

MISSOURI RIVER AND MISSISSIPPI RIVER FLOOD-PEAK ELEVATIONS AND DISCHARGES—ST. CHARLES AND VICINITY

The 1993 flood-peak elevations of the Missouri and the Mississippi Rivers in St. Charles and vicinity were determined from USGS stage-gaging station data and by surveying high-water flood marks after the water had receded (fig. 7). All USGS flood-peak elevation data on the Missouri and the Mississippi Rivers were compiled with flood-mark data collected by the U.S. Army Corps of Engineers (Kansas City District), the Missouri Department of Natural Resources (Division of Geology and Land Survey), and St. Louis County (Department of Highways and Traffic).

The water-surface elevations of the 1993 flooding of the Missouri River at St. Charles are shown in figure 8. The figure shows the June through August elevations for the Missouri River at the USGS stage-gaging station (06587450) on the downstream side of State Highway 115 bridge (abandoned) at St. Charles (fig. 7). Although only stage (water-surface elevation) data are continuously collected at this gaging station, six discharge measurements were made near the flood peak of 1993 (USGS, unpubl. data, 1993). From these measurements, the flood-peak discharge of the Missouri River at St. Charles was determined and is given with the 1993 flood-peak elevations and discharges for USGS streamflow and stage-gaging stations on the lower Missouri River from Kansas City to Hannibal, Missouri, in table 1. The Missouri River flood-peak elevations and discharges in St. Charles and vicinity would have been higher had the Federal reservoir system not been in place and operational. For example, Missouri River peak discharges between Kansas City, Missouri, and St. Louis were estimated to have been reduced by more than 100,000 cfs as a result of storage of flood flows in reservoirs upstream (Perry, 1994, p. 11).

The water-surface elevations and discharges of the 1993 flooding of the Mississippi River near St. Charles and vicinity are shown in figure 9. The figure shows the June through August elevations and discharges for the Mississippi River at the USGS streamflow gaging station (05587450) at Grafton, Illinois. At this station, the Mississippi River flood-peak elevation of 441.96 ft above sea level on August 1, 1993, was greater than the previous maximum elevation of April 1973 by more than 4.9 ft.

Table 1. Summary of 1993 flood-peak elevations and discharges for U.S. Geological Survey streamflow and stage-gaging stations on the lower Missouri River.

Station name	Peak elevation (feet above sea level)	Peak discharge (cubic feet per second)	Peak date
06587450 Missouri River at St. Charles, Mo.	441.96	758,227	August 1, 1993
06587450 Missouri River at Hannibal, Mo.	437.15	677,175	August 1, 1993
06587450 Missouri River at Bonneville, Mo.	433.52	603,512	August 1, 1993
06587450 Missouri River at Jefferson City, Mo.	428.50	558,530	August 1, 1993
06587450 Missouri River at Hannibal, Mo.	418.53	518,833	August 1, 1993
06587450 Missouri River at St. Charles, Mo.	413.62	490,000	August 1, 1993

FLOOD PROFILES

The flood-peak elevations determined from the USGS stage-gaging station data and by surveying flood-mark data along the Missouri and the Mississippi River flood plains (fig. 7) were used to interpret the 1993 flood profiles and to assist in delineating the area inundated by the August 1 flood peak near St. Charles and vicinity. These flood profiles are subject to errors in maximum-height interpretation, localized increases or decreases in water-surface elevations because of water-velocity differences, and accuracy of reference elevations used in the surveying process. The best Missouri and Mississippi River flood-peak profiles (figs. 10, 11, respectively) and surface-water contour lines (fig. 7) were determined from flood-peak elevation data for each river. Some individual data values are not consistent with the profiles and contour lines; the influence of each data value was based on the quality of the flood mark. Flood-peak elevation locations are plotted and referred by distance, in river miles, upstream from the mouth of the Missouri and the Ohio Rivers.

Near St. Charles, the 1993 Missouri River flooding was confined to the main channel (for the most part) by the Earth Levee system through the 3 mi reach from just upstream of Interstate 70 to State Highway 370 (fig. 7). However, just downstream from State Highway 370, the flood flow breached the levee system along the north and south banks of the main channel of the Missouri River. The breaching of these levees caused lateral differences in flood-peak elevations between the north and south flood plains (fig. 7).

INUNDATED AREA

The extent of the Missouri and the Mississippi Rivers flooding from August 1 through 3, 1993, near St. Charles and vicinity was determined by using surface-water contours shown in figure 7. These elevation data were used to handle the outlines of the 1993 inundation boundaries for each river on a 1:24,000-scale (contour interval, 10 ft) topographic map of St. Charles and vicinity. By using the GIS software package ARC/INFO, the hand-drawn inundation boundaries were manually digitized from the 1:24,000-scale maps and stored. Topographic maps that have contour intervals of more than 5 ft usually are not used alone to establish flood boundaries. Therefore, a second outline of the 1993 flood inundation boundaries of the Missouri and the Mississippi Rivers was scanned from a set of 1:24,000-scale aerial photographs taken on August 2, 1993 (Walker and Associates, Fenton, Missouri). These scanned inundation boundaries were manually digitized into a second ARC/INFO coverage.

