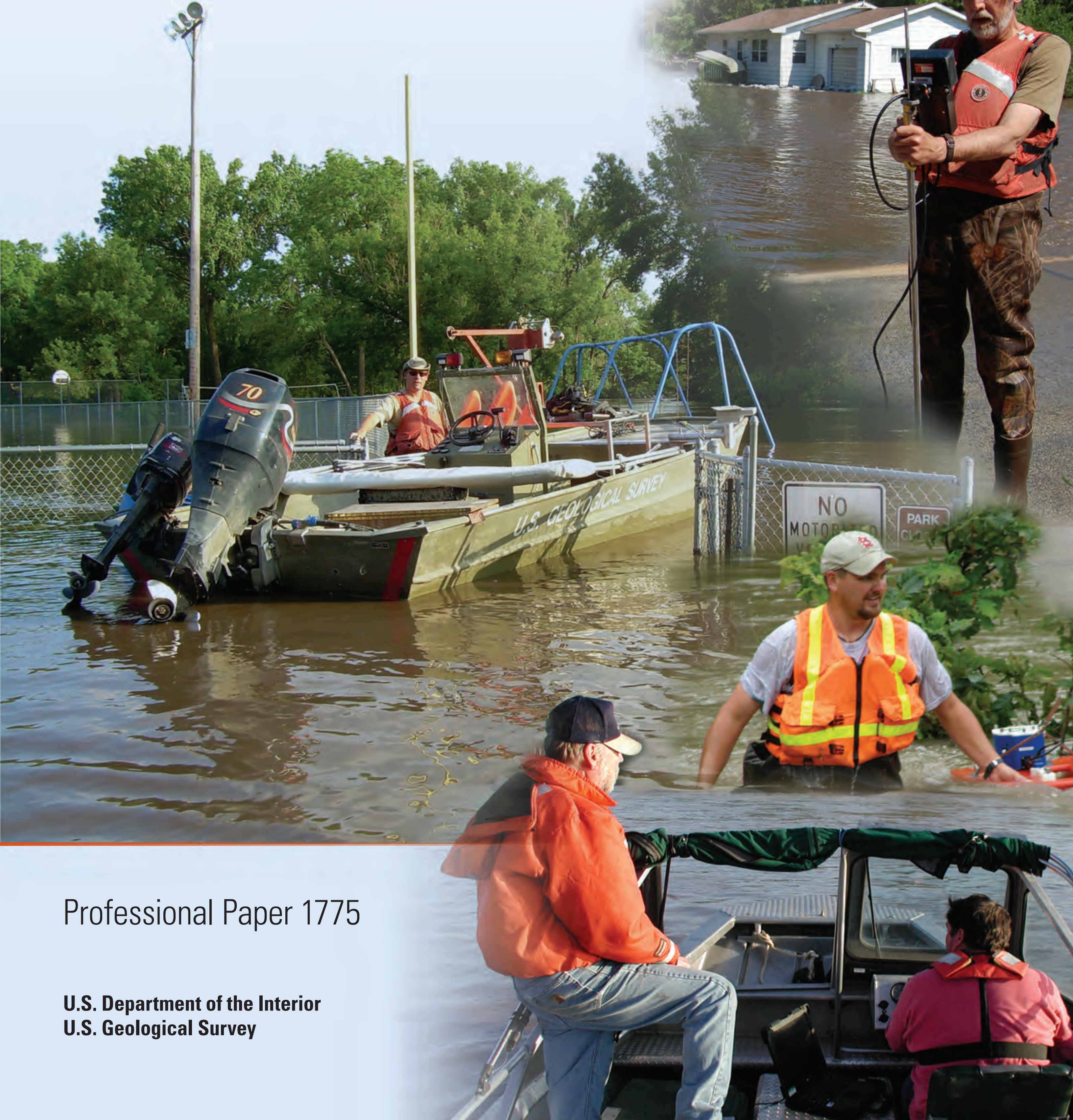
# Flooding in the United States Midwest, 2008




Professional Paper 1775

**U.S. Department of the Interior**
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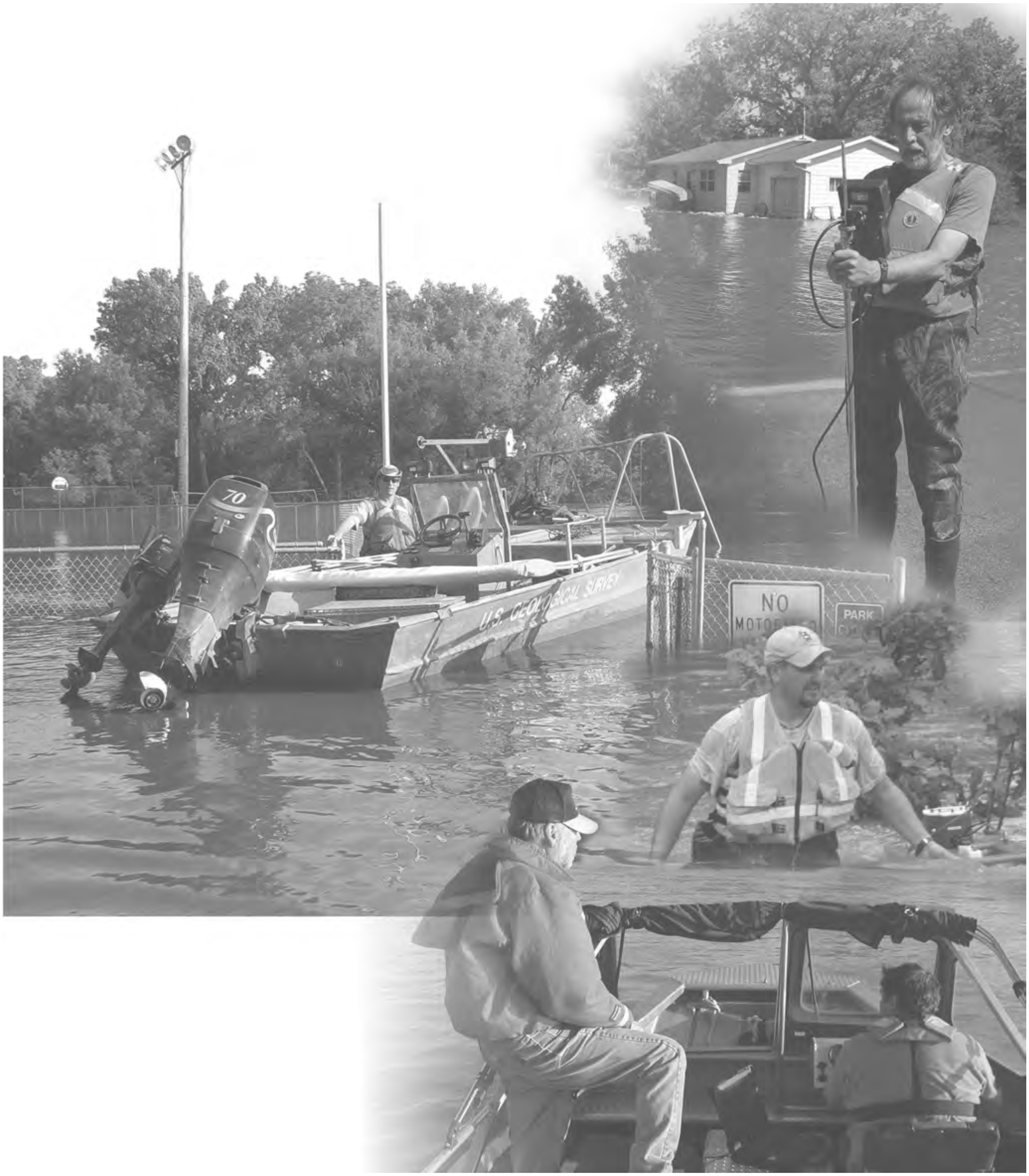


**Front cover.**
Left center: USGS personnel launching boat in Janesville, Iowa park. Boat was used to access the streamgage on the Cedar River at Janesville, Iowa (USGS streamgage 05458500). Photograph by Scott Strader, USGS.
Upper right: USGS hydrographer analyzing stream velocity data collected in the road overflow caused by West Fork Cedar Creek in Finchford, Iowa (USGS streamgage 05458900). Photograph by Don Becker, USGS.
Center right: USGS hydrographer retrieving streamflow measurement instrument temporarily lodged in overbank trees on Long Branch Creek at Atlanta, Missouri (USGS streamgage 06906150). Photograph by C. Shane Barks, USGS.
Lower right: USGS hydrographers making a measurement of streamflow on the Gasconade River at Jerome, Missouri (USGS streamgage 06933500). Photograph by Richard Huizinga, USGS.

# Flooding in the United States Midwest, 2008

By Robert R. Holmes, Jr., Todd A. Koenig, and Krista A. Karstensen

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**U.S. Department of the Interior**
KEN SALAZAR, Secretary

**U.S. Geological Survey**
Marcia K. McNutt, Director

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*USGS hydrographer inspecting the gage house on the Current River near Doniphan, Missouri (USGS streamgage 07068000). Photograph by Paul Rydlund, USGS.*

USGS hydrographer measuring streamflow on the Meramec River near Eureka, Missouri (USGS streamgage 07068000). Photograph by Paul Rydlund, USGS

# Tables



# Conversion Factors

Inch/Pound to SI

| **Multiply** | **By** | **To obtain** |
|---|---|---|
| | Length | |
| foot (ft) | 0.3048 | meter (m) |
| mile (mi) | 1.609 | kilometer (km) |
| | Area | |
| square mile ($mi^2$) | 259.0 | hectare (ha) |
| square mile ($mi^2$) | 2.590 | square kilometer ($km^2$) |
| | Volume | |
| | Flow rate | |
| foot per second (ft/s) | 0.3048 | meter per second (m/s) |
| cubic foot per second ($ft^3/s$) | 0.02832 | cubic meter per second ($m^3/s$) |

# Glossary

Note: Glossary definitions are taken from Langbein and Iseri (1960) whenever possible

**Annual exceedance probability (AEP)** The probability, or chance, of a flood of a given streamflow magnitude being equaled or exceeded in any given year. The probability can be expressed as a fraction, decimal, or percentage.

**Annual exceedance probability flood quantile (AEP flood quantile)** The value of the peak streamflow that corresponds to a particular annual exceedance probability (for example, 1-percent AEP flood quantile)

**Bulletin 17B** Report by the Interagency Advisory Committee on Water Data, published in 1982, that delineates the recommended method for flood-probability analysis in the United States.

**Confidence Limits** To gauge the accuracy of an approximation based on a probability distribution, upper and lower confidence limits can be estimated based on the properties of the probability distribution. This report includes the 95-percent confidence limits of the estimate of the flood quantiles as computed by the methods outlined in Bulletin 17B.

**Discharge** In its simplest concept discharge means outflow; therefore, the use of this term is not restricted as to course or location, and it can be applied to describe the flow of water from a pipe or from a drainage basin.

**Flood** An overflow or inundation that comes from a river or other body of water, and causes or threatens damage.

**Flood Peak** The highest value of the stage or streamflow attained by a flood; often designated as peak stage or peak streamflow respectively.

**Flood Quantile** See “Annual Exceedance Probability Flood Quantile”

**Flood Stage** The stage at which overflow of the natural banks of a stream begins to cause damage in the reach in which the water surface elevation is measured.

**Hydrograph** A graph showing stage, streamflow, velocity, or other property of water with respect to time.

**Log-Pearson Type III Probability Distribution (LPIII)** One of the family of probability distributions developed by Karl Pearson that is used in the United States as a best-fit for the distribution of annual peak flood streamflows in the Bulletin 17B analysis procedures developed by the Interagency Advisory Committee on Water Data (1982).

**Peak-of-Record Streamflow** The largest instantaneous streamflow value for the period that data have been collected.

**Peak Stage** See “Flood Peak.”

**Peak Streamflow** See “Flood Peak.”

**Precipitation** As used in hydrology, precipitation is the discharge of water, in liquid or solid state, out of the atmosphere, generally upon a land or water surface. It is the common process by which atmospheric water becomes surface or subsurface water. The term “precipitation” is also commonly used to designate the quantity of water that is precipitated.

**Probability** A means to express the likelihood of something occurring, also known as chance. The probability can be expressed as a fraction, decimal, or percentage.

**Probability Distribution** Describes the range of possible values that a random variable can attain and the probability that the value of the random variable is within any subset of that range.

**Rating Curve** A graph showing the relation between the stage (gage height), usually plotted as the ordinate, and amount of water flowing in the channel (streamflow) expressed as volume per unit time, plotted as abscissa.

**Recurrence Interval** The average interval of time within which the given flood is expected to be equaled or exceeded once.

**Regional Regression Equation** Equation developed through use of regression techniques that relate the flood-probability data at many streamgages in a region to the basin characteristics of the streams monitored by the streamgages. For any location along a stream, a user can enter the basin characteristics (drainage area, basin slope, etc.) as independent variables into the equations and compute various flow characteristics (for example, 1-percent AEP flood quantile, 2-percent AEP flood quantile, and annual mean streamflow).

**Stage** Height of a water surface above an established datum, also known as gage height.

**Streamflow** The discharge that occurs in a natural channel. Although the term discharge can be applied to flow in a canal, the word streamflow uniquely describes the discharge in a surface stream course. The units of measurement often are reported in cubic feet per second ($ft^3/s$).

**Streamgage** A particular site on a stream where a record of streamflow is obtained.

**Trend** The change of a particular variable with either time or spatial location as computed by statistical analysis.

**Trend Magnitude** The value of the trend as computed by a statistical analysis.

*USGS streamgage on the Meramec River near Eureka, Missouri (USGS streamgage 07019000). Photograph by Robert Holmes, USGS.*

*Flooding at Burlington Street Bridge over the Iowa River at Iowa City, Iowa, July 2008. Photograph by James Caldwell, USGS.*

# Flooding in the United States Midwest, 2008

By Robert R. Holmes, Jr., Todd A. Koenig, and Krista A. Karstensen


## Abstract

During 2008, record precipitation amounts, coupled with already saturated soils, resulted in flooding along many rivers in the United States Midwest. Separate flooding events occurred in January, February, March, April, May, June, July, and September of 2008. The June floods were by far the most severe and widespread with substantial (and in places record) flooding and damage occurring in Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, Oklahoma, South Dakota, and Wisconsin. Indiana had the most recurrent flooding during 2008, with peak-of-record streamflows occurring during January, February, March, June, and September. During 2008, peak-of-record streamflows were recorded at more than 147 U.S. Geological Survey (USGS) streamgages. The annual exceedance probability of the peak streamflows at 26 streamgages was less than 0.2 percent and between 0.2 and 1 percent at 67 streamgages. Trends in flood magnitudes were computed for USGS Midwest streamgages that had no regulation. No Midwest-wide systematic trends upward or downward were evident, although clusters of consistent trends (both upward and downward) were detected in parts of the Midwest.


## Introduction

Flooding occurred on numerous rivers throughout the Midwestern United States (hereafter referred to as the Midwest) at various times during 2008 (fig. 1). The Midwest, and in particular the southern Midwest, has been identified as an area of the conterminous United States where the largest flood streamflows are likely to occur because of the close proximity of subtropical moisture from the Gulf of Mexico (O'Connor and Costa, 2003). This tendency toward large floods was dramatically displayed in 2008 as flooding dominated the media for weeks, with reports of property destruction, evacuations, and loss of life. At various times during 2008, flooding in the Midwest occurred in parts of Arkansas, Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, Oklahoma, South Dakota, and Wisconsin. Examples of the severity of the flooding include the Cedar River, which inundated 14 percent of Cedar Rapids, Iowa, displaced more than 24,000 people, and damaged or destroyed an estimated 5,400 houses and 700 businesses (National Weather Service, 2009). In southwestern Wisconsin, an earthen embankment between Lake Delton and the Wisconsin

*USGS hydrographer making a streamflow measurement on the Salt Fork near Sidney, Illinois (USGS streamgage 03337848). Photograph by Robert Holmes, USGS.*


**Figure 1.** The United States Midwest and general areas of flooding streams, January to September, 2008.

River failed, causing a rapid emptying of Lake Delton and more than $5 million in property destruction (Adams, 2008). In Columbus, Indiana, the Columbus Regional Hospital had more than $125 million in damages (Indiana News Center, 2008), and at least 70 businesses were inundated and suffered damages (Indianapolis Star, 2008). The June 2008 flooding resulted in the loss of 11 lives and damages in excess of $5 billion (National Weather Service, 2009).

The 2008 Midwest floods stand out not only with respect to their cost in human lives, property damage, and environmental effects, but also with respect to their persistence. Separate incidences of flooding occurred over several months in parts of the Midwest; for example, Indiana had severe flooding during January, February, March, June, and September. Because of the severity and unusual repetitiveness of the flooding in parts of the Midwest, documenting the 2008 floods is essential.

Previously published U.S. Geological Survey (USGS) reports provide detailed documentation and analysis of the 2008 flooding in particular geographic areas of the Midwest (Fitzpatrick and others, 2008; Funkhouser and Eng, 2008; Morlock and others, 2008), and two of these reports contain flood-inundation maps for selected rivers in Indiana and Wisconsin. This report consolidates the flooding information and documents the flood peaks (stage and streamflow) for all States in the Midwest that were affected by the 2008 floods. Flood peak data are reported for USGS streamgages in the Midwest that had peak streamflows with an annual exceedance probability (AEP) of less than 10 percent. AEP is the probability, or chance, of a flood of a given streamflow magnitude being equaled or exceeded in any given year. In addition, flood peak data for selected streamgages, which had AEPs greater than 10 percent, also are included to aid in comparing the 2008 floods with previous floods. Documenting the flood peaks, along with the antecedent conditions, flood chronology, AEP, and flood trends, will help put the 2008 floods in historic context and facilitate public and private consideration of flood-control, land-use, and flood-insurance regulations by local and regional citizens and elected officials.

*Wabash River at Riverton, Indiana (USGS streamgage 03342000). Photograph by Paul Baker, USGS.*

## The Role of the U.S. Geological Survey in Flood Response

The USGS was established in 1879 by Congress to classify the public lands and "examine the geological structure, mineral resources, and products of the national domain" (Rabbitt, 1989). As part of this mission, the USGS provides practical, unbiased information about the Nation's rivers and streams that is crucial in mitigating hazards associated with floods. Some of the scientific investigations conducted by the USGS that include data collection and scientific interpretation to address flood issues include the following:

- Operating a nationwide network of long-term streamgages;
- Determining and documenting high water-mark elevations;
- Constructing inundation maps;
- Determining peak streamflow at miscellaneous locations by using indirect methods;
- Collecting remotely-sensed geospatial information;
- Analyzing trends, geographic distribution, and flood probabilities;
- Determining paleoflood occurrence, timing, and magnitude; and
- Modeling flood processes, including rainfall-runoff, flood wave movement, multidimensional hydraulics of floods, and sediment transport.

The operation of more than 7,500 active streamgages nationwide enables the USGS to provide data for a variety of needs, with one of the most important needs being flood prediction and characterization. USGS streamgages provide critical real-time streamflow and stage data during flooding events to support the operational programs of the National Weather Service (NWS; flood forecasting), U.S. Army Corps of Engineers (USACE; water-control, flood-fighting, and mitigation activities), Federal Emergency Management Agency (FEMA; emergency management and mitigation), and numerous State and local agencies. The USGS expends extra effort to keep streamgages operational during floods, when damage to the streamgages increases. USGS streamgages operate autonomously for collecting stage data; however, on-site direct streamflow measurements are required and consist of USGS personnel making on-site physical observations of stream velocity and stream depth to determine streamflow. These direct streamflow measurements are required periodically to calibrate the stage-streamflow rating curve (rating curve). The rating curve is used to determine the streamflow from the stage data when USGS personnel are not physically present at the streamgage to make a streamflow measurement.

The need for direct streamflow measurement (fig. 2) to calibrate the rating curve increases during floods, because the rating curve can change as a result of river-channel changes. An example of the changes that can occur in the rating curve that would be detected only by actual field measurements is shown in figure 3. In this figure, two direct streamflow measurements made during flooding in 2008 (numbers 353 and 354, fig. 3) on the Platte River near Kearney, Nebraska, resulted in a more than 1-foot (ft) correction of the rating curve at the upper end (above a stage of 5.9 ft) of the rating. At a streamflow of 15,000 cubic feet per second ($ft^3/s$), the stage on the rating curve changed by 1.2 feet, from approximately 7.0 to 8.2.

The importance of accurate rating curves is demonstrated by examination of the potential impact of an incorrect rating curve on the flood-forecasting operations of the NWS. The NWS uses USGS rating curves as part of their forecasting process to estimate the forecasted stream stage from their computer-model prediction of forecasted streamflow. Based on the example in figure 3, if the original rating curve had been used, a NWS computer-model prediction of 15,000 $ft^3/s$ would have resulted in the NWS predicting a corresponding stage of 7.0 ft. In actuality, as the new rating indicates, the stage would have been approximately 8.2 ft. In the absence of the USGS rating curve calibration efforts, an under-prediction of approximately 1.2 ft would have occurred, with potentially serious implications for life and property.

To meet critical needs for real-time streamflow data, the USGS mobilizes all available field personnel in areas of flooding to make direct streamflow measurements and maintain streamgages in operational readiness. The rapid response of USGS field personnel provides reliable and accurate stage and streamflow data in near real time to the many entities that rely on these data while minimizing interruptions in the dissemination of data that would hamper flood-response operations. During the June 2008 flooding, the USGS made 449 direct streamflow measurements throughout the Midwest to ensure the accuracy of the rating curves.


*USGS hydrographer determining the outside stage for the Skillet Fork near Wayne City, Illinois (USGS streamgage 03380500). Photograph by Robert Holmes, USGS.*

**Figure 2.** U.S. Geological Survey hydrographer measuring streamflow on the Platte River near Sharps Station, Missouri (USGS streamgage 06821190), with an acoustic Doppler current profiler (ADCP) mounted to a tethered boat to collect velocity and depth readings that are sent by radio link to a laptop computer inside the field vehicle. The gage house for this site can be seen in the background. Photograph by Chris Rowden, USGS.

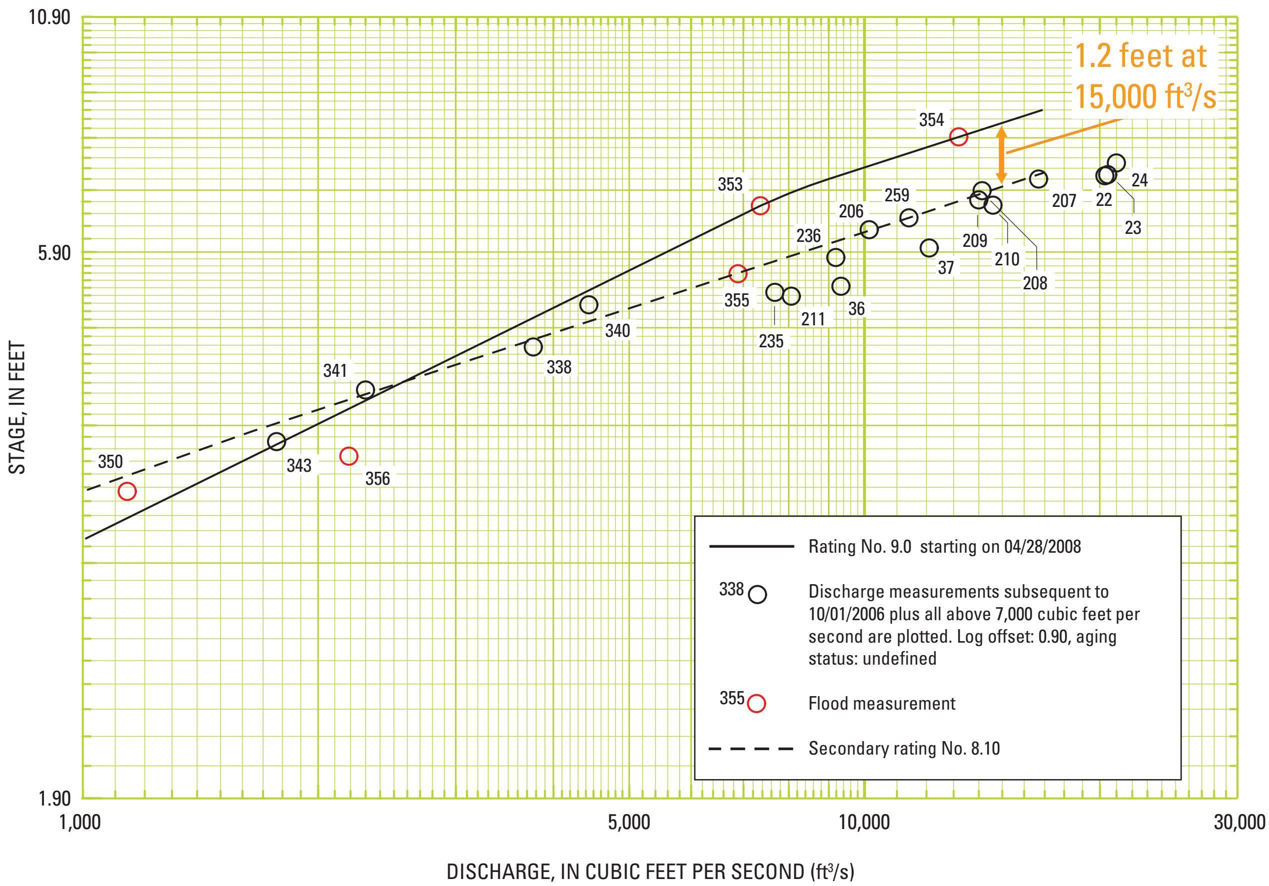



**Figure 3.** Changes in the rating curve for the Platte River near Kearney, Nebraska (USGS streamgage 06770200), as a result of on-site direct streamflow measurements made in May 2008.

## 2008 Flooding: Causes, Chronology, and Magnitude

An understanding of the causes of flooding requires some knowledge of hydrology and the hydrologic cycle. The hydrologic cycle is described by Hjelmfelt and Cassidy (1975) as follows:

> "Water occurs in many places and in many phases on, in, and over the earth. The transformation from one phase to another and the motion from one location to another constitutes the hydrologic cycle, which is a closed system having no beginning nor end."

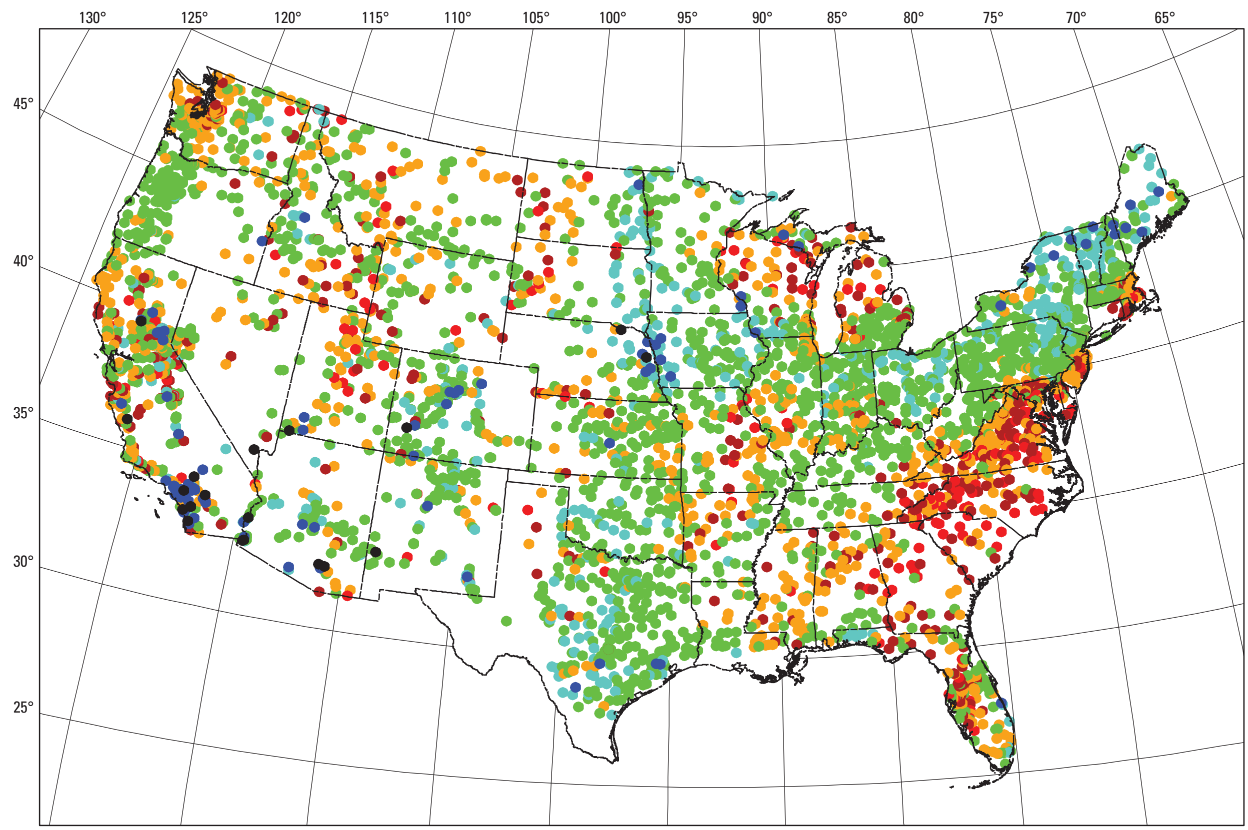
The hydrology of a region as large as the Midwest is complex because of the heterogeneity of the variables controlling the movement of water in the hydrologic cycle: precipitation (source, type, rate, and amount), vegetation, temperature, soil, geology, topography, stream gradient, and man-made structures. In addition, the flood hydrology of small basins is different than that of large basins, with different characteristic causes of flooding. Flooding in small basins often is caused by localized intense precipitation of short duration (minutes to hours). Flooding in large basins often is caused by large amounts of sustained precipitation over a long duration (days to weeks) and broad geographic area.

The 2008 flooding in the Midwest occurred on small and large streams. The area of flooding was widespread and, at various times, included parts of Arkansas, Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, Oklahoma, South Dakota, and Wisconsin. Separate flooding events occurred in January, February, March, April, May, June, July, and September of 2008.

### Antecedent Conditions for the 2008 Midwest Flooding

The genesis of most major widespread flooding is not one particular storm or precipitation event. Most flooding is the result of frequent and consistently abundant precipitation occurring over the same geographic area for an extended period. As the soil becomes increasingly saturated and the receiving streams reach bankfull stage, additional precipitation results in flooding. Much of the area in the Midwest that was affected by flooding in 2008 began in the early winter of 2007 with streamflows in the normal to above-normal ranges (fig. 4). Above-average snowfalls occurred in the northern one-half of the Midwest during the winter of 2007-2008, and the snow accumulated into large snowpacks. In some parts of central Wisconsin, the snowpacks contained the equivalent of 10 to 12 inches (in.) of water (National Weather Service, 2009). Although the melting of the snowpacks was not a direct cause of catastrophic flooding, the melting contributed to the flooding by saturating the soils and filling the streams to near bankfull conditions in numerous locations.

The first flood-inducing precipitation event began on January 7, 2008 (fig. 5). This was the first of many rainfall events that occurred during the next several months across areas of the Midwest, and this event caused major flooding in parts of east-central Illinois and northern, western, and southwestern Indiana. Although this event did not result in severe




Base from U.S. Geological Survey digital data, 1:2,000,000, 2006
Universal Transverse Mercator projection, zone 15

From U.S. Geological Survey WaterWatch, accessed February 3, 2010 (http://water.weather.gov)

0 200 400 600 MILES
0 200 400 600 KILOMETERS

**EXPLANATION**

**Streamflow conditions, in percentile classes**

- High
- Greater than 90, much above normal
- 76 – 90, above normal
- 25 – 75, normal
- 10 – 24, below normal
- Less than 10, much below normal
- Low

**Figure 4.** Streamflow conditions at U.S. Geological Survey streamgages across the United States on November 30, 2007 (U.S. Geological Survey, 2007).


*Flooding on the West Fork Cedar River at Finchford, Iowa. Photograph by Don Becker, USGS.*

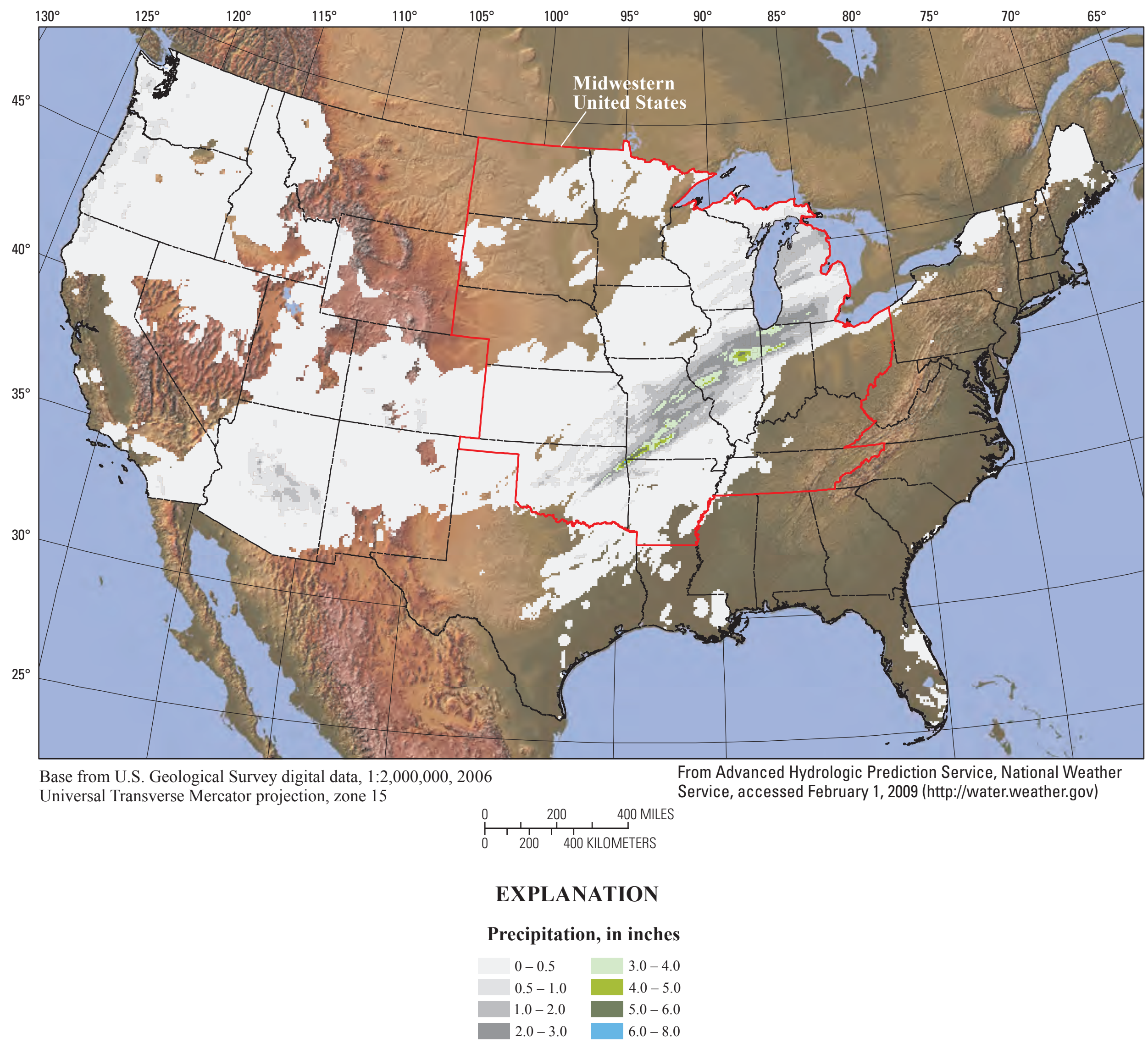



**Figure 5.** Observed precipitation across the United States for the previous 24 hours at 7:00 a.m. Central Standard Time on January 8, 2008. (National Weather Service, 2008a).

*USGS hydrographer measuring the streamflow flowing across U.S. Highway 30 near Cedar Rapids, Iowa. Photograph by Scott Strader, USGS.*

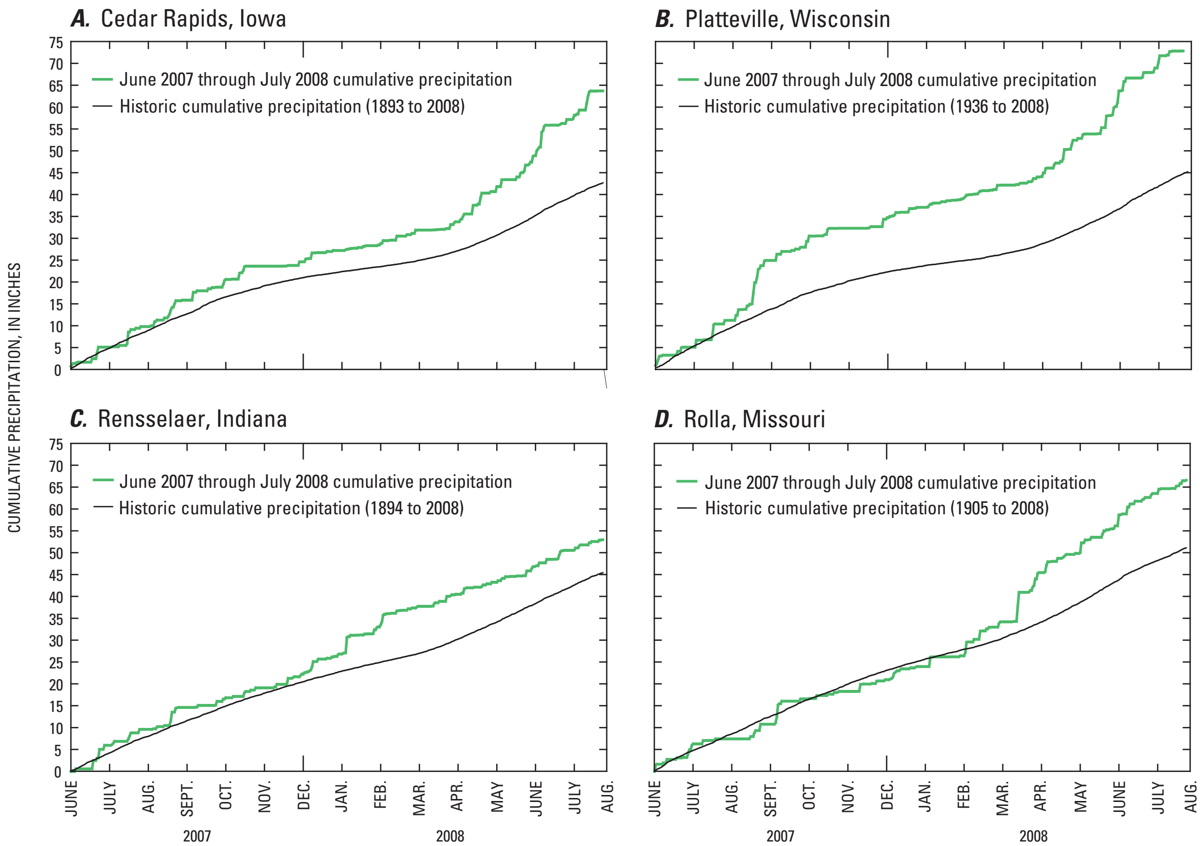



**Figure 6.** Cumulative precipitation totals from June 1, 2007, to July 31, 2008, in relation to historic average cumulative precipitation for selected sites in the Midwest. (National Climatic Data Center, 2008).

flooding outside of Indiana, the widespread rainfall contributed to increased soil-moisture levels and streamflows in other areas of the Midwest. Consistent above-normal precipitation during 2007-2008 occurred in much of the Midwest, as evidenced when comparing the June 2007 to July 2008 cumulative precipitation with historic average cumulative precipitation for four selected precipitation gages in the Midwest (figs. 6*A-D*).

## Chronology and Magnitude of Flooding: January through September 2008

The 2008 Midwest floods were caused by persistent and excessive precipitation amounts on saturated soils. Record 6-month precipitation totals were set at 106 Midwest locations during January through June 2008 (Midwest Regional Climate Center, 2008). The 6-month total precipitation was composed of numerous discrete storm sequences that induced multiple flooding events in different geographic locations. Peak-of-record streamflows were set at 147 USGS Midwestern streamgages during 2008. The USGS streamgages that had peak streamflows with an AEP of less than 10 percent are listed in tables 1–7 (at the back of this report), with each table representing a unique flooding period during 2008. Selected streamgages that reported peak streamflow with AEPs greater than 10 percent also appear in the tables for comparison with other record flood periods [for example, Mississippi River at St. Louis, Missouri, and Wabash River at Terre Haute, Indiana (table 5)]. Each USGS streamgage listed in these tables contains a map "site number" that allows cross reference from the table to the respective map figure for that flood period. To minimize figure clutter, only the major rivers (for example, Illinois, Mississippi, Missouri, Ohio, and Wabash Rivers) and selected small rivers mentioned in the report text for that particular flood period are shown on the figures. The tables include 2008 peak-stage and streamflow data, previous peak-of-record flood data, the estimated AEP for the 2008 peak streamflow, and estimates of the magnitude of the streamflow corresponding to the 4-percent, 2-percent, 1-percent, and 0.2-percent AEP. For each figure corresponding to a particular flood period, the size of the symbol for each streamgage represents the estimated AEP that corresponds to the magnitude of the observed peak streamflow – the less probable (less frequent) the peak streamflow, the larger the symbol.

The first major flooding occurred just after the new year began as the result of precipitation during January 7–9, 2008. Examination of daily NWS Next Generation Weather Radar (NEXRAD) observations indicated as much as 6.7 in. of precipitation occurred during these 3 days (fig. 7) on

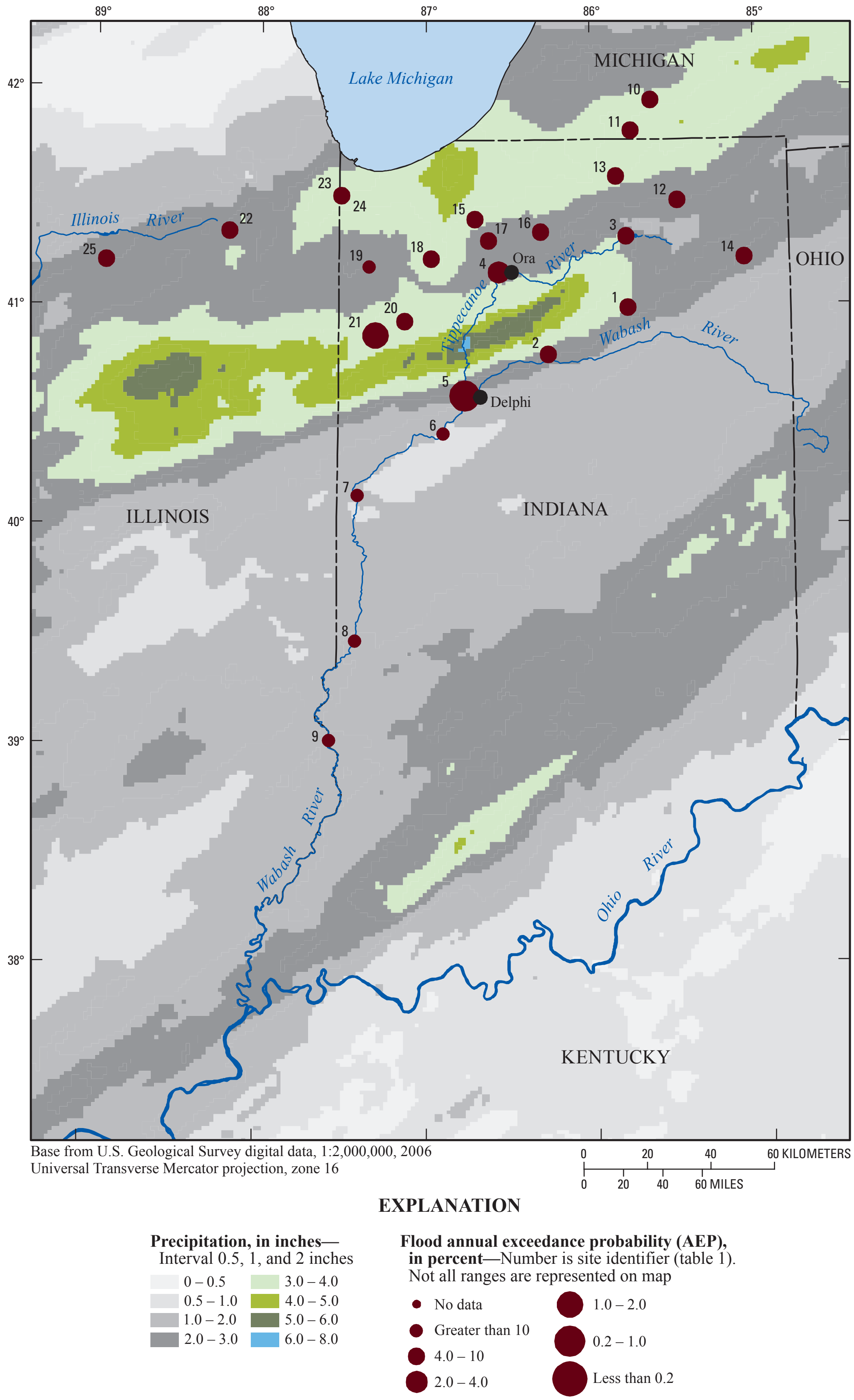



**Figure 7.** Cumulative precipitation totals for January 7–9, 2008, and locations of U.S. Geological Survey streamgages in Illinois, Indiana, and Michigan with peak streamflows that had an annual exceedance probability less than 10 percent.

