

Illinois

Very intense rainfall fell over most of central Illinois during April 11–12, 1994. Rainfall amounts ranged from 1.40 to 5.28 inches in less than 6 hours at most measurement locations (National Oceanic and Atmospheric Administration, 1994a). Flooding resulted along the Vermilion, Embarras, Sangamon, and Illinois Rivers (fig. 25) and their tributaries due to the very intense rain. Two people died after trying to drive their cars across flooded roadways. Danville's water-treatment plant also flooded causing \$10 million in damage (National Oceanic and Atmospheric Administration, 1994b). Fifteen streamgages had significant flood discharges in April 1994 (table 14). Although flood levels did not reach 1993 crest values, levels still were high enough to cause widespread lowland flooding and flooding in towns near the Illinois and Mississippi Rivers.

The Illinois, Big Muddy, and Sangamon Rivers and many of their tributaries began to rise above flood stage on May 14, 1995, due to excessive amounts of rainfall in the preceding 2 weeks over central and southern Illinois. The flooding continued into June as even more rain fell over the area during the last half of May and first part of June. Damage in and near Lincoln was \$2 million (National Oceanic and Atmospheric Administration, 1995b). The Mississippi River flooded tens of thousands of acres of cropland. Flooding in the Cairo area was considerably worse in 1995 than in 1993 because the Ohio River also was above flood stage. At the confluence of the Ohio and Mississippi Rivers at Cairo, a State park was totally underwater. The flooding on the Mississippi upstream from Cairo did not reach the levels of the 1993 flood. The U.S. Coast Guard halted all barge traffic from Cairo northward for over a week. This action was taken in an effort to prevent wake damage, especially to levees, which were in danger of overtopping. The closure of the river was very costly to the barge industry. The Mississippi River crested at 47 feet, about 14 feet above flood stage, at Cape Girardeau, Missouri, on May 24. The Ohio River crested at 55.6 feet at Cairo on May 25. Extensive flooding of bottom lands resulted as the Ohio River crested well above flood stage. Thousands of acres of crops were submerged. One of the major differences between the floods of 1993 and 1995 was the length of occurrence. The flood of 1993 covered two periods—a spring flood and then the major summer flooding, which continued into September. Although many rivers were still above flood stage at the end of May 1995, river stages fell rapidly and were not above flood stage after June 1995. Another difference was the lack of levees that remained along the rivers. Many agricultural levees destroyed by the flood of 1993 were not rebuilt. Many of the remaining levees were quickly overtopped or washed away in 1995 (National Oceanic and Atmospheric Administration, 1995b).

Slow-moving thunderstorms dumped between 6 and 10 inches of rain near Beardstown on May 8, 1996 (National Oceanic and Atmospheric Administration, 1996a). The resulting flash flooding washed out several roads. Sixty-six homes sustained damage, ranging from water in the basement to structural collapse. No injuries were reported, and damage was estimated at \$2 million (National Oceanic and Atmospheric Administration, 1996b).

The Wabash River was above flood stage for most of May 1996 near Crossville (National Oceanic and Atmospheric Administration, 1996b). On May 7, the river crested at 20.9 feet, 5.9 feet above flood stage. A 9-mile long earthen levee protecting bottomland farm fields was breached at the same time the river crested. This breach resulted in an additional 5,000 acres of flooded cropland near Grayville. The levee near Mt. Carmel was breached. Two counties were declared Federal disaster areas as a result of the flooding.

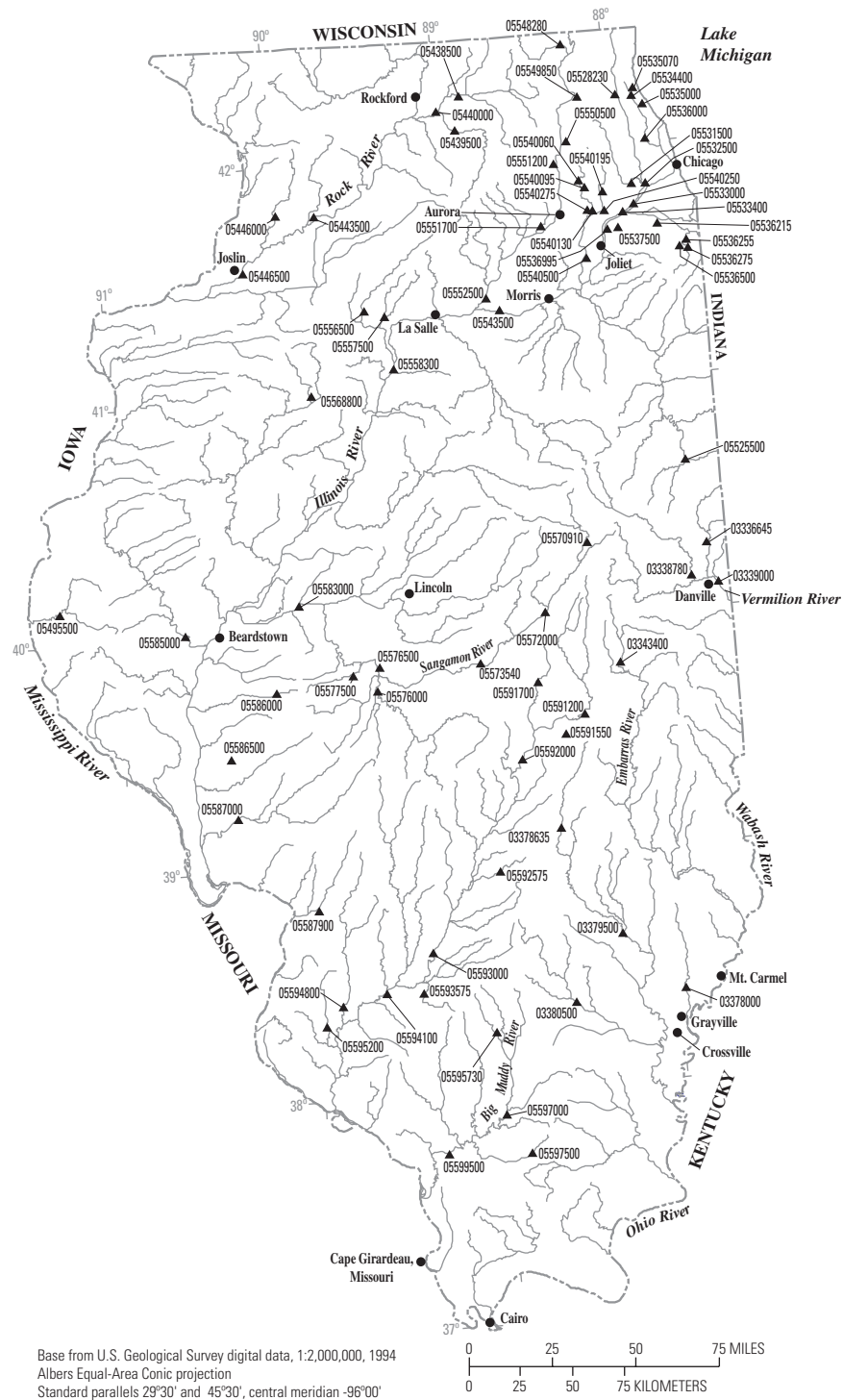
Record-breaking rainfall over parts of north-central and northeastern Illinois resulted in unprecedented flash flooding July 17–18, 1996. The area of most-intense rain, in excess of 5 inches, fell in a corridor from near Rockford through Aurora and Joliet to the southern suburbs of Chicago (National Oceanic and Atmospheric Administration, 1996a). The 16.91 inches that fell at Aurora set a 24-hour record for the State of Illinois. Much of this area had from 7 to 11 inches of rainfall. Eleven northeastern Illinois counties were declared a Federal disaster. Twenty USGS streamgages recorded all-time record streamflows (table 14). As a result of the flood, a total of \$103 million in disaster housing grants were issued, \$49 million in personal property and small business loans were approved, and \$6 million in small business loans were approved. There also were more than \$2 million in State grants approved. Crop damage was likely in the tens of millions of dollars. Two deaths were directly attributed to the flood (National Oceanic and Atmospheric Administration, 1996b).

Excessive rainfall occurred on February 20–22, 1997. Between 3 to 4 inches of rain fell over parts of northern Illinois (National Oceanic and Atmospheric Administration, 1997a). Widespread flooding resulted from excessive rains falling on frozen soil. The upper Illinois River crested within a foot of the record from Morris downstream to LaSalle (National Oceanic and Atmospheric Administration, 1997b) on February 22. A 63-year-old woman died when she drove her car into a barricaded, flooded viaduct under railroad tracks in a south suburb of Chicago. The single largest effect of the excessive rains was felt along the Rock River where record flooding occurred. Near Joliet (streamgage 05446500, table 14), the Rock River reached a record crest of 18.88 feet.

A massive flood crest moved down the Ohio River during the first few weeks of March 1997. Approximately 10 inches of rain fell within a 1- to 3-day period in the middle Ohio River Valley from the Louisville, Kentucky, area to Cincinnati, Ohio. This resulted in the worst river flood in about 30 years along the Illinois shore, and one of the five worst on record (National Oceanic and Atmospheric Administration, 1997a).

References

- National Oceanic and Atmospheric Administration (NOAA), 1994a–97a, Climatological data (by State): Asheville, North Carolina, National Climatic Data Center, various months.
- National Oceanic and Atmospheric Administration (NOAA), 1994b–97b, Storm data (by State): Asheville, North Carolina, National Climatic Data Center, various months.



EXPLANATION

05599500 ▲ Streamgage and number

Figure 25. Location of streamgages with significant floods during 1994–98 water years for Illinois.

Table 14. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Illinois.

[mi², square miles; ft, feet above an arbitrary datum; ft³/s, cubic feet per second; --, not determined or not applicable; >, greater than; <, less than. Source: Recurrence intervals calculated from U.S. Geological Survey data. Other data from U.S. Geological Survey reports or databases]

Streamgage number (fig. 25)	Streamgage name	Total drainage (mi ²)	Maximum stage and discharge for period of record through 1998 water year				Significant floods 1994–98 water years				
			Period of record (water years)	Water year	Stage (ft)	Discharge (ft ³ /s)	Date (month/ day/ year)	Stage (ft)	Discharge (ft ³ /s)	Regulated during flood ¹	Recurrence interval (years)
03336645	Middle Fork Vermilion River above Oakwood, IL	432	1979–98	1994	20.46	15,500	4/13/94	20.46	15,500	N	25–50
03338780	North Fork Vermilion River near Bismarck, IL	262	1989–98	1994	22.45	20,100	4/12/94	22.45	20,100	N	5–10
03339000	Vermilion River near Danville, IL	1,290	1915–21, 1929, 1931–98	1939 1994	28.59 31.56	48,700 47,900	4/13/94	31.56	47,900	N	>100
03343400	Embarras River near Camargo, IL	186	1961–98	1994	17.33	8,040	4/12/94 5/11/96	17.33 16.43	8,040 6,740	N N	50–100 25
03378000	Bonpas Creek at Browns, IL	228	1941–98	1961	26.04	7,500	11/15/93	23.60	6,490	N	25–50
03378635	Little Wabash River near Effingham, IL	240	1967–98	1996	21.19	17,800	5/8/96	21.19	17,800	N	>100
03379500	Little Wabash River below Clay City, IL	1,131	1915–98	1950	26.67	47,000	5/19/95	26.08	43,700	N	30
03380500	Skillet Fork at Wayne City, IL	464	1909–12, 1915–21, 1929–98	1990 1961	25.75 25.80	59,400 51,000	5/18/95	23.71	38,100	N	40
05438500	Kishwaukee River at Belvidere, IL	538	1940–98	1994	14.19	11,900	2/20/94	14.19	11,900	N	25
05439500	South Branch Kishwaukee River near Fairdale, IL	387	1937, 1940–98	1996	13.37	25,400	2/20/94 7/18/96 2/21/97	10.31 13.37 10.71	8,790 25,400 9,940	N N N	10 >100 20
05440000	Kishwaukee River near Perryville, IL	1,099	1938, 1940–98	1996 1938	23.54 23.85	24,200 --	2/21/94 7/18/96 2/22/97	20.71 23.54 19.76	17,100 24,200 17,400	N N N	10–25 50–100 10–25
05443500	Rock River at Como, IL	8,753	1915–76, 1978–86, 1991–98	1973	15.66	59,700	5/29/96	13.58	48,300	N	25
05446000	Rock Creek at Morrison, IL	164	1940–71, 1978–98	1946 1997	-- 17.76	5,770 5,050	2/21/97	17.76	5,050	N	100

Table 14. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Illinois.—Continued

[mi², square miles; ft, feet above an arbitrary datum; ft³/s, cubic feet per second; --, not determined or not applicable; >, greater than; <, less than. Source: Recurrence intervals calculated from U.S. Geological Survey data. Other data from U.S. Geological Survey reports or databases]

Streamgage number (fig. 25)	Streamgage name	Total drainage (mi ²)	Maximum stage and discharge for period of record through 1998 water year				Significant floods 1994–98 water years				
			Period of record (water years)	Water year	Stage (ft)	Discharge (ft ³ /s)	Date (month/ day/ year)	Stage (ft)	Discharge (ft ³ /s)	Regulated during flood ¹	Recurrence interval (years)
05446500	Rock River near Joslin, IL	9,549	1940–98	1993 1997	18.35 18.88	46,500 41,000	5/31/96	18.73	44,800	N	10–25
05495500	Bear Creek near Marcelline, IL	349	1944–98	1996 1985	28.36 28.38	35,500 29,500	5/8/96	28.36	35,500	N	>100
05525500	Sugar Creek at Milford, IL	446	1949–98	1951 1994	20.90 28.16	22,900 19,400	4/12/94	28.16	19,400	N	10–25
05528230	Indian Creek at Prairie View, IL	36.0	1960–61, 1963–65, 1967–71, 1973–76, 1990–96	1996	7.10	1,800	5/17/96	7.10	1,800	N	200–500
05531500	Salt Creek at Western Springs, IL	115	1946–98	1987	10.54	3,540	2/21/97	9.35	2,510	N	25–50
05532500	Des Plaines River at Riverside, IL	630	1914–98	1987	9.90	9,770	2/22/97	8.45	6,990	N	20
05533000	Flag Creek near Willow Springs, IL	16.5	1960–98	1961	13.71	2,680	7/18/96	10.37	2,300	N	25–50
05533400	Sawmill Creek near Lemont, IL	13.0	1961–79, 1986–98	1996	17.53	3,070	7/18/96	17.53	3,070	N	200–300
05534400	North Branch Chicago River at Bannockburn, IL	15.8	1960–76, 1996	1996	17.54	3,070	7/18/96	17.54	3,070	N	--
05535000	Skokie River at Lake Forest, IL	13.0	1952–98	1997 1982	7.24 8.35	496 435	2/21/97	7.24	496	N	50–100
05535070	Skokie River near Highland Park, IL	21.1	1967–98	1987 1997	9.09 9.13	895 894	2/21/97	9.13	894	N	50–100
05536000	North Branch Chicago River at Niles, IL	100	1951–98	1987	11.35	2,590	2/21/97	10.63	2,260	N	25–50

Table 14. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Illinois.—Continued

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05536215	Thorn Creek at Glenwood, IL	24.7	1950–98	1996	--	2,700	7/18/96	--	2,700	N	25–50
				1968	11.26	2,600					
05536255	Butterfield Creek at Flossmoor, IL	23.5	1948–55, 1957–98	1996	12.59	2,220	7/18/96	12.59	2,220	N	25–50
05536275	Thorn Creek at Thornton, IL	104	1947–98	1957	16.00	4,700	7/18/96	16.24	4,470	N	30
				1981	17.06	4,140					
05536500	Tinley Creek near Palos Park, IL	11.2	1951–55, 1957–98	1996	10.25	2,010	7/18/96	10.25	2,010	N	50–100
				1955	10.30	1,930					
05536995	Chicago Sanitary and Ship Canal at Romeoville, IL	739	1985–98	1997	23.95	19,466	2/21/97	23.95	19,466	Y	--
				1996	25.08	19,448	7/18/96	25.08	19,448	Y	--
05537500	Long Run near Lemont, IL	20.9	1951–98	1996	11.10	5,310	7/18/96	11.10	5,310	N	>500
05540060	Kress Creek at West Chicago, IL	18.1	1961–80, 1986–98	1996	9.24	1,980	7/18/96	9.24	1,980	N	>500
05540095	West Branch Du Page River near Warrenville, IL	90.4	1969–98	1996	6.41	3,470	7/18/96	6.41	3,470	N	200–500
05540130	West Branch Du Page River near Naperville, IL	123	1989–98	1996	14.31	6,620	7/18/96	14.31	6,620	N	>500
05540195	Saint Joseph Creek at U.S. Route 34 at Lisle, IL	11.1	1989–98	1996	12.89	1,280	7/18/96	12.89	1,280	N	>500
05540250	East Branch Du Page River at Bolingbrook, IL	75.8	1989–98	1996	23.75	3,980	7/18/96	23.75	3,980	N	>500
05540275	Spring Brook at 87th Street near Naperville, IL	9.90	1988–98	1996	10.77	1,750	7/18/96	10.77	1,750	N	25–50
05540500	Du Page River at Shorewood, IL	324	1941–98	1996	14.03	17,300	7/18/96	14.03	17,300	N	>500

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05543500	Illinois River at Marseilles, IL	8,259	1892, 1894–98, 1900, 1904–98	1997 1922	16.85 20.10	95,000 60,600	2/22/97	16.85	95,000	Y	100–200
05548280	Nippersink Creek near Spring Grove, IL	192	1960, 1966–98	1986	14.26	2,910	2/21/94	13.66	2,830	N	10–25
05549850	Flint Creek near Fox River Grove, IL	37.0	1960, 1962–76, 1990–96	1996	5.88	690	5/21/96	5.88	690	N	>500
05550500	Poplar Creek at Elgin, IL	35.2	1952–98	1997	6.78	1,180	2/21/97	6.78	1,180	N	200
05551200	Ferson Creek near Saint Charles, IL	51.7	1961–83, 1985–98	1997	8.77	2,580	7/18/96 2/21/97	7.79 8.77	1,990 2,580	N N	10–25 50–100
05551700	Blackberry Creek near Yorkville, IL	70.2	1961–98	1996	13.16	5,510	7/18/96	13.16	5,510	N	>500
05552500	Fox River at Dayton, IL	2,642	1915–24, 1926–98	1996 1955	24.47 24.63	55,400 47,100	7/19/96 2/22/97	24.47 21.46	55,400 41,200	N N	>500 200–500
05556500	Big Bureau Creek at Princeton, IL	196	1937–98	1974	16.01	12,500	2/21/97	15.73	12,000	N	50
05557500	East Bureau Creek near Bureau, IL	99.0	1937–91, 1993–98	1997 1938	17.09 17.39	9,260 6,200	2/21/97	17.09	9,260	N	100–200
05558300	Illinois River at Henry, IL	13,543	1982–98	1997 1982	27.19 30.75	117,000 104,000	2/23/97	27.19	117,000	Y	--
05568800	Indian Creek near Wyoming, IL	62.7	1960–98	1974 1997	13.81 23.00	6,540 4,710	2/21/97	23.00	4,710	N	25–50
05570910	Sangamon River at Fisher, IL	240	1979–98	1994	21.58	13,000	4/12/94	21.58	13,000	N	25–50
05572000	Sangamon River at Monticello, IL	550	1908–13, 1915–98	1927 1994	18.50 19.06	19,000 15,900	4/13/94	19.06	15,900	N	30

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05573540	Sangamon River at Route 48 at Decatur, IL	938	1983–98	1994 1983	21.12 23.04	17,100 12,400	4/15/94	21.12	17,100	Y	--
05576000	South Fork Sangamon River near Rochester, IL	867	1950–98	1994	32.40	20,300	4/14/94	32.40	20,300	N	50–100
05576500	Sangamon River at Riverton, IL	2,618	1908–12, 1915–27, 1929–31, 1933–73, 1975–79, 1981–98	1943 1927	31.52 32.04	68,700 41,000	4/13/94	28.28	46,300	N	50–100
05577500	Spring Creek at Springfield, IL	107	1948–98	1996	16.23	10,700	5/8/96	16.23	10,700	N	50–100
05583000	Sangamon River near Oakford, IL	5,093	1910–12, 1915–18, 1921–22, 1926–29, 1931–98	1943	25.63	123,000	4/15/94	23.21	78,100	N	50–100
05585000	La Moine River at Ripley, IL	1,293	1921–98	1985 1995	29.07 29.15	28,000 26,100	5/18/95 5/8/96	29.15 29.07	26,100 26,100	N N	25–50 25–50
05586000	North Fork Mauvaise Terre Creek near Jacksonville, IL	29.1	1950–90, 1992–98	1994 1990	12.35 12.77	7,160 4,600	4/12/94 5/8/96	12.35 12.04	7,160 5,670	N N	50–100 25–50
05586500	Hurricane Creek near Roodhouse, IL	2.30	1951–90, 1992–95	1957	11.77	1,700	4/12/94	10.95	995	N	25–50
05587000	Macoupin Creek near Kane, IL	868	1921–33, 1941–98	1994 1991	28.32 --	40,100 13,700	4/12/94	28.32	40,100	N	50–100
05587900	Cahokia Creek at Edwardsville, IL	212	1969–98	1979	24.74	8,200	5/18/95	21.75	7,310	N	--
05591200	Kaskaskia River at Cooks Mills, IL	473	1971–98	1994	17.30	9,950	4/13/94	17.30	9,950	N	10–25

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05591550	Whitley Creek near Allenville, IL	34.6	1980–98	1996	12.62	3,200	4/29/96	12.62	3,200	N	100
05591700	West Okaw River near Lovington, IL	112	1980–98	1996	16.40	10,300	5/8/96	16.40	10,300	N	100–200
05592000	Kaskaskia River at Shelbyville, IL	1,054	1908–13, 1939, 1941–98	1957	22.37	25,900	3/22/98	12.99	5,580	Y	2–5
05592575	Hickory Creek near Brownstown, IL	44.2	1989–98	1994	16.43	6,250	11/14/93	16.43	6,250	N	5–10
05593000	Kaskaskia River at Carlyle, IL	2,719	1908–12, 1915, 1930–98	1943	33.70	54,400	5/10/96	23.34	12,300	Y	<2
							4/10/98	23.39	12,200	Y	<2
05593575	Little Crooked Creek near New Minden, IL	84.3	1968–98	1995	21.76	11,900	5/17/95	21.76	11,900	N	10–25
							4/29/96	21.42	11,300	N	10–25
05594100	Kaskaskia River near Venedy Station, IL	4,393	1970–98	1995	25.79	50,300	5/19/95	25.79	50,300	Y	--
05594800	Silver Creek near Freeburg, IL	464	1971–98	1995	25.38	15,300	5/19/95	25.38	15,300	N	25–50
05595200	Richland Creek near Hecker, IL	129	1970–98	1996	44.40	23,400	4/29/96	44.40	23,400	N	>500
05595730	Rayse Creek near Waltonville, IL	88.0	1980–98	1994	17.73	21,200	11/14/93	17.73	21,200	N	10–25
05597000	Big Muddy River at Plumfield, IL	794	1909–12, 1915–98	1961 1983	29.56	42,900	5/1/96	31.83	14,200	Y	5–10
					31.84	11,800					
05597500	Crab Orchard Creek near Marion, IL	31.7	1952–98	1996	13.60	9,270	5/11/96	13.60	9,270	N	>500
							5/31/97	13.21	6,970	N	>500
05599500	Big Muddy River at Murphysboro, IL	2,169	1916–17, 1919, 1931–98	1996 1961	36.33	33,800	5/2/96	36.33	33,800	Y	25–50
					37.77	33,300					

¹Regulated during flood: N, no; Y, yes.

Indiana

Widespread excessive rain and embedded thunderstorms began late April 10, 1994, and continued periodically through April 12, producing anywhere from 3 to 7 inches of rain across much of the State (National Oceanic and Atmospheric Administration, 1994a). As a result, flooding occurred across many parts of Indiana. The main exceptions were in the extreme north and extreme south. Record flooding occurred April 12–15 on Mud Pine and Sugar Creeks, along Big Pine Creek, and along the Vermilion River (fig. 26). The Vermilion River exceeded its record flood of 1939 by 3 to 4 feet (National Oceanic and Atmospheric Administration, 1994b). Other rivers, including the Wabash, White, East Fork White, Tippecanoe, Eel, Maumee, and St. Mary Rivers, exceeded their banks along nearly their entire lengths for a 1- to 2-week period. These were the highest floodwaters in many of these rivers since 1991. A man died in floodwaters, apparently when his truck was washed into a ditch by high, fast-moving water east of Medora, Indiana (National Oceanic and Atmospheric Administration, 1994b).

Torrential rains caused the worst flooding since 1959 across many southern Indiana locations during April 1996. Between 5 and 9 inches of rain fell April 28–29 (National Oceanic and Atmospheric Administration, 1996a). The most notable flooding occurred along the Blue River. The Blue River crested at 27.15 feet at Fredericksburg (streamgage 03302800, table 15) and 28.9 feet at Milltown (National Oceanic and Atmospheric Administration, 1996b). Major flooding occurred along the Whitewater River in east-central and southeastern Indiana. The river level below Brookville Lake reached its

highest stage since 1968. The excessive rainfall also resulted in the lake level rising to nearly 4 feet above the previous record pool elevation (National Oceanic and Atmospheric Administration, 1996a).

Widespread rainfall amounts of about 10 inches in the middle Ohio River Valley, from around Louisville, Kentucky, to Cincinnati, Ohio, occurred during a 1- to 3-day period during the last week in April 1996 (National Oceanic and Atmospheric Administration, 1996a). The Ohio River rose rapidly and reached a crest of 60.7 feet on May 6 at Markland Dam, which is just across the river in Kentucky. This resulted in a massive flood crest that took a few weeks to travel down the Ohio River. The resultant flood was the worst in about 30 years, and one of the five worst on record.

More than 7 inches of rain fell in a 12-hour period on July 18, 1996, near the city of Huntington, Indiana (National Oceanic and Atmospheric Administration, 1996a), causing flash flooding. Damage to the city alone was estimated at \$1.5 million (National Oceanic and Atmospheric Administration, 1996b). The flooding in this area was the worst since 1959.

References

- National Oceanic and Atmospheric Administration (NOAA), 1994a–96a, Climatological data (by State): Asheville, North Carolina, National Climatic Data Center, various months.
- National Oceanic and Atmospheric Administration (NOAA), 1994b–96b, Storm data (by State): Asheville, North Carolina, National Climatic Data Center, various months.

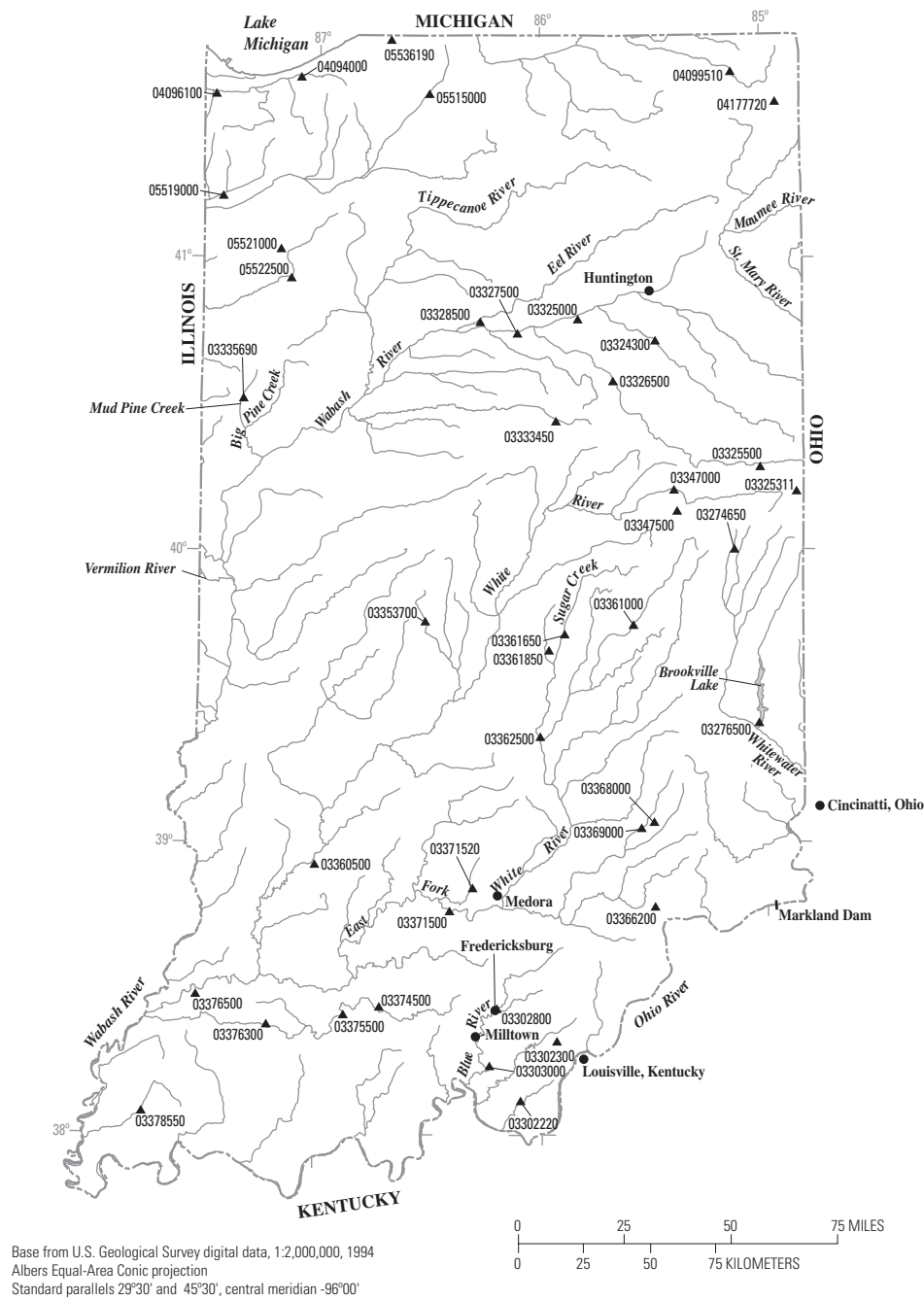


Figure 26. Location of streamgages with significant floods during 1994–98 water years for Indiana.

Table 15. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Indiana.

