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Prepared in cooperation with the
Georgia Department of Transportation
Preconstruction Division
Office of Bridge Design

Historic Flooding in Georgia, 2009

Open-File Report 2010–1230

U.S. Department of the Interior
U.S. Geological Survey

Cover. Powder Springs Creek at Powder Springs, Cobb County, Georgia, September 21, 2009. Photo by Brian E. McCallum, USGS.

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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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Conversion Factors and Datums

Multiply	By	To obtain
	Length	
inch	2.54	centimeter (cm)
inch	25.4	millimeter (mm)
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	
cubic foot (ft^3)	28.32	cubic decimeter (dm^3)
cubic foot (ft^3)	0.02832	cubic meter (m^3)
	Flow rate	
cubic foot per second (ft^3/s)	0.02832	cubic meter per second (m^3/s)

Temperature in degrees Fahrenheit (°F) may be converted to degrees Celsius (°C) as follows:

$$°C = (°F - 32) / 1.8$$

Vertical coordinate information is referenced North American Vertical Datum of 1988 (NAVD 88).

Horizontal coordinate information is referenced to North American Datum of 1983 (NAD 83).

Elevation, as used in this report, refers to distance above the vertical datum.

Historic Flooding in Georgia, 2009

By Anthony J. Gotvald

Abstract

Heavy rains in southern Georgia during March 27–April 3, 2009, and in northern Georgia during September 16–22, 2009, caused severe flooding and widespread damages to residential, public, and commercial structures. Of the 159 counties in Georgia, 69 were declared disaster areas because of flooding. The heavy rainfall in southern Georgia resulted in severe flooding in the Satilla–St. Marys and upper Ochlockonee Basins and caused approximately $60 million in damages to the public infrastructure. The heavy rainfall in northern Georgia resulted in severe flooding on many streams within the upper Chattahoochee, Altamaha, and Coosa–Tallapoosa Basins and caused 10 deaths, evacuation of thousands of residents, and approximately $500 million in damages.

The U.S. Geological Survey computed annual exceedance probabilities of the peak flows in 2009 at 238 streamgages throughout the State. Record peak flows were recorded at 40 streamgages for the respective periods of record as a result of the heavy rainfall during the two multiday events. The peak flows at 33 streamgages exceeded the 1-percent annual exceedance probability (100-year recurrence interval), and 19 of these exceeded the 0.2-percent annual exceedance probability (500-year recurrence interval).

Introduction

Flood data are needed by Federal, State, and local agencies to make informed decisions in meeting mission requirements related to flood-hazard mitigation, planning, and response. For example, the Federal Emergency Management Agency (FEMA) needs timely information on the magnitude and probability of floods to help respond to flood damage, direct emergency response management, protect infrastructure, provide recovery guidance, and plan for future flood events.

In past flood reports, flood frequencies were expressed as recurrence intervals for selected flood quantiles, such as the "100-year flood." The use of recurrence-interval terminology is now discouraged by the U.S. Geological Survey (USGS) because it sometimes causes confusion for the general public. The term is sometimes interpreted to imply that there is a set time interval between floods of a particular magnitude when, in fact, floods are random processes that are best understood by using probabilistic terms. While a flood identified by a specific recurrence interval (T-year) is statistically expected to occur, on average, once during the specified period, it may actually occur multiple times during the period or not at all.

The terminology associated with flood-frequency estimates is undergoing a shift away from the T-year recurrence interval to the annual exceedance probability (AEP) as a percentage (P-percent). The use of AEP is now recommended because it conveys the probability, or odds, of a flood of a given magnitude being equaled or exceeded in any given year. For example, a 1-percent AEP flood (formerly known as the "100-year flood") corresponds to the flow magnitude that has a probability of 0.01 of being equaled or exceeded in any given year. The percent, P, is computed as the inverse of the T-year recurrence interval multiplied by 100. T-year recurrence intervals with corresponding AEPs are shown in table 1.

Table 1. T-year recurrence intervals with corresponding percent annual exceedance probabilities for flood-frequency flow estimates.

T-year recurrence interval	P-percent annual exceedance probability
2	50
5	20
10	10
25	4
50	2
100	1
200	0.5
500	0.2

Rainfall in southern Georgia during March 27–April 3, 2009, resulted in floods that exceeded the 1-percent AEP at six USGS streamgages, one of which exceeded the 0.2-percent AEP. Because of the magnitude of and damages from this flood, a Presidential Disaster Declaration, FEMA–1833–DR (Federal Emergency Management Agency, 2009a), was declared for 46 counties (fig. 1) on April 23, 2009. FEMA reported that 1,875 homes and 29 businesses were affected by floodwaters. Approximately $60 million in public infrastructure damage occurred to roads, culverts, bridges, and a water-treatment facility (U.S. Geological Survey, 2009).

Prolonged rainfall in northern Georgia from September 16 to September 22, 2009, resulted in floods that exceeded the 0.2-percent AEP at 18 streamgages. More than 20 inches of rain fell in parts of northern Georgia during this period. A Presidential Disaster Declaration, FEMA–1858–DR (Federal Emergency Management Agency, 2009b), was declared for 23 counties (fig. 1) on September 24, 2009. Approximately