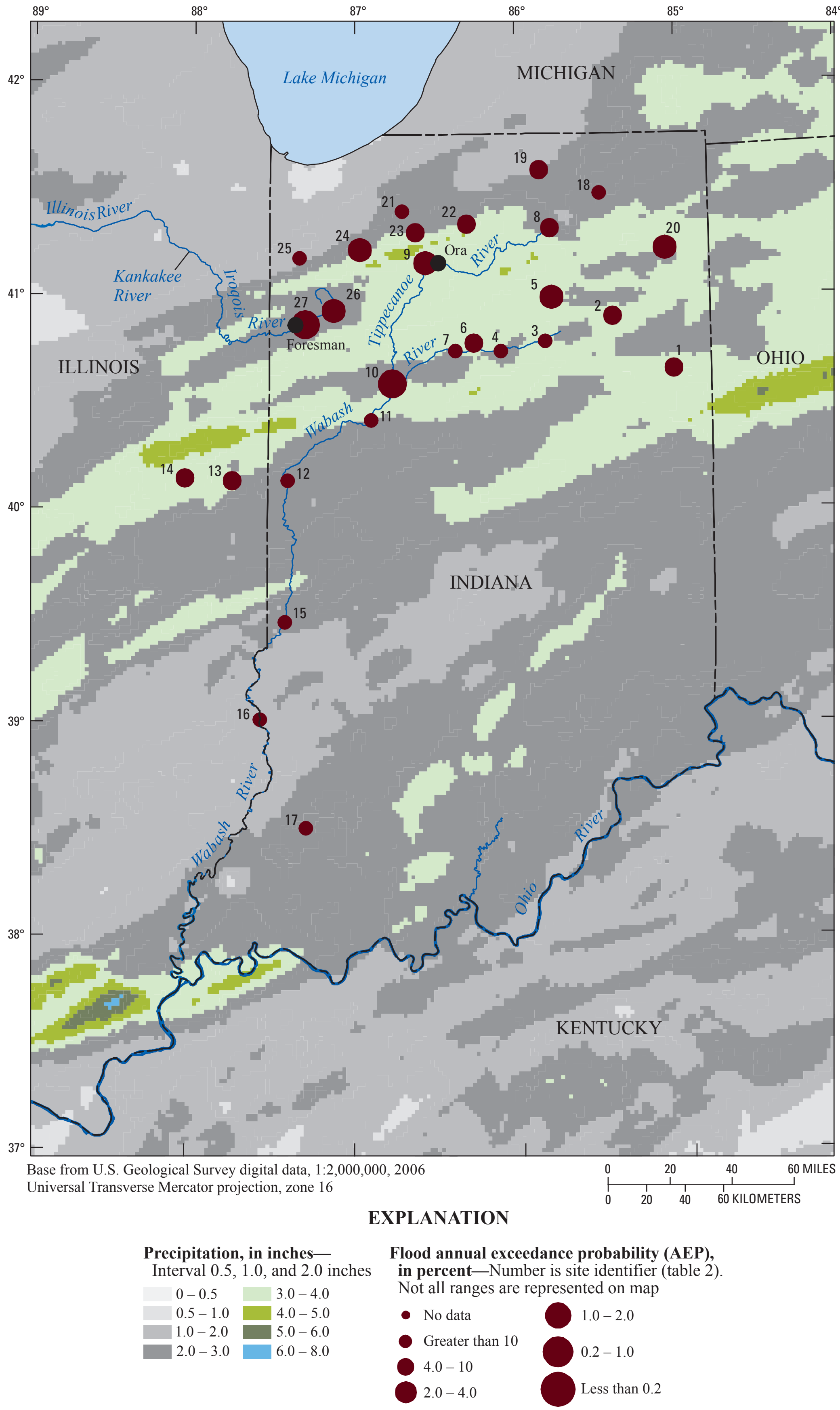
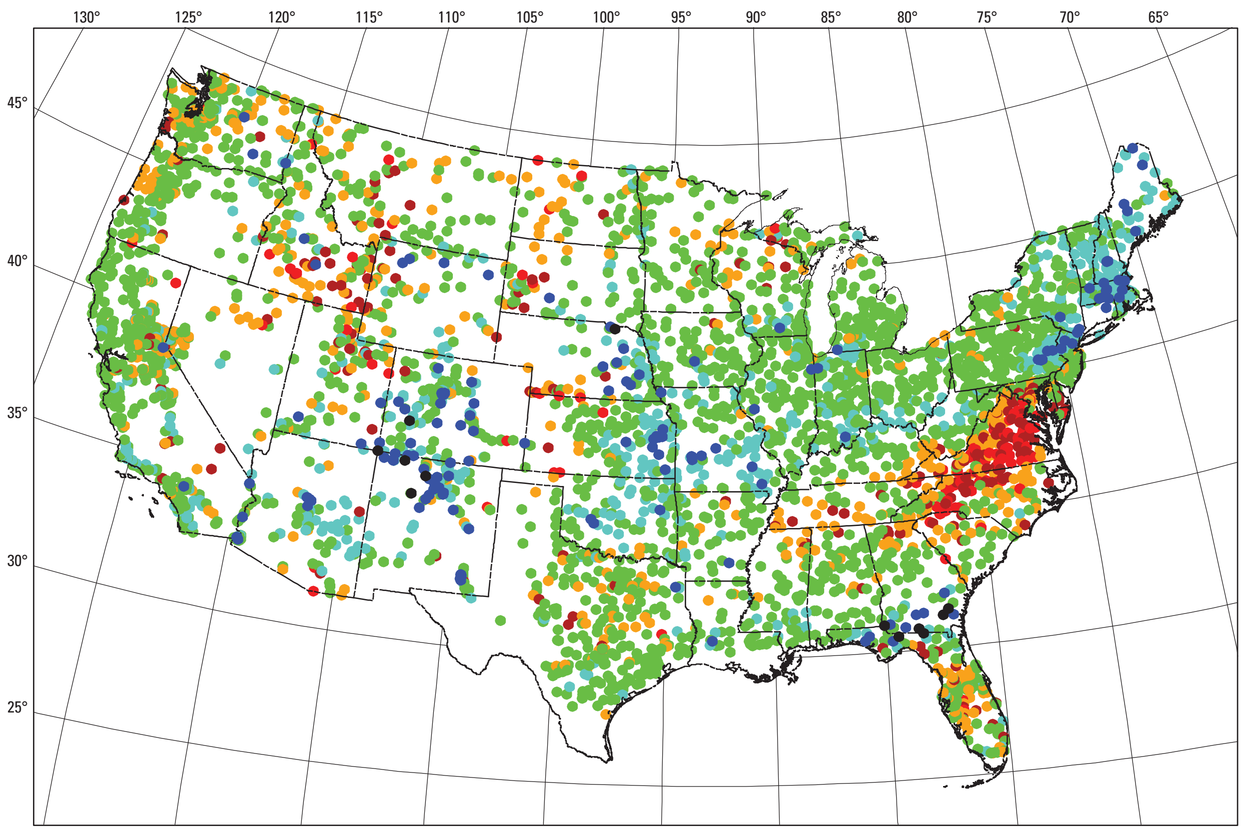



**Figure 8.** Cumulative precipitation totals for February 3–7, 2008, and locations of U.S. Geological Survey streamgages in Illinois and Indiana with peak streamflows that had an annual exceedance probability less than 10 percent.

frozen, often bare, ground, which resulted in major flooding in Illinois, Indiana, and Michigan. Peak-of-record streamflow occurred at USGS streamgages on the Tippecanoe River at Ora and Delphi, Indiana (USGS streamgages 03331500 and 03333050, respectively, table 1).

Precipitation that began on February 3, 2008, and continued through much of February 7 (fig. 8) resulted in an accumulation of up to 6.3 in. and flooding in Illinois and Indiana. The Iroquois River had a peak-of-record streamflow at the Foresman, Indiana, streamgage (USGS streamgage 05524500) that surpassed the 1958 record (table 2). The February flooding occurred in many of the same areas that had flooding during the previous month, with the Tippecanoe River being a prime example of recurrent flooding. The USGS streamgage near Ora, Indiana (USGS streamgage 03331500), had a peak streamflow of 9,200 ft$^3$/s on February 8 (table 2), which was within 90 ft$^3$/s of the January 10 peak streamflow of 9,290 ft$^3$/s (table 1). Although the severe flooding during February was limited to Illinois and Indiana, by the end of February 2008, the additional precipitation across the Midwest resulted in streamflows that were above normal at numerous USGS streamgages in Arkansas, Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, Oklahoma, South Dakota, and Wisconsin (fig. 9).

Substantial rainfall that contributed amounts as much as 12.8 in. occurred during March 16-20, 2008, in a band through Arkansas, Illinois, Indiana, Missouri, and Oklahoma (fig. 10). Most of the rivers in the five-State flood area peaked by March 19, although some of the large basins peaked as late as March 24 (for example, White River near Georgetown,

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**EXPLANATION**

**Streamflow conditions, in percentile classes**

- High
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- Less than 10, much below normal
- Low

**Figure 9.** Streamflow conditions at U.S. Geological Survey streamgages on February 28, 2008 (U.S. Geological Survey, 2007).

Arkansas (USGS streamgage 07076750), table 3). Peak-of-record streamflows occurred on the Spring, White, and Black Rivers in Arkansas; the Castor and James Rivers in Missouri; the South Fork Saline River and Crab Orchard Creek in southern Illinois; and the Blue River and Big Creek in southern Indiana (table 3). Streamflow peaks on the Gasconade River in Missouri were near the flood of record (for example, Gasconade River near Rich Fountain, Missouri (USGS streamgage 06934000), table 3). The town of Harrisburg, Illinois, which is surrounded by a levee to protect it from backwater from the Ohio River approximately 30 miles (mi) away, was inundated by flooding from more than 11.5 in. of rain in less than 48 hours on March 18 and 19, 2008. Local drainage, interior to the levee system, proved to be too much for the pumping system and resulted in more than 44 businesses and 30 homes being flooded. The flooding resulted in an estimated $16.8 million in damages (Fodor, 2009). In Arkansas, one remarkable scene of destruction was captured on video by USGS hydrologic technician Steven B. Franks, (U.S. Geological Survey, 2010) as he witnessed a house that had been washed into the White River floating downstream and colliding with a bridge at the White River at Calico Rock, Arkansas (USGS streamgage 07060500).

Additional flooding occurred in early April 2008 in many of the same areas of Arkansas, Missouri, and Oklahoma as in March. As much as 9.6 in. of rain fell during April 7–11, 2008,

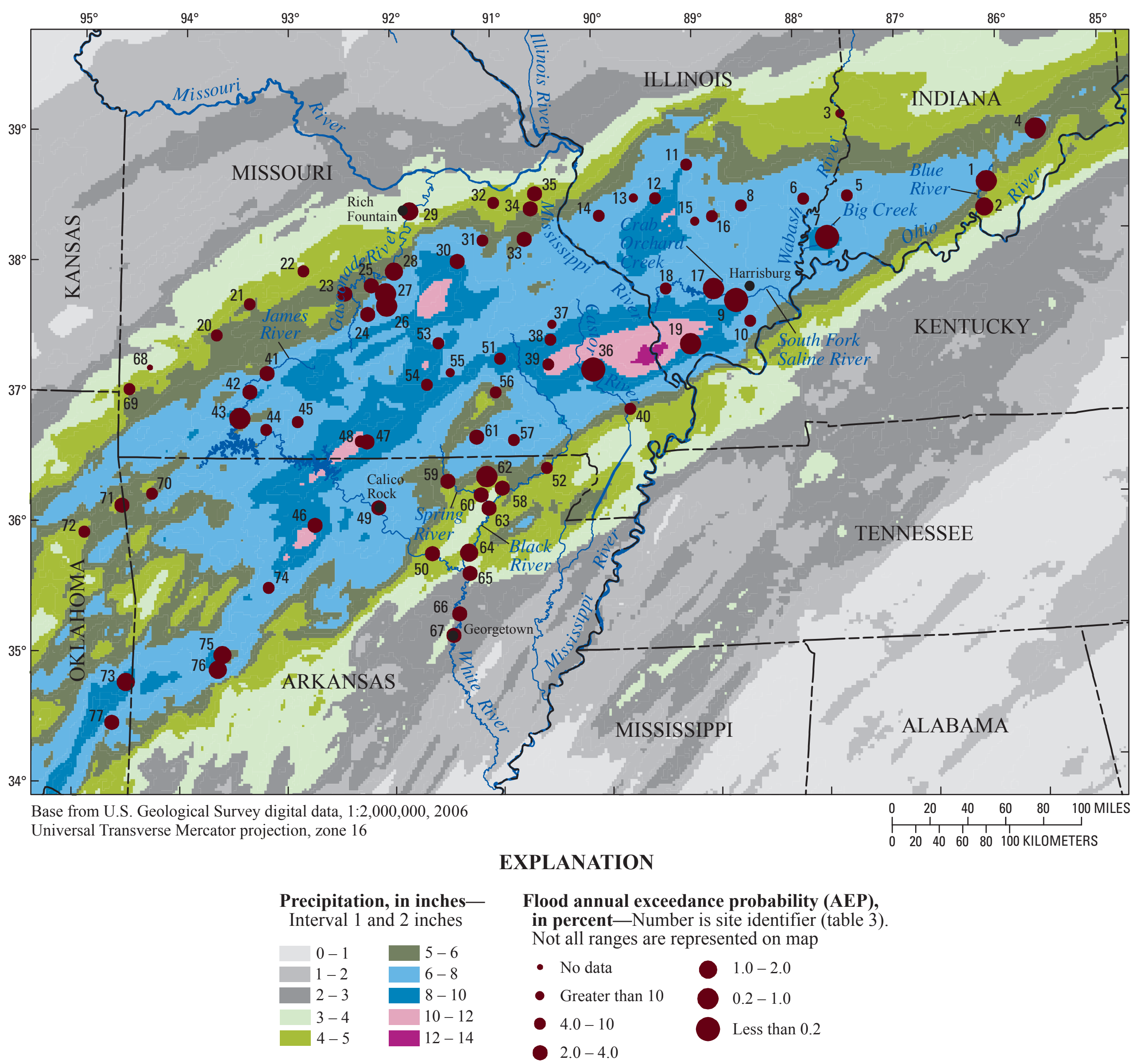


**Figure 10.** Cumulative precipitation totals for March 16–20, 2008, and locations of U.S. Geological Survey streamgages in Arkansas, Illinois, Indiana, Missouri, and Oklahoma with peak streamflows that had an annual exceedance probability less than 10 percent.

which produced flooding along numerous rivers (fig. 11*A*) and peak-of-record streamflow on North Sylamore Creek in Arkansas that exceeded the 1982 record peak streamflow (USGS streamgage 07060710, table 4).

An isolated system in late April produced flooding from up to 6.3 in. of precipitation that fell in eastern Iowa during April 22–26, 2008 (fig. 11*B*). Substantial flooding was limited mostly to streams with drainage areas less than 400 square miles ($mi^2$), such as Black Hawk Creek at Hudson, Iowa (USGS streamgage 05463500), where a peak-of-record streamflow occurred on April 25, 2008 (table 4). Although the late-April precipitation produced only isolated flooding on smaller drainages, it provided additional moisture for continued soil saturation in Iowa.

Substantial rainfalls occurred during May and June throughout much of the Midwest, resulting in some of the worst flooding during 2008. Examination of daily NEXRAD rainfall observations for the Midwest area that included Illinois, Indiana, Iowa, Michigan, Missouri, and Wisconsin indicated that from May 21 to June 14, 2008, precipitation amounts greater than 0.5 in. occurred daily somewhere within the six-State area (National Weather Service, 2008a). Total

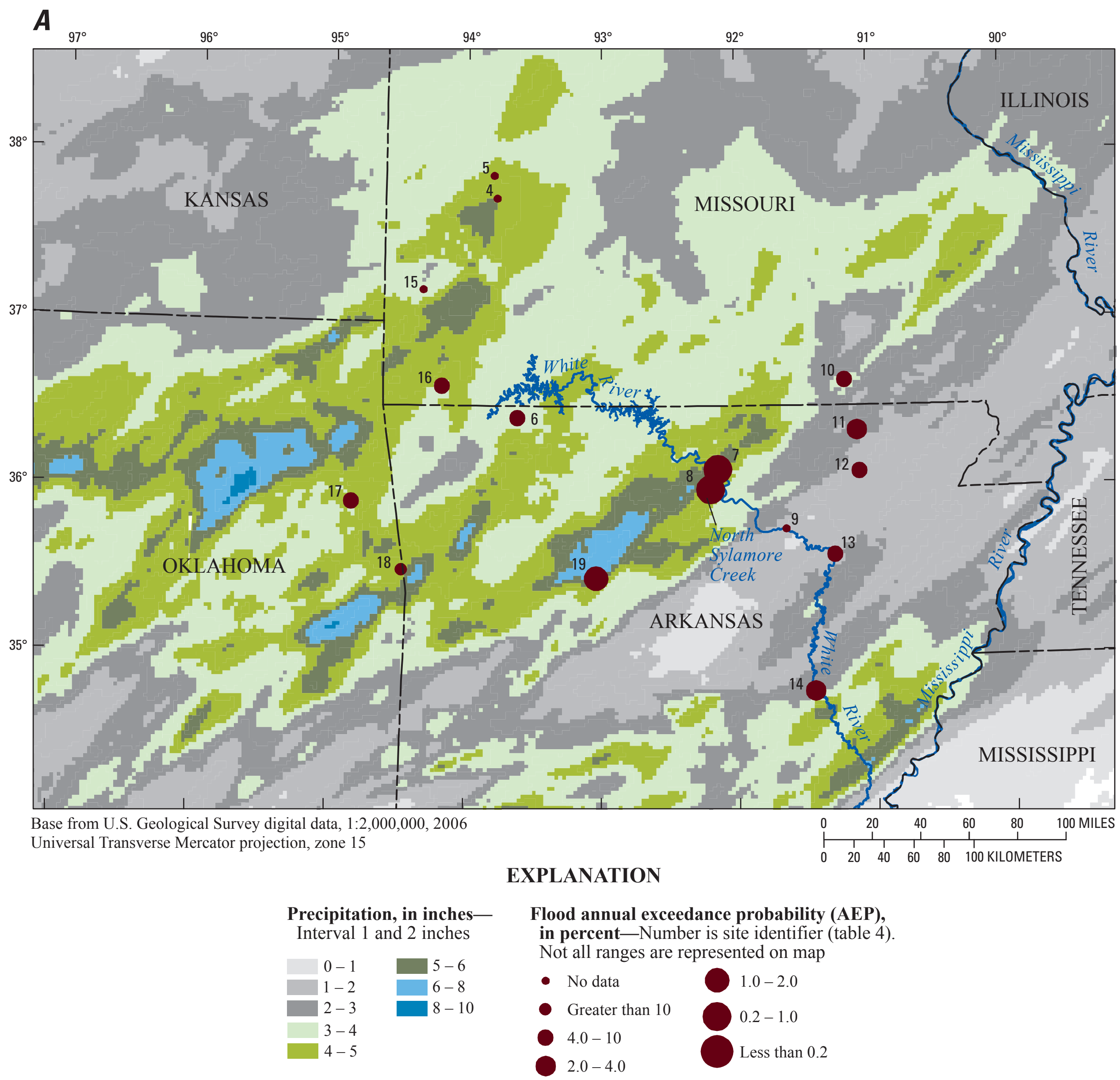


**Figure 11.** Cumulative precipitation totals for *A*, April 7–11, 2008, and locations of U.S. Geological Survey streamgages in Arkansas, Missouri, and Oklahoma with peak streamflows that had an annual exceedance probability less than 10 percent; and *B*, cumulative precipitation totals for April 21–25, 2008, and locations of U.S. Geological Survey streamgages in Iowa with peak streamflows that had an annual exceedance probability less than 10 percent.

precipitation for this 25-day period was more than 20 in. in several locations (fig. 12). The rainfall amounts for this period are considered extreme by the NWS, which determined the annual exceedance probabilities to be between 0.1 to 0.2 percent for the observed rainfall in parts of Iowa, east-central Illinois, and south-central Indiana and less than 0.1 percent for isolated areas in Iowa (fig. 13) (Geoffrey M. Bonnin, National Oceanic and Atmospheric Administration, National Weather Service, Office of Hydrologic Development, written commun., 2008). New June total precipitation records were set at 66 sites in the Midwest (Midwestern Regional Climate Center, 2008). The record precipitation produced 77 peak-of-record streamflows at USGS streamgages during June, particularly in Iowa (39 peak-of-record streamflows) and Wisconsin (19 peak-of-record streamflows). The USGS streamgage at Cedar Rapids, Iowa (USGS streamgage 05464500), recorded a peak streamflow of 140,000 ft$^3$/s on June 13 that was 92 percent greater than the previous peak-of-record streamflow (73,000 ft$^3$/s) set in 1961, and the peak stage of 31.12 ft was 11 ft above the previous peak-of-record stage of 20.00 ft set in 1929 (table 5). Other peak-of-record streamflows were observed at USGS streamgages in Illinois,

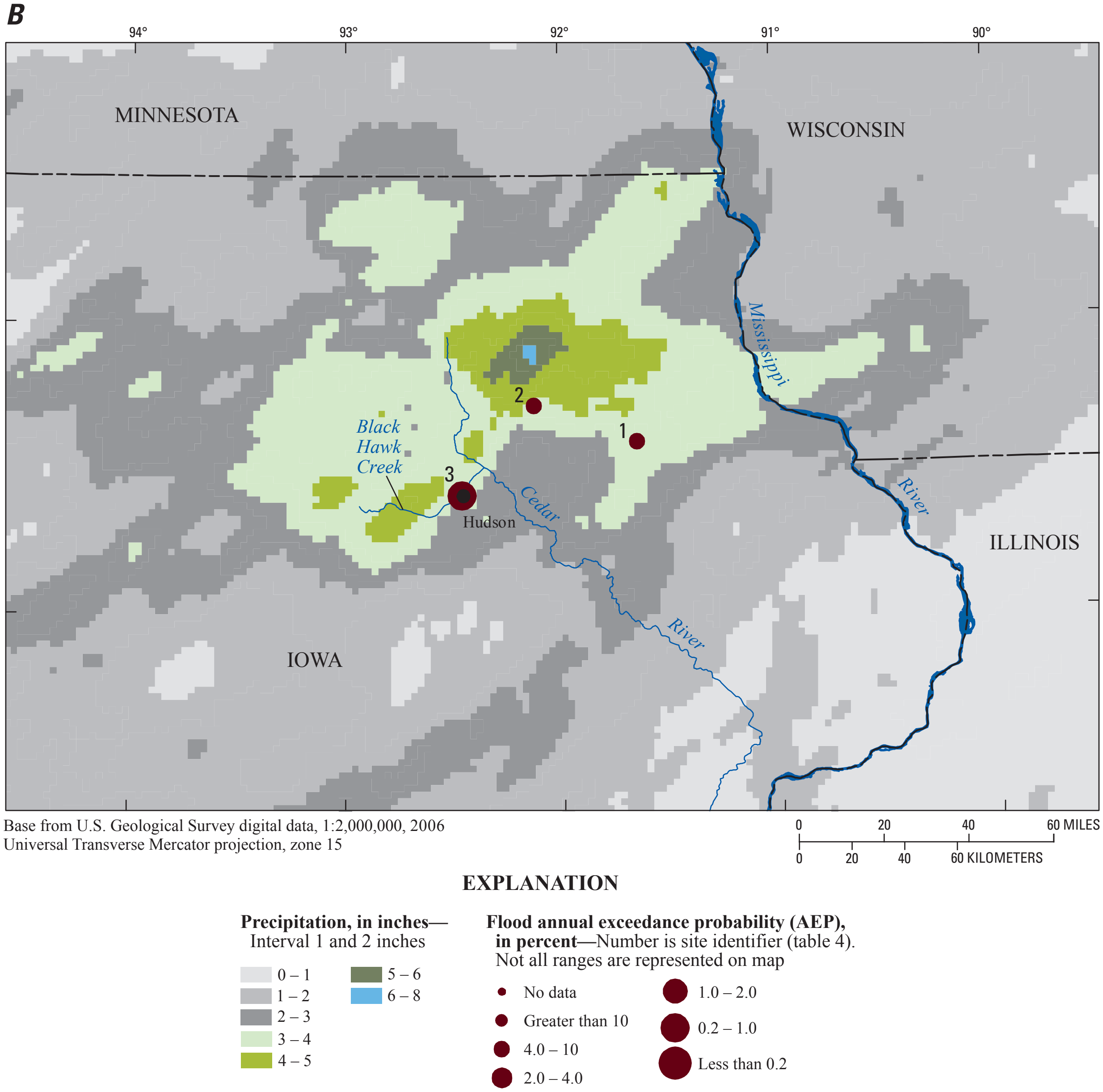


**Figure 11.** Cumulative precipitation totals for *A*, April 7–11, 2008, and locations of U.S. Geological Survey streamgages in Arkansas, Missouri, and Oklahoma with peak streamflows that had an annual exceedance probability less than 10 percent; and *B*, cumulative precipitation totals for April 21–25, 2008, and locations of U.S. Geological Survey streamgages in Iowa with peak streamflows that had an annual exceedance probability less than 10 percent.—Continued

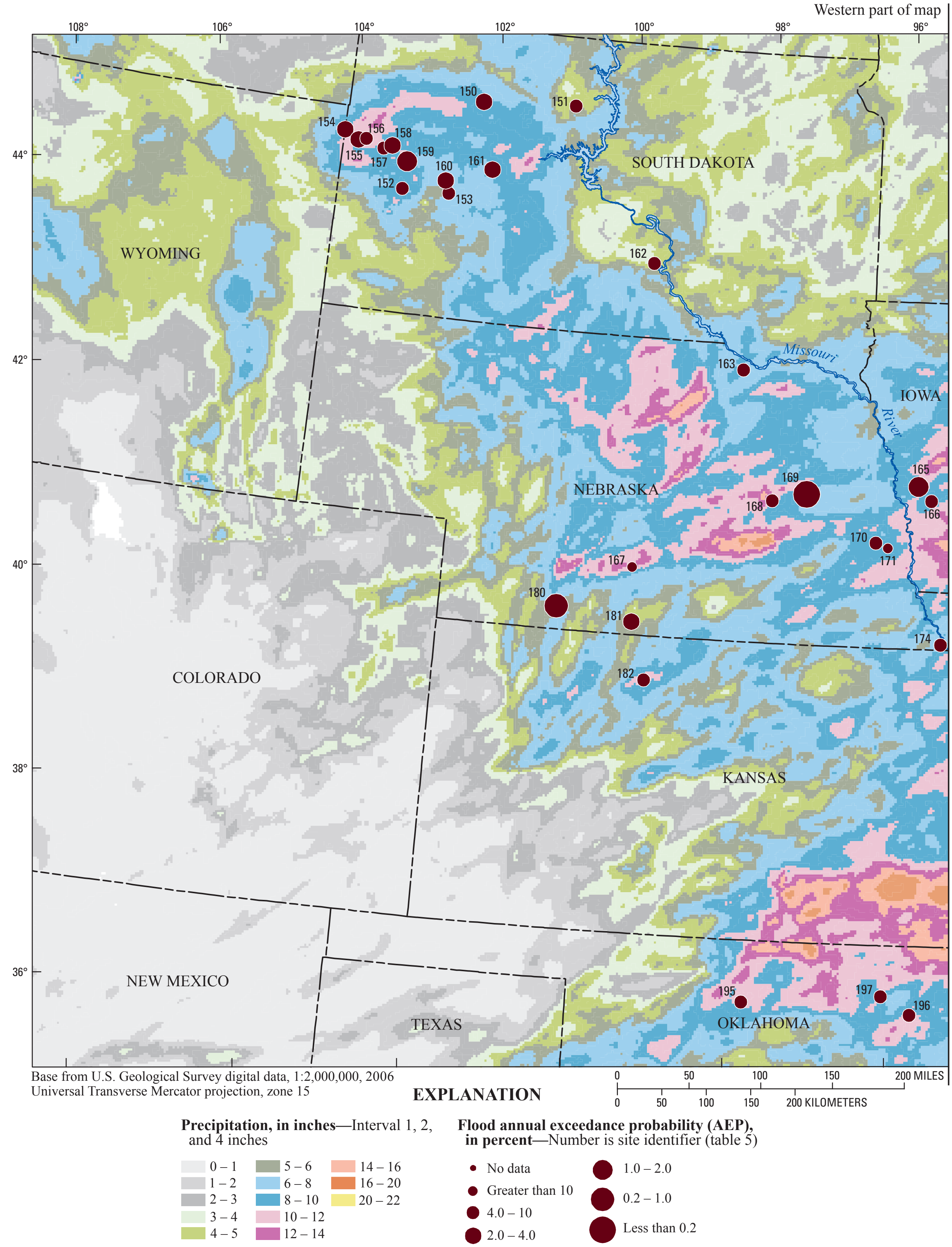


**Figure 12.** Cumulative precipitation totals for May 21 through June 14, 2008, and locations of U.S. Geological Survey streamgages in several Midwestern States with peak streamflows that had an annual exceedance probability less than 10 percent.

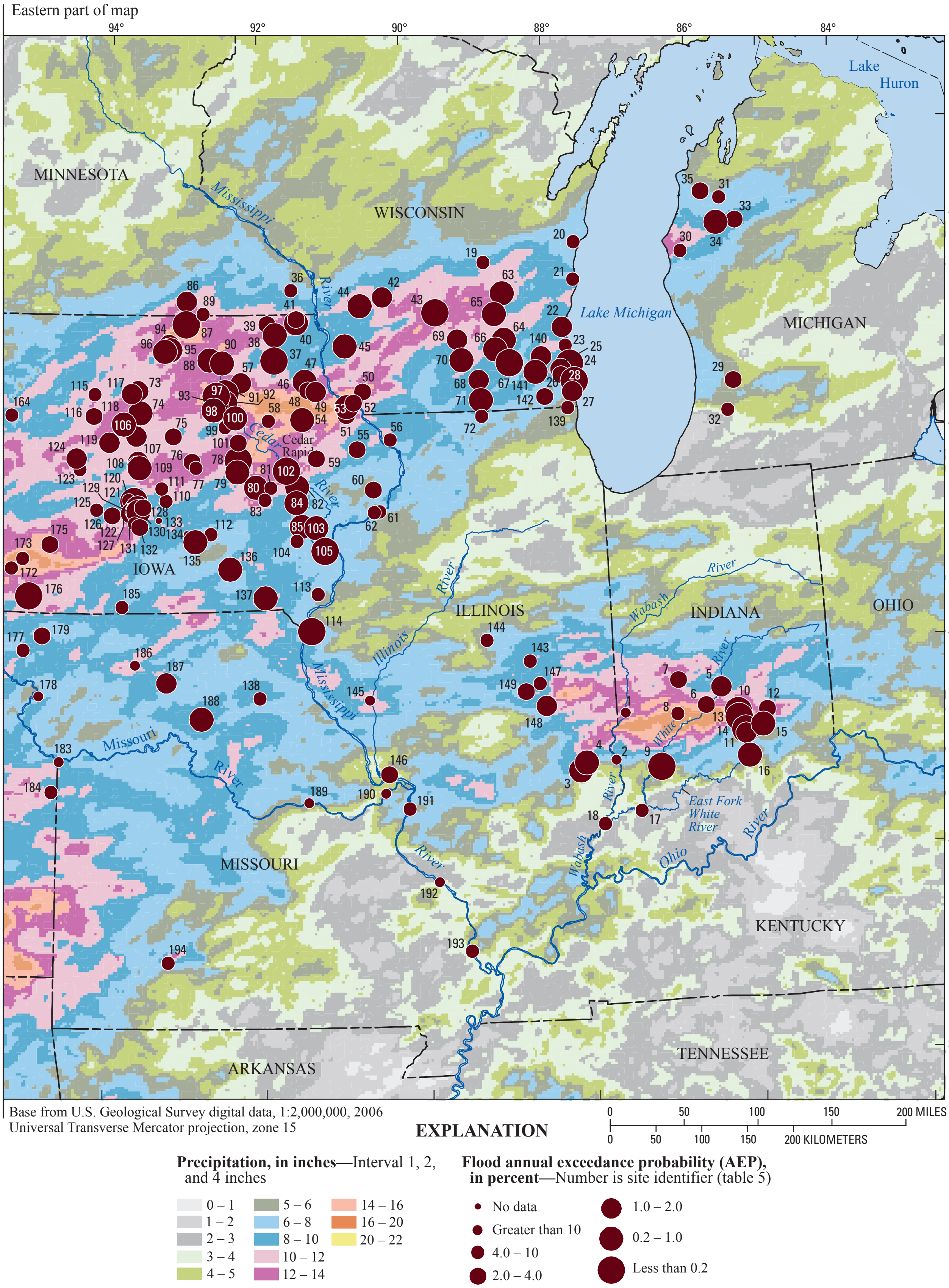


**Figure 12.** Cumulative precipitation totals for May 21 through June 14, 2008, and locations of U.S. Geological Survey streamgages in several Midwestern States with peak streamflows that had an annual exceedance probability less than 10 percent.—Continued

Indiana, Michigan, Nebraska, Oklahoma, and South Dakota. Some locations in Indiana received a third or fourth round of flooding (fig. 14).

July proved to be no drier in southern Iowa and northern Missouri, which had two periods of substantial precipitation and subsequent flooding. Slightly more than 8 in. of precipitation occurred in south-central Iowa during July 5–8, 2008 (fig. 15A), causing peak streamflows on some small and mid-size streams on the order of 2-percent AEP, including the Chariton River near Moulton, Iowa (USGS streamgage 06904010, table 6). More abundant precipitation, as much as 17 in., over a much wider area between July 17 and July 28, 2008 (fig. 15*B*) fell on Iowa and Missouri. The later July precipitation produced new peak-of-record streamflows at USGS streamgages on the Salt and Chariton Rivers in Missouri (table 6).

Hurricanes Gustav and Ike initiated substantial precipitation events in September. The remnants of Hurricane Gustav passed over the Midwest during September 1–5, 2008, by tracking through Arkansas, Missouri, Illinois, and Michigan. Arkansas received the brunt of the precipitation as more than 12 in. of rainfall occurred during this period (fig. 16*A*).

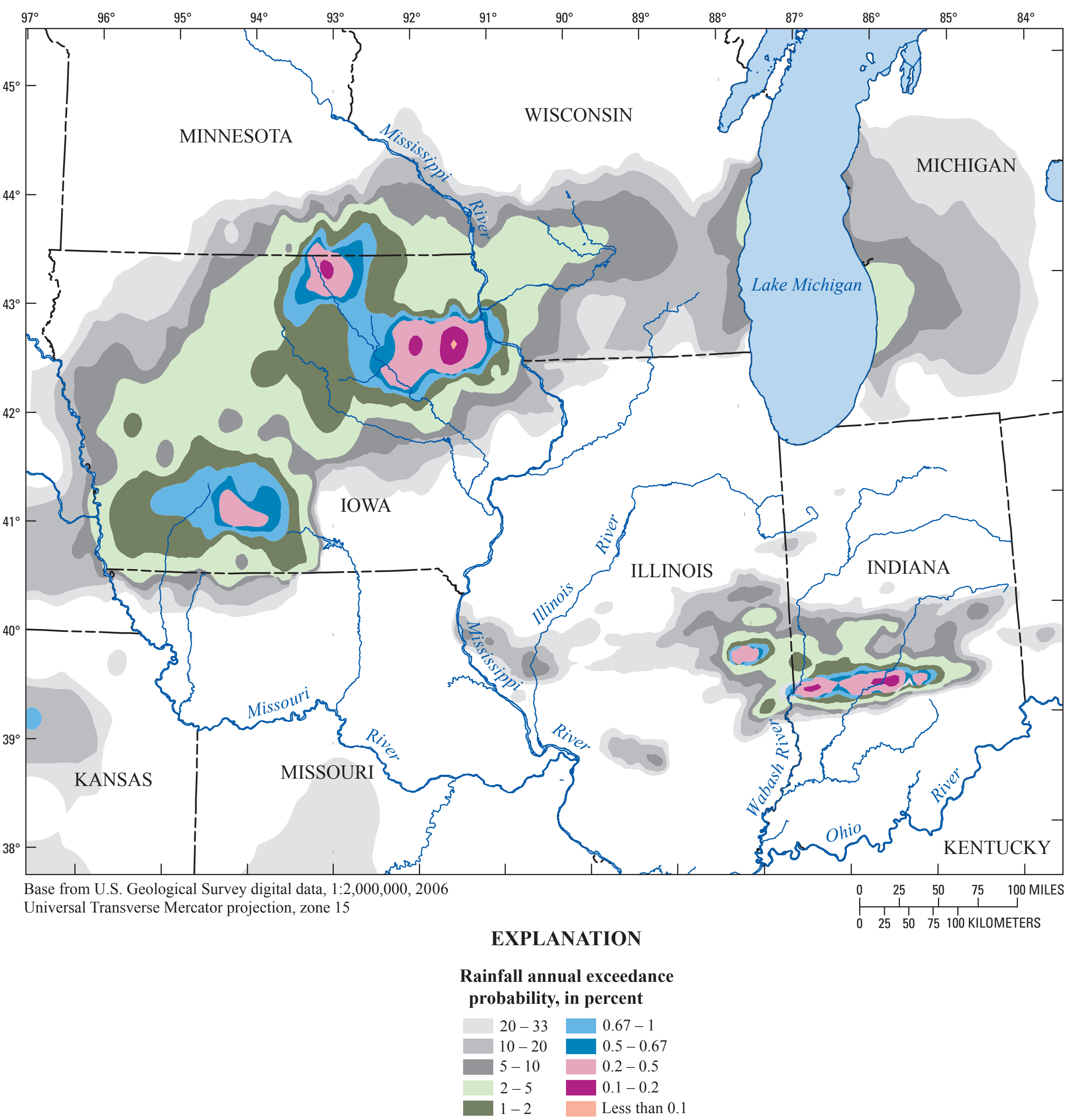


**Figure 13.** Annual exceedance probability for the rainfall total from May 23, 2008, to June 12, 2008 (revised from Geoffrey M. Bonnin, NOAA, National Weather Service, Office of Hydrologic Development, written commun., 2008)

Although no peak-of-record streamflows occurred at USGS streamgages, the peak streamflow at Dutch Creek at Waltreak, Arkansas, and Saline River at Benton, Arkansas (USGS streamgages 07260000 and 07363000, table 7), were near the 1-percent AEP.

During September 13–15, 2008, the remnants of Hurricane Ike passed through Oklahoma, Arkansas, Missouri, Illinois, Indiana, and Michigan along a similar track as Hurricane Gustav earlier in the month. The passage of the remnants of Hurricane Ike was preceded by a continental-type storm event during September 11–13, 2008, that produced more than 12 in. of rainfall in parts of Kansas, which received little of the Hurricane Ike-induced rainfall that followed. Substantial precipitation from a combination of the continental-type storm and the remnants of Hurricane Ike occurred in Arkansas, Illinois, Indiana, Iowa, Michigan, Missouri, and Oklahoma (fig. 16*B*). Numerous peak-of-record streamflows occurred, particularly in the urban areas of St. Louis, Missouri, and Chicago, Illinois (table 7). The River Des Peres in St. Louis flooded, with the loss of two lives and the City of St. Louis temporarily condemning 275 properties in the aftermath of the flood (Gillerman, 2008). One resident reported that this was the sixth time their home had been flooded since 1988 (Gillerman, 2008).

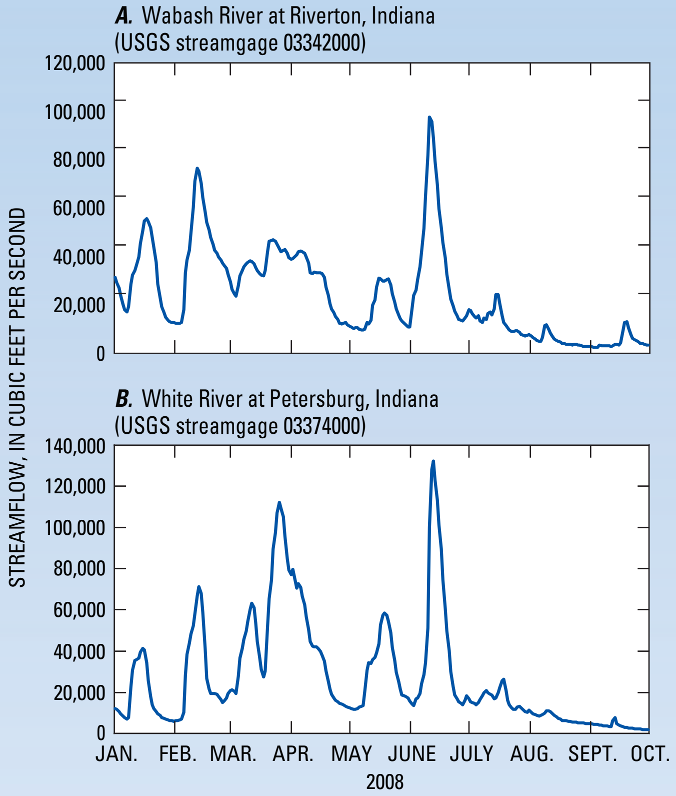


**Figure 14.** Streamflow for Wabash River at Riverton, Indiana and White River at Petersburg, Indiana.

*Flooding in Waterloo, Iowa. Photograph by Don Becker, USGS.*

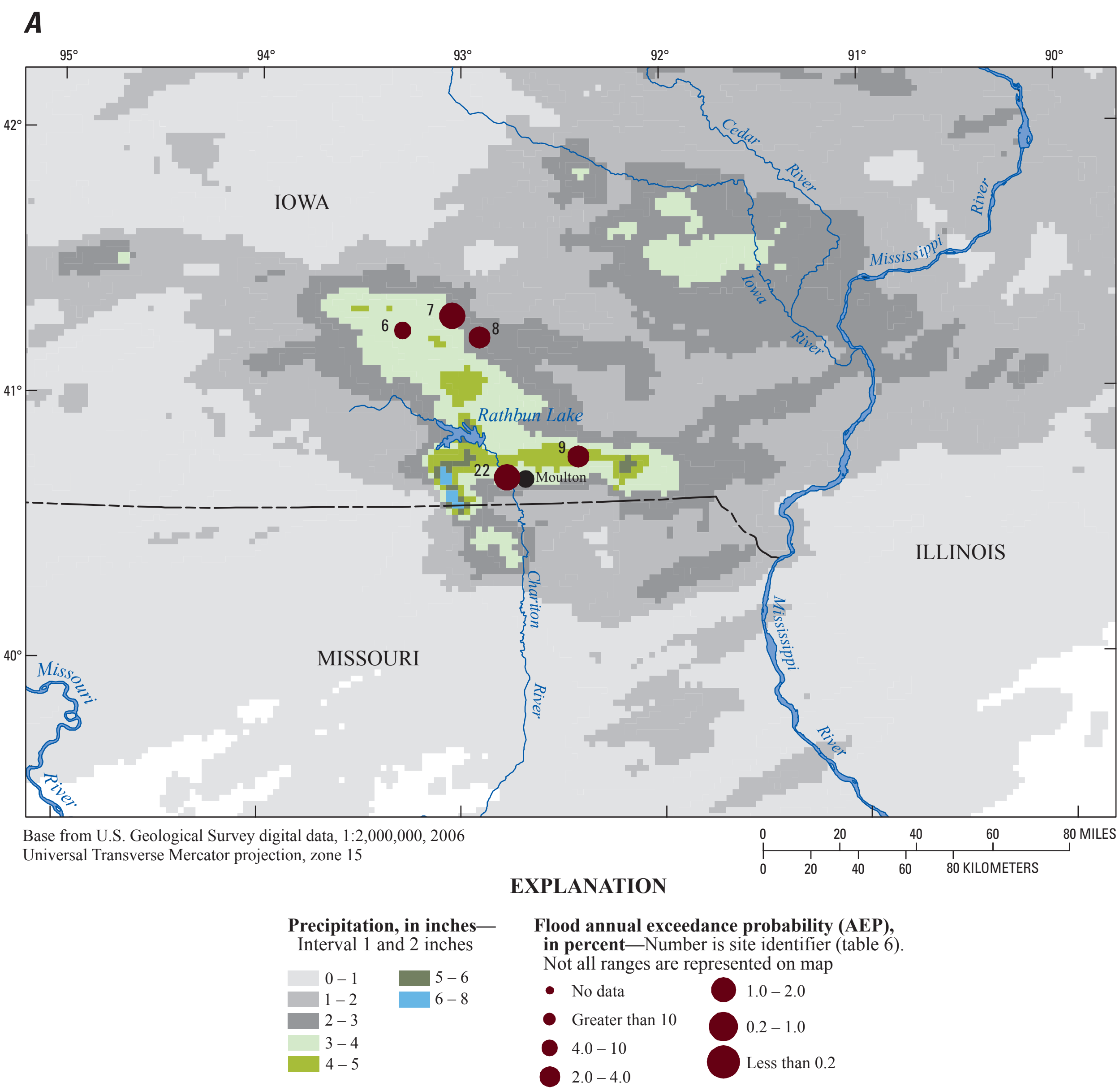


**Figure 15.** Cumulative precipitation totals for *A*, July 5–8, 2008, and locations of U.S. Geological Survey streamgages in Iowa with peak streamflows that had an annual exceedance probability less than 10 percent; and *B*, cumulative precipitation totals for July 17–28, 2008,and locations of U.S. Geological Survey streamgages in Iowa and Missouri with peak streamflows that had an annual exceedance probability less than 10 percent.