[mi², square miles; ft, feet above an arbitrary datum; ft³/s, cubic feet per second; --, not determined or not applicable; >, greater than. Source: Recurrence intervals calculated from U.S. Geological Survey data. Other data from U.S. Geological Survey reports or databases]

Streamgage number (fig. 26)	Streamgage name	Total drainage (mi ²)	Maximum stage and discharge for period of record through 1998 water year				Significant floods 1994–98 water years				
			Period of record (water years)	Water year	Stage (ft)	Discharge (ft ³ /s)	Date (month/ day/ year)	Stage (ft)	Discharge (ft ³ /s)	Regulated during flood ¹	Recurrence interval (years)
03274650	Whitewater River near Economy, IN	10.4	1971–99	1994	8.91	1,120	11/14/93	8.91	1,120	N	10–25
03276500	Whitewater River at Brookville, IN	1,224	1913, 1916–20, 1924–99	1959 1913	27.78 39.00	81,800 --	4/29/96	21.86	49,200	Y	25–50
03302220	Buck Creek near New Middletown, IN	65.2	1970–99	1997	17.26	20,500	3/2/97	17.26	20,500	N	50–100
03302300	Little Indian Creek near Galena, IN	16.1	1969–99	1997	9.79	6,110	3/1/97	9.79	6,110	N	25–50
03302800	Blue River at Fredericksburg, IN	283	1969–99	1996	27.15	39,000	4/29/96	27.15	39,000	N	>100
03303000	Blue River near White Cloud, IN	476	1910–13, 1915–16, 1932–99	1996	23.30	29,400	4/30/96	23.30	29,400	N	50
03324300	Salamonie River near Warren, IN	425	1958–99	1998 1959	16.82 17.05	13,500 13,200	8/5/98	16.82	13,500	N	25–50
03325000	Wabash River at Wabash, IN	1,768	1913, 1924–99	1943 1913	24.22 28.70	49,600 90,000	7/19/96 7/22/98	18.47 18.98	18,800 20,000	Y Y	10–25 10–25
03325311	Little Mississinewa River at Union City, IN	9.67	1983–97	1994 1987	8.23 8.67	625 315	11/14/93	8.23	625	N	10–25
03325500	Mississinewa River near Ridgeville, IN	133	1947–99	1958	16.25	13,900	11/14/93	15.35	10,000	N	25–50
03326500	Mississinewa River at Marion, IN	682	1913, 1924–99	1927 1913	17.40 19.20	25,000 --	8/5/98	16.00	21,500	Y	10–25
03327500	Wabash River at Peru, IN	2,686	1913, 1943–99	1943 1913	24.46 28.10	68,000 115,000	7/22/98	--	21,100	Y	10–25
03328500	Eel River near Logansport, IN	789	1943–99	1985 1943	12.68 13.20	17,700 17,000	7/23/98	11.77	14,800	N	10–25
03333450	Wildcat Creek near Jerome, IN	146	1913, 1962–99	1992 1913	13.31 18.00	7,120 --	6/12/98	13.43	6,940	N	10–25

Table 15. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Indiana.—Continued

[mi², square miles; ft, feet above an arbitrary datum; ft³/s, cubic feet per second; --, not determined or not applicable; >, greater than. Source: Recurrence intervals calculated from U.S. Geological Survey data. Other data from U.S. Geological Survey reports or databases]

Streamgage number (fig. 26)	Streamgage name	Total drainage (mi ²)	Maximum stage and discharge for period of record through 1998 water year				Significant floods 1994–98 water years				
			Period of record (water years)	Water year	Stage (ft)	Discharge (ft ³ /s)	Date (month/ day/ year)	Stage (ft)	Discharge (ft ³ /s)	Regulated during flood ¹	Recurrence interval (years)
03335690	Mud Pine Creek near Oxford, IN	39.4	1971–99	1994	16.98	12,100	4/12/94	16.98	12,100	N	>100
03347000	White River at Muncie, IN	241	1904, 1913, 1924–29, 1931–89, 1991–99	1964 1913	11.98 19.60	14,300 --	11/15/93	13.00	10,500	Y	10–25
03347500	Buck Creek near Muncie, IN	35.5	1955–99	1964	13.96	1,780	11/15/93	13.69	1,730	N	50
03353700	West Fork White Lick Creek at Danville, IN	28.8	1957–99	1957	16.00	6,660	2/27/97	12.08	5,120	N	25–50
03360500	White River at Newberry, IN	4,688	1897, 1908–99	1913	27.50	130,000	11/18/93	25.87	105,000	Y	100
03361000	Big Blue River at Carthage, IN	184	1949, 1951–99	1963	14.62	12,900	11/14/93	12.91	8,410	N	25–50
03361650	Sugar Creek at New Palestine, IN	93.9	1968–99	1994 1991	10.08 10.31	2,340 2,220	11/14/93	10.08	2,340	N	25–50
03361850	Buck Creek at Acton, IN	78.8	1968–99	1969	14.99	7,140	11/14/93	14.44	6,310	N	50–100
03362500	Sugar Creek near Edinburgh, IN	474	1943–99	1956	18.38	27,600	11/15/93	17.05	20,500	N	25
03366200	Harberts Creek near Madison, IN	9.31	1969–99	1990	8.96	2,150	4/29/96	7.67	1,970	N	25–50
03368000	Brush Creek near Nebraska, IN	11.4	1956–99	1981	12.99	9,360	4/16/98	12.20	5,200	N	50
03369000	Vernon Fork Muscatatuck River near Butlerville, IN	85.9	1942–99	1959	25.41	26,200	4/16/98	21.54	18,500	Y	50–100
03371500	East Fork White River near Bedford, IN	3,861	1913, 1940–99	1996	36.32	80,500	5/1/96	36.32	80,500	N	25
03371520	Back Creek at Leesville, IN	24.1	1913, 1971–99	1973 1913	14.00 18.10	15,300 --	4/16/98	11.18	8,590	N	10–25

Table 15. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Indiana.—Continued

[mi², square miles; ft, feet above an arbitrary datum; ft³/s, cubic feet per second; --, not determined or not applicable; >, greater than. Source: Recurrence intervals calculated from U.S. Geological Survey data. Other data from U.S. Geological Survey reports or databases]

Streamgage number (fig. 26)	Streamgage name	Total drainage (mi ²)	Maximum stage and discharge for period of record through 1998 water year				Significant floods 1994–98 water years				
			Period of record (water years)	Water year	Stage (ft)	Discharge (ft ³ /s)	Date (month/ day/ year)	Stage (ft)	Discharge (ft ³ /s)	Regulated during flood ¹	Recurrence interval (years)
03374500	Patoka River near Cuzco, IN	170	1913, 1962–99	1964	20.02	14,700	6/1/96	--	2,830	Y	--
03375500	Patoka River at Jasper, IN	262	1913, 1937, 1948–99	1964 1961	15.17 20.62	14,100 13,700	4/30/96	17.21	6,370	Y	--
03376300	Patoka River at Winslow, IN	603	1937, 1961, 1964–74, 1987–99	1964 1937	28.84 28.90	15,500 --	5/2/96	27.37	11,600	Y	--
03376500	Patoka River near Princeton, IN	822	1935–99	1937 1996	-- 24.35	18,700 13,900	5/4/96	24.35	13,900	Y	--
03378550	Big Creek near Wadesville, IN	104	1966–99	1996	20.35	10,400	4/29/96	20.35	10,400	N	50–100
04094000	Little Calumet River at Porter, IN	66.2	1945–99	1991 1955	10.93 11.66	3,880 3,110	5/10/96	10.63	3,400	N	25–50
04096100	Galena River near Laporte, IN	17.2	1970–99	1991 1993	-- 7.04	900 617	5/10/96	7.00	874	N	25–50
04099510	Pigeon Creek near Angola, IN	106	1946–99	1996 1950	10.92 14.95	1,000 744	5/21/96	10.92	1,000	N	100
04177720	Fish Creek at Hamilton, IN	37.5	1970–99	1996	14.49	1,510	5/17/96	14.49	1,510	N	>100
05515000	Kankakee River near North Liberty, IN	174	1951–99	1982 1968	9.01 9.04	908 629	7/19/96	8.84	891	N	50
05519000	Singleton Ditch at Schneider, IN	123	1949–88 1990–99	1976 1991	11.24 12.54	3,550 2,460	6/16/97	12.05	2,270	N	10–25
05521000	Iroquois River at Rosebud, IN	35.6	1949–99	1991 1959	7.93 8.86	656 383	10/17/93	7.28	569	N	25–50
05522500	Iroquois River at Rensselaer, IN	203	1910, 1949–99	1958	16.54	2,550	10/18/93	15.52	2,520	N	50–100
05536190	Hart Ditch at Munster, IN	70.7	1943–99	1991	8.72	3,010	7/18/96 2/21/97	8.03 8.00	2,710 2,700	N N	10–25 10–25

¹Regulated during flood: N, no; Y, yes.

Iowa

Rainfall of 4 to 7 inches was common in central Iowa near Boone (fig. 27) June 16 and 17, 1996 (National Oceanic and Atmospheric Administration, 1996a). Doppler radar precipitation estimates were as high as 8.5 inches in the area. The South Skunk River crested at an all time high discharge. Crop damage was extensive as well with many fields becoming flooded. Total damage in Ames and surrounding areas was believed to be several million dollars (National Oceanic and Atmospheric Administration, 1996b). Intense thunderstorms returned within a week, and additional flooding occurred throughout Iowa. Precipitation totals for some areas were more than 15 inches in 2 days. The flash flooding was considered the worst since the summer of 1993.

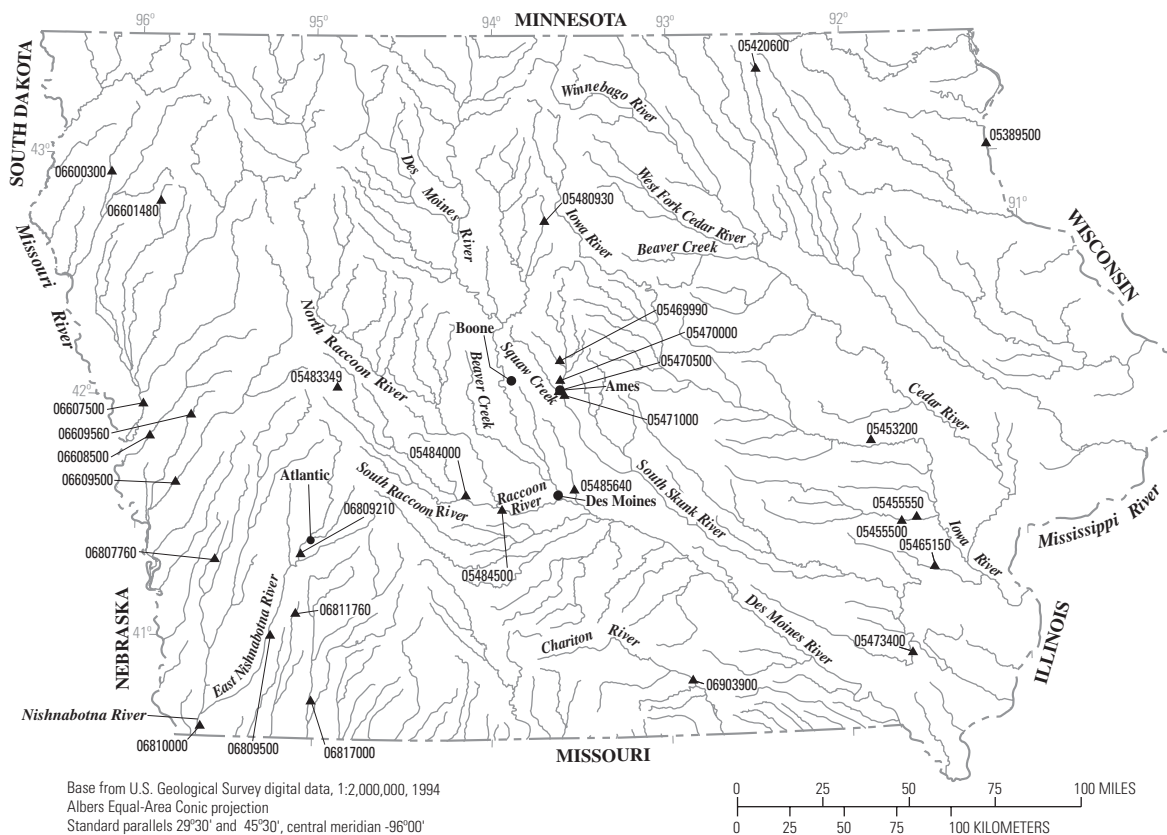
Significant ice jams formed along the downstream reaches of the Racoon River on February 19, 1997. A woman was driving across a flood-plain road south of Des Moines when one of the ice jams suddenly broke. The water rose quickly and swept her vehicle off the road with her in it, and she drowned (National Oceanic and Atmospheric Administration, 1997b).

In June 1998, a strong upper level system, combined with a warm front located to the south of Iowa, set the stage for a major flood. Iowa soils were already saturated before the flood began. Extremely intense rain fell over southwestern and central Iowa from this storm. Southwestern Iowa was the hardest hit as more than 13.18 inches of rain fell at Atlantic on June 14 (National Oceanic and Atmospheric Administration, 1998a). This amount of rain set a State record for the greatest 24-hour rainfall total from an official site. Damage was more than a \$1 million (National Oceanic and Atmospheric Administration, 1998b). The East Nishnabotna River near Atlantic crested at 22.36 feet on June 15 (streamgage 06809210, table 16), missing the all-time record by about 0.5 foot set in September 1972 (Fischer, 1999). Very intense rains of 2 to 4 inches also fell over the Racoon and South Skunk River Basins, resulting in widespread flooding. Both the North and South Racoon Rivers flooded. The flood waves from both rivers merged on the main

stem to create the second highest crest on record for the Racoon River. Only the great flood of 1993 created higher crests. Following a brief break from the rain on June 16, rainfall resumed June 17–18. Excessive rain fell over just about the entire State on both days, with amounts of 1 to 3 inches of rain on the first night in the Nishnabotna, upper Des Moines, and the downstream parts of the South Skunk River Basins (National Oceanic and Atmospheric Administration, 1998a). These rains fell on already saturated soils and resulted in considerable runoff. On the 18th, the Des Moines metropolitan area was blitzed with massive flooding. Local rains of 1 to 4 inches fell in the city, much of it falling in 1 to 2 hours (National Oceanic and Atmospheric Administration, 1998a). Much of this water was quickly added to the flows on the already high Racoon River. Cleanup and repair of the damage from this flood alone were estimated at \$12 million (National Oceanic and Atmospheric Administration, 1998b). Numerous rivers south of Des Moines flooded as well. On June 21–23, flooding occurred in the southwestern part of the State. The main rivers affected by the June flood episodes were the East Nishnabotna, Nishnabotna, and Racoon Rivers, the Des Moines River in the vicinity of Des Moines, and the South Skunk River and Squaw Creek in the vicinity of Ames. The crop-damage estimate from these June 1998 floods totaled more than \$100 million (National Oceanic and Atmospheric Administration, 1998b).

References

- Fischer, E.E., 1999, Flood of June 15–17, 1998, Nishnabotna and East Nishnabotna Rivers, southwest Iowa: U.S. Geological Survey Open-File Report 99–70, 15 p.
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EXPLANATION

06903900 ▲ Streamgage and number

Figure 27. Location of streamgages with significant floods during 1994–98 water years for Iowa.

Table 16. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Iowa.

[mi², square miles; ft, feet above an arbitrary datum; ft³/s, cubic feet per second; --, not determined or not applicable; >, greater than. Source: Recurrence intervals calculated from U.S. Geological Survey data. Other data from U.S. Geological Survey reports or databases]

Streamgage number (fig. 27)	Streamgage name	Total drainage (mi ²)	Maximum stage and discharge for period of record through 1998 water year				Significant floods 1994–98 water years				
			Period of record (water years)	Water year	Stage (ft)	Discharge (ft ³ /s)	Date (month/ day/ year)	Stage (ft)	Discharge (ft ³ /s)	Regulated during flood ¹	Recurrence interval (years)
05389500	Mississippi River at McGregor, IA	67,500	1880, 1937–98	1965	25.38	276,000	4/15/97	21.38	201,000	Y	25
05420600	Little Wapsipinicon River tributary near Riceville, IA	1.10	1953–98	1997	5.91	3,300	3/11/97	5.91	3,300	N	--
05453200	Price Creek at Amana, IA	29.1	1966–86, 1989–98	1997	87.16	3,770	2/19/97	87.16	3,770	N	--
05455500	English River at Kalona, IA	573	1930, 1940–98	1993	22.55	36,100	5/11/96	21.06	25,100	N	35–40
05455550	Bulgers Run near Riverside, IA	6.31	1965–87, 1989, 1992–98	1965	89.04	3,080	5/10/96	88.10	2,780	N	--
05465150	North Fork Long Creek at Ainsworth, IA	30.2	1965–98	1997	90.44	5,000	2/19/97	90.44	5,000	N	--
05469990	Keigley Branch near Story City, IA	31.0	1966–98	1996	92.26	3,440	6/17/96	92.26	3,440	N	40–60
05470000	South Skunk River near Ames, IA	315	1921–27, 1930, 1933–98	1996	15.89	14,000	7/17/96	15.89	14,000	N	>500
05470500	Squaw Creek at Ames, IA	204	1918, 1920–27, 1965–98	1993	18.54	24,300	6/17/96	15.29	12,700	N	60–80
05471000	South Skunk River below Squaw Creek near Ames, IA	556	1944, 1953–79, 1990, 1992–98	1993 1975	25.53 25.57	26,500 14,700	6/17/96	25.13	24,400	N	>500

Table 16. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Iowa.—Continued

[mi², square miles; ft, feet above an arbitrary datum; ft³/s, cubic feet per second; --, not determined or not applicable; >, greater than. Source: Recurrence intervals calculated from U.S. Geological Survey data. Other data from U.S. Geological Survey reports or databases]

Streamgage number (fig. 27)	Streamgage name	Total drainage (mi ²)	Maximum stage and discharge for period of record through 1998 water year				Significant floods 1994–98 water years				
			Period of record (water years)	Water year	Stage (ft)	Discharge (ft ³ /s)	Date (month/ day/ year)	Stage (ft)	Discharge (ft ³ /s)	Regulated during flood ¹	Recurrence interval (years)
05473400	Cedar Creek near Oakland Mills, IA	530	1979–98	1996 1993	21.03 21.27	12,300 8,920	5/28/96	21.03	12,300	N	50–75
05480930	White Fox Creek at Clarion, IA	13.3	1966–98	1995 1993	92.91 93.59	1,700 1,400	6/29/95	92.91	1,700	N	--
05483349	Middle Raccoon River tributary at Carroll, IA	6.58	1966–98	1996	25.88	4,600	7/17/96	25.88	4,600	N	75–100
05484000	South Raccoon River at Redfield, IA	994	1940–98	1993 1958	26.98 29.04	44,000 35,000	6/15/98	24.67	35,100	N	50–70
05484500	Raccoon River at Van Meter, IA	3,441	1915–98	1993	26.34	70,100	6/15/98	23.29	47,400	N	40–50
05485640	Fourmile Creek at Des Moines, IA	92.7	1972–79, 1981–98	1998	15.00	5,600	6/18/98	15.00	5,600	N	10–20
06600300	West Branch Floyd River near Struble, IA	180	1956–94, 1996–98	1994 1983	15.86 15.86	8,920 7,590	3/4/94	15.86	8,920	N	15–20
06601480	Big Whiskey Slough near Remsen, IA	12.9	1967, 1969–71, 1973, 1975, 1978–86, 1988–90, 1993–98	1996 1979	93.56 94.87	1,210 --	6/21/96	93.56	1,210	N	--
06607500	Little Sioux River near Turin, IA	3,526	1940–98	1996 1971	26.99 27.44	32,000 30,000	6/22/96	26.99	32,000	N	10–15
06608500	Soldier River at Pisgah, IA	407	1940–98	1996	28.87	34,700	7/17/96	28.87	34,700	N	70–90
06609500	Boyer River at Logan, IA	871	1881, 1918–25, 1938–98	1990 1965	22.54 25.22	30,800 --	7/17/96	23.87	28,700	N	30–35

Table 16. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Iowa.—Continued

[mi², square miles; ft, feet above an arbitrary datum; ft³/s, cubic feet per second; --, not determined or not applicable; >, greater than. Source: Recurrence intervals calculated from U.S. Geological Survey data. Other data from U.S. Geological Survey reports or databases]

Streamgage number (fig. 27)	Streamgage name	Total drainage (mi ²)	Maximum stage and discharge for period of record through 1998 water year				Significant floods 1994–98 water years				
			Period of record (water years)	Water year	Stage (ft)	Discharge (ft ³ /s)	Date (month/ day/ year)	Stage (ft)	Discharge (ft ³ /s)	Regulated during flood ¹	Recurrence interval (years)
06609560	Willow Creek near Soldier, IA	29.1	1966–77, 1979–98	1993	84.66	6,840	7/17/96	83.02	5,660	N	20–30
06807760	Middle Silver Creek near Oakland, IA	25.7	1953–98	1998	15.63	2,540	7/14/98	15.63	2,540	N	60–80
06809210	East Nishnabotna River near Atlantic, IA	436	1958, 1961–98	1998 1972	22.36 22.81	41,400 26,700	6/15/98	22.36	41,400	N	200–300
06809500	East Nishnabotna River at Red Oak, IA	894	1917–25, 1936–98	1998	29.39	60,500	6/15/98	29.39	60,500	N	>500
06810000	Nishnabotna River above Hamburg, IA	2,806	1917, 1922–23, 1929–98	1998	33.18	65,100	6/17/98	33.18	65,100	N	>500
06811760	Tarkio River near Elliott, IA	10.7	1952–87, 1989–91, 1993, 1996–98	1998	14.68	5,000	6/14/98	14.68	5,000	N	--
06817000	Nodaway River at Clarinda, IA	762	1918–25, 1936–98	1947	25.30	31,100	6/15/98	23.89	30,200	N	20
06903900	Chariton River near Rathbun, IA	549	1957–98	1960	25.30	21,800	12/14/93	14.94	2,780	Y	--

¹Regulated during flood: N, no; Y, yes.

Kansas

Approximately 10 inches of rain fell April 9–11, 1994, over much of southeastern Kansas (National Oceanic and Atmospheric Administration, 1994a). At Farlington (fig. 28), rainfall measured 11.25 inches. Many streams and rivers exceeded flood stage throughout the area. The Fall, Marmaton, Neosho, and Verdigris Rivers all exceeded flood stage (National Oceanic and Atmospheric Administration, 1994b). In Fort Scott, the Marmaton River crested almost 10 feet above flood stage. The Neosho River was out of its banks from Iola to the Oklahoma border. Excessive rains returned at the end of April with many of the same streams going out of their banks for the second time (table 17).

Minor to moderate flooding occurred across extreme northeastern and east-central Kansas during May 1995. The floods were caused by above-normal rainfall through the month. The Kansas City area experienced its wettest May in 106 years of record, with a 12.75-inch deluge (National Oceanic and Atmospheric Administration, 1995a). This was 7.71 inches above normal and easily eclipsed the previous record rainfall of 11.00 inches set in 1915. Most rivers only went a few feet above

their respective flood stage, but at Osawatimie on the Marais des Cygnes River (National Oceanic and Atmospheric Administration, 1995b), the level topped out 10.6 feet above flood stage. The Missouri River remained above flood stage at Atchison and Leavenworth into June.

Intense rain of 5 to 12 inches fell over parts of extreme southeastern Kansas during September 13–15, 1998 (National Oceanic and Atmospheric Administration, 1998a). Unofficial reports of rainfall as high as 14 inches were reported west of Fort Scott in the Marmaton River Basin. The stage of the Marmaton River at Fort Scott reached 50.05 feet on September 14, which is the second highest stage ever recorded.

References

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National Oceanic and Atmospheric Administration (NOAA), 1994b–98b, Storm data (by State): Asheville, North Carolina, National Climatic Data Center, various months.

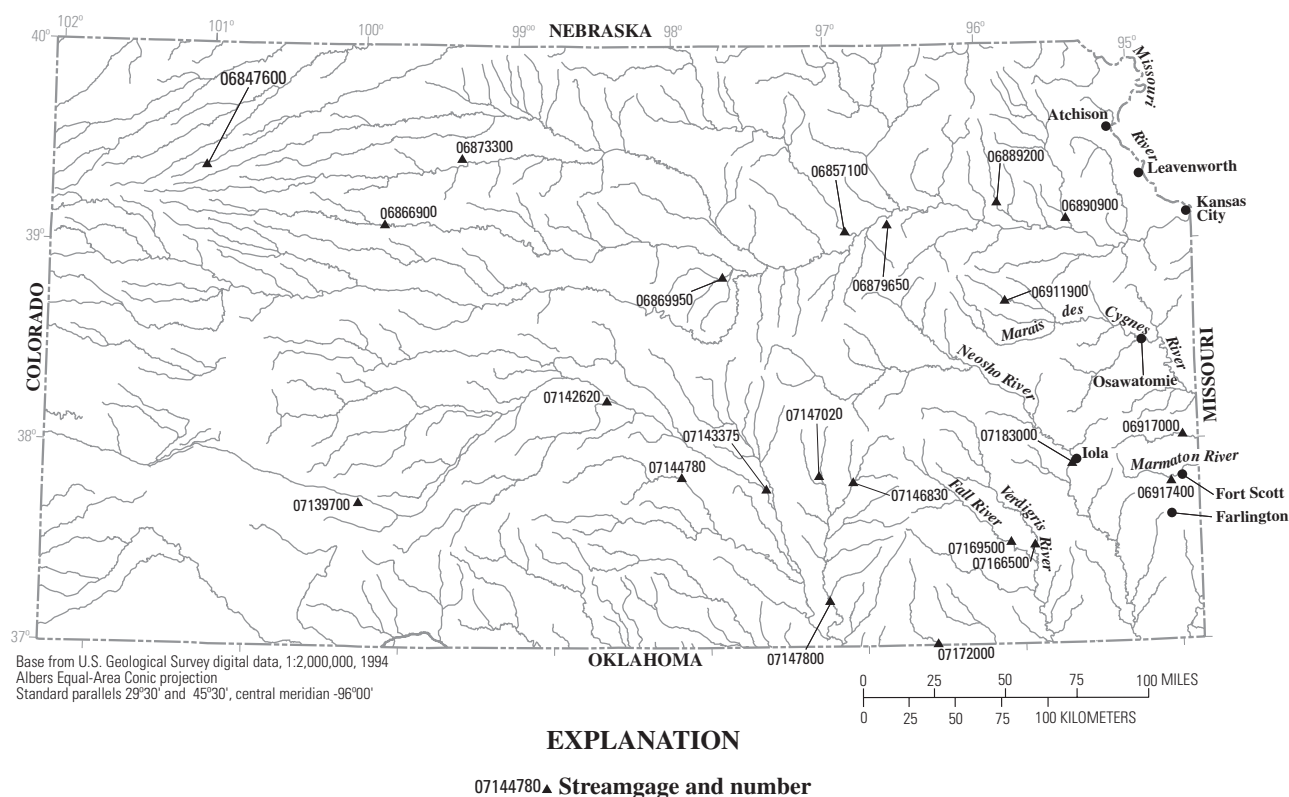


Figure 28. Location of streamgages with significant floods during 1994–98 water years for Kansas.

Table 17. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Kansas.

[mi², square miles; ft, feet above an arbitrary datum; ft³/s, cubic feet per second; --, not determined or not applicable; >, greater than. Source: Recurrence intervals calculated from U.S. Geological Survey data. Other data from U.S. Geological Survey reports or databases]

Streamgage number (fig. 28)	Streamgage name	Total drainage (mi ²)	Maximum stage and discharge for period of record through 1998 water year				Significant floods 1994–98 water years				
			Period of record (water years)	Water year	Stage (ft)	Discharge (ft ³ /s)	Date (month/ day/ year)	Stage (ft)	Discharge (ft ³ /s)	Regulated during flood ¹	Recurrence interval (years)
06847600	Prairie Dog Creek tributary at Colby, KS	7.53	1957–97	1975	27.44	4,300	6/15/96	16.60	1,400	N	25
06857100	Republican River below Milford Dam, KS	24,890	1964–98	1993	21.52	33,700	12/11/97	16.03	18,700	Y	--
06866900	Saline River near Wakeeney, KS	696	1950, 1956–66, 1982–98	1957	19.40	13,000	9/18/95	16.20	7,040	Y	5
				1950	27.00	--					
06869950	Mulberry Creek near Salina, KS	261	1961–89, 1991–98	1995	27.14	8,440	5/28/95	27.14	8,440	N	10–25
06873300	Ash Creek tributary near Stockton, KS	.89	1957–93, 1995–98	1996	14.79	1,380	8/3/96	14.79	1,380	N	50–100
				1993	15.54	530					
06879650	Kings Creek near Manhattan, KS	4.09	1980–98	1995	13.98	10,200	5/13/95	13.98	10,200	N	25
06889200	Soldier Creek near Delia, KS	157	1951, 1959–98	1982	23.95	29,400	5/13/95	23.09	19,900	N	100
				1951	24.00	--					
06890900	Delaware River below Perry Dam, KS	1,117	1970–98	1995	--	14,000	5/31/95	--	14,000	Y	--
				1970	--	9,920					
06911900	Dragoon Creek near Burlingame, KS	114	1946, 1961–98	1977	22.05	24,800	5/17/95	22.80	20,200	N	50
				1946	23.40	--					
06917000	Little Osage River at Fulton, KS	295	1949–98	1987	35.21	62,800	4/28/94	32.61	38,000	N	50–100
06917400	Marmaton River tributary near Fort Scott, KS	2.80	1957–98	1998	17.23	2,160	9/14/98	17.23	2,160	N	25
07139700	Arkansas River tributary near Dodge City, KS	8.66	1957–89, 1992–98	1997	16.32	1,730	9/12/97	16.32	1,730	N	>100
07142620	Rattlesnake Creek near Raymond, KS	1,167	1961–98	1973	8.74	2,140	5/28/95	8.37	1,530	Y	--

Table 17. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Kansas.—Continued

[mi², square miles; ft, feet above an arbitrary datum; ft³/s, cubic feet per second; --, not determined or not applicable; >, greater than. Source: Recurrence intervals calculated from U.S. Geological Survey data. Other data from U.S. Geological Survey reports or databases]

Streamgage number (fig. 28)	Streamgage name	Total drainage (mi ²)	Maximum stage and discharge for period of record through 1998 water year				Significant floods 1994–98 water years				
			Period of record (water years)	Water year	Stage (ft)	Discharge (ft ³ /s)	Date (month/ day/ year)	Stage (ft)	Discharge (ft ³ /s)	Regulated during flood ¹	Recurrence interval (years)
07143375	Arkansas River near Maize, KS	39,110	1987–98	1993	16.84	44,900	5/28/95	15.03	26,700	Y	--
07144780	North Fork Ninnescah River above Cheney Reservoir, KS	787	1966–98	1980	11.65	87,000	5/27/95	10.93	47,900	N	25–50
07146830	Walnut River at Highway 54 east of El Dorado, KS	350	1982–98	1995	16.90	13,000	6/9/95	16.90	13,000	Y	--
07147020	Whitewater River tributary near Towanda, KS	.17	1963–98	1995	16.59	540	6/9/95	16.59	540	N	100
07147800	Walnut River at Winfield, KS	1,880	1898, 1904, 1915, 1922–98	1944 1929	38.30 41.00	105,000 94,400	6/10/95	37.30	85,800	Y	25–50
07166500	Verdigris River near Altoona, KS	1,138	1939–98	1951	31.09	71,000	4/28/94	27.19	31,000	Y	5
07169500	Fall River at Fredonia, KS	827	1904, 1923, 1927–28, 1939–98	1945	36.17	49,000	4/28/94	31.94	31,000	Y	5
07172000	Caney River near Elgin, KS	445	1939–98	1987	42.35	104,000	7/3/95	29.64	43,200	N	10
07183000	Neosho River near Iola, KS	3,818	1885, 1895–1904, 1918–98	1951	43.00	436,000	4/28/94	27.95	37,100	Y	2–5

¹Regulated during flood: N, no; Y, yes.

Kentucky

During May 1995, the Mississippi River was well above flood stage, and the Ohio River was also flooding. Near the confluence of these rivers at Wickliffe, Kentucky (fig. 29), the worst flooding occurred since 1973. The bridge over the Ohio River between Cairo, Illinois, and Wickliffe, Kentucky, was closed for the first time since 1973. A state of emergency was declared in four Kentucky counties along the Mississippi River.

Excessive rainfall of 7 to 9 inches of rain fell during a 6-hour period in central Kentucky on July 19, 1996 (National Oceanic and Atmospheric Administration, 1996a), which created flash floods that caused more than \$2 million in property damage (National Oceanic and Atmospheric Administration, 1996b). On July 31, excessive rains just south of Cincinnati, Ohio, created flood conditions on creeks and small rivers in north-central Kentucky. Damage totaled nearly \$7 million (National Oceanic and Atmospheric Administration, 1996b).

On March 1, 1997, a severe weather situation with tornadoes and very intense rainfall occurred along a nearly stationary front from Texas to West Virginia. Excessive rains totaling more than 12 inches occurred at many locations in Kentucky (National Oceanic and Atmospheric Administration, 1997a). Flooding killed 21 persons, 101 counties were declared Federal disaster areas, and estimated damage in Kentucky was \$250 to 500 million (National Oceanic and Atmospheric Administration, 1997b). The Ohio River crested on March 7 (70.5 feet) at Louisville (streamgage 03294500, table 18) at about 16 feet above flood stage. The town of Falmouth (population 2,700) was almost totally destroyed (National Oceanic and Atmospheric Administration, 1997b). Record flooding occurred all along the Licking River Basin as 24-hour rainfall amounts beginning early March 1, 1997, totaled from 6 to 10 inches (National Oceanic and Atmospheric Administration, 1997a). The South Fork Licking River at Cynthiana (streamgage 03252500, table 18) crested 8 feet above flood stage at a record 28.03 feet on March 2. The Licking River at Blue Licks Spring crested 22.6 feet above flood stage at a record 47.6 feet on

March 2 (National Oceanic and Atmospheric Administration, 1997b).

The record rainfall led to major flooding along the Salt River Basin including the Rolling Fork. The Salt River at Shepherdsville (streamgage 03298500, table 18) crested at 40.9 feet on March 2. This was the worst flooding here since March 1964. The Rolling Fork near Boston (streamgage 03301500, table 18) crested at a record level of 53.2 feet on March 2. The Green River at Rochester crested at 30.7 feet on March 7 (National Oceanic and Atmospheric Administration, 1997b). This is the second highest stage on record. The record rainfall caused the highest stage on the Kentucky River at Frankfort (streamgage 03287500, table 18) since 1978 when the river crested at 45.22 feet on March 3.

The excessive rains in March 1997 caused the worst flooding on the Ohio River since 1964 and in some spots since 1937. On March 8 the river crested at a record 52.4 feet at Cannelton Dam at Cannelton, Indiana (streamgage 03303280, table 18) and at 50.4 feet at Tell City, Indiana (National Oceanic and Atmospheric Administration, 1997b). The crest at Paducah, nearly 52 feet (National Oceanic and Atmospheric Administration, 1997b), was the highest since 1950, and one of the worst floods on record.

Excessive rainfall from thunderstorms caused flash floods on April 17 and 18 and general flooding on April 19 and 20 in southeastern Kentucky. Flooding was especially severe along the Right and Left Forks of Beaver Creek (National Oceanic and Atmospheric Administration, 1997b).

References

- National Oceanic and Atmospheric Administration (NOAA), 1996a–97a, Climatological data (by State): Asheville, North Carolina, National Climatic Data Center, various months.
- National Oceanic and Atmospheric Administration (NOAA), 1996b–97b, Storm data (by State): Asheville, North Carolina, National Climatic Data Center, various months.

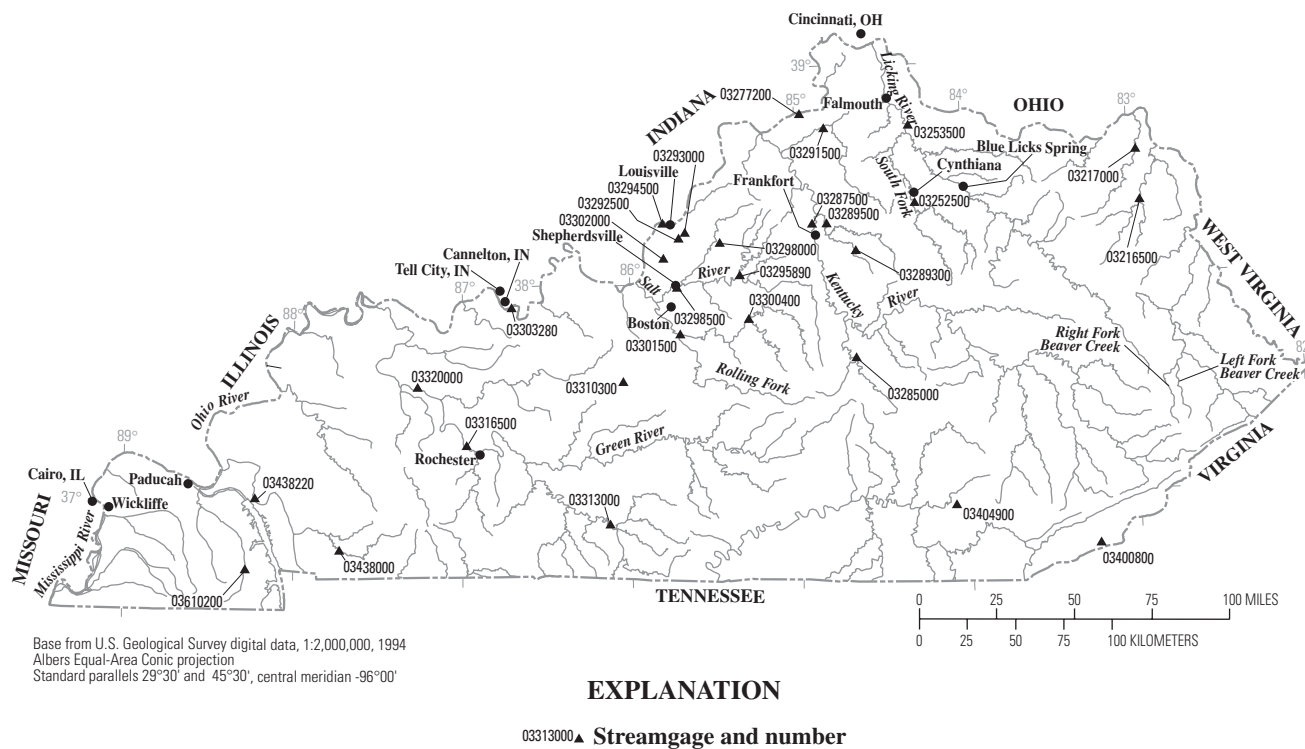


Figure 29. Location of streamgages with significant floods during 1994–98 water years for Kentucky.