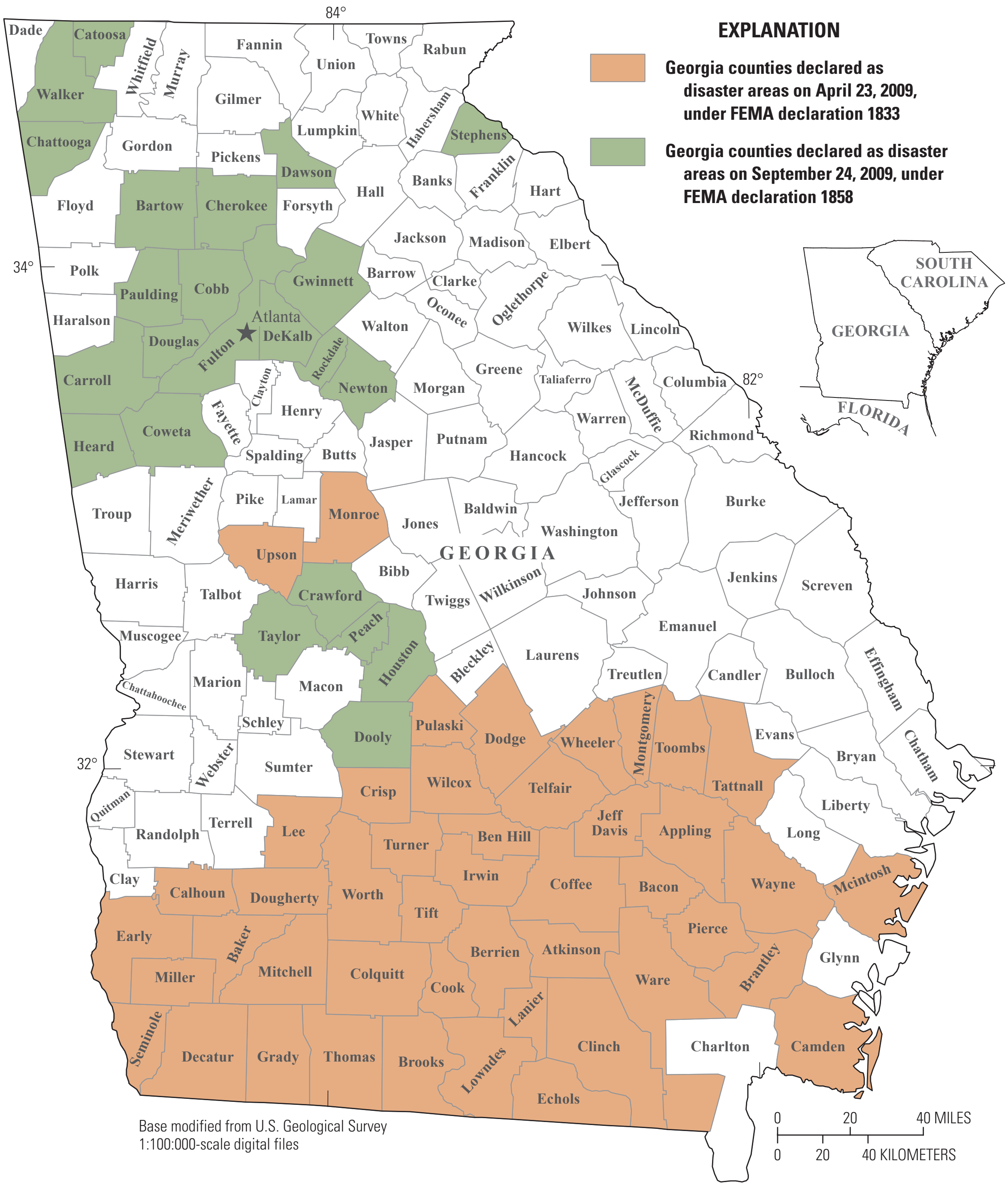

Figure 1. A total of 69 Georgia counties that were declared disaster areas because of flooding in 2009.

$500 million in damages occurred, including damages to 20,000 homes and structures. Ten fatalities in Georgia were attributed to the September 2009 flooding. The majority of these incidents resulted from driving on roads covered with moving water. None of the fatalities occurred, however, because of bridge failures, which is reflective of the efforts of the Georgia Department of Transportation (GDOT) to inspect bridges and determine closures during the floods (National Weather Service, 2010).

To document the severity of the 2009 flooding in Georgia, the USGS in cooperation with the GDOT, compiled the peak stages and flows and computed the AEPs of the peak flows at USGS streamgages in Georgia.

Purpose and Scope

The purpose of this report is to provide the magnitude and probability of the floods during 2009 in Georgia. The AEPs of the peak flows for the 2009 water year (October 1, 2008–September 30, 2009) were determined for 238 USGS streamgages in Georgia where peak-flow data are recorded. This report contains the peak stages and flows and the AEPs of the peak flows for 83 USGS streamgages in Georgia where the peak flow exceeded the 10-percent AEP. For streamgages on regulated streams and at sites with significant backwater, an AEP is not given. This information is valuable to the GDOT and to local engineers and planners in ongoing and future bridge and roadway design studies.

Description of Storms Associated with the Floods

Heavy rains during March 27–April 3, 2009, caused severe flooding in southern Georgia. A series of weather systems with similar storm tracks and heavy rain swept across the region during this period (fig. 2). The National Weather Service (NWS) radar rainfall estimates of these storms show 10-day rainfall totals over 12 inches across southwestern Georgia with maximum 10-day totals in excess of 16 inches (National Weather Service, 2009c). Daily rainfall totals exceeded 6 inches, which is equal to a 10-percent AEP (Hershfield, 1961), at four USGS raingages on March 28, 2009.

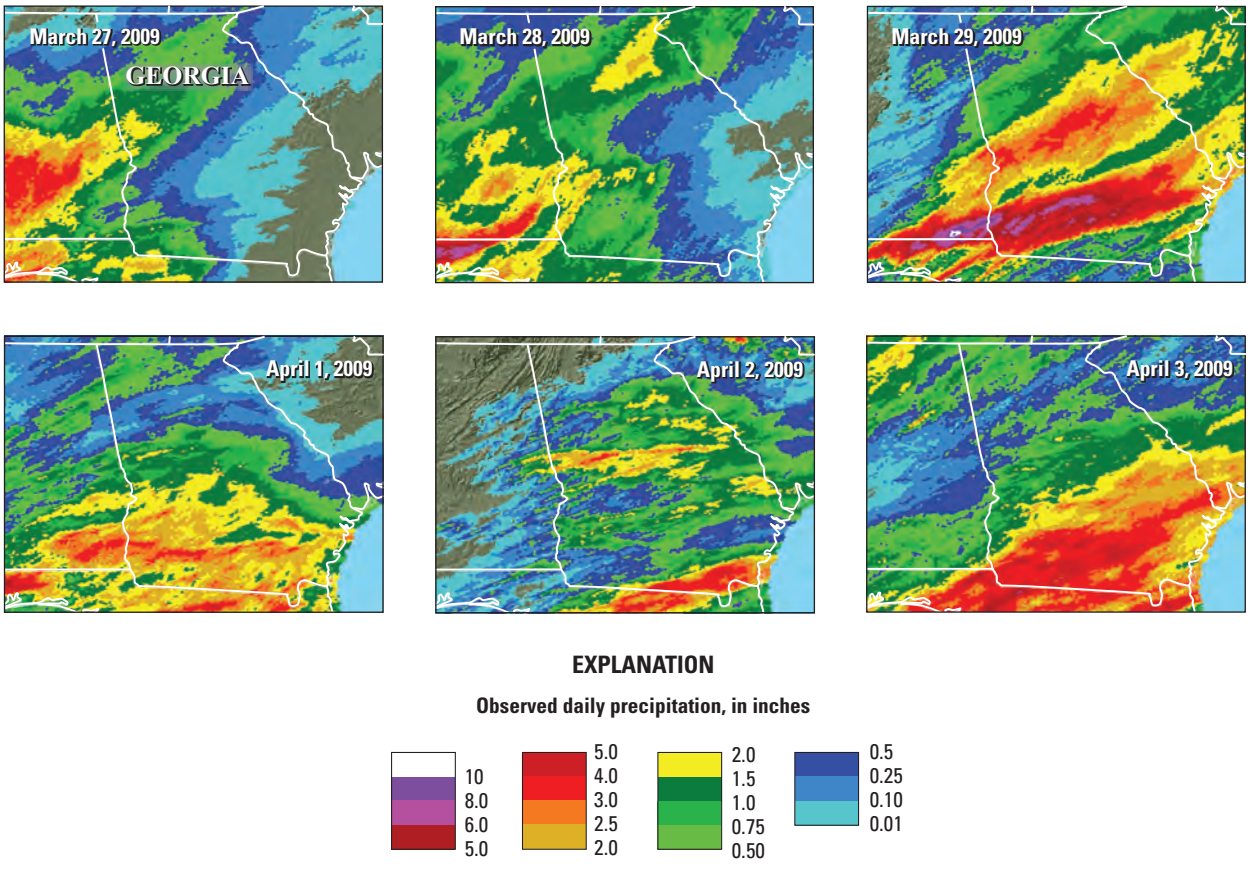

Figure 2. Daily rainfall totals in Georgia during March 27–29 and April 1–3, 2009 (images from the National Weather Service, 2009b).

Prolonged rains resulting from a nearly stationary frontal boundary during September 16–22, 2009, caused severe flooding in northern Georgia. More than 20 inches of rain fell during this period (fig. 3). Rainfall in parts of Douglas, Paulding, Cobb, Carroll, Gwinnett, and Walker Counties exceeded 10 inches during a 24-hour period, which exceeds a 0.02-percent AEP (National Weather Service, 2009a).

The maximum rainfall recorded in a 24-hour period was 21.03 inches, which occurred at the Douglas County Water and Sewer Authority near Douglasville (National Weather Service, 2010). The southeastern United States had above-normal precipitation from August to early September, which resulted in saturated soil conditions that made the region extremely flood prone (National Weather Service, 2010).