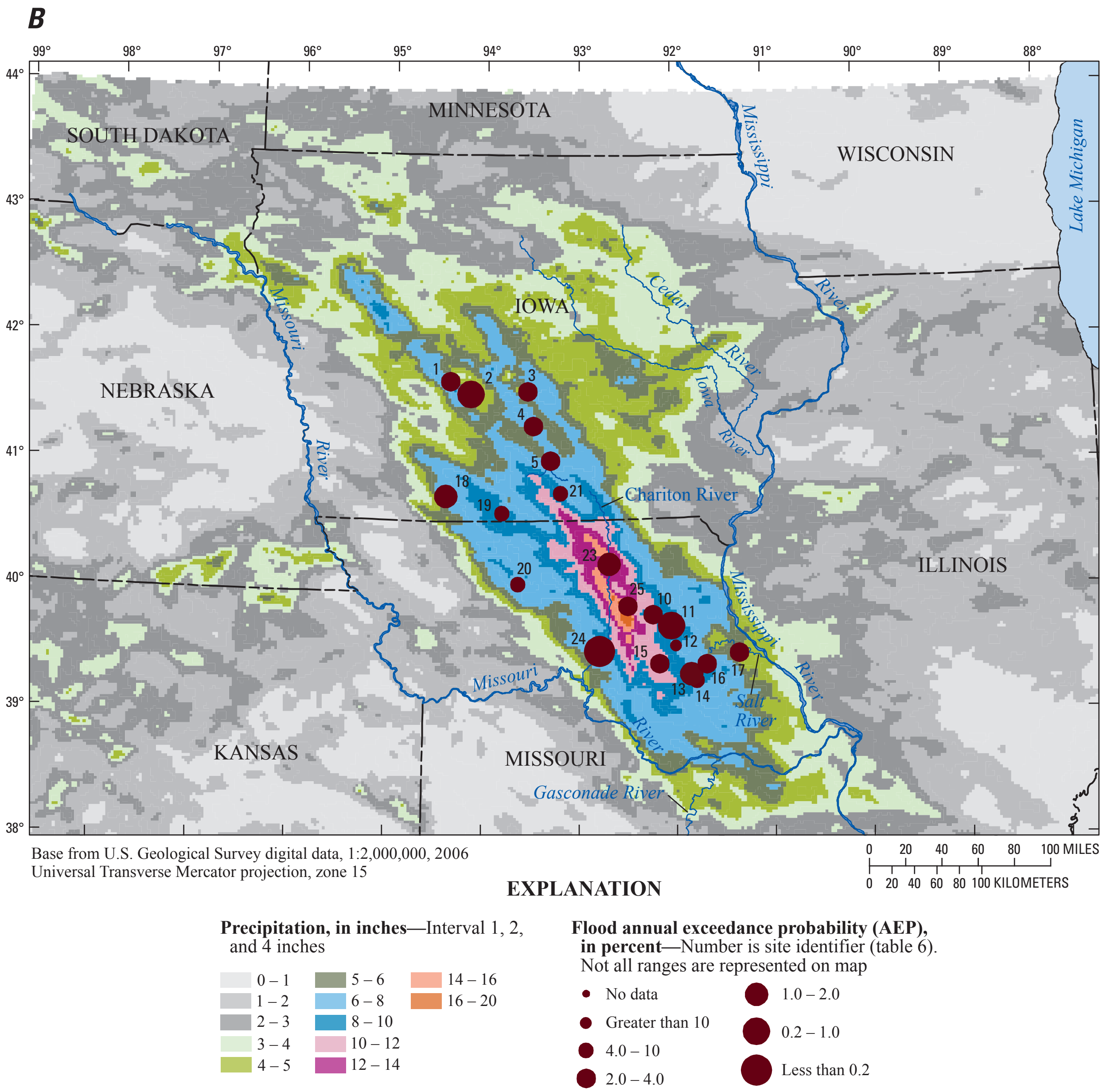


**Figure 15.** Cumulative precipitation totals for *A*, July 5–8, 2008, and locations of U.S. Geological Survey streamgages in Iowa with peak streamflows that had an annual exceedance probability less than 10 percent; and *B*, cumulative precipitation totals for July 17–28, 2008,and locations of U.S. Geological Survey streamgages in Iowa and Missouri with peak streamflows that had an annual exceedance probability less than 10 percent.—Continued

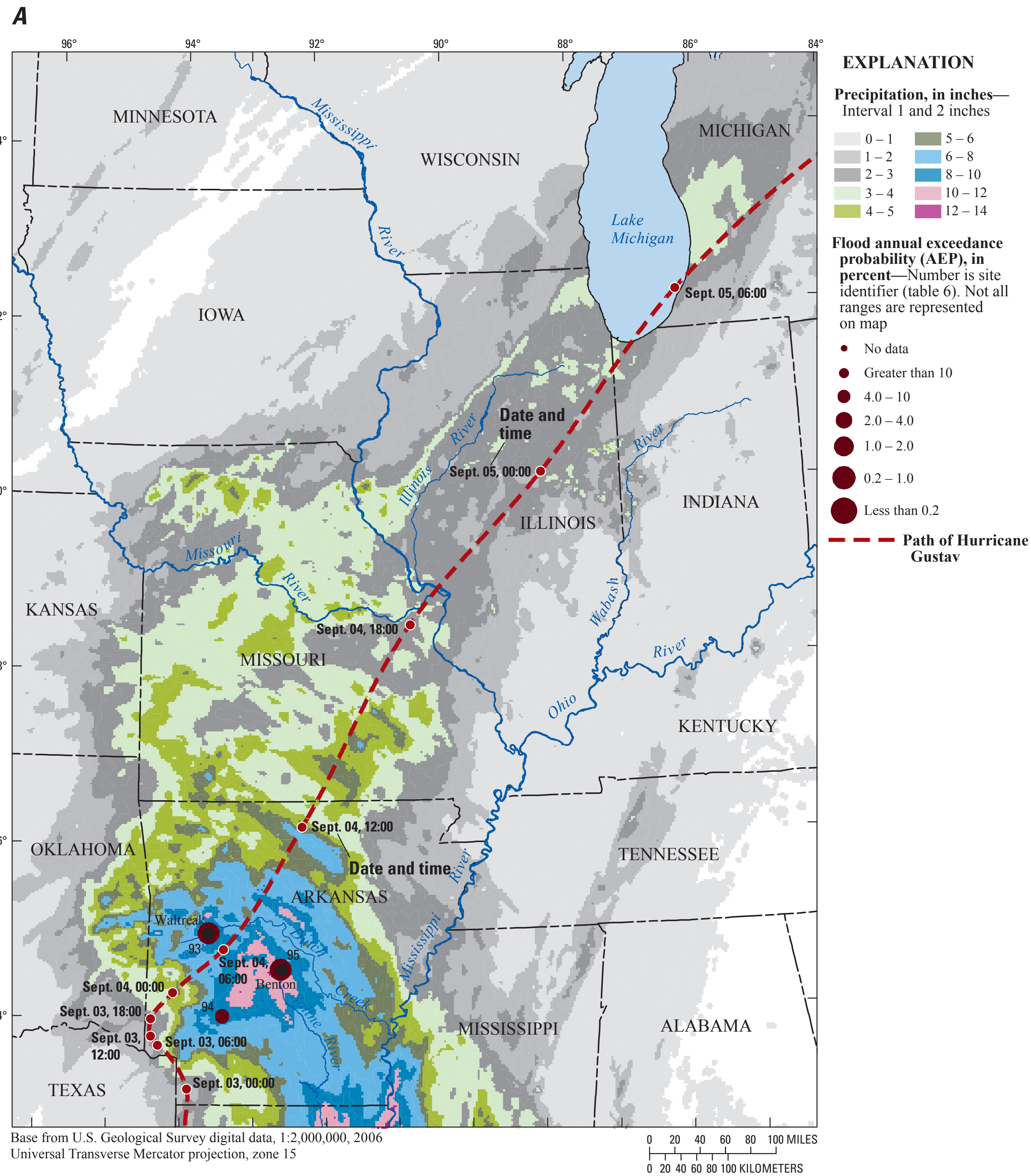


**Figure 16.** Cumulative precipitation totals for *A*, September 1–5, 2008, the path of the remnants of Hurricane Gustav, and locations of U.S. Geological Survey streamgages in Arkansas with peak streamflow that had an annual exceedance probability less than 10 percent; and *B*, cumulative precipitation totals for September 11–15, 2008, the path of the remnants of Hurricane Ike, and locations of U.S. Geological Survey streamgages in Illinois, Indiana, Iowa, Kansas, Michigan, Missouri, and Oklahoma with peak streamflows that had an annual exceedance probability less than 10 percent.

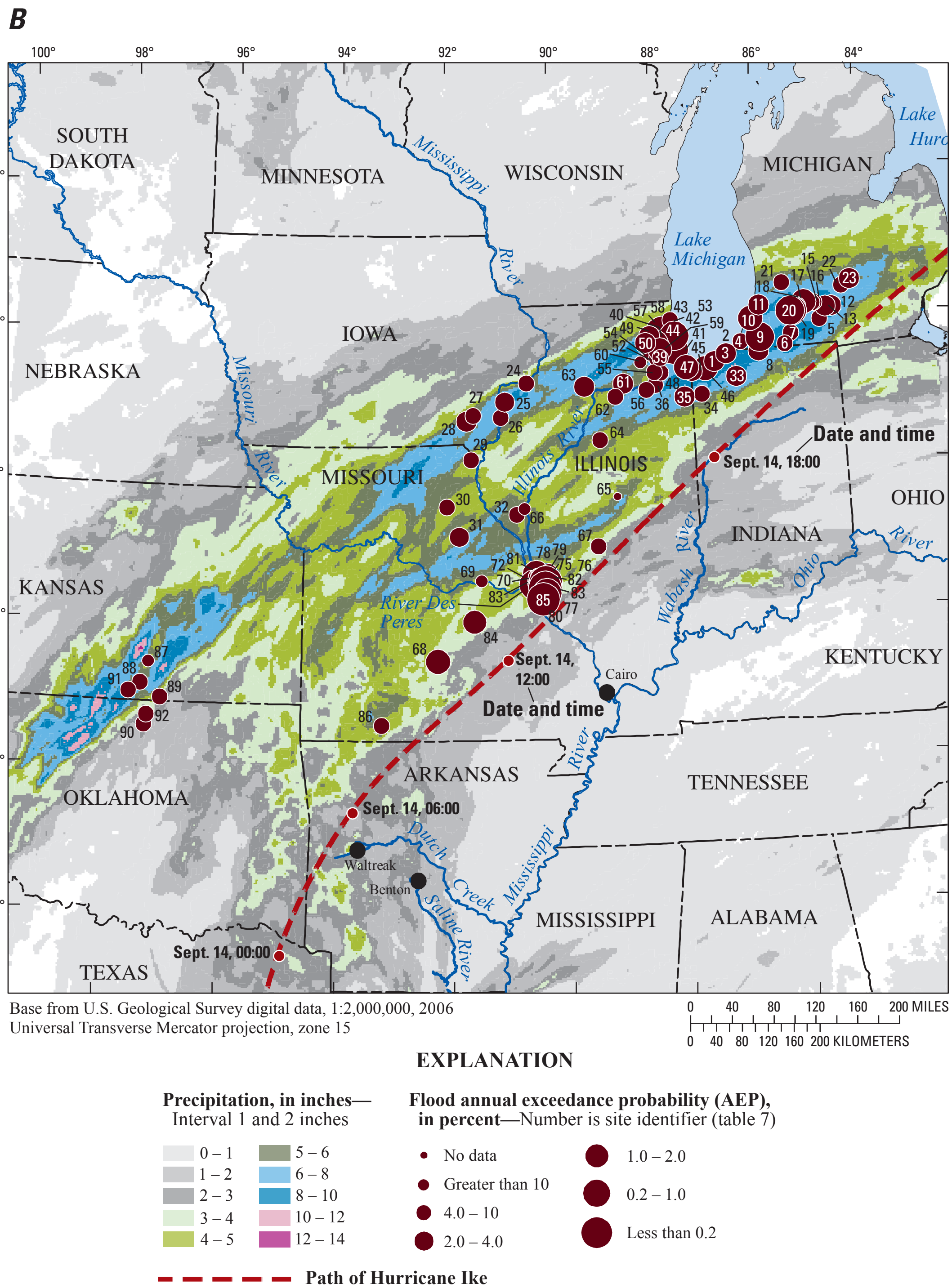


**Figure 16.** Cumulative precipitation totals for *A*, September 1–5, 2008, the path of the remnants of Hurricane Gustav, and locations of U.S. Geological Survey streamgages in Arkansas with peak streamflow that had an annual exceedance probability less than 10 percent; and *B*, cumulative precipitation totals for September 11–15, 2008, the path of the remnants of Hurricane Ike, and locations of U.S. Geological Survey streamgages in Illinois, Indiana, Iowa, Kansas, Michigan, Missouri, and Oklahoma with peak streamflows that had an annual exceedance probability less than 10 percent.—Continued

## 2008 Flooding: Comparison with Historic Floods

Placing the magnitude of a flood into context is desirable for comparison with previous floods. Ranking the observed 2008 peak streamflows at USGS streamgages against previous streamflow peaks of record indicates the relative magnitude of the 2008 floods (tables 1–7). In many locations, the 2008 streamflow peaks were the largest to occur in many decades. For example, the June 2008 flood on the Cedar River at Cedar Rapids, Iowa, (USGS streamgage 05464500, table 5) is the largest streamflow ever recorded at this site and exceeds the previous peak-of-record stage by more than 11 ft. During 2008, 147 USGS streamgages recorded new peak-of-record streamflows, with 77 peak-of-record streamflows set during the June floods alone.

To gain perspective of the magnitude of 2008 peak streamflows compared with previous annual peak streamflows, the annual streamflow peaks through time were plotted from data recorded at six USGS streamgages across the Midwest (fig. 17). Also included in these plots is the estimated value of the 1-percent AEP flood quantile at these six sites. The benchmark for major flooding on many of the major tributaries and much of the main stem of the upper Mississippi River (above Cairo, Illinois) is the 1993 flood; however, for some of the tributaries, and certainly for the rivers in Arkansas, Indiana, Illinois, Michigan, Nebraska, Oklahoma, and South Dakota, floods other than 1993 flood serve as the benchmarks for record flooding as evidenced in figure 17. The 2008 flood hydrographs for selected USGS streamgages in the Midwest are presented in figure 18 with previous record flood hydrographs to enable comparisons. Although the June 2008 floods were record setting on some of the Mississippi River tributaries in Iowa, Wisconsin, Illinois, and Missouri, [for example, Cedar River at Cedar Rapids, Iowa (fig. 18*A*) and Iowa River at Iowa City, Iowa (fig. 18*B*)], the Mississippi River main stem did not have record-setting streamflows at the USGS streamgages. The Mississippi River at Keokuk, Iowa (fig. 18*C*) peak streamflow in June 2008 ranked second in 131 years of systematic streamflow records, just 8,000 $ft^3/s$ shy of the 1993 record peak streamflow of 446,000 $ft^3/s$. Contrast the near peak-of-record streamflow at Keokuk, Iowa (ranked 2nd in 131 years of record), with the 2008 peak streamflow 184 mi downstream on the Mississippi River at St. Louis, Missouri. The 2008 peak streamflow ranked only 25th in the 147 years of systematic streamflow records, well below the 1993 record peak streamflow (fig. 18*D*). The 2008 streamflow on the Mississippi River at St. Louis was lower primarily because of the smaller streamflow contribution from the Missouri River in 2008, which contributed streamflow of as much as 750,000 $ft^3/s$ in 1993 (Parrett and others, 1993) compared with a maximum streamflow during June 2008 of 302,000 $ft^3/s$ at the USGS streamgage at St. Charles, Missouri (table 5).

## 2008 Flooding: Annual Exceedance Probability

Although ranking floods helps to illustrate the relative magnitude of the floods, it has limited use for evaluating the future risk of flooding. Determining the AEP requires flood-probability analysis, which involves determining the parameters needed to estimate a probability distribution from a set of observed peak streamflow data. The probability distribution relates probability to the magnitude of a certain size flood being equaled or exceeded.

Selection of the probability distribution and the process for fitting the parameters of the distribution may vary depending on the underlying characteristics of the data. For consistency, Federal agencies that estimate flood frequencies follow standard guidelines, known as Bulletin 17*B* (Interagency Advisory Committee on Water Data, 1982), which recommend the use of the log-Pearson type III (LPIII) distribution and the “method of moments” for estimating the distribution parameters (mean, standard deviation, and skewness of the data). The analysis is based on annual peak streamflow data. For USGS streamgages, the data are available from the USGS National Water Information System database (U.S. Geological Survey, 2008).

In previous flood reports (for example, Chin and others, 1975; Parrett and others, 1993; Holmes and Kupka, 1997), flood probabilities were expressed as flood frequencies by listing the T-year recurrence interval for a particular flood quantile (for example, the “100-year flood”). Use of the T-year recurrence interval to describe flood probability is now discouraged by the USGS because it tends to confuse the general public. A T-year recurrence interval is sometimes interpreted to imply that there is a set time interval between floods of a specific magnitude when, in fact, floods are random processes that are best understood using probabilistic terms. The use of an AEP percentage for a flood is now recommended because of the clear communication, by the terminology, that the peak streamflow is being characterized by its probability or chance of occurrence. The reader can easily convert from the AEP to the T-year recurrence interval by simply taking the reciprocal of the AEP. For example, a 1-percent AEP flood corresponds to the streamflow magnitude that is equaled or exceeded by a probability (expressed as a decimal) of 0.01 in any given year. The reciprocal of 0.01 is 100, thus the T-year recurrence interval for the 1-percent AEP flood is the 100-year flood. Equivalence of selected AEP and recurrence intervals are as follows:

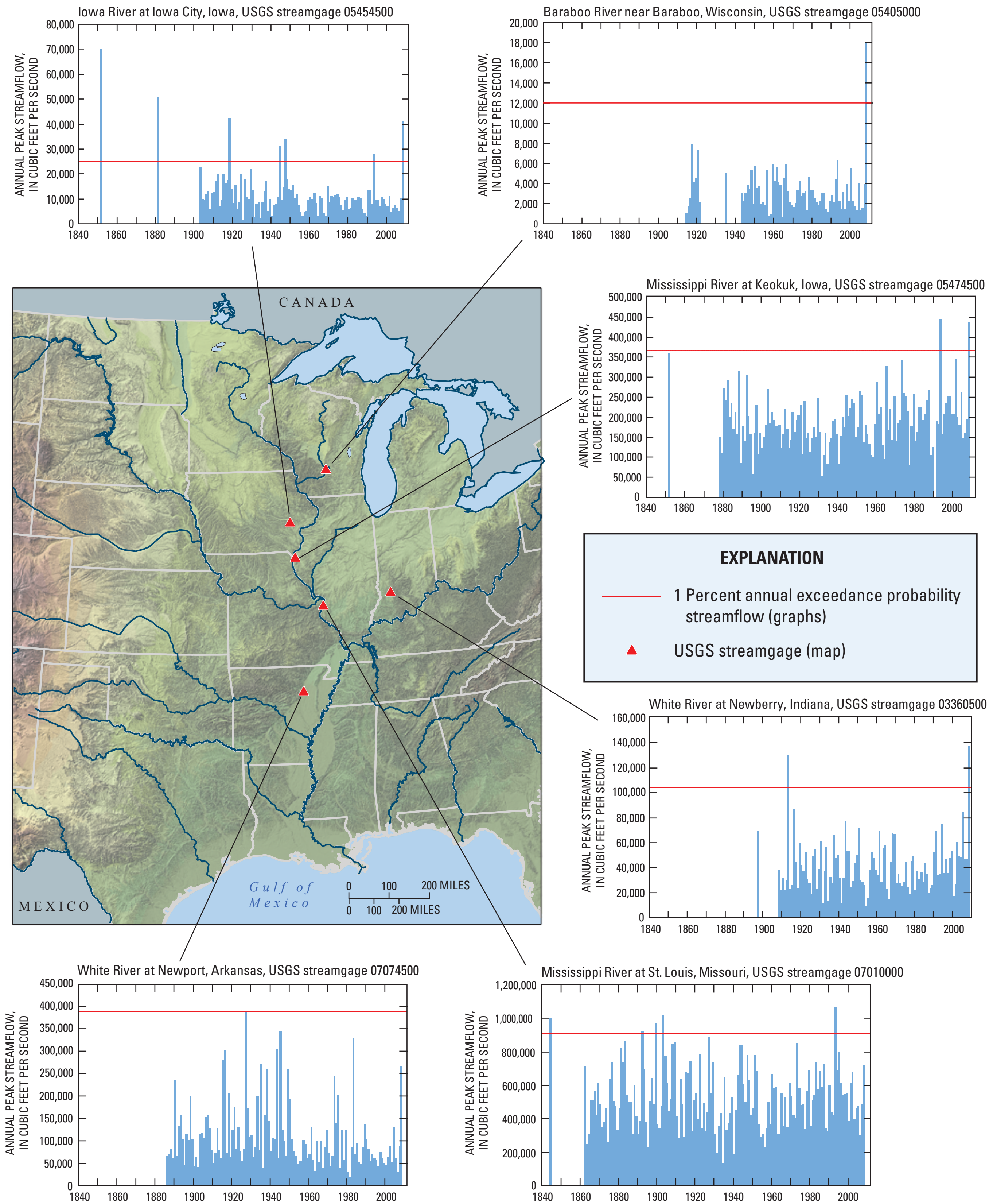


**Figure 17.** Annual peak streamflows for the period of record up to 2008 and the 1-percent annual exceedance probability at selected U.S. Geological Survey streamgages in the Midwest.

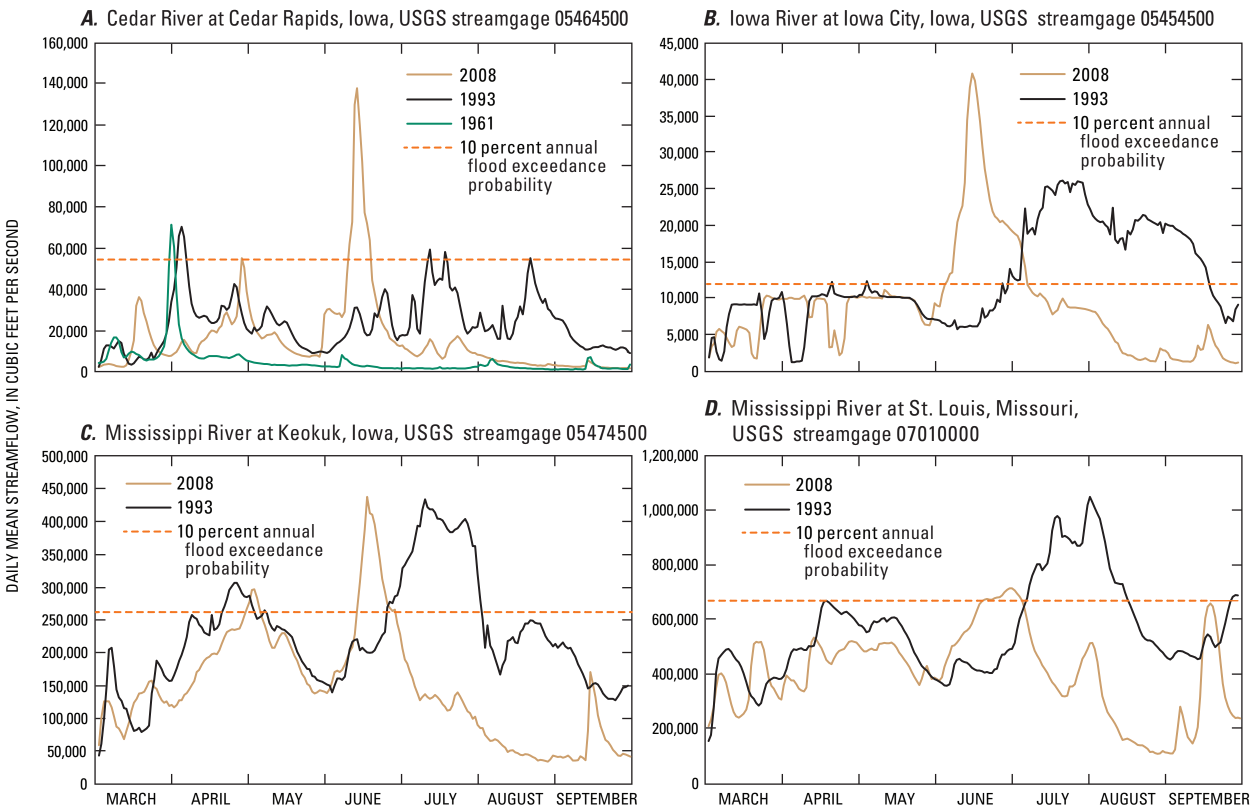


**Figure 18.** Streamflow for selected U.S. Geological Survey streamgages for the 2008 flood period and previous major floods, and the 10-percent annual exceedance probability for each site.

| AEP (percent) | Recurrence interval (years) |
|---|---|
| 50 | 2 |
| 20 | 5 |
| 10 | 10 |
| 4 | 25 |
| 2 | 50 |
| 1 | 100 |
| 0.2 | 500 |

The reliability of an AEP flood quantile from Bulletin 17B methods may be expressed as a "variance of prediction" and is computed by using the asymptotic formula given by Cohn and others (2001), with the addition of the mean-squared error of generalized skew (Griffis and others, 2004). The variance of prediction varies as a function of the length of record, the fitted flood-probability distribution parameters (mean, standard deviation, and weighted skew), and the accuracy of the method used to determine the regional skew component of the weighted skew. The variance of prediction generally decreases with length of record and the fit of the LPIII distribution.

Besides estimating AEP flood quantiles by Bulletin 17B methods, another way to obtain an AEP flood quantile estimate is by using regional regression equations (RRE). RRE are developed by using regression techniques that relate the flood-probability data at many streamgages in a particular region to the basin characteristics of the streams being monitored by the streamgages (Jennings and others, 1994). For any location along a stream (gaged or ungaged), a user can enter the basin characteristics (drainage area, basin slope, and so on) as independent variables into the equations and compute various streamflow characteristics, such as the 1-percent AEP flood quantile. The variance of prediction from the regional regression is a function of the RRE and the values of the independent variables used to develop the streamflow estimate from the RRE. The variance generally increases with departure of the actual values from the mean values of the independent variables. The USGS uses software programs, such as GLSNET (Generalized Least Squares NETwork analysis; Tasker and Stedinger, 1989), to compute the model error variance.

The optimal estimate of the AEP flood quantile for a gaged site is determined by weighting the AEP flood quantile estimate determined from the Bulletin 17B methods with the AEP flood quantile estimate determined from the RRE. The weights are inversely proportional to the variances of prediction, yielding the weighted estimator:

$$LogQ_{P,OPT} = \frac{\left(Var\left[RRE\right]* LogQ_{P,LPIII} + Var\left[LPIII\right]* LogQ_{P,RRE}\right)}{\left(Var\left[RRE\right] + Var\left[LPIII\right]\right)} \quad (1)$$

where

$Q_{P,OPT}$ is the optimal estimate of AEP flood quantile for a particular probability of flooding (p) (Interagency Advisory Committee on Water Data, 1982, Appendix 8);

$Var[RRE]$ is the variance of the RRE estimate of the AEP flood quantile for a particular probability of flooding (p);

$Q_{P,LPIII}$ is the Bulletin 17B method estimate of the AEP flood quantile for a particular probability of flooding (*p*);

$Var[LPIII]$ is the variance of the Bulletin 17B estimate of the AEP flood quantile for a particular probability of flooding (p); and

$Q_{P,RRE}$ is the RRE estimate of the AEP flood quantile for a particular probability of flooding (*p*).

Previous USGS reports have expressed the accuracy of RREs in terms of equivalent years of record and used these estimates with the length of record at the streamgage to combine RRE and LPIII AEP flood quantile estimates (for example, Hodge and Tasker, 1995; Soong and others, 2004; Ries and Dillow, 2006). The length of record, however, can fail to account for the true variance of LPIII flood-probability estimates. For example, the length of record fails to account for any improvement in the information provided by the regional skew. Furthermore, flood-probability distributions computed from two different streamgaging records of the same length may not be of equal reliability because of differences in underlying variances of the streamflow records for each site. For example, a small drainage basin may have dynamic, more highly varied records and may be more difficult to accurately measure the streamflow than a large drainage basin; hence, the LPIII distributions in a small drainage basin could be expected to have larger variances than in a large drainage basin. More importantly, the equivalent years-of-record concept, although relatively easy to grasp, misconstrues the relation between the AEP flood quantile estimates and the variances. Using estimated variances provides a more natural characterization of the underlying uncertainty of the various streamflow estimates.

The optimal (weighted) estimates of the AEP flood quantiles corresponding to the 4-percent, 2-percent, 1-percent, and 0.2-percent AEP, along with their respective 95-percent confidence limits, for most of the streams in the Midwest that were flooded during the January to September 2008 time frame, are given in tables 1–7. Presenting this information for the streams in this report allows the reader to better assess the uncertainty of the AEP for each stream in the tables. During January through September 2008, peak streamflows at 26 USGS streamgages had a less than 0.2-percent AEP, and peak streamflows at 67 USGS streamgages had an AEP in the range of 0.2 to 1 percent.

## Effects of the 2008 Flooding on Annual Exceedance Probability Estimates

The calculation of AEP flood quantiles by the guidelines published in Bulletin 17B is dependent on annual peak streamflow data from USGS streamgages. As more data become available, the AEP flood quantile estimates are affected. As a result, the AEP flood quantiles for the various AEP values (for example, 50-percent, 2-percent, and 1-percent AEP) change through time at each site. The effects of changing the length of the annual peak streamflow record on AEP flood quantiles are shown for selected sites in figure 19, which has the moving unweighted (not weighted with RRE estimate) AEP flood quantile plotted through time. A minimum of 10 years of annual peak streamflow data was needed for these sites before the first unweighted AEP flood quantile was computed by Bulletin 17B methods. Thereafter, the moving unweighted AEP flood quantiles for the 50-percent, 2-percent, and 1-percent AEP were computed using the Bulletin 17B guidelines for each successive year, keeping all previous annual peak streamflow data in the analysis. By examining the time series for each graph, it is apparent that increases in the 1-percent and 2-percent unweighted AEP flood quantile occur with each new major flood, followed by slight decreases in the years following each major flood. The 50-percent unweighted AEP flood quantile estimate is mostly insensitive to major floods.

Inclusion of the 2008 flood-peak streamflow in the analysis increases the 2-percent and 1-percent unweighted AEP flood quantile estimate for each of the six selected USGS streamgages (fig. 19). The unregulated streams in the Midwest with more than 10 years of record and that had peak streamflows during 2008 with an estimated AEP less than 1 percent are presented in figure 20. Including the 2008 peak streamflow in the flood-probability analysis increased the estimate of the 1-percent unweighted AEP flood quantile anywhere from 20 percent to more than 100 percent for streamgages with less than 25 years of record (fig. 20). In contrast, streamgages with more than 80 years of record had a less than 10 percent increase in the 1-percent unweighted AEP flood quantile, inferring that the longer the period of record used for the flood-probability analysis, the less pronounced the effect of including the 2008 flood data. A similar observation can be made for the confidence limits. All other factors being equal, one can reasonably conclude that as the length of record increases, the instability in the AEP flood quantile estimate decreases and the confidence limits narrow, resulting in a decrease in the level of uncertainty in the AEP flood quantile estimate. For this report, the 2008 peak streamflows were included in all flood-probability analyses to determine the AEP flood quantile estimates provided in tables 1–7.

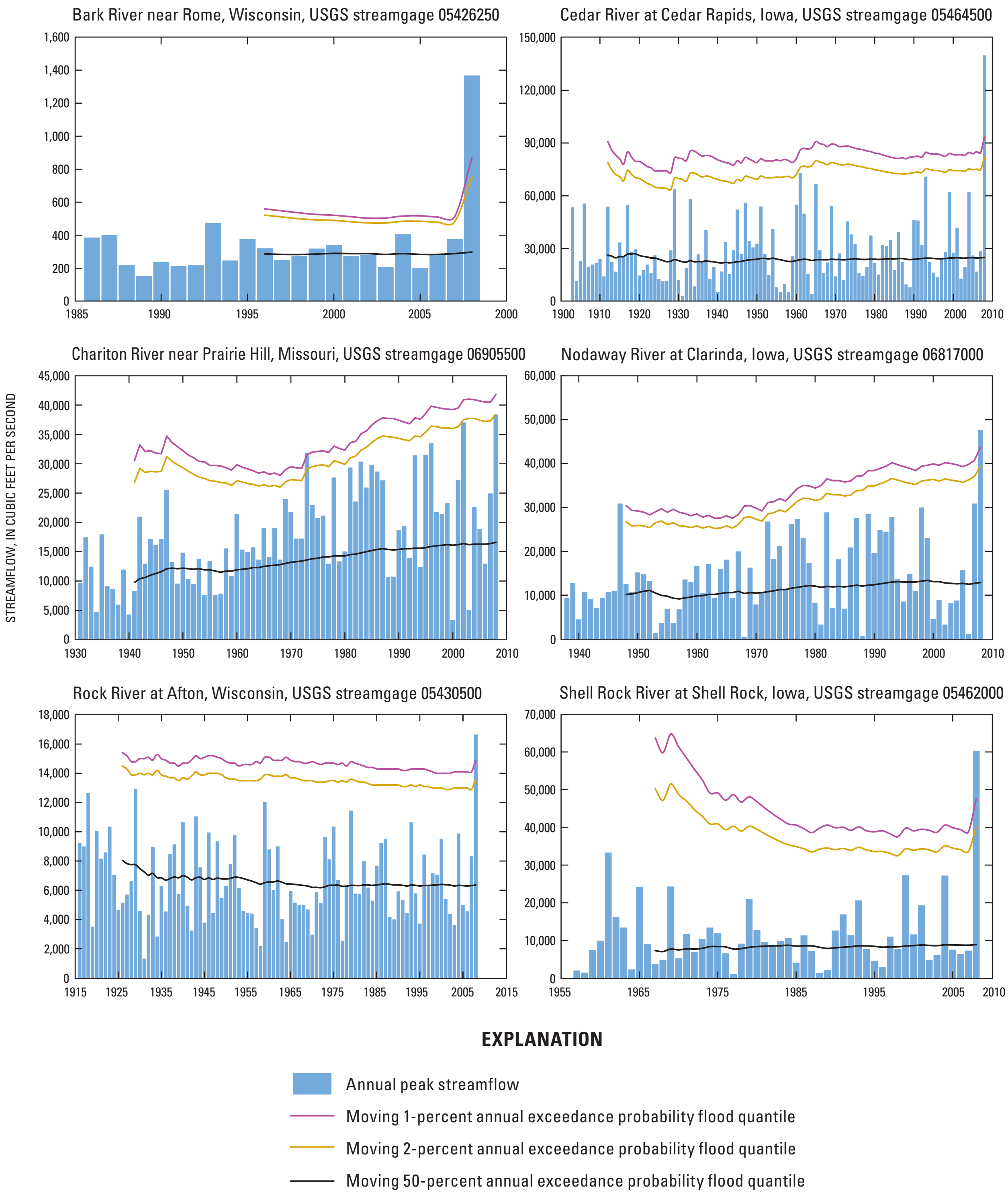


**Figure 19.** Effects of annual peak streamflows on moving 50-percent, 2-percent, and 1-percent unweighted annual exceedance probability flood quantiles through time at selected U.S. Geological Survey streamgages.

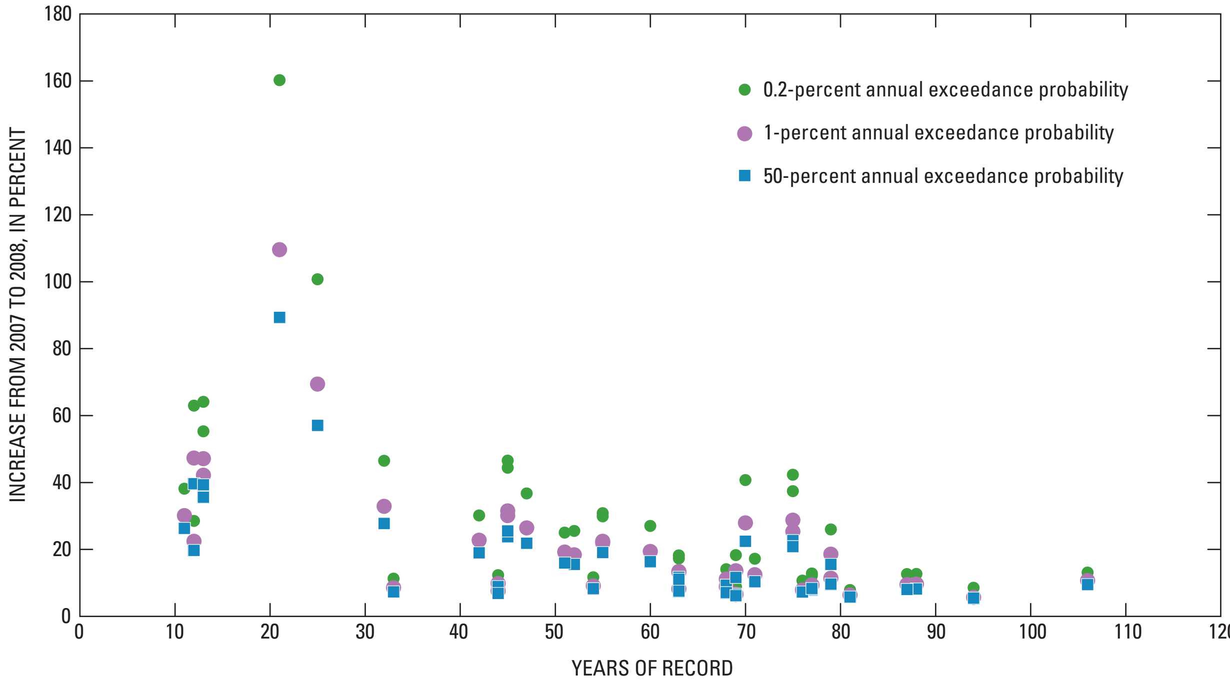


**Figure 20.** Increase in the 0.2-percent, 1-percent, and 50-percent unweighted annual exceedence probability flood quantiles for unregulated streams in the Midwest with more than 10 years of record when 2008 peak streamflow data were included in the flood-probability analysis.

## Trends in Flood Maxima

Trends in peak streamflows are important to investigate, as a trend may indicate to emergency and infrastructure managers changes in levels of risk to public safety. The annual peak-streamflow time-series data were analyzed for selected USGS streamgages in the Midwest to determine the presence and subsequent magnitude of trends through time at each site. Only trend magnitudes were computed with no effort to conduct null hypothesis significance testing (NHST), as much discussion in recent literature has focused on problems with NHST (Nichols, 2001) and the issue of long-term persistence (Cohn and Lins, 2005).

The trend magnitudes were computed based on the Sen slope estimator (Sen, 1968) using the MAKESENS application from the Finnish Meteorological Institute (Salmi and others, 2002). The Sen slope, also known as the Kendall-Theil robust line, is a nonparametric estimate of trend magnitude slope for a univariate time series when the time interval is constant (equally spaced).

$$f(t) = M_q t + B \qquad (2)$$

where

$f(t)$ is the increasing or decreasing function of time for the trend magnitudes of the peak streamflows used in the investigation,

$M_q$ is the Sen slope (trend magnitude),

$t$ is time, and

$B$ is a constant.

The Sen slope is the median slope of all pairwise comparisons with each pairwise difference divided by the number of years separating the records. To determine the Sen slope estimate in equation 2, the slopes of all data pairs are calculated:

$$M_{j,k} = \frac{(x_k - x_j)}{\Delta t_{j,k}} \qquad \text{for } j = 1, \ldots, n\text{-}1;\ j < k \le n \qquad (3)$$

where

$M_{j,k}$ is the slope between data points $x_j$ and $x_k$;

$x_j$ is the data measurement at time *j*;

$x_k$ is the data measurement at time *k;* and

$\Delta t_{j,k}$ is the change in time between observations.

The Sen slope, $M_q$, is equal to the median value of all the $M_{j,k}$.

The streamgages selected for trend analysis were selected from the streamgages that had peak streamflows less than 10-percent AEP in 2008 and met the criteria outlined in Hodgkins and others (2007). The criteria stipulate that the streamgage must have at least 50 years of data with no more than 5 percent missing and that the stream must not be


regulated by the presence of a substantial dam or other water-diversion and control structure. The minimum timeframe of 50 years of record is arbitrary. The USGS streamgages that did not meet these criteria were eliminated from the analyses. In the Midwestern States included in this investigation, 147 streamgages on unregulated streams met the criteria and were included in the computation of trend magnitudes of annual peak streamflows.