Table 18. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Kentucky.

[mi², square miles; ft, feet above an arbitrary datum; ft³/s, cubic feet per second; --, not determined or not applicable; >, greater than; <, less than. Source: Recurrence intervals calculated from U.S. Geological Survey data. Other data from U.S. Geological Survey reports or databases]

Streamgage number (fig. 29)	Streamgage name	Total drainage (mi ²)	Maximum stage and discharge for period of record through 1998 water year				Significant floods 1994–98 water years				
			Period of record (water years)	Water year	Stage (ft)	Discharge (ft ³ /s)	Date (month/ day/ year)	Stage (ft)	Discharge (ft ³ /s)	Regulated during flood ¹	Recurrence interval (years)
03216500	Little Sandy River at Grayson, KY	400	1937, 1939–98	1950 1997	27.53 30.57	24,500 16,300	3/2/97	30.57	16,300	Y	5–10
03217000	Tygarts Creek near Greenup, KY	242	1934, 1937, 1941–98	1997	23.65	34,400	3/2/97	23.65	34,400	N	>100
03252500	South Fork Licking River at Cynthiana, KY	621	1918–94, 1997	1997	28.03	39,000	3/2/97	28.03	39,000	N	--
03253500	Licking River at Catawba, KY	3,300	1854, 1888–1998	1997	57.57	110,000	3/3/97	57.57	110,000	Y	--
03277200	Ohio River at Markland Dam near Warsaw, KY	83,170	1971–98	1997	60.72	579,000	3/6/97	60.72	579,000	Y	--
03285000	Dix River near Danville, KY	318	1943–98	1996 1979	18.93 21.81	52,400 44,400	7/20/96	18.93	52,400	N	>100
03289300	South Elkhorn Creek near Midway, KY	105	1983–98	1997	26.37	12,300	3/2/97	26.37	12,300	N	--
03287500	Kentucky River at Frankfort, KY	5,411	1895–1998	1978	48.47	118,000	3/2/97	45.22	93,500	Y	--
03289500	Elkhorn Creek near Frankfort, KY	473	1916–20, 1932, 1937, 1940–13, 1989–98	1997	17.96	35,900	3/4/97	17.96	35,900	N	>100
03291500	Eagle Creek at Glencoe, KY	437	1913, 1915–20, 1928–31, 1937, 1939–87, 1989–98	1997	29.08	58,300	3/2/97	29.08	58,300	N	>100

Table 18. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Kentucky.—Continued

[mi², square miles; ft, feet above an arbitrary datum; ft³/s, cubic feet per second; --, not determined or not applicable; >, greater than; <, less than. Source: Recurrence intervals calculated from U.S. Geological Survey data. Other data from U.S. Geological Survey reports or databases]

Streamgage number (fig. 29)	Streamgage name	Total drainage (mi ²)	Maximum stage and discharge for period of record through 1998 water year				Significant floods 1994–98 water years				
			Period of record (water years)	Water year	Stage (ft)	Discharge (ft ³ /s)	Date (month/ day/ year)	Stage (ft)	Discharge (ft ³ /s)	Regulated during flood ¹	Recurrence interval (years)
03292500	South Fork Beargrass Creek at Louisville, KY	17.2	1940–83, 1988–98	1997	17.81	5,290	3/2/97	17.81	5,290	N	50–100
03293000	Middle Fork Beargrass Creek at Louisville, KY	18.9	1943, 1945–83, 1985–98	1997 1970	8.70 9.60	5,900 5,200	3/2/97	8.70	5,900	N	>100
03294500	Ohio River at Louisville, KY	91,170	1832, 1848, 1858–59, 1866–69, 1872–1998	1937 1997	85.44 70.47	1,110,000 716,000	3/6/97	70.47	716,000	Y	--
03295890	Brashears Creek at Taylorsville, KY	259	1982–98	1997	31.54	44,800	3/2/97	31.54	44,800	Y	--
03298000	Floyds Fork at Fisherville, KY	138	1937, 1943, 1945–98	1997	17.39	42,100	3/2/97	17.39	42,100	N	>100
03298500	Salt River at Shepherdsville, KY	1,197	1937–98	1964 1937	41.50 47.30	78,200 71,300	3/2/97	40.92	71,300	Y	--
03300400	Beech Fork at Maud, KY	436	1964, 1973–98	1997	27.60	41,500	3/2/97	27.60	41,500	N	50–100
03301500	Rolling Fork near Boston, KY	1,299	1937, 1939–98	1997 1937	53.22 55.20	69,800 --	3/3/97	53.22	69,800	N	>100
03302000	Pond Creek near Louisville, KY	64.0	1937, 1945–98	1964 1997	22.69 25.66	8,020 7,800	3/2/97	25.66	7,800	N	>100
03303280	Ohio River at Cannelton Dam at Cannelton, IN	97,000	1979–98	1997	52.42	735,000	3/8/97	52.42	735,000	Y	--
03310300	Nolin River at White Mills, KY	357	1960–98	1997	36.46	24,500	3/2/97	36.46	24,500	N	50–100

Table 18. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Kentucky.—Continued

[mi², square miles; ft, feet above an arbitrary datum; ft³/s, cubic feet per second; --, not determined or not applicable; >, greater than; <, less than. Source: Recurrence intervals calculated from U.S. Geological Survey data. Other data from U.S. Geological Survey reports or databases]

Streamgage number (fig. 29)	Streamgage name	Total drainage (mi ²)	Maximum stage and discharge for period of record through 1998 water year				Significant floods 1994–98 water years				
			Period of record (water years)	Water year	Stage (ft)	Discharge (ft ³ /s)	Date (month/ day/ year)	Stage (ft)	Discharge (ft ³ /s)	Regulated during flood ¹	Recurrence interval (years)
03313000	Barren River near Finney, KY	942	1942–50, 1961–94	1962 1943 1994	-- 99.50 90.66	78,000 23,500 7,470	4/11/94	90.66	7,470	Y	--
03316500	Green River at Paradise, KY	6,183	1940–50, 1961–81, 1992–98	1962 1997	40.46 37.63	107,000 86,300	3/7/97	37.63	83,300	Y	--
03320000	Green River at Lock 2 at Calhoun, KY	7,566	1913, 1931–98	1937 1997	43.70 33.23	208,000 86,000	3/7/97	33.23	86,000	Y	--
03400800	Martins Fork near Smith, KY	55.8	1968–98	1977 1998	24.24 14.05	9,000 1,520	4/19/98	14.05	1,520	Y	<2
03404900	Lynn Camp Creek at Corbin, KY	53.8	1957–98	1998 1957	14.33 22.50	6,820 9,000	4/17/98	14.33	6,820	N	25–50
03438000	Little River near Cadiz, KY	244	1940–98	1997	26.44	37,600	3/1/97	26.44	37,600	N	>100
03438220	Cumberland River near Grand Rivers, KY	17,598	1900, 1965–97	1997	45.72	209,000	3/5/97	45.72	209,000	Y	--
03610200	Clarks River at Almo, KY	134	1983–98	1997 1991	18.35 18.84	23,300 16,600	3/2/97	18.35	23,300	N	--

¹Regulated during flood: N, no; Y, yes.

Louisiana

A nearly stationary area of rain and embedded thunderstorms produced excessive rain across much of central and southern Louisiana on January 26–27, 1994. Storm totals of 6 to 8 inches were common in a large swath from southwestern and west-central Louisiana into east-central Louisiana (National Oceanic and Atmospheric Administration, 1994a). Within this area, rainfall totals of 8 to 12 inches occurred west of Alexandria (fig. 30), overwhelming drainage capacity and resulting in flash flooding.

Torrential rain of 8 to 12 inches fell across parts of southwestern, west-central, and east-central Louisiana during the night and morning hours of April 11, 1995 (National Oceanic and Atmospheric Administration, 1995a). The Calcasieu River crested at Oakdale on April 12 at 15.7 feet (National Oceanic and Atmospheric Administration, 1995b). In east-central Louisiana, floods occurred on the Amite, Comite, Tickfaw, Tangipahoa, and Tchefuncte Rivers. During May 8–10, 1995, extreme weather conditions, which produced as much as 27.5 inches of rain during a 55-hour period (National Oceanic and

Atmospheric Administration, 1995a), caused the most severe flooding in recent history along coastal areas of the Gulf of Mexico in Mississippi and southeastern Louisiana. At least six people died, and thousands more were left homeless as a result of the intense flooding. At least \$3 billion in property damage was reported in New Orleans, Louisiana (National Oceanic and Atmospheric Administration, 1995b).

Recurrent thunderstorms during April 1997 caused many streams in Louisiana to flood. The most significant flood was at the Wax Lake outlet at Calumet (streamgage 07381590, table 19). This streamgage recorded the largest discharge since records began in 1942.

References

- National Oceanic and Atmospheric Administration (NOAA), 1994a–95a, Climatological data (by State): Asheville, North Carolina, National Climatic Data Center, various months.
National Oceanic and Atmospheric Administration (NOAA), 1994b–95b, Storm data (by State): Asheville, North Carolina, National Climatic Data Center, various months.

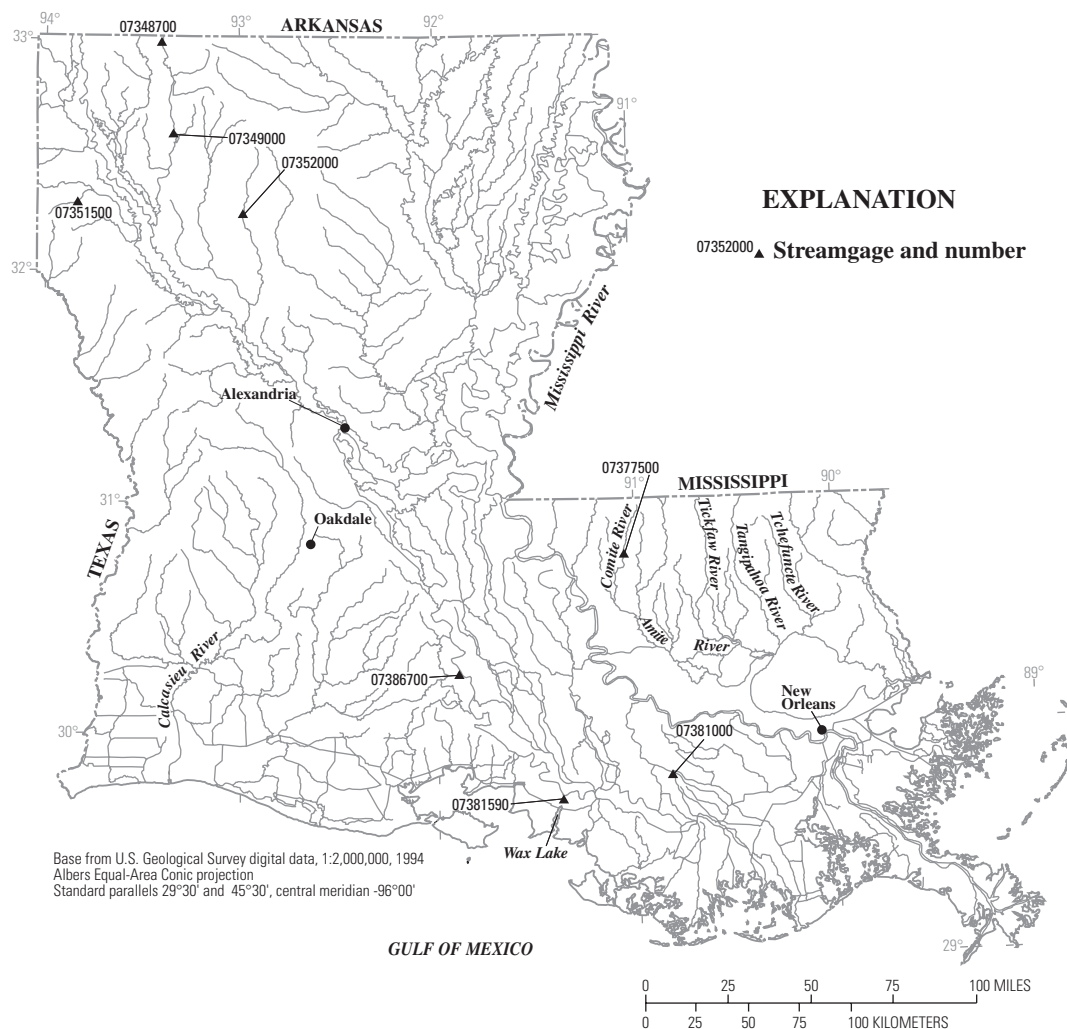


Figure 30. Location of streamgages with significant floods during 1994–98 water years for Louisiana.

Table 19. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Louisiana.

[mi², square miles; ft, feet above an arbitrary datum; ft³/s, cubic feet per second; --, not determined or not applicable. Source: Recurrence intervals calculated from U.S. Geological Survey data. Other data from U.S. Geological Survey reports or databases]

Streamgage number (fig. 30)	Streamgage name	Total drainage (mi ²)	Maximum stage and discharge for period of record through 1998 water year				Significant floods 1994–98 water years				
			Period of record (water years)	Water year	Stage (ft)	Discharge (ft ³ /s)	Date (month/ day/ year)	Stage (ft)	Discharge (ft ³ /s)	Regulated during flood ¹	Recurrence interval (years)
07348700	Bayou Dorcheat near Springhill, LA	605	1958–98	1997	21.97	36,700	4/6/97	21.97	36,700	N	--
				1958	22.79	36,400					
07349000	Bayou Dorcheat near Minden, LA	1,097	1929–31, 1933, 1936–92, 1994–98	1958 1997	24.90 25.12	44,800 38,200	4/8/97	25.12	38,200	N	--
07351500	Cypress Bayou near Keithville, LA	66.0	1939–98	1997	13.31	26,100	4/23/95	12.29	15,700	N	--
				1955	13.62	23,700	4/5/97	13.31	26,100	N	--
07352000	Saline Bayou near Lucky, LA	154	1941–98	1945	12.90	13,500	4/23/95	11.45	10,800	N	--
07377500	Comite River near Olive Branch, LA	145	1943–98	1977	22.88	22,400	4/12/95	18.23	21,400	N	--
				1961	23.37	19,900	4/28/97	17.81	22,200	N	--
07381000	Bayou Lafourche at Thibodaux, LA	--	1966–88, 1993–97	1995 1973	-- 7.64	1,450 --	5/9/95	--	1,450	Y	--
07381590	Wax Lake outlet at Calumet, LA	--	1942–85, 1988, 1990–98	1997 1973	-- 11.16	258,000 --	4/5/97 5/18/98	-- --	258,000 197,000	Y Y	-- --
07386700	Ruth Canal near Ruth, LA	--	1940, 1947–85, 1997–98	1997 1940	-- 18.40	802 --	4/21/97	--	802	Y	--

¹Regulated during flood: N, no; Y, yes.

Maine

The town of Fort Fairfield (fig. 31) received its worst flooding in history when ice jams and excessive rains caused the Aroostook River to overflow its banks on April 16, 1994. Floodwaters several feet deep, carrying ice chunks 3 feet thick, caused approximately \$9 million in damage to businesses and residences (National Oceanic and Atmospheric Administration, 1994b).

Flooding throughout Maine occurred during January 27–30, 1996, when the last and most intense storm in a series of three low-pressure centers moved northeast from the Great Lakes. South to southeast winds brought warm temperatures and excessive rainfall to the area. Rainfall from the storm exceeded 4 inches in the western Maine mountains, with 2 to 3 inches common over much of central Maine (National Oceanic and Atmospheric Administration, 1996a). High runoff and ice jams caused flooding on many rivers and streams from the western mountains to the northeastern corner of the State.

Low pressure moving through western New England caused flooding in the southwestern part of Maine, April 16–18, 1996. Storm damage to non-Federal public property was estimated at \$2.5 million from the storm, including river and coastal flood damage and land-slump damage to public property (National Oceanic and Atmospheric Administration,

1996b). A Federal disaster was declared for five counties in southwestern Maine.

A coastal storm, fed with tropical moisture by the circulation around Hurricane Lily, produced between 8 and 19 inches of rain throughout southwestern Maine during a 30-hour period from October 20–23, 1996 (National Oceanic and Atmospheric Administration, 1996a). Damage was more than \$26 million (National Oceanic and Atmospheric Administration, 1996b). Streamgages on Branch Brook, the Little Ossipee River, and the Presumpscot River experienced their peak of record during this flood (table 20).

Rapidly melting snow, caused by record-breaking warmth, combined with rainfall caused flooding on the Kennebec and Androscoggin Rivers and their tributaries on March 30–31, 1998.

References

- National Oceanic and Atmospheric Administration (NOAA), 1994a–98a, Climatological data (by State): Asheville, North Carolina, National Climatic Data Center, various months.
 National Oceanic and Atmospheric Administration (NOAA), 1994b–98b, Storm data (by State): Asheville, North Carolina, National Climatic Data Center, various months.



Figure 31. Location of streamgages with significant floods during 1994–98 water years for Maine.

Table 20. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Maine.

[mi², square miles; ft, feet above an arbitrary datum; ft³/s, cubic feet per second; --, not determined or not applicable. Source: Recurrence intervals calculated from U.S. Geological Survey data. Other data from U.S. Geological Survey reports or databases]

Streamgage number (fig. 31)	Streamgage name	Total drainage (mi ²)	Maximum stage and discharge for period of record through 1998 water year				Significant floods 1994–98 water years				
			Period of record (water years)	Water year	Stage (ft)	Discharge (ft ³ /s)	Date (month/ day/ year)	Stage (ft)	Discharge (ft ³ /s)	Regulated during flood ¹	Recurrence interval (years)
01014000	Saint John River below Fish River, at Fort Kent, ME	5,665	1927–98	1979	27.31	151,000	4/17/94	26.60	144,000	N	40
01021200	Dennys River at Dennysville, ME	92.9	1956–98	1973	9.35	3,930	3/10/98	8.70	3,440	Y	40
01022294	East Branch Bear Brook near Beddington, ME	.04	1989–98	1998	6.91	18.6	3/9/98	6.91	18.6	N	40
01022295	West Branch Bear Brook near Beddington, ME	.04	1989–98	1998	6.75	16.4	3/9/98	6.75	16.4	N	40
01054200	Wild River at Gilead, ME	69.6	1960, 1965–98	1960	15.60	28,300	10/22/95	14.84	24,500	N	80
01064000	Presumpscot River at outlet of Sebago Lake, ME	441	1887–1998	1902	--	7,000	6/17/98	--	3,760	Y	25
01064118	Presumpscot River at Westbrook, ME	577	1976–95, 1997	1997	34.10	23,300	10/22/96	34.10	23,300	Y	250
01066000	Saco River at Cornish, ME	1,293	1917–98	1936	21.90	46,600	6/18/98	15.11	27,500	N	30
01066500	Little Ossipee River near South Limington, ME	168	1936, 1941–82, 1997	1997 1997	7.02 7.04	5,800 5,760	10/22/96	7.02	5,800	N	30
01069500	Mousam River near West Kennebunk, ME	99.0	1940–84, 1997	1983 1977	5.64 5.82	4,020 3,540	10/22/96	5.36	3,600	Y	50
01069700	Branch Brook near Kennebunk, ME	101.7	1965–74, 1997	1997	8.08	1,020	10/22/96	8.08	1,020	N	40

¹Regulated during flood: N, no; Y, yes.

Maryland

Unseasonably warm air was drawn northward around the circulation of a deepening storm west of the Appalachian Mountains (fig. 32) on January 18–19, 1996, causing melting of nearly all of a 1- to 2-foot deep snowpack. The melting snow and excessive rains associated with the storm caused widespread, and in some cases, catastrophic flooding and flash flooding on January 19. Flash flooding began at around the same time as the onset of excessive pre-frontal rains. Some areas received between 2 and 4 inches of rain during this period (National Oceanic and Atmospheric Administration, 1996a). Damage throughout Maryland was over \$30 million (National Oceanic and Atmospheric Administration, 1996b). Record floods occurred on Cattail Creek, Monacacy River, Morgan Run, Savage River, Wills Creek, and Youghiogheny River (table 21). The Potomac River was the highest since the Hurricane Agnes flood of 1972.

Torrential convective rainfall moved across north-central Maryland during the early morning hours of June 19, 1996, producing widespread and in some cases catastrophic flooding across the area. Damage estimates were \$7 million (National Oceanic and Atmospheric Administration, 1996b). Rainfall of more than 5.5 inches fell in Emmitsburg, with as much as 13 inches in nearby Gettysburg, Pennsylvania, during the late-night hours. The Monacacy River at Bridgeport (streamgage 01639000, table 21) had the largest flow since 1933 and the

largest flood of record. The worst damage was in Emmitsburg, where numerous residences, businesses, and farms were flooded. There was one fatality approximately 3 miles southwest of Emmitsburg, where a woman left her van along Little Owens Creek and was swept away by the floodwaters.

The track of Tropical Storm Fran from south-central through western Virginia on September 6, 1996, allowed gusty southeast winds at and just above the surface to channel water up the Chesapeake Bay and its main tributaries. This became a small-scale storm surge, containing 6-foot waves and tides that ran in some places nearly 6 feet above normal. Torrential rains associated with Tropical Storm Fran caused the rapid onset of river flooding along the headwaters of the Potomac River late on September 6, spreading gradually southeast throughout the entire basin by early September 10. Damage was estimated to be more than \$14 million in the State of Maryland (National Oceanic and Atmospheric Administration, 1996b).

References

- National Oceanic and Atmospheric Administration (NOAA), 1996a, Climatological data (by State): Asheville, North Carolina, National Climatic Data Center, various months.
National Oceanic and Atmospheric Administration (NOAA), 1996b, Storm data (by State): Asheville, North Carolina, National Climatic Data Center, various months.

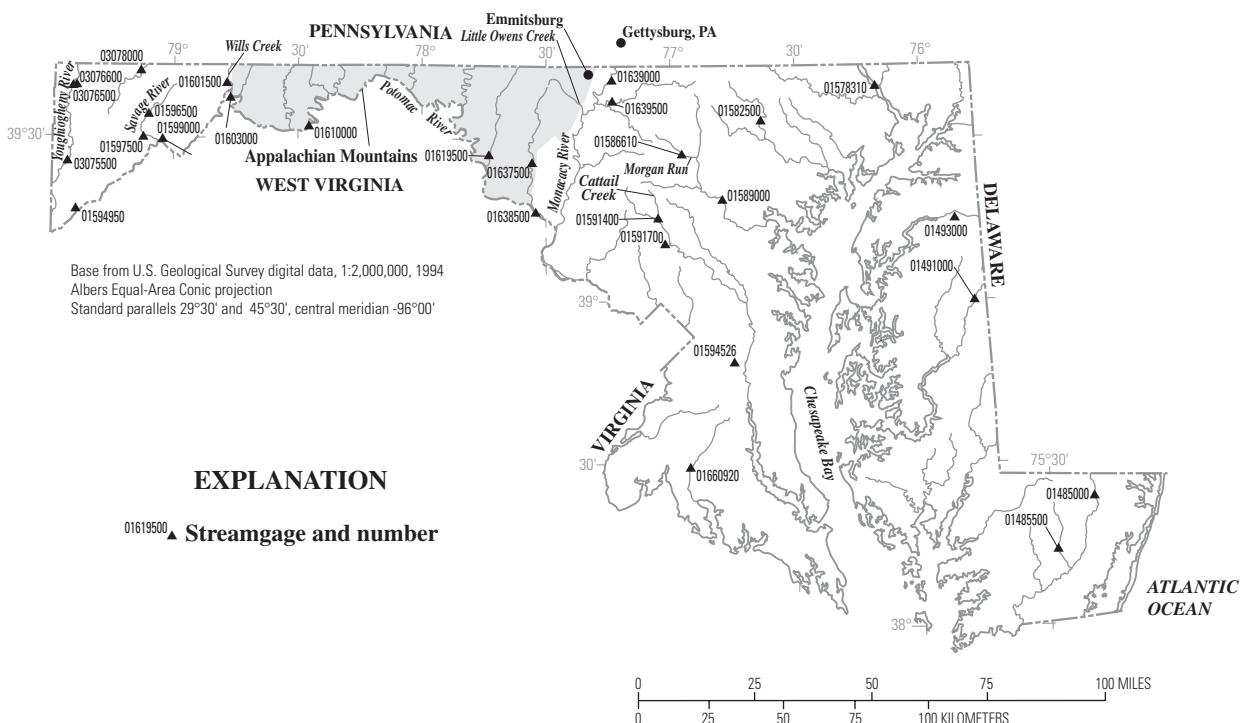


Figure 32. Location of streamgages with significant floods during 1994–98 water years for Maryland.

Table 21. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Maryland.

[mi², square miles; ft, feet above an arbitrary datum; ft³/s, cubic feet per second; --, not determined or not applicable. Source: Recurrence intervals calculated from U.S. Geological Survey data. Other data from U.S. Geological Survey reports or databases]

Streamgage number (fig. 32)	Streamgage name	Total drainage (mi ²)	Maximum stage and discharge for period of record through 1998 water year				Significant floods 1994–98 water years				
			Period of record (water years)	Water year	Stage (ft)	Discharge (ft ³ /s)	Date (month/ day/ year)	Stage (ft)	Discharge (ft ³ /s)	Regulated during flood ¹	Recurrence interval (years)
01485000	Pocomoke River near Willards, MD	60.5	1950–98	1989	15.41	2,820	1/29/98	13.90	1,970	N	30–35
01485500	Nassawango Creek near Snow Hill, MD	44.9	1950–98	1998	8.13	2,300	1/29/98	8.13	2,300	N	75
				1989	9.07	3,930					
01491000	Choptank River near Greensboro, MD	113	1948–98	1967	14.47	6,970	12/14/96	12.52	5,120	N	15–20
01493000	Unicorn Branch near Millington, MD	19.7	1948–98	1997	6.09	1,160	6/19/96	5.98	1,090	N	15–20
				1960	7.17	1,060	12/14/96	6.09	1,160	N	15–20
01578310	Susquehanna River at Conowingo, MD	27,100	1968–98	1972	36.83	1,130,000	1/20/96	34.18	909,000	Y	--
01582500	Gunpowder Falls at Glencoe, MD	160	1984–98	1994	13.72	5,180	3/4/94	13.72	5,180	Y	--
01586610	Morgan Run near Louisville, MD	28.0	1983–98	1996	8.45	3,550	1/19/96	8.45	3,550	N	10–20
01589000	Patapsco River at Hollofield, MD	285	1933, 1945–91, 1994	1972	31.30	80,600	4/14/94	3.99	15,700	Y	--
01591400	Cattail Creek near Glenwood, MD	22.9	1979–98	1996	8.96	5,210	1/19/96	8.96	5,210	N	10–25
				1979	11.69	4,000					
01591700	Hawlings River near Sandy Spring, MD	27.0	1979–98	1996	9.24	5,180	1/19/96	9.24	5,180	N	15–25
01594526	Western Branch at Upper Marlboro, MD	89.7	1986–89, 1993–98	1996	13.20	3,630	1/19/96	13.20	3,630	N	5–10
01594950	McMillan Fork near Fort Pendleton, MD	2.30	1987–98	1994	7.23	340	2/9/94	7.23	340	N	10–20
01596500	Savage River near Barton, MD	49.1	1949–98	1955	8.45	7,510	9/6/96	7.97	6,620	N	100
01597500	Savage River below Savage River dam near Bloomington, MD	106	1949–98	1996	7.81	9,190	9/7/96	7.81	9,190	Y	--
				1986	7.81	8,550					
01599000	Georges Creek at Franklin, MD	72.4	1924, 1931–98	1936	9.60	8,500	9/6/96	12.77	6,500	N	45–50
				1996	12.77	6,500					

Table 21. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Maryland.—Continued

[mi², square miles; ft, feet above an arbitrary datum; ft³/s, cubic feet per second; --, not determined or not applicable. Source: Recurrence intervals calculated from U.S. Geological Survey data. Other data from U.S. Geological Survey reports or databases]

Streamgage number (fig. 32)	Streamgage name	Total drainage (mi ²)	Maximum stage and discharge for period of record through 1998 water year				Significant floods 1994–98 water years				
			Period of record (water years)	Water year	Stage (ft)	Discharge (ft ³ /s)	Date (month/ day/ year)	Stage (ft)	Discharge (ft ³ /s)	Regulated during flood ¹	Recurrence interval (years)
01601500	Wills Creek near Cumberland, MD	247	1924, 1930–98	1996	23.11	45,900	1/19/96	23.11	45,900	N	200
01603000	North Branch Potomac River near Cumberland, MD	877	1889, 1924, 1930–98	1936 1889	29.10 29.20	88,200 89,000	1/19/96	25.56	59,200	Y	--
01610000	Potomac River at Paw Paw, WV	3,129	1877, 1889, 1924, 1928, 1936, 1939–98	1936	54.00	240,000	9/7/96	43.45	140,000	N	30–35
01619500	Antietam Creek near Sharpsburg, MD	281	1928–98	1956	16.73	12,600	1/19/96	13.71	8,960	N	25–30
01637500	Catoctin Creek near Middletown, MD	66.9	1948–98	1977	14.13	12,000	1/19/96	11.72	8,560	N	20–25
01638500	Potomac River at Point of Rocks, MD	9,651	1889, 1895–1998	1936	41.03	480,000	1/21/96	36.34	310,000	N	40
01639000	Monocacy River at Bridgeport, MD	173	1933, 1942–98	1996	25.42	24,400	6/19/96	25.42	24,400	N	95–100
01639500	Big Pipe Creek at Bruceville, MD	102	1948–98	1975	18.98	28,000	1/19/96	13.65	10,100	N	20–25
01660920	Zekiah Swamp Run near Newtown, MD	79.9	1984–98	1994 1986	5.26 5.74	3,380 982	3/29/94	5.26	3,380	N	10–25
03075500	Youghiogheny River near Oakland, MD	134	1936, 1942–98	1996 1936	13.06 15.30	14,100	1/19/96	13.06	14,100	N	50–100
03076500	Youghiogheny River at Friendsville, MD	295	1899–1905, 1923–31, 1940–98	1996 1924	9.54 14.20	16,100 15,600	2/9/94 1/19/96	8.25 9.54	12,000 16,100	Y Y	15–20 --
03076600	Bear Creek at Friendsville, MD	48.9	1965–98	1971	9.60	4,650	1/19/96	8.82	4,310	N	50
03078000	Casselman River at Grantsville, MD	62.5	1948–98	1955	10.70	8,400	1/19/96	9.15	6,410	N	50–100

¹Regulated during flood: N, no; Y, yes.

Massachusetts

On June 13, 1996, thunderstorms with torrential downpours produced a flash flood that resulted in the worst flooding on the Sawmill River in 100 years of records (fig. 33). The Massachusetts Emergency Management Agency estimated damage from this flood at close to \$2 million (National Oceanic and Atmospheric Administration, 1996b). Local residents who had lived in the area for many years said this was the worst flooding they had witnessed since the Great New England Hurricane of 1938.

An extensive, slow-moving surface low-pressure system became positioned along the mid-Atlantic Coast during the evening of October 19, 1996. Record-breaking rainfall occurred in northeastern Massachusetts where intense rain bands remained stationary for many hours. Rainfall totals of 8 inches were widespread with this storm (National Oceanic and Atmospheric Administration, 1996a) and resulted in widespread small stream and tributary flooding. A maximum storm total of 13.03 inches was recorded at Newburyport, exceeding the 100-year, 2-day precipitation (National Oceanic and Atmospheric Administration, 1996a). There was widespread severe urban flooding, especially in downtown Boston and from the Greater Boston Metropolitan Area northward as rainfall of

historic proportions occurred there. Damage from the excessive rain was in the tens of millions of dollars (National Oceanic and Atmospheric Administration, 1996b). The Shawsheen and Parker Rivers set new flood-of-record discharges (table 22).

On June 12–14, 1998, a very slow-moving storm system moved through southeastern New England. The combination of its slow movement and the presence of tropical moisture across the region caused the storm to produce rainfall of 6 to 12 inches (National Oceanic and Atmospheric Administration, 1998a) over much of eastern Massachusetts, resulting in widespread urban, small stream, and river flooding. Damage was estimated at \$13 million (National Oceanic and Atmospheric Administration, 1998b). Record floods occurred on the Threemile River at North Dighton (streamgage 01109060, table 22).

References

- National Oceanic and Atmospheric Administration (NOAA), 1996a–98a, Climatological data (by State): Asheville, North Carolina, National Climatic Data Center, various months.
National Oceanic and Atmospheric Administration (NOAA), 1996b–98b, Storm data (by State): Asheville, North Carolina, National Climatic Data Center, various months.

