850 m^3/s) 3:00 a.m., Apr. 21 [gage height, 20.78 ft (6.334 m)]. Discharge exceeded the 100-year flood.

October 1962 to February 1973: Discharge, 19,200 ft^3/s (544 m^3/s) July 9, 1967 [gage height, 19.76 ft (6.023 m)].

Mean discharge, in cubic feet per second, 1973

Day	March	April	May	Day	March	April	May	Day	March	April	May
1	200	1,900	227	11	1,600	890	950	21	340	17,000	53
2	500	1,750	938	12	1,450	890	320	22	266	7,820	84
3	600	1,750	830	13	1,900	1,040	181	23	190	6,900	86
4	500	1,900	770	14	2,300	1,130	127	24	352	3,850	86
5	400	971	350	15	1,340	1,340	97	25	2,360	2,100	532
6	350	282	390	16	1,340	1,600	77	26	2,500	706	499
7	1,050	196	920	17	1,020	1,230	70	27	2,300	274	1,300
8	960	173	1,230	18	282	1,230	62	28	3,000	202	1,340
9	1,040	620	1,230	19	187	704	55	29	2,500	166	2,660
10	1,340	830	1,340	20	258	2,780	49	30	830	139	3,250
								31	1,060	-----	1,750
Monthly mean discharge, in cubic feet per second									1,110	2,080	705
Runoff, in inches									5.80	10.5	3.69

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1973

Date	Hour	Gage height	Dis-charge	Date	Hour	Gage height	Dis-charge
Apr. 20	12:00 m.	16.64	1.380	Apr. 21	2:00 p.m.	19.15	10,900
	4:00 p.m.	17.35	2,620		9:00 p.m.	18.53	6,550
	8:00 p.m.	17.68	3,490		12:00 p.m.	18.74	7,640
	10:00 p.m.	18.85	8,350				
	11:00 p.m.	19.80	17,600	Apr. 22	2:00 a.m.	18.90	8,700
	12:00 p.m.	20.50	26,100		6:00 a.m.	18.51	6,450
Apr. 21	2:00 a.m.	20.75	29,400				
	3:00 a.m.	20.78	30,000				
	6:00 a.m.	20.55	26,800				
	8:00 a.m.	20.20	22,600				
	10:00 a.m.	19.75	17,100				

TABLE 12.—*Station descriptions and discharge and suspended-sediment data*—Continued

Period	Highest mean discharge, in cubic feet per second, for the indicated number of consecutive days 1	3	7	15	30
March–May 1973	17,000	10,600	5,880	3,350	2,370
Recurrence interval, in years, for 1973 flood volumes	>100	>100	>100	>100	100

SLOUGH CREEK BASIN

(35) 06906600 Burge Branch near Arrow Rock, Mo.

Location.—Lat 39°02′43″, long 92°56′35″, in SW¼NE¼ sec. 1, T. 49 N., R. 19 W., Cooper County, on right bank 30 ft (9 m) upstream from culvert on county road, 1.5 miles (2.4 km) south of Arrow Rock.
Drainage area.—0.33 mi² (0.855 km²).
Gage.—Graphic water-stage recorder. Altitude of gage is 610 ft (186 m), from topographic map.
Maxima.—March–May 1973: Discharge, 276 ft³/s (7.82 m³/s) 11:00 p.m., Apr. 20 [gage height, 9.27 ft (2.825 m), from flood-mark]. Discharge exceeded the 100-year flood.

October 1959 to February 1973: Discharge, 134 ft³/s (3.79 m³/s) Sept. 13, 1961 [gage height 4.38 ft (1.335 m)]; gage height, 7.31 ft (2.228 m) June 8, 1966.

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1973

Date	Hour	Gage height	Dis-charge	Date	Hour	Gage height	Dis-charge	Date	Hour	Gage height	Dis-charge
Apr. 20	7:00 p.m.	3.66	20	Apr. 20	10:00 p.m.	5.20	76	Apr. 21	4:00 a.m.	3.82	26
	7:15 p.m.	4.00	33		1015 p.m.	5.85	92		6:00 a.m.	3.27	8.5
	7:30 p.m.	4.60	57		10:30 p.m.	7.15	117				
	7:45 p.m.	6.00	95		10:45 p.m.	8.90	212				
	8:00 p.m.	8.00	140		11:00 p.m.	9.27	276				
	8:15 p.m.	8.50	175		11:15 p.m.	8.75	198				
	8:30 p.m.	8.00	140		11:30 p.m.	8.15	148				
	8:45 p.m.	6.00	95		11:45 p.m.	6.90	113				
	9:00 p.m.	5.03	72		12:00 p.m.	6.27	100				
	9:15 p.m.	5.40	82								
	9:30 p.m.	6.65	108	21	1:00 a.m.	5.48	84				
	9:45 p.m.	6.55	106		2:00 a.m.	4.38	48				

MISSOURI RIVER BASIN

(36) 06934500 Missouri River at Hermann, Mo.

Location.—Lat 38°42′36″, long 91°26′91″, in SW¼ sec. 25, T. 46 N., R. 5 W., Montgomery County, on downstream side of third pier from right abutment of bridge on State Highway 19 at Hermann. River mile, 97.9 (157.5 km).
Drainage area.—528,200 mi² (1,368,000 km²), approximately.
Gage.—Water-stage recorder. Datum of gage is 481.56 ft (146.779 m) above mean sea level. Prior to Sept. 26, 1930, nonrecording gage at site 480 ft (146 m) downstream at datum 0.07 ft (.02 m) lower. Sept. 26, 1930, to Mar. 27, 1932, nonrecording gage; Mar. 28, 1932, to June 12, 1945, water-stage recorder; June 13, 1945, to Apr. 2, 1946, nonrecording gage; at present site and datum.
Flood stage.—21 ft (6.4 m). Flood stage was exceeded for 73 consecutive days (Mar. 6–May 17). Previous record was 37 days (June 23 to July 29, 1951).
Maxima.—March–May 1973; Discharge, 500,000 ft³/s (14,160 m³/s) 3:15 a.m., Apr. 25 [gage-height, 33.70 ft (10.272 m)].

October 1897 to Feb. 1973: Maximum discharge 676,000 ft³/s (19,140 m³/s) June 6, 7, 1903 [gage height 29.5 ft (8.99 m)], discharge computed by Corps of Engineers; maximum gage height, 33.33 ft (10.159 m) July 19, 1951.

Maximum stage known, 35.5 ft (10.82 m) in June 1844 [discharge about 892,000 ft³/s (25,260 m³/s), computed by Corps of Engineers].
Remarks.—Natural flow of stream is affected by many reservoirs and diversions. Recurrence intervals of peaks and flood volumes have not been computed.

Period	Highest mean discharge, in cubic feet per second, for the indicated number of consecutive days 1	3	7	15	30
March–May 1973	489,000	467,000	416,000	355,000	333,000
1929–72	615,000	600,000	554,000	523,000	481,000
Recurrence interval, in years, for 1973, flood volumes	—	—	—	—	—

TABLE 12.—*Station descriptions and discharge and suspended-sediment data*—Continued

Mean water discharge and suspended-sediment concentration, discharge, and percent sand

Date	March: Stage	March: Discharge (1,000 ft³/s)	March: Suspended sediment[1] Concentration (mg/l)	March: Suspended sediment[1] Discharge (1,000 tons/day)	March: Suspended sediment[1] Percent sand
1	15.10	115	1,000	310	--
2	14.47	109	990	291	--
3	14.61	110	980	290	--
4	15.17	117	1,050	330	--
5	17.19	142	1,600	610	--
6	20.70	192	2,900	1,500	--
7	26.49	289	3,640	2,840	42
8	27.48	307	3,600	3,000	--
9	27.10	299	2,800	2,300	--
10	27.00	296	2,300	1,900	--
11	29.38	343	2,300	2,100	--
12	29.75	350	2,300	2,200	--
13	29.46	333	2,100	1,900	--
14	29.99	333	1,950	1,750	33
15	30.13	338	1,900	1,700	--
16	30.01	337	2,100	1,900	--
17	28.84	315	2,100	1,800	--
18	27.90	299	2,000	1,600	--
19	26.67	277	1,830	1,370	33
20	25.58	253	1,700	1,200	--
21	24.51	230	1,600	1,000	--
22	24.22	221	1,400	840	--
23	23.62	207	1,320	740	36
24	22.49	194	1,300	680	--
25	23.61	227	1,800	1,100	--
26	27.94	288	2,100	1,600	--
27	29.05	323	2,000	1,700	--
28	29.95	349	1,890	1,780	47
29	30.66	368	1,800	1,800	--
30	30.66	368	1,800	1,800	--
31	30.60	364	1,800	1,800	--
Total		8,293		45,731	
Monthly mean discharge		268		1,477	
Maximum		368		3,000	
Minimum		109		290	

Date	April: Stage	April: Discharge (1,000 ft³/s)	April: Suspended sediment[1] Concentration (mg/l)	April: Suspended sediment[1] Discharge (1,000 tons/day)	April: Suspended sediment[1] Percent sand
1	31.33	386	1,800	1,900	--
2	31.39	389	1,800	1,900	--
3	31.59	397	1,800	1,900	--
4	31.71	402	1,760	1,910	41
5	31.85	403	1,700	1,800	--
6	31.59	394	1,600	1,700	--
7	30.62	346	1,400	1,300	--
8	29.15	300	1,300	1,100	--
9	27.77	260	1,170	820	59
10	26.64	245	1,000	660	--
11	25.72	234	920	590	--
12	25.06	228	830	510	--
13	24.74	228	820	510	--
14	24.74	233	900	570	--
15	25.50	251	1,000	680	--
16	26.22	270	1,200	870	--
17	27.30	297	1,300	1,000	--
18	27.81	313	1,300	1,050	65
19	28.34	323	1,300	1,100	--
20	28.78	333	1,300	1,200	--
21	29.02	338	1,400	1,300	--
22	30.75	381	1,600	1,600	--
23	32.61	463	1,900	2,400	--
24	33.21	489	1,580	2,090	--
25	33.06	449	1,090	1,330	--
26	32.35	407	870	960	--
27	31.61	376	770	780	--
28	30.41	345	700	660	73
29	28.59	289	720	560	--
30	26.53	234	760	480	78
31	----	---	---	---	--
Total		10,003		35,230	
Monthly mean discharge		333		1,174	
Maximum		489		2,400	
Minimum		228		480	

Date	May: Stage	May: Discharge (1,000 ft³/s)	May: Suspended sediment[1] Concentration (mg/l)	May: Suspended sediment[1] Discharge (1,000 tons/day)	May: Suspended sediment[1] Percent sand
1	24.55	203	740	410	--
2	23.05	181	750	360	--
3	23.89	194	850	450	--
4	25.07	214	990	570	--
5	25.27	218	1,000	590	--
6	25.39	221	1,100	660	--
7	25.97	231	1,000	620	--
8	27.03	249	1,100	740	--
9	27.54	259	1,110	780	44
10	27.86	266	1,100	790	
11	28.26	275	1,100	820	--
12	28.45	280	1,100	830	--
13	28.06	274	1,100	820	--
14	26.95	255	1,000	690	--
15	25.09	225	880	530	33
16	22.63	187	770	390	--
17	21.10	166	700	310	--
18	20.09	153	620	250	--
19	19.29	143	540	210	--
20	18.21	130	480	170	--
21	17.04	117	421	130	32
22	17.98	126	360	120	--
23	18.94	135	360	130	--
24	18.69	130	395	140	42
25	18.65	131	420	150	--
26	18.66	132	450	160	--
27	19.06	138	530	200	--
28	20.79	163	770	340	--
29	21.72	177	1,200	570	--
30	22.31	187	1,600	810	--
31	22.68	194	1,500	790	--
Total		5,954		14,530	
Monthly mean discharge		192		469	
Maximum		280		830	
Minimum		117		120	

Date	June: Stage	June: Discharge (1,000 ft³/s)	June: Suspended sediment[1] Concentration (mg/l)	June: Suspended sediment[1] Discharge (1,000 tons/day)	June: Suspended sediment[1] Percent sand
1	22.68	194	1,400	730	--
2	21.10	170	1,300	600	--
3	18.95	140	1,200	450	--
4	18.05	129	1,200	420	22
5	19.25	143	1,200	460	--
6	20.45	158	1,200	510	--
7	20.65	161	1,200	520	--
8	19.80	149	1,100	440	--
9	18.90	138	990	370	--
10	18.16	129	870	300	--
11	17.70	123	730	240	--
12	16.58	110	585	170	20
13	15.48	99	520	140	--
14	14.80	93	433	110	24
15	15.50	99	430	110	--
16	16.26	106	500	140	--
17	15.64	100	460	120	--
18	15.00	94	440	110	--
19	18.54	133	570	200	--
20	18.86	136	680	250	--
21	16.11	104	600	170	--
22	14.72	92	480	120	--
23	13.94	86	420	98	--
24	13.55	83	370	83	--
25	12.70	77	340	701	--
26	12.17	73	320	63	--
27	12.43	76	300	62	--
28	11.59	70	280	53	--
29	11.37	69	270	50	--
30	11.16	68	250	46	--
31					
Total		3,403		7,206	
Monthly mean discharge		113		240	
Maximum		194		730	
Minimum		68		46	

[1] Suspended-sediment data based on observations at 2- to 10-day intervals.

TABLE 12.—*Station descriptions and discharge and suspended-sediment data*—Continued

MISSISSIPPI RIVER MAIN STEM

(37) 07010000 Mississippi River at St. Louis, Mo.

Location.—Lat 38°37′44″, long 90°10′47″, on downstream side of west pier of Eads Bridge at St. Louis, 15 miles (24.1 km) downstream from Missouri River, 19.2 miles (30.9 km) upstream from Meramec River, and at mile 180.0 (289.6 km) above Ohio River.

Drainage area.—701,000 mi^2 (1,820,000 km^2).

Gage.—Continuous water-stage recorder. Datum of gage is 379.94 ft (115.806 m) above mean sea level.

Flood stage.—30.0 ft (9.1 m). Flood stage was exceeded for 77 consecutive days (Mar. 10 to May 25). Previous record was 63 consecutive days (May 17 to July 18, 1844).

Maxima.—March–June 1973: Discharge, 852,000 ft^3/s (24,130 m^3/s) 3:00 p.m., Apr. 28 [gage height, 43.23 ft (13.177 m)]. Recurrence interval of discharge is 30 years (based on figure 52).

January 1861 to February 1973: Daily discharge, 1,019,000 ft^3/s (28,860 m^3/s) June 10, 11, 1903 [gage height, 38.00 ft (11.582 m)]; gage height, 40.28 ft (12.277 m) July 21, 1951.

Flood of June 27, 1844 reached a stage of 41.32 ft (12.594 m), from floodmarks (discharge, 1,300,000 ft^3/s (36,820 m^3/s), computed by Corps of Engineers). Flood in April 1785 may have reached a stage of 42.0 ft (12.80 m).

Remarks.—Natural flow of stream affected by many reservoirs and navigation dams in upper Mississippi River basin an by many reservoirs and diversions for irrigation in Missouri River basin.

Mean gage height, in feet, and discharge, in cubic feet per second, 1973

Day	March Stage	March Discharge	April Stage	April Discharge	May Stage	May Discharge	June Stage	June Discharge
1	15.48	244,000	38.66	737,000	41.47	800,000	30.95	463,000
2	15.45	243,000	38.97	745,000	40.09	758,000	31.10	467,000
3	14.95	233,000	39.31	755,000	38.39	707,000	30.57	457,000
4	15.33	238,000	39.61	763,000	37.33	674,000	29.40	436,000
5	17.01	267,000	39.77	768,000	36.98	662,000	28.95	429,000
6	19.46	309,000	39.75	758,000	36.91	662,000	28.80	427,000
7	24.53	406,000	39.47	746,000	37.08	665,000	28.94	431,000
8	28.19	484,000	38.87	722,000	37.39	674,000	28.82	431,000
9	29.47	511,000	38.20	692,000	37.59	680,000	28.27	422,000
10	30.18	528,000	37.38	659,000	37.84	686,000	27.62	412,000
11	31.31	552,000	36.21	627,000	38.01	689,000	27.05	404,000
12	32.35	576,000	35.29	605,000	38.12	692,000	26.59	397,000
13	33.11	594,000	34.51	586,000	38.04	689,000	25.97	387,000
14	33.90	614,000	33.93	570,000	37.82	680,000	25.16	371,000
15	34.55	631,000	33.69	565,000	37.35	665,000	24.40	356,000
16	35.00	641,000	33.80	570,000	36.42	635,000	24.07	346,000
17	35.21	646,000	33.89	576,000	34.89	592,000	24.05	342,000
18	35.02	626,000	33.98	570,000	33.52	552,000	23.28	327,000
19	34.54	598,000	34.17	570,000	32.60	525,000	23.39	327,000
20	34.06	588,000	34.51	592,000	31.84	504,000	25.42	363,000
21	33.49	574,000	34.83	611,000	31.15	484,000	26.55	383,000
22	32.80	559,000	35.75	635,000	30.46	467,000	25.80	371,000
23	32.38	549,000	37.29	680,000	30.31	461,000	24.78	356,000
24	32.05	542,000	39.16	734,000	30.34	459,000	23.52	336,000
25	31.75	537,000	40.51	773,000	29.95	449,000	22.28	317,000
26	32.45	554,000	41.68	806,000	29.36	436,000	20.92	295,000
27	33.90	594,000	42.61	830,000	28.99	429,000	20.00	283,000
28	35.48	638,000	43.17	851,000	28.70	422,000	19.89	281,000
29	36.64	672,000	43.09	848,000	29.27	429,000	19.29	273,000
30	37.60	703,000	42.52	830,000	29.95	441,000	18.33	257,000
31	38.19	724,000	----	------	30.50	453,000		
Monthly mean discharge, in cubic feet per second		521,800		692,500		584,500		371,600
Runoff, in inches		0.86		1.10		0.96		0.59
Runoff, in thousands of acre-feet		32,080		41,210		35,943		22,110

Water temperature, stage, water discharge, and suspended-sediment data at given time

Date		Hour	Water temperature (°C)	Stage (ft)	Discharge (1,000 ft^3/s)	Suspended sediment: Concentration, mg/l: Right	Middle	Left	Average	Discharge (1,000 tons/day)	Percent sand
March	26	12:45 p.m.	8.3	32.2	549	410	---	340	425	630	36
	31	11:57 a.m.	10.5	38.1	722	674	---	363	519	1,012	33
April	4	1:10 p.m.	9.0	39.6	763	627	538	356	507	1,045	28
	5	12:55 p.m.	9.4	---	768	862	616	351	610	1,265	16
	6	3:10 p.m.	11.0	39.8	761	---	540	---	540	1,109	10
	7	11:20 a.m.	10.5	---	746	---	508	---	508	1,023	11
	8	1:55 p.m.	10.5	38.8	719	---	398	---	398	772	12
	9	11:15 a.m.	9.5	---	692	---	373	---	373	697	23
	10	2:00 p.m.	8.0	37.5	665	---	432	---	432	776	28
	11	11:30 a.m.	7.5	---	627	---	467	---	467	791	27
	12	12:00 m.	8.0	35.4	608	501	410	173	361	593	29
	13	11:30 a.m.	8.0	34.4	581	472	471	187	376	590	35
	17	1:05 p.m.	10.5	33.9	576	590	---	260	425	661	--
	27	12:25 p.m.	16	42.6	830	895	---	682	788	1,766	--
	29	1:30 p.m.	17	43.1	848	557	---	420	488	1,117	--
May	9	3:30 p.m.	15	37.6	680	512	---	252	382	701	--

TABLE 12.—*Station descriptions and discharge and suspended-sediment data*—Continued

Period	Highest mean discharge, in cubic feet per second, for the indicated number of consecutive days 1	3	7	15	30
March–June 1973	851,000	843,000	820,000	752,000	698,000
1934–72	834,000	829,000	789,000	736,000	687,000
Recurrence interval, in years, for 1973 flood volumes	30	30	25	20	30

MISSISSIPPI RIVER MAIN STEM

(38) 07020500 Mississippi River at Chester, Ill.

Location.—Lat 37°54′10″, long 89°51′10″, in SW¼ sec. 24, T. 7 S., R. 7 W., third principal meridian, Randolph County, on downstream side of left pier of main truss of highway bridge at Chester, 8.1 miles (13.0 km) downstream from Kaskaskia River, and at mile 109.9 (176.8 km) above Ohio River.