For comparison of streamgages with varying basin sizes, the Sen slope for each streamgage was divided by the median annual peak streamflow value to determine the percentage of

◀ *Streamgage 05462000, Shell Rock River at Shell Rock, Iowa. Photograph by Don Becker, USGS.*

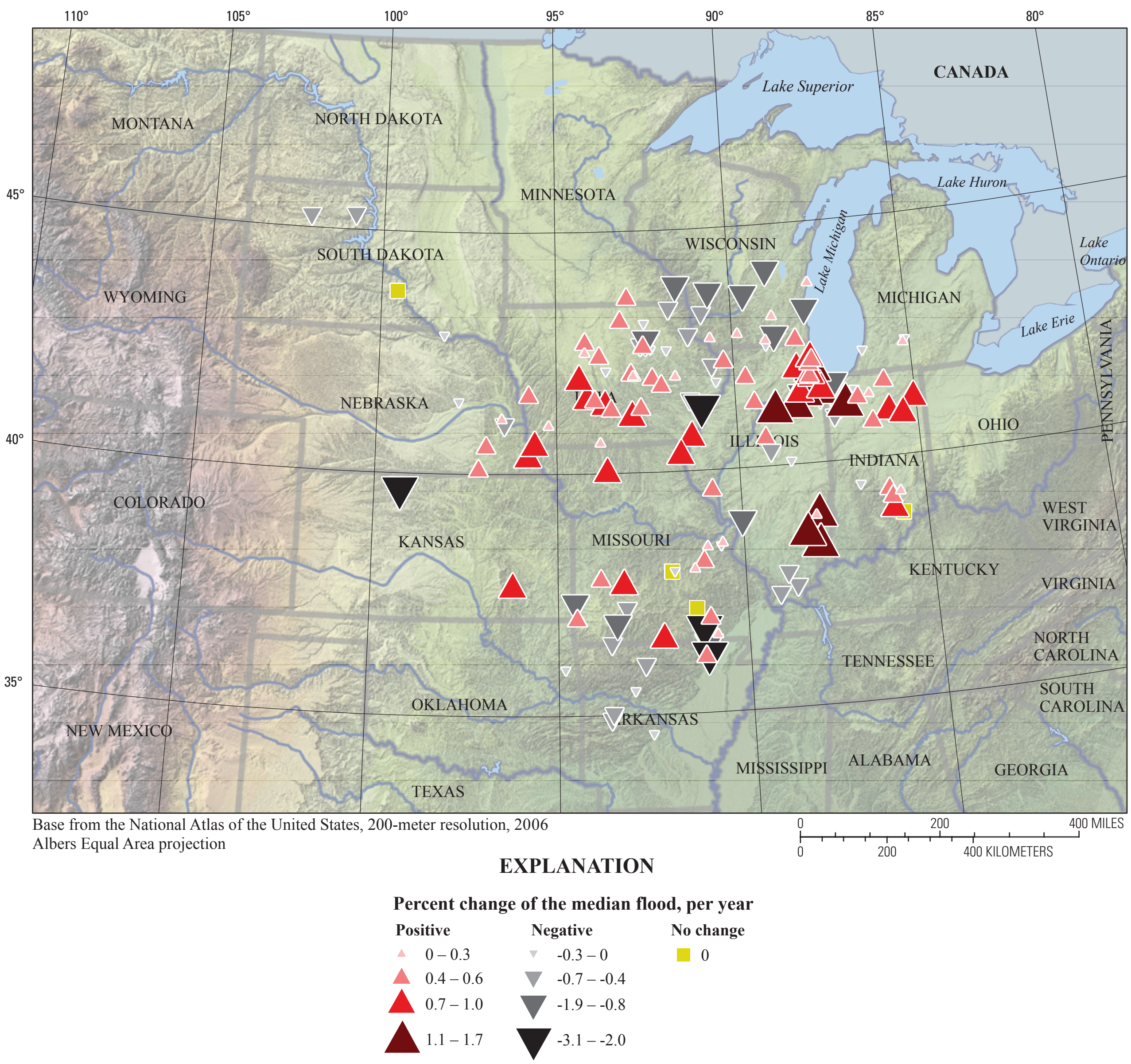


**Figure 21.** Percentage changes in the median annual peak streamflow values for selected U.S. Geological Survey streamgages on unregulated streams with data from 1958 to 2007.

change with respect to the median annual peak streamflow at each streamgage. Examination of the trend magnitude (scaled by median annual peak flood streamflow) from1958 to 2007 does not indicate a systematic trend for the Midwest in either direction. Of the 147 streamgages, 83 had an upward trend, 60 had a downward trend, and 4 had no trend (fig. 21). The clustering of upward trends in magnitude (positive percentages) in northeastern Illinois and northwestern Indiana (fig. 21) likely is explained partially by increased urbanization in the Chicago metropolitan area between 1958 and 2007. A clustering of downward trends in magnitude (negative percentages) occurred in areas of eastern Iowa, southern Wisconsin, and southern Illinois. An additional analysis was conducted on 14 streamgages on unregulated streams with annual peak streamflow data from 1918 to 2007; of these 14 sites, 10 streamgages had an upward trend (fig. 22).

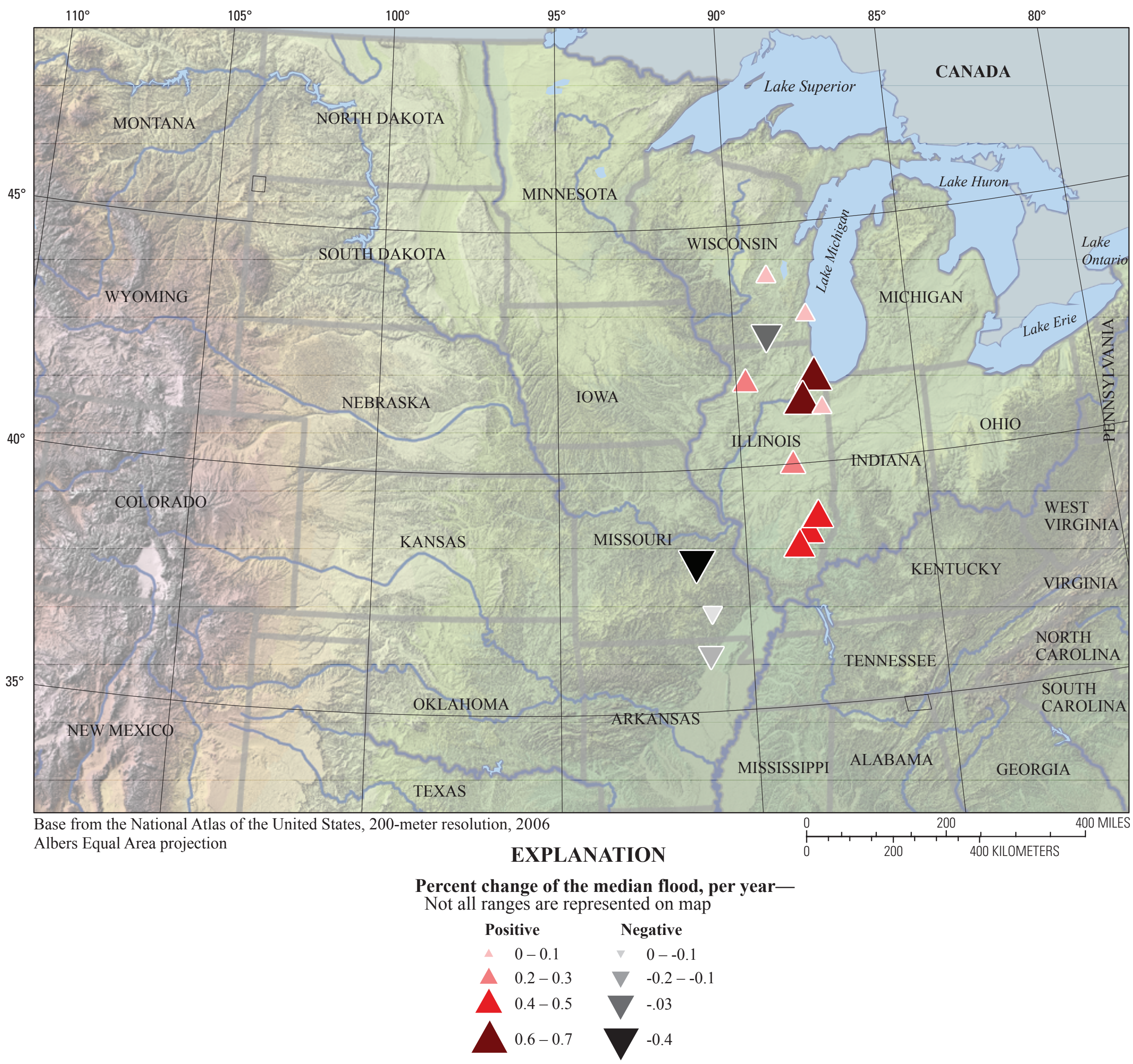


**Figure 22.** Percentage changes in the median annual peak streamflow values for selected U.S. Geological Survey streamgages on unregulated streams with data from 1918 to 2007.

## Summary

Above-average precipitation occurred throughout much of the United States Midwest during late 2007, which left soils extremely wet or saturated as the 2007–2008 winter months approached. Melting of the above-average snow accumulations in the upper Midwest provided a perfect setting for enhanced runoff by keeping the soil saturated and streams flowing well above baseflow throughout spring 2008. Heavy precipitation occurred in January in parts of Illinois and Indiana and initiated the first of many rounds of flooding in the Midwest. Discrete episodes of extreme or heavy precipitation resulted in flooding in parts of the Midwest during the months of January–April, June, July, and September, 2008. New total precipitation records were set at 106 National Weather Service rain gages during January through June 2008. During June 2008, new monthly total precipitation records were set at 66 rain gages, with precipitation totals in the range of 0.2-percent to 0.1-percent annual exceedance probability in parts of Illinois, Indiana, and Iowa.

In 2008, more than 147 USGS Midwestern streamgages had peak-of-record streamflows. Of these 147 peak-of-record streamflows, 77 were set in June alone, and 39 of the 77 were in Iowa.

Rare floods (less than 0.2-percent chance of exceedance) were recorded at USGS streamgages at 26 sites, and 67 streamgages recorded peak streamflows having an annual exceedance probability between 0.2 percent and 1 percent. Recurrent flooding in Indiana set new records at several streamgages during the months of January, February, March, June, and September 2008. The June flooding was by far the most severe and widespread, causing damage in Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, Oklahoma, South Dakota, and Wisconsin.

Trend magnitudes were computed at 147 unregulated Midwest streamgages. The computed trend magnitudes and percentages of change in the median annual peak streamflow values indicated that although clustering of increasing and decreasing trends occurred, no consistent trend was evident across the Midwest.

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*Flooding on the West Fork Cedar River near Finchford, Iowa. Photograph by Don Becker, USGS.*

# Tables 1–7


*USGS hydrographers preparing to make a boat measurement of the streamflow coming across the road on the Cedar River near Conesville, Iowa (USGS streamgage 05465000). Photograph by Scott Strader, USGS.*

**Table 1.** Summary of peak stages, streamflows, and flood-probability estimates for selected U.S. Geological Survey streamgages during January 2008.

[mi², square mile; ft, foot; ft³/s, cubic foot per second; AEP, annual exceedance probability; <, less than; --, no data; >, greater than]

| Site number (fig. 7) | Station number | Station name | Contributing drainage area (mi²) | Flood data: Previous maximum streamflow: Date | Flood data: Previous maximum streamflow: Stage (ft) | Flood data: Previous maximum streamflow: Streamflow (ft³/s) | Flood data: Flood of January 2008: Rank[a]/annual peaks | Flood data: Flood of January 2008: Date | Flood data: Flood of January 2008: Peak stage (ft) | Flood data: Flood of January 2008: Peak streamflow (ft³/s) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 03328000 | Eel River at North Manchester, Ind. | 417 | 12/1990 | 20.16 | 8,740 | ([c]) | 1/9/2008 | 13.88 | 7,950 |
| 2 | 03328500 | Eel River near Logansport, Ind. | 789 | 02/1985 | 12.68 | 17,700 | ([c]) | 1/10/2008 | 11.26 | 13,300 |
| 3 | 03330500 | Tippecanoe River at Oswego, Ind. | 113 | 03/1982 | 9.25 | [d]950 | ([c]) | 1/13/2008 | 8.51 | [d]650 |
| 4 | 03331500 | Tippecanoe River near Ora, Ind. | 856 | 06/1981 | 15.08 | 8,660 | 1/64 | 1/10/2008 | 15.63 | 9,290 |
| 5 | 03333050 | Tippecanoe River near Delphi, Ind. | 1,869 | 12/1990 | 12.87 | 22,100 | 1/20 | 1/8/2008 | 17.83 | [e]37,600 |
| 6 | 03335500 | Wabash River at Lafayette, Ind. | 7,267 | 03/1913 | 32.90 | 190,000 | ([c]) | 1/10/2008 | 21.95 | [d]59,800 |
| 7 | 03336000 | Wabash River at Covington, Ind. | 8,218 | 03/1913 | 35.10 | 200,000 | ([c]) | 1/11/2008 | 25.99 | [d]56,700 |
| 8 | 03341500 | Wabash River at Terre Haute, Ind. | 12,263 | 03/1913 | 31.20 | 245,000 | ([c]) | 1/13/2008 | 21.56 | [d]58,500 |
| 9 | 03342000 | Wabash River at Riverton, Ind. | 13,161 | 03/1913 | 26.40 | 250,000 | ([c]) | 1/17/2008 | 21.21 | [d]55,800 |
| 10 | 04097500 | St. Joseph River at Three Rivers, Mich. | 1,350 | 04/1950 | 10.60 | 8,260 | 3/49 | 1/12/2008 | 9.44 | 6,330 |
| 11 | 04099000 | St. Joseph River at Mottville, Mich. | 1,866 | 06/1989 | 10.41 | [d]11,400 | 8/86 | 1/12/2008 | 8.59 | [d]8,110 |
| 12 | 04100222 | North Branch Elkhart River at Cosperville, Ind. | 142 | 03/1982 | 8.12 | [d]919 | 4/37 | 1/12/2008 | [h]7.28 | [d]742 |
| 13 | 04100500 | Elkhart River at Goshen, Ind. | 594 | 02/1985 | 11.87 | 6,360 | ([c]) | 1/9/2008 | 10.07 | 4,860 |
| 14 | 04180000 | Cedar Creek near Cedarville, Ind. | 270 | 12/1990 | 13.38 | 5,580 | ([c]) | 1/9/2008 | 12.03 | 4,870 |
| 15 | 05515500 | Kankakee River at Davis, Ind. | 537 | 01/2005 | 13.05 | 1,930 | ([c]) | 1/8/2008 | 13.61 | 1,760 |
| 16 | 05516500 | Yellow River at Plymouth, Ind. | 294 | 10/1954 | 17.13 | 5,390 | 3/60 | 1/10/2008 | 15.13 | 4,010 |
| 17 | 05517000 | Yellow River at Knox, Ind. | 435 | 10/1954 | 13.75 | 5,660 | ([c]) | 1/12/2008 | 12.14 | 4,290 |
| 18 | 05517500 | Kankakee River at Dunns Bridge, Ind. | 1,160 | 03/1982 | 13.38 | 5,870 | ([c]) | 1/13/2008 | 12.69 | 5,230 |
| 19 | 05518000 | Kankakee River at Shelby, Ind. | 1,779 | 03/1982 | 12.98 | 7,650 | ([c]) | 1/12/2008 | 12.43 | 5,660 |
| 20 | 05522500 | Iroquois River at Rensselaer, Ind. | 203 | 07/2003 | 16.59 | 2,620 | ([c]) | 1/10/2008 | 15.06 | 2,290 |
| 21 | 05524500 | Iroquois River near Foresman, Ind. | 449 | 06/1958 | 24.42 | 5,930 | ([c]) | 1/9/2008 | 24.16 | 6,420 |
| 22 | 05527500 | Kankakee River near Wilmington, Ill. | 5,150 | 07/1957 | 11.40 | 75,900 | 7/96 | 1/9/2008 | 8.77 | 49,500 |
| 23 | 05536179 | Hart Ditch at Dyer, Ind. | 37.6 | 11/1990 | 15.33 | 3,010 | ([c]) | 1/8/2008 | 12.31 | 1,660 |
| 24 | 05536195 | Little Calumet River at Munster, Ind. | 90.0 | 04/1959 | 13.67 | 1,510 | 6/50 | 1/9/2008 | 14.58 | 1,050 |
| 25 | 05555300 | Vermilion River near Leonore, Ill. | 1,251 | 07/1958 | 15.30 | 33,500 | 3/78 | 1/9/2008 | 25.22 | 26,900 |

| Site number (fig. 7) | Estimated AEP for observed peak streamflow (percent) | Expected peak streamflows for selected AEP with 95-percent confidence limits (ft³/s)[b]: 4-percent AEP (25-year recurrence) | | | 2-percent AEP (50-year recurrence) | | | 1-percent AEP (100-year recurrence) | | | 0.2-percent AEP (500-year recurrence) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Estimate | Confidence limit: Low | Confidence limit: High | Estimate | Confidence limit: Low | Confidence limit: High | Estimate | Confidence limit: Low | Confidence limit: High | Estimate | Confidence limit: Low | Confidence limit: High |
| 1 | 4–10 | 8,220 | 7,210 | 9,370 | 9,170 | 7,840 | 10,700 | 10,100 | 8,440 | 12,200 | 12,400 | 9,670 | 15,900 |
| 2 | 4–10 | 15,500 | 13,500 | 17,700 | 17,400 | 14,800 | 20,500 | 19,400 | 16,000 | 23,500 | 24,200 | 18,600 | 31,300 |
| 3 | 4–10 | 782 | 662 | 925 | 895 | 733 | 1,090 | 1,010 | 804 | 1,280 | 1,310 | 970 | 1,770 |
| 4 | 2–4 | 8,920 | 7,660 | 10,400 | 9,990 | 8,370 | 11,900 | 11,000 | 8,990 | 13,500 | 13,300 | 10,200 | 17,200 |
| 5 | < 1 | [f]22,200 | -- | -- | [f]24,600 | -- | -- | [f]27,100 | -- | -- | -- | -- | -- |
| 6 | > 10 | 96,100 | 86,500 | 107,000 | 110,000 | 96,500 | 125,000 | 124,000 | 106,000 | 144,000 | 158,000 | 128,000 | 195,000 |
| 7 | > 10 | 105,000 | 94,800 | 117,000 | 119,000 | 105,000 | 135,000 | 133,000 | 115,000 | 154,000 | 165,000 | 135,000 | 202,000 |
| 8 | > 10 | 139,000 | 125,000 | 154,000 | 156,000 | 138,000 | 177,000 | 174,000 | 150,000 | 201,000 | 213,000 | 174,000 | 260,000 |
| 9 | > 10 | 134,000 | 121,000 | 149,000 | 152,000 | 134,000 | 172,000 | 169,000 | 146,000 | 196,000 | 208,000 | 171,000 | 254,000 |
| 10 | 4–10 | [g]6,360 | 5,720 | 7,310 | [g]6,970 | 6,200 | 8,140 | [g]7,560 | 6,660 | 8,950 | [g]8,900 | 7,680 | 10,900 |
| 11 | 4–10 | [g]8,780 | 8,080 | 9,730 | [g]9,800 | 8,930 | 11,000 | [g]10,800 | 9,780 | 12,300 | [g]13,400 | 11,800 | 15,700 |
| 12 | 4–10 | 873 | 725 | 1,050 | 984 | 793 | 1,220 | 1,100 | 859 | 1,410 | 1,390 | 1,020 | 1,900 |
| 13 | 4–10 | 5,600 | 4,910 | 6,380 | 6,180 | 5,290 | 7,230 | 6,740 | 5,610 | 8,090 | 7,950 | 6,240 | 10,100 |
| 14 | 4–10 | 5,280 | 4,740 | 5,880 | 5,630 | 4,950 | 6,410 | 5,950 | 5,100 | 6,920 | 6,580 | 5,360 | 8,090 |
| 15 | 4–10 | 1,830 | 1,710 | 1,960 | 1,940 | 1,790 | 2,100 | 2,050 | 1,860 | 2,250 | 2,300 | 2,010 | 2,620 |
| 16 | 4–10 | 4,100 | 3,530 | 4,750 | 4,600 | 3,860 | 5,480 | 5,100 | 4,170 | 6,240 | 6,290 | 4,870 | 8,120 |
| 17 | 4–10 | 4,510 | 3,950 | 5,140 | 5,020 | 4,300 | 5,860 | 5,530 | 4,630 | 6,600 | 6,750 | 5,360 | 8,490 |
| 18 | 4–10 | 5,390 | 4,940 | 5,870 | 5,730 | 5,170 | 6,350 | 6,060 | 5,370 | 6,840 | 6,800 | 5,760 | 8,040 |
| 19 | > 10 | 6,370 | 5,940 | 6,830 | 6,730 | 6,180 | 7,320 | 7,060 | 6,390 | 7,810 | 7,760 | 6,740 | 8,930 |
| 20 | 4–10 | 2,360 | 2,160 | 2,580 | 2,570 | 2,310 | 2,860 | 2,770 | 2,450 | 3,140 | 3,250 | 2,740 | 3,860 |
| 21 | 1–2 | 5,690 | 4,930 | 6,550 | 6,300 | 5,340 | 7,430 | 6,880 | 5,690 | 8,320 | 8,210 | 6,430 | 10,500 |
| 22 | 4–10 | 54,700 | 47,300 | 63,300 | 61,300 | 51,600 | 72,900 | 67,500 | 55,200 | 82,600 | 80,800 | 61,300 | 106,000 |
| 23 | > 10 | [g]3,100 | 2,380 | 4,690 | [g]3,730 | 2,780 | 5,990 | [g]4,420 | 3,200 | 7,540 | [g]6,340 | 4,290 | 12,300 |
| 24 | 4–10 | 1,210 | 1,050 | 1,510 | 1,320 | 1,130 | 1,720 | 1,440 | 1,210 | 1,940 | 1,730 | 1,410 | 2,490 |
| 25 | 4–10 | 30,700 | 25,600 | 36,900 | 35,000 | 28,300 | 43,400 | 39,100 | 30,500 | 50,200 | 48,200 | 34,400 | 67,500 |

[a] Rank of the maximum instantaneous peak streamflow measured during January 2008 compared to all systematic and historic annual peaks. A rank of 1 indicates that the January 2008 peak streamflow was higher than all other recorded annual peaks.

[b] Unless otherwise noted, expected peak streamflows are based on Water Resources Council Bulletin 17B weighting by variance method.

[c] The peak streamflow for January 2008 was exceeded by another peak streamflow during 2008.

[d] Streamflow affected to unknown degree by regulation or diversion.

[e] Streamflow affected by regulation or diversion.

[f] Expected peak streamflows are Indiana Coordinated Discharges, which do not include confidence limits (*http://www.state.in.us/dnr/water/4898.htm*).

[g] Expected peak streamflows based on Bulletin 17B systematic frequency-curve estimate only.

[h] A higher stage exists that corresponds to a streamflow that is less than the peak streamflow.


*Flooding in Spencer, Indiana from the White River (left) and USGS personnel launching boat (right) to make a streamflow measurement on the White River near Newberry, Indiana (USGS streamgage 03360500). Photographs by Paul Baker, USGS.*

**Table 2.** Summary of peak stages, streamflows, and flood-probability estimates for selected U.S. Geological Survey streamgages during February 2008.

[mi², square mile; ft, foot; ft³/s, cubic foot per second; AEP, annual exceedance probability; >, greater than; --, no data]

| Site number (fig. 8) | Station number | Station name | Contributing drainage area (mi²) | Flood data: Previous maximum streamflow | | | Flood of February 2008 | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Date | Stage (ft) | Streamflow (ft³/s) | Rank[a]/ annual peaks | Date | Peak stage (ft) | Peak streamflow (ft³/s) |
| 1 | 03322900 | Wabash River at Linn Grove, Ind. | 453 | 07/2003 | 14.76 | [c]14,500 | 2/45 | 2/7/2008 | 13.52 | [c]9,890 |
| 2 | 03324000 | Little River near Huntington, Ind. | 263 | 01/1950 | 16.90 | 5,990 | 5/65 | 2/7/2008 | 18.91 | 5,180 |
| 3 | 03325000 | Wabash River at Wabash, Ind. | 1,768 | 03/1913 | 28.70 | 90,000 | 44/86 | 2/6/2008 | 16.37 | [d]14,400 |
| 4 | 03327500 | Wabash River at Peru, Ind. | 2,686 | 03/1913 | 28.10 | 115,000 | 39/67 | 2/6/2008 | 12.39 | [d]15,800 |
| 5 | 03328000 | Eel River at North Manchester, Ind. | 417 | 12/1990 | 20.16 | 8,740 | 3/87 | 2/6/2008 | 14.09 | 8,230 |
| 6 | 03328500 | Eel River near Logansport, Ind. | 789 | 02/1985 | 12.68 | 17,700 | 6/66 | 2/7/2008 | 11.31 | 13,500 |
| 7 | 03329000 | Wabash River at Logansport, Ind. | 3,779 | 03/1913 | 25.30 | 140,000 | 41/94 | 2/6/2008 | 12.70 | [c]32,400 |
| 8 | 03330500 | Tippecanoe River at Oswego, Ind. | 113 | 03/1982 | 9.25 | [c]950 | 6/60 | 2/10/2008 | 8.54 | [c]661 |
| 9 | 03331500 | Tippecanoe River near Ora, Ind. | 856 | 06/1981 | 15.08 | 8,660 | ([f]) | 2/8/2008 | 15.60 | 9,200 |
| 10 | 03333050 | Tippecanoe River near Delphi, Ind. | 1,869 | 12/1990 | 12.87 | 22,100 | ([f]) | 2/6/2008 | 14.89 | [d]24,600 |
| 11 | 03335500 | Wabash River at Lafayette, Ind. | 7,267 | 03/1913 | 32.90 | 190,000 | 15/105 | 2/7/2008 | 23.94 | [c]72,400 |
| 12 | 03336000 | Wabash River at Covington, Ind. | 8,218 | 03/1913 | 35.10 | 200,000 | 15/82 | 2/8/2008 | 27.67 | [c]74,000 |
| 13 | 03336645 | Middle Fork Vermilion River, Oakwood, Ill. | 432 | 04/1994 | 20.46 | 15,500 | 4/32 | 2/6/2008 | 16.16 | 12,600 |
| 14 | 03336900 | Salt Fork near St. Joseph, Ill. | 134 | 05/1968 | 18.26 | 6,860 | 4/38 | 2/6/2008 | 19.06 | 5,660 |
| 15 | 03341500 | Wabash River at Terre Haute, Ind. | 12,263 | 03/1913 | 31.20 | 245,000 | ([f]) | 2/10/2008 | 25.00 | [c]92,200 |
| 16 | 03342000 | Wabash River at Riverton, Ind. | 13,161 | 03/1913 | 26.40 | 250,000 | ([f]) | 2/12/2008 | 24.16 | [c]77,300 |
| 17 | 03374000 | White River at Petersburg, Ind. | 11,125 | 03/1913 | 29.50 | 235,000 | ([f]) | 2/13/2008 | 23.58 | [c]70,600 |
| 18 | 04100222 | North Branch Elkhart River at Cosperville, Ind. | 142 | 03/1982 | 8.12 | [c]919 | ([f]) | 2/11/2008 | 7.58 | [c]718 |
| 19 | 04100500 | Elkhart River at Goshen, Ind. | 594 | 02/1985 | 11.87 | 6,360 | 8/81 | 2/6/2008 | 10.39 | 5,080 |
| 20 | 04180000 | Cedar Creek near Cedarville, Ind. | 270 | 12/1990 | 13.38 | 5,580 | 3/62 | 2/7/2008 | 12.83 | 5,290 |
| 21 | 05515500 | Kankakee River at Davis, Ind. | 537 | 01/2005 | 13.05 | 1,930 | ([f]) | 2/6/2008 | [g]13.17 | 1,580 |
| 22 | 05516500 | Yellow River at Plymouth, Ind. | 294 | 10/1954 | 17.13 | 5,390 | ([f]) | 2/7/2008 | 14.94 | 3,590 |
| 23 | 05517000 | Yellow River at Knox, Ind. | 435 | 10/1954 | 13.75 | 5,660 | 3/65 | 2/9/2008 | 12.16 | 4,310 |
| 24 | 05517500 | Kankakee River at Dunns Bridge, Ind. | 1,160 | 03/1982 | 13.38 | 5,870 | 2/60 | 2/12/2008 | [g]12.72 | 5,420 |
| 25 | 05518000 | Kankakee River at Shelby, Ind. | 1,779 | 03/1982 | 12.98 | 7,650 | ([f]) | 2/13/2008 | 12.27 | 5,710 |
| 26 | 05522500 | Iroquois River at Rensselaer, Ind. | 203 | 07/2003 | 16.59 | 2,620 | 4/61 | 2/7/2008 | 15.64 | 2,490 |
| 27 | 05524500 | Iroquois River near Foresman, Ind. | 449 | 06/1958 | 24.42 | 5,930 | 1/60 | 2/7/2008 | [g]22.70 | 6,480 |

| Site number (fig. 8) | Estimated AEP for observed peak streamflow (percent) | Expected peak streamflows for selected AEP with 95-percent confidence limits (ft³/s)[b]: 4-percent AEP (25-year recurrence) | | | 2-percent AEP (50-year recurrence) | | | 1-percent AEP (100-year recurrence) | | | 0.2-percent AEP (500-year recurrence) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Estimate | Confidence limit: Low | High | Estimate | Confidence limit: Low | High | Estimate | Confidence limit: Low | High | Estimate | Confidence limit: Low | High |
| 1 | 4–10 | 10,100 | 8,610 | 12,000 | 11,000 | 9,100 | 13,400 | 11,800 | 9,440 | 14,700 | 13,200 | 9,940 | 17,500 |
| 2 | 4–10 | 5,530 | 5,010 | 6,090 | 5,940 | 5,290 | 6,670 | 6,340 | 5,540 | 7,260 | 7,250 | 6,040 | 8,700 |
| 3 | > 10 | [e]22,500 | -- | -- | [e]25,500 | -- | -- | [e]29,500 | -- | -- | -- | -- | -- |
| 4 | > 10 | [e]23,900 | -- | -- | [e]26,900 | -- | -- | [e]30,900 | -- | -- | -- | -- | -- |
| 5 | 2–4 | 8,220 | 7,210 | 9,370 | 9,170 | 7,840 | 10,700 | 10,100 | 8,440 | 12,200 | 12,400 | 9,670 | 15,900 |
| 6 | 4–10 | 15,500 | 13,500 | 17,700 | 17,400 | 14,800 | 20,500 | 19,400 | 16,000 | 23,500 | 24,200 | 18,600 | 31,300 |
| 7 | > 10 | 68,400 | 59,600 | 78,500 | 80,300 | 67,700 | 95,300 | 92,800 | 75,700 | 114,000 | 125,000 | 94,100 | 166,000 |
| 8 | 4–10 | 782 | 662 | 925 | 895 | 733 | 1,090 | 1,010 | 804 | 1,280 | 1,310 | 970 | 1,770 |
| 9 | 2–4 | 8,920 | 7,660 | 10,400 | 9,990 | 8,370 | 11,900 | 11,000 | 8,990 | 13,500 | 13,300 | 10,200 | 17,200 |
| 10 | 1–2 | [e]22,200 | -- | -- | [e]24,600 | -- | -- | [e]27,100 | -- | -- | -- | -- | -- |
| 11 | > 10 | 96,100 | 86,500 | 107,000 | 110,000 | 96,500 | 125,000 | 124,000 | 106,000 | 144,000 | 158,000 | 128,000 | 195,000 |
| 12 | > 10 | 105,000 | 94,800 | 117,000 | 119,000 | 105,000 | 135,000 | 133,000 | 115,000 | 154,000 | 165,000 | 135,000 | 202,000 |
| 13 | 4–10 | 14,800 | 12,200 | 18,000 | 17,300 | 13,700 | 21,800 | 19,900 | 15,200 | 26,100 | 26,500 | 18,500 | 37,900 |
| 14 | 4–10 | 6,280 | 4,830 | 8,150 | 7,390 | 5,460 | 10,000 | 8,580 | 6,070 | 12,100 | 11,600 | 7,430 | 18,200 |
| 15 | > 10 | 139,000 | 125,000 | 154,000 | 156,000 | 138,000 | 177,000 | 174,000 | 150,000 | 201,000 | 213,000 | 174,000 | 260,000 |
| 16 | > 10 | 134,000 | 121,000 | 149,000 | 152,000 | 134,000 | 172,000 | 169,000 | 146,000 | 196,000 | 208,000 | 171,000 | 254,000 |
| 17 | > 10 | 153,000 | 139,000 | 170,000 | 173,000 | 153,000 | 195,000 | 191,000 | 166,000 | 221,000 | 235,000 | 192,000 | 286,000 |
| 18 | > 10 | 873 | 725 | 1,050 | 984 | 793 | 1,220 | 1,100 | 859 | 1,410 | 1,390 | 1,020 | 1,900 |
| 19 | 4–10 | 5,600 | 4,910 | 6,380 | 6,180 | 5,290 | 7,230 | 6,740 | 5,610 | 8,090 | 7,950 | 6,240 | 10,100 |
| 20 | 2–4 | 5,280 | 4,740 | 5,880 | 5,630 | 4,950 | 6,410 | 5,950 | 5,100 | 6,920 | 6,580 | 5,360 | 8,090 |
| 21 | > 10 | 1,830 | 1,710 | 1,960 | 1,940 | 1,790 | 2,100 | 2,050 | 1,860 | 2,250 | 2,300 | 2,010 | 2,620 |
| 22 | 4–10 | 4,100 | 3,530 | 4,750 | 4,600 | 3,860 | 5,480 | 5,100 | 4,170 | 6,240 | 6,290 | 4,870 | 8,120 |
| 23 | 4–10 | 4,510 | 3,950 | 5,140 | 5,020 | 4,300 | 5,860 | 5,530 | 4,630 | 6,600 | 6,750 | 5,360 | 8,490 |
| 24 | 2–4 | 5,390 | 4,940 | 5,870 | 5,730 | 5,170 | 6,350 | 6,060 | 5,370 | 6,840 | 6,800 | 5,760 | 8,040 |
| 25 | > 10 | 6,370 | 5,940 | 6,830 | 6,730 | 6,180 | 7,320 | 7,060 | 6,390 | 7,810 | 7,760 | 6,740 | 8,930 |
| 26 | 2–4 | 2,360 | 2,160 | 2,580 | 2,570 | 2,310 | 2,860 | 2,770 | 2,450 | 3,140 | 3,250 | 2,740 | 3,860 |
| 27 | 1–2 | 5,690 | 4,930 | 6,550 | 6,300 | 5,340 | 7,430 | 6,880 | 5,690 | 8,320 | 8,210 | 6,430 | 10,500 |

[a] Rank of the maximum instantaneous peak streamflow measured during February 2008 compared to all systematic and historic annual peaks. A rank of 1 indicates that the February 2008 peak streamflow was higher than all other recorded annual peaks.

[b] Unless otherwise noted, expected peak streamflows are based on Water Resources Council Bulletin 17B weighting by variance method.

[c] Streamflow affected to unknown degree by regulation or diversion.

[d] Streamflow affected by regulation or diversion.

[e] Expected peak streamflows are Indiana Coordinated Discharges, which do not include confidence limits (*http://www.state.in.us/dnr/water/4898.htm*).

[f] The peak streamflow for February 2008 was exceeded by another peak streamflow during 2008.

[g] A higher stage exists that corresponds to a streamflow that is less than the peak streamflow.

*Flooding in Harrisburg, Illinois. Flooding was because of local drainage interior to the levee (foreground) that could not be evacuated quick enough by the pumping station located in the brick structure atop the levee. Photograph by Robert Holmes, USGS.*

*Flooding in Harrisburg, Illinois. Photograph by Robert Holmes, USGS.*

**Table 3.** Summary of peak stages, streamflows, and flood-probability estimates for selected U.S. Geological Survey streamgages during March 2008.

[mi², square mile; ft, foot; ft³/s, cubic foot per second; AEP, annual exceedance probability; >, greater than; <, less than; --, no data]

| Site number (fig. 10) | Station number | Station name | Contributing drainage area (mi²) | Flood data: Previous maximum streamflow: Date | Stage (ft) | Streamflow (ft³/s) | Flood of March 2008: Rank[a]/ annual peaks | Date | Peak stage (ft) | Peak streamflow (ft³/s) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 03302800 | Blue River at Fredricksburg, Ind. | 206 | 04/1996 | 27.15 | 39,000 | 1/40 | 3/19/2008 | 27.37 | 41,700 |
| 2 | 03303000 | Blue River near White Cloud, Ind. | 284 | 04/1996 | 23.30 | 29,400 | 1/83 | 3/20/2008 | 24.15 | 31,000 |
| 3 | 03342000 | Wabash River at Riverton, Ind. | 13,161 | 03/1913 | 26.40 | 250,000 | ([c]) | 3/22/2008 | 19.99 | [d]47,100 |
| 4 | 03366500 | Muscatatuck River near Deputy, Ind. | 293 | 01/1959 | 34.27 | 52,200 | 2/61 | 3/19/2008 | 30.51 | 36,600 |
| 5 | 03376500 | Patoka River near Princeton, Ind. | 822 | 01/1937 | 26.80 | 18,700 | 6/74 | 3/24/2008 | [e]24.11 | [f]12,600 |
| 6 | 03378000 | Bonpas Creek at Browns, Ill. | 228 | 05/1961 | 24.04 | 7,500 | 6/68 | 3/20/2008 | 23.27 | 5,530 |
| 7 | 03378550 | Big Creek at Wadesville, Ind. | 104 | 04/1996 | 20.35 | 10,400 | 1/43 | 3/19/2008 | 20.55 | 14,300 |
| 8 | 03380500 | Skillet Fork at Wayne City, Ill. | 464 | 05/1990 | 25.75 | 59,400 | 6/91 | 3/20/2008 | 23.29 | 22,900 |
| 9 | 03382100 | South Fork Saline River near Carrier Mills, Ill. | 147 | 01/1982 | 16.32 | 5,160 | 1/43 | 3/19/2008 | 18.41 | 24,300 |
| 10 | 03384450 | Lusk Creek near Eddyville, Ill. | 42.9 | 08/1985 | 27.78 | 16,100 | 5/42 | 3/18/2008 | 22.05 | 9,740 |
| 11 | 05592900 | East Fork Kaskaskia River near Sandoval, Ill. | 113 | 05/1990 | 20.03 | [h]17,000 | 4/29 | 3/19/2008 | 20.06 | 9,300 |
| 12 | 05593575 | Crooked Creek near New Minden, Ill. | 84.3 | 05/1995 | 21.76 | 11,900 | 5/41 | 3/19/2008 | 21.22 | 9,950 |
| 13 | 05594100 | Kaskaskia River near Venedy Station, Ill. | 4,393 | 05/1995 | 25.79 | [f]50,300 | 8/39 | 3/21/2008 | 24.01 | [f]38,000 |
| 14 | 05595200 | Richland Creek near Hecker, Ill. | 129 | 04/1996 | 44.40 | 23,400 | 4/39 | 3/19/2008 | 42.90 | 13,200 |
| 15 | 05595730 | Rayse Creek near Waltonville, Ill. | 88.0 | 11/1993 | 17.73 | 21,200 | 7/29 | 3/19/2008 | 16.09 | 13,700 |
| 16 | 05595820 | Casey Fork at Mount Vernon, Ill. | 76.9 | 05/1990 | 17.03 | 16,100 | 4/23 | 3/19/2008 | 16.09 | 10,300 |
| 17 | 05597500 | Crab Orchard Creek near Marion, Ill. | 31.7 | 12/2001 | 13.63 | 9,430 | 1/57 | 3/19/2008 | 13.74 | 10,000 |
| 18 | 05599490 | Big Muddy River at Murphysboro, Ill. | 2,159 | 05/1996 | [i]37.65 | 33,800 | 4/80 | 3/22/2008 | 37.24 | 31,500 |
| 19 | 05600000 | Big Creek near Wetaug, Ill. | 32.2 | 03/1943 | 15.90 | 7,200 | 1/67 | 3/19/2008 | 15.74 | [h]7,200 |
| 20 | 06918440 | Sac River near Dadeville, Mo. | 257 | 09/1993 | 27.56 | 36,100 | 3/44 | 3/19/2008 | 21.32 | 14,600 |
| 21 | 06921070 | Pomme de Terre River near Polk, Mo. | 276 | 09/1993 | 27.10 | 34,300 | 3/40 | 3/19/2008 | 22.81 | 22,800 |
| 22 | 06923950 | Niangua River, Tunnel Dam, Macks Creek, Mo. | 598 | 01/2005 | 16.33 | 28,800 | 1/13 | 3/19/2008 | 17.06 | 32,600 |
| 23 | 06928000 | Gasconade River near Hazelgreen, Mo. | 1,250 | 12/1982 | 34.46 | 90,000 | 3/64 | 3/19/2008 | 34.92 | 89,500 |
| 24 | 06928300 | Roubidoux Creek above Fort Wood, Mo. | 165 | 05/2002 | 14.86 | 12,900 | ([c]) | 3/19/2008 | 19.92 | 24,500 |
| 25 | 06928430 | Roubidoux Creek below Fort Wood, Mo. | 287 | 05/2002 | 14.13 | 14,000 | 1/8 | 3/19/2008 | 18.45 | 28,900 |
| 26 | 06930000 | Big Piney River near Big Piney, Mo. | 560 | 12/1982 | 24.50 | 81,200 | 2/79 | 3/19/2008 | 23.58 | 64,000 |
| 27 | 06930060 | Big Piney below Fort Wood, Mo. | 593 | 05/2002 | 18.89 | 43,400 | 3/8 | 3/19/2008 | 23.45 | 66,000 |
| 28 | 06933500 | Gasconade River at Jerome, Mo. | 2,840 | 12/1982 | 31.34 | 136,000 | 3/90 | 3/20/2008 | 30.43 | 118,000 |
| 29 | 06934000 | Gasconade River near Rich Fountain, Mo. | 3,180 | 12/1982 | 33.27 | 134,000 | 2/69 | 3/21/2008 | 32.64 | 119,000 |
| 30 | 07013000 | Meramec River near Steelville, Mo. | 781 | 08/1915 | 26.50 | 60,000 | 4/93 | 3/19/2008 | 26.84 | 52,700 |
| 31 | 07014500 | Meramec River near Sullivan, Mo. | 1,475 | 08/1915 | 33.50 | 90,000 | 4/78 | 3/20/2008 | 31.69 | 66,900 |
| 32 | 07016500 | Bourbeuse River at Union, Mo. | 808 | 12/1982 | 33.80 | 73,300 | 5 /95 | 3/21/2008 | 25.89 | 36,900 |
| 33 | 07018100 | Big River near Richwoods, Mo. | 735 | 09/1993 | 30.33 | 59,800 | 2/25 | 3/19/2008 | 28.70 | 52,800 |
| 34 | 07018500 | Big River at Byrnesville, Mo. | 917 | 08/1915 | 30.20 | 80,000 | 4/87 | 3/20/2008 | 27.57 | 47,300 |
| 35 | 07019000 | Meramec River near Eureka, Mo. | 3,788 | 08/1915 | 40.20 | 175,000 | 4/91 | 3/21/2008 | 40.06 | 123,000 |
| 36 | 07021000 | Castor River at Zalma, Mo. | 423 | 12/1982 | 29.92 | [d]97,100 | 1/80 | 3/19/2008 | 30.47 | [d]114,000 |
| 37 | 07035800 | St. Francis River near Mill Creek, Mo. | 505 | 11/1993 | 33.10 | 130,000 | 3/20 | 3/19/2008 | 23.61 | 50,500 |
| 38 | 07036100 | St. Francis River near Saco, Mo. | 664 | 11/1993 | 36.10 | 161,000 | 2/17 | 3/19/2008 | 28.93 | 69,000 |
| 39 | 07037500 | St. Francis River near Patterson, Mo. | 956 | 12/1982 | 35.77 | 155,000 | 3/87 | 3/19/2008 | 30.82 | 79,300 |
| 40 | 07043500 | Little River Ditch No.1 near Morehouse, Mo. | 450 | 02/1989 | 19.30 | 12,000 | 6/60 | 3/19/2008 | 18.66 | 10,100 |
| 41 | 07050700 | James River near Springfield, Mo. | 246 | 07/1909 | 22.00 | 62,000 | 3/54 | 3/18/2008 | 19.32 | 34,200 |
| 42 | 07052250 | James River near Boaz, Mo. | 462 | 07/1973 | 20.56 | 31,400 | 1/15 | 3/19/2008 | 23.55 | 41,900 |
| 43 | 07052500 | James River at Galena, Mo. | 987 | 09/1993 | 33.46 | 73,200 | 1/87 | 3/19/2008 | 35.96 | 85,100 |
| 44 | 07053810 | Bull Creek near Walnut Shade, Mo. | 191 | 05/2002 | 14.41 | 32,200 | ([c]) | 3/18/2008 | 16.00 | 24,700 |
| 45 | 07054080 | Beaver Creek at Bradleyville, Mo. | 298 | 05/2002 | 17.92 | 20,800 | 1/14 | 3/19/2008 | 19.03 | 33,200 |
| 46 | 07056000 | Buffalo River near St. Joe, Ark. | 829 | 12/1982 | 53.75 | 158,000 | 3/81 | 3/19/2008 | 49.41 | 134,000 |