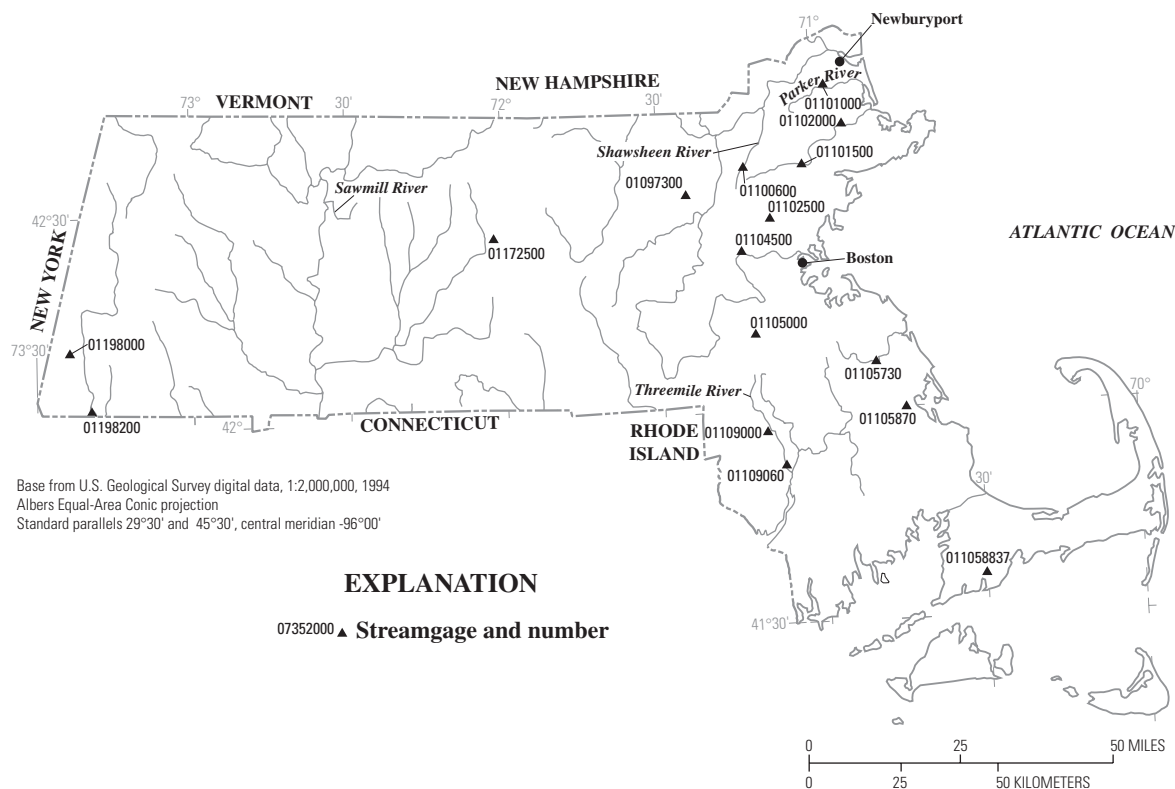


Figure 33. Location of streamgages with significant floods during 1994–98 water years for Massachusetts.

Table 22. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Massachusetts.

[mi², square miles; ft, feet above an arbitrary datum; ft³/s, cubic feet per second; --, not determined or not applicable. Source: Recurrence intervals calculated from U.S. Geological Survey data. Other data from U.S. Geological Survey reports or databases]

Streamgage number (fig. 33)	Streamgage name	Total drainage (mi ²)	Maximum stage and discharge for period of record through 1998 water year				Significant floods 1994–98 water years				
			Period of record (water years)	Water year	Stage (ft)	Discharge (ft ³ /s)	Date (month/ day/ year)	Stage (ft)	Discharge (ft ³ /s)	Regulated during flood ¹	Recurrence interval (years)
01097300	Nashoba Brook near Acton, MA	12.8	1964–98	1979 1998	5.57 6.89	679 293	10/21/96	5.55	665	N	30
01100600	Shawsheen River near Wilmington, MA	36.5	1964–98	1997	10.49	1,850	10/22/96	10.49	1,850	N	70
01101000	Parker River at Byfield, MA	21.3	1946–98	1997	7.82	883	10/22/96	7.82	883	N	150
01101500	Ipswich River at South Middleton, MA	44.5	1938–98	1987 1997	7.51 7.88	1,010 896	10/21/96	7.88	896	N	30
01102000	Ipswich River near Ipswich, MA	125	1931–98	1987	9.43	3,550	10/23/96	8.98	3,120	N	60
01102500	Aberjona River at Winchester, MA	24.7	1940–98	1979 1997	15.46 16.78	1,330 1,150	10/21/96 6/14/98	16.78 15.22	1,150 1,070	N N	50 50
01104500	Charles River at Waltham, MA	251	1932–98	1976	6.54	4,150	10/21/96	6.05	2,990	Y	20
01105000	Neponset River at Norwood, MA	34.7	1938, 1940–98	1955	14.65	1,490	6/14/98	10.89	1,100	Y	50
01105730	Indian Head River at Hanover, MA	30.3	1967–98	1968	7.13	1,390	10/21/96	6.76	1,290	N	50
01105870	Jones River at Kingston, MA	19.8	1967–98	1968 1997	4.60 5.18	575 343	10/21/96	5.18	343	Y	10
011058837	Quashnet River at Waquoit Village, MA	2.58	1989–98	1998	3.09	42	7/1/98	3.09	42	Y	10
01109000	Wading River near Norton, MA	43.3	1926–98	1968	11.47	1,460	6/14/98	11.47	1,220	N	50
01109060	Threemile River at North Dighton, MA	84.3	1967–98	1998	8.89	2,870	6/16/98	8.89	2,870	N	50
01172500	Ware River near Barre, MA	55.1	1947–94, 1996–98	1956	6.31	1,890	1/30/96	5.34	1,350	Y	15–20
01198000	Green River near Great Barrington, MA	51.0	1952–71, 1994–96	1996	9.84	6,740	7/13/96	9.84	6,740	N	>200
01198200	Konkapot River at Ashley Falls, MA	61.1	1963–71, 1994–96	1996	6.29	1,280	1/28/96	6.29	1,280	N	20

¹Regulated during flood: N, no; Y, yes.

Michigan

Repeated, highly localized, excessive rainfall near Juniata, Michigan (fig. 34), on July 8, 1994, resulted in flooding along the Cass River. Damage to roads, bridges, buildings, and so forth was estimated to be approximately \$1.5 million (National Oceanic and Atmospheric Administration, 1994b).

Melting of a deep snowpack during April 19–26, 1996, triggered flooding on the Escanaba and Ford Rivers and their tributaries in the central part of the Upper Peninsula. Damage was estimated at nearly \$1.6 million (National Oceanic and Atmospheric Administration, 1996b).

On May 10, 1996, 24-hour rainfall totals of 8 to 9 inches southeast of Benton Harbor, Michigan (National Oceanic and Atmospheric Administration, 1996a), caused over \$5 million in damage from flooding (National Oceanic and Atmospheric Administration, 1996b). One week later on May 18, excessive rains on Isle Royale caused the greatest discharge in 33 years of record on Washington Creek at Windigo (streamgage 04001000, table 23).

Severe thunderstorms developed along a warm front across central lower Michigan during the evenings of June 20 and 21, 1997. The storms moved southeast across the Saginaw River Basin and the Thumb Region and produced excessive rainfall. As a result of this weather, flash flooding caused \$19 million in property damage (National Oceanic and Atmospheric Administration, 1997b). Flash flooding was widespread throughout the Saginaw River Basin and most of eastern Michigan.

References

- National Oceanic and Atmospheric Administration (NOAA), 1994a–97a, Climatological data (by State): Asheville, North Carolina, National Climatic Data Center, various months.
- National Oceanic and Atmospheric Administration (NOAA), 1994b–97b, Storm data (by State): Asheville, North Carolina, National Climatic Data Center, various months.



Table 23. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Michigan.

[mi², square miles; ft, feet above an arbitrary datum; ft³/s, cubic feet per second; --, not determined or not applicable; >, greater than. Source: Recurrence intervals calculated from U.S. Geological Survey data. Other data from U.S. Geological Survey reports or databases]

Streamgage number (fig. 34)	Streamgage name	Total drainage (mi ²)	Maximum stage and discharge for period of record through 1998 water year				Significant floods 1994–98 water years				
			Period of record (water years)	Water year	Stage (ft)	Discharge (ft ³ /s)	Date (month/ day/ year)	Stage (ft)	Discharge (ft ³ /s)	Regulated during flood ¹	Recurrence interval (years)
04001000	Washington Creek at Windigo, MI	13.2	1965–98	1996	8.17	657	5/18/96	8.17	657	N	25–50
04057510	Sturgeon River near Nahma Junction, MI	183	1967–98	1985	11.50	2,120	4/26/96	11.11	1,900	N	25–50
04059500	Ford River near Hyde, MI	450	1955–98	1960	8.27	7,590	4/26/96	7.45	5,630	N	25
04061500	Paint River at Crystal Falls, MI	597	1945–98	1960	9.82	10,900	4/26/96	7.89	7,300	N	25
04102500	Paw Paw River at Riverside, MI	390	1952–98	1987	10.90	3,580	2/24/97	10.66	3,110	N	25–50
04102700	South Branch Black River near Bangor, MI	83.6	1967–98	1997	14.90	2,390	2/21/97	14.90	2,390	N	25–50
04106320	West Fork Portage Creek near Oshtemo, MI	13.0	1973–98	1993	2.47	36	10/28/94	2.42	36	N	25–50
04106400	West Fork Portage Creek at Kalamazoo, MI	18.7	1960–98	1997	3.33	46	6/21/97	3.33	46	N	10–25
04108600	Rabbit River near Hopkins, MI	71.4	1966–98	1997	11.11	3,740	6/21/97	11.11	3,740	N	50–100
04108645	Rabbit River at Hamilton, MI	274	1979–98	1997	21.60	12,000	6/21/97	21.60	12,000	N	50–100
04108800	Macatawa River near Zeeland, MI	65.8	1961–98	1997	16.72	8,810	6/21/97	16.72	8,810	N	50–100
04115000	Maple River at Maple Rapids, MI	434	1945–98	1986	12.33	8,770	7/8/94	10.27	5,610	N	25
04115265	Fish Creek near Crystal, MI	39.7	1988–98	1990	5.53	558	2/21/97	4.99	320	N	10–20
04119055	Plaster Creek at Grand Rapids, MI	46.6	1974–98	1997	13.43	2,300	2/22/97	13.43	2,300	N	25–50
04130500	Black River near Tower, MI	311	1943–98	1960	7.13	2,340	4/1/98	6.41	1,860	N	25
04135500	Au Sable River at Grayling, MI	110	1943–94	1994	3.25	322	7/6/94	3.25	322	N	>100
04135700	South Branch Au Sable River near Luzerne, MI	401	1967–89, 1991–98	1976	7.30	1,120	4/7/97	6.87	940	N	10–20
04136500	Au Sable River at Mio, MI	1,361	1953–98	1998	6.37	4,380	4/1/98	6.37	4,380	Y	25–50

Table 23. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Michigan.—Continued

[mi², square miles; ft, feet above an arbitrary datum; ft³/s, cubic feet per second; --, not determined or not applicable; >, greater than. Source: Recurrence intervals calculated from U.S. Geological Survey data. Other data from U.S. Geological Survey reports or databases]

Streamgage number (fig. 34)	Streamgage name	Total drainage (mi ²)	Maximum stage and discharge for period of record through 1998 water year				Significant floods 1994–98 water years				
			Period of record (water years)	Water year	Stage (ft)	Discharge (ft ³ /s)	Date (month/ day/ year)	Stage (ft)	Discharge (ft ³ /s)	Regulated during flood ¹	Recurrence interval (years)
04147500	Flint River near Otisville, MI	530	1953–89, 1991–98	1996	15.73	7,470	6/24/96	15.73	7,470	N	25–50
04160350	Pine River near Rattle Run, MI	135	1974–98	1996	24.24	5,730	6/22/96	24.24	5,730	N	25–50
04161540	Paint Creek at Rochester, MI	70.9	1960–98	1968	5.22	918	6/19/96	--	890	N	10–25
				1965	5.95	880					
04163400	Plum Brook at Utica, MI	16.5	1966–98	1996	10.62	1,290	6/18/96	10.62	1,290	N	25–50
04166000	River Rouge at Birmingham, MI	33.3	1951–98	1968	8.70	1,390	6/18/96	7.36	1,070	N	25
04166200	Evans Ditch at Southfield, MI	9.49	1959–98	1982	15.03	1,200	8/6/98	12.83	962	N	15–25
04176605	Otter Creek at La Salle, MI	51.0	1988–98	1997	11.60	3,010	6/2/97	11.60	3,010	N	25–50

¹Regulated during flood: N, no; Y, yes.

Minnesota

Excessive rainfall of between 5 and 15 inches in the region north of Montevideo, Minnesota (fig. 35), resulted in major property and crop damage on July 3, 1995 (National Oceanic and Atmospheric Administration, 1995a). The Chippewa River near Milan (streamgage 05304500, table 24) rose 9 feet on July 3 and 4, and crested at 13.48 feet on July 6. This was the second highest crest ever for the Chippewa River near Milan.

Moderate to severe flooding occurred on the Red River of the North and many of its tributaries in Minnesota during April 1996. Above-normal precipitation was observed over the basin for the 6 months prior to the flood. In addition, deep snow cover, with drifts as much as 12 feet high, lingered into early April (National Oceanic and Atmospheric Administration, 1996b). This combined with a rapid snowmelt to produce a significant spring flood despite below-average precipitation from mid-March through April. Ice jams contributed to the flooding. The flooding was, for many areas, the worst since 1979 and the most devastating on record. Three streamgages had peaks of record (table 24). Eleven counties were declared Federal disaster areas.

The 1997 spring flooding along the upstream reaches of the Minnesota River and Red River of the North broke many existing flood records in Minnesota. The winter of 1996–97 had extraordinary snowfall with most areas having more than 6 feet of snow, which is two to three times greater than normal. Fargo, North Dakota, had 117 inches of snow compared to an average of 39 inches. Several other cities had in excess of 100 inches (National Oceanic and Atmospheric Administration, 1997a). The western Minnesota towns of Crookston and Madison had 3.08 and 3.14 inches of rain, respectively, on this snowpack on April 5–6 and coupled with warm air temperatures resulted in rapid snowmelt in western Minnesota and eastern North Dakota. Temperatures were approximately 10 degrees above normal in the first week of April. However, during the second and third weeks, temperatures were 20 degrees below normal.

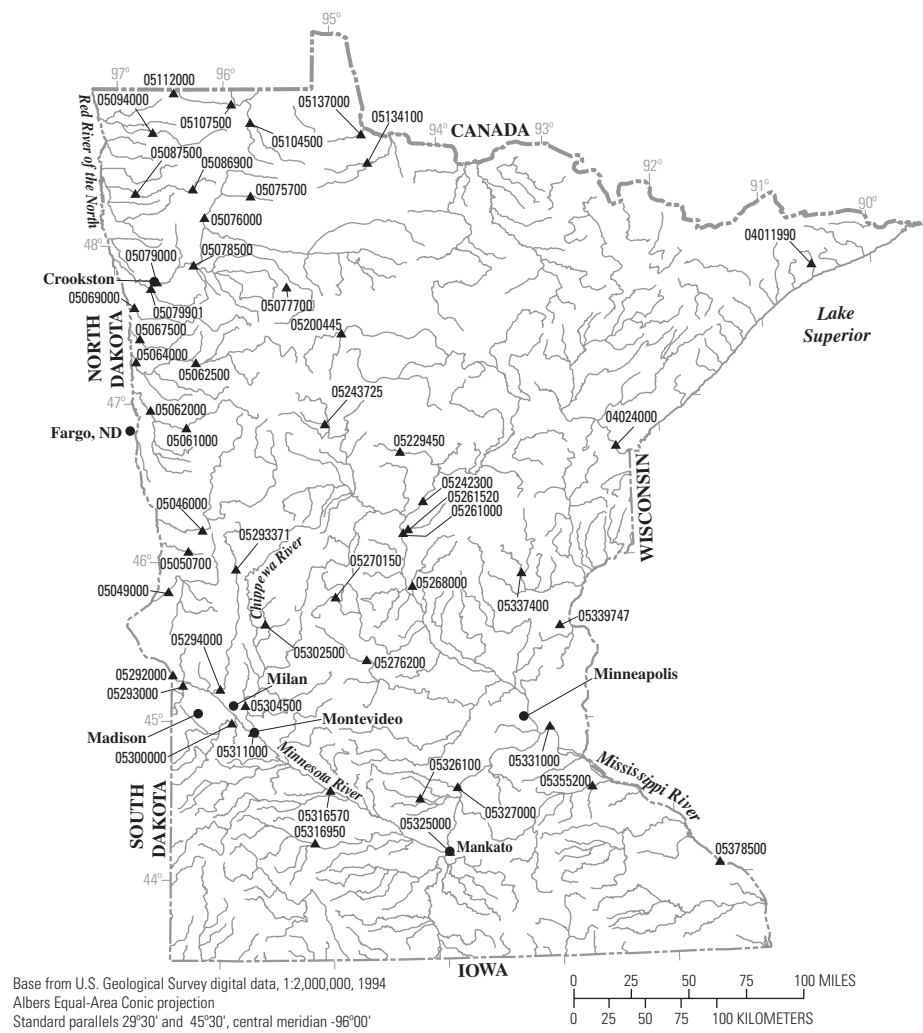
Flood workers had to struggle in the middle of a blizzard at times to save property. Twenty-three streamgages in Minnesota experienced their peak of record during the flood of 1997 (table 24).

The Federal Emergency Management Agency's (FEMA's) estimate of public infrastructure damage in Minnesota from the 1997 flood was approximately \$300 million (Federal Emergency Management Agency, 1997). Before the water receded, 58 of Minnesota's 87 counties were declared Federal disaster areas. The American Red Cross reported that the massive floods affected 23,263 families. Total flood damage and associated economic impacts were estimated to be as high as \$2 billion (Minnesota Department of Natural Resources, 1997).

Excessive rainfall of as much as 9.5 inches on June 17, 1997, resulted in scattered mud slides and widespread street and basement flooding in the Mankato area. Total damage to the area around Mankato exceeded \$20 million (National Oceanic and Atmospheric Administration, 1997b).

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- National Oceanic and Atmospheric Administration (NOAA), 1995b–97b, Storm data (by State): Asheville, North Carolina, National Climatic Data Center, various months.



EXPLANATION

05325000 ▲ Streamgauge and number

Figure 35. Location of streamgages with significant floods during 1994–98 water years for Minnesota.

Table 24. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Minnesota.

[mi², square miles; ft, feet above an arbitrary datum; ft³/s, cubic feet per second; --, not determined or not applicable; >, greater than. Source: Recurrence intervals calculated from U.S. Geological Survey data. Other data from U.S. Geological Survey reports or databases]

Streamgage number (fig. 35)	Streamgage name	Total drainage (mi ²)	Maximum stage and discharge for period of record through 1998 water year				Significant floods 1994–98 water years				
			Period of record (water years)	Water year	Stage (ft)	Discharge (ft ³ /s)	Date (month/ day/ year)	Stage (ft)	Discharge (ft ³ /s)	Regulated during flood ¹	Recurrence interval (years)
04011990	Cascade River at Forest Road 45 near Grand Marais, MN	--	1985–98	1996	12.95	1,350	5/19/96	12.95	1,350	N	>10
04024000	St. Louis River at Scanlon, MN	3,430	1908–98	1950	--	37,900	4/21/96	--	27,600	Y	>10
				1979	13.93	34,200					
05046000	Otter Tail River below Orwell Dam near Fergus Falls, MN	1,740	1931–98	1953	5.60	1,710	5/22/97	4.63	1,500	Y	>10
05049000	Mustinka River above Wheaton, MN	834	1916–17, 1919–24, 1931–58, 1985–98	1997	23.63	8,800	4/7/97	23.63	8,800	N	>25
05050700	Rabbit River near Nashua, MN	56.1	1979–98	1997	15.76	1,640	4/5/97	15.76	1,640	N	>10
05061000	Buffalo River near Hawley, MN	325	1921, 1945–98	1997	10.77	2,360	4/6/97	10.77	2,360	N	>25
				1921	11.30	3,000					
05062000	Buffalo River near Dilworth, MN	975	1931–98	1975	27.10	13,600	4/6/97	27.02	8,370	N	>25
05062500	Wild Rice River at Twin Valley, MN	934	1909–17, 1931–98	1997	15.91	10,000	4/6/97	15.91	10,000	N	>100
05064000	Wild Rice River at Hendrum, MN	1,560	1944–98	1997	33.85	10,600	4/18/97	33.85	10,600	Y	>50
05067500	Marsh River near Shelly, MN	220	1944–98	1979	23.36	4,880	4/18/97	25.45	4,300	Y	>10
				1997	25.45	4,300					
05069000	Sand Hill River at Climax, MN	420	1943–98	1965	17.81	4,560	4/19/96	25.17	4,290	N	>10
				1997	39.40	4,360	4/20/97	39.40	4,360	N	>10
05075700	Mud River near Grygla, MN	170	1979–98	1996	18.57	1,950	4/19/96	18.57	1,950	N	>25
				1997	19.00	1,400					
05076000	Thief River near Thief River Falls, MN	985	1909–17, 1919–26, 1929–98	1950	17.38	5,610	4/22/97	15.20	4,120	Y	>10
05077700	Ruffy Brook near Gonvick, MN	45.2	1961–80, 1982–98	1996	5.78	455	4/19/96	5.78	455	N	>10
				1962	6.70	364					
05078500	Clearwater River at Red Lake Falls, MN	1,380	1910–17, 1919, 1935–98	1979	12.38	10,300	4/19/96	12.24	9,400	N	>10
				1995	13.25	3,110					

Table 24. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Minnesota.—Continued

[mi², square miles; ft, feet above an arbitrary datum; ft³/s, cubic feet per second; --, not determined or not applicable; >, greater than. Source: Recurrence intervals calculated from U.S. Geological Survey data. Other data from U.S. Geological Survey reports or databases]

Streamgage number (fig. 35)	Streamgage name	Total drainage (mi ²)	Maximum stage and discharge for period of record through 1998 water year				Significant floods 1994–98 water years				
			Period of record (water years)	Water year	Stage (ft)	Discharge (ft ³ /s)	Date (month/ day/ year)	Stage (ft)	Discharge (ft ³ /s)	Regulated during flood ¹	Recurrence interval (years)
05079000	Red Lake River at Crookston, MN	5,270	1897, 1902, 1904–20, 1922–98	1969	27.33	28,400	4/20/96 4/18/97	24.84 28.40	21,700 28,000	N N	>10 >50
05079901	Burnham Creek near Crookston, MN	--	1986–98	1997	22.63	3,000	4/15/97	22.63	3,000	N	>10
05086900	Middle River near Newfolden, MN	91.1	1979–98	1996 1997	18.31 18.71	2,300 2,000	5/18/96	18.31	2,300	N	>25
05087500	Middle River at Argyle, MN	255	1945, 1950–98	1996	18.27	5,020	5/19/96 4/19/97	18.27 17.96	5,020 4,330	N N	>50 >25
05094000	South Branch Two Rivers at Lake Bronson, MN	422	1929–37, 1941–47, 1954–98	1966	18.23	5,410	4/22/96 4/20/97	14.45 14.58	4,290 4,260	N N	>10 >10
05104500	Roseau River below South Fork near Malung, MN	430	1929–38, 1940–98	1996 1966	-- 23.37	7,310 5,050	5/19/96	--	7,310	N	>50
05107500	Roseau River at Ross, MN	1,090	1896, 1919, 1927, 1929–91, 1995–98	1950 1896	18.25 19.00	6,560 8,200	4/26/97	17.30	4,670	N	>10
05112000	Roseau River below State Ditch 51 near Caribou, MN	1,420	1917, 1920–98	1950	11.81	4,080	5/18/96 5/8/97	10.78 2.00	3,350 3,320	N N	>25 >25
05134100	North Branch Rapid River near Baudette, MN	180	1986–98	1996	13.27	1,550	5/18/96	13.27	1,550	N	>10
05137000	Winter Road River near Baudette, MN	145	1986–98	1996	15.35	2,420	5/18/96	15.35	2,420	N	>25
05200445	Mississippi River at Bemidji, MN	400	1973–98	1997	13.17	1,820	4/18/97	13.17	1,820	Y	>25
05229450	Pine River near Pine River, MN	--	1986–98	1997 1990	5.19 5.25	1,410 1,100	4/6/97	5.19	1,410	N	>10

Table 24. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Minnesota.—Continued

[mi², square miles; ft, feet above an arbitrary datum; ft³/s, cubic feet per second; --, not determined or not applicable; >, greater than. Source: Recurrence intervals calculated from U.S. Geological Survey data. Other data from U.S. Geological Survey reports or databases]

Streamgage number (fig. 35)	Streamgage name	Total drainage (mi ²)	Maximum stage and discharge for period of record through 1998 water year				Significant floods 1994–98 water years				
			Period of record (water years)	Water year	Stage (ft)	Discharge (ft ³ /s)	Date (month/ day/ year)	Stage (ft)	Discharge (ft ³ /s)	Regulated during flood ¹	Recurrence interval (years)
05242300	Mississippi River at Brainerd, MN	7,320	1988–98	1997	16.03	15,400	4/10/97	16.03	15,400	Y	>10
05243725	Straight River near Park Rapids, MN	53.2	1987–98	1997	2.33	149	4/6/97	2.33	149	N	>50
05261000	Mississippi River near Fort Ripley, MN	11,010	1972–98	1997	14.15	32,200	4/8/97	14.15	32,200	Y	>25
05261520	Nokasippi River below Fort Ripley, MN	178	1986–98	1997	14.93	1,030	4/9/97	14.93	1,030	N	>10
05268000	Platte River at Royalton, MN	432	1930–36, 1972–98	1972 1997	7.84 14.72	6,850 3,800	4/5/97	14.72	3,800	N	>10
05270150	Ashley Creek near Sauk Centre, MN	113	1986–98	1997	17.12	740	4/6/97	17.12	740	N	>10
05276200	North Fork Crow River at Paynesville, MN	243	1973–98	1997	8.85	2,460	4/3/97	8.85	2,460	N	>10
05292000	Minnesota River at Ortonville, MN	1,160	1938–98	1997	12.85	5,070	4/10/97	12.85	5,070	Y	>50
05293000	Yellow Bank River near Odessa, MN	459	1940–98	1969	19.07	6,970	4/2/97	17.94	6,770	N	45
05293371	Pomme de Terre (site 210) near Elbow Lake, MN	--	1986–98	1997 1993	6.72 7.08	550 420	4/7/97	6.72	550	N	>25
05294000	Pomme de Terre River at Appleton, MN	905	1931–98	1997	18.13	8,890	4/7/97	18.13	8,890	Y	>500
05300000	Lac Qui Parle River near Lac Qui Parle, MN	960	1911–14, 1931–98	1969 1965	18.94 19.37	17,100 8,370	4/7/97	17.68	13,100	N	>50
05302500	Little Chippewa River near Starbuck, MN	94.1	1979–98	1997	15.45	850	4/6/97	15.45	850	N	>100
05304500	Chippewa River near Milan, MN	1,880	1937–98	1997	18.03	14,400	7/6/95 4/6/97	13.48 18.03	8,440 14,400	N N	>10 >100

Table 24. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Minnesota.—Continued

[mi², square miles; ft, feet above an arbitrary datum; ft³/s, cubic feet per second; --, not determined or not applicable; >, greater than. Source: Recurrence intervals calculated from U.S. Geological Survey data. Other data from U.S. Geological Survey reports or databases]

Streamgage number (fig. 35)	Streamgage name	Total drainage (mi ²)	Maximum stage and discharge for period of record through 1998 water year				Significant floods 1994–98 water years				
			Period of record (water years)	Water year	Stage (ft)	Discharge (ft ³ /s)	Date (month/ day/ year)	Stage (ft)	Discharge (ft ³ /s)	Regulated during flood ¹	Recurrence interval (years)
05311000	Minnesota River at Montevideo, MN	6,180	1910–98	1997	23.90	47,500	4/6/97	23.90	47,500	Y	>50
05316570	Beaver Creek near Beaver Falls, MN	194	1972–80, 1982–98	1997	14.73	3,300	4/2/97	14.73	3,300	N	>100
05316950	Cottonwood River near Springfield, MN	777	1973–98	1997	28.77	7,860	3/29/97	28.77	7,860	N	>5
05325000	Minnesota River at Mankato, MN	14,900	1881, 1903–98	1965 1993	29.09 30.11	94,100 75,600	4/10/97	27.61	79,800	Y	>50
05326100	Middle Branch Rush River near Gaylord, MN	67.3	1979–98	1997 1979	19.22 21.00	3,200 715	3/28/97	19.22	3,200	N	>100
05327000	High Island Creek near Henderson, MN	237	1974–98	1997 1993	9.31 9.72	2,830 2,750	7/25/97	9.31	2,830	N	>10
05331000	Mississippi River at St. Paul, MN	36,800	1867–70, 1872–1998	1965	26.01	171,000	4/13/97	22.37	134,000	Y	>50
05337400	Knife River near Mora, MN	102	1975–98	1997	6.48	1,870	4/6/97	6.48	1,870	N	>5
05339747	Goose Creek at Harris, MN	--	1986–98	1996	7.50	295	4/19/96	7.50	295	N	>5
05355200	Cannon River at Welch, MN	1,340	1888, 1911–13, 1931–87, 1992–98	1965 1998	14.01 15.05	36,100 23,500	6/27/98	15.05	23,500	Y	50
05378500	Mississippi River at Winona, MN	59,200	1879–1922, 1924–98	1965	20.77	268,000	4/11/97	18.27	194,000	Y	>25

¹Regulated during flood: N, no; Y, yes.

Mississippi

During May 8–10, 1995, extreme weather conditions, which produced as much as 27.5 inches of rain during a 55-hour period (National Oceanic and Atmospheric Administration, 1995a), caused the most severe flooding in recent history along coastal areas of the Gulf of Mexico in Mississippi and southeastern Louisiana. At least six people died, and thousands more were left homeless as a result of the intense flooding. At least \$3 billion in property damage was reported in New Orleans, Louisiana, alone, and millions more in damage was reported in the Gulf Coast counties of Mississippi and parishes in southeastern Louisiana as a result of the storm (National Oceanic and Atmospheric Administration, 1995b). In Mississippi, flooding was most severe in the Biloxi and Wolf River Basins (fig. 36, table 25). The response of these rivers to the storm was both rapid and devastating as rivers in the affected basins reached record or near-record stages and returned to below flood stage within 48 hours after the end of the rainfall.

The Mississippi River went above flood stage around March 9, 1997, and crested between March 21 and 26. Considerable damage occurred on the Mississippi side of the river downstream from the confluence of the Mississippi and the Arkansas Rivers (National Oceanic and Atmospheric Administration, 1997b).

Flash flooding occurred due to excessive rainfall totaling 6.40 inches near Lexington, Mississippi, during June 9–10,

1997 (National Oceanic and Atmospheric Administration, 1997a). Mississippi Emergency Management Agency estimated damage at \$3.5 million dollars (National Oceanic and Atmospheric Administration, 1997b). Approximately 1,000 people were evacuated. The town's eastern commercial area was inundated by floodwaters.

On September 28, 1998, Hurricane Georges made landfall just east of Biloxi, Mississippi, with maximum sustained winds of about 105 miles per hour. At landfall, Georges was a strong category 2 hurricane. From September 28–30, 1998, Georges brought torrents of rain to the central Gulf Coast from Gulfport, Mississippi, to the eastern parts of the Florida Panhandle. Rainfall amounts ranging from 15 to more than 25 inches were reported in many areas of southern Alabama, the Florida Panhandle, and the Mississippi Gulf Coast (National Oceanic and Atmospheric Administration, 1998a). Severe flooding occurred in southern Mississippi.

References

- National Oceanic and Atmospheric Administration (NOAA), 1995a–98a, Climatological data (by State): Asheville, North Carolina, National Climatic Data Center, various months.
- National Oceanic and Atmospheric Administration (NOAA), 1995b–98b, Storm data (by State): Asheville, North Carolina, National Climatic Data Center, various months.



Figure 36. Location of streamgages with significant floods during 1994–98 water years for Mississippi.

Table 25. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Mississippi.

[mi², square miles; ft, feet above an arbitrary datum; ft³/s, cubic feet per second; --, not determined or not applicable. Source: Recurrence intervals calculated from U.S. Geological Survey data. Other data from U.S. Geological Survey reports or databases]

Streamgage number (fig. 36)	Streamgage name	Total drainage (mi ²)	Maximum stage and discharge for period of record through 1998 water year				Significant floods 1994–98 water years				
			Period of record (water years)	Water year	Stage (ft)	Discharge (ft ³ /s)	Date (month/ day/ year)	Stage (ft)	Discharge (ft ³ /s)	Regulated during flood ¹	Recurrence interval (years)
02434000	Town Creek at Tupelo, MS	111	1939–46, 1949–98	1955	27.72	23,000	3/2/97	26.61	20,000	N	50–100
02437600	James Creek at Aberdeen, MS	28.4	1963–98	1985 1997	15.21 25.10	6,970 6,770	5/27/97	25.10	6,770	N	20
02439980	Chuquatonchee Creek near Okalona, MS	68.5	1951, 1953, 1964–73, 1975–81, 1985–87, 1989–95, 1998	1973	16.93	15,000	3/6/98	14.56	7,060	Y	--
02440600	Line Creek near Maben, MS	4.76	1952–80, 1982–98	1984	28.33	7,540	6/26/94	28.30	7,480	N	--
02448620	Flat Scooba Creek tributary near Scooba, MS	.44	1967–98	1979	8.87	427	1/7/98	5.74	263	N	--
02473047	Gordon Creek at Hattiesburg, MS	8.83	1969–98	1983	61.89	6,920	1/7/98	13.84	4,920	N	15
02479300	Red Creek near Vestry, MS	441	1959–98	1987	21.48	28,000	9/29/98	20.89	24,300	N	20
02479560	Escatawpa River near Agricola, MS	562	1974–98	1998	22.81	27,800	9/30/98	22.81	27,800	N	20
02479600	Escatawpa River near Hurley, MS	646	1958–70, 1998	1998	19.30	27,500	9/30/98	19.30	27,500	N	20
02480500	Tuxachanie Creek near Biloxi, MS	92.4	1906, 1948, 1953–98	1998	26.06	20,300	9/29/98 5/10/95	26.06 24.92	20,300 16,900	N	100 50
02481000	Biloxi River at Wortham, MS	96.2	1948, 1953–98	1995	28.94	13,500	5/9/95	28.94	13,500	N	100
02481130	Biloxi River near Lyman, MS	251	1957, 1964–85, 1987–98	1995	23.95	36,800	5/10/95	23.95	36,800	N	50
02481510	Wolf River near Landon, MS	308	1971–98	1995	28.85	24,500	5/10/95	28.85	24,500	N	50

Table 25. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Mississippi.—Continued

[mi², square miles; ft, feet above an arbitrary datum; ft³/s, cubic feet per second; --, not determined or not applicable. Source: Recurrence intervals calculated from U.S. Geological Survey data. Other data from U.S. Geological Survey reports or databases]

Streamgage number (fig. 36)	Streamgage name	Total drainage (mi ²)	Maximum stage and discharge for period of record through 1998 water year				Significant floods 1994–98 water years				
			Period of record (water years)	Water year	Stage (ft)	Discharge (ft ³ /s)	Date (month/ day/year)	Stage (ft)	Discharge (ft ³ /s)	Regulated during flood ¹	Recurrence interval (years)
02485950	Town Creek at Jackson, MS	11.4	1885, 1914, 1921, 1953–98	1921	19.00	6,000	6/10/97	12.12	4,110	N	20
02486100	Lynch Creek at Jackson, MS	12.0	1953–95	1995 1953	16.30 18.90	7,180 7,500	4/20/95	16.30	7,180	N	50
07287400	Black Creek at Lexington, MS	88.1	1987–98	1997	27.89	18,600	6/10/97	27.89	18,600	N	25

¹Regulated during flood: N, no; Y, yes.