Drainage area.—712,600 mi² (1,846,000 km²), approximately.

Gage.—Continuous water-stage recorder. Datum of gage is 341.05 ft (103.952 m) above mean sea level.

Flood stage.—27.0 ft (8.2 m). Flood stage was exceeded for 97 consecutive days (Mar. 8 to June 13). Previous record was 36 consecutive days (June 27 to Aug. 1, 1951).

Maxima.—March–June 1973: Discharge, 886,000 ft³/s (25,090 m³/s) 12:00 m., Apr. 30 [gage height, 43.32 ft (13.204 m)]. Recurrence interval of discharge is 20 years (based on figure 52).

October 1927 to February 1973: Discharge determined, 886,000 ft³/s (25,090 m³/s) July 3, 1947 (discharge, including unmeasured overflow, was greater May 24, 1943; gage height, 39.3 ft (11.98 m) July 23, 1951.

Flood of June 30, 1844, reached a stage of 39.8 ft[(12.13 m), (discharge 1,350,000 ft³/s (38,230 m³/s), computed by Corps of Engineers)].

Remarks.—Natural flow of stream affected by many reservoirs and navigation dams in upper Mississippi River basin and by many reservoirs and diversions for irrigation in Missouri River basin. Flood-volume-frequency data are not available for this station.

Mean gage height, in feet, and discharge, in cubic feet per second, 1973

Day	March Stage	March Discharge	April Stage	April Discharge	May Stage	May Discharge	June Stage	June Discharge
1	16.07	237,000	38.14	744,000	----	864,000	30.00	468,000
2	17.16	254,000	38.48	762,000	42.31	833,000	30.37	476,000
3	16.92	249,000	38.84	779,000	41.00	788,000	30.67	482,000
4	16.74	244,000	39.34	804,000	39.56	738,000	30.41	476,000
5	17.37	254,000	39.67	796,000	38.39	704,000	30.06	470,000
6	19.20	284,000	39.85	784,000	37.54	683,000	29.78	464,000
7	22.92	358,000	39.87	784,000	37.41	683,000	29.55	458,000
8	26.65	444,000	39.52	774,000	----	695,000	29.45	454,000
9	28.84	499,000	39.11	756,000	38.15	710,000	29.22	448,000
10	30.20	533,000	38.50	732,000	38.20	710,000	28.73	436,000
11	31.70	569,000	37.83	704,000	----	707,000	28.14	422,000
12	32.40	586,000	37.02	680,000	----	721,000	27.61	412,000
13	33.05	603,000	36.09	650,000	----	718,000	27.16	406,000
14	33.82	623,000	35.25	626,000	38.42	710,000	26.63	398,000
15	34.50	644,000	34.62	609,000	38.22	701,000	25.88	386,000
16	35.00	659,000	34.19	596,000	37.72	683,000	25.23	374,000
17	35.20	662,000	33.99	591,000	36.90	656,000	25.07	374,000
18	35.37	668,000	34.00	591,000	35.62	618,000	24.77	370,000
19	35.24	662,000	34.12	596,000	34.42	586,000	24.75	372,000
20	34.81	647,000	34.61	611,000	33.35	557,000	25.22	380,000
21	34.38	629,000	34.86	614,000	32.41	535,000	26.34	400,000
22	33.81	610,000	35.62	628,000	31.62	513,000	26.82	406,000
23	33.26	593,000	37.00	671,000	30.94	498,000	26.33	394,000
24	32.91	581,000	38.08	704,000	30.60	490,000	25.40	374,000
25	32.55	566,000	39.48	756,000	30.34	482,000	24.33	350,000
26	32.30	557,000	40.80	801,000	30.01	474,000	23.16	328,000
27	32.61	562,000	41.50	822,000	30.19	476,000	22.00	308,000
28	33.54	588,000	42.09	843,000	29.87	468,000	21.27	296,000
29	35.00	629,000	43.12	879,000	29.40	456,000	20.86	291,000
30	36.27	674,000	43.26	885,000	29.42	456,000	20.27	282,000
31	37.44	713,000	----	------	29.69	462,000	----	------
Monthly mean discharge in cubic feet per second		528,400		719,100		625,000		398,500
Runoff, in inches		0.86		1.13		1.01		0.62
Runoff, in thousands of acre-feet		32,490		42,790		38,430		23,710

TABLE 12.—*Station descriptions and discharge and suspended-sediment data*—Continued

Water temperature, stage, water discharge, and suspended-sediment data at given time

Date	Hour [1]	Water temperature (°C)	Stage (ft)	Discharge (1,000 ft ^{3}/s)	Suspended sediment: Concentration (mg/l)	Suspended sediment: Discharge (1,000 t/day)	Suspended sediment: Percent sand
April 5	5:00 p.m.	12.5	39.9	804	588	1,276	13
7	---------	11.0	39.8	784	601	1,272	16
8	4:45 p.m.	10.5	39.5	774	564	1,179	23
9	12:00 m.	9.0	39.2	760	459	942	19
10	5:30 p.m.	8.5	38.4	728	405	796	23
11	12:20 p.m.	9.5	38.0	710	369	707	23

[1] Time shown is for temperature and suspended-sediment samples.

Period	Highest mean discharge, in cubic feet per second, for the indicated number of consecutive days: 1	3	7	15	30
March–June 1973	885,000	876,000	847,000	779,000	726,000
Recurrence interval, in years, for 1973 flood volumes	------	------	------	------	------

MISSISSIPPI RIVER MAIN STEM

(39) 07022000 Mississippi River at Thebes, Ill.

Location.—Lat 37°13′00″, long 89°27′50″, in NW¼ sec. 17, T. 15 S., R. 3 W., Alexander County, near center span on downstream side of railroad bridge at Thebes, 5 miles (8.0 km) downstream from Headwater Division Channel, and at mile 43.7 (70.3 km) above Ohio River.
Drainage area.—717,200 mi^2 (1,858,000 km^2), approximately.
Gage.—Continuous water-stage recorder at base gage (Thebes). Continuous water-stage recorder at auxiliary gage (Cape Girardeau), 8.2 miles (13.2 km) upstream. Datum of base gage is at mean sea level.
Flood stage.—333.0 ft (101.5 m). Flood stage was exceeded for 95 consecutive days (Mar. 11 to June 13). Previous record was 38 days (Mar. 24 to Apr. 30, 1945).
Maxima.—March–June 1973: Discharge, 886,000 ft^3/s (25,090 m^3/s) 3:00 p.m., Apr. 30; maximum elevation, 343.43 ft (104.677 m) 11:00 a.m. Apr. 30. Recurrence interval of discharge is 20 years (based on figure 30).

October 1932 to February 1973: Discharge, 893,000 ft^3/s (25,290 m^3/s) May 27, 1943 [(elevation, 340.33 ft (103.733 m), present datum)].

Flood of July 4, 1844, reached an elevation of 354.14 ft (105.199 m), present datum, at Grays Point, from floodmarks [discharge, 1,375,000 ft^3/s (38,940 m^3/s), computed by Corps of Engineers].
Remarks.—Natural flow of stream affected by many reservoirs and navigation dams in upper Mississippi River basin and by many reservoirs and diversions for irrigation in Misssouri River basin.

Mean gage height, in feet, and discharge, in cubic feet per second, 1973

Day	March Stage	March Discharge	April Stage	April Discharge	May Stage	May Discharge	June Stage	June Discharge
1	19.57	230,000	40.96	750,000	43.25	876,000	34.56	492,000
2	20.70	251,000	41.15	765,000	43.28	838,000	34.75	502,000
3	21.14	259,000	41.04	768,000	42.71	829,000	35.06	514,000
4	20.84	255,000	41.29	777,000	41.97	798,000	35.32	520,000
5	20.98	260,000	41.50	801,000	41.20	753,000	35.29	518,000
6	22.06	283,000	41.50	813,000	40.58	720,000	35.08	508,000
7	24.67	339,000	41.52	799,000	40.33	708,000	34.71	495,000
8	28.18	416,000	41.40	807,000	40.57	724,000	34.45	487,000
9	30.75	471,000	41.14	765,000	40.61	726,000	34.30	481,000
10	32.69	513,000	40.88	765,000	40.50	724,000	34.05	473,000
11	35.22	572,000	40.51	739,000	40.51	725,000	33.66	461,000
12	36.65	600,000	40.10	707,000	40.49	728,000	33.21	448,000
13	37.25	608,000	39.58	679,000	40.38	729,000	32.77	441,000
14	37.88	630,000	38.90	655,000	40.28	725,000	32.35	435,000
15	38.55	649,000	38.43	632,000	40.10	717,000	31.62	424,000
16	38.93	674,000	38.03	619,000	39.91	708,000	30.80	412,000
17	39.17	681,000	37.89	610,000	39.52	694,000	30.18	405,000
18	39.45	675,000	37.83	606,000	38.90	663,000	29.91	401,000
19	39.58	669,000	37.94	615,000	38.15	635,000	29.55	396,000
20	39.58	668,000	38.44	631,000	37.37	603,000	29.61	399,000
21	39.57	654,000	38.56	639,000	36.70	573,000	30.06	408,000
22	39.30	642,000	38.87	653,000	36.07	550,000	30.82	420,000
23	38.90	630,000	39.69	693,000	35.48	535,000	30.97	419,000
24	38.64	616,000	40.32	718,000	34.94	521,000	30.51	402,000
25	38.53	604,000	40.85	752,000	34.53	509,000	29.65	378,000
26	38.29	596,000	41.70	788,000	34.16	499,000	28.60	355,000
27	38.18	598,000	42.39	800,000	35.25	526,000	27.36	334,000
28	38.38	614,000	42.55	856,000	35.19	519,000	26.34	315,000
29	39.10	641,000	42.95	851,000	34.65	501,000	25.70	305,000

TABLE 12.—*Station descriptions and discharge and suspended-sediment data*—Continued

Mean gage height, in feet, and discharge, in cubic feet per second, 1973—Continued

Day	March		April		May		June	
	Stage	Discharge	Stage	Discharge	Stage	Discharge	Stage	Discharge
30	39.60	693,000	43.32	878,000	34.31	488,000	25.18	297,000
31	40.54	717,000	----	------	34.39	486,000	----	------
Monthly mean discharge, in cubic feet per second		539,000		731,000		655,800		428,200
Runoff, in inches		0.87		1.14		1.05		0.67
Runoff, in thousands of acre-feet		33,140		43,500		40,320		25,480

Water temperature, stage, discharge, and suspended-sediment data at given time

Date	Hour [1]	Water temperature (°C)	Stage (ft)	Discharge (1,000 ft³/s)	Suspended sediment		
					Concentration (mg/l)	Discharge (1,000 t/day)	Percent sand
April 7	6:45 p.m.	10.5	41.5	799	704	1,519	14
8	8:00 a.m.	9.5	41.4	807	720	1,569	28
9	6:00 p.m.	9.0	41.1	765	591	1,221	30
10	9:00 a.m.	8.0	40.9	765	623	1,287	36
11	8:15 a.m.	8.5	40.5	739	425	848	38
13	12:40 p.m.	9.0	39.6	679	400	733	42

[1] Time shown is for temperature and suspended-sediment samples.

	Highest mean discharge, in cubic feet per second, for the indicated number of consecutive days				
	1	3	7	15	30
March–June 1973	878,000	868,000	847,000	793,000	743,000
1934–72	886,000	863,000	813,000	767,000	713,000
Recurrence interval, in years, for 1973 flood volumes	20	20	20	20	30

OHIO RIVER BASIN

(40) 03384500 Ohio River at Golconda, Ill.

Location.—Lat 37°21′28″, long 88°28′27″, Pope County, on right bank at lock and dam 51, at Golconda, 0.5 mile (0.8 km) upstream from McGilligan Creek, 0.7 mile (1.1 km) downstream from Lusk Creek, and at mile 903.1 (1,453.1 km).

Drainage area.—143,900 mi² (372,700 km²), approximately.

Gage.—Nonrecording gage read hourly. Datum of gage is 294.6 ft (89.79 m) above mean sea level, Ohio River datum. Auxiliary nonrecording gage read hourly at lock and dam 50, 26.3 miles (42.3 km) upstream.

Flood stage.—Periods when river exceeded flood stage of 40 ft (12.2 m) for selected floods, are shown in the following tabulation:

1937: Jan. 13 to Feb. 15	(34 days)
1945: Feb. 28 to Apr. 6	(38 days)
1950: Jan. 8 to Mar. 4	(56 days)
1964: Mar. 10 to 31	(22 days)
1973: Mar. 20 to Apr. 5	(17 days)
May 2 to 10	(9 days)

Maxima.—March–May 1973: Discharge, 601,000 ft³/s (17,000 m³/s) Mar. 26, 4:00 p.m., gage height, 45.7 ft (13.93 m) Mar. 26, 27.

1937 to February 1973: Discharge 1,470,000 ft³/s (41,600 m³/s). Feb. 2, 3, 1937; gage height, 62.6 ft (19.08 m) Feb. 1–3, 1937.

Remarks.—Flow partly regulated by many dams and reservoirs.

Mean gage height, in feet, and discharge, in cubic feet per second, 1973

Day	March		April		May	
	Stage	Discharge	Stage	Discharge	Stage	Discharge
1	16.30	121,000	43.26	509,000	39.13	472,000
2	16.08	117,000	42.61	493,000	40.18	490,000
3	15.80	115,000	41.85	474,000	41.07	506,000
4	15.86	110,000	40.94	447,000	41.81	538,000
5	15.67	109,000	39.92	420,000	42.34	546,000
6	16.34	120,000	38.92	401,000	42.65	549,000
7	18.22	148,000	38.47	403,000	42.58	547,000
8	21.30	198,000	38.54	414,000	42.31	533,000
9	24.00	242,000	38.70	427,000	41.45	499,000
10	26.14	262,000	39.01	434,000	40.14	452,000
11	28.89	290,000	39.00	444,000	38.51	404,000

TABLE 12.—*Station descriptions and discharge and suspended-sediment data*—Continued

Mean gage height, in feet, and discharge, in cubic feet per second, 1973—Continued

Day	March		April		May	
	Stage	Discharge	Stage	Discharge	Stage	Discharge
12	30.64	312,000	39.00	449,000	37.04	372,000
13	31.85	325,000	38.90	452,000	36.02	354,000
14	32.66	331,000	38.69	452,000	35.42	344,000
15	32.58	333,000	38.55	449,000	35.10	339,000
16	32.91	316,000	38.21	442,000	34.34	327,000
17	34.62	319,000	37.74	427,000	33.41	300,000
18	36.65	338,000	37.44	412,000	31.98	273,000
19	38.68	377,000	36.94	398,000	30.20	239,000
20	40.17	420,000	37.12	401,000	28.21	211,000
21	41.48	460,000	36.54	409,000	26.47	186,000
22	42.60	492,000	36.72	417,000	24.81	158,000
23	43.48	527,000	37.60	429,000	23.37	152,000
24	44.35	555,000	38.11	435,000	22.18	145,000
25	45.09	580,000	38.39	436,000	21.77	154,000
26	45.56	599,000	38.70	447,000	21.94	160,000
27	45.64	594,000	38.63	456,000	24.22	189,000
28	45.31	579,000	38.51	458,000	26.16	238,000
29	44.84	567,000	38.40	456,000	28.43	283,000
30	44.30	547,000	38.54	459,000	30.54	311,000
31	43.84	523,000	----	------	31.24	312,000
Monthly mean discharge, in cubic feet per second		352,500		438,300		341,400
Runoff, in inches		2.82		3.40		2.74

CUMBERLAND RIVER BASIN

(41) 03438220 Cumberland River near Grand Rivers, Ky.

Location.—Lat 37°01′18″, long 88°13′16″, Lyon County, on right bank in powerhouse at Barkley Dam, 1.5 miles (2.4 km) northeast of Grand Rivers, and at mile 30.6 (49.2 km).

Drainage area.—17,598 mi² (45,579 km²).

Gage.—Water-stage recorder. Datum of gage is 300.00 ft (91.440 m) above mean sea level. Auxiliary water-stage recorder 11.0 miles (17.7 km) downstream, and at mile 19.6 (31.5 km). Prior to June 27, 1964 base gage 27.8 miles (44.7 km) downstream at mile 2.8 (4.5 km), at datum 0.44 ft (0.134 m) lower.

Maxima.—March–May 1973: Discharge, 126,000 ft³/s (3,570 m³/s) Mar. 17, 12:00 p.m., gage height, 39.72 ft (12.107 m) Mar. 25, 0615 hours.

1939 to February 1973: Discharge, 201,000 ft³/s (5,690 m³/s) Feb. 18, 1950; gage height, 43.10 ft (13.137 m) Feb. 13, 1950 (former site and datum).

Flood of January to February 1937 reached a stage of 51.1 ft[(15.58 m) (former site and datum)]; 60.3 ft (18.38 m) present site and datum (from river profile).

Remarks.—Regulation by hydroelectric and navigation dams in the Cumberland River basin. Barkley-Kentucky canal diverts water from or to Kentucky Lake in Tennessee River basin.

Mean discharge, in cubic feet per second, 1973

Day	March	April	May	Day	March	April	May
1	41,900	78,100	52,700	16	89,300	71,200	70,000
2	44,300	70,700	51,600	17	114,000	71,600	69,500
3	45,700	69,500	50,600	18	122,000	71,700	69,300
4	63,200	68,300	54,400	19	121,000	65,300	62,300
5	63,500	68,500	59,500	20	118,000	55,100	54,500
6	63,100	69,000	61,400	21	106,000	54,600	55,700
7	62,500	69,200	61,800	22	96,200	54,800	57,200
8	61,100	68,800	61,200	23	91,400	63,400	58,000
9	65,500	68,000	61,800	24	92,100	72,300	59,000
10	67,700	68,500	64,200	25	83,200	70,100	59,700
11	76,000	68,300	67,000	26	71,700	59,800	59,500
12	82,200	68,300	68,800	27	71,800	53,200	59,000
13	81,800	68,200	71,700	28	73,000	52,500	56,900
14	66,900	68,500	72,300	29	73,100	53,000	65,300
15	62,900	70,600	72,300	30	78,500	52,500	72,900
				31	84,800	-----	64,300
Monthly mean discharge in cfs					78,520	65,450	62,080
Runoff in inches					5.15	4.15	4.07

TABLE 12.—*Station descriptions and discharge and suspended-sediment data*—Continued

OHIO RIVER BASIN

(42) 03611500 Ohio River at Metropolis, Ill.

Location.—Lat 37°08′51″, long 88°44′27″, McCraken County, near center of span on downstream side of pier of Paducah & Illinois Railroad bridge at Metropolis, 9.5 miles (15.3 km) downstream from Tennessee River, 37 miles (59.5 km) upstream from mouth, and at mile 944.1 (1,520 km).
Drainage area.—203,000 mi² (526,000 km²), approximately.
Gage.—Water-stage recorder. Datum of gage 276.27 ft (84.207 m) above mean sea level. Auxiliary water-stage recorder, 18 miles (29 km) downstream.
Flood stage.—Periods when river exceeded flood stage of 43 ft (13.1 m) for selected floods, are shown in the following tabulation:

1937: Jan. 9 to Feb. 23	(46 days)
1945: Feb. 23 to Apr. 17	(54 days)
1950: Jan. 6 to Mar 6	(60 days)
1964: Mar. 9 to Apr. 1	(24 days)
1973: Mar. 13 to May 20	(69 days)

Maxima.—March–May 1973: Discharge, 990,000 ft³/s (28,000 m³/s) Mar. 26, 2:00 p.m., [gage height, 50.22 ft (15.307 m)].
1928 to February 1973: Discharge, 1,780,000 ft³/s (50,400 m³/s) Feb. 1, 1937 [total discharge, including overflow through Bay Creek and Cache River Valleys, 1,850,000 ft³/s (52,400 m³/s)]; maximum gage height, 66.60 ft (20.300 m) Feb. 2, 1937.
Remarks.—Flow regulated by many dams and reservoirs.