| Site number (fig. 10) | Estimated AEP for observed peak streamflow (percent) | Expected peak streamflows for selected AEP with 95-percent confidence limits (ft³/s)[b]: 4-percent AEP (25-year recurrence): Estimate | Confidence limit: Low | High | 2-percent AEP (50-year recurrence): Estimate | Confidence limit: Low | High | 1-percent AEP (100-year recurrence): Estimate | Confidence limit: Low | High | 0.2-percent AEP (500-year recurrence): Estimate | Confidence limit: Low | High |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.2–1 | 24,100 | 19,200 | 30,200 | 28,300 | 22,100 | 36,300 | 32,700 | 25,000 | 42,900 | 44,400 | 31,600 | 62,200 |
| 2 | 1–2 | 27,300 | 23,700 | 31,500 | 31,000 | 26,300 | 36,600 | 34,900 | 28,800 | 42,200 | 44,700 | 34,700 | 57,500 |
| 3 | > 10 | 134,000 | 121,000 | 149,000 | 152,000 | 134,000 | 172,000 | 169,000 | 146,000 | 196,000 | 208,000 | 171,000 | 254,000 |
| 4 | .2–1 | 29,600 | 26,600 | 33,000 | 32,800 | 28,900 | 37,200 | 35,700 | 30,900 | 41,300 | 42,300 | 35,000 | 51,100 |
| 5 | 4–10 | [g]13,800 | 11,200 | 18,400 | [g]15,800 | 12,700 | 21,800 | [g]17,900 | 14,100 | 25,300 | [g]22,800 | 17,300 | 34,200 |
| 6 | 4–10 | 6,600 | 5,640 | 7,740 | 7,480 | 6,210 | 9,010 | 8,370 | 6,750 | 10,400 | 10,500 | 7,880 | 14,100 |
| 7 | < .2 | 8,940 | 7,330 | 10,900 | 9,730 | 7,730 | 12,200 | 10,500 | 8,070 | 13,600 | 12,100 | 8,650 | 16,900 |
| 8 | 4–10 | 29,800 | 23,200 | 38,300 | 36,700 | 27,300 | 49,200 | 43,900 | 31,200 | 61,800 | 62,300 | 39,600 | 98,000 |
| 9 | < .2 | 7,780 | 5,780 | 10,500 | 9,450 | 6,660 | 13,400 | 11,300 | 7,550 | 16,800 | 16,200 | 9,610 | 27,300 |
| 10 | 4–10 | 11,900 | 9,370 | 15,100 | 13,600 | 10,400 | 17,900 | 15,400 | 11,300 | 21,100 | 19,700 | 13,100 | 29,500 |
| 11 | 4–10 | 11,500 | 8,170 | 16,300 | 13,700 | 9,290 | 20,300 | 16,000 | 10,300 | 24,900 | 21,600 | 12,500 | 37,500 |
| 12 | 4–10 | 11,600 | 8,720 | 15,500 | 13,700 | 9,850 | 19,100 | 15,800 | 10,900 | 23,000 | 20,800 | 12,800 | 33,600 |
| 13 | > 10 | [g]54,800 | 44,600 | 72,300 | [g]62,600 | 50,100 | 84,700 | [g]70,200 | 55,400 | 97,100 | [g]87,200 | 66,900 | 126,000 |
| 14 | 4–10 | 14,600 | 11,100 | 19,200 | 17,100 | 12,400 | 23,500 | 19,700 | 13,700 | 28,200 | 25,900 | 16,300 | 41,200 |
| 15 | > 10 | 19,500 | 12,600 | 30,300 | 23,600 | 14,400 | 38,700 | 27,700 | 16,000 | 48,000 | 37,300 | 19,100 | 73,100 |
| 16 | 4–10 | 13,600 | 8,990 | 20,500 | 16,200 | 10,200 | 25,700 | 18,800 | 11,200 | 31,400 | 25,100 | 13,300 | 47,200 |
| 17 | .2–1 | 6,480 | 4,690 | 8,940 | 8,050 | 5,530 | 11,700 | 9,740 | 6,350 | 14,900 | 14,100 | 8,110 | 24,400 |
| 18 | 4–10 | [g]32,600 | 27,200 | 41,500 | [g]37,200 | 30,600 | 48,700 | [g]41,900 | 34,000 | 56,200 | [g]53,000 | 41,600 | 74,600 |
| 19 | .2–1 | 4,240 | 3,530 | 5,090 | 4,920 | 3,950 | 6,140 | 5,660 | 4,360 | 7,350 | 7,650 | 5,360 | 10,900 |
| 20 | 4–10 | 20,100 | 14,300 | 28,300 | 25,700 | 17,600 | 37,700 | 31,900 | 21,000 | 48,400 | 46,900 | 28,900 | 76,200 |
| 21 | 4–10 | 26,300 | 22,100 | 31,300 | 29,100 | 23,700 | 35,700 | 31,900 | 25,200 | 40,300 | 38,700 | 28,500 | 52,600 |
| 22 | 4–10 | 40,100 | -- | -- | 47,300 | -- | -- | 55,100 | -- | -- | 73,500 | -- | -- |
| 23 | 2–4 | 79,700 | 64,000 | 99,300 | 94,900 | 73,400 | 123,000 | 110,000 | 81,800 | 147,000 | 144,000 | 98,900 | 209,000 |
| 24 | 2–4 | [j]21,200 | -- | -- | [j]25,300 | -- | -- | [j]29,700 | -- | -- | [j]40,300 | -- | -- |
| 25 | 2–4 | [j]26,900 | -- | -- | [j]31,900 | -- | -- | [j]37,200 | -- | -- | [j]50,000 | -- | -- |
| 26 | .2–1 | 41,400 | 33,200 | 51,800 | 50,200 | 38,700 | 65,000 | 59,400 | 44,200 | 79,800 | 82,000 | 56,500 | 119,000 |
| 27 | .2–1 | [j]42,000 | -- | -- | [j]49,700 | -- | -- | [j]58,000 | -- | -- | [j]77,700 | -- | -- |
| 28 | 1–2 | 97,900 | 81,900 | 117,000 | 116,000 | 93,800 | 143,000 | 135,000 | 105,000 | 173,000 | 181,000 | 131,000 | 251,000 |
| 29 | 1–2 | 94,900 | 77,700 | 116,000 | 114,000 | 89,800 | 144,000 | 134,000 | 102,000 | 175,000 | 184,000 | 130,000 | 260,000 |
| 30 | 2–4 | 49,900 | 40,700 | 61,300 | 58,700 | 45,800 | 75,100 | 67,700 | 50,700 | 90,300 | 89,500 | 61,600 | 130,000 |
| 31 | 4–10 | 74,900 | 56,600 | 99,300 | 89,000 | 63,500 | 125,000 | 104,000 | 70,800 | 152,000 | 138,000 | 87,500 | 218,000 |
| 32 | 4–10 | 38,400 | 32,200 | 45,700 | 45,600 | 37,000 | 56,100 | 53,200 | 41,900 | 67,700 | 72,700 | 53,000 | 99,500 |
| 33 | 2–4 | 52,300 | 37,900 | 72,000 | 60,800 | 42,600 | 86,700 | 69,400 | 47,100 | 102,000 | 89,800 | 57,000 | 142,000 |
| 34 | 2–4 | 46,600 | 38,700 | 56,000 | 54,800 | 44,100 | 68,100 | 63,300 | 49,200 | 81,300 | 84,000 | 60,500 | 116,000 |
| 35 | 2–4 | 114,000 | 95,400 | 136,000 | 136,000 | 110,000 | 167,000 | 159,000 | 125,000 | 202,000 | 219,000 | 160,000 | 300,000 |
| 36 | < .2 | 50,900 | 37,600 | 68,700 | 63,900 | 45,300 | 90,100 | 77,100 | 52,600 | 113,000 | 107,000 | 67,900 | 170,000 |
| 37 | > 10 | 67,000 | 45,800 | 98,100 | 78,100 | 51,600 | 118,000 | 89,300 | 57,400 | 139,000 | 116,000 | 70,300 | 191,000 |
| 38 | 4–10 | 86,100 | 61,400 | 121,000 | 98,500 | 67,800 | 143,000 | 111,000 | 73,900 | 166,000 | 140,000 | 87,500 | 224,000 |
| 39 | 4–10 | 84,700 | 70,600 | 102,000 | 98,300 | 79,400 | 122,000 | 112,000 | 87,700 | 144,000 | 146,000 | 106,000 | 202,000 |
| 40 | 4–10 | 10,900 | 9,510 | 12,400 | 11,900 | 10,200 | 14,000 | 13,000 | 10,800 | 15,600 | 15,300 | 11,800 | 19,700 |
| 41 | 2–4 | 33,200 | 27,600 | 39,900 | 38,200 | 30,700 | 47,500 | 42,900 | 33,300 | 55,300 | 53,400 | 38,300 | 74,500 |
| 42 | 2–4 | 38,300 | 30,000 | 49,100 | 44,100 | 32,800 | 59,100 | 50,200 | 35,700 | 70,600 | 65,900 | 42,900 | 101,000 |
| 43 | .2–1 | 55,800 | 46,200 | 67,400 | 65,600 | 52,500 | 81,900 | 75,800 | 58,600 | 97,900 | 101,000 | 72,200 | 141,000 |
| 44 | 4–10 | 33,000 | 21,100 | 51,600 | 39,600 | 24,700 | 63,300 | 46,400 | 28,500 | 75,700 | 62,900 | 36,900 | 107,000 |
| 45 | 4–10 | 34,200 | 22,600 | 51,800 | 40,800 | 26,200 | 63,500 | 47,600 | 29,900 | 75,800 | 64,200 | 38,300 | 107,000 |
| 46 | 2–4 | 122,000 | 99,800 | 157,000 | 146,000 | 118,000 | 193,000 | 171,000 | 136,000 | 231,000 | 233,000 | 178,000 | 327,000 |

**Table 3.** Summary of peak stages, streamflows, and flood-probability estimates for selected U.S. Geological Survey streamgages during March 2008.—Continued

[mi$^2$, square mile; ft, foot; ft$^3$/s, cubic foot per second; AEP, annual exceedance probability; >, greater than; <, less than; --, no data]

| Site number (fig. 10) | Station number | Station name | Contributing drainage area (mi$^2$) | Flood data: Previous maximum streamflow | | | Flood data: Flood of March 2008 | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Date | Stage (ft) | Streamflow (ft$^3$/s) | Rank[a]/ annual peaks | Date | Peak stage (ft) | Peak streamflow (ft$^3$/s) |
| 47 | 07057500 | North Fork River near Tecumseh, Mo. | 561 | 11/1985 | 28.10 | 133,000 | 4/64 | 3/19/2008 | 22.79 | 60,600 |
| 48 | 07058000 | Bryant Creek near Tecumseh, Mo. | 570 | 12/1982 | 26.74 | 71,100 | 3/53 | 3/19/2008 | 22.12 | 42,800 |
| 49 | 07060500 | White River at Calico Rock, Ark. | 9,980 | 01/1916 | 52.90 | 350,000 | ([c]) | 3/19/2008 | 39.64 | [f]197,000 |
| 50 | 07061000 | White River at Batesville, Ark. | 11,100 | 02/1916 | 31.90 | 382,000 | 17/93 | 3/20/2008 | 26.96 | [f]208,000 |
| 51 | 07061900 | Logan Creek at Ellington, Mo. | 139 | 05/2002 | 13.22 | 16,300 | 1/15 | 3/18/2008 | 13.20 | 16,600 |
| 52 | 07064000 | Black River at Corning, Ark. | 1,749 | 03/1964 | 15.23 | [f]32,500 | 4/102 | 3/22/2008 | 15.92 | [f]27,100 |
| 53 | 07064533 | Current River above Akers, Mo. | 295 | 11/2003 | 7.07 | 5,540 | 1/7 | 3/19/2008 | 18.52 | 29,500 |
| 54 | 07065200 | Jacks Fork near Mountain View, Mo. | 185 | 04/2004 | 17.68 | 17,400 | 1/6 | 3/18/2008 | 20.39 | 23,600 |
| 55 | 07065495 | Jacks Fork at Alley Spring, Mo. | 298 | 11/1993 | 21.97 | 48,700 | 3/15 | 3/19/2008 | 15.23 | 30,000 |
| 56 | 07067000 | Current River at Van Buren, Mo. | 1,667 | 03/1904 | 29.00 | 153,100 | 10/96 | 3/20/2008 | 25.71 | 82,600 |
| 57 | 07068000 | Current River at Doniphan, Mo. | 2,038 | 03/1904 | 24.90 | 130,000 | 4/92 | 3/19/2008 | 24.11 | 95,200 |
| 58 | 07069000 | Black River at Pocahontas, Ark. | 4,840 | 04/1927 | 25.90 | 80,000 | 2/73 | 3/22/2008 | 26.56 | [d]72,200 |
| 59 | 07069305 | Spring River at Town Branch Bridge, Hardy, Ark. | 867 | 09/2006 | 16.75 | 44,500 | 1/7 | 3/19/2008 | 22.29 | 80,700 |
| 60 | 07069500 | Spring River at Imboden, Ark. | 1,180 | 12/1982 | 38.12 | 244,000 | 2/73 | 3/19/2008 | 29.15 | 97,300 |
| 61 | 07071500 | Eleven Point River near Bardley, Mo. | 793 | 12/1982 | 21.64 | 49,800 | 2/88 | 3/19/2008 | 21.33 | 49,400 |
| 62 | 07072000 | Eleven Point River near Ravenden Springs, Ark. | 1,130 | 12/1982 | 29.06 | 162,000 | 2/77 | 3/19/2008 | 23.81 | 69,700 |
| 63 | 07072500 | Black River at Black Rock, Ark. | 7,370 | 12/1982 | 31.51 | 190,000 | 3/104 | 3/20/2008 | 29.74 | 135,000 |
| 64 | 07074420 | Black River near Elgin Ferry, Ark. | 8,420 | 03/2002 | 26.33 | 59,500 | 1/17 | 3/21/2008 | [e]32.57 | [h]127,000 |
| 65 | 07074500 | White River at Newport, Ark. | 19,900 | 04/1927 | 35.60 | 387,000 | 8/123 | 3/21/2008 | 33.87 | [f]266,000 |
| 66 | 07074850 | White River near Augusta, Ark. | 20,500 | 02/1989 | 35.54 | [f]140,000 | 1/16 | 3/22/2008 | 38.41 | [f]252,000 |
| 67 | 07076750 | White River near Georgetown, Ark. | 22,400 | 12/1982 | 28.87 | [f]179,000 | 2/30 | 3/24/2008 | 30.18 | [f]175,000 |
| 68 | 07185765 | Spring River at Carthage, Mo. | 425 | 11/1972 | 17.15 | 24,800 | 1/20 | 3/19/2008 | 18.38 | -- |
| 69 | 07187000 | Shoal Creek above Joplin, Mo. | 427 | 05/1943 | 16.80 | 62,100 | 6/85 | 3/19/2008 | 18.28 | 24,100 |
| 70 | 07195000 | Osage Creek near Elm Springs, Ark. | 130 | 05/1950 | 16.70 | 22,500 | 5/43 | 3/18/2008 | 15.55 | 15,800 |
| 71 | 07195500 | Illinois River near Watts, Okla. | 635 | 07/1960 | 25.96 | 68,000 | 3/53 | 3/19/2008 | 24.73 | [d]53,000 |
| 72 | 07196500 | Illinois River near Tahlequah, Okla. | 959 | 05/1950 | 27.94 | 150,000 | 6/76 | 3/20/2008 | 22.29 | [d]61,800 |
| 73 | 07247250 | Black Fork below Big Creek near Page, Okla. | 74.4 | 04/2002 | 20.94 | 23,300 | 1/16 | 3/18/2008 | 23.36 | 34,600 |
| 74 | 07257006 | Big Piney at Highway 164 near Dover, Ark. | 306 | 12/1982 | [i]33.87 | 110,000 | 6/16 | 3/18/2008 | 21.76 | 73,700 |
| 75 | 07260000 | Dutch Creek at Waltreak, Ark. | 81.4 | 07/1969 | 22.38 | 24,500 | 2/73 | 3/19/2008 | 20.00 | 22,400 |
| 76 | 07261500 | Fourche LaFave River near Gravelly, Ark. | 410 | 12/1982 | 32.45 | 162,000 | 2/69 | 3/19/2008 | 30.91 | 81,500 |
| 77 | 07338750 | Mountain Fork at Smithville, Okla. | 320 | 10/1998 | 30.40 | 46,500 | 1/15 | 3/19/2008 | 30.55 | 54,900 |

| Site number (fig. 10) | Estimated AEP for observed peak streamflow (percent) | Expected peak streamflows for selected AEP with 95-percent confidence limits (ft$^3$/s)[b]: 4-percent AEP (25-year recurrence) | | | 2-percent AEP (50-year recurrence) | | | 1-percent AEP (100-year recurrence) | | | 0.2-percent AEP (500-year recurrence) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Estimate | Confidence limit: Low | Confidence limit: High | Estimate | Confidence limit: Low | Confidence limit: High | Estimate | Confidence limit: Low | Confidence limit: High | Estimate | Confidence limit: Low | Confidence limit: High |
| 47 | 2–4 | 57,800 | 40,900 | 81,800 | 72,500 | 49,100 | 107,000 | 87,400 | 57,100 | 134,000 | 121,000 | 74,100 | 199,000 |
| 48 | 4–10 | 45,200 | 34,500 | 59,200 | 55,900 | 41,100 | 76,100 | 67,500 | 47,900 | 95,300 | 96,500 | 63,300 | 147,000 |
| 49 | [k]2–4 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 50 | [k]2–4 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 51 | 4–10 | 22,300 | 13,600 | 36,600 | 27,500 | 16,500 | 45,900 | 32,800 | 19,400 | 55,500 | 45,400 | 25,900 | 79,400 |
| 52 | 4–10 | [g]28,700 | 24,200 | 35,500 | [g]33,000 | 27,500 | 41,600 | [g]37,300 | 30,700 | 47,900 | [g]47,100 | 37,800 | 62,700 |
| 53 | 4–10 | [j]34,800 | -- | -- | [j]41,700 | -- | -- | [j]49,200 | -- | -- | [j]67,200 | -- | -- |
| 54 | 4–10 | [j]28,400 | -- | -- | [j]34,300 | -- | -- | [j]40,600 | -- | -- | [j]56,000 | -- | -- |
| 55 | > 10 | 39,900 | 26,200 | 61,000 | 47,100 | 30,000 | 73,900 | 54,300 | 33,900 | 87,100 | 71,700 | 42,500 | 121,000 |
| 56 | 4–10 | 99,300 | 79,800 | 124,000 | 122,000 | 94,200 | 157,000 | 145,000 | 108,000 | 194,000 | 202,000 | 139,000 | 292,000 |
| 57 | 4–10 | 95,700 | 77,600 | 118,000 | 117,000 | 91,300 | 149,000 | 139,000 | 105,000 | 184,000 | 194,000 | 135,000 | 278,000 |
| 58 | 2–4 | 66,400 | 56,000 | 82,100 | 80,300 | 66,500 | 101,000 | 95,600 | 77,700 | 125,000 | 137,000 | 107,000 | 188,000 |
| 59 | 2–4 | [l]79,700 | -- | -- | [l]98,500 | -- | -- | [l]118,100 | -- | -- | -- | -- | -- |
| 60 | 2–4 | 94,700 | 77,000 | 123,000 | 120,000 | 95,400 | 160,000 | 149,000 | 116,000 | 205,000 | 232,000 | 172,000 | 341,000 |
| 61 | 2–4 | 46,900 | 36,100 | 60,900 | 60,400 | 44,700 | 81,700 | 75,400 | 53,600 | 106,000 | 114,000 | 74,700 | 174,000 |
| 62 | .2–1 | 41,300 | 33,900 | 52,600 | 51,600 | 41,500 | 67,600 | 63,000 | 49,800 | 85,000 | 94,900 | 71,900 | 136,000 |
| 63 | 2–4 | 116,000 | 101,000 | 137,000 | 140,000 | 120,000 | 169,000 | 166,000 | 140,000 | 203,000 | 235,000 | 192,000 | 300,000 |
| 64 | [m]1–2 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 65 | [k]2–4 | 238,000 | -- | -- | 306,000 | -- | -- | 389,000 | -- | -- | 666,000 | -- | -- |
| 66 | [k]2–4 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 67 | [k]2–4 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 68 | [n]-- | 40,600 | 28,800 | 57,400 | 49,700 | 33,900 | 72,900 | 58,800 | 38,800 | 89,100 | 79,700 | 49,100 | 129,000 |
| 69 | 4–10 | 32,800 | 25,000 | 43,000 | 41,900 | 30,700 | 57,200 | 51,900 | 36,600 | 73,600 | 77,100 | 50,300 | 118,000 |
| 70 | 4–10 | 20,100 | 15,200 | 29,100 | 24,500 | 18,100 | 36,800 | 29,200 | 21,100 | 45,200 | 40,800 | 28,300 | 67,500 |
| 71 | 2–4 | 52,900 | 41,800 | 67,000 | 62,200 | 47,400 | 81,500 | 71,700 | 52,800 | 97,400 | 94,700 | 63,700 | 141,000 |
| 72 | 4–10 | 71,800 | 56,600 | 91,000 | 89,400 | 67,700 | 118,000 | 109,000 | 79,200 | 150,000 | 163,000 | 107,000 | 249,000 |
| 73 | 1–2 | 29,500 | 20,600 | 42,400 | 34,600 | 23,200 | 51,700 | 39,800 | 25,700 | 61,900 | 53,200 | 31,100 | 91,100 |
| 74 | 4–10 | 82,100 | 65,000 | 111,000 | 102,000 | 79,200 | 142,000 | 125,000 | 94,400 | 179,000 | 185,000 | 134,000 | 283,000 |
| 75 | 1–2 | 17,800 | 14,300 | 22,200 | 21,200 | 16,400 | 27,500 | 24,600 | 18,200 | 33,200 | 33,400 | 22,300 | 50,000 |
| 76 | 1–2 | 68,800 | 57,400 | 86,100 | 78,900 | 65,000 | 101,000 | 88,500 | 72,100 | 115,000 | 109,000 | 87,200 | 146,000 |
| 77 | 2–4 | 51,900 | 40,300 | 66,800 | 57,800 | 43,600 | 76,700 | 63,800 | 46,700 | 87,300 | 78,000 | 53,000 | 115,000 |

[a] Rank of the maximum instantaneous peak streamflow measured during March 2008 compared to all systematic and historic annual peaks. A rank of 1 indicates that the March 2008 peak streamflow was higher than all other recorded annual peaks.

[b] Unless otherwise noted, expected peak streamflows are based on Water Resources Council Bulletin 17B weighting by variance method.

[c] The peak streamflow for March 2008 was exceeded by another peak streamflow during 2008.

[d] Streamflow affected to unknown degree by regulation or diversion.

[e] Peak stage was because of backwater. Backwater adjustments were made to the streamflow.

[f] Streamflow affected by regulation or diversion.

[g] Expected peak streamflows based on Bulletin 17B systematic frequency-curve estimate only.

[h] Estimated.

[i] Streamgage previously was at a different location and datum (05599490 replaced 05599500 after 2007 and 07257006 replaced 07257000 after 1992).

[j] Expected peak streamflows based on regional regression equation estimates only.

[k] Estimated AEP based on Bulletin 17B expected probability method.

[l] Expected peak streamflows based on Ries and Dillow method (2006) using 7 years of record.

[m] Estimated AEP based on 2-station analysis using 17 non-consecutive years of record.

[n] Estimated AEP uncharacterized because of regulation or insufficient data.


*Flooding on the Current River at Montauk State Park, Montauk, Missouri. Photographs by Paul Rydlund, USGS.*

**Table 4.** Summary of peak stages, streamflows, and flood-probability estimates for selected U.S. Geological Survey streamgages during April 2008.

[mi$^2$, square mile; ft, foot; ft$^3$/s, cubic foot per second; AEP, annual exceedance probability; --, no data]

| Site number (fig. 11) | Station number | Station name | Contributing drainage area (mi$^2$) | Flood data: Previous maximum streamflow | | | Flood data: Flood of April 2008 | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Date | Stage (ft) | Streamflow (ft$^3$/s) | Rank[a]/ annual peaks | Date | Peak stage (ft) | Peak streamflow (ft$^3$/s) |
| 1 | 05416200 | Lamont Creek Tributary near Lamont, Iowa | 1.8 | 06/2000 | 20.13 | [c]635 | 1/18 | 4/25/2008 | 23.18 | 1,190 |
| 2 | 05420875 | Buck Creek near Oran, Iowa | 37.9 | 05/1999 | 91.02 | [c]5,600 | 2/43 | 4/25/2008 | 91.33 | 2,930 |
| 3 | 05463500 | Black Hawk Creek at Hudson, Iowa | 303 | 07/1969 | 18.23 | 19,300 | 1/51 | 4/25/2008 | 19.03 | 22,500 |
| 4 | 06919020 | Sac River at Highway J below Stockton, Mo. | 1,292 | 09/1993 | 23.71 | 13,300 | 4/35 | 4/10/2008 | 21.26 | [d]10,100 |
| 5 | 06919900 | Sac River near Caplinger Mills, Mo. | 1,810 | 04/1994 | 30.95 | 61,500 | 6/34 | 4/11/2008 | 26.12 | [d]23,300 |
| 6 | 07050500 | Kings River near Berryville, Ark. | 527 | 11/1985 | 38.91 | 66,000 | 5/80 | 4/10/2008 | 35.29 | [c]50,100 |
| 7 | 07060500 | White River at Calico Rock, Ark. | 9,980 | 01/1916 | 52.90 | 350,000 | 11/116 | 4/11/2008 | 40.27 | [d]202,000 |
| 8 | 07060710 | North Sylamore Creek near Fifty Six, Ark. | 58.1 | 12/1982 | 20.60 | 25,200 | 1/54 | 4/10/2008 | 19.16 | 28,200 |
| 9 | 07061000 | White River at Batesville, Ark. | 11,100 | 02/1916 | 31.90 | 382,000 | ([h]) | 4/11/2008 | -- | [d]199,000 |
| 10 | 07071500 | Eleven Point River near Bardley, Mo. | 793 | 12/1982 | 21.64 | 49,800 | ([h]) | 4/11/2008 | 19.72 | 41,400 |
| 11 | 07072000 | Eleven Point River near Ravenden Springs, Ark. | 1,130 | 12/1982 | 29.06 | 162,000 | ([h]) | 4/11/2008 | 21.35 | 43,600 |
| 12 | 07072500 | Black River at Black Rock, Ark. | 7,370 | 12/1982 | 31.51 | 190,000 | ([h]) | 4/11/2008 | 28.67 | 108,000 |
| 13 | 07074500 | White River at Newport, Ark. | 19,900 | 04/1927 | 35.60 | 387,000 | ([h]) | 4/13/2008 | -- | [d]237,000 |
| 14 | 07077000 | White River at DeValls Bluff, Ark. | 23,400 | 04/1927 | 34.60 | [d]-- | 3/73 | 4/17/2008 | 31.41 | [d]189,000 |
| 15 | 07185765 | Spring River at Carthage, Mo. | 425 | 11/1972 | 17.15 | 24,800 | ([h]) | 4/10/2008 | 17.74 | -- |
| 16 | 07188653 | Big Sugar Creek near Powell, Mo. | 141 | 05/2002 | 15.70 | 11,000 | 1/8 | 4/10/2008 | 18.11 | 15,800 |
| 17 | 07197000 | Baron Ford at Eldon, Okla. | 307 | 06/2000 | 26.77 | [j]54,700 | 5/63 | 4/10/2008 | 23.50 | [j]39,600 |
| 18 | 07249985 | Lee Creek near Short, Okla. | 420 | 04/1945 | [c]35.00 | [c]112,000 | 10/78 | 4/10/2008 | 23.19 | 55,700 |
| 19 | 07257500 | Illinois Bayou near Scottsville, Ark. | 241 | 12/1982 | 27.49 | 130,000 | 2/71 | 4/10/2008 | 23.46 | 77,600 |

| Site number (fig. 11) | Estimated AEP for observed peak streamflow (percent) | Expected peak streamflows for selected AEP with 95-percent confidence limits (ft$^3$/s)[b]: 4-percent AEP (25-year recurrence) | | | 2-percent AEP (50-year recurrence) | | | 1-percent AEP (100-year recurrence) | | | 0.2-percent AEP (500-year recurrence) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Estimate | Confidence limit: Low | Confidence limit: High | Estimate | Confidence limit: Low | Confidence limit: High | Estimate | Confidence limit: Low | Confidence limit: High | Estimate | Confidence limit: Low | Confidence limit: High |
| 1 | 4–10 | 1,380 | 1,030 | 1,840 | 1,770 | 1,300 | 2,410 | 2,200 | 1,580 | 3,060 | 3,380 | 2,260 | 5,050 |
| 2 | 4–10 | 3,630 | 2,840 | 4,640 | 4,650 | 3,560 | 6,080 | 5,720 | 4,270 | 7,660 | 8,440 | 5,880 | 12,100 |
| 3 | .2–1 | 15,100 | 11,900 | 19,000 | 18,300 | 14,200 | 23,600 | 21,600 | 16,400 | 28,400 | 29,700 | 21,100 | 41,600 |
| 4 | [e]-- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 5 | [e]-- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 6 | 4–10 | 55,800 | 45,800 | 71,300 | 68,200 | 55,000 | 89,600 | 81,600 | 64,600 | 110,000 | 117,000 | 89,000 | 166,000 |
| 7 | [f].2–1 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 8 | .2–1 | [g]17,000 | 12,400 | 23,300 | [g]20,000 | 14,300 | 28,000 | [g]22,800 | 15,900 | 32,500 | [g]29,500 | 19,700 | 44,300 |
| 9 | [e]-- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 10 | 4–10 | 46,900 | 36,100 | 60,900 | 60,400 | 44,700 | 81,700 | 75,400 | 53,600 | 106,000 | 114,000 | 74,700 | 174,000 |
| 11 | 2–4 | 41,300 | 33,900 | 52,600 | 51,600 | 41,500 | 67,600 | 63,000 | 49,800 | 85,000 | 94,900 | 71,900 | 136,000 |
| 12 | 4–10 | 116,000 | 101,000 | 137,000 | 140,000 | 120,000 | 169,000 | 166,000 | 140,000 | 203,000 | 235,000 | 192,000 | 300,000 |
| 13 | [f]4–10 | 238,000 | -- | -- | 306,000 | -- | -- | 389,000 | -- | -- | 666,000 | -- | -- |
| 14 | [f]2–4 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 15 | [e]-- | 40,600 | 28,800 | 57,400 | 49,700 | 33,900 | 72,900 | 58,800 | 38,800 | 89,100 | 79,700 | 49,100 | 129,000 |
| 16 | 4–10 | [i]21,400 | -- | -- | [i]25,700 | -- | -- | [i]30,400 | -- | -- | [i]41,500 | -- | -- |
| 17 | 4–10 | 51,000 | 39,300 | 66,200 | 60,900 | 45,200 | 82,000 | 70,900 | 50,600 | 99,500 | 95,300 | 61,500 | 148,000 |
| 18 | > 10 | 74,800 | 59,900 | 93,200 | 89,200 | 69,100 | 115,000 | 104,000 | 77,800 | 139,000 | 142,000 | 96,700 | 209,000 |
| 19 | 1–2 | 61,300 | 49,600 | 80,400 | 76,400 | 60,400 | 103,000 | 93,200 | 72,100 | 130,000 | 140,000 | 104,000 | 209,000 |

[a] Rank of the maximum instantaneous peak streamflow measured during April 2008 compared to all systematic and historic annual peaks. A rank of 1 indicates that the April 2008 peak streamflow was higher than all other recorded annual peaks.

[b] Unless otherwise noted, expected peak streamflows are based on Water Resources Council Bulletin 17B weighting by variance method.

[c] Estimated.

[d] Streamflow affected by regulation or diversion.

[e] Estimated AEP uncharacterized because of regulation or insufficient data.

[f] Expected peak streamflows based on Bulletin 17B expected probability method.

[g] Expected peak streamflows based on Bulletin 17B systematic frequency-curve estimate only.

[h] The peak streamflow for April 2008 was exceeded by another peak streamflow during 2008.

[i] Expected peak streamflows based on regional regression equation estimates only.

[j] Streamflow affected to unknown degree by regulation or diversion.

*Hydrographer working to repair instrumentation on the Big Muddy River at Murphysboro, Illinois (USGS streamgage 05599490). Photograph by Robert Holmes, USGS.*


*Hydrographer making a streamflow measurement on the Big Muddy at Murphysboro, Illinois (USGS streamgage 05599490). Photograph by Robert Holmes, USGS.*

**Table 5.** Summary of peak stages, streamflows, and flood-probability estimates for selected U.S. Geological Survey streamgages during May and June 2008.

[mi², square mile; ft, foot; ft³/s, cubic foot per second; AEP, annual exceedance probability; >, greater than; <, less than; --, no data; R., River]

| Site number (fig. 12) | Station number | Station name | Contributing drainage area (mi²) | Flood data: Previous maximum streamflow: Date | Previous maximum streamflow: Stage (ft) | Previous maximum streamflow: Streamflow (ft³/s) | Flood of June 2008: Rank[a]/annual peaks | Flood of June 2008: Date | Flood of June 2008: Peak stage (ft) | Flood of June 2008: Peak streamflow (ft³/s) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 03341500 | Wabash River at Terre Haute, Ind. | 12,263 | 03/1913 | 31.20 | 245,000 | 27/118 | 6/8/2008 | 25.02 | [c]92,400 |
| 2 | 03342000 | Wabash River at Riverton, Ind. | 13,161 | 03/1913 | [d]26.40 | 250,000 | 10/73 | 6/10/2008 | 26.56 | [c]98,100 |
| 3 | 03345500 | Embarras River at Ste. Marie, Ill. | 1,516 | 01/1950 | 25.95 | 44,800 | 1/98 | 6/7/2008 | 28.06 | 60,400 |
| 4 | 03346000 | North Fork Embarras River Near Oblong, Ill. | 318 | 01/1950 | 24.38 | 27,100 | 1/68 | 6/7/2008 | 26.26 | 46,200 |
| 5 | 03353637 | Little Buck Creek near Indianapolis, Ind. | 17.0 | 12/1990 | [d]9.10 | 2,300 | 1/19 | 6/7/2008 | 13.01 | 2,850 |
| 6 | 03354000 | White River near Centerton, Ind. | 2,444 | 03/1913 | 21.90 | 90,000 | 2/65 | 6/7/2008 | 19.85 | [c]63,500 |
| 7 | 03357350 | Plum Creek near Bainbridge, Ind. | 3.0 | 09/1989 | 6.50 | 940 | 1/39 | 6/4/2008 | 7.15 | 1,000 |
| 8 | 03358000 | Mill Creek near Cataract, Ind. | 245 | 12/1990 | -- | 12,200 | 3/59 | 6/7/2008 | 22.61 | 10,800 |
| 9 | 03360500 | White River at Newberry, Ind. | 4,688 | 03/1913 | 27.50 | 130,000 | 1/102 | 6/9/2008 | 28.59 | [c]138,000 |
| 10 | 03362000 | Youngs Creek near Edinburgh, Ind. | 107 | 01/1952 | 13.40 | 10,700 | 1/66 | 6/7/2008 | 15.67 | 20,500 |
| 11 | 03362500 | Sugar Creek near Edinburgh, Ind. | 474 | 05/1956 | 18.38 | 27,600 | 1/66 | 6/7/2008 | 19.23 | 39,900 |
| 12 | 03363500 | Flatrock River at St. Paul, Ind. | 303 | 01/1949 | [d]10.60 | 18,500 | 6/78 | 6/7/2008 | 12.82 | 16,400 |
| 13 | 03363900 | Flatrock River at Columbus, Ind. | 534 | 01/2005 | 16.45 | 22,400 | 1/41 | 6/7/2008 | 19.94 | 62,500 |
| 14 | 03364000 | East Fork White River at Columbus, Ind. | 1,707 | 03/1913 | 17.90 | 100,000 | 2/64 | 6/8/2008 | 18.61 | 68,100 |
| 15 | 03364500 | Clifty Creek at Hartsville, Ind. | 91.4 | 03/1913 | 25.10 | 20,000 | 2/62 | 6/7/2008 | 17.85 | 16,200 |
| 16 | 03365500 | East Fork White River at Seymour, Ind. | 2,341 | 03/1913 | 21.00 | 120,000 | 2/86 | 6/8/2008 | 20.91 | 96,400 |
| 17 | 03374000 | White River at Petersburg, Ind. | 11,125 | 03/1913 | 29.50 | 235,000 | 7/86 | 6/12/2008 | 26.96 | [c]135,000 |
| 18 | 03377500 | Wabash River at Mount Carmel, Ill. | 28,635 | 03/1913 | 33.00 | 428,000 | 11/128 | 6/14/2008 | 33.24 | [c]255,000 |
| 19 | 04073500 | Fox River at Berlin, Wis. | 1,340 | 03/1946 | [d]15.50 | 6,900 | 5/111 | 6/22/2008 | [e]16.08 | 6,020 |
| 20 | 04085427 | Manitowoc River at Manitowoc, Wis. | 526 | 03/1979 | [d]13.24 | 8,280 | 2/35 | 6/13/2008 | 12.04 | 6,100 |
| 21 | 04086000 | Sheboygan River at Sheboygan, Wis. | 418 | 08/1998 | [f]12.02 | 7,820 | 3/65 | 6/9/2008 | 11.08 | 6,810 |
| 22 | 04086600 | Milwaukee River near Cedarburg, Wis. | 607 | 05/2004 | 13.11 | 5,720 | 1/27 | 6/13/2008 | 13.98 | 6,980 |
| 23 | 04087000 | Milwaukee River at Milwaukee, Wis. | 696 | 06/1997 | 10.00 | 16,500 | 6/94 | 6/7/2008 | 8.07 | 10,400 |
| 24 | 04087204 | Oak Creek at South Milwaukee, Wis. | 25.0 | 08/1986 | 9.88 | 1,140 | 1/45 | 6/7/2008 | 11.56 | 2,370 |
| 25 | 04087220 | Root River near Franklin, Wis. | 49.2 | 03/1960 | 9.57 | 5,130 | 1/46 | 6/8/2008 | 11.00 | 5,350 |
| 26 | 04087233 | Root River Canal near Franklin, Wis. | 57.0 | 03/1974 | 9.88 | 1,440 | 1/45 | 6/9/2008 | 12.13 | 1,560 |
| 27 | 04087240 | Root River at Racine, Wis. | 189 | 03/1974 | 8.54 | 4,500 | 1/45 | 6/9/2008 | 11.29 | 8,050 |
| 28 | 04087257 | Pike River near Racine, Wis. | 38.5 | 08/2007 | 8.24 | 1,720 | 1/37 | 6/8/2008 | 8.97 | 1,960 |
| 29 | 04108600 | Rabbit River near Hopkins, Mich. | 71.4 | 06/1997 | 11.11 | [h]3,740 | 3/44 | 6/8/2008 | 9.37 | 1,770 |
| 30 | 04122500 | Pere Marquette River at Scottville, Mich. | 681 | 09/1986 | 8.07 | 6,440 | 2/69 | 6/13/2008 | 5.81 | 3,110 |
| 31 | 04124000 | Manistee River near Sherman, Mich. | 60.8 | 03/1913 | 7.10 | 3,570 | 5/89 | 6/14/2008 | 16.37 | 3,200 |
| 32 | 04124200 | Manistee River near Mesick, Mich. | 1,018 | 03/2006 | 6.38 | [c]3,150 | 1/11 | 6/14/2008 | 6.87 | [c]3,690 |
| 33 | 04124500 | East Branch Pine River near Tustin, Mich. | 60.0 | 08/1956 | 6.23 | 876 | 3/53 | 6/13/2008 | 6.26 | 760 |
| 34 | 04125460 | Pine River near Hoxeyville, Mich. | 245 | 08/1956 | 6.82 | 2,440 | 1/42 | 6/14/2008 | 9.29 | 2,870 |
| 35 | 04125550 | Manistee River near Wellston, Mich. | 1,451 | 03/1998 | 10.91 | [c]6,130 | 1/12 | 6/14/2008 | 11.06 | [c]6,500 |
| 36 | 05385500 | South Fork Root River near Houston, Minn. | 275 | 06/2000 | 14.90 | 13,800 | 4/56 | 6/9/2008 | 14.35 | 10,900 |
| 37 | 05387440 | Upper Iowa River at Bluffton, Iowa | 367 | 08/2007 | 12.66 | 8,440 | 1/6 | 6/9/2008 | 15.49 | 16,600 |
| 38 | 05387490 | Dry Run Creek near Decorah, Iowa | 21.0 | 08/1993 | 20.80 | 4,620 | 1/26 | 6/8/2008 | 21.53 | 5,820 |
| 39 | 05387500 | Upper Iowa River at Decorah, Iowa | 511 | 08/1993 | [h]14.35 | [h]20,500 | 1/57 | 6/9/2008 | 17.90 | 34,100 |
| 40 | 05388250 | Upper Iowa River near Dorchester, Iowa | 770 | 05/1941 | 21.80 | 30,400 | 1/33 | 6/9/2008 | 22.46 | 31,200 |
| 41 | 05388310 | Waterloo Creek near Dorchester, Iowa | 43.6 | 07/1978 | 14.80 | 9,380 | 2/39 | 6/8/2008 | 14.57 | 8,800 |
| 42 | 05404116 | West Branch Baraboo River at Hillsboro, Wis. | 39.1 | 06/1990 | 15.26 | 4,010 | 1/21 | 6/8/2008 | 16.12 | 5,260 |
| 43 | 05405000 | Baraboo River near Baraboo, Wis. | 609 | 03/1917 | [d]17.50 | 7,900 | 1/75 | 6/13/2008 | 27.48 | 18,100 |
| 44 | 05408000 | Kickapoo River at La Farge, Wis. | 266 | 07/1978 | 14.92 | 14,300 | 1/70 | 6/8/2008 | 15.78 | 22,100 |
| 45 | 05410490 | Kickapoo River at Steuben, Wis. | 687 | 07/1978 | 14.81 | 16,500 | 1/75 | 6/10/2008 | 19.16 | 28,700 |
| 46 | 05411850 | Turkey River near Eldorado, Iowa | 641 | 05/2004 | 19.61 | 19,700 | 1/9 | 6/9/2008 | 21.46 | 50,100 |