Missouri

Parts of eastern, southern, and southeastern Missouri received 6 to 10 inches of rain the evening of November 13 and 14, 1993 (National Oceanic and Atmospheric Administration, 1993a). Numerous tributaries of the Missouri and Mississippi Rivers quickly rose above flood stage including the Gasconade, Osage, Meramec, Bourbeuse, Big, Current, and James Rivers (fig. 37). Eight streamgages had the peak of record during this flood (table 26). Estimates of flood damage neared \$50 million, but there were no reported deaths (National Oceanic and Atmospheric Administration, 1993b).

The rains returned to the same areas in Missouri during the second week of April 1994 as 7 to 9 inches of rain fell during a 3-day period (National Oceanic and Atmospheric Administration, 1994a), bringing a quick return to river flooding. Most of the more intense rains were south of the Missouri River. The most serious flooding occurred along the Mississippi, Missouri, Meramec, Bourbeuse, and Big Rivers in eastern Missouri. Damage was over \$10 million, and three deaths occurred (National Oceanic and Atmospheric Administration 1994b). Rainfall in April averaged from 4 inches above normal at Kansas City to near 8 inches above normal at Columbia. This April was the wettest on record at Columbia, the second wettest at Springfield and St. Louis, and the fourth wettest at Kansas City (National Oceanic and Atmospheric Administration, 1994a).

Serious flooding returned to the Missouri and Mississippi River Valleys in Missouri, during May 1995, 2 short years after the record flood of 1993. While the flood did cause a great deal of hardship and disruption to the economy and daily lives, it was estimated that people, homes, and business affected by the flood

in 1995 were 50 percent less than in 1993 (National Oceanic and Atmospheric Administration, 1995b). This was due primarily to the Federally sponsored buyout programs that moved many people out of the flood plains. The flood of May 1995 was triggered by abnormally excessive rain. May rainfall averages across Missouri ranged from 3 inches above normal at Springfield to 9 inches above normal at St. Louis. May 1995 was the wettest May on record for St. Louis where 12.92 inches of rain fell. The spring (March, April, May) of 1995 was the fifth wettest in St. Louis history with a total of 19.44 inches. The majority of serious flooding was on the main stems of the Missouri and Mississippi Rivers, as well as backwater points on tributaries. Nearly \$30 million in damage resulted (National Oceanic and Atmospheric Administration, 1995b). The Mississippi and Missouri Rivers were closed to barge traffic, bringing that industry to a standstill.

A series of thunderstorm complexes produced widespread flooding over central and south-central Missouri on July 26, 1998. Cooperative weather stations reported more than 8 inches of rain at Versailles, Rolla, and Salem (National Oceanic and Atmospheric Administration, 1998a). Flooding caused widespread damage to roads and low-water crossings and bridges.

References

- National Oceanic and Atmospheric Administration (NOAA), 1993a–98a, Climatological data (by State): Asheville, North Carolina, National Climatic Data Center, various months.
- National Oceanic and Atmospheric Administration (NOAA), 1993b–98b, Storm data (by State): Asheville, North Carolina, National Climatic Data Center, various months.



EXPLANATION

09537200 ▲ Streamgage and number

Figure 37. Location of streamgages with significant floods during 1994–98 water years for Missouri.

Table 26. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Missouri.

[mi², square miles; ft, feet above an arbitrary datum; ft³/s, cubic feet per second; --, not determined or not applicable; >, greater than. Source: Recurrence intervals calculated from U.S. Geological Survey data. Other data from U.S. Geological Survey reports or databases]

Streamgage number (fig. 37)	Streamgage name	Total drainage (mi ²)	Maximum stage and discharge for period of record through 1998 water year				Significant floods 1994–98 water years				
			Period of record (water years)	Water year	Stage (ft)	Discharge (ft ³ /s)	Date (month/ day/ year)	Stage (ft)	Discharge (ft ³ /s)	Regulated during flood ¹	Recurrence interval (years)
05497000	North Fabius River at Monticello, MO	452	1922–98	1973	33.03	20,700	5/28/96	29.63	17,200	N	10
05498000	Middle Fabius River near Monticello, MO	393	1946–98	1973	27.14	17,700	5/29/96	24.87	13,800	N	5
05503800	Crooked Creek near Paris, MO	80.0	1980–98	1996	13.62	9,460	5/7/96	13.62	9,460	N	50–100
05506500	Middle Fork Salt River at Paris, MO	356	1940–98	1973	25.21	45,000	5/8/96	21.84	15,800	N	10–25
05507600	Lick Creek at Perry, MO	104	1980–98	1996	22.25	11,800	5/7/96	22.25	11,800	N	25–50
05514500	Cuivre River near Troy, MO	903	1922–72, 1974–81, 1983–98	1942	33.40	120,000	4/12/94	32.47	107,000	N	>500
06905500	Chariton River near Prairie Hill, MO	1,870	1929–98	1996	22.33	33,600	5/24/95 5/27/96	21.96 22.33	31,600 33,600	N N	5 --
06906800	Lamine River near Otterville, MO	543	1988–98	1995	29.43	84,900	5/18/95	29.43	84,900	N	>500
06917000	Little Osage River at Fulton, KS	295	1949–98	1987	35.21	62,800	4/28/94	32.61	38,000	N	--
06918440	Sac River near Dadeville, MO	257	1966–98	1993	27.56	36,100	4/11/94	20.88	13,700	N	5
06919500	Cedar Creek near Pleasant View, MO	420	1909, 1923–26, 1943, 1949–98	1958 1909	27.35 27.70	37,000 --	4/12/94	27.36	36,300	N	50
06919900	Sac River near Caplinger Mills, MO	1,810	1975–98	1994	30.95	61,500	4/12/94	30.95	61,500	Y	--
06930000	Big Piney River near Big Piney, MO	560	1922–70, 1972–82, 1989–96	1943	20.70	32,700	11/15/93	19.81	30,800	N	10

Table 26. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Missouri.—Continued

[mi², square miles; ft, feet above an arbitrary datum; ft³/s, cubic feet per second; --, not determined or not applicable; >, greater than. Source: Recurrence intervals calculated from U.S. Geological Survey data. Other data from U.S. Geological Survey reports or databases]

Streamgage number (fig. 37)	Streamgage name	Total drainage (mi ²)	Maximum stage and discharge for period of record through 1998 water year				Significant floods 1994–98 water years				
			Period of record (water years)	Water year	Stage (ft)	Discharge (ft ³ /s)	Date (month/ day/ year)	Stage (ft)	Discharge (ft ³ /s)	Regulated during flood ¹	Recurrence interval (years)
07013000	Meramec River near Steelville, MO	781	1915, 1917–98	1998	27.22	55,800	7/27/98	27.22	55,800	N	10–25
07015720	Bourbeuse River near High Gate, MO	135	1965–98	1983	23.65	49,300	7/26/98	23.57	34,500	N	100–500
07016500	Bourbeuse River at Union, MO	808	1897, 1915–98	1983	33.80	73,300	4/13/94	27.77	42,000	N	25–50
07017200	Big River at Irondale, MO	175	1965–96, 1998	1994	28.95	49,100	11/14/93	28.95	49,100	N	100–500
07018100	Big River near Richwoods, MO	735	1984–98	1997 1993	28.25 30.33	61,500 59,800	12/10/96	28.25	61,500	N	50–100
07018500	Big River at Byrnesville, MO	917	1915, 1923–88, 1990, 1992–98	1993 1915	29.37 30.20	63,600 80,000	11/16/93	27.61	50,200	N	25
07019000	Meramec River near Eureka, MO	3,788	1904–05, 1915–16, 1922–97	1915 1983	40.20 42.89	175,000 145,000	4/14/94	40.90	123,000	N	10–25
07034000	Saint Francis River near Roselle, MO	234	1987–97	1994	26.50	45,700	11/14/93	26.50	45,700	N	100–500
07035000	Little Saint Francis River at Fredericktown, MO	90.5	1984–97	1994	26.50	25,100	11/14/93	26.50	25,100	N	100–500
07035800	Saint Francis River near Mill Creek, MO	505	1987–92, 1994–97	1994	33.10	130,000	11/14/93	33.10	130,000	N	>500
07036100	Saint Francis River near Saco, MO	664	1984–97	1994	36.10	161,000	11/14/93	36.10	161,000	N	>500
07037000	Big Creek at Des Arc, MO	99.6	1987–97	1994	16.85	25,700	11/14/93	16.85	25,700	N	100–500

Table 26. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Missouri.—Continued

[mi², square miles; ft, feet above an arbitrary datum; ft³/s, cubic feet per second; --, not determined or not applicable; >, greater than. Source: Recurrence intervals calculated from U.S. Geological Survey data. Other data from U.S. Geological Survey reports or databases]

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			Period of record (water years)	Water year	Stage (ft)	Discharge (ft ³ /s)	Date (month/ day/ year)	Stage (ft)	Discharge (ft ³ /s)	Regulated during flood ¹	Recurrence interval (years)
07037500	Saint Francis River near Patterson, MO	956	1915, 1921–75, 1977–97	1983	35.77	155,000	11/15/93	34.30	133,000	N	100–500
07057500	North Fork River near Tecumseh, MO	561	1945–98	1986	28.10	133,000	11/14/93	24.59	71,200	N	100
07061500	Black River near Annapolis, MO	484	1939–98	1994	27.38	109,000	11/14/93	27.38	109,000	N	>500
07066000	Jacks Fork at Eminence, MO	398	1895, 1904, 1922–98	1994 1904 1895	17.82 27.00 27.00	58,500 -- --	11/15/93	17.82	58,500	N	100–500
07067000	Current River at Van Buren, MO	1,667	1904, 1913–91, 1993–98	1915 1904	25.90 29.00	125,000 --	11/15/93	27.39	92,900	N	10–25
07189000	Elk River near Tiff City, MO	872	1940–98	1941	28.40	137,000	6/11/95	24.45	69,900	N	25

¹Regulated during flood: N, no; Y, yes.

Montana

As much as 11 inches of rain fell during a 24-hour period in southern Canada and northwestern Montana along the Continental Divide, June 6, 1995 (National Oceanic and Atmospheric Administration, 1995a). As a result, flooding occurred on both sides of the divide. Significant floods occurred on the North Fork Flathead River (fig. 38) as well as many of the smaller rivers and streams of northwestern Montana (table 27).

Warmer temperatures during February 7–11, 1996, after an extended cold and snowy period, caused numerous flooding problems across central Montana during the second week of February. Snowmelt over frozen ground caused streams and rivers to go out of their banks, washing out roads and bridges. Flooding problems ranged from minor inundation of fields to parts of towns being underwater. Ice jams also caused flooding problems as snowmelt ran into frozen streams and rivers. Some of the worst flooding occurred in East Helena where three creeks went out of their banks. Ice jams on the Missouri River caused flooding in Fort Benton. Much of the town was under 1 to 2 feet of water at one point. Seven counties were declared Federal disaster areas. A rapid warming of temperatures, after an extended cold, snowy period, caused ice jams and flooding problems across north-central Montana on March 3–5, 1996. Many small streams went out of their banks, washing out numerous roads. The estimated damage across the region totaled about \$1.5 million, mostly from washed out roads and bridges (National Oceanic and Atmospheric Administration, 1996b).

Snowmelt flooding caused numerous road closings and road washouts throughout western Montana in May and June 1996. Flooding on the Bitterroot River caused the bridge near Victor to move 6 inches downstream and drop 23 inches. Estimated repair to fix the bridge was \$1 million, and total damage from the flooding was more than \$2 million (National Oceanic and Atmospheric Administration, 1996b).

The spring snowmelt for 1997 caused flooding once again in the mountains of Montana. Damage exceeded \$2.5 million (National Oceanic and Atmospheric Administration, 1997b).

Rain falling at the rate of more than 5 inches per hour inundated the town of Culbertson in eastern Montana on July 4, 1998 (National Oceanic and Atmospheric Administration, 1997a). Forty-three homes sustained damage with 20 basements completely filled with water and sewage that backed up during the storm. Two homes were moved completely off of their foundations. Highway 2 was flooded and closed from Poplar to the North Dakota line until the next morning. Damage was more than \$2 million (National Oceanic and Atmospheric Administration, 1997b).

References

- National Oceanic and Atmospheric Administration (NOAA), 1995a–97a, Climatological data (by State): Asheville, North Carolina, National Climatic Data Center, various months.
- National Oceanic and Atmospheric Administration (NOAA), 1995b–97b, Storm data (by State): Asheville, North Carolina, National Climatic Data Center, various months.

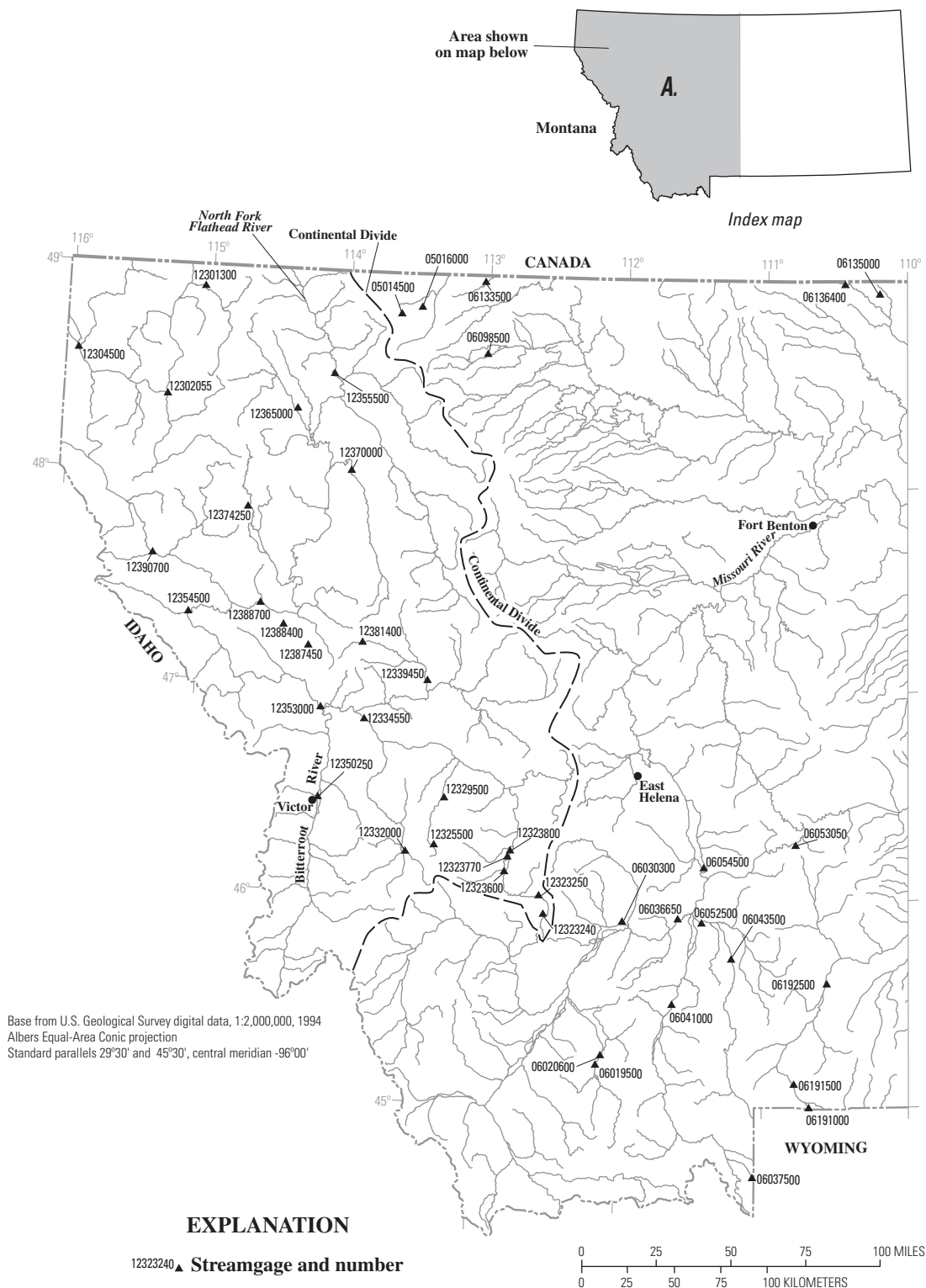
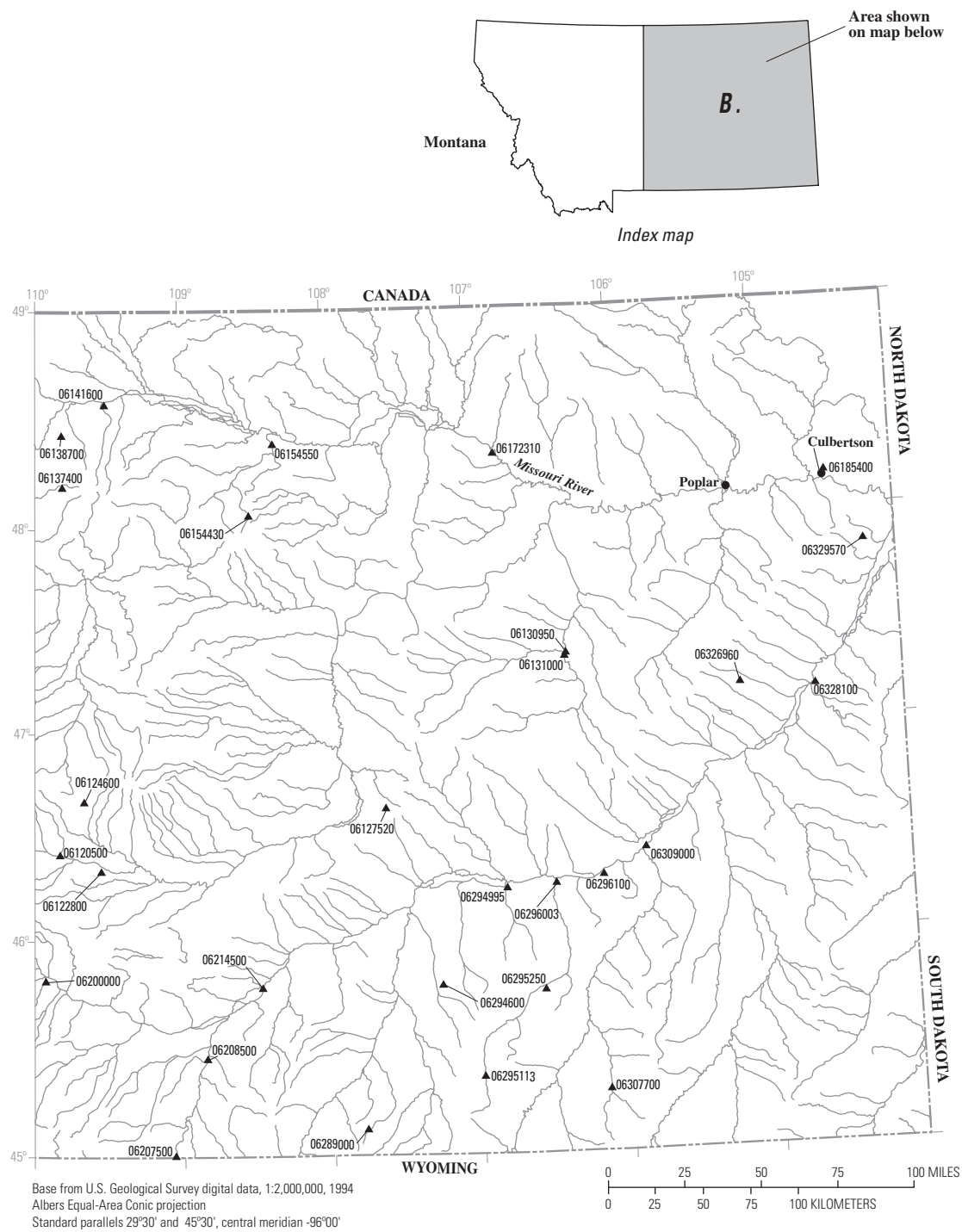


Figure 38. (A) Location of streamgages with significant floods during 1994–98 water years for Montana.



EXPLANATION

06207500▲ Streamgage and number

Figure 38. (B) Location of streamgages with significant floods during 1994–98 water years for Montana.—Continued

Table 27. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Montana.

[mi², square miles; ft, feet above an arbitrary datum; ft³/s, cubic feet per second; --, not determined or not applicable; >, greater than. Source: Recurrence intervals calculated from U.S. Geological Survey data. Other data from U.S. Geological Survey reports or databases]

Streamgage number (fig. 38)	Streamgage name	Total drainage (mi ²)	Maximum stage and discharge for period of record through 1998 water year				Significant floods 1994–98 water years				
			Period of record (water years)	Water year	Stage (ft)	Discharge (ft ³ /s)	Date (month/ day/ year)	Stage (ft)	Discharge (ft ³ /s)	Regulated during flood ¹	Recurrence interval (years)
05014500	Swiftcurrent Creek at Many Glacier, MT	30.9	1913–98	1964	10.00	6,700	6/7/95	7.72	3,150	N	45–50
05016000	Swiftcurrent Creek at Lake Sherberne, MT	64.6	1913–98	1995	8.63	2,510	6/7/95	8.63	2,510	N	--
06019500	Ruby River above reservoir near Alder, MT	538	1939–98	1984	6.24	3,810	6/6/95	5.14	2,060	N	30–35
06020600	Ruby River below reservoir near Alder, MT	596	1963–98	1984	8.52	3,010	6/7/95	6.85	1,820	Y	--
06030300	Jefferson River tributary number 2 near Whitehall, MT	4.50	1958–98	1994	8.30	425	7/6/94	8.30	425	N	>100
06036650	Jefferson River near Three Forks, MT	9,532	1979–98	1995	9.00	17,000	6/9/95	9.00	17,000	N	10–25
06037500	Madison River near West Yellowstone, MT	420	1914–17, 1919–73, 1984–86, 1989–98	1996	3.78	2,820	5/18/96	3.78	2,820	N	>100
							5/18/97	3.58	2,630	N	75
06041000	Madison River below Ennis Lake near McAllister, MT	2,186	1943–98	1970	8.01	9,550	6/10/96	7.60	7,980	Y	--
06043500	Gallatin River near Gallatin Gateway, MT	825	1890–94, 1931–81, 1985–98	1971 1974	6.49 7.38	9,270 9,100	6/2/97	6.71	9,160	N	25–30
06052500	Gallatin River at Logan, MT	1,795	1895–1900, 1902–05, 1929–33, 1935–98	1899 1997	-- 9.80	9,840 9,400	6/8/97	9.80	9,400	N	30–35

Table 27. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Montana.—Continued

[mi², square miles; ft, feet above an arbitrary datum; ft³/s, cubic feet per second; --, not determined or not applicable; >, greater than. Source: Recurrence intervals calculated from U.S. Geological Survey data. Other data from U.S. Geological Survey reports or databases]

Streamgage number (fig. 38)	Streamgage name	Total drainage (mi ²)	Maximum stage and discharge for period of record through 1998 water year				Significant floods 1994–98 water years				
			Period of record (water years)	Water year	Stage (ft)	Discharge (ft ³ /s)	Date (month/ day/ year)	Stage (ft)	Discharge (ft ³ /s)	Regulated during flood ¹	Recurrence interval (years)
06053050	Lost Creek near Ringling, MT	9.59	1974–98	1996 1986	3.62 3.98	300 80	2/8/96	3.62	300	N	25
06054500	Missouri River at Toston, MT	14,669	1890, 1910–16, 1941–98	1997	12.22	34,000	6/12/97	12.22	34,000	N	45–50
06098500	Cut Bank Creek near Browning, MT	123	1918, 1920–24, 1991–98	1995	5.59	5,480	6/7/95	5.59	5,480	N	25–50
06120500	Musselshell River at Harlowton, MT	1,125	1909–98	1975	10.01	7,270	6/12/97	8.25	3,720	N	20
06122800	Musselshell River near Shawmut, MT	1,479	1986–97	1997 1991	-- 6.65	5,000 3,020	6/12/97	--	5,000	N	--
06124600	East Fork Roberts Creek tributary near Judith Gap, MT	.74	1974–98	1997 1974	3.87 3.89	83 82	7/20/97	3.87	83	N	10–20
06127520	Home Creek near Sumatra, MT	1.98	1973–98	1994	5.11	278	3/2/94	5.11	278	N	25–30
06130950	Little Dry Creek near Van Norman, MT	1,224	1958–75, 1986, 1995	1995	9.20	10,000	--/--/95	9.20	10,000	N	>100
06131000	Big Dry Creek near Van Norman, MT	2,554	1940–48, 1950–98	1947	13.39	24,600	3/3/94	10.90	15,600	N	15–20

Table 27. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Montana.—Continued

[mi², square miles; ft, feet above an arbitrary datum; ft³/s, cubic feet per second; --, not determined or not applicable; >, greater than. Source: Recurrence intervals calculated from U.S. Geological Survey data. Other data from U.S. Geological Survey reports or databases]

Streamgage number (fig. 38)	Streamgage name	Total drainage (mi ²)	Maximum stage and discharge for period of record through 1998 water year				Significant floods 1994–98 water years				
			Period of record (water years)	Water year	Stage (ft)	Discharge (ft ³ /s)	Date (month/ day/ year)	Stage (ft)	Discharge (ft ³ /s)	Regulated during flood ¹	Recurrence interval (years)
06133500	North Fork Milk River above Saint Mary Canal near Browning, MT	59.0	1911–12, 1924, 1926–27, 1937, 1941–42, 1944–45, 1948, 1950–51, 1953–98	1967	7.95	3,090	3/19/97	10.50	2,860	N	35–40
06135000	Milk River at eastern crossing of international boundary, MT	2,506	1910–11, 1913–15, 1917, 1919–98	1996	15.03	12,000	3/13/96	15.03	12,000	N	25–50
							3/22/97	11.36	10,000	N	10–25
06136400	Spring Coulee tributary near Simpson, MT	2.49	1972, 1974–98	1997	4.29	56	2/17/97	4.29	56	N	--
06137400	Big Sandy Creek at reservation boundary near Rocky Boy, MT	24.7	1982–98	1998	6.07	510	6/27/98	6.07	510	N	25
06138700	South Fork Spring Coulee near Havre, MT	6.47	1960–98	1966	4.42	190	3/10/96	4.24	170	N	10–25
				1982	4.70	145					
06141600	Little Box Elder Creek at mouth near Havre, MT	95.9	1986–92, 1994–96	1996	10.30	960	3/11/96	10.30	960	N	10–25
06154430	Lodge Pole Creek at Lodge Pole, MT	19.5	1987–98	1997	6.02	306	5/26/97	6.02	306	N	25–50
06154550	Peoples Creek below Kuhr Coulee near Dodson, MT	675	1989–98	1996	13.03	1,800	3/13/96	13.03	1,800	N	5–10
06172310	Milk River at Tampico, MT	21,078	1974–77, 1988–98	1997	--	11,000	3/27/97	--	11,000	N	5–10
				1991	25.40	7,240					

Table 27. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Montana.—Continued

[mi², square miles; ft, feet above an arbitrary datum; ft³/s, cubic feet per second; --, not determined or not applicable; >, greater than. Source: Recurrence intervals calculated from U.S. Geological Survey data. Other data from U.S. Geological Survey reports or databases]

Streamgage number (fig. 38)	Streamgage name	Total drainage (mi ²)	Maximum stage and discharge for period of record through 1998 water year				Significant floods 1994–98 water years				
			Period of record (water years)	Water year	Stage (ft)	Discharge (ft ³ /s)	Date (month/ day/ year)	Stage (ft)	Discharge (ft ³ /s)	Regulated during flood ¹	Recurrence interval (years)
06185400	Missouri River tributary number 5 at Culbertson, MT	3.67	1963–98	1998	12.87	3,790	7/4/98	12.87	3,790	N	>100
06191000	Gardner River near Mammoth Yellowstone National Park, MT	202	1939–72, 1984–98	1956 1997	4.46 5.03	2,080 2,050	6/2/97	5.03	2,050	N	25
06191500	Yellowstone River at Corwin Springs, MT	2,623	1890–93, 1911–98	1996 1918	10.92 11.50	32,200 32,000	6/10/96 6/6/97	10.92 10.91	32,200 32,200	N N	100 100
06192500	Yellowstone River near Livingston, MT	3,551	1897–1905, 1929–32, 1938–98	1997	10.72	38,000	6/10/96 6/6/97	9.97 10.72	37,100 38,000	N N	75–100 75–100
06200000	Boulder River at Big Timber, MT	523	1947–53, 1955–98	1997	9.00	9,940	6/5/97	9.00	9,940	N	50
06207500	Clarks Fork Yellowstone River near Belfry, MT	1,154	1922–98	1981	9.97	14,800	6/11/96 6/11/97	8.98 8.68	11,400 10,900	N N	25 10–25
06208500	Clarks Fork Yellowstone River at Edgar, MT	2,032	1922–32, 1934–69, 1987–98	1997	9.30	11,100	6/15/96 6/12/97	9.19 9.30	11,000 11,100	N N	10–25 25
06214500	Yellowstone River at Billings, MT	11,795	1904–05, 1918, 1929–98	1997	15.00	82,000	6/12/97	15.00	82,000	N	>100
06289000	Little Bighorn River at State line near Wyola, MT	193	1939–98	1944	4.87	2,730	6/6/97	4.35	2,100	N	10–25
06294600	East Cabin Creek tributary near Hardin, MT	8.63	1973–98	1998	5.70	277	6/8/98	5.70	277	N	25–50
06294995	Armells Creek near Forsyth, MT	370	1975–84, 1988–95	1994	10.25	3,990	3/3/94	10.25	3,990	N	25

Table 27. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Montana.—Continued

[mi², square miles; ft, feet above an arbitrary datum; ft³/s, cubic feet per second; --, not determined or not applicable; >, greater than. Source: Recurrence intervals calculated from U.S. Geological Survey data. Other data from U.S. Geological Survey reports or databases]

Streamgage number (fig. 38)	Streamgage name	Total drainage (mi ²)	Maximum stage and discharge for period of record through 1998 water year				Significant floods 1994–98 water years				
			Period of record (water years)	Water year	Stage (ft)	Discharge (ft ³ /s)	Date (month/ day/ year)	Stage (ft)	Discharge (ft ³ /s)	Regulated during flood ¹	Recurrence interval (years)
06295113	Rosebud Creek at reservation boundary near Kirby, MT	123	1980–98	1996 1986	6.30 6.50	219 --	3/17/96	6.30	219	N	25–50
06295250	Rosebud Creek near Colstrip, MT	799	1975–98	1994 1978	8.42 9.03	754 605	3/2/94	8.42	754	N	25–50
06296003	Rosebud Creek at mouth near Rosebud, MT	1,302	1975–98	1994	7.70	3,700	3/4/94	7.70	3,700	N	50–100
06296100	Snell Creek near Hathaway, MT	10.5	1963–77, 1979, 1982–98	1994	3.70	767	3/2/94	3.70	767	N	10–25
06307700	Cow Creek near Fort Howes Ranger Station near Otter, MT	8.37	1972–98	1995	9.21	296	7/15/95	9.21	296	N	25–50
06309000	Yellowstone River at Miles City, MT	48,253	1923, 1929–98	1978 1979	16.50 16.62	102,000 53,900	6/15/97	14.53	83,300	N	10–25
06326960	Timber Fork Upper Sevenmile Creek tributary near Lindsay, MT	1.13	1974–98	1997	10.42	250	7/1/97	10.42	250	N	25–50
06328100	Yellowstone River tributary number 6 near Glendive, MT	2.93	1974–98	1994	5.88	576	6/7/94	5.88	576	N	25–50
06329570	First Hay Creek near Sidney, MT	29.1	1963–98	1997	6.42	3,530	7/1/97	6.42	3,530	N	50–100
12301300	Tobacco River near Eureka, MT	440	1948, 1959–98	1991	7.16	3,180	4/28/97	6.82	2,830	N	25
12302055	Fisher River near Libby, MT	838	1948, 1969–98	1996	10.35	12,000	2/9/96	10.35	12,000	N	100
12304500	Yaak River near Troy, MT	766	1948, 1954, 1956–98	1954	11.40	13,400	5/17/97	9.58	12,600	N	50–100
12323240	Blacktail Creek at Butte, MT	95.4	1989–98	1995	5.28	303	2/19/95	5.28	303	N	10–25

Table 27. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Montana.—Continued

[mi², square miles; ft, feet above an arbitrary datum; ft³/s, cubic feet per second; --, not determined or not applicable; >, greater than. Source: Recurrence intervals calculated from U.S. Geological Survey data. Other data from U.S. Geological Survey reports or databases]

Streamgage number (fig. 38)	Streamgage name	Total drainage (mi ²)	Maximum stage and discharge for period of record through 1998 water year				Significant floods 1994–98 water years				
			Period of record (water years)	Water year	Stage (ft)	Discharge (ft ³ /s)	Date (month/ day/ year)	Stage (ft)	Discharge (ft ³ /s)	Regulated during flood ¹	Recurrence interval (years)
12323250	Silver Bow Creek below Blacktail Creek at Butte, MT	103	1984–98	1998	8.11	447	7/30/98	8.11	447	N	50
12323600	Silver Bow Creek at Opportunity, MT	284	1989–98	1996	6.91	1,300	2/11/96	6.91	1,300	N	25–50
12323770	Warm Springs Creek at Warm Springs, MT	163	1984–98	1997 1984	4.55 4.61	494 462	6/5/97	4.55	494	N	10–25
12323800	Clark Fork near Galen, MT	572	1989–98	1997	5.07	1,240	6/7/97	5.07	1,240	N	--
12325500	Flint Creek near Southern Cross, MT	52.6	1941–98	1942 1962	1.86 4.56	174 35	6/6/95	2.53	172	N	--
12329500	Flint Creek at Maxville, MT	208	1942–98	1943 1974	6.79 7.49	1,680 680	2/9/96	6.68	1,040	N	10–25
12332000	Middle Fork Rock Creek near Philipsburg, MT	123	1938–98	1974	5.58	1,680	6/9/96	5.41	1,540	N	10–25
12334550	Clark Fork at Turah Bridge near Bonner, MT	3,641	1986–98	1996	9.05	12,400	2/9/96	9.05	12,400	N	10–25
12339450	Clearwater River near Clearwater, MT	345	1975–92, 1997	1997	8.52	3,800	5/28/97	8.52	3,800	N	50–100
12350250	Bitterroot River at Bell Crossing near Victor, MT	1,963	1987–98	1996	10.07	18,700	6/9/96	10.07	18,700	N	25
12353000	Clark Fork below Missoula, MT	9,003	1930–98	1997	12.18	55,100	5/18/97	12.18	55,100	N	25–50
12354500	Clark Fork at Saint Regis, MT	10,709	1911–23, 1929–98	1997	20.27	68,900	5/18/97	20.27	68,900	N	25–50
12355500	North Fork Flathead River near Columbia Falls, MT	1,548	1911–17, 1929–98	1964	18.60	69,100	6/7/95	17.07	59,200	N	>100

Table 27. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Montana.—Continued

[mi², square miles; ft, feet above an arbitrary datum; ft³/s, cubic feet per second; --, not determined or not applicable; >, greater than. Source: Recurrence intervals calculated from U.S. Geological Survey data. Other data from U.S. Geological Survey reports or databases]

Streamgage number (fig. 38)	Streamgage name	Total drainage (mi ²)	Maximum stage and discharge for period of record through 1998 water year				Significant floods 1994–98 water years				
			Period of record (water years)	Water year	Stage (ft)	Discharge (ft ³ /s)	Date (month/ day/ year)	Stage (ft)	Discharge (ft ³ /s)	Regulated during flood ¹	Recurrence interval (years)
12365000	Stillwater River near Whitefish, MT	524	1931–50, 1964, 1973–98	1997 1948	20.20 20.90	4,570 4,330	5/18/97	20.20	4,570	N	50–100
12370000	Qan River near Bigfork, MT	671	1922–98	1974	7.34	8,890	5/18/97	7.27	8,520	N	50
12374250	Mill Creek above Bassoo Creek near Niarada, MT	19.6	1983–98	1997 1991	2.60 6.83	173 113	4/28/97	2.60	173	N	25
12381400	South Fork Jocko River near Arlee, MT	56.0	1983–98	1997	4.31	1,220	5/17/97	4.31	1,220	N	50–100
12387450	Valley Creek near Arlee, MT	15.3	1983–98	1997	3.04	116	5/16/97	3.04	116	N	25–50
12388400	Revais Creek below West Fork near Dixon, MT	23.4	1983–98	1997	4.36	382	6/1/97	4.36	382	N	50
12388700	Flathead River at Perma, MT	8,795	1984–98	1997	21.65	54,700	6/7/97	21.65	54,700	Y	--
12390700	Prospect Creek at Thompson Falls, MT	182	1956–98	1974	9.86	5,490	2/9/96	9.54	5,160	N	>100

¹Regulated during flood: N, no; Y, yes.