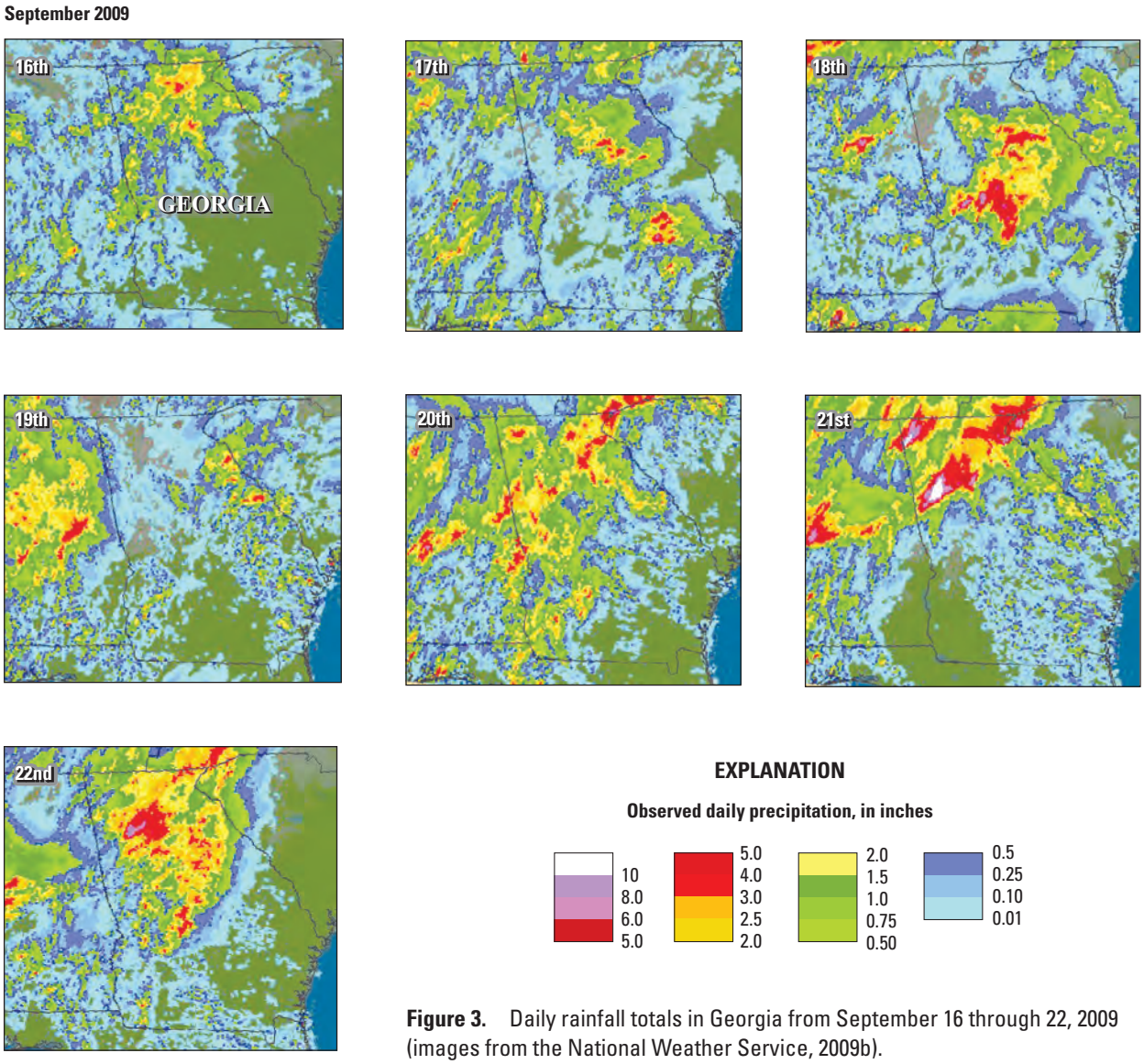

Figure 3. Daily rainfall totals in Georgia from September 16 through 22, 2009 (images from the National Weather Service, 2009b).

Description of the Floods

Water levels rose in many streams throughout Georgia as a result of the heavy rainfall during March 27–April 3 and September 16–22, 2009. USGS personnel monitored and reported flood information to other Federal, State, and local agencies from the onset of the two storms until floodwaters receded. Stage and discharge data were reported to the U.S. Army Corps of Engineers (USACE), the NWS, FEMA, various State natural resource and transportation departments, electrical power companies, and numerous county and city officials. The information provided to these groups was essential to their work to minimize loss of life and property. The NWS used USGS flood data to provide flood warnings to the general public in flood-affected areas.

Flooding was so severe during the September rainfall in northern Georgia that 20 USGS streamgages in Georgia were severely damaged or destroyed. The peak stage at Dog River at Fairplay, GA (USGS streamgage 02337410, see map on page 9 for location) in Douglas County was 12 feet above the shelter that housed the streamgaging equipment. All 20 streamgages, however, were restored to operational status within 5 days. During both heavy rainfall events, more than 35 USGS personnel worked in the field to collect and provide hydrologic information, and as a result, more than 100 direct discharge flood measurements were made at streamgages throughout the State (fig. 4).

Figure 4. U.S. Geological Survey hydrographers measuring the Sweetwater Creek flow over Interstate 20 near Atlanta, Georgia, September 2009. Photograph by Alan M. Cressler, USGS.

Flood Stages and Streamflows

The USGS examined the 2009 annual peak-flow data for the 238 streamgages that record annual peak-flow data in Georgia (fig. 5). The streamgages with annual peak-flow record are either continuous-record gages or crest-stage gages. At continuous-record gages, the water-surface elevation (stage) of the stream is recorded at fixed intervals, typically at 15-minute intervals. At crest-stage gages, only the crest (highest) stage that occurs between site visits is recorded.