Mean gage height, in feet, and discharge, in cubic feet per second, 1973

Day	March Stage	March Discharge	April Stage	April Discharge	May Stage	May Discharge
1	24.20	213,000	54.40	883,000	50.26	620,000
2	24.18	214,000	54.02	860,000	51.11	667,000
3	24.34	212,000	53.50	840,000	51.56	706,000
4	25.04	228,000	52.93	800,000	51.97	745,000
5	25.19	229,000	52.33	761,000	52.18	768,000
6	25.50	234,000	51.65	714,000	52.20	780,000
7	26.65	250,000	51.05	683,000	52.15	785,000
8	29.31	285,000	50.80	682,000	52.15	785,000
9	32.93	340,000	50.69	674,000	51.82	764,000
10	36.24	392,000	50.58	693,000	51.30	734,000
11	39.39	443,000	50.36	682,000	50.54	686,000
12	41.77	505,000	50.13	687,000	49.73	650,000
13	43.17	531,000	49.74	677,000	48.88	604,000
14	44.10	535,000	49.37	678,000	48.35	601,000
15	44.25	516,000	49.05	675,000	48.00	598,000
16	45.30	583,000	48.69	665,000	47.67	596,000
17	47.72	704,000	48.27	659,000	47.05	583,000
18	49.60	757,000	48.08	654,000	46.18	546,000
19	51.31	823,000	47.79	638,000	44.98	505,000
20	52.17	843,000	47.92	631,000	43.49	455,000
21	53.01	879,000	47.40	595,000	41.85	397,000
22	53.69	918,000	47.31	598,000	40.38	372,000
23	54.10	936,000	47.88	630,000	38.84	337,000
24	54.53	956,000	48.81	668,000	37.47	326,000
25	54.98	976,000	49.25	670,000	36.55	331,000
26	55.20	989,000	49.50	660,000	36.33	342,000
27	55.11	980,000	49.29	619,000	37.55	398,000
28	54.90	967,000	49.20	585,000	39.23	436,000
29	54.72	949,000	49.25	576,000	40.50	495,000
30	54.54	931,000	49.65	585,000	42.08	559,000
31	54.55	906,000	----	------	42.99	593,000
Monthly mean discharge, in cubic feet per second		620,100		680,700		573,000
Runoff, in inches		3.52		3.74		3.26

OBION RIVER BASIN

(43) 07027500 South Fork Forked Deer River at Jackson, Tenn.

Location.—Lat 35°35′38″, long 88°48′52″, Madison County, on right bank 20 ft (6.1 m) downstream from bridge on U.S. Highway 45, 0.6 mile (1.0 km) downstream from Meridian Creek, and 1.4 miles (2.3 km) south of the post office in Jackson.
Drainage area.—495 mi² (1,282 km²).
Gage.—Water-stage recorder. Datum of gage is 330.76 ft (100.816 m) above mean sea level, datum of 1929, supplementary adjustment of 1955.
Flood stage.—17 ft (5.2 m). Flood stage was exceeded for 2 days in March and for 8 days in April.
Maxima.—March–May 1973: Discharge, 31,200 ft³/s (884 m³/s) 7:00 a.m., April 21 [gage height, 22.28 ft (6.791 m)]. Recurrence interval of discharge is 35 years.
1929 to February 1973: Discharge 43,600 ft³/s (1,230 m³/s) Jan. 21, 1935 [gage height 24.0 ft (7.32 m)].

TABLE 12.—*Station descriptions and discharge and suspended-sediment data*—Continued

Mean discharge, in cubic feet per second, 1973

Day	March	April	May	Day	March	April	May	Day	March	April	May
1 ----	468	2,140	1,010	11 ----	2,930	1,100	1,160	21 ----	2,210	29,300	535
2 ----	510	1,800	3,010	12 ----	3,250	853	1,080	22 ----	1,260	16,100	402
3 ----	1,140	1,560	3,620	13 ----	2,820	700	772	23 ----	1,060	8,640	629
4 ----	892	1,120	3,610	14 ----	2,440	610	610	24 ----	924	7,530	667
5 ----	940	899	2,970	15 ----	3,110	568	523	25 ----	1,280	6,180	655
6 ----	820	721	2,160	16 ----	4,070	646	473	26 ----	1,510	4,460	465
7 ----	3,060	1,350	2,150	17 ----	5,280	856	479	27 ----	1,300	3,640	1,970
8 ----	3,150	2,060	3,220	18 ----	5,830	1,230	431	28 ----	1,100	2,760	2,740
9 ----	2,300	1,740	2,700	19 ----	4,380	2,910	413	29 ----	1,030	1,530	2,070
10 ----	1,620	1,510	1,590	20 ----	3,470	16,700	727	30 ----	1,180	1,100	2,160
								31 ----	2,520	-----	1,590
Monthly mean discharge, in cubic feet per second									2,189	4,077	1,503
Runoff, in inches									5.10	9.19	3.50

Gage height, in feet, and discharge, in cubic feet per second, at indicated time; 1973

Date	Hour	Gage height	Discharge	Date	Hour	Gage height	Discharge	Date	Hour	Gage height	Discharge
Apr. 18 -	2:00 a.m.	7.35	865	Apr. 20 -	8:00 a.m.	19.35	12,100	Apr. 22 -	2:00 p.m.	19.75	14,500
	12:00 m.	7.72	976		10:00 a.m.	19.74	14,400		6:00 p.m.	19.32	11,900
	6:00 p.m.	8.72	1,280		12:00 m.	20.11	16,700		12:00 p.m.	18.78	9,120
	8:00 p.m.	10.45	1,800		2:00 p.m.	20.53	19,200	23 -	2:00 a.m.	18.63	8,520
	10:00 p.m.	12.30	2,350		4:00 p.m.	20.95	21,700		6:00 a.m.	18.72	8,880
	12:00 p.m.	12.98	2,550		6:00 p.m.	21.30	24,100		10:00 a.m.	18.85	9,400
19 -	2:00 a.m.	13.35	2,660		8:00 p.m.	21.61	26,300		4:00 p.m.	18.63	8,520
	4:00 a.m.	13.50	2,710		10:00 p.m.	21.87	28,100		12:00 p.m.	18.42	7,770
	6:00 a.m.	13.49	2,710		12:00 p.m.	22.05	29,400	24 -	2:00 a.m.	18.40	7,700
	8:00 a.m.	13.44	2,690	21 -	2:00 a.m.	22.17	30,400		12:00 m.	18.36	7,560
	10:00 a.m.	12.99	2,560		4:00 a.m.	22.24	30,900		12:00 p.m.	18.21	7,080
	12:00 m.	12.26	2,340		6:00 a.m.	22.27	31,200	25 -	2:00 a.m.	18.16	6,930
	2:00 p.m.	11.54	2,120		7:00 a.m.	22.28	31,200		12:00 m.	17.90	6,200
	4:00 p.m.	10.89	1,930		8:00 a.m.	22.27	31,200		12:00 p.m.	17.46	5,220
	6:00 p.m.	13.33	2,660		10:00 a.m.	22.25	31,000	26 -	12:00 m.	16.91	4,400
	8:00 p.m.	16.13	3,680		2:00 p.m.	22.14	30,100		12:00 p.m.	16.51	3,970
	10:00 p.m.	16.93	4,420		6:00 p.m.	21.90	28,300	27 -	12:00 a.m.	16.07	3,640
	12:00 p.m.	17.78	5,900		12:00 p.m.	21.36	25,500		12:00 p.m.	15.34	3,290
20 -	2:00 a.m.	18.31	7,380	22 -	2:00 a.m.	21.14	23,000	28 -	12:00 m.	13.80	2,800
	4:00 a.m.	18.62	8,480		6:00 a.m.	20.68	20,100		12:00 p.m.	11.11	1,990
	6:00 a.m.	18.96	9,900		10:00 a.m.	20.20	17,200	29 -	12:00 m.	9.45	1,500
									12:00 p.m.	8.59	1,240

OBION RIVER BASIN

(44) 07028950 Turkey Creek at Fairview, Tenn.

Location.—Lat 35°46′07″, long 88°49′59″, Madison County, at bridge on U.S. Highway 45 E, 0.6 mile (1.0 km) northeast of Fairview.
Drainage area.—13.3 mi² (34.4 km²).
Gage.—Water-stage and rainfall recorders. Gage set to arbitrary datum.
Flood stage.—13 ft (4.0 m).
Maxima.—March–May 1973: Discharge, 5,400 ft³/s (153 m³/s) April 19 [gage height 15.10 ft (4.602 m)]. Recurrence interval of discharge is 25 years.
1967 to February 1973: Discharge, 6,360 ft³/s (180 m³/s) July 16, 1972 [gage height, 15.42 ft (4.700 m)].

HATCHIE RIVER BASIN

(45) 07029500 Hatchie River at Bolivar, Tenn.

Location.—Lat 35°16′31″, long 88°58′36″, Hardeman County, on left bank on upstream end of bridge pier on State Highway 18, 250 ft (76 m) upstream from Illinois Central Gulf Railroad bridge, 0.6 mile (1.0 km) downstream from Spring Creek, and 1.5 miles (2.4 km) northeast of Bolivar.
Drainage area.—1,480 mi² (3,833 km²).
Gage.—Water-stage recorder. Datum of gage is 323.49 ft (98.600 m) above mean sea level, datum of 1929, supplementary adjustment of 1955.
Flood stage.—15 ft (4.6 m). Flood stage was exceeded for 10 consecutive days in March and for 14 consecutive days in April and May.
Maxima.—March–May 1973: Discharge, 61,600 ft³/s (1,740 m³/s). March 18 [gage height, 21.66 ft (6.602 m)]. Recurrence interval of discharge is 70 years.
1929 to February 1973: Discharge 56,300 ft³/s (1,590 m³/s) Feb. 15, 1948 [gage height 21.53 ft (6.562 m)].

TABLE 12.—*Station descriptions and discharge and suspended-sediment data*—Continued

Mean discharge, in cubic feet per second, 1973

Day	March	April	May	Day	March	April	May	Day	March	April	May
1	1,950	6,130	9,300	11	5,650	5,390	5,950	21	25,400	15,100	2,010
2	1,800	6,130	8,700	12	6,100	5,080	5,650	22	16,300	11,900	2,090
3	1,960	6,340	9,380	13	6,130	4,870	5,180	23	12,000	14,600	2,050
4	2,330	6,820	8,320	14	6,100	4,660	4,700	24	9,380	15,800	2,240
5	2,540	7,020	7,380	15	8,080	4,440	4,250	25	8,180	15,000	2,550
6	2,710	6,710	6,900	16	16,200	4,290	3,670	26	7,240	13,800	2,740
7	4,580	6,590	7,650	17	37,900	4,190	2,730	27	6,650	14,100	4,750
8	4,750	6,520	8,180	18	59,300	4,390	2,090	28	6,180	13,600	8,110
9	4,720	6,230	7,590	19	51,200	4,980	1,800	29	5,940	12,200	7,660
10	4,370	5,790	6,880	20	37,900	17,200	1,860	30	5,760	10,600	6,860
								31	6,170	-----	6,300
Monthly mean discharge, in cubic feet per second									12,110	8,682	5,342
Runoff, in inches									9.44	6.55	4.16

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1973

Date	Hour	Gage Height	Dis-charge	Date	Hour	Gage Height	Dis-charge	Date	Hour	Gage Height	Dis-charge
Mar. 14	2:00 a.m.	14.55	6,080	Mar. 17	10:00 p.m.	21.04	51,600	Mar. 20	4:00 a.m.	20.31	41,900
	12:00 m.	14.53	6,020		12:00 p.m.	21.15	53,400		8:00 a.m.	20.16	40,300
	12:00 p.m.	14.78	6,650	18	2:00 a.m.	21.33	56,300		12:00 m.	19.90	37,600
15	6:00 a.m.	14.98	7,150		4:00 a.m.	21.41	57,700		4:00 p.m.	19.66	35,400
	12:00 m.	15.17	7,710		6:00 a.m.	21.50	59,000		8:00 p.m.	19.41	33,200
	6:00 p.m.	15.50	8,900		8:00 a.m.	21.57	60,100		12:00 p.m.	19.24	31,700
	12:00 p.m.	16.09	11,400		10:00 a.m.	21.65	61,400	21	4:00 a.m.	19.00	29,500
16	6:00 a.m.	16.68	14,100		12:00 m.	21.62	60,900		8:00 a.m.	18.70	27,100
	12:00 m.	17.09	16,000		1:00 p.m.	21.66	61,600		12:00 m.	18.46	25,200
	6:00 p.m.	17.54	18,300		2:00 p.m.	21.60	60,600		4:00 p.m.	18.24	23,400
	12:00 p.m.	18.18	22,900		4:00 p.m.	21.65	61,400		8:00 p.m.	17.98	21,300
17	2:00 a.m.	18.46	25,200		6:00 p.m.	21.58	60,300		12:00 p.m.	17.80	20,000
	4:00 a.m.	18.77	27,700		8:00 p.m.	21.62	60,900	22	4:00 a.m.	17.58	18,600
	6:00 a.m.	18.99	29,400		10:00 p.m.	21.56	60,000		8:00 a.m.	17.36	17,300
	8:00 a.m.	19.32	32,400		12:00 p.m.	21.47	58,500		12:00 m.	17.13	16,200
	10:00 a.m.	19.66	35,400	19	2:00 a.m.	21.44	58,000		4:00 p.m.	16.98	15,400
	12:00 m.	19.90	37,600		4:00 a.m.	21.39	57,200		8:00 p.m.	16.78	14,500
	2:00 p.m.	20.13	39,900		8:00 a.m.	21.14	53,200		12:00 p.m.	16.62	13,800
	4:00 p.m.	20.46	43,600		12:00 m.	21.01	51,200	23	12:00 m.	16.21	11,900
	6:00 p.m.	20.65	46,100		4:00 p.m.	20.88	49,300		12:00 p.m.	15.92	10,600
	8:00 p.m.	20.83	48,600		8:00 p.m.	20.62	45,700	24	12:00 m.	15.60	9,300
					12:00 p.m.	20.49	43,900		12:00 p.m.	15.40	8,500

Period	Highest mean discharge, in cubic feet per second, for the indicated number of consecutive days: 1	3	7	15	30
March–May 1973	59,200	49,300	34,200	20,000	13,100
1930–72	55,100	49,300	37,600	22,600	16,200
Recurrence interval, in years, for 1973 flood volumes	50	40	30	25	15

MISSISSIPPI RIVER MAIN STEM

(46) 07032000 Mississippi River at Memphis, Tenn.

Location.—Lat 35°07′37″, long 90°04′25″, on left bank 50 feet (15 m) downstream from Harahan Bridge at Memphis, Shelby County, 1.3 miles (2.1 km) downstream from Beale Street gage, 3.5 miles (5.6 km) downstream from Wolf River, 70 miles (113 km) upstream from St. Francis River and at mile 734.8 (1,182.3 km).

Drainage area.—932,800 mi² (2,416,000 km²), approximately.

Gage.—Water-stage recorder. Datum of gage is 183.91 ft (56.056 m) above mean sea level, datum of 1929, 184.21 ft (56.147 m) above mean Gulf level (1912 Mississippi River Commission), and 190.86 ft (58.174 m) on Memphis datum (1881 Mississippi River Commission). Prior to April 16, 1934, Beale Street staff gage 1.3 miles (2.1 km) upstream at same datum. April 16 to December 21, 1934, staff gage 1,000 ft (305 m) downstream at same datum.

Flood stage.—34.0 ft (10.4 m). 1973 flood exceeded flood stage for 63 consecutive days (March 24 to May 25).

Maxima.—March–June 1973: Discharge, 1,633,000 ft³/s (46,200 m³/s) April 1–2 [gage height, 40.03 ft (12.201 m)]. Maximum stage was 40.48 ft (12.338 m) May 8. Recurrence interval of discharge is 20 years (based on figure 30).

January 1933 to February 1973: Discharge, 1,980,000 ft³/s (56,100 m³/s) Feb. 8, 1937; maximum gage height, 48.69 ft (14.841 m), Feb. 10, 1937.

Maximum stage known prior to 1937, about 45.2 ft (13.78 m) on Apr. 9, 1913.

Remarks.—Streamflow is affected by many reservoirs, navigation dams, and diversions.

TABLE 12.—*Station descriptions and discharge and suspended-sediment data*—Continued

Stage, in feet, and discharge in cubic feet per second

Day	March Stage	March Discharge	April Stage	April Discharge	May Stage	May Discharge	June Stage	June Discharge
1	14.81	504,000	40.03	1,630,000	38.57	1,440,000	28.40	944,000
2	14.22	490,000	40.02	1,630,000	39.18	1,490,000	28.70	947,000
3	13.72	478,000	40.05	1,620,000	39.40	1,510,000	29.05	952,000
4	13.58	477,000	40.28	1,620,000	39.65	1,520,000	29.29	953,000
5	13.73	483,000	40.31	1,610,000	39.86	1,540,000	29.42	967,000
6	13.98	492,000	40.29	1,590,000	39.98	1,540,000	29.60	984,000
7	14.47	508,000	40.24	1,570,000	40.32	1,560,000	29.70	998,000
8	14.80	527,000	40.10	1,540,000	40.43	1,570,000	29.77	997,000
9	16.10	576,000	40.00	1,520,000	40.35	1,540,000	29.72	992,000
10	18.13	650,000	39.68	1,480,000	40.18	1,550,000	29.60	983,000
11	21.07	756,000	39.30	1,480,000	40.10	1,560,000	29.45	974,000
12	23.14	838,000	39.06	1,480,000	39.95	1,540,000	29.30	963,000
13	24.97	890,000	38.80	1,460,000	39.65	1,520,000	29.20	954,000
14	26.73	949,000	38.51	1,430,000	39.30	1,490,000	29.00	943,000
15	28.04	992,000	38.25	1,410,000	38.95	1,470,000	28.67	926,000
16	29.59	1,050,000	38.05	1,390,000	38.36	1,430,000	28.07	899,000
17	30.33	1,070,000	37.60	1,360,000	37.85	1,390,000	27.10	860,000
18	31.12	1,090,000	37.39	1,350,000	37.38	1,370,000	25.90	816,000
19	32.00	1,120,000	37.24	1,340,000	36.87	1,340,000	24.70	774,000
20	32.93	1,150,000	37.70	1,370,000	36.45	1,320,000	23.71	741,000
21	34.00	1,200,000	37.53	1,360,000	35.95	1,300,000	23.00	716,000
22	35.09	1,260,000	37.49	1,370,000	35.13	1,240,000	22.50	701,000
23	36.37	1,330,000	37.72	1,390,000	34.43	1,210,000	22.30	695,000
24	37.59	1,400,000	37.61	1,380,000	33.27	1,140,000	22.39	699,000
25	38.20	1,460,000	37.65	1,390,000	32.25	1,080,000	22.61	706,000
26	38.80	1,510,000	37.74	1,410,000	30.60	1,010,000	22.71	709,000
27	39.11	1,530,000	37.92	1,430,000	29.37	967,000	22.45	700,000
28	39.37	1,550,000	38.13	1,440,000	28.30	931,000	21.74	681,000
29	39.55	1,580,000	38.28	1,440,000	27.82	918,000	20.55	644,000
30	39.65	1,610,000	38.43	1,440,000	27.83	925,000	19.42	607,000
31	39.82	1,620,000			28.06	940,000		
Monthly mean discharge, in cubic feet per second		1,005,000		1,464,000		1,334,000		848,000
Runoff, in thousands of acre-feet		61,770		87,140		82,020		50,430

Period	Highest mean discharge, in cubic feet per second, for the indicated number of consecutive days: 1	3	7	15	30
March–June 1973	1,633,000	1,627,000	1,621,000	1,583,000	1,497,000
1934–72	1,970,000	1,960,000	1,950,000	1,900,000	1,750,000
Recurrence interval, in years, for 1973 flood volumes	20	30	30	--	40

NONCONNAH CREEK BASIN

(47) 07032200 Nonconnah Creek near Germantown, Tenn.

Location.—Lat 35°02′59″, long 89°49′08″, Shelby County, on left bank at downstream side of bridge on Winchester Road, 2.6 miles (4.2 km) south of Germantown and 17.3 miles (27.8 km) upstream from mouth.
Drainage area.—68.2 mi^2 (176.6 km^2).
Gage.—Water-stage recorder. Datum of gage is 262.92 ft (80.138 m) above mean sea level, datum of 1929, supplementary adjustment of 1955.
Bankfull stage.—Approximately 25 ft (7.6 m).
Maxima.—March–May 1973: Discharge, 8,260 ft^3/s (234 m^3/s) 1:15 a.m., Apr. 20 [gage height 25.08 (7.644 m)]. Recurrence interval of discharge is 25 years.
1969 to February 1973: Discharge 7,260 ft^3/s (206 m^3/s) Dec. 10, 1972 [gage height 23.43 ft (7.141 m)].