Nebraska

More than 3 inches of rain fell in an hour on July 15, 1994 (National Oceanic and Atmospheric Administration, 1994a), near Scottsbluff (fig. 39), overflowing an irrigation canal. Backups occurred in a sewer system as a result of the runoff, damaging 19 homes. Nearly 200 other homes were flooded due to the storm's runoff, with more than \$1.1 million in damage (National Oceanic and Atmospheric Administration, 1994b).

Excessive rains of 2 to 4 inches fell across north-central and northeastern Nebraska on May 27–28, 1995, with rapid rises of 2 to 3 feet on area streams and creeks. Flooding occurred on the Elkhorn and Niobrara Rivers and their many tributaries. Damage was more than \$2 million (National Oceanic and Atmospheric Administration, 1995b).

Thunderstorms developed August 22, 1995, over north-central Nebraska and moved eastward. Continuous redevelopment of thunderstorms resulted in 5- to 8-inch rainfalls in the Niobrara River Basin. Several roads were washed out and numerous bridges suffered structural damage resulting in more than \$1 million in damage (National Oceanic and Atmospheric Administration, 1995b).

An ice-jam release in March 1996 created a large flood on the Middle Loup River at Dunning (streamgage 06775500,

table 28). Isolated intense thunderstorms through the spring and summer of 1996 caused some flash flooding across the State. Buffalo Creek near Overton (streamgage 06769000), Middle Loup River at Dunning (streamgage 06775500), and Maple Creek near Nickerson (streamgage 06800000) had their peaks of record during this period. More than \$9 million in damage to property and almost \$22 million damage to crops were reported (National Oceanic and Atmospheric Administration, 1996b).

A series of thunderstorms produced in excess of 7.5 inches of rain west of Kimball during a 5-hour period on May 24, 1997 (National Oceanic and Atmospheric Administration, 1997a). Widespread flooding occurred along Lodgepole Creek and in Sand Draw. More than \$2 million in damage occurred (National Oceanic and Atmospheric Administration 1997b).

References

- National Oceanic and Atmospheric Administration (NOAA), 1994a–97a, Climatological data (by State): Asheville, North Carolina, National Climatic Data Center, various months.
National Oceanic and Atmospheric Administration (NOAA), 1994b–97b, Storm data (by State): Asheville, North Carolina, National Climatic Data Center, various months.

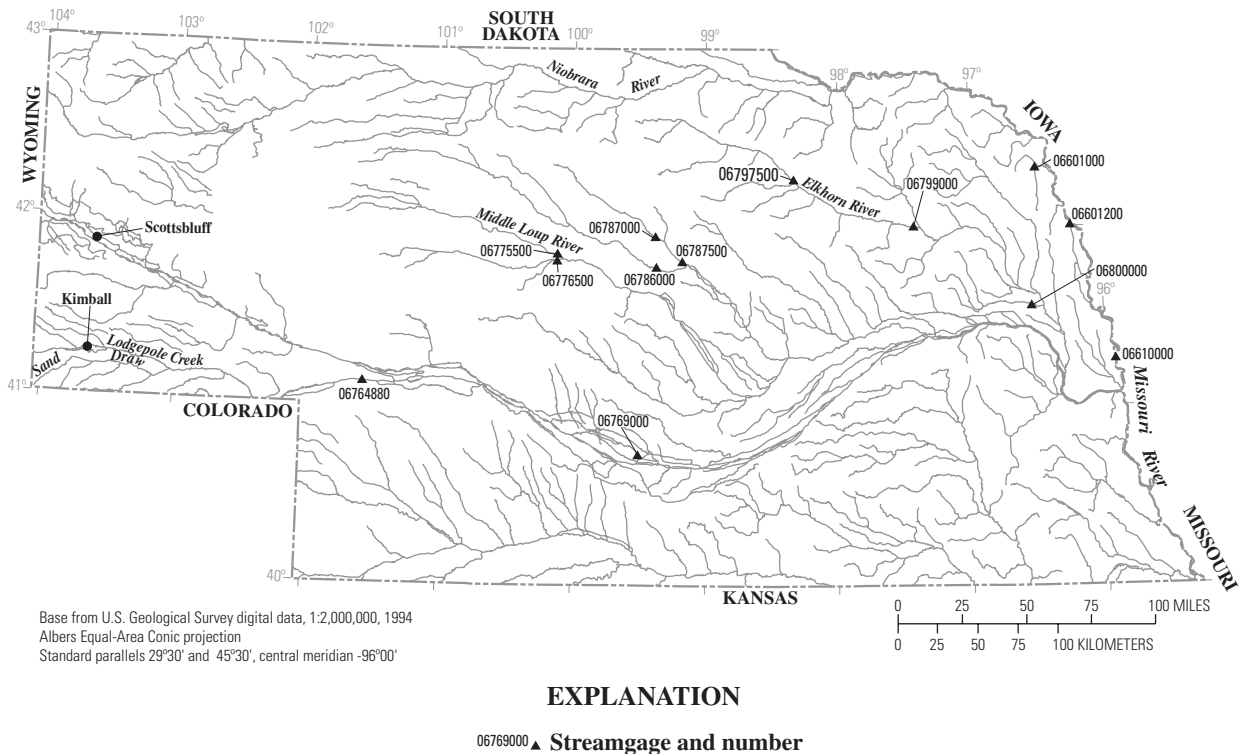


Figure 39. Location of streamgages with significant floods during 1994–98 water years for Nebraska.

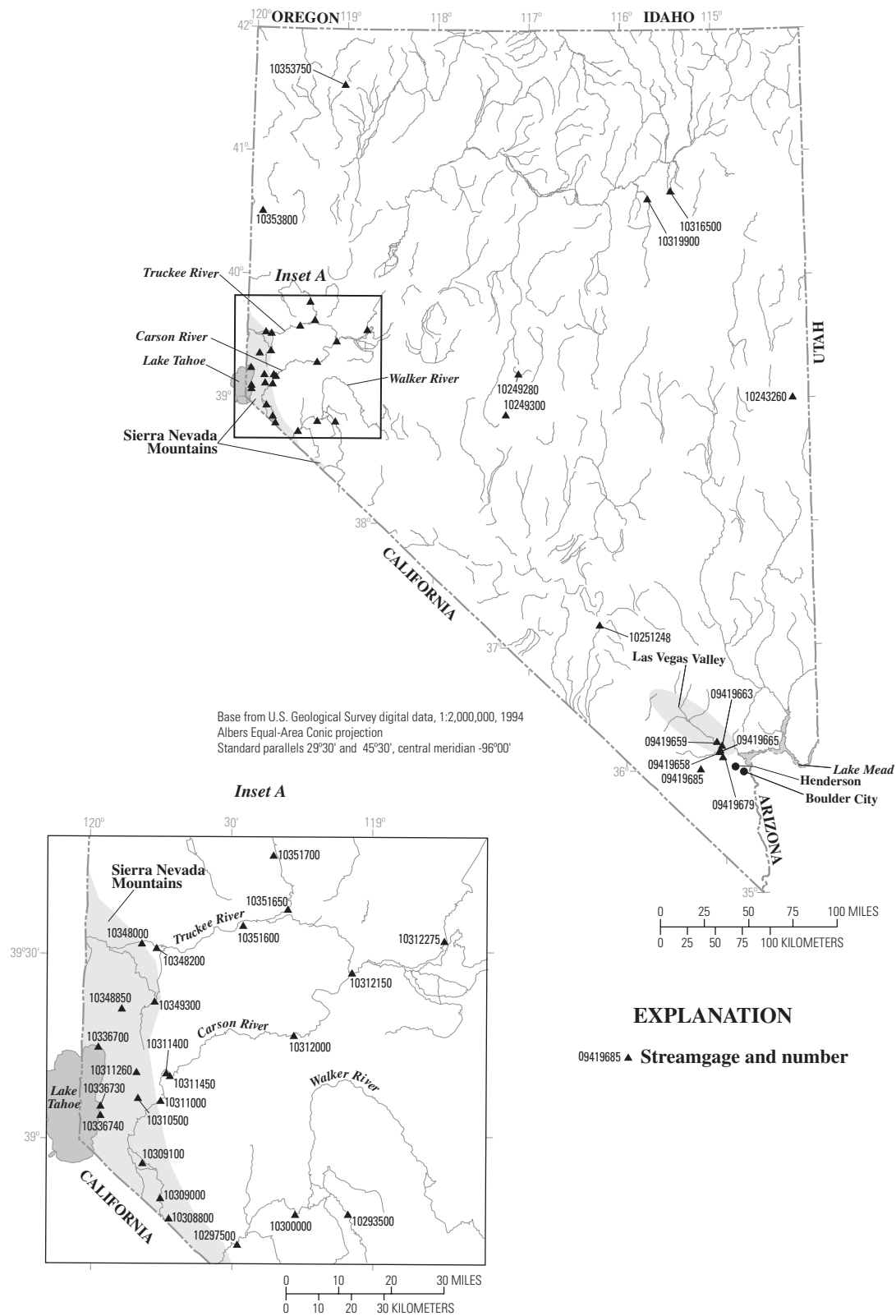


Figure 40. Location of streamgages with significant floods during 1994–98 water years for Nevada.

Table 29. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Nevada.

[mi², square miles; ft, feet above an arbitrary datum; ft³/s, cubic feet per second; --, not determined or not applicable; >, greater than; <, less than. Source: Recurrence intervals calculated from U.S. Geological Survey data. Other data from U.S. Geological Survey reports or databases]

Streamgage number (fig. 40)	Streamgage name	Total drainage (mi ²)	Maximum stage and discharge for period of record through 1998 water year				Significant floods 1994–98 water years				
			Period of record (water years)	Water year	Stage (ft)	Discharge (ft ³ /s)	Date (month/ day/ year)	Stage (ft)	Discharge (ft ³ /s)	Regulated during flood ¹	Recurrence interval (years)
09419658	Las Vegas Wash near Sahara Avenue near Las Vegas, NV	1,146	1975, 1988–98	1998 1990	12.50 16.27	4,400 1,960	9/11/98	12.50	4,400	Y	--
09419659	Sloan Channel tributary at Las Vegas Boulevard near North Las Vegas, NV	17.5	1989–98	1998	15.34	920	9/11/98	15.34	920	Y	--
09419663	Las Vegas Wash tributary south of Nellis Air Force Base, NV	1.20	1963–81, 1983–98	1998	21.00	600	9/11/98	21.00	600	Y	--
09419665	Sloan Channel at Charleston Boulevard near Las Vegas, NV	144	1989–98	1998 1997	11.41 11.72	1,230 700	9/11/98	11.41	1,230	Y	--
09419679	Las Vegas Wasteway near East Las Vegas, NV	--	1980–83, 1985–98	1983 1990	6.56 6.99	630	11/21/96	6.81	523 453	N	--
09419685	Bird Springs Wash near Arden, NV	--	1987–98	1998	44.05	35	7/20/98	44.05	35	N	--
10243260	Lehman Creek near Baker, NV	11.0	1948–55, 1993–97	1995	5.01	80	6/29/95	5.01	80	N	--
10249280	Kingston Creek below Cougar Canyon near Austin, NV	23.4	1967–98	1983 1995	3.19 3.86	385 234	6/3/95	3.86	234	Y	--
10249300	South Twin River near Round Mountain, NV	20.0	1965–98	1983	4.39	510	6/3/98	3.20	148	N	--
10251248	Unnamed tributary-Stockade Wash near Rattlesnake Ridge, Nevada Test Site, NV	3.90	1984–88, 1991–95	1995	5.49	90	3/11/95	5.49	90	N	--
10293500	East Walker River above Strosnider Ditch near Mason, NV	1,100	1947–92, 1995–98	1986 1997	7.49 9.61	2,820 2,610	1/4/97	9.61	2,610	Y	>25

Table 29. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Nevada.—Continued

[mi², square miles; ft, feet above an arbitrary datum; ft³/s, cubic feet per second; --, not determined or not applicable; >, greater than; <, less than. Source: Recurrence intervals calculated from U.S. Geological Survey data. Other data from U.S. Geological Survey reports or databases]

Streamgage number (fig. 40)	Streamgage name	Total drainage (mi ²)	Maximum stage and discharge for period of record through 1998 water year				Significant floods 1994–98 water years				
			Period of record (water years)	Water year	Stage (ft)	Discharge (ft ³ /s)	Date (month/ day/ year)	Stage (ft)	Discharge (ft ³ /s)	Regulated during flood ¹	Recurrence interval (years)
10297500	West Walker River at Hoye Bridge near Wellington, NV	497	1921–22, 1924–32, 1958–98	1997	13.68	11,500	1/3/97	13.68	11,500	Y	>100
10300000	West Walker River near Hudson, NV	964	1915–18, 1920–24, 1947–92, 1995–98	1997	12.18	11,400	1/3/97	12.18	11,400	Y	>100
10308800	Bryant Creek near Gardnerville, NV	31.5	1961–73, 1978–80, 1995–98	1997	8.70	1,360	1/2/97	8.70	1,300	N	<25
10309000	East Fork Carson River near Gardnerville, NV	356	1890–93, 1901–05, 1908–10, 1917, 1925–28, 1936–38, 1940–98	1997	13.00	20,300	1/3/97	13.00	20,300	N	100
10309100	East Fork Carson River at Minden, NV	392	1975–84, 1994–98	1997 1980	10.41 11.40	10,900 8,000	1/2/97	10.41	10,900	Y	--
10310500	Clear Creek near Carson City, NV	15.5	1948–78, 1989–98	1997	3.94	266	1/2/97	3.94	266	N	50
10311000	Carson River near Carson City, NV	886	1939–98	1997	18.43	30,500	1/3/97	18.43	30,500	N	>75
10311260	Vicee Canyon Creek near Sagebrush Ranch near Carson City, NV	1.83	1979–80, 1982, 1984, 1986, 1991–97	1997	9.66	4,000	1/2/97	9.66	4,000	N	>100

Table 29. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Nevada.—Continued

[mi², square miles; ft, feet above an arbitrary datum; ft³/s, cubic feet per second; --, not determined or not applicable; >, greater than; <, less than. Source: Recurrence intervals calculated from U.S. Geological Survey data. Other data from U.S. Geological Survey reports or databases]

Streamgage number (fig. 40)	Streamgage name	Total drainage (mi ²)	Maximum stage and discharge for period of record through 1998 water year				Significant floods 1994–98 water years				
			Period of record (water years)	Water year	Stage (ft)	Discharge (ft ³ /s)	Date (month/ day/ year)	Stage (ft)	Discharge (ft ³ /s)	Regulated during flood ¹	Recurrence interval (years)
10311400	Carson River at Deer Run Road near Carson City, NV	958	1980–85, 1991–98	1997	24.23	24,000	1/3/97	24.23	24,000	N	<100
10311450	Brunswick Canyon near New Empire, NV	12.7	1966–78, 1980–98	1995	5.02	245	3/11/95	5.02	245	N	<10
10312000	Carson River near Fort Churchill, NV	1,450	1911–98	1997	15.27	22,300	1/3/97	15.27	22,300	N	>100
10312150	Carson River below Lahontan Reservoir near Fallon, NV	1,801	1980–98	1983	8.34	3,160	5/17/96	7.78	2,430	Y	--
10312275	Carson River at Tarzyn Road near Fallon, NV	--	1986–98	1996 1997	6.11 8.73	942 821	5/27/96	6.11 8.73	942 821	Y	--
10316500	Lamoille Creek near Lamoille, NV	24.9	1915–16, 1918–20, 1922, 1944–98	1997 1982	5.29 6.23	838 829	6/4/97	5.29	838	N	--
10319900	South Fork Humboldt River above Tenmile Creek near Elko, NV	898	1989–98	1995	5.82	2,710	6/3/95	5.82	2,710	N	--
10336700	Incline Creek near Crystal Bay, NV	6.69	1970–73, 1975, 1988–98	1997	3.87	179	1/2/97	3.87	179	N	<50
10336730	Glenbrook Creek at Glenbrook, NV	3.75	1972–75, 1988–98	1997	6.46	144	1/2/97	6.46	144	N	50
10336740	Logan House Creek near Glenbrook, NV	2.08	1984–98	1997	4.75	11	1/2/97	4.75	11	N	<25
10348000	Truckee River at Reno, NV	1,067	1907–21, 1925–26, 1931–34, 1947–98	1956 1997	13.63 14.94	20,800 18,200	1/2/97	14.94	18,200	Y	<50

Table 29. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Nevada.—Continued

[mi², square miles; ft, feet above an arbitrary datum; ft³/s, cubic feet per second; --, not determined or not applicable; >, greater than; <, less than. Source: Recurrence intervals calculated from U.S. Geological Survey data. Other data from U.S. Geological Survey reports or databases]

Streamgage number (fig. 40)	Streamgage name	Total drainage (mi ²)	Maximum stage and discharge for period of record through 1998 water year				Significant floods 1994–98 water years				
			Period of record (water years)	Water year	Stage (ft)	Discharge (ft ³ /s)	Date (month/ day/ year)	Stage (ft)	Discharge (ft ³ /s)	Regulated during flood ¹	Recurrence interval (years)
10348200	Truckee River near Sparks, NV	1,070	1978–98	1997	--	18,000	1/2/97	--	18,000	Y	--
				1986	15.22	14,900					
10348850	Galena Creek at Galena Creek State Park, NV	7.69	1985–98	1997	5.54	2,610	1/2/97	5.54	2,610	N	<50
10349300	Steamboat Creek at Steamboat, NV	123	1962–98	1986	6.79	3,600	1/1/97	6.03	2,090	Y	>25
10351600	Truckee River below Derby Dam near Wadsworth, NV	1,676	1909–10, 1916, 1918–98	1997	14.56	19,900	1/3/97	14.56	19,900	Y	<50
10351650	Truckee River at Wadsworth, NV	1,728	1966–86, 1994–98	1997	19.62	19,100	1/3/97	19.62	19,100	Y	<50
10351700	Truckee River near Nixon, NV	1,827	1956, 1958–98	1997	15.28	21,200	1/3/97	15.28	21,200	Y	50
10353750	Mahogany Creek near Summit Lake, NV	13.3	1988–98	1995	5.34	50	6/5/95	5.34	50	N	--
				1998	5.56	40					
10353800	Smoke Creek below reservoir near Smoke Creek, NV	50.1	1986, 1989–98	1995	8.43	4,320	3/9/95	8.43	4,320	Y	--
				1986	9.00	2,270					

¹Regulated during flood: N, no; Y, yes.

New Hampshire

A coastal storm, which was fed tropical moisture by the circulation around Hurricane Lily, produced 8 to 13 inches of rain throughout parts of central and southern New Hampshire during October 20–23, 1996 (National Oceanic and Atmospheric Administration, 1996a). Many homes and businesses were flooded, roads and bridges were washed out, and several dams were damaged. Total damage was more than \$10.8 million (National Oceanic and Atmospheric Administration, 1996b). Oyster River near Durham (streamgage 01073000) had a peak of record during this flood (table 30).

Three to 8 inches of rain during June 13–15, 1998 (National Oceanic and Atmospheric Administration, 1998a), caused small rivers and streams to rise in central and southern New Hampshire. Many roads were flooded and (or) washed out. Campgrounds and some lakeside homes had to be evacuated. More than \$1 million in damage resulted (National Oceanic and

Atmospheric Administration, 1998b). Excessive rains returned on June 27, 1998. From 3 to possibly as much as 6 inches of rain fell in 12 hours (National Oceanic and Atmospheric Administration, 1998a) causing the Baker River (fig. 41) and its tributaries to rise very rapidly. Bridges were destroyed, vehicles were washed away, and some towns were completely isolated. Damage was near \$1.5 million (National Oceanic and Atmospheric Administration, 1998b).

References

National Oceanic and Atmospheric Administration (NOAA), 1996a–98a, Climatological data (by State): Asheville, North Carolina, National Climatic Data Center, various months.
National Oceanic and Atmospheric Administration (NOAA), 1996b–98b, Storm data (by State): Asheville, North Carolina, National Climatic Data Center, various months.

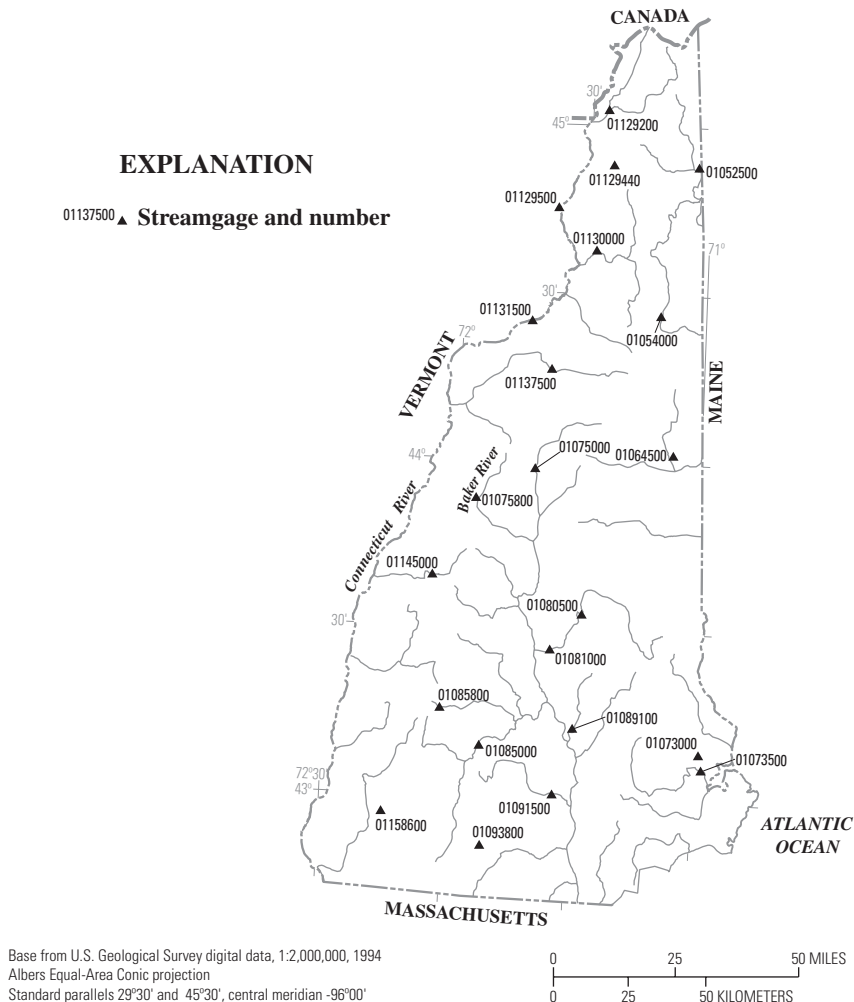


Figure 41. Location of streamgages with significant floods during 1994–98 water years for New Hampshire.

Table 30. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in New Hampshire.

[mi², square miles; ft, feet above an arbitrary datum; ft³/s, cubic feet per second; --, not determined or not applicable; >, greater than. Source: Recurrence intervals calculated from U.S. Geological Survey data. Other data from U.S. Geological Survey reports or databases]

Streamgage number (fig. 41)	Streamgage name	Total drainage (mi ²)	Maximum stage and discharge for period of record through 1998 water year				Significant floods 1994–98 water years				
			Period of record (water years)	Water year	Stage (ft)	Discharge (ft ³ /s)	Date (month/ day/ year)	Stage (ft)	Discharge (ft ³ /s)	Regulated during flood ¹	Recurrence interval (years)
01052500	Diamond River near Wentworth Location, NH	152	1942–98	1998	12.11	12,800	3/31/98	12.11	12,800	N	>100
				1981	12.23	3,620					
01054000	Androscoggin River near Gorham, NH	1,361	1914–98	1923	--	21,900	4/1/98	10.15	20,400	Y	50
				1998	10.15	20,400					
01064500	Saco River near Conway, NH	385	1903–09, 1910–12, 1929–98	1998	14.67	36,500	6/14/98	14.67	36,500	--	10–25
01073000	Oyster River near Durham, NH	12.1	1935–98	1997	6.67	1,160	10/21/96	6.67	1,160	N	>100
				1936	7.45	548					
01073500	Lamprey River near Newmarket, NH	183	1935–98	1987	15.14	7,570	10/22/96	14.59	7,080	Y	50–75
01075000	Pemigewasset River at Woodstock, NH	193	1940–80, 1985–98	1960	16.13	47,000	10/22/95	14.09	33,500	N	25–50
01075800	Stevens Brook near Wentworth, NH	12.9	1964–98	1996	4.51	650	11/12/95	4.51	650	--	10–25
01080500	Lake Winnepesaukee outlet at Lakeport, NH	363	1934–83, 1988–98	1936	--	2,890	6/22/98	--	2,620	Y	10–25
01081000	Winnepesaukee River at Tilton, NH	471	1937–98	1984	8.68	4,580	6/28/98	8.04	3,940	Y	25
01085000	Contoocook River near Henniker, NH	368	1938, 1940–77, 1989–98	1938	21.30	22,200	10/22/96	13.18	9,840	Y	25–50
01085800	West Branch Warner River near Bradford, NH	5.75	1963–98	1984	--	800	11/12/95	9.14	690	N	10–25
				1996	9.14	690					
01089100	Soucook River at Pembroke Road near Concord, NH	81.9	1989–98	1996	11.59	2,320	4/17/96	11.59	2,320	N	10–25

Table 30. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in New Hampshire.—Continued

[mi², square miles; ft, feet above an arbitrary datum; ft³/s, cubic feet per second; --, not determined or not applicable; >, greater than. Source: Recurrence intervals calculated from U.S. Geological Survey data. Other data from U.S. Geological Survey reports or databases]

Streamgage number (fig. 41)	Streamgage name	Total drainage (mi ²)	Maximum stage and discharge for period of record through 1998 water year				Significant floods 1994–98 water years				
			Period of record (water years)	Water year	Stage (ft)	Discharge (ft ³ /s)	Date (month/ day/ year)	Stage (ft)	Discharge (ft ³ /s)	Regulated during flood ¹	Recurrence interval (years)
01091500	Piscataquog River near Goffstown, NH	202	1936, 1938 1940–78, 1983–98	1938	17.52	21,900	10/21/96	10.61	6,470	Y	5–10
01093800	Stony Brook tributary near Temple, NH	3.60	1964–98	1997 1977	5.63 7.13	648 336	10/21/96	5.63	648	N	25–50
01129200	Connecticut River below Indian Stream near Pittsburg, NH	254	1957–98	1996	7.97	5,240	4/27/96 3/31/98	7.97 7.87	5,240 5,120	Y Y	50–100 50–100
01129440	Mohawk River near Colebrook NH	36.7	1987–98	1998	10.99	4,880	3/31/98	10.99	4,880	N	10–25
01129500	Connecticut River at North Stratford, NH	799	1931–98	1998 1981	15.63 16.40	32,300 17,000	3/31/98	15.63	32,300	Y	>100
01130000	Upper Ammonoosuc River near Groveton, NH	232	1936, 1941–80, 1983–98	1969	12.01	24,100	3/31/98	8.97	9,130	N	25–50
01131500	Connecticut River near Dalton, NH	1,514	1928–98	1936	25.60	48,300	4/1/98	23.70	42,000	Y	25–50
01137500	Ammonoosuc River at Bethlehem Junction, NH	87.6	1940–98	1996	12.34	11,300	11/12/95	12.34	11,300	N	50
01145000	Mascoma River at West Canaan, NH	80.5	1938, 1940–78, 1985–98	1953 1938	8.94 9.60	3,780 4,310	6/27/98	8.59	3,420	N	25–50
01158600	Otter Brook below Otter Brook Dam near Keene, NH	47.2	1959–98	1987 1994	8.62 8.64	752 720	4/18/94	8.64	720	Y	10–25

¹Regulated during flood: N, no; Y, yes.

New Jersey

The combination of warm temperatures, snowmelt, frozen ground, and basin average precipitation of 1.5 to 2 inches (National Oceanic and Atmospheric Administration, 1994a) caused urban flooding throughout interior southern New Jersey on January 28, 1994. The sudden increase in temperatures led to the formation of a few ice jams on area streams and rivers adding to the flooding problems. The area around Trenton (fig. 42) was the hardest hit with an estimated \$4.5 million in damage (National Oceanic and Atmospheric Administration, 1994b).

Thunderstorms with torrential downpours remained nearly stationary over the eastern Philadelphia suburbs for about 2 hours on July 14, 1994. Rainfall amounts of 3 to more than 7 inches were reported. In Westmont, 3.25 inches of rain fell within 30 minutes, 4.72 inches within 1 hour, and 6.54 inches in 3 hours. The rainfall rate of 4.72 inches per hour represents a greater than 100-year, 1-hour precipitation event for a single location in southern New Jersey (National Oceanic and Atmospheric Administration, 1994a).

Strong southerly winds ushered very mild and moisture-laden air into the State on January 19, 1996. Street flooding and poor drainage became a major problem early on due to the rains, significant snowmelt, and ice jams. The flash flooding of the afternoon and early evening on January 19 led to larger river flooding through January 21. The worst damage occurred along the Delaware River, which crested at its highest stages since the summer of 1955 (table 31). Widespread flooding along the Raritan River was described as the worst in Manville since Tropical Storm Doria in August 1971. Damage was near \$14 million, and one life was lost (National Oceanic and Atmospheric Administration, 1996b).

Nearly stationary thunderstorms dropped between 3.5 and 7.6 inches of rain within 4 hours northwest of Trenton during the evening of June 12, 1996 (National Oceanic and Atmospheric Administration, 1996a). This caused widespread flash flooding throughout the area. Nearly every roadway was flooded. The 7.6 inches of rain represent about a daily 100-year storm (National Oceanic and Atmospheric Administration, 1996a). Approximately \$8 million in property damage

occurred, most of it in Ewing (National Oceanic and Atmospheric Administration, 1996b).

Rain, intense at times, fell across the northern half of New Jersey during the daylight hours of October 19, 1996. Storm precipitation totals ranged from 5 to nearly 7 inches (National Oceanic and Atmospheric Administration, 1996a). Four streamgages experienced their peak of record during this flood (table 31). Damage was near \$45 million, but there were no deaths (National Oceanic and Atmospheric Administration, 1996b).

On July 25, 1997, a long period of excessive rain occurred in northern New Jersey as a strong warm front moved slowly north toward the area. In addition, the area was affected by fringe precipitation from Tropical Storm Danny. Excessive rainfall [from 4 to 7 inches with isolated higher amounts (National Oceanic and Atmospheric Administration, 1997a)] caused widespread serious flooding of homes, streets, rivers, streams, and poor drainage areas in and around Newark. Property damage estimates were at least \$3 million (National Oceanic and Atmospheric Administration, 1997b).