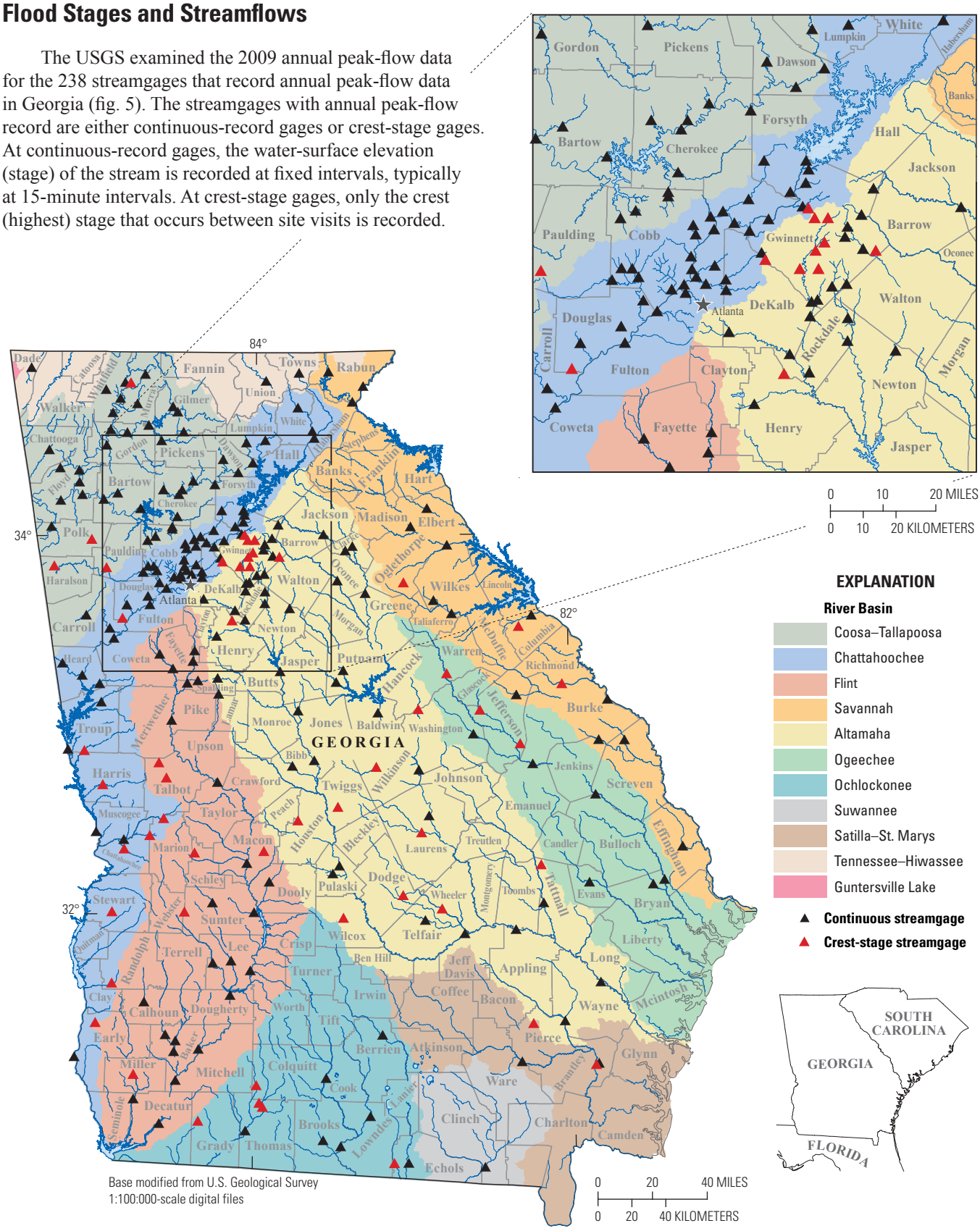

Figure 5. Location of the 238 U.S. Geological Survey streamgages in Georgia that record peak flow, 2009.

Measurements of flow (discharge) are measured (directly or indirectly) throughout the range of recorded stages, and a relation between stage and discharge is developed for each gaging station. Using this stage-discharge relation (rating), discharges for all recorded stages are determined. The highest peak discharge that occurs during a given water year (October 1–September 30) is the annual peak flow for the year. The peak-flow records for USGS streamgages are available from the USGS National Water Information System (NWIS) database at *http://nwis.waterdata.usgs.gov/usa/nwis/peak/*.

During the September 2009 flooding, USGS personnel could not access every streamgage that needed direct discharge measurements because of road and bridge closures. Four interstate highways in the Atlanta metropolitan area were closed because of flooding, including the west side of the Interstate 285 beltway. After the floodwaters receded, USGS personnel surveyed and collected data to make indirect measurements of peak flows at 17 streamgages by using the procedures outlined by Benson and Dalrymple (1967). The peak flows for these 17 streamgages were computed by using indirect methods—2 were made by using contracted opening methods; 8 were made by using culvert methods; and 7 were made by using slope-area methods.

A compilation of the peak stage and flow data for 2009 at all of the USGS streamgages that recorded annual peak flows that exceeded the 10-percent AEP is provided in table 2 (see page 12 of this report). The 17 peak flows that were computed by using indirect methods are noted in the table. The peak flow recorded in 2009 was the new peak of record at 40 streamgages.

Annual Exceedance Probabilities

The AEPs at each rural streamgage were estimated by comparing the 2009 peak streamflows with the weighted AEP estimates published in Gotvald and others (2009). For urban streamgages, the AEPs were computed by using the USGS computer program PeakFQ, version 5.2 (Flynn and others, 2006), which is based on guidelines provided by the Interagency Advisory Committee on Water Data (1982) in Bulletin 17B. For streamgages on regulated streams and at sites with significant backwater, an AEP is not given in table 2. Figure 6 is a map of the AEPs for the 238 USGS streamgages in Georgia that record peak flow.

Rainfall in southern Georgia during March 27–April 3, 2009, resulted in flood flows that exceeded the 1-percent AEP at six streamgages, one of which exceeded the 0.2-percent annual exceedance flow. The prolonged rainfall in northern Georgia during September 16–22, 2009, resulted in floods that exceeded the 1-percent AEP at 27 streamgages, 18 of which exceeded the 0.2-percent annual exceedance flow. Cobb and Gwinnett Counties each had six streamgages with peak flows that exceeded the 0.2-percent AEP. The peak flows for two streamgages (USGS 02337197 and USGS 02337410) in Douglas County, where the most intense rainfall occurred, were 3 to 5 times greater than the 0.2-percent AEP flow.

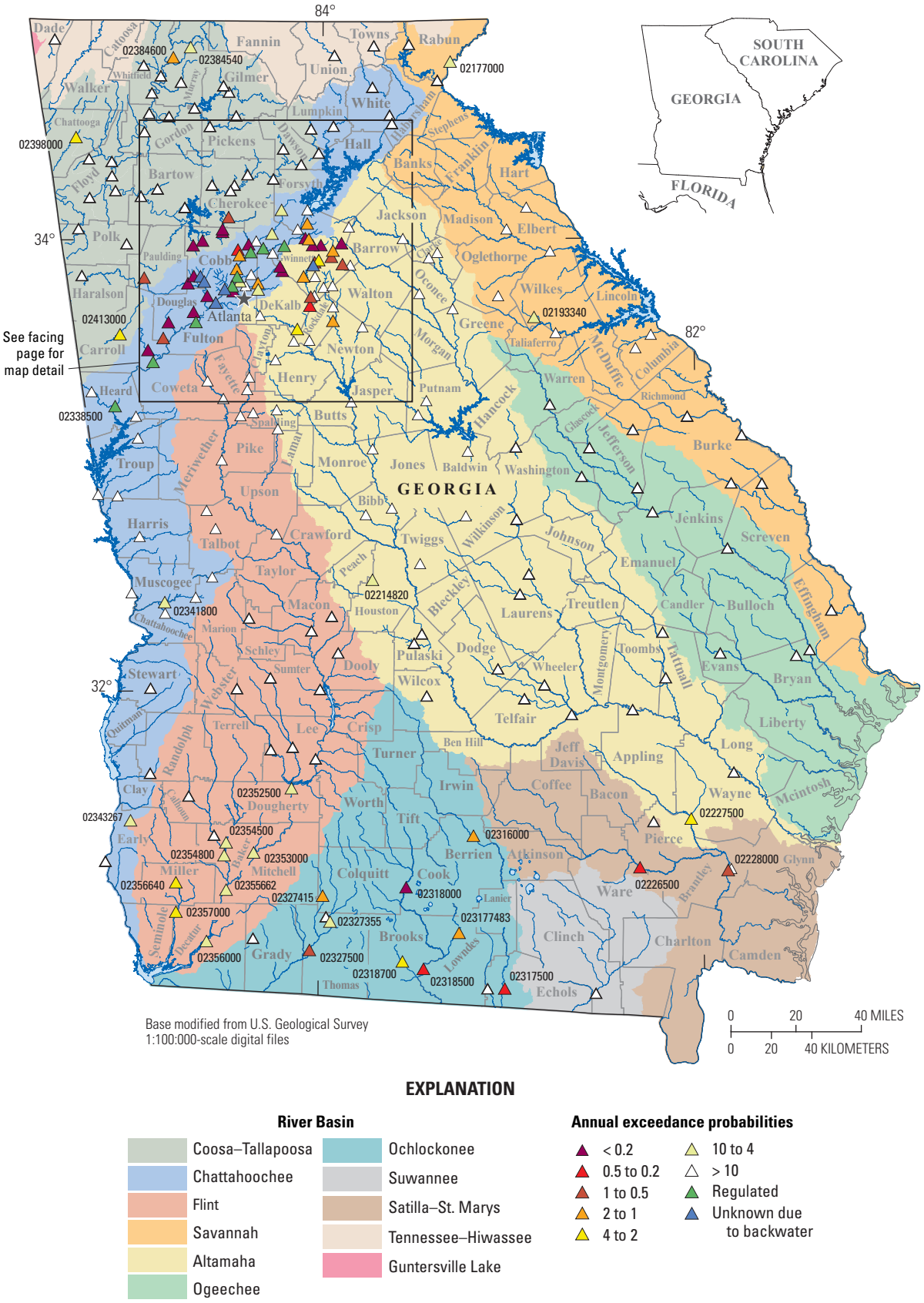

Figure 6. Annual exceedance probabilities of the 238 U.S. Geological Survey streamgages in Georgia that record peak flow, 2009.