Mean discharge, in cubic feet per second, 1973

Day	March	April	May	Day	March	April	May	Day	March	April	May
1	6.6	56	16	11	1,570	16	14	21	12	439	1.6
2	268	19	1,450	12	187	11	14	22	7.8	306	1.3
3	82	13	657	13	36	6.6	7.0	23	5.8	2,840	3.2
4	26	12	151	14	502	5.0	4.2	24	181	1,570	2.4
5	28	10	41	15	1,190	4.3	3.2	25	163	729	1.0
6	1,010	9.0	25	16	1,210	54	2.8	26	51	136	.86
7	1,090	232	1,230	17	380	14	2.4	27	23	175	846
8	136	142	831	18	62	735	2.2	28	16	51	148
9	30	232	99	19	27	723	1.9	29	15	25	11
10	537	46	22	20	18	4,080	1.9	30	13	17	3.3
								31	436	-----	1.7
Monthly mean discharge, in cubic feet per second									301	424	181
Runoff, in inches									5.07	6.91	3.04

TABLE 12.—*Station descriptions and discharge and suspended-sediment data*—Continued

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1973

Date	Hour	Gage height	Dis-charge	Date	Hour	Gage height	Dis-charge	Date	Hour	Gage height	Dis-charge
Apr. 19	2:00 a.m.	7.18	488	Apr. 20	10:00 p.m.	9.09	1,080	Apr. 23	4:00 p.m.	16.85	3,780
	12:00 m.	6.30	190		12:00 p.m.	8.96	1,040		6:00 p.m.	13.68	2,490
	6:00 p.m.	6.08	125	21	2:00 a.m.	8.65	945		8:00 p.m.	11.20	1,710
	8:00 p.m.	7.87	711		4:00 a.m.	8.32	846		10:00 p.m.	9.87	1,310
	10:00 p.m.	14.64	2,860		12:00 m.	6.72	327		12:00 p.m.	9.06	1,070
	12:00 p.m.	21.57	6,160		12:00 p.m.	6.07	122	24	2:00 a.m.	8.72	966
20	3:00 a.m.	25.08	8,260	22	2:00 a.m.	6.02	110		12:00 m.	7.86	708
	2:00 a.m.	24.82	8,090		12:00 m.	5.92	90		2:00 p.m.	9.51	1,200
	4:00 a.m.	23.63	7,380		4:00 p.m.	7.21	498		4:00 p.m.	14.41	2,760
	6:00 a.m.	22.52	6,710		12:00 p.m.	8.22	816		5:45 p.m.	15.20	3,080
	8:00 a.m.	21.70	6,240	23	2:00 a.m.	8.14	792		6:00 p.m.	15.20	3,080
	10:00 a.m.	20.19	5,400		4:00 a.m.	7.90	720		8:00 p.m.	14.87	2,950
	12:00 m.	16.82	3,770		6:00 a.m.	13.52	2,430		10:00 p.m.	13.17	2,310
	2:00 p.m.	12.61	2,130		8:00 a.m.	18.94	4,770		12:00 p.m.	10.61	1,530
	4:00 p.m.	10.73	1,570		10:00 a.m.	20.05	5,330	25	2:00 a.m.	9.30	1,140
	6:00 p.m.	9.90	1,320		12:00 m.	19.60	5,100		12:00 m.	7.95	735
	8:00 p.m.	9.18	1,100		2:00 p.m.	18.72	4,660		12:00 p.m.	6.51	254

ST. FRANCIS RIVER BASIN

(48) 07042500 Little River ditch 251 near Lilbourn, Mo.

Location.—Lat 36°33′19″, long 89°40′10″, on line between secs. 8 and 17, T. 22 N., R. 13 E., New Madrid County, on right bank 150 ft (46 m) upstream from bridge on U.S. Highway 62, 3.7 miles (6.0 km) southwest of Lilbourn, and 4 miles (6.4 km) northwest of Marston.

Drainage area.—235 mi^2 (609 km^2).

Gage.—Digital water-stage recorder. Datum of gage is 263.46 ft (80.303 m) above mean sea level (levels by Missouri State Highway Commission). Prior to Oct. 27, 1967, nonrecording gage at present site and datum.

Flood stage.—14 ft (4.3 m).

Maxima.—March–May 1973: Discharge, 5,200 ft^3/s (147 m^3/s) 3:15 a.m., Apr. 20 [gage height 13.00 ft (3.962 m)]. Maximum gage height, 13.07 ft (3.984 m) 0600 hours Apr. 23. Discharge exceeded the 100-year flood.

October 1945 to February 1973: Discharge, 3,530 ft^3/s (100 m^3/s) March 10, 1964 [gage height, 15.00 ft (4.572 m)]. Maximum gage height, 15.16 ft (4.621 m) Feb. 15, 1950.

Flood in, June 1945 reached a stage of 15.6 ft (4.75 m), from floodmark [discharge, 3,200 ft^3/s (90.6 m^3/s)].

Mean discharge, in cubic feet per second, 1973

Day	March	April	May	Day	March	April	May	Day	March	April	May
1	280	963	1,080	11	3,000	563	1,280	21	817	3,150	455
2	270	889	3,760	12	2,500	509	955	22	703	2,930	450
3	260	743	2,670	13	2,040	464	703	23	603	3,980	582
4	260	786	1,710	14	1,260	433	618	24	556	3,110	1,020
5	250	605	1,050	15	1,180	422	574	25	575	2,080	639
6	250	535	856	16	942	426	560	26	564	1,290	499
7	500	605	1,270	17	887	425	528	27	507	1,070	1,080
8	374	723	1,370	18	795	1,090	510	28	482	906	1,010
9	300	740	964	19	680	2,100	499	29	475	820	1,010
10	400	696	814	20	719	4,410	480	30	483	736	1,020
								31	1,810		918
Monthly mean discharge, in cubic feet per second									797	1,270	998
Runoff, in inches									3.91	6.05	4.90

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1973

Date	Hour	Gage height	Dis-charge	Date	Hour	Gage height	Dis-charge	Date	Hour	Gage height	Dis-charge
Apr. 18	2:00 a.m.	3.54	462	Apr. 19	6:00 p.m.	12.38	4,580	Apr. 21	2:00 a.m.	12.40	3,510
	8:00 a.m.	4.55	765		8:00 p.m.	12.72	4,920		8:00 a.m.	12.11	3,240
	12:00 m.	6.14	1,240		10:00 p.m.	12.89	5,090		2:00 p.m.	11.98	3,130
	2:00 p.m.	6.63	1.390		12:00 p.m.	12.94	5,140		8:00 p.m.	11.61	2,840
	6:00 p.m.	7.09	1,530						10:00 p.m.	11.40	2,690
	12:00 p.m.	6.84	1,450	20	2:00 a.m.	12.96	4,500		12:00 p.m.	11.18	2,560
					6:00 a.m.	13.00	4,540				
19	2:00 a.m.	6.63	1,390		12:00 m.	12.90	4,440	22	4:00 a.m.	10.60	2,340
	10:00 a.m.	5.72	1,120		6:00 p.m.	12.78	4,320		6:00 a.m.	10.32	2,240
	12:00 m.	6.68	1,000		10:00 a.m.	12,65	4,190		10:00 a.m.	11.75	2,920
	2:00 p.m.	9.46	2,360		12:00 p.m.	12.57	4,120		6:00 p.m.	12.19	3,290
	4:00 p.m.	11.36	3,620						12:00 p.m.	12.68	3,730

TABLE 12.—*Station descriptions and discharge and suspended-sediment data*—Continued

Gage height, in feet, and discharge, in cubic feet per second, at indicated time, 1973

Date	Hour	Gage height	Discharge	Date	Hour	Gage height	Discharge
Apr. 23	2:00 a.m.	12.92	3,910	Apr. 25	12:00 m.	9.15	2,080
	12:00 m.	13.07	4,050		6:00 p.m.	8.20	1,750
	6:00 p.m.	13.07	4,050		12:00 p.m.	7.29	1,440
	8:00 pm..	12.90	3,890				
	12:00 p.m.	12.70	3,710				
24	6:00 a.m.	12.48	3,490				
	12:00 m.	12.09	3,140				
	6:00 p.m.	11.62	2,780				
	12:00 p.m.	10.93	2,430				
25	6:00 a.m.	10.01	2,380				

Date	Hour	Gage height	Discharge	Date	Hour	Gage height	Discharge
May 1	6:00 a.m.	4.23	670	May 3	10:00 a.m.	10.44	2,840
	12:00 m.	4.46	740		12:00 m.	10.21	2,680
	6:00 p.m.	6.67	830		6:00 p.m.	9.56	2,400
	8:00 p.m.	7.92	1,820		10:00 p.m.	9.14	2,250
	10:00 p.m.	8.92	2,170				
	12:00 p.m.	10.12	2,620	4	8:00 a.m.	7.86	1,800
					12:00 m.	7.61	1,710
2	2:00 a.m.	11.09	3,380		6:00 p.m.	6.86	1,460
	4:00 a.m.	11.53	3,780		12:00 p.m.	6.22	1,270
	12:00 m.	11.90	4,110				
	10:00 p.m.	11.45	3,700				

Period	Highest mean discharge, in cubic feet per second, for the indicated number of consecutive days: 1	3	7	15	30
March–May 1973	4,410	3,500	3,110	2,270	1,610
1946–72	3,490	3,460	3,220	2,840	2,140
Recurrence interval, in years, for 1973 flood volumes	>100	20	10	10	10

WHITE RIVER BASIN

(49) 07072500 Black River at Black Rock, Ark.

Location.—Lat 36°06′15″, long 91°05′50″, in NW¼ sec. 21, T. 17 N., R. 1 W., Lawrence County, on right bank 900 ft (274 m) downstream from St. Louis-San Francisco Railway bridge at Black Rock, 3.7 miles (6.0 km) downstream from Spring River, and at mile 68.3 (109.9 km).
Drainage area.—7,369 mi² (19,090 km²).
Gage.—Nonrecording gage read twice daily, more often during rises. Datum of gage is 229.56 ft (69.970 m) above mean sea level. Prior to Aug. 1, 1946, at site 900 ft (274 m) upstream at same datum.
Flood stage.—20 ft (6.1 m).
Maxima.—March–May 1973: Discharge, 105,000 ft³/s (2,970 m³/s) 2:00 a.m. April 24 [gage height, 29.94 ft (8.912 m)]. Recurrence interval of discharge is 20 years.
1929 to 1931; 1940 to Feb. 1973: Discharge, 103,000 ft³/s (2,920 m³/s) Jan. 25, 1949 [gage height, 28.5 ft (8.69 m)].
Remarks.—Flow slightly regulated by Clearwater Lake (Missouri), 189 miles (304 km) upstream, since June 3, 1948 [capacity, 413,700 acre-ft (510 hm³)].

Mean discharge, in cubic feet per second, 1973

Day	March	April	May	Day	March	April	May	Day	March	April	May
1	8,850	33,800	46,600	11	40,200	26,400	37,000	21	33,000	50,200	19,700
2	8,530	29,400	52,800	12	43,900	24,600	38,000	22	29,500	51,500	18,600
2	8,380	26,800	49,900	13	34,400	23,900	37,400	23	27,200	84,700	19,500
4	8,280	25,800	40,100	14	33,300	23,100	34,700	24	25,600	98,900	20,000
5	8,250	25,000	35,700	15	38,600	22,900	32,000	25	26,700	87,500	18,900
6	8,410	24,000	37,200	16	43,500	23,800	29,600	26	28,000	86,800	17,600
7	15,000	23,400	42,900	17	43,500	23,800	26,800	27	26,000	83,300	22,500
8	15,500	23,300	45,400	18	41,000	24,900	24,600	28	24,300	73,500	34,600
9	15,000	25,000	45,600	19	38,300	30,000	22,800	29	23,700	63,700	30,500
10	24,500	27,900	40,000	20	35,600	46,400	21,100	30	23,500	54,100	25,000
								31	32,100	-----	22,200
Monthly mean discharge, in cubic feet per second									26,210	42,280	31,910
Runoff, in inches									4.13	6.44	5.02

TABLE 12.—*Station descriptions and discharge and suspended-sediment data*—Continued

MISSISSIPPI RIVER MAIN STEM

(50) 07265450 Mississippi River near Arkansas City, Ark.

Location.—Lat 33°33′55″, long 91°14′35″, sec. 18, T. 13 S., R.1 W., on right bank 3 miles (4.8 km) southwest of Arkansas City, and at mile 554.1 (891.5 km) above Head of Passes.
Drainage area.—1,130,600 mi² (2,928,300 km²) 22,240 mi² (57,600 km²) non-contributing.
Gage.—Staff gage. Datum of gage is 96.66 ft (29.462 m) above mean sea level, datum of 1929, supplementary adjustment of 1941.
Flood stage.—44 ft (13.4 m).
Maxima.—March–June 1973: Discharge, 1,880,000 ft³/ (53,200 m³/s) May 12 [gage height 47.62 ft (14.515 m)].
November 1879 to February 1973: iDscharge, 2,159,000 ft³/s (61,100 m³/s) Feb. 16, 1937 [maximum gage height, 53.86 ft (16.417 m) on Feb. 17, 1937, a discharge of about 2,472,000 ft³/s (70,000 m³/s) occurred in early May, 1927].
Remarks.—Station was included for use in sediment analysis.

Average velocity, water temperature, stage, water discharge, suspended sediment, and bed material

Date		Average velociy (fps)	Water temperature (°C)	Stage (ft)	Discharge (1,000 ft³/s)	Suspended sediment						Bed material (mm)		
						Concentration, mg/1				Discharge (1,000 tons/day)	Percent sand			
						Right	Middle	Left	Average			D_{16}	D_{50}	D_{84}
March	2	4.53	6.5	23.82	662	191	258	172	207	388	36	0.26	0.34	2.42
	5	4.10	8.0	22.24	597	194	276	143	204	328	43	.26	.34	.45
	12	5.50	10.5	27.47	870	524	551	454	510	1,272	25	.29	.41	.67
	30	7.88	12.0	42.01	1,680	263	273	252	262	1,229	35	---	---	---
April	2	8.04	13.0	42.98	1,730	230	240	263	244	1,241	42	.27	.36	.49
	9	7.75	12.0	44.08	1,790	185	236	248	223	1,148	40	.26	.36	.48
	16	7.32	11.5	43.76	1,700	216	288	309	271	1,316	43	.56	4.28	6.32
	25	7.19	14.5	44.89	1,760	184	195	252	210	1,050	51	.29	.66	2.83
	30	7.40	15.5	46.04	1,820	212	228	381	274	1,435	51	.29	.38	.51
May	8	7.10	17.0	47.13	1,840	178	214	344	245	1,261	45	.21	2.20	3.00
	14	6.98	18.5	47.40	1,810	175	212	250	212	1,099	47	.26	.37	.67
	23	6.86	19.0	44.78	1,670	134	182	186	167	805	40	.36	1.36	4.09
	28	6.50	20.0	41.76	1,480	143	163	182	163	695	42	.22	.31	.53
June	4	5.46	21.0	36.55	1,200	206	246	227	226	736	37	.26	.35	.50
	12	5.31	23.0	36.66	1,170	190	207	249	215	689	35	.29	.37	.50
	18	5.27	25.0	34.82	1,090	206	221	208	212	624	38	.27	.35	.48
	25	4.94	26.0	30.09	877	191	362	218	257	654	18	.30	.38	.51

YAZOO RIVER BASIN

(51) 07272000 Sardis Lake near Sardis, Miss.

Location.—Lat 34°23′57″, long 89°47′10″, in NE¼SW¼ sec. 12, T. 8 S., R. 6 W., Chickasaw meridian, Panola County, in gatehouse of dam on Little Tallahatchie River, 7.5 miles (12.1 km) southeast of Sardis, and 25.7 miles (41.4 km) upstream from head of Panola-Quitman Floodway.
Drainage area.—1,545 mi² (4,000 km²).
Gage.—Water-stage recorder. Datum of gage is at mean sea level (levels by Corps of Engineers). Prior to Oct. 1, 1958, at datum 219.43 ft (66.882 m) above mean sea level.
Maxima.—March–May 1973: Contents, 1,840,700 acre-ft (2.270 hm³) April 28 (elevation 285.83 or 87.121 m).
1939 to February 1973: Contents, 1,394,100 acre-ft (1,720 hm³) May 14, 1970 (elevation, 278.32 ft or 84.832 m).
Remarks.—Reservoir is formed by hydraulic-fill earth dam, with concrete spillway and outlet tunnel on opposite ends of dam. Storage began Aug. 26, 1939; dam completed Aug. 1, 1940. Capacity, 1,569,900 acre-ft (1,940 hm³) at elevation 281.4 ft of 85.77 m (crest of spillway), of which about 1,478,000 acre-ft (1,820 hm³) is available for flood-control storage and about 108,000 acre-ft (133 hm³) of storage is maintained in conservation pool for incidental recreational purposes at elevation 236.0 ft or 71.93 m (16.6 ft or 5.06 m above sill of outlet tunnel). Water below elevation 219.4 ft (66.87 m) cannot be withdrawn through outlet tunnel. Figures given herein represent total contents.

[Elevation, in feet, and contents, in thousands of acre-ft, at 8:00 a.m., 1973]

Day	March		April		May	
	Elevation	Contents	Elevation	Contents	Elevation	Contents
1	273.8	1,160.4	284.4	1,747.4	285.4	1,810.7
2	273.6	1,153.7	284.4	1,748.7	285.2	1,798.0
3	273.6	1,151.3	284.3	1,745.5	285.0	1,787.8
4	273.6	1,150.8	284.2	1,739.3	284.9	1,781.5
5	273.6	1,151.8	284.1	1,732.3	284.8	1,774.5
6	273.6	1,152.3	284.0	1,726.7	284.6	1,765.1
7	273.6	1,153.2	283.9	1,721.1	284.5	1,755.6
8	273.8	1,160.9	283.9	1,720.5	284.4	1,751.8
9	273.9	1,168.1	284.0	1,722.3	284.4	1,748.7
10	274.0	1,169.1	283.9	1,716.7	284.3	1,743.0
11	274.0	1,172.5	283.8	1,714.3	284.2	1,735.5
12	274.4	1,189.1	283.7	1,708.1	284.1	1,729.2
13	274.9	1,217.2	283.6	1,702.6	284.0	1,726.1
14	275.2	1,230.7	283.5	1,695.8	283.9	1,717.4
15	276.1	1,278.4	283.4	1,688.5	283.8	1,710.6
16	279.3	1,448.2	283.3	1,681.7	283.6	1,702.0
17	282.4	1.630.3	283.3	1,681.7	283.5	1,692.8

TABLE 12.—*Station descriptions and discharge and suspended-sediment data*—Continued

Day	March Elevation	March Contents	April Elevation	April Contents	May Elevation	May Contents
18	284.0	1,721.7	283.3	1,684.2	283.4	1,684.8
19	284.2	1,739.3	283.4	1,690.9	283.2	1,676.2
20	284.2	1,739.9	283.6	1,700.1	283.1	1,668.3
21	284.2	1,738.6	283.6	1,701.4	283.0	1,662.8
22	284.2	1,736.1	283.6	1,698.9	282.9	1,656.1
23	284.1	1,733.0	283.7	1,705.7	282.8	1,648.3
24	284.1	1,728.6	284.8	1,772.0	282.7	1,642.9
25	284.1	1,733.0	285.3	1,808.2	282.6	1,641.7
26	284.2	1,739.3	285.6	1,826.7	282.6	1,637.5
27	284.3	1,741.8	285.8	1,836.3	282.5	1,632.1
28	284.2	1,739.3	285.8	1,840.7	282.6	1,641.7
20	284.2	1,734.2	285.8	1,836.3	282.8	1,652.5
30	284.1	1,733.0	285.6	1,824.7	282.8	1,651.3
31	284.2	1,738.6	----	------	282.7	1,646.5

YAZOO RIVER BASIN

(52) 07274500 Enid Lake near Enid, Miss.