Torrential rain from thunderstorms fell across southeastern New Jersey on August 20–21, 1997, as a low-pressure system developed south of Delaware Bay and slowly moved northeast across southern New Jersey. Storm totals included 10.12 inches in Millville and 7.2 inches in Vineland. The storm total of 13.52 inches of rainfall at the Atlantic City International Airport represented a greater than 100-year storm for the area. A 100-year storm for this area is 7.25 inches (National Oceanic and Atmospheric Administration, 1997a). Total damage was estimated at \$54 million, but no deaths occurred (National Oceanic and Atmospheric Administration, 1997b).

References

- National Oceanic and Atmospheric Administration (NOAA), 1994a–97a, Climatological data (by State): Asheville, North Carolina, National Climatic Data Center, various months.
- National Oceanic and Atmospheric Administration (NOAA), 1994b–97b, Storm data (by State): Asheville, North Carolina, National Climatic Data Center, various months.

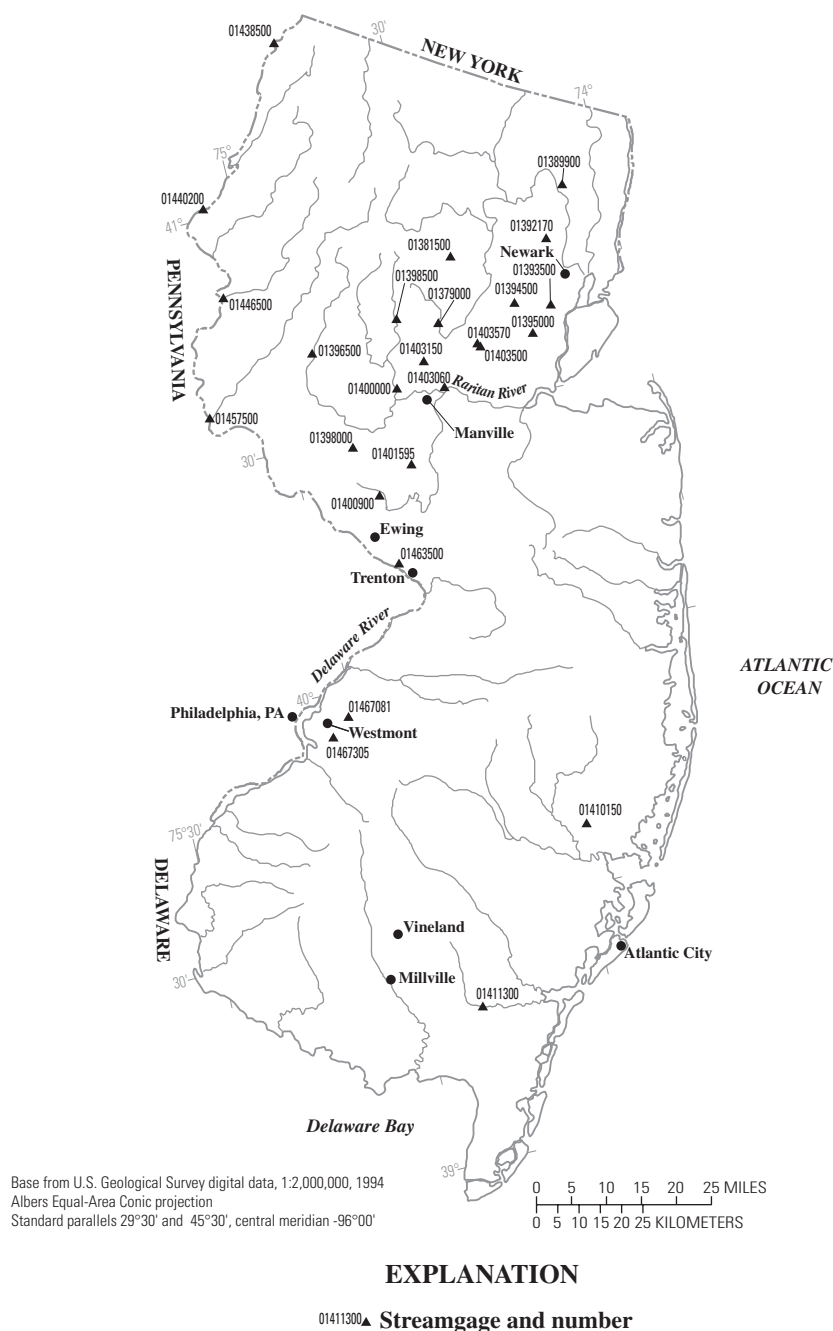


Figure 42. Location of streamgages with significant floods during 1994–98 water years for New Jersey.

Table 31. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in New Jersey.

[mi², square miles; ft, feet above an arbitrary datum; ft³/s, cubic feet per second; --, not determined or not applicable; >, greater than. Source: Recurrence intervals calculated from U.S. Geological Survey data. Other data from U.S. Geological Survey reports or databases]

Streamgage number (fig. 42)	Streamgage name	Total drainage (mi ²)	Maximum stage and discharge for period of record through 1998 water year				Significant floods 1994–98 water years				
			Period of record (water years)	Water year	Stage (ft)	Discharge (ft ³ /s)	Date (month/ day/ year)	Stage (ft)	Discharge (ft ³ /s)	Regulated during flood ¹	Recurrence interval (years)
01379000	Passaic River near Millington, NJ	55.4	1904–06, 1922–98	1997	9.89	2,290	10/20/96	9.89	2,290	N	80
01381500	Whippany River at Morristown, NJ	29.4	1922–98	1971	8.60	2,800	10/20/96	7.79	2,300	N	40
01389900	Fleischer Brook at Market Street at Elmwood Park, NJ	1.37	1967–93, 1995–98	1978	6.47	470	7/8/96	2.82	1,600	N	--
01392170	Third River at Bloomfield, NJ	7.71	1989–98	1997	7.34	1,410	10/19/96	7.34	1,410	N	6
01393500	Elizabeth River at Elizabeth, NJ	20.2	1922–98	1971	18.70	4,110	7/25/97	--	3,080	N	9
01394500	Rahway River near Springfield, NJ	25.5	1938–99	1973	9.76	5,430	7/25/97	9.56	5,140	N	50
01395000	Rahway River at Rahway, NJ	40.9	1922–87, 1989–98	1973	7.88	5,420	10/19/96	7.50	4,210	N	30
01396500	South Branch Raritan River near High Bridge, NJ	65.3	1896, 1902, 1904, 1919–24, 1926–98	1979 1994	12.07 14.26	6,910 2,000	10/20/96	11.13	4,730	N	30
01398000	Neshanic River at Reaville, NJ	25.7	1931–98	1971	13.84	15,900	10/19/96	12.63	11,100	N	25
01398500	North Branch Raritan River near Far Hills, NJ	26.2	1919, 1922–98	1971 1919	7.28 7.60	6,390 7,000	10/19/96	6.65	5,090	N	35
01400000	North Branch Raritan River near Raritan, NJ	190	1896, 1924–98	1971	15.47	28,600	10/19/96	15.44	28,500	N	100
01400900	Stony Brook at Glenmoore, NJ	17.0	1957–95	1971	11.02	6,100	1/28/94	9.94	4,950	N	35
01401595	Rock Brook near Blawenburg, NJ	9.03	1967–76, 1978–98	1971	10.00	4,530	10/19/96	8.19	3,130	N	20
01403060	Raritan River below Callo Dam at Bound Brook, NJ	785	1896, 1904–09, 1936–39, 1942, 1945–98	1971	37.47	46,100	10/20/96	35.58	40,100	N	25

Table 31. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in New Jersey.—Continued

[mi², square miles; ft, feet above an arbitrary datum; ft³/s, cubic feet per second; --, not determined or not applicable; >, greater than. Source: Recurrence intervals calculated from U.S. Geological Survey data. Other data from U.S. Geological Survey reports or databases]

Streamgage number (fig. 42)	Streamgage name	Total drainage (mi ²)	Maximum stage and discharge for period of record through 1998 water year				Significant floods 1994–98 water years				
			Period of record (water years)	Water year	Stage (ft)	Discharge (ft ³ /s)	Date (month/ day/ year)	Stage (ft)	Discharge (ft ³ /s)	Regulated during flood ¹	Recurrence interval (years)
01403150	West Branch Middle Brook near Martinsville, NJ	1.99	1980–98	1997	6.89	700	10/19/96	6.89	700	N	15
01403500	Green Brook at Plainfield, NJ	9.75	1916, 1927, 1936, 1938–98	1938 1970	5.82 6.10	2,890 2,050	10/19/96	5.82	2,120	N	30
01403570	Stony Brook at North Plainfield, NJ	6.88	1938, 1975–81, 1991–98	1997 1938	7.35 10.00	3,130 --	10/19/96	7.35	3,130	N	30
01410150	East Branch Bass River near New Gretna, NJ	8.11	1978–98	1997	7.28	750	8/22/97	7.28	750	N	100
01411300	Tuckahoe River at Head of River, NJ	30.8	1971–96, 1998	1997	9.09	1,340	8/21/97 2/5/98	9.09 6.72	1,340 638	N N	>100 40
01438500	Delaware River at Montague, NJ	3,480	1904, 1936–98	1955 1904	35.15 35.50	250,000 --	1/20/96	26.66	149,000	N	30
01440200	Delaware River near Delaware Water Gap, NJ	3,850	1955, 1965–96	1955	37.40	260,000	1/20/96	24.89	155,000	N	40
01446500	Delaware River at Belvidere, NJ	4,535	1904, 1923–98	1955	30.21	273,000	1/20/96	22.96	158,000	N	40
01457500	Delaware River at Riegelsville, NJ	6,328	1841, 1904, 1907–98	1955	38.85	340,000	1/20/96	28.72	187,000	N	40
01463500	Delaware River at Trenton, NJ	6,780	1902, 1904–98	1955	28.60	329,000	1/20/96	22.20	179,000	N	25
01467081	South Branch Pennsauken Creek at Cherry Hill, NJ	8.98	1968–76, 1978–98	1994	11.63	1,500	7/14/94	11.63	1,500	N	100
01467305	Newton Creek at Collingswood, NJ	1.33	1964–75, 1977–98	1994	6.82	328	7/14/94	6.82	328	N	70

¹Regulated during flood: N, no; Y, yes.

New Mexico

Intense thunderstorms across New Mexico occurred intermittently during May, June, July, and August 1994, and caused six streamgages to experience their peak of record (table 32). On May 31, 1994, the Rio Grande River below Elephant Butte Dam (streamgage 08361000) had its greatest discharge since the flood of 1942 on May 31, 1994.

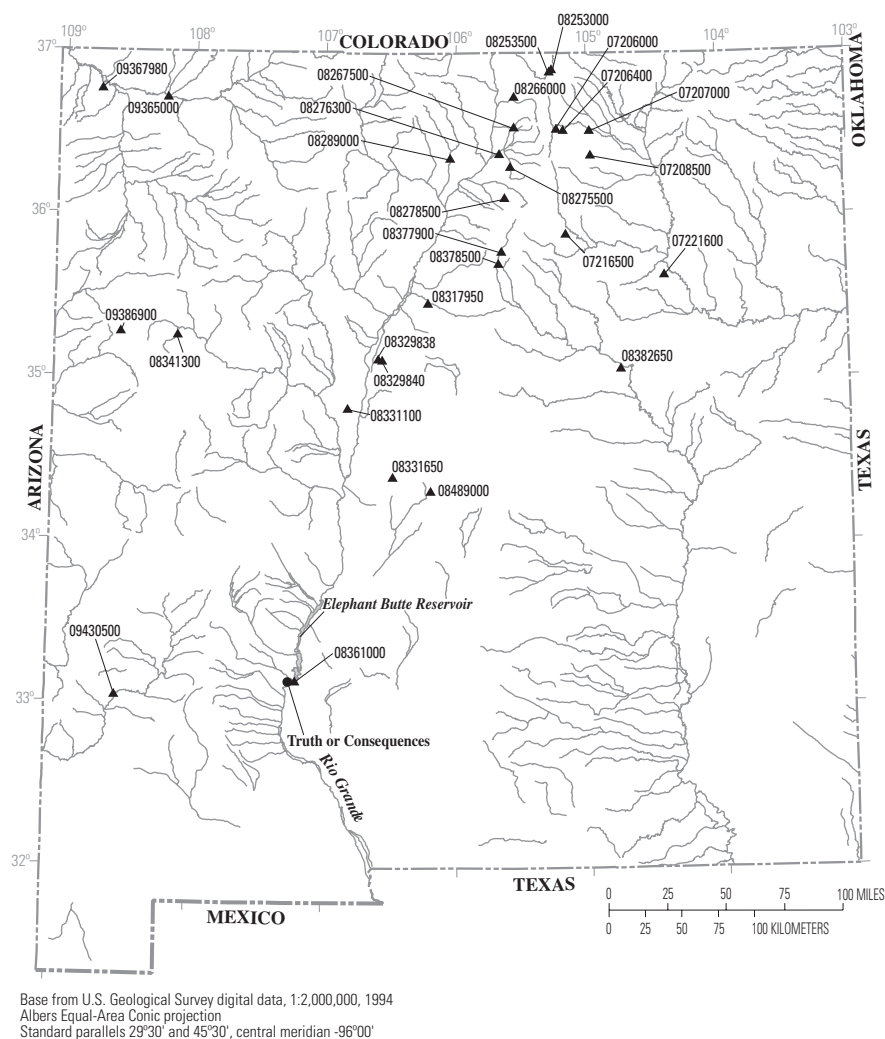
Intense thunderstorms produced excessive rainfall during June 1995, causing flooding in various parts of the State. Peaks of record were set at two streamgages in June (table 32).

An estimated rainfall of as much as 4.50 inches fell in a 3-hour period shortly after midnight on June 29, 1997 (National Oceanic and Atmospheric Administration, 1997a) near Truth or Consequences (fig. 43). Several roads were washed out or

damaged, and several cars were washed into Elephant Butte Reservoir. Considerable damage also took place to utilities and a number of homes and businesses, mainly due to the rapid run-off rather than rising water levels in established drainages. Damage was near \$1 million (National Oceanic and Atmospheric Administration, 1997b).

References

National Oceanic and Atmospheric Administration (NOAA), 1997a, Climatological data (by State): Asheville, North Carolina, National Climatic Data Center, various months.
National Oceanic and Atmospheric Administration (NOAA), 1997b, Storm data (by State): Asheville, North Carolina, National Climatic Data Center, various months.



EXPLANATION

08361000▲ Streamgage and number

Figure 43. Location of streamgages with significant floods during 1994–98 water years for New Mexico.

Table 32. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in New Mexico.

[mi², square miles; ft, feet above an arbitrary datum; ft³/s, cubic feet per second; --, not determined or not applicable. Source: Recurrence intervals calculated from U.S. Geological Survey data. Other data from U.S. Geological Survey reports or databases]

Streamgage number (fig. 43)	Streamgage name	Total drainage (mi ²)	Maximum stage and discharge for period of record through 1998 water year				Significant floods 1994–98 water years				
			Period of record (water years)	Water year	Stage (ft)	Discharge (ft ³ /s)	Date (month/ day/ year)	Stage (ft)	Discharge (ft ³ /s)	Regulated during flood ¹	Recurrence interval (years)
07206000	Cimarron River below Eagle Nest Dam, NM	167	1950–98	1994	--	303	5/23/94	3.63	303	Y	--
				1955	2.79	205					
07206400	Clear Creek near Ute Park, NM	7.44	1962–77, 1979–84, 1986–96	1965	3.05	151	7/24/94	3.00	150	N	35
07207000	Cimarron River near Cimarron, NM	294	1950–97	1965	12.42	15,500	6/3/95	4.32	892	Y	--
07208500	Rayado Creek at Sauble Ranch near Cimarron, NM	65.0	1914, 1917–20, 1924, 1928–32, 1934–96	1965	11.50	9,000	6/18/95	4.86	666	N	10
07216500	Mora River near Golondrinas, NM	267	1916–20, 1929–86, 1988–98	1952	--	14,000	5/19/94	5.82	6,180	N	60
				1969	9.30	3,180					
07221600	Lagarita Creek tributary near Sanchez, NM	1.19	1972, 1982, 1989–96	1994	5.83	1,500	5/11/94	5.83	1,500	N	10
08253000	Casias Creek near Costilla, NM	16.6	1937–97	1994	2.06	196	5/25/94	2.06	196	N	50
				1971	2.07	181					
08253500	Santistevan Creek near Costilla, NM	2.15	1938–98	1995	1.57	20	6/29/95	1.57	20	N	25
				1941	1.73	18					
08266000	Cabresto Creek near Questa, NM	36.7	1944–96	1994	5.41	289	5/21/94	5.41	289	Y	--
08267500	Rio Hondo near Valdez, NM	36.2	1935–98	1941	2.73	541	6/20/95	3.98	460	N	20
				1979	4.53	402					

Table 32. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in New Mexico.—Continued

[mi², square miles; ft, feet above an arbitrary datum; ft³/s, cubic feet per second; --, not determined or not applicable. Source: Recurrence intervals calculated from U.S. Geological Survey data. Other data from U.S. Geological Survey reports or databases]

Streamgage number (fig. 43)	Streamgage name	Total drainage (mi ²)	Maximum stage and discharge for period of record through 1998 water year				Significant floods 1994–98 water years				
			Period of record (water years)	Water year	Stage (ft)	Discharge (ft ³ /s)	Date (month/ day/ year)	Stage (ft)	Discharge (ft ³ /s)	Regulated during flood ¹	Recurrence interval (years)
08275500	Rio Grande del Rancho near Talpa, NM	83.0	1953–98	1991	4.16	644	5/20/94	3.50	529	N	25
08276300	Rio Pueblo de Taos below Los Cordovas, NM	380	1957–98	1994	8.88	2,260	5/20/94	8.88	2,260	Y	25
				1991	8.93	1,660					
08278500	Rio Santa Barbara near Penasco, NM	38.0	1954–57, 1992–98	1995	6.21	838	6/18/95	6.21	838	N	--
08289000	Rio Ojo Caliente at La Madera, NM	419	1932–98	1998	6.00	3,990	8/14/94	8.27	3,640	N	35
				1994	8.27	3,640	7/8/98	6.00	3,990	N	70
08317950	Galisteo Creek below Galisteo Dam, NM	597	1971–97	1997	--	3,460	8/24/97	--	3,460	Y	--
				1981	7.11	1,590					
08329838	South Fork Hahn Arroyo in Albuquerque, NM	2.03	1979–83, 1992–98	1994	4.42	574	5/11/94	4.42	574	N	--
08329840	Hahn Arroyo in Albuquerque, NM	4.23	1979–98	1998	2.93	1,150	12/27/97	2.93	1,150	N	--
08331100	Belen Highline Canal tributary near Los Lunas, NM	.16	1955–95	1965	--	754	8/15/94	7.30	480	N	25
				1994	7.30	480					
08331650	Canada Montoso near Scholle, NM	35.0	1961–80, 1982–95, 1997	1997	7.47	5,600	7/31/97	7.47	5,600	N	40
08341300	Bluewater Creek above Bluewater Dam, Bluewater, NM	75.0	1953–71, 1973–77, 1989–96, 1998	1953	8.99	3,570	3/6/95	4.45	1,940	N	20
08361000	Rio Grande below Elephant Butte Dam, NM	29,450	1915–98	1942	--	8,220	5/31/94	--	5,270	Y	--
				1998	7.54	2,810					

Table 32. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in New Mexico.—Continued

[mi², square miles; ft, feet above an arbitrary datum; ft³/s, cubic feet per second; --, not determined or not applicable. Source: Recurrence intervals calculated from U.S. Geological Survey data. Other data from U.S. Geological Survey reports or databases]

Streamgage number (fig. 43)	Streamgage name	Total drainage (mi ²)	Maximum stage and discharge for period of record through 1998 water year				Significant floods 1994–98 water years				
			Period of record (water years)	Water year	Stage (ft)	Discharge (ft ³ /s)	Date (month/ day/ year)	Stage (ft)	Discharge (ft ³ /s)	Regulated during flood ¹	Recurrence interval (years)
08377900	Rio Mora near Tererro, NM	53.2	1964–98	1991 1979	4.08 4.15	937 820	6/8/97	3.99	864	N	25
08378500	Pecos River near Pecos, NM	189	1920–22, 1924, 1926, 1928–98	1929	6.20	4,500	6/7/97	4.79	2,060	N	20
08382650	Pecos River above Santa Rosa Lake, NM	2,340	1976–98	1996	19.06	16,000	7/11/96	19.06	16,000	N	20
08489000	Big Draw near Mountainair, NM	4.06	1953–71, 1973–74, 1978–83, 1985–96	1954	8.68	1,710	6/26/96	6.64	1,040	N	20
09365000	San Juan River at Farmington, NM	7,240	1924–97	1927 1935	-- 8.00	68,000 32,800	6/2/97	7.77	13,000	Y	4
09367980	Rattlesnake Arroyo near Shiprock, NM	--	1980–96	1995	6.25	3,800	9/7/95	6.25	3,800	N	20
09386900	Rio Nutria near Ramah, NM	71.4	1970–98	1995	9.34	1,850	3/5/95	9.34	1,850	N	30
09430500	Gila River near Gila, NM	1,864	1928–98	1985 1941	13.00 17.19	35,200 25,400	9/22/97	11.18	18,200	N	20

¹Regulated during flood: N, no; Y, yes.

New York

The most disastrous flood in more than 20 years struck central New York from January 19–20, 1996. Significant widespread flooding of streams, rivers, homes and businesses, streets and highways, woodlands, and farmland occurred as a result of rapid snowmelt and nearly simultaneous storm runoff. An area of intense low pressure, which was located over the Mid-Atlantic region on Friday morning January 19, produced unseasonably warm temperatures, high dew points, and strong winds. This resulted in rapid melting of 1 to 3 feet of snow. In addition to the rapid snowmelt, 1 to 3 inches of rain fell as the system moved northeast along the coast (National Oceanic and Atmospheric Administration, 1996a). There were 10 known fatalities. Total damage statewide was more than \$200 million (National Oceanic and Atmospheric Administration 1996b). Flash floods that began early on January 19 gave rise to main-stem river floods that persisted until the evening of January 21. Near-record river flooding occurred January 19–20 in the Chemung, upper Susquehanna, Hudson, and upper Delaware River Basins (fig. 44). At Waverly, the Susquehanna River crested at 20.35 feet, its third highest level of all time, which was about 1 foot lower than the all time crest of 21.40 feet recorded on March 19, 1946 (National Oceanic and Atmospheric Administration, 1996b). Flooding was so widespread and severe that this event became known as the “Deluge of '96.” Thirty-one streamgages experienced their peak of record in New York during this flood (table 33).

On Friday October 18, 1996, a strong low-pressure system developed along a cold front in New Jersey. With a high-pressure system in place across northern New England, the low slowly intensified and moved slowly off the southern New

Jersey Coast during October 19. The increasing difference in pressures caused strong and gusty east winds, which also transported abundant moisture from the Atlantic Ocean across the region. Excessive flood-producing rains along with minor-to-major coastal flooding occurred. More than \$17 million in damage resulted from coastal and river flooding (National Oceanic and Atmospheric Administration, 1996b).

During November 8–9, 1996, a slow-moving, low-pressure system tracked from northern Pennsylvania to northern New York. This system produced 4 to 5 inches of rain across most of central New York and the northern Catskill Mountains (National Oceanic and Atmospheric Administration, 1996a). The resulting runoff caused flooding along the Mohawk River to the Hudson River. Nearly \$25 million in damage resulted (National Oceanic and Atmospheric Administration, 1996b).

An area of weak low pressure and a moist, unstable air mass over New England and New York resulted in evening and late-night thunderstorms with locally torrential downpours in extreme northern New York during June 25–27, 1998. Approximately \$20 million in damage resulted (National Oceanic and Atmospheric Administration, 1998b).

References

- National Oceanic and Atmospheric Administration (NOAA), 1996a–98a, Climatological data (by State): Asheville, North Carolina, National Climatic Data Center, various months.
- National Oceanic and Atmospheric Administration (NOAA), 1996b–98b, Storm data (by State): Asheville, North Carolina, National Climatic Data Center, various months.

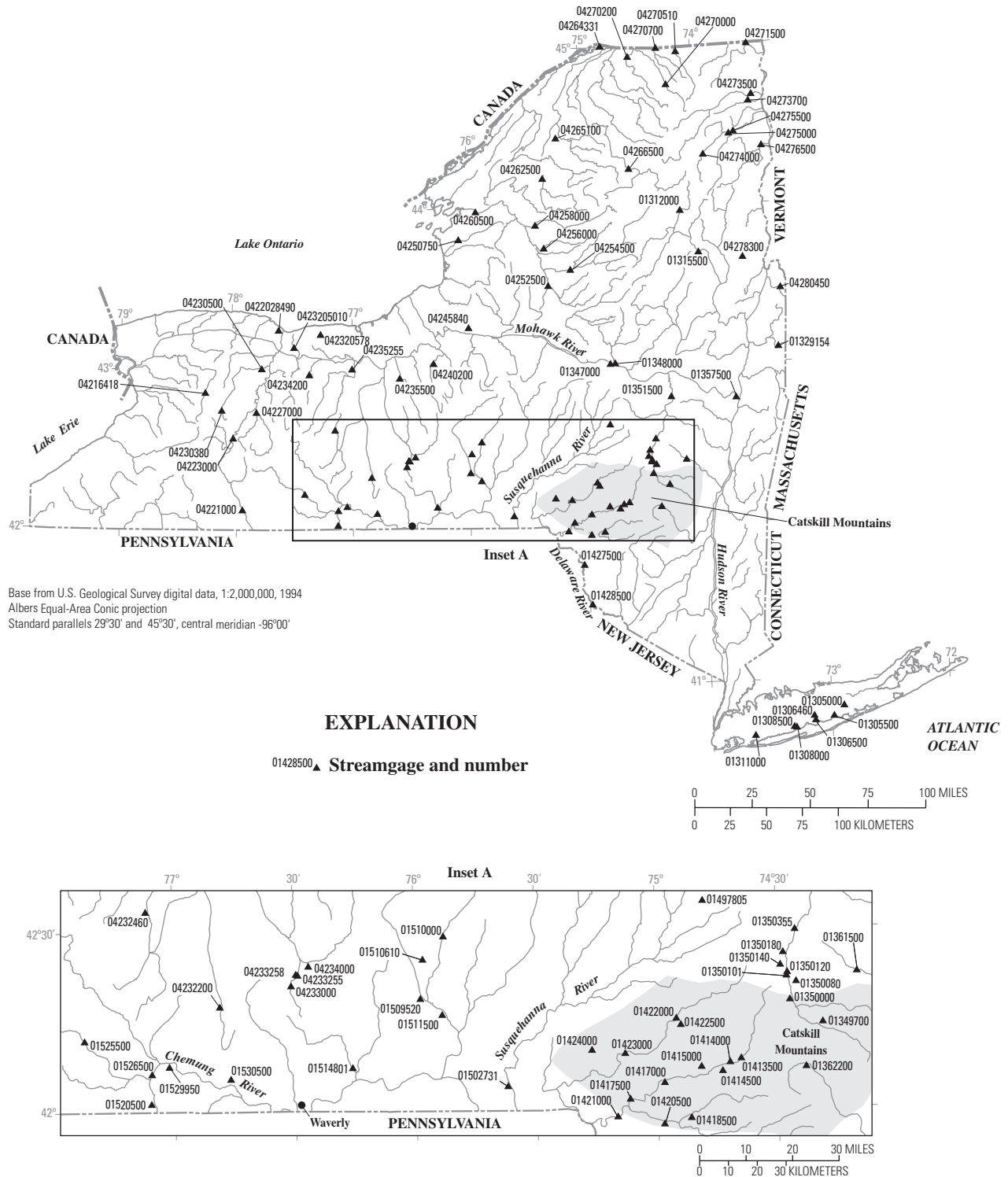


Figure 44. Location of streamgages with significant floods during 1994–98 water years for New York.

Table 33. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in New York.

[mi², square miles; ft, feet above an arbitrary datum; ft³/s, cubic feet per second; --, not determined or not applicable; >, greater than. Source: Recurrence intervals calculated from U.S. Geological Survey data. Other data from U.S. Geological Survey reports or databases]

Streamgage number (fig. 44)	Streamgage name	Total drainage (mi ²)	Maximum stage and discharge for period of record through 1998 water year				Significant floods 1994–98 water years				
			Period of record (water years)	Water year	Stage (ft)	Discharge (ft ³ /s)	Date (month/ day/ year)	Stage (ft)	Discharge (ft ³ /s)	Regulated during flood ¹	Recurrence interval (years)
01305000	Carmans River at Yaphank, NY	71.0	1943–98	1989	2.09	143	6/13/98	1.99	122	N	25
01305500	Swan River at East Patchogue, NY	8.60	1947–98	1990	2.71	77	6/13/98	2.39	69	N	75–100
01306460	Connetquot Brook near Central Islip, NY	18.0	1978–98	1998	3.89	155	6/13/98	3.89	155	N	10–25
01306500	Connetquot River near Oakdale, NY	24.0	1944–93, 1997–98	1956	--	263	6/13/98	--	174	N	--
01308000	Sampawams Creek at Babylon, NY	22.7	1945–98	1998	3.73	254	6/13/98	3.73	254	N	>100
01308500	Carlls River at Babylon, NY	35.4	1945–98	1998	2.46	336	6/13/98	2.46	336	N	100
01311000	Pines Brook at Malverne, NY	10.0	1939–98	1994	5.28	866	1/28/94 10/19/96	5.28 4.81	866 578	N N	75–100 25
01312000	Hudson River near Newcomb, NY	192	1926–98	1998	12.84	11,500	11/10/96 1/9/98	9.01 12.84	5,900 11,500	N N	10 >100
01315500	Hudson River at North Creek, NY	792	1908–98	1949	12.14	28,900	1/9/98	11.54	26,300	Y	50
01329154	Steele Brook at Shushan, NY	2.85	1979–98	1996	6.56	149	1/19/96	6.56	149	N	10–25
01347000	Mohawk River near Little Falls, NY	1,342	1901, 1902, 1904, 1913, 1928–98	1913	--	34,800	1/19/96	18.47	30,700	Y	75–100
01348000	East Canada Creek at East Creek, NY	289	1946–96, 1998	1946	9.00	24,000	1/19/96 1/09/98	8.32 8.46	17,000 17,800	N N	50 50–75
01349700	East Kill near Jewett Center, NY	35.6	1951, 1956, 1960, 1967–68, 1972–74, 1987, 1996–98	1996	17.00	13,500	1/19/96	17.00	13,500	N	25
01350000	Schoharie Creek at Prattsville, NY	237	1904, 1908–24, 1926–28, 1930–98	1996	19.39	52,800	1/19/96	19.39	52,800	N	25–50

Table 33. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in New York.—Continued

[mi², square miles; ft, feet above an arbitrary datum; ft³/s, cubic feet per second; --, not determined or not applicable; >, greater than. Source: Recurrence intervals calculated from U.S. Geological Survey data. Other data from U.S. Geological Survey reports or databases]

Streamgage number (fig. 44)	Streamgage name	Total drainage (mi ²)	Maximum stage and discharge for period of record through 1998 water year				Significant floods 1994–98 water years				
			Period of record (water years)	Water year	Stage (ft)	Discharge (ft ³ /s)	Date (month/ day/ year)	Stage (ft)	Discharge (ft ³ /s)	Regulated during flood ¹	Recurrence interval (years)
01350080	Manor Kill at West Conesville near Gilboa, NY	32.4	1987–98	1996	10.20	5,050	1/19/96	10.20	5,050	N	10–25
01350101	Schoharie Creek at Gilboa, NY	316	1936, 1938, 1956, 1976–98	1996	30.60	70,800	1/19/96	30.60	70,800	Y	75–100
01350120	Platter Kill at Gilboa, NY	10.9	1976–98	1996	6.70	1,370	1/19/96	6.70	1,370	N	25
01350140	Mine Kill near North Blenheim, NY	16.2	1975–98	1996	5.20	2,550	1/19/96	5.20	2,550	N	25–50
01350180	Schoharie Creek at North Blenheim, NY	358	1971–98	1996	17.61	75,600	1/19/96	17.61	75,600	Y	75–100
01350355	Schoharie Creek at Breakabeen, NY	444	1976–98	1996	20.51	80,200	1/19/96	20.51	80,200	Y	75–100
01351500	Schoharie Creek at Burtonsville, NY	886	1940–98	1996	12.88	81,600	1/20/96	12.88	81,600	Y	>100
01357500	Mohawk River at Cohoes, NY	3,450	1915–98	1964	23.15	143,000	1/20/96	22.68	132,000	Y	100
01361500	Catskill Creek at Oak Hill, NY	98.0	1911–77, 1980, 1987–98	1987	16.60	15,400	1/19/96	15.35	13,400	N	25–50
01362200	Esopus Creek at Allaben, NY	63.7	1951, 1964–98	1951	--	20,000	1/19/96	13.58	15,000	N	25–50
01413500	East Branch Delaware River at Margaretville, NY	163	1937–98	1996	14.88	25,800	1/19/96	14.88	25,800	N	75–100
01414000	Platte Kill at Dunraven, NY	34.9	1942–62, 1996–98	1996	11.20	5,690	1/19/96	11.20	5,690	N	>100
01414500	Mill Brook near Dunraven, NY	25.2	1937–98	1996	12.56	5,380	1/19/96 11/9/96	12.56 11.09	5,380 3,850	N N	75–100 25

Table 33. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in New York.—Continued

[mi², square miles; ft, feet above an arbitrary datum; ft³/s, cubic feet per second; --, not determined or not applicable; >, greater than. Source: Recurrence intervals calculated from U.S. Geological Survey data. Other data from U.S. Geological Survey reports or databases]