A limited amount of onsite inspection was done in areas where the two outlines did not agree as to the limits of flood inundation. For example, some small areas of land within the inundation boundaries (between and levee systems and Portage des Sioux Bottom) may be at or slightly above the August 1 through 3 flood-peak elevations; however, some of these small areas may not be delineated. Other discrepancies in the outlines were the result of inaccuracies in the manual delineation of the flood boundary (horizontal/vertical) on topographic maps with a 10-ft contour interval and inconsistencies in visually defining the peak/floodwater/land-surface contact (particularly in local areas of dense vegetation) from the aerial photographs. The August 1 through 3, 1993, Missouri River and Mississippi River extent of flooding shown in figure 7 is considered to be the best interpretation on the basis of both inundation outlines.

FEDERAL EMERGENCY MANAGEMENT AGENCY 100- AND 500-YEAR FLOOD PROFILES

The National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973 were established to encourage State and local governments to adopt wise flood-management practices. The FEMA has adopted the 100-year flood as the base flood for purposes of defining the flood boundaries of flood insurance rate maps. The 500-year flood can be used to identify additional areas of flood risk in a community (U.S. Department of Housing and Urban Development, 1993a, p. 34). To assist in the evaluation of the Missouri and the Mississippi Rivers flooding from August 1 through 3, 1993, in St. Charles and vicinity, the FEMA 100- and 500-year flood profiles for the Missouri (U.S. Department of Housing and Urban Development, 1993b, panels 138-140) and the Mississippi (U.S. Department of Housing and Urban Development, 1993c) are shown in figures 10 and 11, respectively.

FLOOD DAMAGES

In St. Charles and vicinity, a substantial part of the 1993 flood damage was related to the floodwater breaching the Missouri River and the Mississippi River levee systems (fig. 12). As a result, agricultural losses were considerable along the fertile Missouri and Mississippi River flood plains, and 50 businesses and 300 mobile homes were damaged. Some of these areas had never been flooded (Jefferson City Post-Tribune, 1993b). At different times during the 1993 flooding, most highway bridges and railroad lines across the Missouri and Mississippi River valleys (Portage des Sioux Bottom) were closed to traffic (fig. 7).

EXPLANATION

- Area inundated by flood of August 1-3, 1993
- Surface-water contour—Shows flood-peak elevation. Interval: 1 foot. Datum is sea level.
- Surface-water contour—Shows flood-peak elevation. Contour spacing condensed due to impracticality. Interval range in feet. Datum is sea level.
- Direction of flow of the Missouri and Mississippi Rivers
- U.S. Geological Survey streamflow and stage-gaging station number, and flood-peak elevation, in feet above sea level
- Missouri River or Mississippi River flood-peak site—Number is flood-peak elevation, in feet above sea level
- Missouri River-mile marker—Number is distance upstream from mouth, in miles
- Mississippi River-mile marker—Number is distance upstream from mouth of Ohio River, in miles
- Illinois River-mile marker—Number is distance upstream from mouth, in miles
- State Highway 370

U.S. Geological Survey gaging station location and number
U.S. Army Corps of Engineers gaging station location
Area inundated by flood of August 1-3, 1993
Study area of this sheet showing 7.5-minute topographic maps used
City limit

Index to area covered by each sheet of this Atlas, study area on this sheet, and location of selected gaging stations in St. Louis and vicinity, Missouri.

Scale 1:24,000
1 MILE
1 KILOMETER
TOPOGRAPHIC CONTOUR INTERVAL 10 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929

Base from U.S. Geological Survey, St. Charles, Grafton, and St. Louis, Missouri, 1:24,000 scale (Photorevised 1980 and 1974); and Jefferson City, Missouri, 1:24,000 scale (Photorevised 1982).

Figure 7. The Missouri River and Mississippi River flood-peak elevations and extent of flooding during August 1-3, 1993, in St. Charles and vicinity, Missouri.

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DELINEATION OF FLOODING WITHIN THE UPPER MISSISSIPPI RIVER BASIN—FLOOD OF AUGUST 1-3, 1993, IN ST. LOUIS AND VICINITY, MISSOURI—ST. CHARLES AND VICINITY

Figure 8. Water surface elevations of the Missouri River at St. Charles, Missouri, June through August 1993 (USGS stage-gaging station 06587450).

Figure 9. Water surface elevations and discharges of the Mississippi River at Grafton, Illinois, June through August 1993 (USGS streamflow-gaging station 05587450).

Figure 10. The 1993 flood-peak elevations and profile and the Federal Emergency Management Agency 100- and 500-year flood profiles (U.S. Department of Housing and Urban Development, 1993b, panels 138-140) along the Missouri River at St. Charles and vicinity, Missouri.

Figure 11. The 1993 flood-peak elevations and profile and the Federal Emergency Management Agency 100- and 500-year flood profiles (U.S. Department of Housing and Urban Development, 1993c) along the Mississippi River near St. Charles and vicinity, Missouri.

Figure 12. Aerial view of the Missouri River flooding during August 1-3, 1993, near State Highway 370 at St. Charles, Missouri, looking west photograph from the Missouri Highway and Transportation Department.

Figure 13. The 1993 Missouri River flood-peak elevations and profile (contour lines).

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