Location.—Lat 34°09′29″, long 89°54′14″, in SW¼NE¼ sec. 2, T. 11 S., R. 7 W., Chickasaw meridian, Yalobusha County, in gatehouse of dam on Yocona River, 0.8 mile (1.3 km) upstream from U.S. Highway 51, 2.8 miles (4.5 km) upstream from Illinois Central Railroad bridge, 3.2 miles (5.1 km) northeast of Enid, and 13.5 miles (21.7 km) upstream from the mouth of Yocona River.

Drainage area.—560 mi^2 (1,450 km^2).

Gage.—Water-stage recorder. Datum of gage is at mean sea level (levels by Corps of Engineers). Prior to May 24, 1952, nonrecording gage at same site. Prior to Oct. 1, 1958, at datum 200.00 ft (60.960 m) above mean sea level.

Maxima.—March–May 1973: Contents, 752,600 acre-ft (927 hm^3) April 27 (elevation, 271.17 ft or 82.653 m).
1951 to February 1973: Contents, 642,000 acre-ft (792 hm^3) May 13, 1970 (elevation, 267.35 ft or 81.488 m).

Remarks.—Reservoir is formed by rolled-filled earth dam with concrete spillway and outlet tunnel. Storage began July 16, 1951. Capacity, 660,000 acre-ft (814 hm^3) at elevation 268.0 ft or 81.68 m (crest of spillway) of which about 602,400 acre-ft (743 hm^3) is available for flood control and about 57,600 acre-ft (71.0 hm^3) of storage is maintained in conservation pool for incidental recreational purposes at elevation 230.0 ft or 70.10 m (25 ft or 7.6 m above sill of outlet tunnel). Water below elevation 205.0 ft (62.48 m) cannot be withdrawn through outlet tunnel. Figures given herein represent total contents.

[Elevation, in feet, and contents, in thousands of acre-ft, at 8:00 a.m., 1973]

Day	March Elevation	March Contents	April Elevation	April Contents	May Elevation	May Contents
1	256.2	381.9	269.6	704.4	270.8	742.0
2	256.2	380.4	269.6	705.2	270.7	738.7
3	256.3	382.7	269.5	704.1	270.7	737.2
4	256.3	382.9	269.4	700.9	270.6	734.2
5	256.4	384.9	269.3	698.0	270.5	731.8
6	256.4	384.3	269.2	694.8	270.3	727.6
7	256.8	393.4	269.2	694.2	270.3	727.0
8	256.9	395.4	269.2	695.1	270.3	727.0
9	256.9	395.6	269.1	691.9	270.3	725.2
10	256.9	395.2	269.1	690.4	270.2	722.9
11	257.7	410.6	269.0	689.3	270.1	719.9
12	258.5	427.6	268.9	685.2	270.1	720.2
13	258.7	431.8	268.8	683.3	270.0	717.2
14	258.7	432.6	268.7	679.3	269.9	713.7
15	261.0	481.8	268.6	675.6	269.7	709.3
16	264.4	563.7	268.5	675.3	269.6	704.4
17	266.7	623.8	268.6	676.1	269.4	698.5
18	267.7	652.2	268.6	677.3	269.2	692.7
19	268.0	658.9	268.8	682.1	268.9	686.1
20	268.1	663.1	268.8	683.0	268.9	686.1
21	268.2	666.5	268.8	681.3	268.8	682.1
22	268.3	669.3	268.6	678.4	268.6	676.4
23	268.4	671.6	268.6	677.3	268.4	670.2
24	268.5	673.0	269.4	698.5	268.5	675.0
25	268.9	685.0	270.5	731.2	268.4	671.9

TABLE 12.—*Station descriptions and discharge and suspended-sediment data*—Continued

Day	March		April		May	
	Elevation	Contents	Elevation	Contents	Elevation	Contents
26	269.0	689.6	270.8	742.3	268.3	667.1
27	268.2	692.7	271.1	750.8	268.1	664.0
28	269.2	694.2	271.2	752.0	268.5	673.0
29	269.2	695.6	271.1	749.5	268.4	672.2
30	269.3	696.8	270.9	745.3	268.3	668.5
31	269.5	704.1	----	----	268.1	664.0

YAZOO RIVER BASIN
(53) 07278000 Arkabutla Lake near Arkabutla, Miss.

Location.—Lat 34°45′26″, long 90°07′27″, in SW¼ sec. 2, T. 4 S., R. 9 W., Chickasaw meridian, De Soto County, in gatehouse of dam on Coldwater River, 4 miles (6.4 km) north of Arkabutla, and 54.3 miles (87.4 km) upstream from the mouth of Coldwater River.

Drainage area.—1,000 mi^2 (2,590 km^2), approximately.

Gage.—Water-stage recorder. Datum of gage is at mean sea level (levels by Corps of Engineers). Prior to July 1, 1942, nonrecording gage at same site. Prior to Oct. 1, 1958, at datum 191.18 ft (58.272 m) above mean sea level.

Maxima.—March–May 1973: Contents, 702,800 acre-ft (867 hm^3) April 25 (elevation, 243.08 ft or 74.091 m).
1941 to February 1973: Contents, 649,900 acre-ft (801 hm^3) May 21, 1953 (elevation, 241.74 ft or 73.682 m).

Remarks.—Reservoir is formed by rolled-filled earth dam with concrete spillway and outlet tunnel. Storage began Aug. 14, 1941. Dam completed Aug. 31, 1945. Capacity, 525,300 acre-ft (648 hm^3) at elevation 238.3 ft or 72.63 m (crest of spillway), of which about 493,800 acre-ft (609 hm^3) is available for flood-control storage and about 31,500 acre-ft (38.8 hm^3) is maintained in conservation pool for incidental recreational purposes at elevation 209.3 ft or 63.79 m (18 ft or 5.5 m above sill of outlet gates). Water below elevation 191.3 ft (58.31 m) cannot be withdrawn through outlet tunnel. Figures given herein represent total contents.

[Elevation, in feet, and contents, in thousands of acre-ft, at 8:00 a.m., 1973]

Day	March		April		May	
	Elevation	Contents	Elevation	Contents	Elevation	Contents
1	228.0	251.4	236.7	473.6	241.5	641.0
2	227.7	246.8	236.7	474.5	241.4	636.0
3	228.1	254.3	236.7	474.8	241.5	641.4
4	228.1	253.7	236.7	473.6	241.5	639.1
5	228.0	251.0	236.6	471.7	241.3	632.6
6	227.7	246.6	236.6	469.9	241.1	626.2
7	228.3	259.0	236.5	468.6	241.1	626.2
8	229.5	283.2	236.6	469.6	241.6	643.7
9	229.4	281.7	236.6	469.6	241.5	640.2
10	229.4	281.0	236.5	468.6	241.3	633.7
11	230.0	296.1	236.5	468.0	241.2	627.7
12	231.2	323.0	236.4	464.9	241.0	622.7
13	231.1	321.6	236.3	462.1	240.8	616.0
14	231.0	318.2	236.2	457.8	240.7	609.4
15	231.5	330.3	236.0	452.9	240.5	602.4
16	233.1	371.1	236.0	451.4	240.3	595.8
17	234.4	406.7	236.0	452.0	240.1	587.8
18	234.9	419.7	236.1	454.4	239.9	581.3
19	235.2	428.1	236.5	467.7	239.7	574.2
20	235.3	432.8	238.8	542.5	239.5	568.6
21	235.4	435.4	240.3	594.4	239.4	562.3
22	235.5	437.2	240.6	606.5	239.2	555.3
23	235.5	438.2	241.1	625.4	239.0	548.7
24	235.6	439.5	242.4	677.2	238.8	544.6
25	236.0	451.1	243.1	702.8	238.7	538.1
26	236.1	456.6	243.0	698.3	238.4	530.3
27	236.2	459.1	242.7	687.1	238.4	531.0
28	236.3	461.2	242.4	675.6	238.7	539.1
29	236.3	462.8	242.1	664.1	238.5	533.0
30	236.4	464.9	241.8	652.5	238.3	526.6
31	236.5	468.6	----	----	238.2	520.9

TABLE 12.—*Station descriptions and discharge and suspended-sediment data*—Continued

YAZOO RIVER BASIN

(54) 07284500 Grenada Lake near Grenada, Miss.

Location.—Lat 33°48′31″, long 89°46′14′, in NE¼NE¼ sec. 4, T. 22 N., R. 5 E., Choctaw meridian, Grenada County, at gatehouse of dam on Yalobusha River, 2.2 miles (3.5 km) upstream from Batupan Creek, 3 miles (5 km) northeast of Grenada, and 63.6 miles (102.3 km) upstream from mouth of Yalobusha River.
Drainage area.—1,320 mi² (3,418 km²), approximately.
Gage.—Water-stage recorder. Datum of gage is at mean sea level (levels by Corps of Engineers). Prior to Dec. 19, 1953, nonrecording gage at same site. Prior to Oct. 1, 1958, at datum 160.00 ft (48.768 m) above mean sea level.
Maxima.—March–May, 1973: Contents, 1,575,600 acre-ft (1,940 hm³) April 28 (elevation 234.48 ft or 71.470 m).
1953 to February 1973: Contents, 1,189,800 acre-ft April 15, 16, 1962 (elevation, 228.62 ft or 69.683 m).
Remarks.—Reservoir is formed by a rolled-fill earth dam with concrete spillway and outlet tunnel. Storage began June 30, 1953. Capacity, 1,337,400 acre-ft (1,650 hm³) at elevation 231.0 ft or 70.41 m (crest of spillway), of which about 1,251,700 acre-ft (1,540 hm³) is available for flood-control storage and about 85,700 acre-ft (106 hm³) of storage is maintained in conservation pool for incidental recreational purposes at elevation 193.0 ft or 58.83 m (24 ft or 7.3 m above sill of outlet gates). Water below 169.0 ft (51.51 m) cannot be withdrawn through outlet tunnel. Figures given herein represent total contents.

[Elevation, in feet, and contents, in thousands of acre-ft, at 8:00 a.m., 1973]

Day	March		April		May	
	Elevation	Contents	Elevation	Contents	Elevation	Contents
1	220.7	777.3	232.9	1,464.1	234.2	1,558.3
2	220.6	772.4	233.0	1,468.9	234.2	1,553.3
3	220.5	770.2	232.9	1,466.2	234.2	1,565.5
4	220.5	770.2	232.9	1,461.4	234.3	1,564.8
5	220.5	770.7	232.8	1,456.6	234.2	1,559.1
6	220.5	769.3	232.7	1,451.8	234.2	1,552.6
7	220.7	777.3	232.8	1,455.3	234.2	1,553.3
8	220.8	784.4	233.0	1,469.6	234.4	1,567.7
9	220.8	784.0	233.0	1,471.0	234.4	1,567.0
10	220.8	782.6	233.0	1,469.6	234.3	1,561.2
11	221.3	804.4	232.9	1,462.8	234.2	1,554.0
12	222.2	849.5	232.8	1,454.6	234.2	1,554.0
13	222.6	865.2	232.7	1,451.8	234.2	1,553.3
14	222.7	872.4	232.6	1,444.4	234.1	1,546.8
15	223.3	900.2	232.5	1,436.9	234.0	1,539.7
16	226.4	1,059.4	232.5	1,438.9	233.8	1,529.8
17	230.3	1,294.7	232.7	1,451.8	233.7	1,520.6
18	231.3	1,357.7	232.8	1,457.3	233.6	1,512.2
19	231.4	1,366.2	233.1	1,477.3	233.4	1,501.0
20	231.5	1,370.8	233.1	1,478.7	233.5	1,503.1
21	231.6	1,374.0	233.0	1,471.7	233.4	1,500.3
22	231.6	1,377.3	232.9	1,464.1	233.3	1,491.2
23	231.6	1,378.0	232.8	1,460.0	233.2	1,482.2
24	231.7	1,381.3	233.2	1,484.9	233.1	1,476.6
25	232.1	1,410.5	234.0	1,539.0	233.0	1,469.6
26	232.4	1,430.8	234.2	1,555.5	232.9	1,464.1
27	232.5	1,437.6	234.4	1,572.0	232.8	1,455.3
28	232.5	1,438.9	234.5	1,575.6	232.8	1,453.9
29	232.6	1,441.7	234.4	1,572.0	232.7	1,449.1
30	232.7	1,448.4	234.3	1,565.5	232.6	1,441.0
31	232.8	1,458.7	----	------	232.4	1,432.2

YAZOO RIVER BASIN

(55) 07287000 Yazoo River at Greenwood, Miss.

Location.—Lat 33°31′17″, long 90°11′03″, in NE¼SW¼ sec. 10, T. 19 N., R. 1 E., Choctaw meridian, Leflore County, on left bank 110 ft (33.5 m) downstream from bridge on U.S. Highways 49E and 82 (old) in Greenwood, 0.4 mile (0.6 km) downstream from Palusha Bayou, 3 miles (4.8 km) downstream from confluence of Little Tallahatchie and Yalobusha Rivers, and at mile 170.8 (274.8 km).
Drainage area.—7,450 mi² (19,300 km²), approximately.
Gage.—Water-stage recorder, and nonrecording gage read twice daily. Datum of gage is 92.07 ft (28.063 m) above mean sea level. Prior to Oct. 1, 1940, nonrecording gages on highway bridges 110 ft (33 m) upstream at various datums.
*Flood stage.—35 feet (10.7 m).
Maxima.—March–May 1973: Discharge, 43.800 ft³/s (1,240 m³/s) Mar. 20, 21 gage height, 38.37 ft (11.695 m) Mar. 21.
1907 to February 1973: Discharge, 72,900 ft³/s (2,060 m³/s) Jan. 19, 1932 (gage height, 40.10 ft (12.222 m).
Maximum stage known, 41.2 ft (12.56 m) in 1882, caused by overflow from Mississippi River (discharge not determined), from reports of Mississippi River Commission.

TABLE 12.—*Station description and discharge and suspended-sediment data*—Continued

Remarks.—Flow partly regulated since Aug. 26, 1939, by Sardis Lake on Little Tallahatchie River (see sta 07272000), Enid Lake on Yocona River (see station 07274500), Arkabutla Lake on Coldwater River (see station 07278000), and Grenada Lake on Yalobusha River (see station 07284500). Station data are included to show outflow from upstream impoundments; peak discharge was not exceptional.
*From reports of U.S. Department of Commerce, NOAA.

[Gage height, in feet, and discharge, in cubic feet per second, 1973]

Day	March		April		May	
	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
1	31.6	20,500	36.9	33,700	34.3	27,700
2	31.6	20,200	36.6	32,100	34.4	28,100
3	31.6	20,000	36.4	30,700	34.9	28,600
4	31.6	20,300	36.1	30,500	35.2	29,100
5	31.7	20,500	35.8	30,400	35.4	29,700
6	31.7	20,500	35.6	29,900	35.5	30,200
7	32.2	21,000	35.4	29,300	35.8	30,800
8	32.2	21,300	35.3	28,500	36.1	31,200
9	32.2	21,800	35.2	27,800	36.2	31,500
10	32.2	21,900	34.9	27,200	36.2	31,700
11	33.5	22,700	34.6	26,400	36.3	31,900
12	33.6	23,000	34.4	25,600	36.4	32,400
13	33.7	23,400	34.1	24,900	36.5	32,500
14	33.7	24,400	33.8	24,100	36.5	32,600
15	34.1	26,900	33.5	24,000	36.4	32,600
16	36.0	27,800	33.4	23,800	36.3	32,300
17	36.5	32,500	33.4	23,700	36.2	31,500
18	37.3	39,200	33.2	24,000	36.0	30,400
19	38.1	41,000	33.2	23,800	35.8	29,800
20	38.3	42,600	33.0	23,700	35.7	28,900
21	38.4	43,800	32.8	23,600	35.5	28,500
22	38.3	4[illegible]000	32.6	23,400	35.3	27,600
23	38.2	41,900	32.4	23,100	35.1	27,100
24	38.0	40,200	32.5	23,100	34.9	26,800
25	38.0	39,900	33.0	24,200	34.7	26,500
26	37.9	39,000	33.3	25,400	34.6	26,300
27	37.8	38,200	33.6	26,400	34.4	25,800
28	37.6	37,500	33.8	26,700	34.3	25,300
29	37.4	36,800	34.0	27,000	34.1	25,100
30	37.2	35,500	34.1	27,300	33.9	24,900
31	37.1	34,500	---	-----	33.7	24,800
Monthly mean discharge, in cubic feet per second		30,380		26,480		29,100
Runoff, in acre-feet		1,868,000		1,575,000		1,790,000

MISSISSIPPI RIVER MAIN STEM

(56) 07289000 Mississippi River at Vicksburg, Miss.

Location.—Lat 32°18′45″, long 90°54′25″, in T. 16 N., R. 3 E., Washington meridian, Warren County, over cavity of fourth pier from left bank at combined highway and railway bridge of Vicksburg Bridge Commission of Warren County, at southern city limits of Vicksburg, 1.5 miles (2.4 km) downstream from Yazoo diversion canal and at mile 430.4 (692.5 km).
Drainage area.—1,144,500 mi² (2,964,300 km²), approximately.
Gage.—Water-stage recorder (bridge gage) maintained by Geological Survey. Jan. 1, 1963, to Dec. 31, 1967, supplementary water-stage recorder on left bank near downstream side of bridge, and since Jan. 1, 1968, on left bank at site 1.1 miles (1.8 km) upstream, maintained by Corps of Engineers. Datum of gage is 46.22 ft (14.088 m) above mean sea level (Corps of Engineers bench mark) or 46.16 ft (14.070 m) above mean gulf level. Gages used by Mississippi River Commission: Dec. 10, 1871, to Sept. 30, 1929, nonrecording gage at mouth of Yazoo diversion canal, 1.5 miles (2.4 km) upstream from bridge gage; since October 1929, nonrecording gage on Yazoo diversion canal, 1,600 ft (490 m) upstream from mouth. Gages used by U.S. Weather Bureau: May 18, 1873, to Oct. 29, 1919, nonrecording gage 0.5 mile (0.8 km) upstream from bridge gage; Oct. 30, 1919, to Nov. 30, 1922, nonreading gage at mouth of Yazoo Canal; Dec. 1, 1922, to Aug. 31, 1934, nonrecording gage on Yazoo diversion canal; Sept. 1, 1934, to Dec. 31, 1962, nonrecording gage at bridge; Jan. 1, 1963, to Dec. 31, 1967, waterstage recorder on left bank near downstream side of bridge and since Jan. 1, 1968, on left bank at site 1.1 miles (1.8 km) upstream.
All gages at same datum, but readings differ due to slope of water surface between them.
Flood stage.—43.0 ft (13.11 m). Flood stage was exceeded for 88 consecutive days (Mar. 24–June 19)
Maxima.—March–May 1973: Discharge, 1,962,000 ft³/s (55.600 m³/s) May 12; maximum gage height, 53.10 ft (16.185 m) May 14 at supplementary recorder. Recurrence interval of discharge is 25 years (based on figure 30).

TABLE 12.—*Station descriptions and discharge and suspended-sediment data*—Continued

1928 to February 1973: Discharge, 2,080,000 ft^3/s (58,900 m^3/s) Feb 17, 1937; maximum gage height, 53.2 ft (16.22 m) Feb. 21, 1937;
Maximum stage known since at least 1871, 58.4 ft (17.80 m), (Corps of Engineers gage on Yazoo diversion canal), approximately 56.0 ft (17.07 m) May 4, 1927 (Geological Survey gage).
Remarks.—Natural flow of stream affected by many reservoirs and navigation dams.