Expected peak streamflows for selected AEP with 95-percent confidence limits (ft³/s)[b]

| Site number | Estimated AEP for observed peak streamflow (percent) | 4-percent AEP (25-year recurrence): Estimate | 4-percent AEP: Confidence limit Low | 4-percent AEP: Confidence limit High | 2-percent AEP (50-year recurrence): Estimate | 2-percent AEP: Confidence limit Low | 2-percent AEP: Confidence limit High | 1-percent AEP (100-year recurrence): Estimate | 1-percent AEP: Confidence limit Low | 1-percent AEP: Confidence limit High | 0.2-percent AEP (500-year recurrence): Estimate | 0.2-percent AEP: Confidence limit Low | 0.2-percent AEP: Confidence limit High |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | > 10 | 139,000 | 125,000 | 154,000 | 156,000 | 138,000 | 177,000 | 174,000 | 150,000 | 201,000 | 213,000 | 174,000 | 260,000 |
| 2 | > 10 | 134,000 | 121,000 | 149,000 | 152,000 | 134,000 | 172,000 | 169,000 | 146,000 | 196,000 | 208,000 | 171,000 | 254,000 |
| 3 | .2–1 | 41,500 | 34,200 | 50,300 | 49,100 | 39,100 | 61,700 | 56,900 | 43,700 | 74,200 | 76,100 | 53,300 | 109,000 |
| 4 | .2–1 | 26,100 | 20,500 | 33,200 | 31,000 | 23,400 | 41,000 | 35,900 | 26,000 | 49,600 | 47,500 | 31,000 | 72,800 |
| 5 | 1–2 | 2,450 | 2,220 | 2,700 | 2,800 | 2,490 | 3,150 | 3,160 | 2,750 | 3,620 | 4,070 | 3,380 | 4,900 |
| 6 | 2–4 | 55,500 | 49,800 | 61,900 | 63,700 | 56,000 | 72,400 | 71,900 | 62,000 | 83,500 | 91,600 | 75,400 | 111,000 |
| 7 | 2–4 | 909 | 741 | 1,120 | 1,050 | 839 | 1,320 | 1,200 | 935 | 1,540 | 1,550 | 1,150 | 2,080 |
| 8 | 4–10 | 11,300 | 9,660 | 13,300 | 13,000 | 10,900 | 15,600 | 14,700 | 12,000 | 18,000 | 18,700 | 14,600 | 23,800 |
| 9 | < .2 | 79,700 | 70,700 | 89,800 | 91,700 | 79,500 | 106,000 | 104,000 | 88,100 | 123,000 | 135,000 | 107,000 | 170,000 |
| 10 | < .2 | 8,670 | 7,070 | 10,600 | 9,820 | 7,840 | 12,300 | 10,800 | 8,500 | 13,800 | 13,000 | 9,860 | 17,200 |
| 11 | < .2 | 20,600 | 17,000 | 25,000 | 23,700 | 19,100 | 29,400 | 26,500 | 21,000 | 33,500 | 32,800 | 25,000 | 43,000 |
| 12 | 2–4 | 16,300 | 13,700 | 19,300 | 18,600 | 15,400 | 22,500 | 20,800 | 16,900 | 25,700 | 25,700 | 20,000 | 33,100 |
| 13 | < .2 | 24,200 | 19,100 | 30,600 | 27,900 | 21,700 | 35,900 | 31,100 | 23,800 | 40,700 | 38,500 | 28,600 | 51,800 |
| 14 | 1–2 | 57,000 | 48,600 | 66,900 | 65,600 | 54,600 | 78,700 | 73,500 | 60,000 | 90,100 | 91,300 | 71,300 | 117,000 |
| 15 | .2–1 | 10,500 | 8,920 | 12,300 | 12,800 | 10,600 | 15,400 | 15,200 | 12,300 | 18,800 | 21,400 | 16,200 | 28,100 |
| 16 | .2–1 | 74,300 | 66,300 | 83,200 | 83,200 | 72,700 | 95,200 | 91,100 | 78,000 | 107,000 | 108,000 | 88,300 | 133,000 |
| 17 | 4–10 | 153,000 | 139,000 | 170,000 | 173,000 | 153,000 | 195,000 | 191,000 | 166,000 | 221,000 | 235,000 | 192,000 | 286,000 |
| 18 | 4–10 | 281,000 | 252,000 | 315,000 | 311,000 | 272,000 | 356,000 | 339,000 | 289,000 | 398,000 | 397,000 | 318,000 | 494,000 |
| 19 | 4–10 | 6,340 | 5,650 | 7,110 | 7,060 | 6,150 | 8,100 | 7,770 | 6,610 | 9,140 | 9,290 | 8,250 | 10,700 |
| 20 | 4–10 | 6,270 | 4,990 | 8,580 | 7,450 | 5,800 | 10,600 | 8,690 | 6,630 | 12,800 | 11,900 | 8,650 | 18,600 |
| 21 | 4–10 | 7,630 | 6,350 | 9,170 | 8,610 | 6,950 | 10,700 | 9,550 | 7,450 | 12,200 | 11,600 | 9,460 | 15,100 |
| 22 | 1–2 | 6,100 | 5,080 | 7,940 | 6,940 | 5,680 | 9,320 | 7,790 | 6,270 | 10,800 | 9,870 | 7,640 | 14,600 |
| 23 | 4–10 | 11,000 | 9,250 | 13,000 | 12,700 | 10,400 | 15,500 | 14,600 | 11,600 | 18,300 | 19,600 | 16,500 | 24,300 |
| 24 | < .2 | 1,230 | 975 | 1,540 | 1,400 | 1,070 | 1,850 | 1,590 | 1,150 | 2,200 | 2,310 | 1,870 | 3,110 |
| 25 | 1–2 | [g]3,430 | 2,730 | 4,630 | [g]4,340 | 3,360 | 6,110 | [g]5,390 | 4,070 | 7,900 | [g]8,510 | 6,050 | 13,600 |
| 26 | 2–4 | 1,470 | 1,250 | 1,720 | 1,610 | 1,340 | 1,950 | 1,760 | 1,410 | 2,190 | 2,020 | 1,710 | 2,550 |
| 27 | < .2 | 4,130 | 3,240 | 5,260 | 4,760 | 3,570 | 6,340 | 5,400 | 3,860 | 7,570 | 8,030 | 6,330 | 11,100 |
| 28 | 1–2 | [g]1,740 | 1,510 | 2,110 | [g]1,900 | 1,630 | 2,340 | [g]2,040 | 1,740 | 2,550 | [g]2,330 | 1,950 | 2,990 |
| 29 | 2–4 | 1,550 | 1,140 | 2,100 | 1,830 | 1,270 | 2,620 | 2,120 | 1,400 | 3,200 | -- | -- | -- |
| 30 | 4–10 | [g]3,540 | 3,210 | 4,010 | [g]3,930 | 3,520 | 4,510 | [g]4,310 | 3,820 | 5,020 | [g]5,190 | 4,520 | 6,210 |
| 31 | 4–10 | [g]3,240 | 3,090 | 3,440 | [g]3,420 | 3,240 | 3,640 | [g]3,580 | 3,380 | 3,840 | [g]3,920 | 3,680 | 4,250 |
| 32 | 4–10 | [g]3,740 | 3,220 | 4,900 | [g]3,970 | 3,390 | 5,370 | [g]4,190 | 3,530 | 5,820 | [g]4,640 | 3,830 | 6,810 |
| 33 | 2–4 | [g]755 | 645 | 925 | [g]844 | 712 | 1,050 | [g]927 | 774 | 1,170 | [g]1,110 | 905 | 1,440 |
| 34 | .2–1 | [g]2,150 | 1,870 | 2,590 | [g]2,440 | 2,090 | 3,020 | [g]2,750 | 2,320 | 3,470 | [g]3,500 | 2,860 | 4,640 |
| 35 | 2–4 | [g]6,220 | 5,440 | 7,950 | [g]6,680 | 5,760 | 8,830 | [g]7,130 | 6,060 | 9,720 | [g]8,150 | 6,720 | 11,900 |
| 36 | 4–10 | 11,900 | 8,800 | 16,200 | 15,400 | 10,900 | 21,600 | 19,100 | 12,900 | 28,100 | 29,100 | 17,600 | 48,000 |
| 37 | 2–4 | [i]16,300 | -- | -- | [i]19,300 | -- | -- | [i]22,300 | -- | -- | [i]29,600 | -- | -- |
| 38 | 1–2 | 4,590 | 3,750 | 5,620 | 5,530 | 4,420 | 6,910 | 6,530 | 5,100 | 8,360 | 9,150 | 6,700 | 12,500 |
| 39 | .2–1 | [j]19,200 | 16,200 | 22,700 | [j]22,800 | 18,800 | 27,600 | [j]26,400 | 21,300 | 32,800 | [j]35,300 | 26,700 | 46,600 |
| 40 | .2–1 | 21,800 | 18,000 | 26,500 | 26,500 | 21,300 | 32,900 | 31,200 | 24,600 | 39,700 | 42,800 | 31,600 | 58,100 |
| 41 | 2–4 | 7,470 | 5,690 | 9,800 | 9,520 | 7,110 | 12,800 | 11,600 | 8,480 | 16,000 | 17,200 | 11,600 | 25,300 |
| 42 | 1–2 | 3,990 | 2,490 | 6,380 | 4,890 | 2,870 | 8,340 | 5,830 | 3,200 | 10,600 | 6,330 | 3,240 | 12,400 |
| 43 | < .2 | 8,320 | 6,690 | 10,300 | 9,990 | 7,720 | 12,900 | 11,800 | 8,710 | 16,000 | 14,800 | 11,900 | 19,700 |
| 44 | .2–1 | 8,870 | 6,460 | 12,200 | 11,400 | 7,790 | 16,600 | 14,300 | 9,160 | 22,200 | 23,500 | 17,400 | 34,700 |
| 45 | .2–1 | 11,500 | 8,280 | 16,100 | 15,200 | 10,200 | 22,600 | 19,400 | 12,200 | 30,900 | 32,700 | 23,800 | 49,300 |
| 46 | < .2 | [i]22,400 | -- | -- | [i]26,400 | -- | -- | [i]30,200 | -- | -- | [i]39,700 | -- | -- |

**Table 5.** Summary of peak stages, streamflows, and flood-probability estimates for selected U.S. Geological Survey streamgages during May and June 2008.—Continued

[mi², square mile; ft, foot; ft³/s, cubic foot per second; AEP, annual exceedance probability; >, greater than; <, less than; --, no data; R., River]

| Site number (fig. 12) | Station number | Station name | Contributing drainage area (mi²) | Flood data: Previous maximum streamflow | | | Flood data: Flood of June 2008 | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Date | Stage (ft) | Streamflow (ft³/s) | Rank[a]/ annual peaks | Date | Peak stage (ft) | Peak streamflow (ft³/s) |
| 47 | 05412020 | Turkey River, French Hollow Creek, Elkader, Iowa | 903 | 06/1991 | 27.32 | 38,300 | 1/8 | 6/10/2008 | 27.77 | 40,500 |
| 48 | 05412400 | Volga River at Littleport, Iowa | 348 | 05/1999 | 25.36 | [h]30,000 | 3/12 | 6/8/2008 | 20.41 | 18,900 |
| 49 | 05412500 | Turkey River at Garber, Iowa | 1,545 | 05/2004 | 32.80 | 66,700 | 4/90 | 6/10/2008 | 29.13 | 45,500 |
| 50 | 05414000 | Platte River near Rockville, Wis. | 142 | 07/1950 | 17.26 | 43,500 | 4/74 | 6/12/2008 | [h]14.17 | [h]15,200 |
| 51 | 05414350 | Little Maquoketa River near Graf, Iowa | 39.6 | 06/2002 | 15.93 | 7,700 | 1/58 | 6/8/2008 | 16.47 | 8,370 |
| 52 | 05414450 | N. Fork Little Maquoketa River, Rickardsville, Iowa | 21.6 | 08/1972 | 14.02 | 7,180 | 1/58 | 6/8/2008 | 12.58 | 8,040 |
| 53 | 05414605 | Bloody Run Tributary near Sherrill, Iowa | .6 | 06/1991 | 19.27 | [h]692 | 1/18 | 6/8/2008 | 22.71 | 1,110 |
| 54 | 05416900 | Maquoketa River at Manchester, Iowa | 275 | 05/2004 | 21.66 | 26,000 | 2/8 | 5/26/2008 | 20.80 | 22,100 |
| 55 | 05418400 | North Fork Maquoketa River near Fulton, Iowa | 505 | 06/2002 | 19.87 | 22,600 | 2/10 | 6/13/2008 | 18.67 | 20,700 |
| 56 | 05419000 | Apple River near Hanover, Ill. | 247 | 06/2002 | 27.91 | 13,700 | 5/74 | 6/9/2008 | 25.20 | 11,300 |
| 57 | 05420680 | Wapsipinicon River near Tripoli, Iowa | 346 | 07/1999 | 18.50 | 19,400 | 3/13 | 6/9/2008 | 18.24 | 18,300 |
| 58 | 05421000 | Wapsipinicon River at Independence, Iowa | 1,048 | 05/1999 | 22.35 | 31,100 | 4/75 | 6/11/2008 | 18.86 | 23,700 |
| 59 | 05421740 | Wapsipinicon River near Anamosa, Iowa | 1,575 | 05/2004 | 22.73 | [h]22,000 | 1/7 | 6/13/2008 | 26.18 | 31,800 |
| 60 | 05422000 | Wapsipinicon River at DeWitt, Iowa | 2,336 | 05/2004 | 13.79 | 31,500 | 1/74 | 6/16/2008 | [d]14.13 | 36,400 |
| 61 | 05422470 | Crow Creek at Bettendorf, Iowa | 17.8 | 06/1990 | 11.03 | 7,700 | 2/30 | 6/13/2008 | 9.56 | 3,590 |
| 62 | 05422600 | Duck Creek, DC Golf Course, Davenport, Iowa | 57.3 | 06/2002 | 16.34 | 7,310 | 1/15 | 6/13/2008 | 16.60 | 7,570 |
| 63 | 05423500 | South Branch Rock River at Waupun, Wis. | 63.6 | 04/1959 | [d]7.97 | 1,500 | 1/42 | 6/13/2008 | 10.09 | 2,350 |
| 64 | 05425500 | Rock River at Watertown, Wis. | 969 | 03/1979 | [d]6.19 | [c]5,080 | 1/71 | 6/13/2008 | 7.81 | [c]7,600 |
| 65 | 05425912 | Beaver Dam River at Beaver Dam, Wis. | 157 | 06/2004 | 10.68 | [l]1,140 | 1/23 | 6/16/2008 | [e]845.53 | [l]1,700 |
| 66 | 05426000 | Crawfish River at Milford, Wis. | 762 | 04/1959 | 11.15 | 6,140 | 1/77 | 6/16/2008 | 13.35 | 7,190 |
| 67 | 05426250 | Bark River near Rome, Wis. | 122 | 04/1993 | 2.56 | 476 | 2/25 | 6/9/2008 | 4.59 | 1,370 |
| 68 | 05427570 | Rock River at Indianford, Wis. | 2,630 | 04/1979 | 16.23 | [c]11,900 | 1/33 | 6/21/2008 | 18.33 | [c]14,900 |
| 69 | 05427718 | Yahara River at Windsor, Wis. | 37.0 | 07/1993 | 6.58 | 2,050 | 1/24 | 6/9/2008 | 6.97 | 3,290 |
| 70 | 05429500 | Yahara River at McFarland, Wis. | 290 | 04/1959 | [d]5.82 | [l]867 | 1/76 | 6/14/2008 | [d]7.17 | [l]976 |
| 71 | 05430500 | Rock River at Afton, Wis. | 3,340 | 03/1929 | [d]11.80 | [c]13,000 | 1/95 | 6/21/2008 | 13.51 | [c]16,700 |
| 72 | 05437500 | Rock River at Rockton, Ill. | 6,363 | 03/1916 | 13.06 | 32,500 | 4/80 | 6/17/2008 | 14.72 | 27,800 |
| 73 | 05449500 | Iowa River near Rowan, Iowa | 429 | 06/1954 | 14.88 | 8,460 | 3/67 | 6/9/2008 | 15.89 | 7,890 |
| 74 | 05451080 | South Fork Iowa River near Blairsburg, Iowa | 12.0 | 03/2007 | 11.79 | 227 | 1/3 | 6/8/2008 | 12.50 | 762 |
| 75 | 05451210 | South Fork Iowa River, New Providence, Iowa | 224 | 06/2007 | 10.68 | 3,910 | 1/13 | 6/8/2008 | 13.84 | 7,390 |
| 76 | 05451500 | Iowa River at Marshalltown, Iowa | 1,532 | 06/1918 | [d]17.74 | 42,000 | 3/92 | 6/13/2008 | 21.79 | 22,400 |
| 77 | 05451700 | Timber Creek near Marshalltown, Iowa | 118 | 08/1977 | 17.69 | 12,000 | 5/60 | 6/8/2008 | 16.19 | 7,010 |
| 78 | 05451955 | Stein Creek near Clutier, Iowa | 23.4 | 06/1982 | 77.92 | 11,400 | 1/36 | 5/30/2008 | 78.02 | 12,200 |
| 79 | 05452000 | Salt Creek near Elberon, Iowa | 201 | 07/1993 | 20.85 | 36,600 | 5/64 | 5/30/2008 | 19.75 | 22,400 |
| 80 | 05453100 | Iowa River at Marengo, Iowa | 2,794 | 07/1993 | 20.31 | 38,000 | 1/52 | 6/12/2008 | 21.38 | 51,000 |
| 81 | 05453200 | Price Creek at Amana, Iowa | 29.1 | 06/1990 | 88.78 | 5,080 | 9/43 | 6/12/2008 | 91.09 | 3,110 |
| 82 | 05453520 | Iowa River below Coralville Dam, Coralville, Iowa | 3,115 | 07/1993 | 63.95 | [l]25,800 | 1/16 | 6/15/2008 | 68.09 | [l]39,900 |
| 83 | 05454180 | Clear Creek Tributary near Williamsburg, Iowa | .4 | 06/2007 | 49.18 | 328 | 1/19 | 6/12/2008 | 49.37 | 346 |
| 84 | 05454500 | Iowa River at Iowa City, Iowa | 3,271 | 06/1851 | 24.10 | 70,000 | 4/108 | 6/15/2008 | 31.53 | [l]41,100 |
| 85 | 05455700 | Iowa River at Lone Tree, Iowa | 4,293 | 07/1993 | 22.94 | [l]57,100 | 2/52 | 6/15/2008 | 23.10 | [l]53,700 |
| 86 | 05457000 | Cedar River near Austin, Minn. | 399 | 09/2004 | 23.26 | 20,000 | 3/69 | 6/12/2008 | 21.42 | 15,300 |
| 87 | 05457440 | Deer Creek near Carpenter, Iowa | 91.6 | 07/2004 | 85.75 | 4,150 | 1/36 | 6/8/2008 | 87.86 | 11,800 |
| 88 | 05457700 | Cedar River at Charles City, Iowa | 1,054 | 07/1999 | 22.81 | 31,200 | 1/54 | 6/9/2008 | 25.33 | 34,600 |
| 89 | 05457778 | Little Cedar River near Johnsburg, Minn. | 45.8 | 08/1993 | 17.58 | 9,280 | 4/23 | 6/12/2008 | 16.04 | 3,710 |
| 90 | 05458000 | Little Cedar River near Ionia, Iowa | 306 | 08/1993 | 18.99 | 14,000 | 1/55 | 6/9/2008 | 21.32 | 24,700 |
| 91 | 05458300 | Cedar River at Waverly, Iowa | 1,547 | 04/2001 | 12.95 | 25,600 | 1/8 | 6/10/2008 | 19.33 | 52,600 |
| 92 | 05458500 | Cedar River at Janesville, Iowa | 1,661 | 07/1999 | 17.15 | 42,200 | 1/88 | 6/10/2008 | 19.45 | 53,400 |

| Estimated AEP for observed peak streamflow (percent) | Expected peak streamflows for selected AEP with 95-percent confidence limits (ft³/s)[b]: 4-percent AEP (25-year recurrence) | | | 2-percent AEP (50-year recurrence) | | | 1-percent AEP (100-year recurrence) | | | 0.2-percent AEP (500-year recurrence) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Estimate | Confidence limit: Low | Confidence limit: High | Estimate | Confidence limit: Low | Confidence limit: High | Estimate | Confidence limit: Low | Confidence limit: High | Estimate | Confidence limit: Low | Confidence limit: High |
| 0.2–1 | [i]26,600 | -- | -- | [i]31,100 | -- | -- | [i]35,600 | -- | -- | [i]46,300 | -- | -- |
| 2–4 | 18,100 | 14,300 | 23,000 | 22,100 | 17,100 | 28,600 | 26,100 | 19,700 | 34,500 | 36,100 | 25,500 | 51,200 |
| 1–2 | 35,100 | 30,500 | 40,400 | 41,100 | 35,000 | 48,300 | 47,300 | 39,300 | 56,900 | 62,300 | 48,800 | 79,600 |
| 2–4 | 14,700 | 10,800 | 19,900 | 17,800 | 12,500 | 25,500 | 20,900 | 13,800 | 31,800 | 23,900 | 14,000 | 40,800 |
| 2–4 | 7,240 | 5,820 | 9,010 | 9,000 | 7,050 | 11,500 | 10,900 | 8,300 | 14,300 | 15,800 | 11,300 | 22,300 |
| .2–1 | 5,010 | 3,920 | 6,400 | 6,260 | 4,800 | 8,180 | 7,610 | 5,680 | 10,200 | 11,200 | 7,820 | 16,100 |
| 2–4 | [g]1,110 | 616 | 2,820 | [g]1,620 | 842 | 4,680 | [g]2,280 | 1,120 | 7,460 | [g]4,660 | 1,990 | 19,800 |
| .2–1 | [i]15,000 | -- | -- | [i]17,900 | -- | -- | [i]20,700 | -- | -- | [i]27,800 | -- | -- |
| 2–4 | [j]19,200 | 15,700 | 23,500 | [j]22,900 | 18,300 | 28,600 | [j]26,600 | 20,800 | 34,000 | [j]35,500 | 26,000 | 48,400 |
| 4–10 | 12,200 | 10,000 | 14,800 | 14,300 | 11,300 | 18,000 | 16,400 | 12,600 | 21,500 | 22,000 | 15,400 | 31,500 |
| 1–2 | 14,500 | 11,100 | 19,000 | 17,300 | 13,000 | 22,900 | 20,000 | 14,800 | 27,100 | 26,900 | 18,600 | 38,900 |
| 4–10 | 23,900 | 20,000 | 28,400 | 28,800 | 23,600 | 35,000 | 33,700 | 27,000 | 42,000 | 45,400 | 34,100 | 60,300 |
| 2–4 | [k]27,600 | -- | -- | [k]33,100 | -- | -- | [k]38,500 | -- | -- | [k]51,400 | -- | -- |
| 2–4 | 31,700 | 26,600 | 37,800 | 37,700 | 31,000 | 45,900 | 43,700 | 35,100 | 54,500 | 57,800 | 43,600 | 76,700 |
| 4–10 | [g]5,040 | 3,370 | 8,920 | [g]6,690 | 4,300 | 12,600 | [g]8,600 | 5,330 | 17,200 | [g]14,200 | 8,180 | 32,300 |
| 4–10 | [g]8,420 | 5,930 | 15,100 | [g]10,100 | 6,870 | 19,400 | [g]11,800 | 7,830 | 24,200 | [g]16,300 | 10,100 | 38,000 |
| .2–1 | 1,450 | 1,060 | 1,980 | 1,710 | 1,190 | 2,450 | 1,960 | 1,310 | 2,940 | 2,980 | 2,080 | 4,910 |
| .2–1 | 4,990 | 4,150 | 6,000 | 5,740 | 4,600 | 7,150 | 6,500 | 5,020 | 8,520 | 8,400 | 6,950 | 10,700 |
| .2–1 | [g]1,200 | 978 | 1,630 | [g]1,390 | 1,110 | 1,970 | [g]1,600 | 1,240 | 2,350 | [g]2,130 | 1,580 | 3,420 |
| .2–1 | 4,950 | 4,220 | 5,810 | 5,600 | 4,620 | 6,780 | 6,230 | 4,970 | 7,810 | 7,550 | 6,370 | 9,370 |
| < .2 | 652 | 538 | 865 | 757 | 611 | 1,050 | 869 | 686 | 1,250 | 1,160 | 873 | 1,810 |
| 1–2 | 12,300 | 9,800 | 15,500 | 14,100 | 10,800 | 18,600 | 16,000 | 11,700 | 22,000 | 18,600 | 14,800 | 26,000 |
| 1–2 | 2,360 | 1,520 | 3,670 | 2,990 | 1,800 | 4,960 | 3,660 | 2,060 | 6,510 | 4,900 | 2,910 | 11,200 |
| .2–1 | 735 | 675 | 817 | 811 | 738 | 913 | 887 | 800 | 1,010 | 1,060 | 942 | 1,240 |
| .2–1 | 12,500 | 11,000 | 14,200 | 13,900 | 11,900 | 16,100 | 15,200 | 12,800 | 18,200 | 18,000 | 14,100 | 22,900 |
| 4–10 | 29,400 | 25,600 | 33,700 | 32,700 | 27,900 | 38,500 | 36,100 | 29,900 | 43,500 | 43,600 | 33,800 | 56,300 |
| 1–2 | 6,390 | 5,140 | 7,950 | 7,560 | 5,900 | 9,690 | 8,750 | 6,620 | 11,600 | 11,600 | 8,160 | 16,400 |
| .2–1 | [i]545 | -- | -- | [i]644 | -- | -- | [i]743 | -- | -- | [i]982 | -- | -- |
| 2–4 | 7,170 | 5,500 | 9,350 | 8,680 | 6,540 | 11,500 | 10,200 | 7,490 | 13,800 | 13,800 | 9,500 | 20,000 |
| 2–4 | 22,300 | 19,300 | 25,800 | 25,900 | 21,900 | 30,600 | 29,400 | 24,300 | 35,600 | 37,600 | 29,200 | 48,400 |
| 4–10 | 8,930 | 7,250 | 11,000 | 10,900 | 8,680 | 13,700 | 13,000 | 10,100 | 16,700 | 18,000 | 13,100 | 24,700 |
| < .2 | 4,870 | 3,790 | 6,250 | 5,990 | 4,570 | 7,850 | 7,180 | 5,350 | 9,630 | 10,400 | 7,220 | 14,900 |
| .2–1 | 15,200 | 12,000 | 19,300 | 18,200 | 14,100 | 23,500 | 21,300 | 16,100 | 28,200 | 29,300 | 20,700 | 41,500 |
| .2–1 | 32,000 | 26,600 | 38,500 | 37,200 | 30,200 | 45,700 | 42,300 | 33,700 | 53,200 | 54,300 | 40,500 | 72,600 |
| > 10 | 4,320 | 3,540 | 5,270 | 5,090 | 4,050 | 6,390 | 5,900 | 4,560 | 7,630 | 7,960 | 5,690 | 11,100 |
| .2–1 | 11,600 | -- | -- | [m]22,200 | -- | -- | [m]28,600 | -- | -- | [m]44,400 | -- | -- |
| 4–10 | [g]559 | 269 | 1,740 | [g]852 | 383 | 3,040 | [g]1,240 | 523 | 5,020 | [g]2,640 | 970 | 13,800 |
| .2–1 | [m]13,100 | -- | -- | [m]23,800 | -- | -- | [m]30,000 | -- | -- | [m]45,300 | -- | -- |
| .2–1 | [m]30,200 | -- | -- | [m]33,100 | -- | -- | [m]53,400 | -- | -- | [m]76,100 | -- | -- |
| 1–2 | 12,200 | 9,940 | 15,000 | 14,300 | 11,200 | 18,100 | 16,300 | 12,300 | 21,500 | 21,000 | 14,400 | 30,600 |
| < .2 | 5,570 | 4,480 | 6,930 | 6,840 | 5,380 | 8,680 | 8,140 | 6,260 | 10,600 | 11,400 | 8,210 | 15,800 |
| .2–1 | 25,100 | 21,200 | 29,800 | 28,900 | 23,800 | 35,000 | 32,500 | 26,200 | 40,400 | 41,000 | 31,100 | 54,200 |
| 4–10 | 4,950 | 3,400 | 7,200 | 6,000 | 4,000 | 8,980 | 7,240 | 4,600 | 11,400 | 10,400 | 5,900 | 18,500 |
| .2–1 | 14,100 | 11,200 | 17,600 | 17,100 | 13,400 | 21,800 | 20,100 | 15,400 | 26,200 | 27,400 | 19,700 | 38,200 |
| < .2 | [o]30,400 | -- | -- | [o]35,400 | -- | -- | [o]40,300 | -- | -- | [o]51,800 | -- | -- |
| .2–1 | 31,700 | 26,800 | 37,400 | 36,900 | 30,600 | 44,600 | 42,000 | 33,900 | 51,900 | 53,900 | 40,800 | 71,000 |

**Table 5.** Summary of peak stages, streamflows, and flood-probability estimates for selected U.S. Geological Survey streamgages during May and June 2008.—Continued

[$mi^2$, square mile; ft, foot; $ft^3/s$, cubic foot per second; AEP, annual exceedance probability; >, greater than; <, less than; --, no data; R., River]

| Site number (fig. 12) | Station number | Station name | Contributing drainage area ($mi^2$) | Flood data: Previous maximum streamflow: Date | Previous maximum streamflow: Stage (ft) | Previous maximum streamflow: Streamflow ($ft^3/s$) | Flood of June 2008: Rank[a]/ annual peaks | Flood of June 2008: Date | Flood of June 2008: Peak stage (ft) | Flood of June 2008: Peak streamflow ($ft^3/s$) |
|---|---|---|---|---|---|---|---|---|---|---|
| 93 | 05458900 | West Fork Cedar River at Finchford, Iowa | 846 | 06/1951 | 17.28 | 31,900 | 2/64 | 6/10/2008 | 20.82 | 25,900 |
| 94 | 05459490 | Spring Creek near Mason City, Iowa | 29.3 | 05/2004 | 91.15 | 5,340 | 2/43 | 6/6/2008 | 92.91 | 4,680 |
| 95 | 05459500 | Winnebago River at Mason City, Iowa | 526 | 03/1933 | 15.70 | 10,800 | 1/76 | 6/8/2008 | 18.74 | 13,100 |
| 96 | 05460100 | Willow Creek near Mason City, Iowa | 78.6 | 05/2004 | 92.21 | 1,270 | 1/42 | 6/8/2008 | 93.28 | 2,380 |
| 97 | 05462000 | Shell Rock River at Shell Rock, Iowa | 1,746 | 1856 | 17.70 | [h]45,000 | 1/56 | 6/10/2008 | 20.36 | 60,400 |
| 98 | 05463000 | Beaver Creek at New Hartford, Iowa | 347 | 06/1947 | 13.50 | 18,000 | 1/63 | 6/8/2008 | 15.71 | 25,900 |
| 99 | 05463500 | Black Hawk Creek at Hudson, Iowa | 303 | 07/1969 | 18.23 | 19,300 | ([p]) | 6/13/2008 | 17.47 | 11,800 |
| 100 | 05464000 | Cedar River at Waterloo, Iowa | 5,146 | 03/1961 | 21.86 | 76,700 | 1/70 | 6/11/2008 | 27.01 | 112,000 |
| 101 | 05464220 | Wolf Creek near Dysart, Iowa | 299 | 05/2004 | 17.39 | 14,500 | 1/10 | 5/30/2008 | 18.25 | 15,700 |
| 102 | 05464500 | Cedar River at Cedar Rapids, Iowa | 6,510 | 03/1961 | [q]19.66 | 73,000 | 1/107 | 6/13/2008 | 31.12 | 140,000 |
| 103 | 05465000 | Cedar River near Conesville, Iowa | 7,787 | 04/1993 | 17.11 | 74,000 | 1/69 | 6/14/2008 | [d]23.37 | 127,000 |
| 104 | 05465150 | North Fork Long Creek at Ainsworth, Iowa | 30.2 | 06/1990 | 90.66 | [h]5,800 | 3/45 | 6/13/2008 | 91.19 | 4,220 |
| 105 | 05465500 | Iowa River at Wapello, Iowa | 12,500 | 07/1993 | 28.10 | [l]111,000 | 1/106 | 6/14/2008 | 32.15 | [l]188,000 |
| 106 | 05469860 | Mud Lake Drainage Ditch 71 at Jewell, Iowa | 65.4 | 07/1993 | 91.32 | 3,700 | 2/43 | 6/8/2008 | 91.87 | 3,120 |
| 107 | 05470000 | South Skunk River near Ames, Iowa | 315 | 06/1996 | [d]15.89 | [h]14,000 | 3/84 | 6/9/2008 | 16.93 | 11,000 |
| 108 | 05470500 | Squaw Creek at Ames, Iowa | 204 | 07/1993 | 18.54 | 24,300 | 3/53 | 5/30/2008 | 15.85 | 12,600 |
| 109 | 05471000 | S. Skunk River below Squaw Creek near Ames, Iowa | 556 | 07/1993 | [d]25.53 | 26,500 | 3/46 | 5/30/2008 | 24.70 | 19,800 |
| 110 | 05471050 | South Skunk River at Colfax, Iowa | 803 | 07/1993 | 21.53 | 14,200 | 2/23 | 6/14/2008 | 20.25 | 10,900 |
| 111 | 05471200 | Indian Creek near Mingo, Iowa | 276 | 06/1991 | 19.16 | 23,500 | 4/41 | 5/31/2008 | 16.33 | 8,450 |
| 112 | 05471500 | South Skunk River near Oskaloosa, Iowa | 1,635 | 05/1944 | 25.80 | 37,000 | 4/64 | 6/12/2008 | 24.61 | 17,300 |
| 113 | 05474000 | Skunk River at Augusta, Iowa | 4,312 | 04/1973 | 27.05 | 66,800 | 9/96 | 6/16/2008 | 22.85 | 43,900 |
| 114 | 05474500 | Mississippi River at Keokuk, Iowa | 119,000 | 07/1993 | 27.58 | [l]446,000 | 2/132 | 6/17/2008 | -- | [l]438,000 |
| 115 | 05479000 | East Fork Des Moines River at Dakota City, Iowa | 1,308 | 09/1938 | 17.40 | [h]22,000 | 10/72 | 6/14/2008 | 19.09 | 10,400 |
| 116 | 05480500 | Des Moines River at Fort Dodge, Iowa | 4,190 | 04/1965 | 17.79 | 35,600 | 3/78 | 6/8/2008 | 15.73 | 34,400 |
| 117 | 05480930 | White Fox Creek at Clarion, Iowa | 13.3 | 07/1993 | 93.59 | 1,400 | 1/42 | 6/8/2008 | 93.85 | 1,480 |
| 118 | 05481000 | Boone River near Webster City, Iowa | 844 | 06/1918 | 19.10 | 21,500 | 2/70 | 6/10/2008 | 17.74 | 20,500 |
| 119 | 05481300 | Des Moines River near Stratford, Iowa | 5,452 | 04/1993 | 25.68 | 42,300 | 1/41 | 6/9/2008 | 27.32 | 50,300 |
| 120 | 05481650 | Des Moines River near Saylorville, Iowa | 5,841 | 06/1954 | 24.50 | 60,000 | 2/47 | 6/13/2008 | 24.03 | [l]50,500 |
| 121 | 05481950 | Beaver Creek near Grimes, Iowa | 358 | 07/1993 | 16.58 | 14,300 | 3/49 | 6/1/2008 | 14.51 | 7,800 |
| 122 | 05482000 | Des Moines River at 2nd Ave, Des Moines, Iowa | 6,245 | 06/1954 | 30.16 | 60,200 | 2/62 | 6/13/2008 | [d]31.50 | [l]47,300 |
| 123 | 05482500 | North Raccoon River near Jefferson, Iowa | 1,619 | 06/1947 | 22.30 | 29,100 | 5/69 | 6/9/2008 | 18.41 | 18,300 |
| 124 | 05482900 | Hardin Creek near Farlin, Iowa | 101 | 07/1993 | 13.97 | 3,010 | 1/57 | 6/8/2008 | 13.40 | 3,030 |
| 125 | 05484000 | South Raccoon River at Redfield, Iowa | 994 | 07/1993 | 26.98 | 44,000 | ([p]) | 6/12/2008 | 20.80 | 26,300 |
| 126 | 05484500 | Raccoon River at Van Meter, Iowa | 3,441 | 07/1993 | 26.34 | 70,100 | 3/94 | 6/12/2008 | 22.67 | 43,500 |
| 127 | 05484650 | Raccoon River at 63rd Street, Des Moines, Iowa | 3,529 | 07/1993 | [d]40.77 | 66,000 | 2/15 | 6/13/2008 | 41.31 | 52,000 |
| 128 | 05484900 | Raccoon River at Fleur Drive, Des Moines, Iowa | 3,625 | 07/1993 | 26.80 | 67,900 | 2/22 | 6/13/2008 | 24.66 | 56,300 |
| 129 | 05485500 | Des Moines R. at Raccoon R., Des Moines, Iowa | 9,879 | 07/1993 | [d]34.29 | [l]116,000 | 2/68 | 6/13/2008 | 35.55 | [l]104,000 |
| 130 | 05485640 | Fourmile Creek at Des Moines, Iowa | 92.7 | 06/1998 | 15.00 | 5,600 | 1/36 | 6/6/2008 | [d]15.14 | 6,810 |
| 131 | 05486000 | North River near Norwalk, Iowa | 349 | 06/1947 | 25.30 | 32,000 | 4/69 | 6/13/2008 | 23.91 | 13,500 |
| 132 | 05486490 | Middle River near Indianola, Iowa | 489 | 06/1947 | 26.40 | 34,000 | 2/69 | 6/6/2008 | 25.55 | 19,000 |
| 133 | 05487500 | Des Moines River near Runnells, Iowa | 11,655 | 07/1993 | 82.88 | [h]134,000 | 3/23 | 6/14/2008 | 79.28 | [l]81,200 |
| 134 | 05488110 | Des Moines River near Pella, Iowa | 12,330 | 07/1993 | 109.71 | [l]105,000 | 2/16 | 6/14/2008 | 108.96 | [l]100,000 |
| 135 | 05488500 | Des Moines River near Tracy, Iowa | 12,479 | 06/1947 | 26.50 | 155,000 | 4/90 | 6/14/2008 | 23.70 | [l]104,000 |
| 136 | 05489500 | Des Moines River at Ottumwa, Iowa | 13,374 | 06/1903 | [d]19.40 | [h]140,000 | 4/94 | 6/17/2008 | 20.60 | [l]102,000 |
| 137 | 05490500 | Des Moines River at Keosauqua, Iowa | 14,038 | 06/1903 | 27.85 | 146,000 | 5/102 | 6/16/2008 | 30.49 | [l]106,000 |
| 138 | 05502500 | Salt River near Shelbina, Mo. | 481 | 05/2002 | 28.65 | 24,600 | ([p]) | 6/27/2008 | 22.93 | 15,200 |

| Site number (fig. 12) | Estimated AEP for observed peak streamflow (percent) | Expected peak streamflows for selected AEP with 95-percent confidence limits ($ft^3/s$)[b]: 4-percent AEP (25-year recurrence): Estimate | 4-percent AEP: Confidence limit: Low | 4-percent AEP: Confidence limit: High | 2-percent AEP (50-year recurrence): Estimate | 2-percent AEP: Confidence limit: Low | 2-percent AEP: Confidence limit: High | 1-percent AEP (100-year recurrence): Estimate | 1-percent AEP: Confidence limit: Low | 1-percent AEP: Confidence limit: High | 0.2-percent AEP (500-year recurrence): Estimate | 0.2-percent AEP: Confidence limit: Low | 0.2-percent AEP: Confidence limit: High |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 93 | 2–4 | 22,300 | 18,200 | 27,200 | 26,400 | 21,100 | 32,900 | 30,400 | 23,800 | 38,900 | 39,800 | 29,100 | 54,500 |
| 94 | 1–2 | 3,300 | 2,330 | 4,680 | 4,040 | 2,780 | 5,860 | 4,750 | 3,200 | 7,060 | 6,500 | 4,160 | 10,200 |
| 95 | .2–1 | 9,020 | 7,360 | 11,000 | 10,500 | 8,340 | 13,300 | 12,000 | 9,250 | 15,600 | 15,600 | 11,200 | 21,700 |
| 96 | .2–1 | 1,500 | 1,230 | 1,840 | 1,750 | 1,390 | 2,210 | 2,020 | 1,560 | 2,610 | 2,680 | 1,940 | 3,720 |
| 97 | < .2 | 29,600 | 25,400 | 34,500 | 34,900 | 29,200 | 41,600 | 40,000 | 32,700 | 49,000 | 51,900 | 39,800 | 67,700 |
| 98 | .2–1 | 16,400 | 13,300 | 20,300 | 19,600 | 15,500 | 24,700 | 22,800 | 17,700 | 29,500 | 30,500 | 22,100 | 42,100 |
| 99 | 4–10 | 15,100 | 11,900 | 19,000 | 18,300 | 14,200 | 23,600 | 21,600 | 16,400 | 28,400 | 29,700 | 21,100 | 41,600 |
| 100 | .2–1 | [g]77,100 | 62,400 | 100,000 | [g]91,200 | 72,600 | 121,000 | [g]105,000 | 82,600 | 143,000 | [g]137,000 | 105,000 | 193,000 |
| 101 | 2–4 | 13,300 | 10,100 | 17,600 | 15,900 | 11,900 | 21,300 | 18,500 | 13,500 | 25,200 | 24,900 | 17,100 | 36,300 |
| 102 | < .2 | [g]70,300 | 60,500 | 84,000 | [g]82,200 | 69,900 | 99,800 | [g]94,100 | 79,200 | 116,000 | [g]122,000 | 100,000 | 154,000 |
| 103 | .2–1 | [g]76,400 | 64,000 | 95,100 | [g]88,600 | 73,200 | 113,000 | [g]101,000 | 82,200 | 130,000 | [g]128,000 | 102,000 | 171,000 |
| 104 | 4–10 | 4,300 | 3,360 | 5,510 | 5,330 | 4,080 | 6,960 | 6,400 | 4,780 | 8,560 | 9,180 | 6,410 | 13,100 |
| 105 | < .2 | [m]86,100 | -- | -- | [m]121,000 | -- | -- | [m]140,000 | -- | -- | [m]185,000 | -- | -- |
| 106 | 1–2 | 2,430 | 1,900 | 3,110 | 2,790 | 2,110 | 3,680 | 3,130 | 2,300 | 4,270 | 3,920 | 2,680 | 5,730 |
| 107 | 1–2 | 8,840 | 7,520 | 10,400 | 10,600 | 8,770 | 12,700 | 12,300 | 9,970 | 15,200 | 16,500 | 12,600 | 21,800 |
| 108 | 1–2 | 9,300 | 7,560 | 11,400 | 11,500 | 9,070 | 14,500 | 13,600 | 10,500 | 17,700 | 19,400 | 13,900 | 27,100 |
| 109 | .2–1 | 14,200 | 12,100 | 16,600 | 16,700 | 13,900 | 20,000 | 19,200 | 15,600 | 23,600 | 25,400 | 19,400 | 33,300 |
| 110 | 4–10 | 14,200 | 11,500 | 17,600 | 16,700 | 13,200 | 21,200 | 19,300 | 14,900 | 24,900 | 25,200 | 18,300 | 34,800 |
| 111 | 4–10 | 11,100 | 9,030 | 13,600 | 13,200 | 10,500 | 16,600 | 15,300 | 11,900 | 19,800 | 20,800 | 15,000 | 28,800 |
| 112 | 4–10 | 20,400 | 17,600 | 23,700 | 23,800 | 20,100 | 28,300 | 27,300 | 22,500 | 33,200 | 35,600 | 27,600 | 45,700 |
| 113 | 4–10 | 44,800 | 40,300 | 49,700 | 50,300 | 44,500 | 56,900 | 55,700 | 48,200 | 64,300 | 67,800 | 55,700 | 82,400 |
| 114 | < .2 | [r]298,000 | -- | -- | [r]331,000 | -- | -- | [r]366,000 | -- | -- | [r]429,000 | -- | -- |
| 115 | 4–10 | 13,900 | 11,000 | 17,600 | 16,600 | 12,700 | 21,600 | 19,300 | 14,300 | 26,000 | 25,800 | 17,800 | 37,400 |
| 116 | 2–4 | 30,500 | 25,600 | 36,300 | 35,800 | 29,200 | 44,000 | 41,300 | 32,600 | 52,300 | 54,600 | 40,100 | 74,500 |
| 117 | 1–2 | 1,140 | 738 | 1,760 | 1,350 | 836 | 2,170 | 1,530 | 907 | 2,590 | 1,910 | 1,020 | 3,580 |
| 118 | .2–1 | 15,300 | 12,900 | 18,200 | 17,700 | 14,400 | 21,600 | 19,900 | 15,800 | 25,100 | 25,200 | 18,600 | 34,000 |
| 119 | 1–2 | [j]41,500 | 34,900 | 49,300 | [j]48,300 | 39,500 | 59,200 | [j]55,200 | 43,700 | 69,800 | [j]71,700 | 52,700 | 97,600 |
| 120 | < .2 | -- | -- | -- | [n]27,000 | -- | -- | [n]34,000 | -- | -- | [n]50,000 | -- | -- |
| 121 | 4–10 | 9,490 | 7,610 | 11,800 | 11,500 | 9,000 | 14,600 | 13,600 | 10,400 | 17,700 | 18,600 | 13,200 | 26,000 |
| 122 | .2–1 | -- | -- | -- | [n]30,000 | -- | -- | [n]37,000 | -- | -- | [n]52,000 | -- | -- |
| 123 | 4–10 | 21,500 | 17,900 | 25,800 | 24,700 | 20,100 | 30,400 | 27,900 | 22,100 | 35,300 | 35,100 | 26,000 | 47,500 |
| 124 | 1–2 | 2,520 | 1,940 | 3,280 | 3,030 | 2,260 | 4,070 | 3,540 | 2,560 | 4,900 | 4,740 | 3,190 | 7,060 |
| 125 | 4–10 | 27,400 | 22,900 | 32,800 | 31,600 | 25,900 | 38,600 | 35,800 | 28,600 | 44,800 | 45,900 | 34,400 | 61,100 |
| 126 | 2–4 | 39,200 | 33,200 | 46,300 | 45,300 | 37,500 | 54,700 | 51,500 | 41,600 | 63,700 | 65,900 | 49,900 | 87,000 |
| 127 | 1–2 | 43,500 | 37,000 | 51,100 | 49,700 | 41,300 | 59,700 | 55,500 | 45,100 | 68,400 | 69,400 | 52,800 | 91,100 |
| 128 | 1–2 | 47,300 | 40,200 | 55,800 | 53,600 | 44,400 | 64,600 | 59,400 | 48,000 | 73,500 | 73,200 | 55,400 | 96,600 |
| 129 | .2–1 | [r]-- | -- | -- | [n]72,000 | -- | -- | [n]87,000 | -- | -- | [n]132,000 | -- | -- |
| 130 | 2–4 | 6,140 | 4,880 | 7,730 | 7,330 | 5,690 | 9,440 | 8,580 | 6,500 | 11,300 | 11,800 | 8,310 | 16,600 |
| 131 | 4–10 | 16,200 | 13,000 | 20,200 | 20,000 | 15,700 | 25,400 | 23,700 | 18,200 | 30,900 | 33,000 | 23,800 | 45,900 |
| 132 | 2–4 | 18,400 | 15,700 | 21,600 | 21,300 | 17,800 | 25,500 | 24,100 | 19,700 | 29,600 | 30,700 | 23,600 | 40,100 |
| 133 | [s]-- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 134 | [s]-- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 135 | .2–1 | -- | -- | -- | [n]51,000 | -- | -- | [n]70,000 | -- | -- | [n]135,000 | -- | -- |
| 136 | .2–1 | -- | -- | -- | [n]61,000 | -- | -- | [n]81,000 | -- | -- | [n]144,000 | -- | -- |
| 137 | .2–1 | -- | -- | -- | [n]66,000 | -- | -- | [n]86,000 | -- | -- | [n]149,000 | -- | -- |
| 138 | 4–10 | 19,300 | 16,200 | 23,000 | 22,600 | 18,300 | 27,900 | 26,000 | 20,300 | 33,300 | 34,100 | 24,400 | 47,800 |