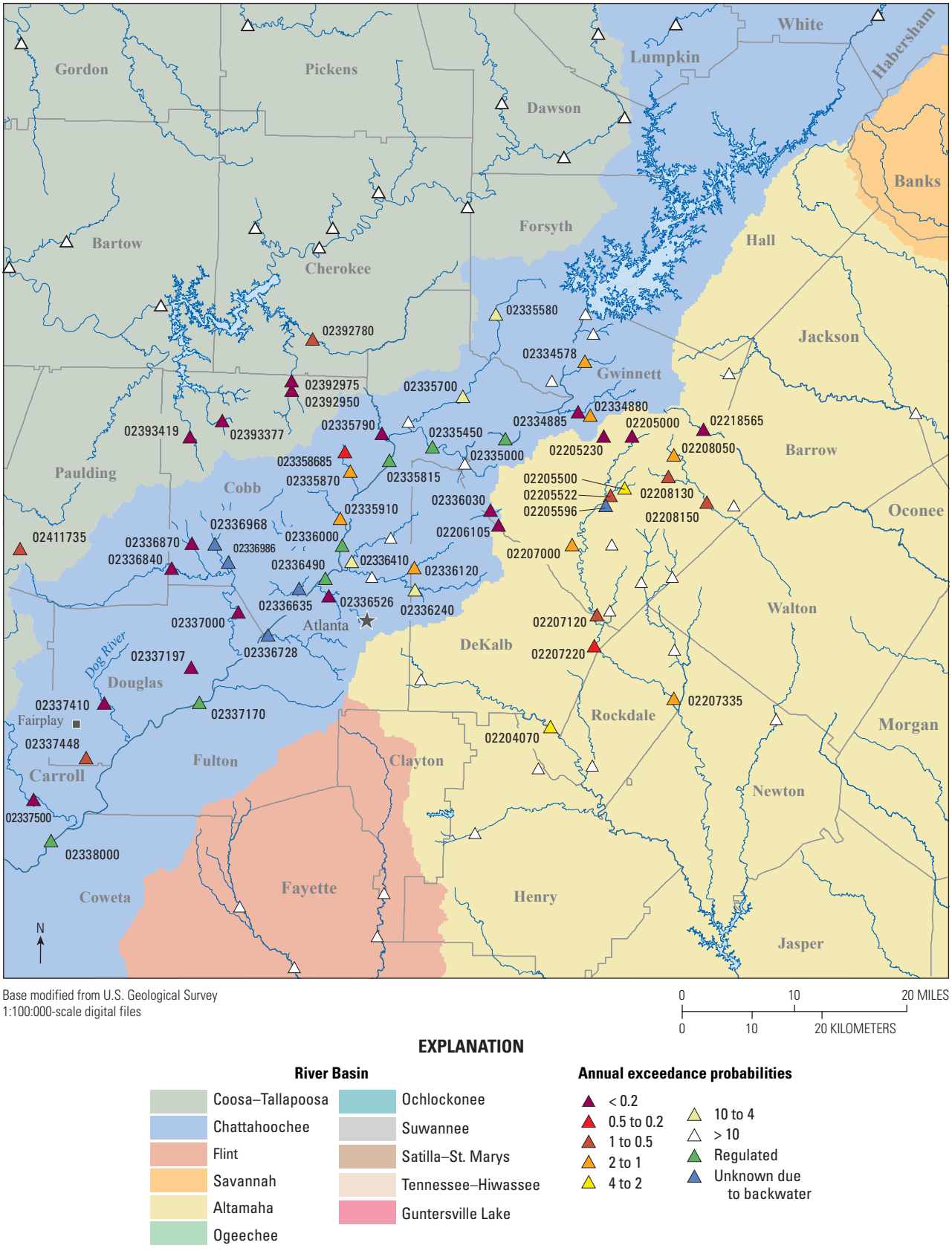

Figure 6. Annual exceedance probabilities of the 238 U.S. Geological Survey streamgages in Georgia that record peak flow, 2009.—Continued

Summary

Heavy rains during March 27–April 3, 2009, and September 16–22, 2009, caused severe flooding in Georgia and resulted in hundreds of millions of dollars worth of damage to homes, businesses, infrastructure, and agricultural lands. Ten deaths were attributed to the September 2009 flooding, and thousands of persons were evacuated from flooded areas.

Estimated 10-day rainfall totals of more than 12 inches fell in parts of southern Georgia during the April–March event, and more than 20 inches fell in parts of northern Georgia during the September event. Of the 238 USGS streamgages that record annual peak flows in Georgia, 40 streamgages have a new record peak flow for the respective periods of record. The peak flow for 2009 exceeded the 1-percent annual exceedance probability at 33 USGS streamgages, 19 of which had peak flows that exceeded the 0.2-percent annual exceedance probability.

Acknowledgments

This report is prepared as part of an ongoing cooperative program of water-resources investigations between the USGS and the GDOT, Preconstruction Division, Office of Bridge Design. The peak stage and flow data described in this report were collected throughout Georgia at streamgages operated in cooperation with the GDOT and a variety of other Federal, State, and local agencies. The author also acknowledges the dedicated work of USGS staff in collecting the peak-flow data documented in this report, including the Georgia USGS field-office staff, Frank Melendez and Timothy Dunleavy of the South Carolina USGS field office, and Keith Ryan and James Chapman of the North Carolina USGS field office.

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Table 2

Table 2. Peak stages and flows at streamgages in Georgia with a peak flow that exceeded the 10-percent annual exceedance probability, 2009.

[USGS, U.S. Geological Survey; mi², square miles; ft, feet above an arbitrary datum; ft³/s, cubic feet per second; —, no data]