[Gage height, in feet, and discharge, in cubic feet per second, 1973]

Day	March		April		May		June	
	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge	Gage height	Discharge
1	34.5	945	48.2	1,670	51.6	1,870	48.2	1,512
2	33.0	898	48.6	1,688	51.7	1,892	47.5	1,479
3	31.1	842	48.8	1,705	51.8	1,897	46.8	1,440
4	29.5	790	49.2	1,720	52.0	1,904	46.3	1,409
5	28.3	747	49.4	1,731	52.1	1,911	45.8	1,377
6	27.4	727	49.6	1,742	52.2	1,909	45.4	1,362
7	27.0	721	50.0	1,755	52.4	1,907	45.1	1,361
8	27.0	720	50.1	1,770	52.6	1,916	45.0	1,359
9	27.2	761	50.3	1,783	52.7	1,930	44.9	1,344
10	27.6	790	50.3	1,780	52.8	1,938	44.9	1,348
11	28.7	823	50.3	1,779	52.9	1,952	44.9	1,354
12	30.2	853	50.4	1,779	53.0	1,962	44.8	1,345
13	31.8	921	50.3	1,780	53.1	1,940	44.7	1,330
14	33.7	987	50.3	1,784	53.1	1,927	44.6	1,309
15	35.4	1,048	50.2	1,790	53.1	1,930	44.5	1,288
16	37.6	1,126	50.2	1,796	53.0	1,934	44.2	1,272
17	38.6	1,158	50.2	1,797	53.0	1,931	44.0	1,271
18	39.4	1,190	50.4	1,799	52.8	1,913	43.7	1,270
19	40.4	1,234	50.2	1,793	52.7	1,900	43.3	1,250
20	41.1	1,253	50.1	1,788	52.6	1,876	42.8	1,211
21	41.6	1,280	50.0	1,783	52.4	1,846	42.4	1,181
22	42.2	1,307	50.1	1,760	52.2	1,847	41.8	1,148
23	42.8	1,337	50.2	1,745	51.9	1,855	41.1	1,113
24	43.3	1,365	50.3	1,760	51.6	1,820	40.4	1,079
25	44.2	1,394	50.5	1,792	51.4	1,785	39.6	1,039
26	44.9	1,432	50.8	1,810	51.1	1,752	38.8	1,010
27	45.5	1,465	51.0	1,822	50.7	1,685	38.1	984
28	46.0	1,510	51.1	1,836	50.4	1,642	37.6	971
29	46.6	1,556	51.3	1,842	49.8	1,622	37.0	959
30	47.2	1,600	51.4	1,851	49.3	1,599	36.4	948
31	47.7	1,654	---	----	48.7	1,560	---	----
Monthly mean discharge, in thousands of cubic feet per second		1,111		1,774		1,850		1,244
Runoff, in thousands of acre-feet		68,300		105,580		113,760		74,030

[Highest mean discharge, in thousands of cubic feet per second, for the following number of consecutive days]

Period	1	3	7	15	30	60	90	120	183
1932–67	2,080	2,070	2,060	2,030	1,940	1,740	1,560	1,450	1,200
1973 flood	1,960	1,950	1,940	1,930	1,890	1,820	1,680	1,510	1,380
Recurrence interval, in years, for 1973 flood volumes	25	35	40	45	50	90	>100	>100	>100

TABLE 12.—*Station descriptions and discharge and suspended-sediment data*—Continued

Average velocity, water temperature, stage, water discharge, suspended sediment, and bed material for given days

Date	Average velocity (fps)	Water temperature (°C)	Stage (ft)	Discharge (1,000 ft³/s)	Suspended sediment: Concentration, mg/l				Suspended sediment: Discharge (1,000 tons/day)	Suspended sediment: Percent sand	Bed material (mm)		
					Right	Middle	Left	Average			D_{16}	D_{50}	D_{84}
March 5	5.50	9.0	30.23	759	282	218	261	254	520	34	0.42	0.65	1.18
12	5.97	12.0	32.07	869	405	346	335	363	850	25	.33	.44	.61
19	7.34	13.0	42.17	1,256	694	505	423	541	1,833	39	.51	1.14	2.90
26	7.73	12.0	46.79	1,435	598	408	296	434	1,682	47	.35	.48	2.61
April 2	8.66	13.5	50.41	1,752	755	492	353	534	2,524	66	.32	.52	3.92
9	8.71	13.0	52.17	1,790	652	406	247	435	2,102	62	.34	.54	3.30
18	8.65	13.5	52.41	1,796	502	364	219	361	1,755	61	.41	.80	2.56
21	8.79	15.0	52.03	1,786	427	289	173	296	1,431	62	.36	.52	1.97
23	8.75	15.0	52.16	1,755	430	241	150	273	1,297	60	.89	1.62	2.90
28	9.07	16.0	53.09	1,840	398	232	167	265	1,321	61	.56	1.16	4.11
30	9.03	16.0	53.45	1,852	349	242	167	253	1,264	57	.37	.52	1.64
May 2	9.17	18.0	53.70	1,888	---	---	---	---	----	--	.76	1.92	7.40
7	9.26	18.5	54.34	1,899	421	264	170	285	1,463	54	.36	.48	.65
9	9.18	18.5	54.75	1,917	---	---	---	---	----	--	1.58	2.97	5.48
14	8.84	19.0	55.05	1,911	314	275	150	247	1,271	50	.38	1.05	4.50
16	8.82	19.0	55.01	1,911	403	238	159	267	1,378	60	.38	.57	2.24
21	8.55	20.0	54.33	1,831	292	206	124	207	1,025	58	1.28	2.38	4.73
23	8.67	20.5	53.88	1,843	333	168	116	205	1,024	59	1.14	2.77	5.60
28	8.43	21.0	52.43	1,623	---	---	---	---	----	--	.89	2.08	6.77
30	8.28	21.0	51.35	1,550	256	167	93	172	721	52	.88	2.44	5.49
June 4	7.68	23.0	48.33	1,429	245	155	120	174	669	37	.55	1.72	5.11
6	7.63	23.5	47.46	1,385	231	137	128	166	618	40	.60	2.45	4.96
11	7.62	24.0	46.92	1,377	280	184	142	203	754	40	1.56	2.75	5.00
13	7.51	24.5	46.75	1,353	245	171	143	186	681	33	1.88	3.27	5.94
18	7.18	26.0	45.78	1,292	226	159	119	168	587	36	.44	2.40	4.88
20	6.94	26.5	44.94	1,231	230	157	122	169	565	32	.96	2.35	4.33
25	6.36	27.0	41.65	1,057	198	161	135	165	470	21	1.66	3.15	5.64
27	6.14	28.0	40.15	1,000	212	163	141	171	464	19	1.41	2.75	4.80

MISSISSIPPI RIVER BASIN
(57) 07290880 Mississippi River at Natchez, Miss.

Location.—Lat 31°33′37″, long 91°25′07″, at bridge on U.S. Highway 84, at Natchez at mile 359 (578 km).
Drainage area.—1,149,400 mi² (2,976,900 km²); 22,240 mi² (57,600 km²) is noncontributing.
Gage.—Wire-weight gage. Datum of gage is 17.28 ft (5.267 m) above mean sea level. 1871 to date. Stages prior to 1941 0.3 miles (0.5 km) upstream at same datum.
Maxima.—March–May 1973: Discharge, 2,017,000 ft³/s (57,100 m³/s) May 18 [gage height, 56.7 ft (17.28 m) May 13].
1871–Feb. 1973; Discharge, 2,046,000 ft³/s (57,900 m³/s) Feb. 19, 1937 [gage height, 58.04 ft (17,691 m) Feb. 21, 1937].
Remarks.—Station data included in this report primarily for sediment analysis.

Average velocity, water temperature, stage, water discharge, suspended sediment, and bed material for given days

Date	Average velocity (fps)	Water temperature (°C)	Stage (ft)	Discharge (1,000 ft³/s)	Suspended sediment: Concentration, mg/l				Suspended sediment: Discharge (1,000 tons/day)	Suspended sediment: Percent sand	Bed material (mm)		
					Right	Middle	Left	Average			D_{16}	D_{50}	D_{84}
March 7	4.57	8.5	30.77	713	187	340	363	297	572	37	0.28	0.38	0.51
15	5.80	12.0	35.75	951	565	454	510	509	1,307	37	.31	.42	.54
28	7.13	11.5	46.63	1,425	354	421	360	379	1,456	45	.31	.44	.59
April 3	8.01	13.5	49.47	1,568	266	235	276	260	1,098	45	.31	.44	.58
10	7.69	12.0	51.65	1,762	247	286	408	314	1,493	59	.31	.45	.63
17	7.78	12.0	51.92	1,729	300	318	310	310	1,444	59	.25	.36	1.39
20	8.10	14.0	51.51	1,720	360	358	258	325	1,509	66	.26	.36	.49
24	7.71	14.5	51.19	1,665	212	314	287	271	1,219	65	.30	.42	.57
27	7.89	15.5	51.90	1,798	250	330	308	296	1,437	63	.28	.40	.58
May 1	8.22	16.0	52.30	1,866	264	247	214	241	1,218	48	.27	.38	.51
4	8.27	16.5	53.04	1,878	258	252	278	262	1,332	58	.25	.37	1.16
8	7.87	18.0	53.62	1,881	259	272	314	282	1,431	66	.26	.36	.52
11	8.08	18.5	53.78	1,913	231	288	207	243	1,251	57	.30	.42	.60
15	8.04	18.5	54.01	1,922	278	314	266	287	1,485	62	.27	.39	.55
May 18	8.41	18.5	53.77	2,028	240	298	226	255	1,395	60	.28	.39	.54
22	7.50	20.0	53.27	1,876	152	227	191	190	962	55	.27	.39	.56
25	7.97	20.5	52.80	1,922	162	240	172	191	992	55	.28	.40	.56
29	7.30	20.5	51.75	1,722	172	191	237	201	931	60	.26	.37	.51
June 1	6.61	21.5	50.54	1,523	158	182	190	177	727	55	.29	.47	1.47
5	6.10	22.0	48.66	1,378	160	208	191	186	693	53	.29	.40	.55
8	6.43	23.0	47.67	1,340	173	205	209	196	709	40	.25	.35	.46
12	6.13	23.5	47.29	1,268	183	186	200	189	650	37	.28	.36	.50
14	6.18	24.0	47.26	1,265	160	226	171	185	636	38	.27	.36	.50
19	6.07	25.5	46.43	1,237	126	181	186	165	549	41	.26	.36	.50
21	5.86	25.5	46.02	1,197	121	173	173	156	503	40	.29	.44	2.02

BUFFALO RIVER BASIN
(58) 07295000 Buffalo River near Woodville, Miss.

Location.—Lat 31°13′35″, long 91°17′45″, in SW¼ sec. 21, T. 3 N., R. 2 W., Washington meridian, Wilkinson County, near center of span on downstream side of bridge on U.S. Highway 61, 1.5 miles (2.4 km) downstream from Fords Creek, 2.8 miles (4.5 km) west of Wilkinson, and 8.5 miles (13.7 km) north of Woodville.

TABLE 12.—*Station descriptions and discharge and suspended-sediment data*—Continued

Drainage area.—182 mi^2 (471 km^2).
Gage.—Water-stage recorder. Datum of gage is 94.52 ft (28.810 m) above mean sea level. Prior to June 1, 1942, nonrecording gage at same site. Prior to Oct. 1, 1964, at datum 3.00 ft (0.914 m) higher.
Maxima.—March–May 1973: Discharge, 65,000 ft^3/s (1840 m^3/s) March 25 (gage height[1], 22.3 ft or 6.80 m); Recurrance interval of discharge is 40 years.
1942 to February 1973: Discharge, 44,800 ft^3/ (1270 m^3/s) Oct. 4, 1964 (gage height, 20.19 ft or 6.154 m).

[1] From flood mark.

[Mean discharge, in cubic feet per second, 1973]

Date	March	April	May
1	138	408	260
2	239	327	1,070
3	175	295	1,800
4	1,260	270	421
5	419	260	300
6	795	250	282
7	1,570	3,080	2,870
8	498	631	1,170
9	538	434	521
10	329	330	393
11	4,570	245	346
12	829	206	337
13	473	187	342
14	375	172	270
15	317	161	250
16	1,130	3,500	233
17	633	4,170	217
18	327	4,000	204
19	262	788	192
20	487	531	182
21	324	421	174
22	223	362	169
23	194	324	161
24	12,400	302	2,500
25	30,700	2,250	610
26	1,680	1,360	353
27	760	502	302
28	570	321	366
29	655	274	261
30	452	261	234
31	981		247
Monthly mean discharge, in cubic feet per second	2,074	887	550
Runoff, in inches	13.14	5.44	3.48

[Highest mean discharge, in cubic feet per second, for the following number of consecutive days]

Period	1	3	7	15	30	60	90	120	183
1943–71	25,400	13,100	6,860	3,420	2,170	1,310	1,120	930	801
1973 flood	30,700	14,900	6,760	3,540	2,310	1,560	1,240	1,040	916
Recurrence interval, in years, for 1973 flood volumes	40	40	40	35	35	40	40	40	35

MISSISSIPPI RIVER MAIN STEM

(59) 07295100 Mississippi River at Tarbert Landing, Miss.

Location.—Lat 31°00′30″, long 91°37′25″, Lot 6, T. 1 N., R. 5 W., Wilkinson County rear left bank at Tarbert Landing, 2½ miles (3.9 km) upstream from lower Old River at mile 306.3 (492.8 km).
Drainage area.—1,128,900 mi^2 (2,923,900 km^2), contributing.
Gage.—Staff gage. Datum of gage is mean sea level.
Maxima.—March–May 1973: Discharge, 1,498,000 ft^3/s (42,400 m^3/s) May 16 [elevation, 54.61 ft (16.645 m)]. Recurrence interval of discharge is 40 years.
1932–February 1973: Discharge, 1,997,000 ft^3/s (56,000 m^3/s) observed on Feb. 19, 1957.
Remarks.—Discharge below the outflow channel were used for the duration table and are for Red River Landing from 1929–62 and Tarbert Landing from 1964–71. Stage data for this station are collected at Red River Landing, mile 301 (484 km). The discharge data are collected upstream from the diversions that are used to control flood stages in the lower basin.

TABLE 12.—*Station descriptions and discharge and suspended-sediment data*—Continued

Mean discharge, in cubic feet per second, 1973

March				April				May				June			
		Suspend sediment				Suspend sediment				Suspend sediment				Suspend sediment	
Day	Mean discharge (1,000 f³/s)	Mean concentration (mg/1)	Discharge (1,000 tons/day)	Day	Mean discharge (1,000 f³/s)	Mean concentration (mg/1)	Discharge (1,000 tons/day)	Day	Mean discharge (1,000 f³/s)	Mean concentration (mg/1)	Discharge (1,000 tons/day)	Day	Mean discharge (1,000 f³/s)	Mean concentration (mg/1)	Discharge (1,000 tons/day)
1	759	343	702	1	1,090	361	1,064	1	1,360	200	732	1	1,220	170	558
2	722	359	699	2	1,110	348	1,044	2	1,390	205	772	2	1,190	172	553
3	686	375	695	3	1,150	350	1,092	3	1,330	219	783	3	1,160	174	546
4	654	391	691	4	1,180	356	1,135	4	1,330	227	815	4	1,130	177	538
5	620	410	686	5	1,210	362	1,179	5	1,400	212	802	5	1,070	191	552
6	594	426	684	6	1,240	368	1,232	6	1,390	203	762	6	1,090	200	588
7	580	439	688	7	1,270	373	1,283	7	1,370	195	724	7	1,050	215	606
8	565	453	691	8	1,290	381	1,329	8	1,320	190	678	8	1,050	208	592
9	559	462	698	9	1,290	391	1,364	9	1,450	174	680	9	1,030	205	569
10	563	469	713	10	1,270	367	1,258	10	1,390	209	786	10	1,040	199	556
11	582	467	734	11	1,290	340	1,184	11	1,350	250	914	11	1,010	195	534
12	591	470	750	12	1,350	310	1,130	12	1,430	236	910	12	1,010	260	711
13	618	468	781	13	1,300	249	854	13	1,420	229	878	13	992	349	936
14	660	461	821	14	1,340	185	672	14	1,430	221	852	14	978	303	801
15	709	452	865	15	1,340	213	766	15	1,430	226	870	15	983	261	692
16	745	447	899	16	1,390	239	895	16	1,500	225	912	16	1,000	222	602
17	780	443	932	17	1,360	276	1,013	17	1,440	234	912	17	979	194	512
18	800	444	959	18	1,410	311	1,181	18	1,440	239	930	18	957	169	436
19	814	448	984	19	1,320	290	1,035	19	1,400	233	881	19	975	191	502
20	833	449	1,009	20	1,370	258	954	20	1,430	222	855	20	964	219	569
21	857	448	1,037	21	1,230	245	817	21	1,410	215	817	21	937	211	533
22	868	454	1,063	22	1,290	255	885	22	1,390	208	780	22	910	204	500
23	887	456	1,091	23	1,300	269	943	23	1,370	182	673	23	878	197	467
24	945	446	1,138	24	1,280	287	991	24	1,360	159	585	24	856	208	492
25	983	445	1,180	25	1,290	304	1,053	25	1,300	163	571	25	856	227	525
26	995	450	1,210	26	1,240	308	1,036	26	1,370	159	589	26	850	206	472
27	1,010	436	1,183	27	1,280	304	1,052	27	1,300	163	573	27	819	189	417
28	1,020	420	1,159	28	1,260	278	945	28	1,350	161	587	28	811	190	410
29	1,040	404	1,135	29	1,360	243	892	29	1,300	164	575	29	744	180	360
30	1,050	390	1,109	30	1,430	215	831	30	1,220	169	557	30	763	210	430
31	1,070	375	1,085	31	----	---	----	31	1,210	170	555	31	----	----	----
Total	24,162		28,071		38,502		31,110		42,570		23,310		29,298		16,559
Monthly mean discharge	779		906		1,284		1,037		1,373		752		977		552
Maximum	1,072		1,210		1,433		1,364		1,498		930		1,216		936
Minimum	559		684		1,093		672		1,207		555		744		360

Period	Highest mean discharge, in cubic feet per second, for the indicated number of consecutive days: 1	3	7	15	30	60	90	120	183
Oct. 1972–June 1973	1,498,000	1,460,000	1,440,000	1,418,000	1,388,000	1,336,000	1,233,000	1,109,000	1,024,000
1929–71	1,520,000	1,520,000	1,510,000	1,500,000	1,470,000	1,400,000	1,300,000	1,210,000	
Recurrence interval, in									1,010,000
years, for 1973 flood volumes	40	30	25	25	22	30	30	22	45

RED RIVER BASIN

(60) 07355500 Red River at Alexandria, La.

Location.—Lat 31°18′46″, long 92°26′34″, in SE¼ sec. 10, T. 4 N., R. 1 W., Rapides Parish, at old bridge on U.S. Highway 165 between Alexandria and Pineville, and 1.7 miles (2.7 km) downstream from Bayou Rigolette.

Drainage area.—67,500 mi² (175,000 km²), of which 5,936 mi² (15,400 km²) above Denison Dam is noncontributing.

Gage-height record.—Nonrecording. Datum of gage is 44.26 ft (13.490 m) above mean sea level, datum of 1929, supplementary adjustment of 1941.

Discharge record.—Stage-discharge relation variable; prior to 1928, peak discharge based on occasional discharge measurements, and since 1928 on loop curves defined by frequent discharge measurements. Discharge measurements furnished by Mississippi River Commission and Corps of Engineers.

Maxima.—March–May 1973: Discharge, 142,000 ft³/s (4,020 m³/s) Apr. 30 [gage height, 35.00 ft (10.668 m)]. Recurrence interval of discharge is 3 years.

1872–February 1973: Discharge, 233,000 ft³/s (6,600 m³/s) Apr. 16–18, 1945 [gage height, 45.2 ft 13.777 m)].

Remarks.—Regulation by Lake Texamo since October 1943 and Texarkana Reservoir since July 1953. Gage heights available from Mississippi River Commission since January 1872; from U.S. Weather Bureau since 1890; from U.S. Corps of Engineers since January 1932. Station data included in this report primarily for sediment analysis.