**Table 5.** Summary of peak stages, streamflows, and flood-probability estimates for selected U.S. Geological Survey streamgages during May and June 2008.—Continued

[$mi^2$, square mile; ft, foot; $ft^3$/s, cubic foot per second; AEP, annual exceedance probability; >, greater than; <, less than; --, no data; R., River]

| Site number (fig. 12) | Station number | Station name | Contributing drainage area ($mi^2$) | Flood data: Previous maximum streamflow: Date | Flood data: Previous maximum streamflow: Stage (ft) | Flood data: Previous maximum streamflow: Streamflow ($ft^3$/s) | Flood data: Flood of June 2008: Rank[a]/ annual peaks | Flood data: Flood of June 2008: Date | Flood data: Flood of June 2008: Peak stage (ft) | Flood data: Flood of June 2008: Peak streamflow ($ft^3$/s) |
|---|---|---|---|---|---|---|---|---|---|---|
| 139 | 05527800 | Des Plaines River at Russell, Ill. | 123 | 05/2004 | 11.09 | 3,500 | 5/49 | 6/11/2008 | 9.47 | 1,910 |
| 140 | 05543830 | Fox River at Waukesha, Wis. | 126 | 04/1960 | 8.00 | 2,500 | 2/47 | 6/9/2008 | 8.85 | 2,440 |
| 141 | 05544200 | Mukwonago River at Mukwonago, Wis. | 74.1 | 08/2007 | 3.96 | [c]317 | 1/33 | 6/13/2008 | 4.95 | [c]364 |
| 142 | 05545750 | Fox River near New Munster, Wis. | 811 | 03/1960 | 9.25 | 7,520 | 3/69 | 6/15/2008 | [e]15.18 | 5,960 |
| 143 | 05572000 | Sangamon River at Monticello, Ill. | 550 | 10/1926 | 18.50 | 19,000 | 7/100 | 6/4/2008 | 18.79 | 13,300 |
| 144 | 05580000 | Kickapoo Creek at Waynesville, Ill. | 227 | 08/1981 | 16.91 | 24,600 | 8/61 | 6/4/2008 | 16.50 | 11,600 |
| 145 | 05586100 | Illinois River at Valley City, Ill. | 26,743 | 05/1943 | 28.61 | [c]123,000 | ([p]) | 6/14/2008 | 17.72 | [c]63,000 |
| 146 | 05587450 | Mississippi River at Grafton, Ill. | 171,300 | 08/1993 | 38.17 | [l]598,000 | 2/23 | 6/28/2008 | 30.80 | [l]440,000 |
| 147 | 05590800 | Lake Fork at Atwood, Ill. | 149 | 03/1979 | 14.03 | 4,030 | 1/36 | 6/7/2008 | 15.75 | 3,550 |
| 148 | 05591200 | Kaskaskia River at Cooks Mills, Ill. | 473 | 05/2002 | 17.85 | 11,000 | 1/38 | 6/7/2008 | 20.41 | 14,100 |
| 149 | 05591700 | West Okaw River near Lovington, Ill. | 112 | 05/1996 | 16.40 | 10,300 | 2/29 | 6/7/2008 | 16.17 | 9,370 |
| 150 | 06359500 | Moreau River near Faith, S. Dak. | 2,660 | 04/1944 | [f]21.90 | 26,000 | 4/65 | 6/7/2008 | 21.50 | 22,900 |
| 151 | 06360500 | Moreau River near Whitehorse, S. Dak. | 4,880 | 03/1997 | 26.93 | 29,700 | 4/55 | 6/8/2008 | 25.56 | 25,000 |
| 152 | 06425100 | Elk Creek near Rapid City, S. Dak. | 190 | 05/1996 | 12.77 | 3,120 | 3/30 | 6/6/2008 | 11.64 | [c]2,390 |
| 153 | 06425500 | Elk Creek near Elm Springs, S. Dak. | 540 | 03/1952 | 10.61 | 8,540 | 4/59 | 6/6/2008 | 14.00 | [c]7,000 |
| 154 | 06428500 | Belle Fourche R. at Wyo./S. Dak. State Line, S. Dak. | 3,280 | 05/1995 | 16.33 | [l]6,320 | 2/62 | 6/6/2008 | 15.98 | [l]5,190 |
| 155 | 06433500 | Hay Creek at Belle Fourche, S. Dak. | 121 | 05/1995 | 10.23 | 1,280 | 1/44 | 6/6/2008 | 10.50 | [h]1,400 |
| 156 | 06436000 | Belle Fourche River near Fruitdale, S. Dak. | 4,540 | 05/1982 | 14.32 | [l]12,700 | 4/63 | 6/6/2008 | 12.95 | [l]8,700 |
| 157 | 06436198 | Whitewood Creek above Vale, S. Dak. | 102 | 05/1995 | 5.72 | 4,250 | 1/26 | 6/5/2008 | 7.29 | 4,500 |
| 158 | 06436760 | Horse Creek above Vale, S. Dak. | 464 | 05/1982 | 24.80 | [c]17,700 | 2/28 | 6/6/2008 | 23.42 | [c]15,100 |
| 159 | 06437000 | Belle Fourche River near Sturgis, S. Dak. | 5,870 | 05/1982 | 19.10 | [l]36,400 | 2/63 | 6/6/2008 | 20.10 | [l]36,100 |
| 160 | 06438000 | Belle Fourche River near Elm Springs, S. Dak. | 7,210 | 06/1964 | 15.90 | [l]45,100 | 1/81 | 6/6/2008 | 19.73 | [l]47,500 |
| 161 | 06438500 | Cheyenne River near Plainview, S. Dak. | 21,600 | 05/1996 | 22.10 | [l]69,700 | 1/47 | 6/7/2008 | 22.63 | [l]73,200 |
| 162 | 06452000 | White River near Oacoma, S. Dak. | 9,940 | 03/1952 | 19.40 | 51,900 | 5/80 | 6/5/2008 | 19.39 | 33,800 |
| 163 | 06465500 | Niobrara River near Verdel, Nebr. | 11,580 | 03/1960 | [d]10.10 | 39,000 | 5/53 | 6/6/2008 | 5.56 | [l]12,400 |
| 164 | 06606837 | (0660683710) Halfway Creek at Schaller, Iowa | 1.7 | 05/2007 | 94.64 | 486 | 1/19 | 6/8/2008 | 97.31 | 1,010 |
| 165 | 06609500 | Boyer River at Logan, Iowa | 871 | 06/1990 | 22.54 | 30,800 | 1/80 | 6/8/2008 | [d]24.75 | 33,600 |
| 166 | 06610581 | Mosquito Creek Tributary near Neola, Iowa | 3.2 | 05/2004 | 87.50 | 1,960 | 2/18 | 6/8/2008 | 85.24 | 1,360 |
| 167 | 06768000 | Platte River near Overton, Nebr. | 51,620 | 06/1935 | [f]6.25 | 37,600 | 22/91 | 5/25/2008 | 9.05 | [l]11,200 |
| 168 | 06794000 | Beaver Creek at Genoa, Nebr. | 429 | 07/1950 | [d]18.70 | 21,200 | 6/68 | 5/30/2008 | 18.15 | 7,270 |
| 169 | 06795500 | Shell Creek near Columbus, Nebr. | 294 | 06/1990 | 22.76 | 8,000 | 1/60 | 5/30/2008 | 22.06 | 11,200 |
| 170 | 06801000 | Platte River near Ashland, Nebr. | 69,300 | 03/1993 | [d]19.23 | 130,000 | 5/45 | 5/31/2008 | 21.06 | [l]85,600 |
| 171 | 06805500 | Platte River at Louisville, Nebr. | 71,000 | 07/1993 | [d]11.90 | 160,000 | 8/56 | 5/31/2008 | 10.48 | [l]96,600 |
| 172 | 06809500 | East Nishnabotna River at Red Oak, Iowa | 894 | 06/1998 | 29.39 | 60,500 | 6/82 | 6/13/2008 | 24.09 | 27,000 |
| 173 | 06811760 | Tarkio River near Elliott, Iowa | 10.7 | 06/1998 | 14.68 | 5,000 | 3/57 | 6/5/2008 | 13.20 | 3,010 |
| 174 | 06813500 | Missouri River at Rulo, Nebr. | 414,900 | 04/1952 | 25.60 | 358,000 | 8/59 | 6/14/2008 | 24.98 | [c]167,000 |
| 175 | 06816290 | West Nodaway River at Massena, Iowa | 23.4 | 02/1973 | 82.39 | [h]4,700 | 1/43 | 6/12/2008 | 80.54 | 4,850 |
| 176 | 06817000 | Nodaway River at Clarinda, Iowa | 762 | 05/2007 | 23.82 | 31,100 | 1/81 | 6/5/2008 | 26.61 | 47,900 |
| 177 | 06817700 | Nodaway River near Graham, Mo. | 1,380 | 09/1993 | 26.89 | 90,700 | 2/26 | 6/6/2008 | 25.90 | 52,300 |
| 178 | 06818000 | Missouri River at St. Joseph, Mo. | 420,100 | 04/1952 | 26.82 | [c]397,000 | 21/89 | 6/13/2008 | 25.10 | [c]171,000 |
| 179 | 06819500 | 102 River at Maryville, Mo. | 515 | 10/1973 | 19.25 | 28,000 | 3/67 | 6/6/2008 | 26.20 | 21,800 |
| 180 | 06838000 | Red Willow Creek near Red Willow, Nebr. | 405 | 06/1947 | 18.36 | 30,000 | 7/69 | 5/23/2008 | 16.02 | [l]3,900 |
| 181 | 06844500 | Republican River near Orleans, Nebr. | 8,880 | 06/1947 | 14.00 | 145,000 | 6/62 | 5/26/2008 | 13.14 | [l]9,680 |
| 182 | 06871500 | Bow Creek near Stockton, Kans. | 341 | 07/1951 | 13.60 | 12,900 | 5/58 | 5/24/2008 | 13.31 | 6,090 |
| 183 | 06893000 | Missouri River at Kansas City, Mo. | 484,100 | 06/1844 | 48.00 | 625,000 | 28/81 | 6/13/2008 | 29.02 | [c]201,000 |
| 184 | 06893080 | Blue River near Stanley, Kans. | 46.0 | 05/1990 | 20.51 | 20,200 | 4/39 | 6/4/2008 | 19.68 | 16,600 |

| Site number (fig. 12) | Estimated AEP for observed peak streamflow (percent) | Expected peak streamflows for selected AEP with 95-percent confidence limits ($ft^3$/s)[b]: 4-percent AEP (25-year recurrence): Estimate | 4-percent AEP: Confidence limit: Low | 4-percent AEP: Confidence limit: High | 2-percent AEP (50-year recurrence): Estimate | 2-percent AEP: Confidence limit: Low | 2-percent AEP: Confidence limit: High | 1-percent AEP (100-year recurrence): Estimate | 1-percent AEP: Confidence limit: Low | 1-percent AEP: Confidence limit: High | 0.2-percent AEP (500-year recurrence): Estimate | 0.2-percent AEP: Confidence limit: Low | 0.2-percent AEP: Confidence limit: High |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 139 | 4–10 | 2,440 | 1,830 | 3,230 | 2,870 | 2,070 | 3,980 | 3,290 | 2,270 | 4,780 | 4,210 | 2,600 | 6,830 |
| 140 | 1–2 | 2,040 | 1,650 | 2,510 | 2,330 | 1,820 | 2,990 | 2,640 | 1,970 | 3,530 | 3,220 | 2,200 | 4,700 |
| 141 | .2–1 | 320 | 292 | 364 | 340 | 308 | 392 | 359 | 322 | 418 | 397 | 352 | 475 |
| 142 | 2–4 | 5,940 | 5,030 | 7,010 | 6,760 | 5,540 | 8,230 | 7,580 | 6,010 | 9,560 | 9,120 | 7,700 | 11,400 |
| 143 | 4–10 | 15,000 | 12,500 | 18,100 | 17,800 | 14,300 | 22,200 | 20,600 | 16,000 | 26,700 | 27,700 | 19,600 | 39,200 |
| 144 | 4–10 | 15,500 | 11,300 | 21,200 | 19,400 | 13,400 | 27,900 | 23,600 | 15,500 | 35,900 | 34,500 | 20,000 | 59,500 |
| 145 | > 10 | [r]110,000 | -- | -- | [r]121,000 | -- | -- | [r]132,000 | -- | -- | [r]157,000 | -- | -- |
| 146 | 2–4 | [r]408,000 | -- | -- | [r]446,000 | -- | -- | [r]488,000 | -- | -- | [r]585,000 | -- | -- |
| 147 | 4–10 | 4,150 | 3,440 | 5,010 | 4,610 | 3,710 | 5,720 | 5,050 | 3,940 | 6,470 | 6,060 | 4,390 | 8,360 |
| 148 | 1–2 | 11,500 | 9,140 | 14,400 | 13,100 | 10,100 | 17,000 | 14,600 | 10,900 | 19,700 | 18,300 | 12,400 | 26,900 |
| 149 | 2–4 | 8,710 | 6,150 | 12,300 | 10,300 | 6,960 | 15,400 | 12,000 | 7,700 | 18,700 | 16,000 | 9,180 | 28,000 |
| 150 | 2–4 | 20,000 | 15,100 | 28,800 | 26,400 | 19,600 | 39,900 | 33,700 | 24,500 | 52,900 | 54,300 | 28,000 | 89,500 |
| 151 | 4–10 | 29,900 | 22,800 | 41,500 | 38,600 | 28,800 | 55,300 | 48,100 | 35,300 | 70,900 | 73,700 | 51,800 | 115,000 |
| 152 | 4–10 | [t]3,460 | -- | -- | [t]4,490 | -- | -- | [t]5,660 | -- | -- | [t]25,900 | -- | -- |
| 153 | 4–10 | [t]8,600 | -- | -- | [t]11,300 | -- | -- | [t]14,600 | -- | -- | [t]48,600 | -- | -- |
| 154 | 2–4 | 5,080 | 3,950 | 6,950 | 6,200 | 4,740 | 8,730 | 7,360 | 5,530 | 10,600 | 10,200 | 7,390 | 15,400 |
| 155 | 2–4 | [t]968 | -- | -- | [t]1,680 | -- | -- | [t]3,160 | -- | -- | [t]20,900 | -- | -- |
| 156 | 4–10 | 11,200 | 7,220 | 19,100 | 14,400 | 9,120 | 25,500 | 17,700 | 11,000 | 32,200 | 25,100 | 15,100 | 48,000 |
| 157 | 4–10 | [t]6,170 | -- | -- | [t]8,760 | -- | -- | [t]12,100 | -- | -- | [t]27,200 | -- | -- |
| 158 | 2–4 | [t]10,600 | -- | -- | [t]16,100 | -- | -- | [t]24,000 | -- | -- | [t]68,000 | -- | -- |
| 159 | 1–2 | 23,400 | 17,300 | 34,200 | 32,100 | 23,000 | 49,100 | 42,700 | 29,700 | 68,200 | 76,300 | 49,700 | 134,000 |
| 160 | 2–4 | 41,600 | 26,400 | 72,800 | 52,800 | 32,900 | 95,500 | 63,700 | 38,900 | 118,000 | 86,600 | 51,400 | 168,000 |
| 161 | 2–4 | 61,200 | 47,900 | 83,500 | 78,400 | 59,800 | 111,000 | 97,800 | 72,900 | 143,000 | 153,000 | 109,000 | 240,000 |
| 162 | 4–10 | 37,200 | 31,000 | 46,500 | 46,500 | 37,900 | 59,800 | 57,000 | 45,600 | 75,400 | 86,900 | 66,600 | 122,000 |
| 163 | 4–10 | [u]16,000 | 13,400 | 20,200 | [u]20,000 | 16,300 | 26,300 | [u]24,700 | 19,700 | 33,900 | [u]39,700 | 29,600 | 59,800 |
| 164 | 4–10 | 1,280 | 956 | 1,710 | 1,670 | 1,230 | 2,280 | 2,100 | 1,510 | 2,930 | 3,260 | 2,190 | 4,880 |
| 165 | 1–2 | 27,100 | 23,200 | 31,600 | 30,600 | 25,600 | 36,500 | 34,100 | 27,900 | 41,600 | 42,200 | 32,500 | 54,900 |
| 166 | 4–10 | 2,040 | 1,530 | 2,730 | 2,650 | 1,950 | 3,610 | 3,310 | 2,380 | 4,610 | 5,110 | 3,420 | 7,630 |
| 167 | > 10 | [u]18,200 | 15,000 | 23,300 | [u]23,400 | 18,800 | 31,100 | [u]29,600 | 23,100 | 40,700 | [u]48,700 | 36,000 | 72,100 |
| 168 | 4–10 | 10,400 | 7,430 | 14,500 | 13,900 | 9,510 | 20,400 | 18,300 | 11,900 | 28,000 | 32,700 | 19,100 | 55,800 |
| 169 | <.2 | 5,620 | 4,560 | 6,930 | 6,800 | 5,370 | 8,600 | 8,030 | 6,170 | 10,400 | 11,000 | 7,910 | 15,300 |
| 170 | 4–10 | [u]102,000 | 83,400 | 134,000 | [u]121,000 | 96,600 | 165,000 | [u]141,000 | 110,000 | 200,000 | [u]195,000 | 146,000 | 298,000 |
| 171 | > 10 | [u]129,000 | 107,000 | 165,000 | [u]154,000 | 125,000 | 201,000 | [u]180,000 | 144,000 | 241,000 | [u]246,000 | 189,000 | 348,000 |
| 172 | 4–10 | 29,200 | 24,500 | 34,900 | 33,800 | 27,700 | 41,200 | 38,400 | 30,700 | 48,000 | 49,200 | 36,900 | 65,600 |
| 173 | 4–10 | 3,070 | 2,410 | 3,920 | 3,850 | 2,950 | 5,010 | 4,660 | 3,490 | 6,220 | 6,780 | 4,750 | 9,690 |
| 174 | 4–10 | [h]194,000 | -- | -- | [r]220,000 | -- | -- | [r]250,000 | -- | -- | [r]320,000 | -- | -- |
| 175 | 2–4 | 4,010 | 3,140 | 5,100 | 4,970 | 3,830 | 6,460 | 5,970 | 4,490 | 7,940 | 8,510 | 5,990 | 12,100 |
| 176 | < .2 | 29,800 | 25,100 | 35,500 | 33,500 | 27,500 | 40,900 | 37,100 | 29,700 | 46,400 | 45,800 | 34,300 | 61,100 |
| 177 | 4–10 | 54,500 | 38,300 | 77,600 | 64,700 | 43,400 | 96,600 | 75,000 | 47,900 | 118,000 | 99,300 | 56,800 | 174,000 |
| 178 | > 10 | [h]208,000 | -- | -- | [r]234,000 | -- | -- | [r]260,000 | -- | -- | [r]324,000 | -- | -- |
| 179 | 2–4 | 21,200 | 17,800 | 25,300 | 24,400 | 19,800 | 30,200 | 27,600 | 21,500 | 35,500 | 35,200 | 25,000 | 49,500 |
| 180 | .2–1 | [u]1,700 | 1,180 | 2,750 | [u]2,520 | 1,670 | 4,380 | [u]3,640 | 2,300 | 6,760 | [u]7,920 | 4,530 | 17,100 |
| 181 | 2–4 | [u]8,440 | 6,100 | 12,800 | [u]10,400 | 7,380 | 16,500 | [u]12,500 | 8,650 | 20,300 | [u]17,400 | 11,600 | 30,100 |
| 182 | 4–10 | 8,770 | 5,620 | 13,700 | 12,700 | 7,740 | 20,900 | 17,400 | 10,100 | 30,100 | -- | -- | -- |
| 183 | > 10 | [h]306,000 | -- | -- | [r]351,000 | -- | -- | [r]401,000 | -- | -- | [r]532,000 | -- | -- |
| 184 | 4–10 | 18,300 | 13,400 | 25,000 | 22,500 | 15,700 | 32,200 | 26,900 | 17,900 | 40,400 | -- | -- | -- |

**Table 5.** Summary of peak stages, streamflows, and flood-probability estimates for selected U.S. Geological Survey streamgages during May and June 2008.—Continued

[$mi^2$, square mile; ft, foot; $ft^3/s$, cubic foot per second; AEP, annual exceedance probability; >, greater than; <, less than; --, no data; R., River]

| Site number (fig. 12) | Station number | Station name | Contributing drainage area ($mi^2$) | Flood data: Previous maximum streamflow | | | Flood data: Flood of June 2008 | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Date | Stage (ft) | Streamflow ($ft^3/s$) | Rank[a]/ annual peaks | Date | Peak stage (ft) | Peak streamflow ($ft^3/s$) |
| 185 | 06898000 | Thompson River at Davis City, Iowa | 701 | 09/1992 | 24.29 | 57,000 | ([p]) | 6/7/2008 | 16.46 | 20,900 |
| 186 | 06899500 | Thompson River at Trenton, Mo. | 1,720 | 06/1947 | 25.70 | 95,000 | ([p]) | 6/25/2008 | 31.01 | 50,400 |
| 187 | 06901500 | Locust Creek near Linneus, Mo. | 550 | 06/1947 | 26.93 | 38,000 | 3/59 | 6/25/2008 | 25.83 | 26,900 |
| 188 | 06905500 | Chariton River near Prairie Hill, Mo. | 1,870 | 05/2002 | 23.01 | [l]37,100 | ([p]) | 6/26/2008 | 22.84 | [l]36,100 |
| 189 | 06934500 | Missouri River at Hermann, Mo. | 522,500 | 07/1993 | 36.97 | [c]750,000 | ([p]) | 6/17/2008 | -- | [c]286,000 |
| 190 | 06935965 | Missouri River at St. Charles, Mo. | 524,000 | 05/2002 | 31.69 | [c]350,000 | ([p]) | 6/18/2008 | -- | [c]303,000 |
| 191 | 07010000 | Mississippi River at St. Louis, Mo. | 697,000 | 08/1993 | 49.58 | [l]1,080,000 | 25/148 | 6/30/2008 | 38.67 | [l]720,000 |
| 192 | 07020500 | Mississippi River at Chester, Ill. | 708,600 | 04/1927 | 34.40 | 1,060,000 | 21/84 | 7/1/2008 | 39.44 | [l]696,000 |
| 193 | 07022000 | Mississippi River at Thebes, Ill. | 713,200 | 07/1844 | -- | 1,075,000 | 26/77 | 7/3/2008 | 41.10 | [l]717,000 |
| 194 | 07050700 | James River near Springfield, Mo. | 246 | 07/1909 | 22.00 | 62,000 | ([p]) | 6/14/2008 | 18.53 | 28,400 |
| 195 | 07160350 | Skeleton Creek at Enid, Okla. | 70.3 | 11/1998 | 14.70 | [l]8,180 | 1/13 | 6/9/2008 | 15.97 | 9,860 |
| 196 | 07176000 | Verdigris River near Claremore, Okla. | 6,534 | 05/1943 | 55.05 | 182,000 | 14/74 | 6/16/2008 | 34.09 | [l]50,400 |
| 197 | 07176500 | Bird Creek at Avant, Okla. | 364 | 10/1959 | 31.40 | 32,400 | 5/64 | 6/9/2008 | 27.58 | [c]27,500 |

| Site number (fig. 12) | Estimated AEP for observed peak streamflow (percent) | Expected peak streamflows for selected AEP with 95-percent confidence limits ($ft^3/s$)[b]: 4-percent AEP (25-year recurrence) | | | 2-percent AEP (50-year recurrence) | | | 1-percent AEP (100-year recurrence) | | | 0.2-percent AEP (500-year recurrence) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Estimate | Confidence limit: Low | High | Estimate | Confidence limit: Low | High | Estimate | Confidence limit: Low | High | Estimate | Confidence limit: Low | High |
| 185 | 4–10 | 23,900 | 19,800 | 28,700 | 28,300 | 23,000 | 34,700 | 32,800 | 26,100 | 41,100 | 44,000 | 33,100 | 58,700 |
| 186 | > 10 | 63,600 | 53,500 | 75,700 | 72,600 | 58,800 | 89,600 | 81,100 | 63,100 | 104,000 | 99,800 | 70,500 | 141,000 |
| 187 | 1–2 | 23,000 | 19,700 | 27,000 | 26,400 | 21,900 | 31,900 | 29,900 | 23,900 | 37,300 | 37,800 | 27,800 | 51,500 |
| 188 | .2–1 | 25,200 | 22,200 | 28,600 | 28,000 | 24,000 | 32,600 | 30,600 | 25,500 | 36,700 | 36,800 | 28,600 | 47,400 |
| 189 | > 10 | [h]533,000 | -- | -- | [r]604,000 | -- | -- | [r]673,000 | -- | -- | [r]833,000 | -- | -- |
| 190 | > 10 | [h]536,000 | -- | -- | [r]606,000 | -- | -- | [r]674,000 | -- | -- | [r]829,000 | -- | -- |
| 191 | 4–10 | [r]780,000 | -- | -- | [r]850,000 | -- | -- | [r]910,000 | -- | -- | [r]1,120,000 | -- | -- |
| 192 | > 10 | [r]805,000 | -- | -- | [r]893,000 | -- | -- | [r]948,000 | -- | -- | [r]1,140,000 | -- | -- |
| 193 | 4–10 | [r]807,000 | -- | -- | [r]895,000 | -- | -- | [r]950,000 | -- | -- | [r]1,142,000 | -- | -- |
| 194 | 4–10 | 33,200 | 27,600 | 39,900 | 38,200 | 30,700 | 47,500 | 42,900 | 33,300 | 55,300 | 53,400 | 38,300 | 74,500 |
| 195 | 4–10 | [g]10,000 | 6,920 | 19,400 | [g]12,100 | 8,060 | 25,700 | [g]14,400 | 9,230 | 33,200 | [g]20,400 | 12,200 | 56,300 |
| 196 | 4–10 | [g]52,100 | 44,800 | 63,700 | [g]59,600 | 50,400 | 74,600 | [g]67,300 | 56,100 | 86,100 | [g]86,000 | 69,500 | 115,000 |
| 197 | 4–10 | 32,100 | 25,600 | 40,300 | 36,300 | 27,600 | 47,800 | 40,800 | 29,500 | 56,500 | 52,300 | 33,400 | 81,900 |

[a] Rank of the maximum instantaneous peak streamflow measured during June 2008 compared to all systematic and historic annual peaks. A rank of 1 indicates that the June 2008 peak streamflow was higher than all other recorded annual peaks.

[b] Unless otherwise noted, expected peak streamflows are based on Water Resources Council Bulletin 17B weighting by variance method.

[c] Streamflow affected to unknown degree by regulation or diversion.

[d] A higher stage exists that corresponds to a streamflow that is less than the peak streamflow.

[e] Streamgage datum changes or stage shifts over period of record. Streamgage vertical datum is referenced to the North American Datum of 1927.

[f] Datum change at site.

[g] Expected peak streamflows based on Bulletin 17B systematic frequency-curve estimate only.

[h] Estimated.

[i] Expected peak streamflows are based on regional regression equation estimates only (Eash, 2001).

[j] Expected peak streamflows are based on inclusion of actual, or area-weighted, annual-peak streamflows from an earlier period of record from nearby discontinued downstream streamgage.

[k] Expected peak streamflows are logarithmic interpolations of weighted estimates between upstream and downstream streamgages.

[l] Streamflow affected by regulation or diversion.

[m] U.S. Army Corps of Engineers (2009).

[n] U.S. Army Corps of Engineers (2002).

[o] Expected peak streamflows are based on weighted estimates from nearby downstream streamgage and regional regression estimates for this streamgage.

[p] The peak streamflow for June 2008 was exceeded by another peak streamflow during 2008.

[q] A higher peak stage of 20.00 occurred in 1929 but corresponded to a lesser peak streamflow.

[r] U.S. Army Corps of Engineers (2004).

[s] Estimated AEP uncharacterized because of regulation.

[t] Expected peak streamflows are based on a regional mixed-population analysis (Sando and others, 2008).

[u] Analysis based on station skew for the current (2008) regulated condition.

*Flooding in Shell Rock, Iowa. Photographs by Don Becker, USGS.*

**Table 6.** Summary of peak stages, streamflows, and flood-probability estimates for selected U.S. Geological Survey streamgages during July 2008.

[$mi^2$, square mile; ft, foot; $ft^3/s$, cubic foot per second; AEP, annual exceedance probability; <, less than; --, no data]

| Site number (fig. 15) | Station number | Station name | Contributing drainage area ($mi^2$) | Flood data: Previous maximum streamflow | | | Flood data: Flood of July 2008 | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Date | Stage (ft) | Streamflow ($ft^3/s$) | Rank[a]/ annual peaks | Date | Peak stage (ft) | Peak streamflow ($ft^3/s$) |
| 1 | 05483600 | Middle Raccoon River at Panora, Iowa | 440 | 07/1993 | 20.04 | [c]22,400 | 3/52 | 7/28/2008 | 14.69 | [c]14,000 |
| 2 | 05484000 | South Raccoon River at Redfield, Iowa | 994 | 07/1993 | 26.98 | 44,000 | 2/69 | 7/28/2008 | 24.04 | 37,100 |
| 3 | 05485640 | Fourmile Creek at Des Moines, Iowa | 92.7 | 06/1998 | 15.00 | 5,600 | ([d]) | 7/28/2008 | 15.38 | 6,390 |
| 4 | 05487470 | South River near Ackworth, Iowa | 460 | 06/1990 | 31.25 | 38,100 | 2/70 | 7/29/2008 | 31.57 | 35,700 |
| 5 | 05487825 | Little White Breast Creek Trib. near Chariton, Iowa | .1 | 08/1993 | 18.93 | [e]56 | 1/19 | 7/28/2008 | 19.72 | 78 |
| 6 | 05487980 | White Breast Creek near Dallas, Iowa | 342 | 07/1982 | 33.45 | 37,300 | 4/46 | 7/8/2008 | 28.44 | 16,900 |
| 7 | 05488200 | English Creek near Knoxville, Iowa | 90.1 | 07/1982 | 30.28 | 28,000 | 3/24 | 7/8/2008 | 27.40 | 14,000 |
| 8 | 05489000 | Cedar Creek near Bussey, Iowa | 374 | 07/1982 | 34.61 | 96,000 | 4/62 | 7/8/2008 | 28.91 | 30,800 |
| 9 | 05494300 | Fox River at Bloomfield, Iowa | 87.7 | 08/2007 | 25.05 | 13,100 | 2/32 | 7/8/2008 | 24.69 | 11,600 |
| 10 | 05502300 | Salt River at Hagers Grove, Mo. | 365 | 05/2002 | 20.91 | 42,000 | 2/35 | 7/25/2008 | 20.88 | 29,300 |
| 11 | 05502500 | Salt River near Shelbina, Mo. | 481 | 05/2002 | 28.65 | 24,600 | 1/65 | 7/26/2008 | 28.65 | 28,000 |
| 12 | 05503800 | Crooked Creek near Paris, Mo. | 80.0 | 04/1973 | 15.53 | 12,100 | 4/30 | 7/25/2008 | 12.35 | 6,810 |
| 13 | 05504800 | South Fork Salt River above Santa Fe, Mo. | 233 | 09/1993 | 28.66 | 31,800 | ([d]) | 7/26/2008 | 24.72 | 15,500 |
| 14 | 05506100 | Long Branch near Santal Fe, Mo. | 180 | 07/1998 | 22.43 | 16,700 | 1/14 | 7/25/2008 | 24.43 | 19,500 |
| 15 | 05506800 | Elk Fork Salt River near Madison, Mo. | 200 | 04/1973 | 33.40 | 42,300 | 3/41 | 7/25/2008 | 30.77 | 24,300 |
| 16 | 05507600 | Lick Creek near Perry, Mo. | 104 | 05/1996 | 22.25 | 11,800 | 2/30 | 7/25/2008 | 26.14 | 15,200 |
| 17 | 05508805 | Spencer Creek at Plum Creek, Frankford, Mo. | 206 | 09/1993 | 18.54 | 20,300 | 1/30 | 7/25/2008 | 19.60 | 20,700 |
| 18 | 06818750 | Platte River near Diagonal, Iowa | 217 | 09/1989 | 23.60 | 8,630 | 1/36 | 7/25/2008 | 25.97 | 13,400 |
| 19 | 06898000 | Thompson River at Davis City, Iowa | 701 | 09/1992 | 24.29 | 57,000 | 5/83 | 7/24/2008 | 16.77 | 21,500 |
| 20 | 06899500 | Thompson River at Trenton, Mo. | 1,720 | 06/1947 | 25.70 | 95,000 | 4/84 | 7/25/2008 | 31.96 | 63,400 |
| 21 | 06903700 | South Fork Chariton River near Promise City, Iowa | 168 | 09/1992 | 34.84 | 70,600 | 5/42 | 7/25/2008 | 25.78 | 17,700 |
| 22 | 06904010 | Chariton River near Moulton, Iowa | 740 | 08/2007 | 37.94 | [c]21,200 | 3/29 | 7/9/2008 | 35.81 | [c]10,300 |
| 23 | 06904500 | Chariton River at Novinger, Mo. | 1,370 | 06/1917 | 28.60 | 27,000 | 1/86 | 7/25/2008 | 28.44 | [c]30,200 |
| 24 | 06905500 | Chariton River near Prairie Hill, Mo. | 1,870 | 05/2002 | 23.01 | [c]37,100 | 1/80 | 7/27/2008 | 23.27 | [c]38,400 |
| 25 | 06906150 | Long Banch Creek near Atlanta, Mo. | 23.0 | 05/2002 | 16.44 | 3,360 | 1/13 | 7/25/2008 | 16.43 | 4,870 |

| Site number (fig. 15) | Estimated AEP for observed peak streamflow (percent) | Expected peak streamflows for selected AEP with 95-percent confidence limits ($ft^3/s$)[b]: 4-percent AEP (25-year recurrence) | | | 2-percent AEP (50-year recurrence) | | | 1-percent AEP (100-year recurrence) | | | 0.2-percent AEP (500-year recurrence) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Estimate | Confidence limit: Low | Confidence limit: High | Estimate | Confidence limit: Low | Confidence limit: High | Estimate | Confidence limit: Low | Confidence limit: High | Estimate | Confidence limit: Low | Confidence limit: High |
| 1 | 2–4 | 14,000 | 11,900 | 16,400 | 16,700 | 13,900 | 20,000 | 19,500 | 15,800 | 23,900 | 26,400 | 20,100 | 34,600 |
| 2 | .2–1 | 27,400 | 22,900 | 32,800 | 31,600 | 25,900 | 38,600 | 35,800 | 28,600 | 44,800 | 45,900 | 34,400 | 61,100 |
| 3 | 2–4 | 6,140 | 4,880 | 7,730 | 7,330 | 5,690 | 9,440 | 8,580 | 6,500 | 11,300 | 11,800 | 8,310 | 16,600 |
| 4 | 2–4 | 31,000 | 25,500 | 37,500 | 36,200 | 29,100 | 44,900 | 41,400 | 32,400 | 52,700 | 53,500 | 39,200 | 73,000 |
| 5 | 2–4 | [f]74 | 53 | 126 | [f]90 | 62 | 164 | [f]108 | 72 | 206 | [f]152 | 96 | 329 |
| 6 | 4–10 | [g]19,100 | 15,700 | 23,200 | [g]22,700 | 18,400 | 28,100 | [g]26,500 | 21,000 | 33,400 | [g]36,300 | 27,200 | 48,400 |
| 7 | 1–2 | 9,510 | 7,270 | 12,400 | 11,600 | 8,720 | 15,500 | 14,100 | 10,300 | 19,300 | 20,900 | 14,200 | 30,800 |
| 8 | 2–4 | 28,000 | 23,400 | 33,400 | 33,400 | 27,400 | 40,800 | 39,000 | 31,200 | 48,800 | 53,500 | 40,200 | 71,100 |
| 9 | 2–4 | 11,500 | 9,080 | 14,500 | 14,000 | 10,900 | 17,900 | 16,500 | 12,700 | 21,500 | 23,400 | 16,900 | 32,200 |
| 10 | 2–4 | 27,600 | 22,100 | 34,500 | 32,000 | 24,600 | 41,600 | 36,200 | 26,700 | 49,200 | 46,000 | 30,500 | 69,400 |
| 11 | .2–1 | 19,300 | 16,200 | 23,000 | 22,600 | 18,300 | 27,900 | 26,000 | 20,300 | 33,300 | 34,100 | 24,400 | 47,800 |
| 12 | > 10 | 8,900 | 6,780 | 11,700 | 10,300 | 7,540 | 14,200 | 11,800 | 8,200 | 16,900 | 15,200 | 9,520 | 24,200 |
| 13 | 4–10 | 20,000 | 13,700 | 29,100 | 23,600 | 15,400 | 36,100 | 27,300 | 17,000 | 43,900 | 36,200 | 20,100 | 65,100 |
| 14 | 1–2 | 16,200 | 11,400 | 23,000 | 18,600 | 12,500 | 27,800 | 21,200 | 13,600 | 33,000 | 27,400 | 15,800 | 47,600 |
| 15 | 2–4 | 21,700 | 16,000 | 29,600 | 25,700 | 18,000 | 36,700 | 29,700 | 19,800 | 44,600 | 39,400 | 23,400 | 66,100 |
| 16 | 2–4 | 14,500 | 11,400 | 18,400 | 16,600 | 12,600 | 22,000 | 18,800 | 13,600 | 25,800 | 23,900 | 15,700 | 36,400 |
| 17 | 2–4 | 19,400 | 16,100 | 23,300 | 21,200 | 17,100 | 26,400 | 23,000 | 17,900 | 29,600 | 27,100 | 19,400 | 37,800 |
| 18 | 1–2 | 10,800 | 9,060 | 12,900 | 12,500 | 10,300 | 15,300 | 14,300 | 11,500 | 17,800 | 18,200 | 13,800 | 24,100 |
| 19 | 4–10 | 23,900 | 19,800 | 28,700 | 28,300 | 23,000 | 34,700 | 32,800 | 26,100 | 41,100 | 44,000 | 33,100 | 58,700 |
| 20 | 4–10 | 63,600 | 53,500 | 75,700 | 72,600 | 58,800 | 89,600 | 81,100 | 63,100 | 104,000 | 99,800 | 70,500 | 141,000 |
| 21 | 4–10 | 17,900 | 14,900 | 21,500 | 21,000 | 17,100 | 25,700 | 24,400 | 19,400 | 30,500 | 33,600 | 25,300 | 44,600 |
| 22 | < 2 | [h]8,130 | -- | -- | [h]8,660 | -- | -- | -- | -- | -- | -- | -- | -- |
| 23 | 1–2 | 25,900 | 21,600 | 31,200 | 30,100 | 24,100 | 37,700 | 34,400 | 26,300 | 44,900 | 44,300 | 30,700 | 64,000 |
| 24 | < .2 | 25,200 | 22,200 | 28,600 | 28,000 | 24,000 | 32,600 | 30,600 | 25,500 | 36,700 | 36,800 | 28,600 | 47,400 |
| 25 | 2–4 | 4,230 | 2,640 | 6,780 | 5,100 | 3,040 | 8,560 | 6,020 | 3,430 | 10,600 | 8,240 | 4,230 | 16,000 |

[a] Rank of the maximum instantaneous peak streamflow measured during July 2008 compared to all systematic and historic annual peaks. A rank of 1 indicates that the July 2008 peak streamflow was higher than all other recorded annual peaks.

[b] Unless otherwise noted, expected peak streamflows are based on Water Resources Council Bulletin 17B weighting by variance method.

[c] Streamflow affected by regulation or diversion.

[d] The peak streamflow for July 2008 was exceeded by another peak streamflow during 2008.

[e] Estimated.

[f] Expected peak streamflows based on Bulletin 17B systematic frequency-curve estimate only.

[g] Expected peak streamflows are based on inclusion of actual, or area-weighted, annual-peak streamflows from an earlier period of record from nearby discontinued downstream streamgage.

[h] Edward Parker, P.E., Hydraulic Engineer, U.S. Army Corps of Engineers, Kansas City District, written commun., January 6, 2010.

*Flooding in Spencer, Indiana. Photograph by Paul Baker, USGS.*


*Flooding in St. Joseph, Illinois. Photograph by Robert Holmes, USGS.*

**Table 7.** Summary of peak stages, streamflows, and flood-probability estimates for selected U.S. Geological Survey streamgages during September 2008.