USGS streamgage number	Stream name and location	Drainage area (mi²)	Latitude (degree minute second)	Longitude (degree minute second)	County	Period of record
02177000	Chattooga River near Clayton, Georgia	207	34 48 50	83 18 22	Columbia	1915, 1917–1929, 1940–2009
02193340	Kettle Creek near Washington, Georgia	33.9	33 40 57	82 51 29	Wilkes	1987–2009
02204070	South River at Klondike Road, near Lithonia, Georgia	182	33 37 47	84 07 43	De Kalb	1961, 1963, 1984–2009
02205000	Wildcat Creek near Lawrenceville, Georgia	1.59	34 00 07	84 00 18	Gwinnett	1954-1984, 1997–2009
02205230	Wolf Creek at Dean Road, near Suwanee, Georgia	0.39	34 00 04	84 02 57	Gwinnett	1987–2009
02205500	Pew Creek near Lawrenceville, Georgia	2.23	33 56 05	84 00 60	Gwinnett	1954–1963, 1995–2009
02205522	Pew Creek at Patterson Road, near Lawrenceville, Georgia	7.00	33 55 33	84 02 16	Gwinnett	2006–2009
02205596	Yellow River Tributary at Plantation Road, near Lawrenceville, Georgia	7.23	33 54 45	84 02 45	Gwinnett	1997–2009
02206105	Jackson Creek at Angels Lane, near Lilburn, Georgia	0.18	33 53 12	84 12 42	Gwinnett	1987–2009
02207000	Garner Creek near Snellville, Georgia	5.54	33 51 45	84 05 50	Gwinnett	1954–1963, 1983, 1995–2009
02207120	Yellow River at State Highway 124, near Lithonia, Georgia	162	33 46 22	84 03 30	Gwinnett	2002–2009
02207220	Yellow River at Pleasant Hill Road, near Lithonia,Georgia	213	33 44 01	84 03 43	De Kalb	2003–2009
02207335	Yellow River at Gees Mill Road, near Milstead, Georgia	260	33 40 01	83 56 17	Rockdale	2002–2009
02208050	Alcovy River near Lawrenceville, Georgia	9.97	33 58 40	83 56 23	Gwinnett	1965–1974, 1995–2003, 2006–2009
02208130	Shoal Creek at Paper Mill Road, near Lawrenceville, Georgia	3.90	33 56 59	83 56 54	Gwinnett	2007–2009
02208150	Alcovy River at New Hope Road, near Grayson, Georgia	30.8	33 55 03	83 53 17	Gwinnett	2001–2009
02214820	Mossy Creek at U.S. Highway 41, near Perry, Georgia	92.9	32 31 15	83 43 23	Houston	1979–2009
02218565	Apalachee River at Fence Road, near Dacula, Georgia	5.68	34 00 37	83 53 39	Gwinnett	1994–2009
02226500	Satilla River near Waycross, Georgia	1,200	31 14 18	82 19 28	Ware	1928, 1937–2009
02227500	Little Satilla River near Offerman, Georgia	646	31 27 05	82 03 16	Pierce	1930, 1948, 1951–2009
02228000	Satilla River at Atkinson, Georgia	2,790	31 13 14	81 51 56	Brantley	1929, 1931–2009
02316000	Alapaha River near Alapaha, Georgia	663	31 23 04	83 11 33	Berrien	1928, 1938–1976, 1984, 1986, 1991, 1993, 2003–2009
02317500	Alapaha River at Statenville, Georgia	1,400	30 42 15	83 01 60	Echols	1928–2009

Table 2. Peak stages and flows at streamgages in Georgia with a peak flow that exceeded the 10-percent annual exceedance probability, 2009.—Continued

[USGS, U.S. Geological Survey; mi^2, square miles; ft, feet above an arbitrary datum; ft^3/s, cubic feet per second; —, no data]

USGS streamgage number	Maximum prior to 2009 water year			Maximum for 2009 water year			Annual exceedance probability (percent)
	Water year	Peak stage (ft)	Peak flow (ft^3/s)	Date	Peak stage (ft)	Peak flow (ft^3/s)	
02177000	2004	11.21	33,300	Sept. 20	8.24	17,400	10 to 4
02193340	1989	17.68	4,150	Sept. 22	16.62	3,730	10 to 4
02204070	1961	—	17,000	Sept. 21	13.55	13,800	4 to 2
02205000	1956	8.20	806	Sept. 21	10.05	[d] 1,840	Exceeds 0.2
02205230	2008	8.71	232	Sept. 22	12.27	[d] 364	Exceeds 0.2
02205500	1996	13.39	2,340	Sept. 21	10.05	1,510	4 to 2
02205522	2006	10.83	750	Sept. 21	19.10	[d] 5,000	1 to 0.5
02205596	2005	10.15	1,200	Sept. 21	[a] 14.00	[d,e] 1,310	Unknown due to back-water effects
02206105	2004	5.17	163	Sept. 21	7.13	249	Exceeds 0.2
02207000	1983	[b] 7.62	2,290	Sept. 21	10.61	[d] 1,900	2 to 1
02207120	2005	17.24	8,430	Sept. 22	27.47	16,500	1 to 0.5
02207220	2005	18.14	10,000	Sept. 22	25.54	22,900	0.5 to 0.2
02207335	2005	16.36	9,960	Sept. 22	22.54	20,800	2 to 1
02208050	1969	[b] 4.92	1,620	Sept. 21	8.29	2,200	2 to 1
02208130	2008	7.30	645	Sept. 21	13.12	[d] 2,280	1 to 0.5
02208150	2003	14.93	8,630	Sept. 21	13.85	6,470	1 to 0.5
02214820	1994	19.86	[c] 24,000	Dec. 11	9.67	1,597	10 to 4
02218565	2003	6.93	962	Sept. 21	8.56	[d] 2,190	Exceeds 0.2
02226500	1948	[b] 22.40	39,000	Apr. 05	22.36	42,100	0.5 to 0.2
02227500	1929	—	38,000	Apr. 04	14.49	16,900	4 to 2
02228000	1929	27.20	110,000	Apr. 07	22.89	74,000	1 to 0.5
02316000	1928	19.00	16,000	Apr. 04	18.63	15,700	2 to 1
02317500	1948	[b] 29.80	27,300	Apr. 07	31.52	33,400	0.5 to 0.2

Table 2. Peak stages and flows at streamgages in Georgia with a peak flow that exceeded the 10-percent annual exceedance probability, 2009.—Continued

[USGS, U.S. Geological Survey; mi², square miles; ft, feet above an arbitrary datum; ft³/s, cubic feet per second; —, no data]

USGS streamgage number	Stream name and location	Drainage area (mi²)	Latitude (degree minute second)	Longitude (degree minute second)	County	Period of record
023177483	Withlacoochee River at McMillan Road, near Bemiss, Georgia	502	30 57 10	83 16 07	Lowndes	1948, 1977–2009
02318000	Little River near Adel, Georgia	577	31 09 20	83 32 37	Cook	1928, 1941–1971, 1973–1979, 1984, 1986, 1991, 2003–2009
02318500	Withlacoochee River at U.S. Highway 84, near Quitman, Georgia	1,480	30 47 35	83 27 13	Brooks	1928–1931, 1938–1949, 1953–1954, 1964, 1979, 1984, 1986, 1989–2009
02318700	Okapilco Creek at State Highway 33, near Quitman, Georgia	269	30 49 32	83 33 45	Brooks	1980–2009
02327355	Ochlockonee River at State Highway 188, near Coolidge, Georgia	260	31 00 08	83 56 21	Thomas	1948, 1981–2009
02327415	Little Ochlockonee River at State Highway 111, near Moultrie, Georgia	44.8	31 07 02	83 58 42	Colquitt	1981–1994, 1996–2009
02327500	Ochlockonee River near Thomasville, Georgia	550	30 52 33	84 02 44	Thomas	1928–1929, 1937–1973, 1975, 1984, 1986, 1990–1996, 2001–2009
02334578	Level Creek at Suwanee Dam Road, near Suwanee, Georgia	5.04	34 05 47	84 04 47	Gwinnett	2003–2009
02334880	Mill Creek at Wildwood Road, near Suwanee, Georgia	1.86	34 01 41	84 04 12	Gwinnett	1995–2009
02334885	Suwanee Creek at Suwanee, Georgia	47.0	34 01 56	84 05 22	Gwinnett	1985–2009
02335000	Chattahoochee River near Norcross, Georgia	1,170	33 59 50	84 12 07	Gwinnett	1886, 1902–2009
02335450	Chattahoochee River above Roswell, Georgia	1,220	33 59 09	84 18 58	Fulton	1977–2009
02335580	Big Creek at State Highway 9, near Cumming, Georgia	36.4	34 09 21	84 13 07	Forsyth	2008–2009
02335700	Big Creek near Alpharetta, Georgia	72.0	34 03 02	84 16 10	Fulton	1961–2009
02335790	Willeo Creek at State Highway 120, near Roswell, Georgia	16.1	34 00 10	84 23 40	Fulton	2008–2009
02335815	Chattahoochee River below Morgan Falls Dam, Georgia	1,370	33 58 05	84 22 58	Fulton	2002–2009
023358685	Sewell Mill Creek at State Highway 120, near Marietta, Georgia	12.57	33 58 45	84 27 08	Cobb	2008–2009
02335870	Sope Creek near Marietta, Georgia	29.2	33 57 14	84 26 36	Cobb	1963, 1966–1967, 1969–1970, 1977, 1982, 1985–2009
02335910	Rottenwood Creed at Interstate North Parkway, near Smyrna, Georgia	18.6	33 53 37	84 27 28	Cobb	1977, 2008-2009
02336000	Chattahoochee River at Atlanta, Georgia	1,450	33 51 33	84 27 16	Fulton	1886, 1902, 1920, 1929–1932, 1937–2009