TABLE 12.—*Station descriptions and discharge and suspended-sediment data*—Continued

Mean water discharge and suspended-sediment concentration and discharge

March				April				May				June			
		Suspended sediment				Suspended sediment				Suspended sediment				Suspended sediment	
Day	Mean discharge (1,000 ft ^{3}/s)	Mean concentration (mg/l)	Discharge (1,000 tons/day)	Day	Mean discharge (1,000 ft ^{3}/s)	Mean concentration (mg/l)	Discharge (1,000 tons/day)	Day	Mean discharge (1,000 ft ^{3}/s)	Mean concentration (mg/l)	Discharge (1,000 tons/day)	Day	Mean discharge (1,000 ft ^{3}/s)	Mean concentration (mg/l)	Discharge (1,000 tons/day)
1	29	503	36	1	105	1,350	390	1	141	1,410	536	1	33	550	49
2	29	503	48	2	104	1,330	380	2	140	1,410	532	2	31	502	42
3	29	503	38	3	103	1,300	365	3	137	1,390	514	3	30	460	36
4	30	503	38	4	102	1,290	361	4	134	1,300	470	4	29	437	33
5	33	550	46	5	95	1,220	323	5	135	1,240	453	5	26	399	28
6	45	657	71	6	94	1,180	299	6	134	1,170	425	6	27	399	28
7	63	870	141	7	94	1,140	280	7	135	1,120	404	7	30	444	36
8	75	1,020	207	8	93	1,100	262	8	134	1,060	383	8	37	611	61
9	83	1,110	252	9	84	1,060	240	9	127	1,080	370	9	52	940	132
10	86	1,120	265	10	80	1,010	219	10	120	1,090	354	10	62	1,350	240
11	85	1,150	274	11	76	970	199	11	120	1,090	349	11	80	1,830	385
12	84	1,150	270	12	73	934	184	12	121	1,090	353	12	88	2,400	570
13	83	1,140	265	13	70	877	161	13	121	1,090	357	13	97	2,210	579
14	84	1,150	271	14	68	871	60	14	121	1,090	356	14	107	2,040	589
15	91	1,190	293	15	62	828	143	15	121	1,090	355	15	109	2,020	599
16	111	1,300	357	16	65	826	145	16	121	1,110	363	16	110	1,970	590
17	117	1,390	420	17	70	862	163	17	120	1,130	366	17	111	1,910	572
18	124	1,460	474	18	73	891	178	18	120	1,040	334	18	109	1,820	537
19	128	1,510	509	19	78	916	193	19	119	960	306	19	104	1,710	481
20	131	1,540	532	20	90	1,010	231	20	115	873	271	20	94	1,460	371
21	131	1,550	540	21	101	1,130	294	21	105	765	219	21	90	1,300	316
22	124	1,510	506	22	107	1,230	342	22	98	669	177	22	80	1,220	274
23	118	1,460	466	23	109	1,300	377	23	85	736	173	23	75	1,150	239
24	114	1,400	421	24	112	1,390	421	24	76	799	164	24	69	1,070	202
25	111	1,390	409	25	120	1,510	490	25	66	801	147	25	67	1,050	192
26	107	1,370	391	26	128	1,630	565	26	60	796	129	26	67	1,030	186
27	104	1,340	373	27	132	1,580	563	27	52	770	106	27	66	1,010	180
28	102	1,340	368	28	136	1,530	561	28	47	816	108	28	60	938	152
29	102	1,340	369	29	139	1,470	551	29	43	801	93	29	54	864	126
30	102	1,340	372	30	142	1,410	541	30	39	693	73	30	46	795	103
31	104	1,340	381	31	----	----	----	31	35	593	36	31	----	----	----
Total	2,756		9,393		2,905		9,581	2	29	503	38		2,037		7,928
Monthly mean discharge	89		303		97		319		105		300		68		264
Maximum	131		540		142		565		141		536		111		599
Minimum	27		36		62		143		35		56		26		28

RED RIVER BASIN

(61) 07367000 Ouachita River at Monroe, La.

Location.—Lat 32°30′19″, long 92°07′32″, in lot 50, T. 18 N., R. 3 E., at bridge on U.S. Highway 80 at Monroe and 5½ miles (8.8 km) upstream from lock and dam No. 4.

Drainage area.—15,298 mi^2 (39,622 km^2).

Gage.—Nonrecording. Datum of gage is 31.40 ft (9.571 m) above mean sea level, datum of 1929, supplementary adjustment of 1941. Prior to Jan. 6, 1937, gage at various sites within a half a mile (0.8 km).

Maxima.—March–May 1973: Maximum daily discharge, 88,900 ft^3/s (2,520 m^3/s) May 5, 6; gage height, 48.8 ft (14.874 m) May 10. Recurrence interval of discharge is 45 years.

1874–February 1973: Discharge, 101,000 ft^3/s (2,860 m^3/s) Feb. 2, 3, 1932 [gage height, 50.45 ft (15.377 m) May 23, 1958].

Remarks.—Records of peak stages furnished by Mississippi River Commission and U.S. Weather Bureau since June 1884 and by Corps of Engineers since January 1932. Record from 1938 to date by U.S. Geological Survey.

Discharge, in cubic feet per second

Day	March	April	May
1	51,500	65,000	83,600
2	51,300	65,100	86,000
3	51,100	65,100	87,900
4	50,900	65,100	88,800
5	50,800	65,100	88,900
6	50,500	65,100	88,900
7	50,400	65,100	88,000
8	50,200	64,500	87,600
9	50,000	64,400	85,000
10	49,900	64,200	83,200
11	50,000	63,200	82,400
12	50,200	62,400	81,200

TABLE 12.—*Station descriptions and discharge and suspended-sediment data*—Continued

Discharge, in cubic feet per second—Continued

Day	March	April	May
13	50,300	61,500	80,200
14	50,400	60,700	79,100
15	51,800	60,000	78,000
16	53,100	59,700	76,900
17	54,200	59,700	75,900
18	55,700	59,900	74,600
19	56,900	59,900	73,100
20	58,100	59,800	71,900
21	59,200	60,000	70,200
22	60,100	69,900	68,900
23	60,800	69,800	67,800
24	61,200	60,000	66,000
25	62,000	60,800	64,200
26	62,700	63,000	62,700
27	63,100	68,200	60,600
28	63,900	73,000	59,300
29	64,500	75,200	58,100
30	64,600	79,200	57,000
31	64,800		56,000
Monthly mean discharge, in cubic feet per second	55,620	63,820	75,230
Runoff, in inches	4.19	4.61	5.67

Period	Highest mean discharge, in cubic feet per second for the indicated number of consecutive days 1	3	7	15	30	60	90	120	183
Oct.–June 1973	88,900	88,900	88,000	84,700	77,900	69,900	63,800	60,600	54,200
1937–71	97,200	96,100	94,500	92,100	85,600	72,000	63,900	59,900	51,800
Recurrence interval, in years, for 1973 flood volumes	45	50	60	60	50	45	23	30	35

RED RIVER BASIN

(62) 07370000 Bayou Macon near Delhi, La.

Location.—Lat 32°27′25″, long 91°28′30″, in E ½ sec. 18, T. 17 N., R. 10 E., Richland-Madison Parish line, near right bank on downstream side of bridge on U.S. Highway 80, 0.2 mile (0.3 km) upstream from Illinois Central Railroad bridge, and 1 mile east of Delhi.

Drainage area.—782 mi² (2,025 km²).

Gage.—Water-stage recorder. Datum of gage is 50.05 ft (15.255 m) above mean sea level (levels by Corps of Engineers). Prior to Mar. 14, 1949, nonrecording gage; Mar. 14, 1949, to Oct. 1, 1963, water-stage recorder; all gages within 2,000 ft (610 m) downstream at same datum. Auxiliary water-stage recorder 7.7 miles (12.4 km) downstream at datum 46.05 ft (14.036 m) above means sea level. Feb. 16, 1945, to Oct. 26, 1962, auxiliary nonrecording gage; Oct. 27, 1962, to Nov. 10, 1964, auxiliary water-stage recorder; and Nov. 11, 1964, to May 10, 1965, auxiliary nonrecording gage at site 0.2 mile (0.3 km) upstream May 11, 1965, to Mar. 9, 1972, nonrecording gage. Prior to Oct. 1, 1964, at datum 2.00 ft (0.610 m) lower.

Maxima.—March–May 1973: Discharge, 8,780 ft³/ (249 m³/s) 5:00 p.m., March 17 [gage height, 22.78 ft (6.943 m) 0815 hours March 18]. Recurrence interval of discharge is 25 years.

1935–February 1973: Discharge, 9,050 ft³/s (256 m³/s) Feb. 13, 1966 [gage height, 26.00 ft (7.925 m) May 6, 7, 1958].

Maximum stage known, 37.5 ft (11.43 m) in March 1882, from records of U.S. Weather Bureau (affected by overflow from Mississippi River).

MISSISSIPPI RIVER BASIN

(63) 07373286 Old River Outflow Channel near Knox Landing, La.

Location.—Lat 31°04′40″, long 91°35′50″, at bridge on State Highway 131 at Old River Control Structure, one-half mile (0.8 km) from Head of Channel and at mile 312 (502 km.).

Gage-height record.—Water-stage recorder. Datum of gage is mean sea level. March 31, 1961 to date.

Discharge record.—Computed daily since 1962.

Maxima.—March–May 1973: Discharge, 510,000 ft³/s (14,400 m³/s April 16 [elevation, 59.3 ft (18.07 m) May 15].

1961–February 1973: Discharge, 390,000 ft³/s (11,000 m³/s) Feb. 18, 1969 [elevation, 47.85 ft (14.585 m) Mar. 23, 1962].

Water discharge and suspended-sediment data for given days

Date	Discharge (1,000 ft³/s)	Suspended sediment: Concentration (mg/1)	Discharge (tons/day)	Percent sand
March 5	222	264	158	26
19	294	503	399	21
21	307	519	430	33

TABLE 12.—*Station descriptions and discharge and suspended-sediment data*—Continued

Water discharge and suspended-sediment data for given days—Continued

Date		Discharge (1,000 ft^3/s)	Suspended sediment Concentration (mg/l)	Suspended sediment Discharge (tons/day)	Suspended sediment Percent sand
	28	364	402	395	37
April	4	424	563	644	62
	11	452	308	376	47
	26	424	151	173	35
May	2	395	206	220	30
	12	394	196	208	22
	19	375	149	151	20
	23	360	168	163	23
	30	356	149	143	22
June	5	325	213	187	32
	12	310	173	145	31
	19	316	166	142	33
	26	308	253	210	33

MISSISSIPPI RIVER DELTA

(64) 07373450 Thompson Creek at Jackson, La.

Location.—Lat 30°50′25″, long 91°13′35″, in lot 75, T. 2 S., R. 1 W., St. Helena meridian at bridge on State Highway 10, 0.5 mile (0.8 km) west of Jackson, 0.5 mile (0.8 km) upstream from West Fork Thompson Creek, and 1.0 mile (1.6 km) upstream from Vaughn Creek.

Drainage area.—99.3 mi^2 (257.2 km^2).

Gage.—Crest-stage gage.

Maxima.—March–May 1973: Discharge, 40,000 ft^3/s (1,130 m^3/s) March 24 [gage height, 92.26 ft (28.121 m)]. Recurrence interval of discharge is 25 years.

1949–59, 1972 to Feb. 1973: Discharge, 36,500 ft^3/s (1,030 m^3/s) Apr. 13, 1955 [gage height, 91.72 ft (27.956 m)].

MISSISSIPPI RIVER BASIN

(65) 07374510 Mississippi River at New Orleans (Carrollton), La.

Location.—Lat 29°56′05″, long 90°08′10″, at Corps of Engineers depot dock.

Drainage area.—1,129,910 mi^2 (2,926,470 km^2), contributing.

Gage-height record.—Water-stage recorder. Datum of gage is mean sea level. 1872 to date. Prior to 1957 at site 0.7 mile (1.1 km) upstream at same datum.

Discharge record.—Intermittently 1851, 1852, 1879 to 1950, 1969, and 1971; computed daily, 1928 to 1936 and 1938 to 1944.

Maxima.—March–May 1973: Discharge, 1,257,000 ft^3/s (35,600 m^3/s) April 15 [gage height, 18.47 ft (5.630 m), April 7].

1872–Feb. 1973: Discharge, 1,557,000 ft^3/s (44,100 $m^3/$ May 16, 1927. Maximum gage height, 21.27 ft (6.483 m) April 25, 1922.

Remarks.—Natural flow is affected by tides and diversions upstream during floods.

Mean water discharge and suspended-sediment concentration and discharge

April Date	Discharge (1,000 ft^3/s)	April Suspended sediment[1] Concentration (mg/1)	Discharge (1,000 tons/day)	Percent sand	May Date	Discharge (1,000 ft^3/s)	May Suspended sediment[1] Concentration (mg/1)	Discharge (1,000 tons/day)	Percent sand	June Date	Discharge (1,000 ft^3/s)	June Suspended sediment[1] Concentration (mg/1)	Discharge (1,000 tons/day)	Percent sand
1	1,040	---	1,220	--	1	1,050	---	1,000	--	1	1,080	---	830	--
2	1,050	---	1,290	--	2	1,047	353	998	16	2	1,069	280	807	17
3	1,070	---	1,290	--	3	1,080	---	1,100	--	3	1,050	---	760	--
4	1,090	---	1,340	--	4	1,100	---	1,200	--	4	1,030	---	710	--
5	1,110	---	1,400	--	5	1,127	421	1,280	17	5	1,008	247	673	16
6	1,152	475	1,477	13	6	1,160	---	1,300	--	6	1,000	---	660	--
7	1,180	---	1,500	--	7	1,190	---	1,400	--	7	990	---	640	--
8	1,200	---	1,600	--	8	1,238	452	1,512	18	8	970	---	630	--
9	1,224	519	1,714	13	9	1,220	---	1,600	--	9	960	---	610	--
10	1,229	553	1,836	16	10	1,191	484	1,557	15	10	941	234	595	18
11	1,240	---	1,800	--	11	1,170	---	1,500	--	11	910	---	630	--
12	1,248	503	1,695	12	12	1,146	440	1,360	13	12	875	287	677	17
13	1,230	---	1,700	--	13	1,160	---	1,300	--	13	890	---	740	--
14	1,207	546	1,778	11	14	1,166	403	1,270	14	14	920	---	800	--
15	1,220	---	1,700	--	15	1,160	---	1,300	--	15	940	---	780	--
16	1,230	---	1,600	--	16	1,146	391	1,211	13	16	960	---	710	--
17	1,240	473	1,583	17	17	1,140	---	1,200	--	17	965	255	665	18
18	1,200	---	1,500	--	18	1,136	370	1,134	18	18	980	---	590	--
19	1,150	455	1,414	14	19	1,140	---	1,100	--	19	1,000	---	510	--
20	1,100	---	1,400	--	20	1,137	380	1,165	21	20	980	---	540	--
21	1,063	454	1,303	20	21	1,130	---	1,200	--	21	952	217	559	17
22	1,070	---	1,300	--	22	1,120	---	1,200	--	22	970	---	560	--
23	1,087	411	1,205	17	23	1,107	384	1,148	17	23	960	---	530	--
24	1,070	---	1,200	--	24	1,100	---	1,100	--	24	940	---	520	--
25	1,062	391	1,122	20	25	1,100	---	1,100	--	25	910	---	500	--
26	1,070	---	1,200	--	26	1,096	355	1,051	14	26	880	---	490	--
27	1,082	453	1,323	18	27	1,100	---	1,000	--	27	860	---	480	--
28	1,070	---	1,200	--	28	1,099	323	957	19	28	860	---	460	--
29	1,052	395	1,122	16	29	1,100	---	940	--	29	850	---	440	--
30	1,050	---	1,100	--	30	1,097	310	917	15	30	820	---	400	--
31	----	---	----	--	31	1,090	---	880	--	31	----	---	---	--
Total	34,086		42,912		Total	35,043		36,980		Total	28,520		18,496	
Monthly mean discharge	1,136		1,430		Monthly mean discharge	1,130		1,193		Monthly mean discharge	951		617	
Maximum	1,040		1,836		Maximum	1,238		1,600		Maximum	1,080		830	
Minimum	1,248		1,100		Minimum	1,047		880		Minimum	820		400	

[1] Suspended-sediment data based on water discharge measurements and sample observations at 1 to 5 day intervals.

TABLE 12.—*Station descriptions and discharge and suspended-sediment data*—Continued

MISSISSIPPI RIVER DELTA
(66) 07377000 Amite River near Darlington, La.

Location.—Lat 30°53′20″, long 90°50′40″, in lot 72, T. 2 S., R. 4 E., St. Helena meridian, St. Helena Parish near center of span on downstream side of State Highway 10, 1.5 miles (2.4 km) upstream from Collins Creek, and 4.0 miles (6.4 km) west of Darlington.

Drainage area.—580 mi^2 (1,502 km^2).

Gage.—Water-stage recorder. Datum of gage is 145.81 ft (44.443 m) above mean sea level. Mar 17, 1949, to Oct. 23, 1950, crest-stage gage; Oct. 24, 1950, to Jan. 12, 1951, nonrecording gage; Jan. 13, 1951, to May 28, 1963 water-stage recorder at former channel 700 ft (213 m) to the left; and July 30, 1963, to Feb. 12, 1964, nonrecording gage at present site. Prior to Oct. 1, 1963, datum 2.99 ft (0.911 m) higher.

Maxima.—March–May 1973: Discharge, 62,100 ft^3/s (1,760 m^3/s) March 25 [gage height, 20.19 ft (6.154 m)]. Recurrence interval of discharge is 16 years.

1949–February 1973: Discharge, 55,700 ft^3/s (1,580 m^3/s) Apr. 13, 1955 [gage height, 18.18 ft (5.541 m), site and datum then in use].

MISSISSIPPI RIVER DELTA
(67) 07378500 Amite River near Denham Springs, La.

Location.—Lat 30°27′50″, long 90°59′25″, in lot 2, T. 7 S., R. 2 E., St. Helena meridian, Livingston Parish, on right bank at downtown side of bridge on U.S. Highway 190, 1,000 ft (305 m) downstream from Comite River, 2.3 miles (3.7 km) south west of town of Denham Springs, and 15 miles (24 km) east of Baton Rouge.

Drainage area.—1,280 mi^2 (3,320 km^2).

Gage.—Water-stage recorder. Datum of gage is 3.87 ft (1.180 m) above mean sea level. Prior to Aug. 8, 1939, nonrecording gage at same site and datum. Auxiliary water-stage recorder 3.0 miles (4.8 km) downstream at datum 3.12 ft (0.951 m) above mean sea level (Corps of Engineers bench mark). Oct. 1, 1945, to Dec. 23, 1952, nonrecording gage at same site and datum.

Maxima.—March–May 1973: Discharge, 61,800 ft^3/s (1,750 m^3/s) 5:00 a.m., March 27 [gage height, 32.63 ft (9.946 m) 0730 hours]. Recurrence interval of discharge is 16 years.

1939–February 1973: Discharge, 67,000 ft^3/s (1,900 m^3/s) May 20, 1953 [gage height, 32.46 ft (9.894 m)].

Discharge in cubic feet per second

Day	March	April	May
1	954	7,370	2,130
2	1,820	7,460	1,910
3	1,310	5,960	1,980
4	3,220	3,810	3,070
5	4,530	2,510	4,740
6	4,540	2,110	5,080
7	4,430	5,900	6,900
8	4,520	9,150	10,700
9	4,500	9,000	10,000
10	4,580	6,510	8,100
11	4,420	3,950	5,360
12	6,780	2,400	3,280
13	8,110	1,960	2,420
14	7,400	1,740	3,480
15	4,660	1,590	3,900
16	2,810	2,910	2,950
17	3,930	14,200	1,810
18	5,200	28,900	1,510
19	4,450	35,500	1,350
20	3,810	27,700	1,240
21	3,870	17,300	1,150
22	3,790	9,820	1,090
23	2,630	4,260	1,030
24	5,530	2,870	1,020
25	24,800	2,410	1,310
26	45,500	5,570	2,520
27	56,300	6,840	1,740
28	31,200	6,700	1,210
29	12,400	4,950	1,040
30	5,550	2,890	950
31	5,530	-----	893
Monthly mean discharge, in cubic feet per second	9,130	8,140	3,090
Runoff, in inches	8.22	7.10	2.78

TABLE 12.—*Station descriptions and discharge and suspended-sediment data*—Continued

Period	Highest mean discharge, in cubic feet per second, for the indicated number of consecutive days								
	1	3	7	15	30	60	90	120	183
Oct. 1972–June 1973	56,300	44,300	25,900	15,000	13,200	9,050	7,170	6,010	5,040
1939–72	63,500	51,000	31,700	18,400	15,000	8,810	7,700	6,510	5,660
Recurrence interval, in years, for 1973 flood volumes	17	14	9	8	30	35	23	23	35

MISSISSIPPI RIVER DELTA
(68) 07380231 Bonnet Carre Floodway near Norco, La.

Location.—Lat 30°03′50″, long 90°23′05″, St. Charles Parish, at bridge on Interstate Highway 10, 4.5 miles (7.2 km) north of Norco, La.
Drainage area.—Indeterminate.