[mi$^2$, square mile; ft, foot; ft$^3$/s, cubic foot per second; AEP, annual exceedance probability; <, less than; --, no data; Br., Branch; >, greater than]

| Site number (fig. 16) | Station number | Station name | Contributing drainage area (mi$^2$) | Flood data | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Previous maximum streamflow | | | Flood of September 2008 | | | |
| | | | | Date | Stage (ft) | Streamflow (ft$^3$/s) | Rank[a]/ annual peaks | Date | Peak stage (ft) | Peak streamflow (ft$^3$/s) |
| 1 | 04093000 | Deep River at Lake George Outlet, Hobart, Ind. | 124 | 11/1990 | 17.58 | 4,230 | 1/62 | 9/15/2008 | 22.18 | 5,280 |
| 2 | 04094000 | Little Calumet River at Porter, Ind. | 66.2 | 11/1990 | 10.93 | 3,880 | 1/64 | 9/15/2008 | 12.04 | 5,320 |
| 3 | 04095300 | Trail Creek at Michigan City, Ind. | 54.1 | 06/1993 | 12.97 | 4,240 | 3/26 | 9/14/2008 | 13.07 | 3,310 |
| 4 | 04096015 | Galien River near Sawyer, Mich. | 80.7 | 05/1996 | 14.13 | 3,440 | 2/13 | 9/15/2008 | 13.26 | 2,510 |
| 5 | 04096405 | St. Joseph River at Burlington, Mich. | 206 | 06/1989 | 5.82 | 1,390 | 4/47 | 9/16/2008 | 6.83 | 1,130 |
| 6 | 04097500 | St. Joseph River at Three Rivers, Mich. | 1,350 | 04/1950 | 10.60 | 8,260 | ([d]) | 9/17/2008 | 9.29 | 6,120 |
| 7 | 04099000 | St. Joseph River at Mottville, Mich. | 1,866 | 06/1989 | 10.41 | [e]11,400 | ([d]) | 9/17/2008 | 8.25 | [e]7,550 |
| 8 | 04101370 | Juday Creek near South Bend, Ind. | 38.0 | 06/1993 | 3.39 | 226 | 1/16 | 9/15/2008 | 3.65 | 249 |
| 9 | 04101800 | Dowagiac River at Sumnerville, Mich. | 255 | 02/1985 | 9.26 | 1,590 | 1/49 | 9/15/2008 | 11.60 | 2,300 |
| 10 | 04102500 | Paw Paw River at Riverside, Mich. | 390 | 10/1986 | 10.90 | 3,580 | 1/57 | 9/17/2008 | 11.24 | 3,870 |
| 11 | 04102700 | South Branch Black River near Bangor, Mich. | 83.6 | 02/1997 | 14.90 | 2,390 | 2/43 | 9/15/2008 | 13.78 | 1,950 |
| 12 | 04103010 | Kalamazoo River near Marengo, Mich. | 267 | 06/1989 | 10.18 | 1,160 | 2/22 | 9/14/2008 | 10.05 | 1,120 |
| 13 | 04103500 | Kalamazoo River at Marshall, Mich. | 449 | 03/1950 | 8.20 | 2,130 | 2/42 | 9/15/2008 | 7.89 | [e]2,030 |
| 14 | 04105000 | Battle Creek at Battle Creek, Mich. | 241 | 04/1947 | 4.48 | 3,640 | 9/77 | 9/17/2008 | 3.46 | 2,410 |
| 15 | 04105500 | Kalamazoo River near Battle Creek, Mich. | 824 | 04/1947 | -- | 7,290 | 3/72 | 9/17/2008 | 7.78 | 5,240 |
| 16 | 04105700 | Augusta Creek near Augusta, Mich. | 38.9 | 06/1978 | 3.41 | 560 | 2/44 | 9/14/2008 | 3.48 | 312 |
| 17 | 04106000 | Kalamazoo River at Comstock, Mich. | 1,010 | 04/1947 | 7.94 | 6,910 | 4/72 | 9/18/2008 | 10.43 | 5,670 |
| 18 | 04106300 | Portage Creek near Kalamazoo, Mich. | 22.4 | 05/1989 | 3.09 | 407 | 2/44 | 9/14/2008 | 3.43 | 398 |
| 19 | 04106320 | West Fork Portage Creek near Oshtemo, Mich. | 13.0 | 12/1992 | 2.47 | 36 | 3/37 | 9/15/2008 | 2.17 | 26 |
| 20 | 04106400 | West Fork Portage Creek at Kalamazoo, Mich. | 18.7 | 12/1992 | 3.23 | 41 | 1/49 | 9/15/2008 | 3.69 | 69 |
| 21 | 04108600 | Rabbit River near Hopkins, Mich. | 71.4 | 06/1997 | 11.11 | [f]3,740 | ([d]) | 9/14/2008 | 8.90 | 1,360 |
| 22 | 04111000 | Grand River near Eaton Rapids, Mich. | 661 | 04/1950 | 8.15 | 3,860 | 2/47 | 9/16/2008 | 8.17 | 3,590 |
| 23 | 04112700 | Sycamore Creek at Harper Rd near Mason, Mich. | 39.5 | 04/1975 | 12.53 | 1,080 | 3/34 | 9/15/2008 | 12.08 | 879 |
| 24 | 05448000 | Mill Creek at Milan, Ill. | 62.4 | 04/1973 | 11.65 | 9,300 | 3/67 | 9/13/2008 | [g]11.37 | 8,790 |
| 25 | 05466500 | Edwards River near New Boston, Ill. | 445 | 04/1973 | 23.33 | 18,000 | 2/74 | 9/14/2008 | 24.13 | 10,300 |
| 26 | 05469350 | Haight Creek at Kingston, Iowa | 2.7 | 06/2007 | 18.16 | 2,450 | 2/19 | 9/13/2008 | [f]16.02 | [f]1,740 |
| 27 | 05473400 | Cedar Creek near Oakland Mills, Iowa | 530 | 08/2007 | 21.28 | 13,100 | 1/31 | 9/14/2008 | 21.96 | 14,100 |
| 28 | 05473450 | Big Creek north of Mount Pleasant, Iowa | 58.0 | 04/1973 | -- | 9,580 | 2/12 | 9/13/2008 | 16.90 | 4,520 |
| 29 | 05495000 | Fox River at Waylund, Mo. | 400 | 04/1973 | 21.71 | 26,400 | 4/87 | 9/15/2008 | 20.61 | 18,600 |
| 30 | 05502500 | Salt River near Shelbina, Mo. | 481 | 05/2002 | 28.65 | 24,600 | ([d]) | 9/16/2008 | 24.29 | 17,800 |
| 31 | 05504800 | South Fork Salt River above Santa Fe, Mo. | 233 | 09/1993 | 28.66 | 31,800 | 2/21 | 9/15/2008 | 26.60 | 22,100 |
| 32 | 05512500 | Bay Creek at Pittsfield, Ill. | 39.4 | 09/1926 | 18.40 | 35,000 | 3/70 | 9/14/2008 | 14.75 | 12,900 |
| 33 | 05515500 | Kankakee River at Davis, Ind. | 537 | 01/2005 | 13.05 | 1,930 | ([d]) | 9/15/2008 | 13.74 | 1,900 |
| 34 | 05518000 | Kankakee River at Shelby, Ind. | 1,779 | 03/1982 | 12.98 | 7,650 | 5/86 | 9/19/2008 | [g]12.86 | 6,230 |
| 35 | 05520500 | Kankakee River at Momence, Ill. | 2,294 | 03/1979 | 10.51 | [f]16,000 | 2/94 | 9/15/2008 | 6.98 | 11,800 |
| 36 | 05527500 | Kankakee River near Wilmington, Ill. | 5,150 | 07/1957 | 11.40 | 75,900 | ([d]) | 9/15/2008 | 8.68 | 48,800 |
| 37 | 05530990 | Salt Creek at Rolling Meadows, Ill. | 30.5 | 08/1987 | 14.03 | 1,650 | 1/35 | 9/13/2008 | 12.99 | [h]2,510 |
| 38 | 05531300 | Salt Creek at Elmhurst, Ill. | 91.5 | 08/1972 | 7.27 | 2,230 | 2/45 | 9/14/2008 | 13.27 | [i]1,940 |
| 39 | 05531500 | Salt Creek at Western Springs, Ill. | 115 | 08/1987 | 10.54 | 3,540 | 2/63 | 9/14/2008 | 9.92 | [i]2,890 |
| 40 | 05532000 | Addison Creek at Bellwood, Ill. | 17.9 | 08/1987 | 12.84 | 1,120 | 4/58 | 9/13/2008 | 10.33 | 808 |

| Site number (fig. 16) | Estimated AEP for observed peak streamflow (percent) | Expected peak streamflows for selected AEP with 95-percent confidence limits (ft$^3$/s)[b] | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 4-percent AEP (25-year recurrence) | | | 2-percent AEP (50-year recurrence) | | | 1-percent AEP (100-year recurrence) | | | 0.2-percent AEP (500-year recurrence) | | |
| | | Estimate | Confidence limit | | Estimate | Confidence limit | | Estimate | Confidence limit | | Estimate | Confidence limit | |
| | | | Low | High | | Low | High | | Low | High | | Low | High |
| 1 | 1–2 | 4,440 | 3,530 | 6,380 | 5,220 | 4,040 | 7,910 | 6,070 | 4,570 | 9,670 | 8,320 | 5,900 | 14,800 |
| 2 | 2–4 | 4,490 | 3,230 | 7,530 | 5,660 | 3,920 | 10,300 | 7,010 | 4,680 | 13,700 | 11,000 | 6,750 | 25,200 |
| 3 | 2–4 | 3,190 | 2,190 | 4,640 | 3,770 | 2,480 | 5,730 | 4,350 | 2,750 | 6,890 | 5,820 | 3,390 | 9,990 |
| 4 | 4–10 | [c]2,880 | 2,210 | 4,580 | [c]3,370 | 2,510 | 5,770 | [c]3,910 | 2,820 | 7,160 | [c]5,330 | 3,600 | 11,300 |
| 5 | 4–10 | [c]1,250 | 1,100 | 1,500 | [c]1,400 | 1,210 | 1,710 | [c]1,550 | 1,320 | 1,920 | [c]1,890 | 1,570 | 2,430 |
| 6 | 4–10 | [c]6,360 | 5,720 | 7,310 | [c]6,970 | 6,200 | 8,140 | [c]7,560 | 6,660 | 8,950 | [c]8,900 | 7,680 | 10,900 |
| 7 | 4–10 | [c]8,780 | 8,080 | 9,730 | [c]9,800 | 8,930 | 11,000 | [c]10,800 | 9,780 | 12,300 | [c]13,400 | 11,800 | 15,700 |
| 8 | 2–4 | [c]238 | 173 | 410 | [c]282 | 199 | 521 | [c]329 | 225 | 649 | [c]450 | 288 | 1,020 |
| 9 | < 1 | 1,590 | 1,360 | 1,850 | 1,770 | 1,470 | 2,130 | 1,950 | 1,570 | 2,430 | -- | -- | -- |
| 10 | 1–2 | 2,980 | 2,430 | 3,650 | 3,450 | 2,700 | 4,400 | 3,950 | 2,960 | 5,250 | -- | -- | -- |
| 11 | 2–4 | 1,860 | 1,460 | 2,360 | 2,150 | 1,620 | 2,860 | 2,470 | 1,780 | 3,440 | -- | -- | -- |
| 12 | 2–4 | [c]1,080 | 950 | 1,320 | [c]1,180 | 1,020 | 1,470 | [c]1,280 | 1,090 | 1,630 | [c]1,500 | 1,250 | 2,010 |
| 13 | 2–4 | 1,910 | 1,590 | 2,290 | 2,150 | 1,740 | 2,660 | 2,410 | 1,880 | 3,080 | -- | -- | -- |
| 14 | 4–10 | 2,800 | 2,340 | 3,350 | 3,210 | 2,580 | 3,980 | 3,620 | 2,810 | 4,670 | -- | -- | -- |
| 15 | 4–10 | 5,340 | 4,510 | 6,320 | 6,110 | 4,990 | 7,490 | 6,930 | 5,460 | 8,790 | -- | -- | -- |
| 16 | 1–2 | 263 | 206 | 336 | 303 | 226 | 406 | 344 | 244 | 485 | -- | -- | -- |
| 17 | 2–4 | [c]5,640 | 5,080 | 6,420 | [c]6,300 | 5,620 | 7,280 | [c]6,960 | 6,140 | 8,150 | [c]8,510 | 7,360 | 10,300 |
| 18 | < 1 | 288 | 234 | 355 | 323 | 252 | 415 | 360 | 269 | 481 | -- | -- | -- |
| 19 | 4–10 | [c]29 | 25 | 35 | [c]33 | 28 | 41 | [c]38 | 32 | 48 | [c]49 | 40 | 67 |
| 20 | .2–1 | [c]47 | 42 | 55 | [c]53 | 46 | 63 | [c]59 | 51 | 72 | [c]75 | 63 | 95 |
| 21 | 4–10 | 1,550 | 1,140 | 2,100 | 1,830 | 1,270 | 2,620 | 2,120 | 1,400 | 3,200 | -- | -- | -- |
| 22 | 4–10 | [c]3,970 | 3,520 | 4,640 | [c]4,360 | 3,830 | 5,190 | [c]4,750 | 4,130 | 5,730 | [c]5,610 | 4,780 | 6,980 |
| 23 | 2–4 | [c]877 | 731 | 1,130 | [c]1,040 | 845 | 1,390 | [c]1,210 | 966 | 1,680 | [c]1,680 | 1,280 | 2,520 |
| 24 | 4–10 | 9,090 | 7,110 | 11,600 | 10,800 | 8,110 | 14,300 | 12,500 | 8,980 | 17,300 | 16,500 | 10,700 | 25,400 |
| 25 | 2–4 | 10,200 | 8,490 | 12,200 | 11,800 | 9,500 | 14,600 | 13,400 | 10,400 | 17,100 | 17,200 | 12,300 | 24,000 |
| 26 | 4–10 | 2,270 | 1,710 | 3,000 | 2,860 | 2,110 | 3,860 | 3,500 | 2,530 | 4,860 | 5,280 | 3,540 | 7,860 |
| 27 | 2–4 | 13,600 | 11,400 | 16,200 | 15,700 | 12,900 | 19,000 | 17,800 | 14,300 | 22,100 | 22,700 | 17,300 | 29,900 |
| 28 | 4–10 | 5,300 | 3,990 | 7,050 | 6,490 | 4,810 | 8,770 | 7,710 | 5,590 | 10,600 | 10,800 | 7,330 | 16,000 |
| 29 | 4–10 | 18,900 | 15,600 | 22,900 | 22,300 | 17,700 | 28,000 | 25,900 | 19,800 | 33,800 | 34,600 | 24,100 | 49,600 |
| 30 | 4–10 | 19,300 | 16,200 | 23,000 | 22,600 | 18,300 | 27,900 | 26,000 | 20,300 | 33,300 | 34,100 | 24,400 | 47,800 |
| 31 | 2–4 | 20,000 | 13,700 | 29,100 | 23,600 | 15,400 | 36,100 | 27,300 | 17,000 | 43,900 | 36,200 | 20,100 | 65,100 |
| 32 | 4–10 | 14,300 | 11,200 | 18,200 | 17,000 | 12,800 | 22,600 | 19,600 | 14,100 | 27,300 | 25,500 | 16,500 | 39,400 |
| 33 | 2–4 | 1,830 | 1,710 | 1,960 | 1,940 | 1,790 | 2,100 | 2,050 | 1,860 | 2,250 | 2,300 | 2,010 | 2,620 |
| 34 | 4–10 | 6,370 | 5,940 | 6,830 | 6,730 | 6,180 | 7,320 | 7,060 | 6,390 | 7,810 | 7,760 | 6,740 | 8,930 |
| 35 | 2–4 | 11,700 | 10,600 | 12,900 | 12,600 | 11,300 | 14,200 | 13,500 | 11,800 | 15,500 | 15,300 | 12,600 | 18,400 |
| 36 | 4–10 | 54,700 | 47,300 | 63,300 | 61,300 | 51,600 | 72,900 | 67,500 | 55,200 | 82,600 | 80,800 | 61,300 | 106,000 |
| 37 | < .2 | 1,520 | 1,320 | 1,860 | 1,690 | 1,440 | 2,110 | 1,850 | 1,560 | 2,360 | 2,220 | 1,820 | 2,950 |
| 38 | [j]-- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 39 | [j]-- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 40 | 4–10 | [c]858 | 767 | 988 | [c]944 | 837 | 1,100 | [c]1,030 | 902 | 1,220 | [c]1,210 | 1,050 | 1,470 |

**Table 7.** Summary of peak stages, streamflows, and flood-probability estimates for selected U.S. Geological Survey streamgages during September 2008.—Continued

[$mi^2$, square mile; ft, foot; $ft^3/s$, cubic foot per second; AEP, annual exceedance probability; <, less than; --, no data; Br., Branch; >, greater than]

| Site number (fig. 16) | Station number | Station name | Contributing drainage area ($mi^2$) | Flood data: Previous maximum streamflow: Date | Stage (ft) | Streamflow ($ft^3/s$) | Flood of September 2008: Rank[a]/ annual peaks | Date | Peak stage (ft) | Peak streamflow ($ft^3/s$) |
|---|---|---|---|---|---|---|---|---|---|---|
| 41 | 05532500 | Des Plaines River at Riverside, Ill. | 630 | 08/1987 | 9.90 | 9,770 | 2/95 | 9/14/2008 | 9.87 | 9,560 |
| 42 | 05534500 | North Branch Chicago River at Deerfield, Ill. | 19.7 | 08/1987 | 11.52 | 933 | 4/56 | 9/13/2008 | 11.39 | 749 |
| 43 | 05535000 | Skokie River at Lake Forest, Ill. | 13.0 | 08/2001 | 7.78 | [h]580 | 5/57 | 9/13/2008 | 7.01 | 464 |
| 44 | 05536000 | North Branch Chicago River at Niles, Ill. | 100 | 08/1987 | 11.35 | 2,590 | 1/58 | 9/13/2008 | 12.13 | 3,340 |
| 45 | 05536179 | Hart Ditch at Dyer, Ind. | 37.6 | 11/1990 | 15.33 | 3,010 | 1/19 | 9/14/2008 | 16.76 | 3,110 |
| 46 | 05536190 | Hart Ditch at Munster, Ind. | 70.7 | 09/2006 | -- | 3,260 | 1/66 | 9/14/2008 | 9.94 | [h,f]3,840 |
| 47 | 05536275 | Thorn Creek at Thornton, Ill. | 104 | 04/2006 | 15.10 | [h]5,540 | 1/62 | 9/14/2008 | 15.89 | 5,860 |
| 48 | 05539000 | Hickory Creek at Joliet, Ill. | 107 | 06/1981 | 14.90 | 17,300 | 10/67 | 9/14/2008 | 18.39 | 7,150 |
| 49 | 05539900 | West Branch DuPage River near West Chicago, Ill. | 28.5 | 08/2007 | 10.35 | [h]1,040 | 1/48 | 9/13/2008 | 12.28 | 1,840 |
| 50 | 05540060 | Kress Creek at West Chicago, Ill. | 18.1 | 07/1996 | 9.24 | 1,980 | 1/43 | 9/14/2008 | 9.37 | 2,100 |
| 51 | 05540095 | West Branch DuPage River near Warrenville, Ill. | 90.4 | 07/1996 | 6.41 | [h]3,470 | 1/40 | 9/14/2008 | 8.03 | 4,930 |
| 52 | 05540130 | West Branch DuPage River near Naperville, Ill. | 123 | 07/1996 | 14.31 | [h]6,620 | 2/20 | 9/14/2008 | 11.98 | 4,160 |
| 53 | 05540160 | East Br. DuPage River near Downers Grove, Ill. | 26.6 | 08/1972 | 16.94 | 1,720 | 3/35 | 9/14/2008 | 17.26 | 1,190 |
| 54 | 05540250 | East Branch DuPage River at Bolingbrook, Ill. | 75.8 | 07/1996 | 23.75 | [h]3,980 | 2/20 | 9/14/2008 | 24.01 | 2,410 |
| 55 | 05540500 | Du Page River at Shorewood, Ill. | 324 | 07/1996 | 14.03 | [h]17,300 | 4/68 | 9/15/2008 | 9.94 | 9,440 |
| 56 | 05542000 | Mazon River near Coal City, Ill. | 455 | 12/1982 | 19.51 | 22,400 | 4/69 | 9/15/2008 | 18.54 | 18,800 |
| 57 | 05550300 | Tyler Creek at Elgin, Ill. | 38.9 | 08/2002 | 8.26 | [h]1,650 | 3/28 | 9/13/2008 | 8.53 | 1,250 |
| 58 | 05550500 | Poplar Creek at Elgin, Ill. | 35.2 | 02/1997 | 6.78 | [h]1,180 | 1/57 | 9/13/2008 | 7.69 | 1,560 |
| 59 | 05551200 | Ferson Creek near St. Charles, Ill. | 51.7 | 02/1997 | 8.77 | 2,580 | 1/48 | 9/13/2008 | 8.96 | 2,980 |
| 60 | 05551700 | Blackberry Creek near Yorkville, Ill. | 70.2 | 07/1996 | 13.16 | 5,510 | 2/48 | 9/15/2008 | 9.94 | 2,130 |
| 61 | 05552500 | Fox River at Dayton, Ill. | 2,642 | 07/1996 | 24.47 | [k]55,400 | 3/93 | 9/14/2008 | 21.48 | [e]44,300 |
| 62 | 05555300 | Vermilion River near Leonore, Ill. | 1,251 | 07/1958 | 15.30 | 33,500 | ([d]) | 9/15/2008 | 24.51 | 25,200 |
| 63 | 05556500 | Big Bureau Creek at Princeton, Ill. | 196 | 05/1974 | 16.01 | 12,500 | 1/72 | 9/14/2008 | 16.62 | 12,700 |
| 64 | 05567500 | Mackinaw River near Congerville, Ill. | 767 | 12/1982 | 20.21 | 44,800 | 5/64 | 9/15/2008 | 18.84 | 25,400 |
| 65 | 05573540 | Sangamon River at Route 48 at Decatur, Ill. | 938 | 05/2002 | 24.33 | [i]31,800 | 2/26 | 9/14/2008 | 24.43 | [i]21,500 |
| 66 | 05586100 | Illinois River at Valley City, Ill. | 26,743 | 05/1943 | 28.61 | [e]123,000 | 17/88 | 9/24/2008 | [g]21.11 | [e]92,200 |
| 67 | 05593900 | East Fork Shoal Creek near Coffeen, Ill. | 55.5 | 12/1966 | 14.45 | 5,910 | 5/45 | 9/14/2008 | 14.25 | 5,070 |
| 68 | 06928300 | Roubidoux Creek above Fort Wood, Mo. | 165 | 05/2002 | 14.86 | 12,900 | 1/7 | 9/14/2008 | 22.45 | 25,900 |
| 69 | 06934500 | Missouri River at Hermann, Mo. | 522,500 | 07/1993 | 36.97 | 750,000 | 24/82 | 9/15/2008 | 31.34 | [e]350,000 |
| 70 | 06935850 | Creve Coeur Creek at Chesterfield, Mo. | 5.6 | 06/2000 | 15.88 | 2,050 | 1/11 | 9/14/2008 | 17.56 | 2,820 |
| 71 | 06935890 | Creve Coeur Creek near Creve Coeur, Mo. | 22.0 | 06/2000 | 16.43 | 6,560 | 1/20 | 9/14/2008 | 16.22 | 8,780 |
| 72 | 06935955 | Fee Fee Creek near Bridgeton, Mo. | 11.7 | 04/1979 | 21.62 | 3,810 | 1/21 | 9/14/2008 | 20.41 | 4,680 |
| 73 | 06935965 | Missouri River at St. Charles, Mo. | 524,000 | 05/2002 | 31.69 | 350,000 | 1/8 | 9/16/2008 | 31.82 | [e]353,000 |
| 74 | 06935980 | Cowmire Creek at Bridgeton, Mo. | 3.7 | 06/2003 | 16.04 | 3,490 | 1/19 | 9/14/2008 | 16.20 | 3,580 |
| 75 | 06936475 | Coldwater Creek near Black Jack, Mo. | 40.4 | 04/2001 | 10.67 | 10,600 | 2/12 | 9/14/2008 | 15.62 | 9,690 |
| 76 | 07005000 | Maline Creek at Bellefontaine Neighbors, Mo. | 24.4 | 05/2004 | 14.06 | 8,210 | 1/13 | 9/14/2008 | 18.08 | 12,800 |
| 77 | 07010022 | River Des Peres near University City, Mo. | 8.9 | 06/2003 | 16.31 | 4,430 | 1/12 | 9/14/2008 | 17.40 | 5,050 |
| 78 | 07010030 | River Des Peres Tributary at Pagedale, Mo. | 2.0 | 07/1998 | 8.84 | 1,290 | 1/12 | 9/14/2008 | 10.38 | 2,160 |
| 79 | 07010035 | Engelholm Creek near Wellston, Mo. | 1.4 | 07/1998 | 8.88 | 1,090 | 1/11 | 9/14/2008 | 10.29 | 1,570 |

| Site number (fig. 16) | Estimated AEP for observed peak streamflow (percent) | Expected peak streamflows for selected AEP with 95-percent confidence limits ($ft^3/s$)[b]: 4-percent AEP (25-year recurrence): Estimate | Confidence limit: Low | High | 2-percent AEP (50-year recurrence): Estimate | Confidence limit: Low | High | 1-percent AEP (100-year recurrence): Estimate | Confidence limit: Low | High | 0.2-percent AEP (500-year recurrence): Estimate | Confidence limit: Low | High |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 41 | 0.2–1 | [c]7,340 | 6,710 | 8,160 | [c]8,010 | 7,280 | 9,000 | [c]8,640 | 7,800 | 9,800 | [c]9,990 | 8,900 | 11,500 |
| 42 | 4–10 | [c]871 | 741 | 1,090 | [c]960 | 806 | 1,230 | [c]1,040 | 867 | 1,360 | [c]1,230 | 995 | 1,660 |
| 43 | 4–10 | [c]509 | 442 | 607 | [c]563 | 485 | 682 | [c]614 | 524 | 753 | [c]721 | 604 | 908 |
| 44 | .2–1 | [c]2,570 | 2,170 | 3,350 | [c]2,890 | 2,400 | 3,920 | [c]3,230 | 2,620 | 4,550 | [c]4,080 | 3,170 | 6,230 |
| 45 | 2–4 | [c]3,100 | 2,380 | 4,690 | [c]3,730 | 2,780 | 5,990 | [c]4,420 | 3,200 | 7,540 | [c]6,340 | 4,290 | 12,300 |
| 46 | [j]-- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 47 | 1–2 | [c]4,730 | 4,110 | 5,650 | [c]5,430 | 4,650 | 6,610 | [c]6,140 | 5,190 | 7,620 | [c]7,860 | 6,470 | 10,100 |
| 48 | 4–10 | [c]8,480 | 6,660 | 12,400 | [c]10,100 | 7,670 | 15,600 | [c]11,800 | 8,730 | 19,200 | [c]16,400 | 11,400 | 30,100 |
| 49 | .2–1 | [c]1,340 | 1,090 | 1,860 | [c]1,560 | 1,230 | 2,260 | [c]1,780 | 1,380 | 2,710 | [c]2,370 | 1,740 | 3,990 |
| 50 | 1–2 | [c]1,320 | 893 | 2,460 | [c]1,750 | 1,130 | 3,570 | [c]2,260 | 1,390 | 5,040 | [c]3,900 | 2,160 | 10,500 |
| 51 | 1–2 | [c]3,750 | 2,940 | 5,510 | [c]4,450 | 3,390 | 6,930 | [c]5,220 | 3,860 | 8,580 | [c]7,310 | 5,070 | 13,500 |
| 52 | 4–10 | [c]4,870 | 3,900 | 6,900 | [c]5,690 | 4,440 | 8,490 | [c]6,580 | 5,000 | 10,300 | [c]8,930 | 6,410 | 15,600 |
| 53 | 4–10 | [c]1,200 | 991 | 1,610 | [c]1,360 | 1,110 | 1,920 | [c]1,540 | 1,220 | 2,260 | [c]1,990 | 1,510 | 3,190 |
| 54 | 4–10 | [c]2,980 | 2,310 | 4,450 | [c]3,570 | 2,680 | 5,650 | [c]4,210 | 3,070 | 7,070 | [c]5,980 | 4,090 | 11,400 |
| 55 | 4–10 | [c]11,400 | 8,660 | 17,600 | [c]13,800 | 10,200 | 22,800 | [c]16,600 | 11,800 | 29,000 | [c]24,200 | 16,100 | 48,500 |
| 56 | 4–10 | 19,900 | 16,800 | 23,600 | 21,900 | 17,900 | 26,900 | 23,700 | 18,700 | 30,100 | 27,200 | 19,700 | 37,400 |
| 57 | > 10 | [c]1,860 | 1,380 | 3,260 | [c]2,190 | 1,570 | 4,190 | [c]2,560 | 1,770 | 5,300 | [c]3,530 | 2,270 | 8,750 |
| 58 | 2–4 | [c]1,420 | 1,110 | 2,100 | [c]1,690 | 1,280 | 2,650 | [c]1,990 | 1,460 | 3,280 | [c]2,790 | 1,930 | 5,200 |
| 59 | 1–2 | 2,540 | 2,000 | 3,230 | 2,930 | 2,220 | 3,870 | 3,310 | 2,410 | 4,540 | 4,140 | 2,730 | 6,290 |
| 60 | > 10 | [c]3,650 | 2,300 | 7,550 | [c]5,050 | 3,010 | 11,600 | [c]6,820 | 3,860 | 17,400 | [c]12,900 | 6,450 | 41,100 |
| 61 | 2–4 | [c]42,100 | 30,900 | 68,800 | [c]52,000 | 36,800 | 91,300 | [c]63,100 | 43,200 | 119,000 | [c]95,200 | 60,200 | 208,000 |
| 62 | 4–10 | 30,700 | 25,600 | 36,900 | 35,000 | 28,300 | 43,400 | 39,100 | 30,500 | 50,200 | 48,200 | 34,400 | 67,500 |
| 63 | 2–4 | 11,500 | 9,470 | 14,100 | 13,100 | 10,400 | 16,600 | 14,600 | 11,000 | 19,200 | 17,700 | 12,200 | 25,800 |
| 64 | 4–10 | 29,600 | 22,500 | 38,900 | 35,800 | 26,000 | 49,300 | 42,200 | 29,300 | 60,900 | 57,800 | 35,900 | 93,200 |
| 65 | [j]-- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 66 | > 10 | [l]110,000 | -- | -- | [l]121,000 | -- | -- | [l]132,000 | -- | -- | [l]157,000 | -- | -- |
| 67 | 4–10 | 5,460 | 4,350 | 6,860 | 6,340 | 4,860 | 8,250 | 7,240 | 5,350 | 9,800 | 9,450 | 6,360 | 14,000 |
| 68 | 1–2 | [m]21,200 | -- | -- | [m]25,300 | -- | -- | [m]29,700 | -- | -- | [m]40,300 | -- | -- |
| 69 | > 10 | [f]533,000 | -- | -- | [l]604,000 | -- | -- | [l]673,000 | -- | -- | [l]833,000 | -- | -- |
| 70 | .2–1 | 2,370 | 1,800 | 3,120 | 2,530 | 1,900 | 3,360 | 2,680 | 1,990 | 3,610 | 2,990 | 2,190 | 4,090 |
| 71 | 4–10 | 9,470 | 6,900 | 13,000 | 12,500 | 8,760 | 17,700 | 16,000 | 10,900 | 23,400 | 26,500 | 17,200 | 40,700 |
| 72 | 2–4 | 4,650 | 3,800 | 5,680 | 5,200 | 4,160 | 6,500 | 5,740 | 4,500 | 7,320 | 6,950 | 5,260 | 9,170 |
| 73 | > 10 | [f]536,000 | -- | -- | [l]606,000 | -- | -- | [l]674,000 | -- | -- | [l]829,000 | -- | -- |
| 74 | 4–10 | 3,890 | 3,120 | 4,840 | 4,290 | 3,310 | 5,550 | 4,590 | 3,420 | 6,170 | 5,020 | 3,490 | 7,230 |
| 75 | 4–10 | 9,430 | 7,120 | 12,500 | 10,100 | 7,320 | 13,900 | 10,600 | 7,430 | 15,100 | 11,500 | 7,590 | 17,300 |
| 76 | 4–10 | 13,300 | 9,460 | 18,600 | 16,100 | 11,100 | 23,400 | 19,600 | 13,200 | 29,200 | 30,600 | 19,700 | 47,600 |
| 77 | 4–10 | 5,150 | 4,050 | 6,560 | 5,530 | 4,150 | 7,380 | 5,890 | 4,210 | 8,240 | 6,640 | 4,230 | 10,400 |
| 78 | .2–1 | 1,700 | 1,120 | 2,580 | 1,870 | 1,160 | 3,010 | 2,010 | 1,180 | 3,420 | 2,240 | 1,160 | 4,320 |
| 79 | 2–4 | 1,480 | 1,100 | 1,990 | 1,620 | 1,200 | 2,190 | 1,750 | 1,280 | 2,380 | 1,990 | 1,450 | 2,740 |

**Table 7.** Summary of peak stages, streamflows, and flood-probability estimates for selected U.S. Geological Survey streamgages during September 2008.—Continued

[mi², square mile; ft, foot; ft³/s, cubic foot per second; AEP, annual exceedance probability; <, less than; --, no data; Br., Branch; >, greater than]

| Site number (fig. 16) | Station number | Station name | Contributing drainage area (mi²) | Flood data: Previous maximum streamflow: Date | Stage (ft) | Streamflow (ft³/s) | Flood of September 2008: Rank[a]/annual peaks | Date | Peak stage (ft) | Peak streamflow (ft³/s) |
|---|---|---|---|---|---|---|---|---|---|---|
| 80 | 07010086 | Deer Creek at Maplewood, Mo. | 36.5 | 07/2004 | 16.57 | 5,560 | 1/13 | 9/14/2008 | 21.53 | 10,300 |
| 81 | 07010090 | MacKenzie Creek near Shrewsbury, Mo. | 3.5 | 06/1998 | 10.80 | 1,730 | 1/12 | 9/14/2008 | 11.36 | 1,970 |
| 82 | 07010180 | Gravois Creek near Mehlville, Mo. | 18.1 | 09/2003 | 16.66 | 4,450 | 1/12 | 9/14/2008 | 19.17 | 5,870 |
| 83 | 07010208 | Martigney Creek near Arnold, Mo. | 2.6 | 07/2006 | 13.31 | 1,710 | 1/10 | 9/14/2008 | 14.67 | 2,120 |
| 84 | 07015720 | Bourbeuse River near High Gate, Mo. | 135 | 12/1982 | 23.65 | 49,300 | 3/45 | 9/14/2008 | 24.38 | 38,800 |
| 85 | 07019317 | Mattese Creek near Mattese, Mo. | 7.9 | 07/2006 | 13.93 | 6,560 | 1/13 | 9/14/2008 | 16.71 | 10,700 |
| 86 | 07053810 | Bull Creek near Walnut Shade, Mo. | 191 | 05/2002 | 14.41 | 32,200 | 3/12 | 9/14/2008 | 16.38 | 25,900 |
| 87 | 07144550 | Arkansas River at Derby, Kans. | 33,567 | 11/1998 | 16.45 | 58,300 | 7/40 | 9/13/2008 | 15.19 | 37,100 |
| 88 | 07145700 | Slate Creek at Wellington, Kans. | 154 | 06/1975 | 25.82 | 28,500 | 2/49 | 9/13/2008 | 24.28 | 14,100 |
| 89 | 07146500 | Arkansas River at Arkansas City, Kans. | 36,106 | 06/1923 | 28.43 | 103,000 | 4/91 | 9/14/2008 | 27.53 | [i]79,100 |
| 90 | 07151000 | Salt Fork Arkansas River at Tonkawa, Okla. | 4,520 | 10/1973 | 28.98 | [e]97,300 | 4/77 | 9/15/2008 | 25.60 | [e]47,300 |
| 91 | 07151500 | Chikaskia River near Corbin, Kans. | 794 | 06/1923 | 28.00 | 60,000 | 6/50 | 9/13/2008 | 20.07 | [f]27,100 |
| 92 | 07152000 | Chikaskia River near Blackwell, Okla. | 1,859 | 06/1923 | 37.00 | [e]100,000 | 4/75 | 9/14/2008 | 35.36 | [e]66,500 |
| 93 | 07260000 | Dutch Creek at Waltreak, Ark. | 81.4 | 07/1969 | 22.38 | 24,500 | d | 9/3/2008 | 19.61 | 21,000 |
| 94 | 07361500 | Antoine River at Antoine, Ark. | 178 | 05/1905 | 29.70 | 40,000 | 6/71 | 9/3/2008 | 26.64 | 25,300 |
| 95 | 07363000 | Saline River at Benton, Ark. | 550 | 04/1927 | 30.50 | 110,000 | 3/80 | 9/3/2008 | 29.27 | [i]94,800 |

| Site number (fig. 16) | Estimated AEP for observed peak streamflow (percent) | Expected peak streamflows for selected AEP with 95-percent confidence limits (ft³/s)[b]: 4-percent AEP (25-year recurrence): Estimate | Confidence limit: Low | Confidence limit: High | 2-percent AEP (50-year recurrence): Estimate | Confidence limit: Low | Confidence limit: High | 1-percent AEP (100-year recurrence): Estimate | Confidence limit: Low | Confidence limit: High | 0.2-percent AEP (500-year recurrence): Estimate | Confidence limit: Low | Confidence limit: High |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 80 | < .2 | 7,570 | 5,240 | 11,000 | 7,880 | 5,270 | 11,800 | 8,100 | 5,280 | 12,400 | 8,500 | 5,350 | 13,500 |
| 81 | 4–10 | 2,010 | 1,570 | 2,580 | 2,110 | 1,560 | 2,840 | 2,180 | 1,550 | 3,060 | 2,290 | 1,520 | 3,430 |
| 82 | .2–1 | 5,170 | 4,040 | 6,620 | 5,450 | 4,180 | 7,120 | 5,720 | 4,310 | 7,580 | 6,280 | 4,630 | 8,510 |
| 83 | 2–4 | 2,100 | 1,590 | 2,770 | 2,330 | 1,750 | 3,100 | 2,560 | 1,900 | 3,440 | 3,070 | 2,250 | 4,190 |
| 84 | 1–2 | 33,700 | 26,800 | 42,400 | 37,700 | 28,900 | 49,200 | 41,200 | 30,400 | 55,800 | 48,900 | 33,400 | 71,800 |
| 85 | < .2 | 7,730 | 5,760 | 10,400 | 8,400 | 6,220 | 11,300 | 9,050 | 6,660 | 12,300 | 10,500 | 7,660 | 14,500 |
| 86 | 4–10 | 33,000 | 21,100 | 51,600 | 39,600 | 24,700 | 63,300 | 46,400 | 28,500 | 75,700 | 62,900 | 36,900 | 107,000 |
| 87 | > 10 | [c]55,800 | 42,600 | 80,400 | [c]70,100 | 52,000 | 105,000 | [c]86,000 | 66,200 | 135,000 | [c]130,000 | 89,100 | 223,000 |
| 88 | 4–10 | 15,000 | 11,200 | 20,200 | 18,500 | 13,100 | 26,000 | 22,200 | 15,000 | 32,900 | -- | -- | -- |
| 89 | 4–10 | [c]81,200 | 66,200 | 104,000 | [c]99,700 | 80,000 | 131,000 | [c]119,000 | 94,100 | 159,000 | [c]168,000 | 129,000 | 234,000 |
| 90 | 4–10 | [c]50,600 | 40,000 | 67,700 | [c]61,500 | 47,800 | 84,400 | [c]72,700 | 55,600 | 102,000 | [c]100,000 | 73,900 | 147,000 |
| 91 | 4–10 | 35,800 | 28,000 | 45,900 | 43,600 | 32,600 | 58,300 | 51,700 | 36,900 | 72,400 | -- | -- | -- |
| 92 | 4–10 | 72,900 | 54,900 | 96,900 | 90,800 | 65,600 | 126,000 | 110,000 | 76,100 | 160,000 | 163,000 | 101,000 | 263,000 |
| 93 | 1–2 | 17,800 | 14,300 | 22,200 | 21,200 | 16,400 | 27,500 | 24,600 | 18,200 | 33,200 | 33,400 | 22,300 | 50,000 |
| 94 | 4–10 | 26,800 | 22,400 | 32,100 | 30,300 | 24,400 | 37,500 | 33,700 | 26,300 | 43,200 | 41,800 | 29,900 | 58,500 |
| 95 | 1–2 | 79,600 | 64,800 | 97,600 | 93,700 | 73,600 | 119,000 | 108,000 | 81,700 | 143,000 | 144,000 | 98,600 | 209,000 |

[a] Rank of the maximum instantaneous peak streamflow measured during September 2008 compared to all systematic and historic annual peaks. A rank of 1 indicates that the September 2008 peak streamflow was higher than all other recorded annual peaks.

[b] Unless otherwise noted, expected peak streamflows are based on Water Resources Council Bulletin 17B weighting by variance method.

[c] Expected peak streamflows based on Bulletin 17B systematic frequency-curve estimate only.

[d] The peak streamflow for September 2008 was exceeded by another peak streamflow during 2008.

[e] Streamflow affected to unknown degree by regulation or diversion.

[f] Estimated.

[g] A higher stage exists that corresponds to a streamflow that is less than the peak streamflow.

[h] All or part of the record affected by urbanization, mining, agricultural changes, channelization, or other.

[i] Streamflow affected by regulation or diversion.

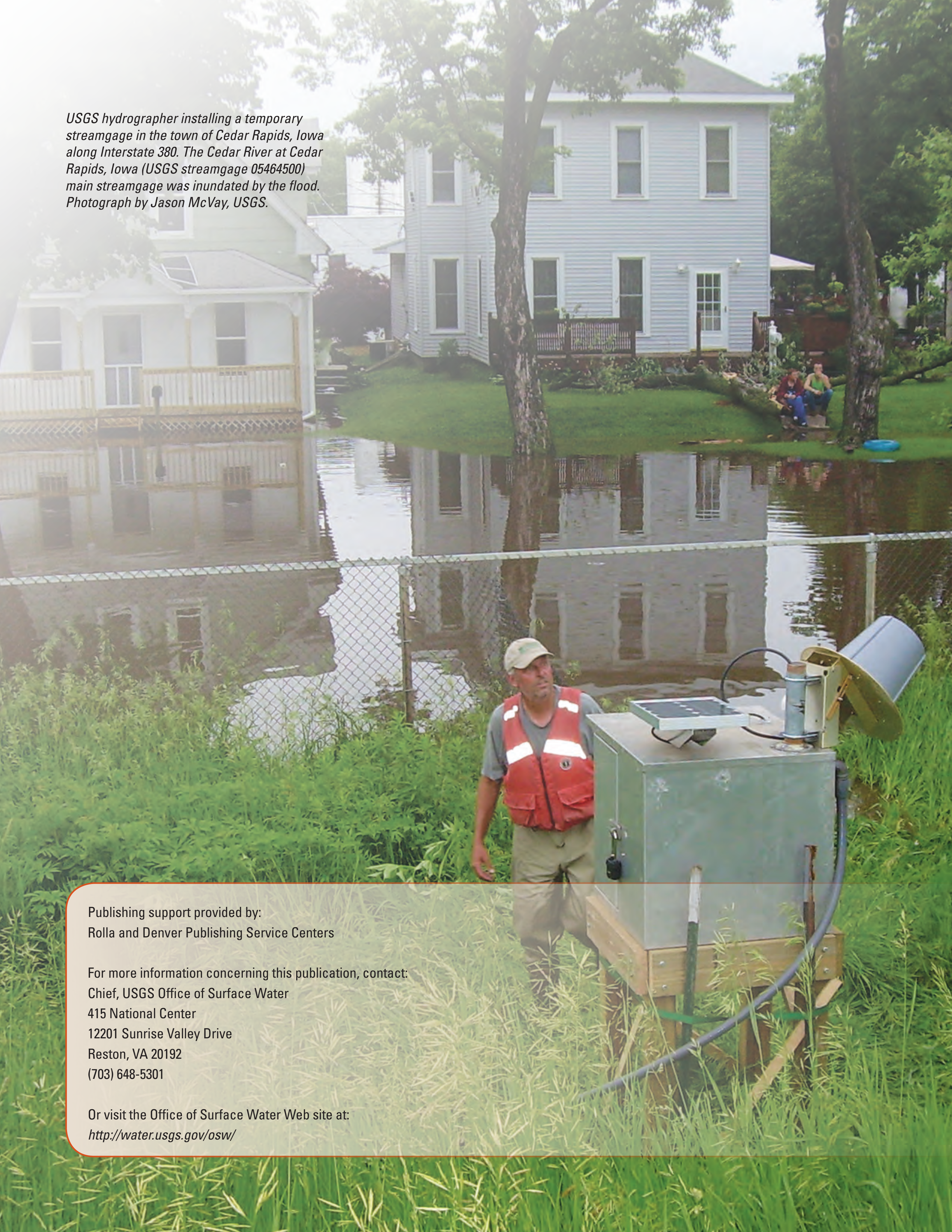
[j] Estimated AEP uncharacterized because of regulation, diversion, or insufficient data.

[k] Streamflow affected by dam failure.

[l] U.S. Army Corps of Engineers (2004).

[m] Expected peak streamflows are based on regional regression equation estimates only.


*Flooding in Coralville, Iowa. Photographs by Don Becker, USGS.*



*USGS hydrographer installing a temporary streamgage in the town of Cedar Rapids, Iowa along Interstate 380. The Cedar River at Cedar Rapids, Iowa (USGS streamgage 05464500) main streamgage was inundated by the flood. Photograph by Jason McVay, USGS.*

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**Back cover.**
USGS hydrographers wade through the flooded streets of Cedar Rapids, Iowa to access streamgage on the Cedar River at Cedar Rapids, Iowa (USGS streamgage 05464500). Photograph by Scott Strader, USGS.

Holmes and others—**Flooding in the United States Midwest, 2008**—Professional Paper 1775


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