Table 2. Peak stages and flows at streamgages in Georgia with a peak flow that exceeded the 10-percent annual exceedance probability, 2009.—Continued

[USGS, U.S. Geological Survey; mi², square miles; ft, feet above an arbitrary datum; ft³/s, cubic feet per second; —, no data]

USGS streamgage number	Maximum prior to 2009 water year			Maximum for 2009 water year			Annual exceedance probability (percent)
	Water year	Peak stage (ft)	Peak flow (ft³/s)	Date	Peak stage (ft)	Peak flow (ft³/s)	
023177483	1948	—	37,500	Apr. 04	25.66	26,200	2 to 1
02318000	1948	21.00	38,800	Apr. 03	22.35	32,900	Exceeds 0.2
02318500	1948	31.70	62,000	Apr. 05	34.67	60,700	0.5 to 0.2
02318700	1986	18.75	18,500	Apr. 03	18.94	18,200	4 to 2
02327355	1948	—	35,000	Apr. 02	18.59	15,450	10 to 4
02327415	2005	10.54	6,750	Apr. 02	10.83	7,630	2 to 1
02327500	1948	29.10	66,000	Apr. 03	23.83	38,600	1 to 0.5
02334578	2004	12.49	2,800	Sept. 21	11.60	1,830	2 to 1
02334880	2004	7.60	676	Sept. 21	10.53	1,230	2 to 1
02334885	1996	12.04	4,350	Sept. 21	14.30	7,870	Exceeds 0.2
02335000	1946	27.70	55,000	Sept. 21	14.51	14,900	Regulated
02335450	2004	9.94	14,600	Sept. 21	11.96	21,100	Regulated
02335580	2008	7.84	709	Sept. 21	10.43	4,800	10 to 4
02335700	1982	13.05	6,100	Sept. 22	12.50	5,200	10 to 4
02335790	2008	7.49	930	Sept. 21	14.70	6,200	Exceeds 0.2
02335815	2004	824.71	20,900	Sept. 21	827.01	35,500	Regulated
023358685	2008	6.17	619	Sept. 21	13.09	[d] 4,570	0.5 to 0.2
02335870	2004	17.47	8,160	Sept. 21	18.35	9,500	2 to 1
02335910	1977	[b] 838.90	3,300	Sept. 21	13.31	[d] 4,500	2 to 1
02336000	1920	29.00	64,000	Sept. 21	27.80	40,900	Regulated

Table 2. Peak stages and flows at streamgages in Georgia with a peak flow that exceeded the 10-percent annual exceedance probability, 2009.—Continued

[USGS, U.S. Geological Survey; mi², square miles; ft, feet above an arbitrary datum; ft³/s, cubic feet per second; —, no data]

USGS streamgage number	Stream name and location	Drainage area (mi²)	Latitude (degree minute second)	Longitude (degree minute second)	County	Period of record
02336030	North Fork Peachtree Creek at Graves Road, near Doraville, Georgia	1.42	33 54 20	84 13 30	Gwinnett	2004–2009
02336120	North Fork Peachtree Creek at Buford Highway, near Atlanta, Georgia	34.8	33 49 53	84 20 34	De Kalb	1961, 1963–1964, 1966–1967, 1969, 1973–1976, 2004–2009
02336240	South Fork Peachtree Creek at Johnson Road, near Atlanta, Georgia	28.7	33 48 10	84 20 27	De Kalb	1961, 1963-1967, 1969, 1973, 1975–1976, 2003–2009
02336410	Nancy Creek at West Wesley Road, at Atlanta, Georgia	37.7	33 50 18	84 26 22	Fulton	1961, 1963–1964, 1966–1967, 1969, 1973–1975, 2003–2009
02336490	Chattahoochee River at State Highway 280, near Atlanta, Georgia	1,590	33 49 01	84 28 48	Fulton	1961, 1972–1977, 1979, 1982–2009
02336526	Proctor Creek at Jackson Parkway, at Atlanta, Georgia	13.4	33 47 39	84 28 28	Fulton	1961, 1963, 1965–1967, 1975, 1983, 1989–1990, 2003–2009
02336635	Nickajack Creek at U.S. Highway 78/278, near Mableton, Georgia	31.5	33 48 12	84 31 17	Cobb	1961, 1963, 1966–1969, 1977, 1996–2009
02336728	Utoy Creek at Great Southwest Parkway, near Atlanta, Georgia	33.9	33 44 36	84 34 06	Fulton	2005–2009
02336840	Sweetwater Creek at Brownsville Road, near Powder Springs, Georgia	102	33 49 38	84 43 11	Cobb	1982, 2008–2009
02336870	Powder Springs Creek near Powder Springs, Georgia	17.3	33 51 33	84 41 17	Cobb	2008–2009
02336968	Noses Creek at Powder Springs Road, near Powder Springs, Georgia	44.5	33 51 33	84 39 10	Cobb	2000–2009
02336986	Olley Creek at Clay Road, near Austell, Georgia	13.5	33 50 10	84 37 54	Cobb	2008–2009
02337000	Sweetwater Creek near Austell, Georgia	246	33 46 22	84 36 53	Douglas	1904–1905, 1916, 1937–2009
02337170	Chattahoochee River near Fairburn, Georgia	2,060	33 39 24	84 40 25	Fulton	1886, 1920, 1946, 1961, 1966–2009
02337197	Anneewakee Creek at Anneewakee Road, near Douglasville, Georgia	23.2	33 42 04	84 41 12	Douglas	2008–2009
02337410	Dog River at State Highway 5, near Fairplay, Georgia	66.5	33 39 14	84 49 16	Douglas	2008–2009
02337448	Hurricane Creek Tributary near Fairplay, Georgia	0.31	33 35 03	84 50 54	Douglas	1977–2009
02337500	Snake Creek near Whitesburg, Georgia	35.5	33 31 46	84 55 42	Carroll	1955–2009
02338000	Chattahoochee River near Whitesburg, Georgia	2,430	33 28 37	84 54 03	Carroll	1886, 1920, 1938–1954, 1961, 1965–2009

Table 2. Peak stages and flows at streamgages in Georgia with a peak flow that exceeded the 10-percent annual exceedance probability, 2009.—Continued

[USGS, U.S. Geological Survey; mi², square miles; ft, feet above an arbitrary datum; ft³/s, cubic feet per second; —, no data]