Measured discharge in cubic feet per second, 1973

Date		Dischrage
April	10	109,000
	13	179,000
	16	173,000
May	2	156,000

Mean water discharge and suspended-sediment concentration and discharge

	April				May				June		
		Suspended sediment				Suspended sediment				Suspended sediment	
Day	Mean discharge (1,000 ft³/s)	Mean concentration (mg/l)	Discharge (1,000 tons/day)	Day	Mean discharge (1,000 ft³/s)	Mean concentration (mg/l)	Discharge (1,000 tons/day)	Day	Mean discharge (1,000 ft³/s)	Mean concentration (mg/l)	Discharge (1,000 tons/day)
1	0	----	0	1	156	601	253	1	119	436	140
2	0	----	0	2	154	532	221	2	109	455	134
3	0	----	0	3	160	479	207	3	101	367	100
4	0	----	0	4	163	643	283	4	93	422	106
5	0	----	0	5	165	640	285	5	85	375	86
6	0	----	0	6	168	637	289	6	77	351	73
7	0	----	0	7	179	699	338	7	72	340	66
8	8	93	9	8	186	754	379	8	66	314	56
9	67	337	61	9	190	803	412	9	60	272	44
10	113	502	153	10	192	771	400	10	56	304	46
11	158	661	282	11	195	752	396	11	52	292	41
12	171	730	337	12	191	768	396	12	50	289	39
13	170	856	393	13	192	801	415	13	48	286	37
14	169	809	369	14	195	739	389	14	47	252	32
15	171	710	328	15	192	667	346	15	41	226	25
16	173	623	291	16	189	709	362	16	34	196	18
17	175	546	258	17	185	676	338	17	27	178	13
18	177	479	229	18	180	755	367	18	20	148	8
19	159	522	224	19	176	751	357	19	14	106	4
20	140	508	192	20	176	541	257	20	7	53	1
21	139	536	201	21	177	584	279	21	2	15	0
22	141	592	225	22	171	708	327	22	0	----	0
23	133	590	212	23	170	571	262	23	0	----	0
24	137	535	198	24	163	516	227	24	0	----	0
25	141	486	185	25	165	483	215	25	0	----	0
26	140	500	189	26	162	478	209	26	0	----	0
27	142	552	200	27	159	554	238	27	0	----	0
28	152	565	232	28	152	485	199	28	0	----	0
29	154	459	191	29	145	442	173	29	0	----	0
30	150	657	266	30	137	452	167	30	0	----	0
31	----	----	----	31	128	443	153	31	----	----	----
Total	3,783		5,218		5,313		9,139		1,180		1,069
Monthly mean discharge	126		174		171		295		39		36
Maximum	177		393		195		415		119		140
Minimum	0		0		128		153		0		0

MISSISSIPPI RIVER DELTA
(70) 07381500 Atchafalaya River at Krotz Springs, La.

Location.—Lat 30°32′48″, long 91°45′04″, in sec. 7, T. 6 S., R.7 E., Louisiana meridian, in first pier from west bank on bridge on U.S. Highway 190, half a mile (0.8 km) north of town of Krotz Springs, 0.6 mile (1.0 km) upstream from New Orleans, Texas & Mexico Railway Co. bridge, 10 miles (16 km) upstream from Bayou Courtableau, and 42 miles (68 km) downstream from confluence of Red River and Old River (head of Atchafalaya River).
Drainage area.—Indeterminate.
Gage.—Water-stage recorder (digital). Datum of gage is at mean gulf level, and 0.03 ft (.009 m) below mean sea level, datum of 1929. supplementary adjustment of 1941 (levels by Corps of Engineers). Since July 1, 1963, auxiliary water-stage recorder 35.6 miles (57.3 km) upstream, at datum 5.73 ft (1.746 m) above mean sea level.
Maxima.—March–May 1973: Discharge. 781.000 ft³/s (22.100 m³/s) May 12 [gage height, 48.70 ft (14.844 m) at Simmesport].
1934–February 1973: Discharge, 624.000 ft³/s (17,700 m³/s) March 6, 1950 [gage height, 37.8 ft (11.52 m) Feb. 28. 1937].
Remarks.—Discharges used for the duration table are for Krotz Springs from 1934–64 and for Simmesport [35.6 miles (57.3 km) upstream] from 1965–73. The flow is governed by diversions from the Mississippi River at Old River control structure. The recurrence intervals are not determined because of the irregular diversion patterns. Sediment data were collected at Simmesport.

TABLE 12.—*Station descriptions and discharge and suspended-sediment data*—Continued

Mean water discharge and suspended-sediment concentration and discharge

March				April				May				June			
		Suspended sediment				Suspended sediment				Suspended sediment				Suspended sediment	
Day	Mean discharge (1,000 ft³/s)	Mean concentration (mg/l)	Discharge (1,000 tons/day)	Day	Mean discharge (1,000 ft³/s)	Mean concentration (mg/l)	Discharge (1,000 tons/day)	Day	Mean discharge (1,000 ft³/s)	Mean concentration (mg/l)	Discharge (1,000 tons/day)	Day	Mean discharge (1,000 ft³/s)	Mean concentration (mg/l)	Discharge (1,000 tons/day)
1	408	336	370	1	550	438	651	1	772	267	520	1	661	333	595
2	404	335	365	2	560	440	665	2	719	268	520	2	674	340	618
3	387	341	356	3	571	441	680	3	682	286	527	3	648	350	612
4	371	348	349	4	572	423	654	4	685	302	559	4	601	359	583
5	354	356	340	5	573	407	629	5	725	316	618	5	625	368	621
6	339	363	332	6	582	389	612	6	720	334	649	6	620	363	608
7	336	368	334	7	597	372	600	7	709	354	678	7	579	363	567
8	335	373	337	8	606	356	583	8	727	372	731	8	607	354	580
9	334	337	340	9	613	341	565	9	731	393	775	9	606	349	571
10	331	383	342	10	620	327	548	10	740	414	828	10	549	351	520
11	335	386	349	11	626	329	556	11	759	436	893	11	562	344	522
12	343	389	360	12	634	331	566	12	781	458	965	12	570	339	521
13	349	393	370	13	630	334	568	13	727	442	867	13	542	356	521
14	357	395	381	14	626	327	569	14	742	418	838	14	552	369	550
15	377	396	403	15	679	334	612	15	736	399	792	15	574	381	591
16	401	396	429	16	691	336	626	16	763	377	776	16	528	404	576
17	414	398	445	17	710	336	645	17	749	360	728	17	530	421	602
18	425	401	460	18	730	337	665	18	760	342	701	18	539	436	635
19	433	405	473	19	668	346	624	19	739	327	652	19	546	453	668
20	441	408	486	20	686	347	642	20	739	311	620	20	550	426	632
21	447	412	497	21	674	332	605	21	737	296	589	21	534	402	580
22	454	415	509	22	648	320	560	22	727	282	554	22	515	380	529
23	465	418	525	23	596	311	500	23	730	268	529	23	503	359	488
24	484	420	549	24	688	289	536	24	749	273	552	24	513	336	466
25	500	422	570	25	641	280	484	25	727	281	551	25	463	323	404
26	515	425	591	26	683	264	486	26	767	284	588	26	492	300	398
27	528	429	611	27	674	265	483	27	733	293	579	27	475	---	380
28	524	432	611	28	692	265	496	28	704	301	573	28	472	---	370
29	521	435	612	29	687	267	495	29	706	308	587	29	472	---	370
30	532	436	626	30	724	266	519	30	687	316	587	30	452	---	350
31	540	438	638	31	---	---	---	31	689	324	602	31	---	---	---
Total	12,984		13,960		19,231		17,424		22,611		20,528		16,554		16,028
Monthly mean discharge	419		450		641		581		729		662		552		534
Maximum	540		638		730		680		781		965		674		668
Minimum	331		332		550		483		682		520		452		398

Period	Highest mean discharge, in cubic feet per second, for the indicated number of consecutive days								
	1	3	7	15	30	60	90	120	183
Oct. 1972–June 1973	781,000	760,000	751,000	745,000	732,000	694,000	647,000	593,000	526,000
1935–71	619,000	619,000	615,000	608,000	590,000	540,000	492,000	457,000	408,000
Recurrence interval, in years for 1973 flood volumes	------	------	------	------	------	------	------	------	------

MISSISSIPPI RIVER DELTA

(71) 07381530 Morganza Floodway near Krotz Springs, La.

Location.—Lat 30°33′16″, long 91°41′51″, Pointe Coupee Parish, at bridge on U.S. Highway 190, 5 miles (8 km) east of the town of Krotz Springs, La.
Drainage area.—Indeterminate.
Remarks.—This was the first time the Morganza Floodway was used since it was constructed.

TABLE 12.—*Station descriptions and discharge and suspended-sediment data*—Continued

Measured discharge and suspended-sediment concentration and discharge

April				May				June			
		Suspended sediment				Suspended sediment				Suspended sediment	
Day	Measured discharge (ft^3/s)	Mean concentration (mg/l)	Discharge (1,000 tons/day)	Day	Measured discharge (ft^3/s)	Mean concentration (mg/l)	Discharge (1,000 tons/day)	Day	Measured discharge (ft^3/s)	Mean concentration (mg/l)	Discharge (tons/day)
1	----	----	----	1	66,900	14	2,610	1	107,000	39	11,200
2	----	----	----	2	75,000	18	3,720	2	104,000	37	10,400
3	----	----	----	3	74,300	19	3,880	3	94,100	29	7,370
4	----	----	----	4	75,300	22	4,420	4	90,600	32	7,750
5	----	----	----	5	74,400	25	5,110	5	84,100	26	5,800
6	----	----	----	6	77.100	21	4,450	6	77,900	27	5,600
7	----	----	----	7	70,800	23	4,400	7	60,800	28	4,600
8	----	----	----	8	74,800	23	4,840	8	58,500	29	4,580
9	----	----	----	9	78,800	23	4,810	9	58,000	25	3,920
10	----	----	----	10	76,100	31	6,450	10	53,900	28	4,070
11	----	----	----	11	78,800	33	7,290	11	44,100	28	3,330
12	----	----	----	12	79,800	30	6,570	12	37,900	25	2,560
13	------	----	----	13	81,500	27	5,940	13	28,300	26	1,980
14	----	----	----	14	85,000	31	7,120	14	23,200	29	1,790
15	----	----	----	15	95,700	25	6,460	15	20,200	28	1,520
16	----	----	----	16	108,000	34	9,960	16	------	--	-----
17	----	----	----	17	122,000	24	7,820	17	------	--	-----
18	----	----	----	18	137,000	26	9,490	18	------	--	-----
19	76,800	40	8,920	19	139,000	38	14,400	19	------	--	-----
20	141,000	40	15,400	20	140,000	33	12,400	20	------	--	-----
21	99,800	35	9,300	21	140,000	36	13,800	21	------	--	-----
22	78,100	32	6,680	22	142,000	31	11,800	22	------	--	-----
23	68,400	27	4,930	23	132,000	31	10,900	23	------	--	-----
24	59,100	30	4,760	24	133,000	72	25,800	24	------	--	-----
25	55,500	25	3,820	25	131,000	32	11,200	25	------	--	-----
26	63,400	23	4,010	26	131,000	43	15,300	26	------	--	-----
27	62,000	26	4,360	27	125,000	48	16,100	27	------	--	-----
28	61,000	26	4,280	28	124,000	33	11,000	28	------	--	-----
29	65,000	19	3,310	29	120,000	49	15,700	29	------	--	-----
30	67,100	17	3,020	30	119,000	34	10,900	30	------	--	-----
31	----	----	----	31	112,000	29	8,770	31	------	--	-----
Total			3,219,300				283,410				
Mean monthly discharge			104,000				9,140				
Maximum			142,000				25,800				
Minimum			66,900				2,610				

MISSISSIPPI RIVER DELTA

(72) 07381590 Wax Lake Outlet at Calumet, La.

Location.—Lat 29°42′09″, long 91°22′07″, St. Mary Parish, at bridge on U.S. Highway 90, 0.5 mile (0.8 km) west of Calumet, and 4.0 miles (6.4 km) west of Patterson, La.
Drainage area.—Indeterminate.
Gage.—Water-stage recorder and staff. Datum of gage is 0.14 ft (0.043 m) below mean sea level.
Discharge record.—Discharge, 1942 to 1946, 1949 to 1955, and intermittently 1957 to date.
Maxima.—March–June 1973: Gage height, 11.18 ft (3.408 m) May 27.
1942 to February 1973: Gage height, 8.4 ft (2.56 m) [affected by hurricane] June 27, 1957.

Measured discharge, 1973

Date	Gage height (ft)	Discharge (ft^3/s)	Date	Gage height (ft)	Discharge (ft^3/s)
April 10	7.5	214,000	May 22	10.5	269,000
13	7.9	213,000	25	10.9	267,000
18	8.9	210,000	29	10.9	272,000
20	8.8	224,000	31	10.8	257,000
24	9.3	226,000	June 5	10.2	234,000
27	9.3	238,000	8	9.6	236,000
May 1	9.6	241,000	12	8.8	209,000
4	9.7	238,000	15	8.3	185,000
8	10.2	246,000	19	7.9	194,000
11	10.2	266,000	21	7.7	191,000
15	10.3	245,000	26	7.3	183,000
17	10.4	257,000	29	6.9	176,000

TABLE 12.—*Station descriptions and discharge and suspended-sediment data*—Continued

Mean water discharge and suspended-sediment concentration and discharge

Day	April			Day	May			Day	June		
		Suspended sediment				Suspended sediment				Suspended sediment	
	Mean discharge (1,000 ft³/s)	Mean concentration (mg/l)	Discharge (1,000 tons/day)		Mean discharge (1,000 ft³/s)	Mean concentration (mg/l)	Discharge (1,000 tons/day)		Mean discharge (1,000 ft³/s)	Mean concentration (mg/l)	Discharge (1,000 tons/day)
1	----	----	----	1	241	362	236	1	252	----	208
2	----	----	----	2	240	----	232	2	248	----	212
3	----	----	----	3	239	----	230	3	243	----	215
4	----	----	----	4	238	347	228	4	239	----	218
5	----	----	----	5	240	----	248	5	234	349	221
6	----	----	----	6	242	----	266	6	235	----	188
7	----	----	----	7	244	----	286	7	235	----	156
8	----	----	----	8	246	454	302	8	236	208	133
9	----	----	----	9	253	----	296	9	229	----	127
10	----	----	----	10	259	----	293	10	222	----	121
11	----	----	----	11	266	----	288	11	216	----	115
12	----	----	----	12	261	----	282	12	209	197	111
13	----	----	----	13	256	----	278	13	201	----	113
14	----	----	----	14	250	----	272	14	193	----	116
15	----	----	----	15	245	404	267	15	185	234	117
16	----	----	----	16	251	----	260	16	187	----	117
17	----	----	----	17	257	369	253	17	190	----	117
18	----	----	----	18	259	----	256	18	192	----	117
19	----	----	----	19	262	----	266	19	194	223	117
20	224	385	233	20	264	----	270	20	192	----	120
21	224	----	234	21	267	----	274	21	191	235	121
22	225	----	235	22	269	381	277	22	189	----	118
23	226	----	236	23	268	----	264	23	188	----	115
24	226	388	237	24	268	----	254	24	186	----	112
25	230	----	256	25	267	340	245	25	185	----	109
26	234	----	271	26	268	----	242	26	183	215	106
27	238	446	287	27	270	----	238	27	181	----	100
28	239	----	270	28	271	----	232	28	178	----	92
29	240	----	260	29	272	310	228	29	176	182	86
30	240	----	246	30	264	----	214	30	174	----	80
31	----	----	----	31	257	296	205	31	----	----	----
Total	2,546		2,765		7,954		7,982		6,163		3,998
Mean monthly discharge	----	----	----		257		257		205		133
Maximum	----	----	----		272		302		252		221
Minimum	----	----	----		238		205		174		80

[1] Suspended-sediment data based on water discharge measurements and suspended-sediment samples obtained at 2- to 7-day intervals.

MISSISSIPPI RIVER DELTA

(73) 07381600 Lower Atchafalaya River at Morgan City, La.

Location.—Lat 29°41′40″, long 91°12′39″, U.S. Coast Guard dock on left bank, 300 ft (91 km) downstream from new U.S. Highway 90 bridge (under construction) at Morgan City, La.
Drainage area.—Indeterminate.
Gage.—Water-stage recorder and staff. Datum of gage is 2.94 ft (0.896 m) below mean sea level.
Discharge record.—Intermittently from 1927 to date.
Maxima.—March–June 1973: Gage height, 13.6 ft (4.15 m) May 23–28.
1905 to February 1973: Gage height, 11.4 ft (3.40 m) [affected by hurricane] June 27, 1957.

Measured discharge, 1973

Date		Gage height (ft)	Discharge (ft³/s)	Date		Gage height (ft)	Discharge (ft³/s)
April	11	10.4	456,000	May	22	13.4	654,000
	13	10.7	493,000		25	13.5	692,000
	18	12.0	546,000		29	13.3	692,000
	20	11.8	513,000		31	13.2	682,000
	24	12.2	522,000	June	5	12.6	639,000
	27	12.3	558,000		8	12.0	611,000
May	1	12.4	562,000		12	11.2	556,000
	4	12.5	568,000		15	10.9	494,000
	8	13.0	586,000		19	10.3	484,000
	11	12.9	609,000		21	10.1	474,000
	15	12.9	610,000		26	9.6	428,000
	17	13.1	640,000		29	9.4	414,000

TABLE 12.—*Station descriptions and discharge and suspended-sediment data*—Continued

Mean water discharge and suspended-sediment concentration and discharge

Day (April)	April Mean discharge (1,000 ft³/s)	April Suspended sediment[1] Mean concentration (mg/l)	April Suspended sediment[1] Discharge (1,000 tons/day)	Day (May)	May Mean discharge (1,000 ft³/s)	May Suspended sediment[1] Mean concentration (mg/l)	May Suspended sediment[1] Discharge (1,000 tons/day)	Day (June)	June Mean discharge (1,000 ft³/s)	June Suspended sediment[1] Mean concentration (mg/l)	June Suspended sediment[1] Discharge (1,000 tons/day)
1	----	----	----	1	562	337	511	1	673	----	504
2	----	----	----	2	564	----	510	2	665	----	480
3	----	----	----	3	566	----	510	3	656	----	450
4	----	----	----	4	568	333	510	4	648	----	425
5	----	----	----	5	572	----	550	5	639	235	405
6	----	----	----	6	577	----	585	6	630	----	392
7	----	----	----	7	582	----	620	7	620	----	384
8	----	----	----	8	586	418	661	8	611	229	337
9	----	----	----	9	594	----	658	9	597	----	375
10	----	----	----	10	601	----	658	10	583	----	373
11	----	----	----	11	609	400	657	11	570	----	371
12	----	----	----	12	609	----	656	12	556	246	369
13	----	----	----	13	610	----	656	13	535	----	350
14	----	----	----	14	610	----	657	14	515	----	330
15	----	----	----	15	610	399	656	15	494	235	313
16	----	----	----	16	625	----	622	16	492	----	325
17	----	----	----	17	640	340	587	17	489	----	336
18	546	391	576	18	643	----	592	18	486	----	345
19	530	----	550	19	646	----	600	19	484	241	351
20	513	373	517	20	648	----	610	20	479	----	347
21	515	----	531	21	651	----	620	21	474	267	342
22	518	----	550	22	654	355	627	22	465	----	334
23	520	----	567	23	667	----	619	23	456	----	328
24	522	418	589	24	679	----	611	24	446	----	322
25	534	----	580	25	692	324	605	25	437	----	318
26	546	----	570	26	692	----	599	26	428	269	311
27	558	375	566	27	692	----	591	27	423	----	290
28	559	----	550	28	692	----	585	28	419	----	260
29	560	----	537	29	692	310	580	29	414	210	235
30	561	----	525	30	687	----	550	30	409	----	215
31	----	----	----	31	682	289	531	31	----	----	----
Total	6,982		7,208		18,967		8,584		15,393	----	10,517
Monthly mean discharge	----	----			618		599		513		351
Maximum	----	----			692		661		673		504
Minimum	----	----			562		510		409		215

[1] Suspended-sediment data based on water discharge measurements and suspended-sediment samples obtained at 2- to 5-day intervals.

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