USGS streamgage number	Maximum prior to 2009 water year			Maximum for 2009 water year			Annual exceedance probability (percent)
	Water year	Peak stage (ft)	Peak flow (ft³/s)	Date	Peak stage (ft)	Peak flow (ft³/s)	
02336030	2004	10.22	1,290	Sept. 21	12.93	[d] 2,850	Exceeds 0.2
02336120	2004	17.70	5,530	Sept. 21	18.57	6,140	2 to 1
02336240	1976	[b] 828.25	4,900	Sept. 21	15.25	4,370	10 to 4
02336410	2004	21.34	5,720	Sept. 21	25.46	5,500	10 to 4
02336490	1961	—	34,000	Sept. 21	35.98	42,300	Regulated
02336526	2003	16.40	8,000	Sept. 21	14.91	[d] 6,220	Exceeds 0.2
02336635	2005	[a] 16.56	7,300	Sept. 21	19.85		Unknown due to back-water effects
02336728	2005	[a] 22.53	Unknown	Sept. 22	27.53		Unknown due to back-water effects
02336840	1982	[b] 904.80	7,200	Sept. 21	31.40	[d] 30,000	Exceeds 0.2
02336870	2008	8.73	964	Sept. 21	19.91	8,940	Exceeds 0.2
02336968	2005	[a] 19.10	Unknown	Sept. 21	23.21		Unknown due to back-water effects
02336986	2008	7.15	548	Sept. 22	27.39		Unknown due to back-water effects
02337000	2005	21.87	13,400	Sept. 22	30.82	31,500	Exceeds 0.2
02337170	1920	31.60	75,000	Sept. 22	30.65	63,900	Regulated
02337197	2008	7.86	1,740	Sept. 21	28.37	[d] 20,400	Exceeds 0.2
02337410	2008	5.90	983	Sept. 21	33.83	[d] 59,900	Exceeds 0.2
02337448	1978	9.46	292	Sept. 21	10.57	376	1 to 0.5
02337500	1961	14.40	7,690	Sept. 21	19.42	13,500	Exceeds 0.2
02338000	1920	—	95,000	Sept. 23	29.74	60,600	Regulated

Table 2. Peak stages and flows at streamgages in Georgia with a peak flow that exceeded the 10-percent annual exceedance probability, 2009.—Continued

[USGS, U.S. Geological Survey; mi², square miles; ft, feet above an arbitrary datum; ft³/s, cubic feet per second; —, no data]

USGS streamgage number	Stream name and location	Drainage area (mi²)	Latitude (degree minute second)	Longitude (degree minute second)	County	Period of record
02338500	Chattahoochee River at U.S. Highway 27, at Franklin, Georgia	2,680	33 16 45	85 05 60	Heard	1920, 1929–1931, 1938–1939, 1949, 1958–1959, 1961, 2004–2009
02341800	Upatoi Creek near Columbus, Georgia	342	32 24 49	84 49 12	Chattahoochee	1969–2009
02343267	Temple Creek at State Highway 39, near Blakely, Georgia	1.09	31 26 35	84 58 60	Early	1978–2009
02352500	Flint River at Albany, Georgia	5,310	31 35 39	84 08 39	Dougherty	1893–2009
02353000	Flint River at Newton, Georgia	5,740	31 18 25	84 20 20	Baker	1925, 1929, 1938–2009
02354500	Chickasawhatchee Creek at Elmodel, Georgia	320	31 21 02	84 28 57	Baker	1916, 1940–1949, 1952–1965, 1970–1983, 1994, 1996–2009
02354800	Ichawaynochaway Creek near Elmodel, Georgia	1,000	31 17 38	84 29 31	Baker	1996–2009
02355662	Flint River at Riverview Plantation, near Hopeful, Georgia	7,080	31 08 26	84 28 49	Mitchell	2003–2009
02356000	Flint River at Bainbridge, Georgia	7,570	30 54 42	84 34 48	Decatur	1897, 1905–1996, 2001–2009
02356640	Spring Creek at U.S. Highway 27, at Colquitt, Georgia	281	31 10 16	84 44 31	Miller	1981–2009
02357000	Spring Creek near Iron City, Georgia	527	31 02 25	84 44 24	Decatur	1938–1978, 1983–2009
02384540	Mill Creek near Crandall, Georgia	7.68	34 52 19	84 43 17	Murray	1985–2009
02384600	Pinhook Creek near Eton, Georgia	3.78	34 49 34	84 48 54	Murray	1964–2009
02392780	Little River at State Highway 5, near Woodstock, Georgia	139	34 07 20	84 30 16	Cherokee	2006–2009
02392950	Noonday Creek at Hawkins Store Road, near Woodstock, Georgia	24.3	34 03 23	84 32 08	Cobb	1999–2009
02392975	Noonday Creek at Shallowford Road, near Woodstock, Georgia	33.6	34 04 06	84 32 08	Cobb	1999–2009
02393377	Butler Creek at Mack Dobbs Road, near Kennesaw, Georgia	3.60	34 01 01	84 38 36	Cobb	2008–2009
02393419	Allatoona Creek at Stilesboro Road, near Acworth, Georgia	14.1	33 59 43	84 41 35	Cobb	2007–2009
02398000	Chattooga River at Summerville, Georgia	192	34 27 59	85 20 10	Chattooga	1938–2009
02411735	McClendon Creek Tributary at State Highway 120, near Dallas, Georgia	0.94	33 50 58	84 57 20	Paulding	1977–2009
02413000	Little Tallapoosa River at U.S. Highway 27, at Carrollton, Georgia	95.1	33 35 50	85 04 49	Carroll	1936, 1938–1965, 2009

[a] Stage affected by backwater.

[b] Stage at different gage datum.

[c] Flow affected by dam failure.

[d] Flow computed using indirect methods.

[e] Annual peak flow greater than indicated value.

Table 2. Peak stages and flows at streamgages in Georgia with a peak flow that exceeded the 10-percent annual exceedance probability, 2009.—Continued

[USGS, U.S. Geological Survey; mi^2, square miles; ft, feet above an arbitrary datum; ft^3/s, cubic feet per second; —, no data]

USGS streamgage number	Maximum prior to 2009 water year			Maximum for 2009 water year			Annual exceedance probability (percent)
	Water year	Peak stage (ft)	Peak flow (ft^3/s)	Date	Peak stage (ft)	Peak flow (ft^3/s)	
02338500	1920	[b] 28.40	105,000	Sept. 23	30.44	76,700	Regulated
02341800	1990	32.12	46,300	Mar. 28	18.85	13,600	10 to 4
02343267	1994	6.13	746	Mar. 28	2.92	156	10 to 4
02352500	1994	43.00	120,000	Apr. 04	31.66	62,800	10 to 4
02353000	1994	45.25	100,000	Apr. 05	32.05	57,500	10 to 4
02354500	1994	20.00	16,000	Apr. 05	12.79	5,260	10 to 4
02354800	1998	31.19	29,200	Apr. 04	23.33	15,900	10 to 4
02355662	2005	36.87	60,700	Apr. 06	39.56	64,600	10 to 4
02356000	1994	[a] 37.20	108,000	Apr. 06	30.91	69,500	10 to 4
02356640	1998	15.91	20,500	Mar. 29	12.53	10,760	4 to 2
02357000	1998	24.40	34,500	Mar. 30	20.75	18,500	4 to 2
02384540	1990	6.96	2,240	Sept. 26	6.12	1,590	10 to 4
02384600	2003	8.08	1,440	Sept. 27	8.58	[d] 1,300	2 to 1
02392780	2006	10.07	3,410	Sept. 21	20.80	16,100	1 to 0.5
02392950	2005	14.16	6,470	Sept. 21	17.28	11,900	Exceeds 0.2
02392975	2005	16.30	6,320	Sept. 21	19.66	11,400	Exceeds 0.2
02393377	2008	5.79	665	Sept. 21	14.27	[d] 6,760	Exceeds 0.2
02393419	2007	12.82	1,200	Sept. 21	23.90	[d] 16,600	Exceeds 0.2
02398000	1990	22.63	30,100	Sept. 21	21.19	23,500	4 to 2
02411735	1981	8.23	860	Sept. 21	7.64	783	1 to 0.5
02413000	1949	19.30	6,010	Sept. 21	17.05	6,210	4 to 2

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