Streamgage number (fig. 44)	Streamgage name	Total drainage (mi ²)	Maximum stage and discharge for period of record through 1998 water year				Significant floods 1994–98 water years				
			Period of record (water years)	Water year	Stage (ft)	Discharge (ft ³ /s)	Date (month/ day/ year)	Stage (ft)	Discharge (ft ³ /s)	Regulated during flood ¹	Recurrence interval (years)
01415000	Tremper Kill near Andes, NY	33.2	1937–98	1996	7.69	5,000	1/19/96	7.69	5,000	N	75–100
01417000	East Branch Delaware River at Downsville, NY	372	1904, 1942–98	1904	16.00	34,000	12/2/96	9.41	11,000	Y	25
01417500	East Branch Delaware River at Harvard, NY	458	1904, 1935–67, 1978–98	1938	16.93	31,400	1/19/96	12.63	12,200	Y	25–50
				1904	--	42,000	12/2/96	12.79	12,400	Y	25–50
01418500	Beaver Kill at Craigie Clair, NY	81.9	1937–74, 1996	1996	11.83	13,000	1/19/96	11.83	13,000	N	50–75
01420500	Beaver Kill at Cooks Falls, NY	241	1914–98	1996	17.79	42,900	1/19/96	17.79	42,900	N	>100
01421000	East Branch Delaware River at Fishes Eddy, NY	784	1904, 1913–98	1904	23.60	70,000	1/19/96	16.88	53,000	Y	>100
01422000	West Branch Delaware River at Delhi, NY	142	1937–74, 1996	1996	9.80	13,000	1/19/96	9.80	13,000	N	>100
01422500	Little Delaware River near Delhi, NY	49.8	1938–74, 1996–98	1996	8.51	6,100	1/19/96	8.51	6,100	N	>100
							11/9/96	7.67	4,540	N	25–50
01423000	West Branch Delaware River at Walton, NY	332	1951–98	1996	16.36	25,000	1/19/96	16.36	25,000	N	50
01424000	Trout Creek near Rockroyal, NY	20.0	1952–67, 1996	1996	10.06	2,800	1/19/96	10.06	2,800	N	50
01427500	Callicoon Creek at Callicoon, NY	110	1940–82, 1987–98	1947	9.68	16,000	1/19/96	8.42	11,200	N	25–50
01428500	Delaware River above Lacka- waxen River near Barryville, NY	2,020	1941–98	1955	26.40	130,000	1/20/96	22.18	98,300	Y	50–75
01497805	Little Elk Creek near Westford, NY	3.73	1978–98	1996	19.92	278	1/19/96	19.92	278	N	25–50

Table 33. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in New York.—Continued

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Streamgage number (fig. 44)	Streamgage name	Total drainage (mi ²)	Maximum stage and discharge for period of record through 1998 water year				Significant floods 1994–98 water years				
			Period of record (water years)	Water year	Stage (ft)	Discharge (ft ³ /s)	Date (month/ day/ year)	Stage (ft)	Discharge (ft ³ /s)	Regulated during flood ¹	Recurrence interval (years)
01502731	Susquehanna River at Windsor, NY	1,820	1988–98	1996	21.22	40,000	1/20/96	21.22	40,000	N	10
01509520	Tioughnioga River at Lisle, NY	453	1988–98	1996 1993	-- 9.31	12,900 12,100	1/20/96	--	12,900	N	10
01510000	Otselic River at Cincinnatus, NY	147	1935, 1939–64, 1970–98	1935 1996	-- 10.89	9,200 8,000	1/19/96	10.89	8,000	N	25
01510610	Merrill Creek tributary near Texas Valley, NY	5.32	1976–81, 1983–98	1996	6.64	1,150	1/19/96	6.64	1,150	N	25–50
01511500	Tioughnioga River at Itaska, NY	730	1930–98	1935	16.61	61,100	1/19/96	10.77	20,800	Y	25–50
01514801	Catatonk Creek northwest of Owego, NY	151	1988–98	1996	14.83	9,740	1/20/96	14.83	9,740	N	25–50
01520500	Tioga River at Lindley, NY	771	1930–98	1972	26.27	128,000	8/18/94	13.38	13,900	Y	10
01525500	Canisteo River at West Cameron, NY	340	1931, 1935–72, 1974–98	1972	23.48	43,000	1/19/96	20.91	29,100	Y	50–75
01526500	Tioga River near Erwins, NY	1,377	1919–98	1972	26.74	190,000	1/19/96	16.98	45,600	Y	75
01529950	Chemung River at Corning, NY	2,005	1972, 1975–98	1972	40.71	228,000	1/19/96	25.93	61,000	Y	25–50
01530500	Newtown Creek at Elmira, NY	77.5	1938–98	1972	19.28	4,000	1/19/96	16.98	3,810	Y	25
04216418	Tonawanda Creek at Attica, NY	76.9	1972, 1978–98	1998	12.71	9,400	7/8/98	12.71	9,400	N	>100
0422028490	Slater Creek (Latta Road) near Greece, NY	1.52	1989–98	1997	4.80	219	10/20/96	4.80	219	N	10–25
04221000	Genesee River at Wellsville, NY	288	1956–58, 1972–98	1972	20.70	38,500	1/19/96	16.13	22,700	N	25–50

Table 33. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in New York.—Continued

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Streamgage number (fig. 44)	Streamgage name	Total drainage (mi ²)	Maximum stage and discharge for period of record through 1998 water year				Significant floods 1994–98 water years				
			Period of record (water years)	Water year	Stage (ft)	Discharge (ft ³ /s)	Date (month/ day/ year)	Stage (ft)	Discharge (ft ³ /s)	Regulated during flood ¹	Recurrence interval (years)
04223000	Genesee River at Portageville, NY	984	1902, 1909–98	1972	32.25	90,000	1/20/96	29.12	56,200	N	25–50
04227000	Canaseraga Creek at Shakers Crossing, NY	335	1916–22, 1959–70, 1972, 1975–98	1972 1916	-- 28.92	11,200 --	1/19/96	13.01	5,510	N	10–25
04230380	Oatka Creek at Warsaw, NY	39.1	1964–98	1998	9.90	4,110	7/8/98	9.90	4,110	N	50–75
04230500	Oatka Creek at Garbutt, NY	200	1946–98	1960	8.64	7,050	1/9/98	8.57	6,160	N	25–50
0423205010	Irondequoit Creek above Blossom Road near Rochester, NY	142	1982–98	1998	9.95	3,300	1/8/98	9.95	3,300	N	75–100
042320578	Bear Creek at Ontario, NY	6.74	1971–73, 1975–98	1998	13.38	238	1/8/98	13.38	238	N	25–50
04232200	Catharine Creek at Montour Falls, NY	41.1	1972, 1975–77, 1987–98	1997	8.48	4,700	11/8/96	8.48	4,700	N	50
04232460	Sugar Creek at Guyanoga, NY	28.9	1966–98	1996	5.88	1,800	1/19/96 1/8/98	5.88 4.98	1,800 1,320	N N	25 10
04233000	Cayuga Inlet near Ithaca, NY	35.2	1935, 1937–98	1935	--	6,500	1/19/96	7.57	4,210	N	25–50
04233255	Cayuga Inlet at Ithaca, NY	86.7	1935, 1971–72, 1975–98	1935	--	14,000	1/19/96	14.67	12,500	N	25–50
04233258	Coy Glen Creek at Ithaca, NY	3.56	1972, 1983–98	1996	22.23	820	1/19/96	22.23	820	N	25
04234000	Fall Creek near Ithaca, NY	126	1926–98	1935	9.52	15,500	1/19/96	7.47	9,450	N	50–75

Table 33. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in New York.—Continued

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			Period of record (water years)	Water year	Stage (ft)	Discharge (ft ³ /s)	Date (month/ day/ year)	Stage (ft)	Discharge (ft ³ /s)	Regulated during flood ¹	Recurrence interval (years)
04234200	Mud Creek at East Victor, NY	64.2	1958, 1961–68, 1976–98	1991 1972	7.22 7.85	1,880 1,800	1/19/96	7.09	1,810	N	10–25
04235255	Canandaigua Outlet tributary near Alloway, NY	2.94	1978–98	1996 1998	7.34 7.34	102 102	1/19/96 1/8/98	7.34 7.34	102 102	N N	10 10
04235500	Owasco Outlet near Auburn, NY	206	1914–98	1972	6.28	3,250	1/9/98	4.65	2,150	Y	10–25
04240200	Ninemile Creek at Camillus, NY	84.3	1959–82, 1989–98	1960 1975	8.25 10.83	2,760 2,120	1/19/96	8.92	2,530	Y	10–25
04245840	Scriba Creek near Constantia, NY	38.4	1966–69, 1971–98	1975 1972	7.33 7.42	1,310 1,200	1/8/98	7.32	1,300	N	25–50
04250750	Sandy Creek near Adams, NY	128	1958–98	1996	11.06	7,700	1/19/96	11.06	7,700	N	10–25
04252500	Black River near Boonville, NY	304	1911–98	1985 1982 1913	11.41 11.31 12.50	12,800 12,800 12,400	1/9/98	11.25	12,100	N	25–50
04254500	Moose River at McKeever, NY	363	1869, 1902–70, 1982, 1985, 1987–98	1947	17.45	18,700	1/8/98	14.91	14,600	N	25–50
04256000	Independence River at Donnattsburg, NY	88.7	1943–98	1985	13.34	9,420	1/8/98	9.53	4,340	N	10–25
04258000	Beaver River at Croghan, NY	291	1931–98	1969	6.98	5,100	1/9/98	6.56	4,440	Y	25–50
04260500	Black River at Watertown, NY	1,864	1869, 1897–1913, 1917–98	1998	16.02	55,500	1/10/98	16.02	55,500	Y	>100

Table 33. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in New York.—Continued

[mi², square miles; ft, feet above an arbitrary datum; ft³/s, cubic feet per second; --, not determined or not applicable; >, greater than. Source: Recurrence intervals calculated from U.S. Geological Survey data. Other data from U.S. Geological Survey reports or databases]

Streamgage number (fig. 44)	Streamgage name	Total drainage (mi ²)	Maximum stage and discharge for period of record through 1998 water year				Significant floods 1994–98 water years				
			Period of record (water years)	Water year	Stage (ft)	Discharge (ft ³ /s)	Date (month/ day/ year)	Stage (ft)	Discharge (ft ³ /s)	Regulated during flood ¹	Recurrence interval (years)
04262500	West Branch Oswegatchie River near Harrisville, NY	244	1917–98	1998	10.64	8,700	1/9/98	10.64	8,700	N	>100
04264331	Saint Lawrence River at Cornwall Ontario near Massena, NY	298,800	1918–98	1993	--	378,000	3/17/98	--	360,000 (Daily)	Y	--
04265100	Elm Creek near Hermon, NY	32.6	1959–98	1974	9.07	1,270	1/19/96	8.82	1,180	N	25
04266500	Raquette River at Piercefield, NY	721	1900, 1909–98	1993 1972	12.04 12.25	8,630 8,360	4/21/94	11.50	7,660	Y	10–25
04270000	Salmon River at Chasm Falls, NY	132	1926–82, 1985, 1987–98	1985	5.63	3,700	4/1/98	5.43	3,540	N	75–100
04270200	Little Salmon River at Bombay, NY	92.2	1959–98	1998	13.27	3,420	3/31/98	13.27	3,420	N	25–50
04270510	Chateaugay River below Chateaugay, NY	151	1966–95, 1997–98	1998 1966	7.54 10.99	5,440 --	11/9/96 3/31/98	7.51 7.54	5,370 5,440	Y Y	10–25 10–25
04270700	Trout River at Trout River, NY	107	1960–98	1996	9.42	6,980	7/5/96	9.42	6,980	N	50–75
04271500	Great Chazy River at Perry Mills, NY	243	1929–68, 1985, 1987–98	1997	12.24	9,700	11/9/96 3/31/98	12.24 10.89	9,700 7,640	N N	>100 50–75
04273500	Saranac River at Plattsburgh, NY	608	1928, 1944–98	1997	12.11	14,400	11/09/96 4/1/98	12.11 10.73	14,400 11,200	Y Y	>100 25
04273700	Salmon River at South Plattsburgh, NY	63.3	1960–86, 1990–98	1997	7.56	4,200	11/9/96 6/27/98	7.56 7.54	4,200 4,170	N N	50–75 50–75
04274000	West Branch Ausable River near Lake Placid, NY	116	1920–68, 1983–98	1938	12.20	10,800	11/9/96	12.09	10,600	N	>100
04275000	East Branch Ausable River at Au Sable Forks, NY	198	1925–98	1997	15.22	23,900	11/9/96	15.22	23,900	N	>100
04275500	Ausable River near Au Sable Forks, NY	446	1911–68, 1990–98	1997	13.83	37,400	11/9/96	13.83	37,400	N	>100

Table 33. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in New York.—Continued

[mi², square miles; ft, feet above an arbitrary datum; ft³/s, cubic feet per second; --, not determined or not applicable; >, greater than. Source: Recurrence intervals calculated from U.S. Geological Survey data. Other data from U.S. Geological Survey reports or databases]

Streamgage number (fig. 44)	Streamgage name	Total drainage (mi ²)	Maximum stage and discharge for period of record through 1998 water year				Significant floods 1994–98 water years				
			Period of record (water years)	Water year	Stage (ft)	Discharge (ft ³ /s)	Date (month/ day/ year)	Stage (ft)	Discharge (ft ³ /s)	Regulated during flood ¹	Recurrence interval (years)
04276500	Bouquet River at Willsboro, NY	270	1924–68, 1980, 1985, 1987–98	1997	10.93	12,300	11/9/96	10.93	12,300	N	50–75
04278300	Northwest Bay Brook near Bolton Landing, NY	22.0	1966–98	1996	6.57	1,950	1/19/96	6.57	1,950	N	25–50
04280450	Mettawee River near Middle Granville, NY	167	1984, 1990–98	1996	10.69	7,600	1/20/96	10.69	7,600	N	10

¹Regulated during flood: N, no; Y, yes.

North Carolina

Rainfall amounts of 5 to 7 inches (National Oceanic and Atmospheric Administration, 1994a) caused serious flooding in the western mountains of North Carolina on March 27, 1994. Bridges were washed away and roads closed. Mudslides were widespread.

Remnants of Tropical Storm Beryl dropped 3 to 4 inches of rain west of Cape Fear (fig. 45) on August 18, 1994 (National Oceanic and Atmospheric Administration, 1994a). The town of Southport sustained nearly \$3 million in damage (National Oceanic and Atmospheric Administration, 1994b).

Hurricane Gordon was a major weather factor along the North Carolina coast during October 17–18, 1994. The storm remained offshore but caused significant flooding and strong winds along the central and northern Carolina coast. The flooding began on Hatteras Island, with about 12 inches of overwash (National Oceanic and Atmospheric Administration, 1994b).

More than 11 inches of rain fell during a 2-day period causing widespread flooding in western North Carolina, January 14–15, 1995. Three Boy Scouts drowned in Pisgah National Forest. They were attempting to cross a footbridge and were swept away in the swollen creek. Two other men drowned. Overall damage was estimated at \$2.5 million (National Oceanic and Atmospheric Administration, 1995b).

Flash flooding developed rapidly during the evening of September 4, 1996, as stationary thunderstorms dumped between 10 and 15 inches of rain in a small area of Hickory Nut Gorge (National Oceanic and Atmospheric Administration, 1996a). A wall of water rushed down the valley of the upper Broad River carrying campsites, RVs, mobile homes, trees, and debris downstream.

Hurricane Fran made landfall near Cape Fear, on September 5, 1996, and was the worst natural economic disaster to occur in North Carolina history. In North Carolina, wind and flooding damage exceeded \$5 billion (National Oceanic and Atmospheric Administration, 1996b). The copious rainfall

produced many severe flash and river floods. The flooding on the Haw River at Haw River (streamgage 02096500, table 34), the Tar River at Louisburg (streamgage 02081747), and at Rocky Mount (streamgage 02082585, table 34) exceeded the highest flood on record. A massive evacuation occurred in Goldsboro where residents of 550 homes had to be moved to public shelters. Excessive rain from Hurricane Fran moved downstream along the Neuse River and, combined with a large amount of debris, led to serious flooding. The Neuse River at Kinston (streamgage 02089500, table 34) crested at 23.3 feet, more than 9 feet above flood stage (National Oceanic and Atmospheric Administration, 1996b).

The remnants of Hurricane Fran produced widespread wind damage and flash flooding in north-central and parts of northwestern North Carolina during the late evening hours of September 5 and morning hours of September 6, 1996. Excessive rainfall forced creeks and streams to leave their banks, flooding roads and damaging crops, roads, and vehicles.

Strong thunderstorms occurred in the early morning of July 23, 1997, between Charlotte and Raleigh. These storms developed ahead of the remnants of Hurricane Danny. Between 5 and 10 inches of rain fell in a few hours (National Oceanic and Atmospheric Administration, 1997a) causing widespread flooding. Two women died after their vehicles became trapped in floodwaters. A young girl perished when she went to play in the water and was swept away. Damage in this area was more than \$11 million (National Oceanic and Atmospheric Administration, 1997b).

References

- National Oceanic and Atmospheric Administration (NOAA), 1994a–97a, Climatological data (by State): Asheville, North Carolina, National Climatic Data Center, various months.
- National Oceanic and Atmospheric Administration (NOAA), 1994b–97b, Storm data (by State): Asheville, North Carolina, National Climatic Data Center, various months.

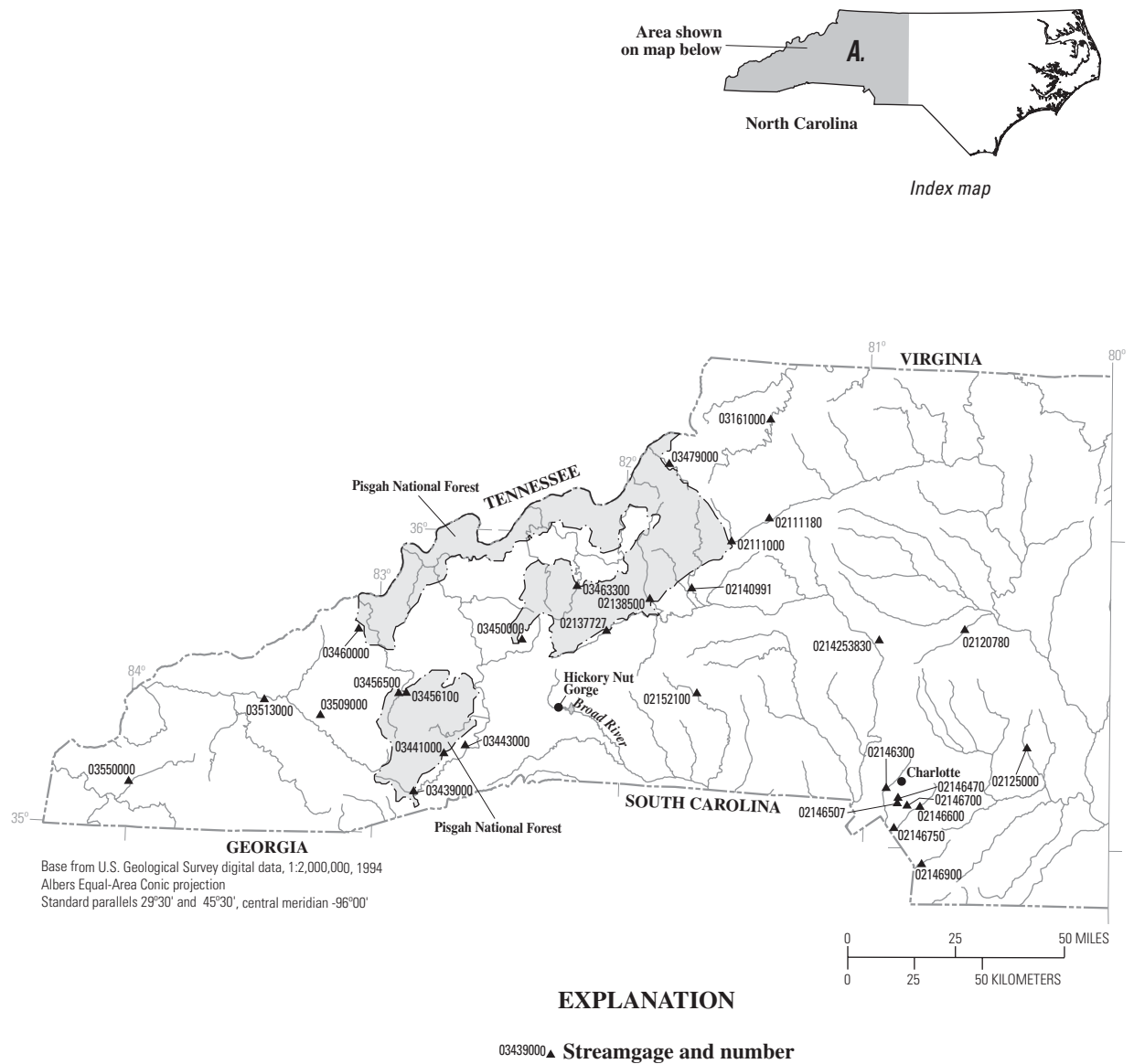


Figure 45. (A) Location of streamgages with significant floods during 1994–98 water years for North Carolina.

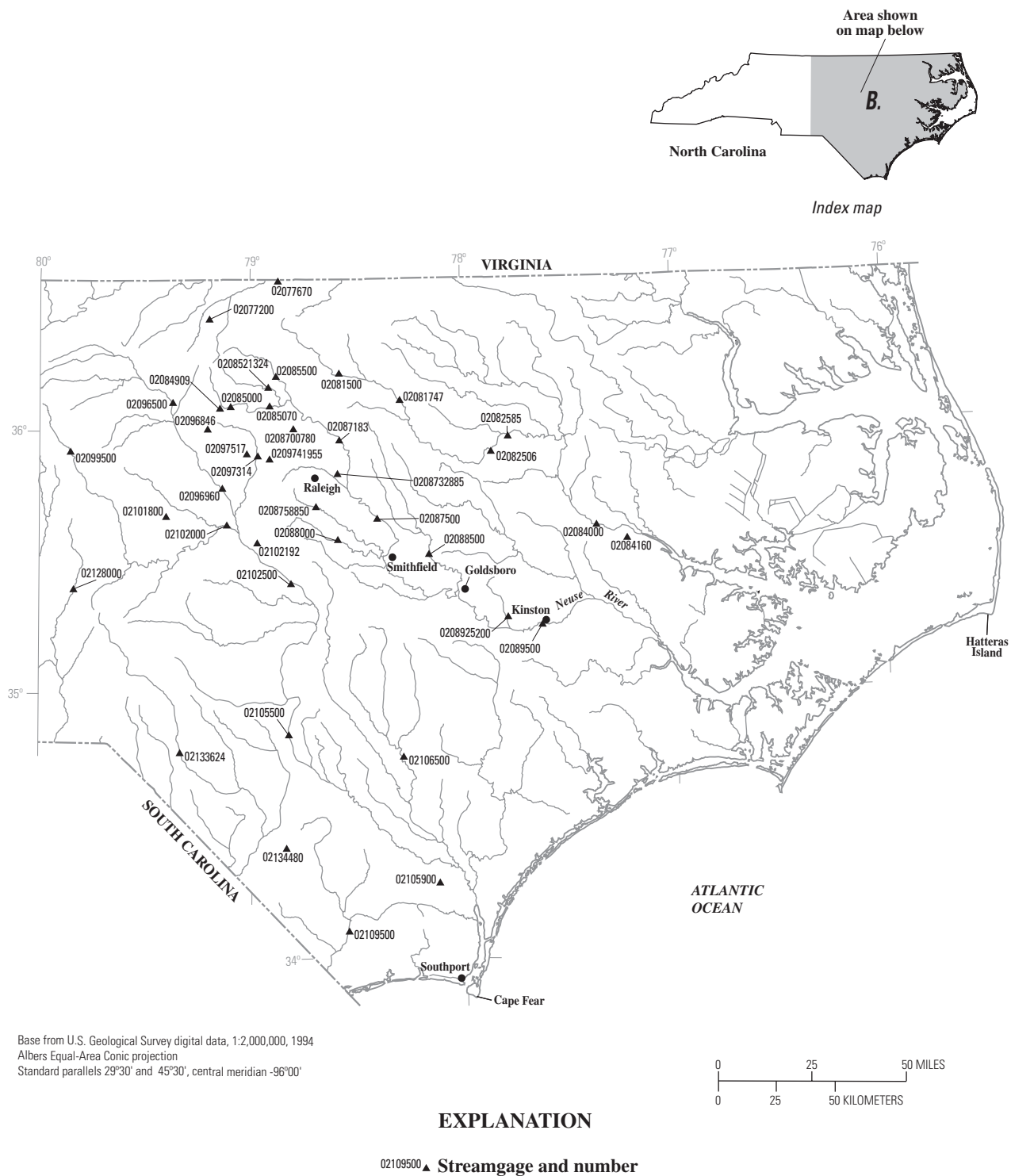


Figure 45. (B) Location of streamgages with significant floods during 1994–98 water years for North Carolina.—Continued

Table 34. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in North Carolina.

[mi², square miles; ft, feet above an arbitrary datum; ft³/s, cubic feet per second; --, not determined or not applicable; >, greater than; <, less than. Source: Recurrence intervals calculated from U.S. Geological Survey data. Other data from U.S. Geological Survey reports or databases]

Streamgage number (fig. 45)	Streamgage name	Total drainage (mi ²)	Maximum stage and discharge for period of record through 1998 water year				Significant floods 1994–98 water years				
			Period of record (water years)	Water year	Stage (ft)	Discharge (ft ³ /s)	Date (month/ day/year)	Stage (ft)	Discharge (ft ³ /s)	Regulated during flood ¹	Recurrence interval (years)
02077200	Hyco Creek near Leasburg, NC	45.9	1965–92, 1994–97	1996 1995	40.47 48.53	9,140 --	9/6/96	40.47	9,140	N	25–50
02077670	Mayo Creek near Bethel Hill, NC	53.5	1978–98	1978	10.83	3,950	9/6/96	10.83	3,040	Y	25
02081500	Tar River near Tar River, NC	167	1940–98	1996	24.06	19,900	9/6/96 3/19/98	24.06 19.36	19,900 13,200	N N	50–100 10–25
02081747	Tar River at Louisburg, NC	427	1964–98	1996	25.34	21,100	9/6/96 3/20/98	25.34 24.62	21,100 18,500	N N	>100 50–100
02082506	Tar River below Tar River Reservoir near Rocky Mount, NC	777	1973–98	1998	23.67	14,700	3/23/98	23.67	14,700	Y	>500
02082585	Tar River at Rocky Mount, NC	925	1977–98	1996	25.88	15,100	9/12/96	25.88	15,100	Y	>500
02084000	Tar River at Greenville, NC	2,620	1888, 1906–76, 1997–98	1919	24.50	46,500	5/7/97 3/28/98	14.05 18.08	13,900 25,500	N N	-- --
02084160	Chicod Creek near Simpson, NC	45.0	1976–87, 1992–98	1998	13.45	3,150	8/27/98	13.45	3,150	N	25
02084909	Sevenmile Creek near Efland, NC	14.1	1988–98	1996	15.47	3,440	9/6/96	15.47	3,440	N	>100
02085000	Eno River at Hillsborough, NC	66.0	1928, 1930–71, 1986–98	1945 1996	20.01 21.13	11,000 10,800	9/6/96	21.13	10,800	N	>100
02085070	Eno River near Durham, NC	141	1964–98	1996	23.58	14,700	9/6/96 3/19/98	23.58 20.76	14,700 10,800	N N	10–25 <10
0208521324	Little River at State Road 1461 near Orange Factory, NC	78.2	1988–98	1996	13.26	11,600	9/6/96	13.26	11,600	N	25
02085500	Flat River at Bahama, NC	149	1926–98	1996	17.26	33,800	9/6/96 3/19/98	17.26 12.05	33,800 16,700	N N	200–500 10–25
0208700780	Little Lick Creek above State Road 1814 near Oak Grove, NC	10.1	1983–95	1995	9.33	1,830	6/29/95	9.33	1,830	N	10–25

Table 34. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in North Carolina.—Continued

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Streamgage number (fig. 45)	Streamgage name	Total drainage (mi ²)	Maximum stage and discharge for period of record through 1998 water year				Significant floods 1994–98 water years				
			Period of record (water years)	Water year	Stage (ft)	Discharge (ft ³ /s)	Date (month/ day/year)	Stage (ft)	Discharge (ft ³ /s)	Regulated during flood ¹	Recurrence interval (years)
02087183	Neuse River near Falls, NC	771	1945, 1971–98	1975	25.21	13,600	9/16/96	8.05	7,650	Y	25–50
0208732885	Marsh Creek near New Hope, NC	6.84	1984–98	1995 1996	12.84 13.33	4,140 3,900	8/27/95	12.84	4,140	N	25
02087500	Neuse River near Clayton, NC	1,150	1919, 1928–98	1945	22.12	22,900	9/7/96	20.12	19,700	Y	50–100
0208758850	Swift Creek near McCullars Crossroads, NC	35.8	1989–98	1996	14.15	6,790	9/6/96	14.15	6,790	N	25–50
02088000	Middle Creek near Clayton, NC	83.5	1940–98	1996	14.88	11,900	9/6/96	14.88	11,900	N	200–500
02088500	Little River near Princeton, NC	232	1919, 1924, 1928, 1930–98	1965 1924	13.94 14.90	7,150 --	9/9/96 3/11/98	13.32 13.51	5,480 5,150	N N	25 10–25
0208925200	Bear Creek at Mays Store, NC	57.7	1988–98	1997	9.50	1,550	10/9/96	9.50	1,550	N	<5
02089500	Neuse River at Kinston, NC	2,692	1919, 1924, 1928–98	1919	25.00	39,000	9/17/96	23.26	27,100	Y	50–100
02096500	Haw River at Haw River, NC	606	1929–98	1996	32.83	51,400	6/29/95 9/6/96	28.46 32.83	29,500 51,400	N N	10–25 200
02096846	Cane Creek near Orange Grove, NC	7.54	1989–98	1996	7.90	2,060	9/6/96	7.90	2,060	N	25
02096960	Haw River near Bynum, NC	1,275	1974–98	1996	21.76	76,700	9/6/96	21.76	76,700	N	>100
02097314	New Hope Creek near Blands, NC	75.9	1983–98	1996	14.05	12,700	9/6/96	14.05	12,700	N	100–200
0209741955	Northeast Creek at State Road 1100 near Genlee, NC	21.1	1983–93, 1996–98	1996	13.92	5,140	9/6/96	13.92	5,140	N	25–50
02097517	Morgan Creek near Chapel Hill, NC	41.0	1983–98	1996	16.18	4,210	9/6/96	16.18	4,210	N	50
02099500	Deep River near Randleman, NC	125	1929–31, 1934–98	1947	32.20	20,000	9/6/96	28.75	15,600	N	50–100

Table 34. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in North Carolina.—Continued

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			Period of record (water years)	Water year	Stage (ft)	Discharge (ft ³ /s)	Date (month/ day/year)	Stage (ft)	Discharge (ft ³ /s)	Regulated during flood ¹	Recurrence interval (years)
02101800	Tick Creek near Mount Vernon Springs, NC	15.5	1959–81, 1994–98	1996	13.41	4,010	9/6/96	13.41	4,010	N	25
02102000	Deep River at Moncure, NC	1,434	1931–98	1945	17.20	80,300	9/6/96	12.94	47,900	N	50
02102192	Buckhorn Creek near Corinth, NC	76.3	1973–98	1973	20.02	6,920	9/6/96	16.79	4,300	Y	25–50
02102500	Cape Fear River at Lillington, NC	3,464	1924–98	1945	33.19	150,000	9/7/96	18.97	51,800	Y	50
02105500	Cape Fear River at Wilm O Huske Lock near Tarheel, NC	4,852	1938–94, 1997–98	1952 1945	29.92 43.44	70,600 --	3/22/98	26.28	47,100	Y	>500
02105900	Hood Creek near Leland, NC	21.6	1953–73, 1994–98	1998	11.53	2,650	8/27/98	11.53	2,650	N	25–50
02106500	Black River near Tomahawk, NC	676	1928, 1945, 1948, 1952–98	1984 1928	22.08 47.00	17,500 11,400	9/10/96	21.31	13,700	N	25–50
02109500	Waccamaw River at Freeland, NC	680	1940–98	1996	17.02	12,400	9/12/96	17.02	12,400	N	50
02111000	Yadkin River at Patterson, NC	28.8	1940–43, 1945–98	1973	12.70	16,200	8/17/94	9.38	5,750	N	10–25
02111180	Elk Creek at Elksville, NC	48.1	1940, 1966–98	1940	22.00	70,000	8/17/94	12.02	18,700	N	25
02120780	Second Creek near Barber, NC	118	1980–98	1995	17.28	8,560	8/28/95	17.28	8,560	N	100–200
02125000	Big Bear Creek near Richfield, NC	55.6	1955–98	1997	16.54	11,400	7/23/97	16.54	11,400	N	25
02128000	Little River near Star, NC	106	1955–93, 1995–98	1997	18.60	15,400	7/23/97 3/19/98	18.60 15.84	15,400 11,300	N N	200–500 50–100
02133624	Lumber River near Maxton, NC	365	1988–92, 1994–98	1998	13.52	3,380	3/22/98	13.52	3,380	N	10–25
02134480	Big Swamp near Tarheel, NC	229	1986–95, 1997–98	1998 1993	13.10 13.34	3,980 2,840	3/11/98	13.10	3,980	N	10–25
02137727	Catawba River near Pleasant Gardens, NC	127	1981–98	1994	15.22	13,700	8/17/94	15.22	13,700	N	10–25

Table 34. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in North Carolina.—Continued

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			Period of record (water years)	Water year	Stage (ft)	Discharge (ft ³ /s)	Date (month/ day/year)	Stage (ft)	Discharge (ft ³ /s)	Regulated during flood ¹	Recurrence interval (years)
02138500	Linville River near Nebo, NC	66.7	1916, 1923–98	1940	11.40	39,500	8/17/94	10.52	18,600	N	25
02140991	Johns River at Arneys Store, NC	201	1986–98	1994	25.23	42,300	8/17/94	25.23	42,300	N	25–50
0214253830	Norwood Creek near Troutman, NC	7.18	1984–98	1997	9.20	1,480	4/28/97	9.20	1,480	N	10–25
02146300	Irwin Creek near Charlotte, NC	30.7	1963–98	1997	20.38	11,600	7/23/97	20.38	11,600	N	500
02146470	Little Hope Creek at Seneca Place, Charlotte, NC	2.63	1967–72, 1983–86, 1988–90, 1995–98	1997	8.50	1,700	7/23/97	8.50	1,700	N	50
02146507	Little Sugar Creek at Archdale Drive at Charlotte, NC	42.6	1978–98	1997	15.06	13,600	7/23/97	15.06	13,600	N	500
02146600	McAlpine Creek at Sardis Road near Charlotte, NC	39.6	1962–98	1995	17.79	9,040	8/27/95	17.79	9,040	N	>200
02146700	McMullen Creek at Sharon View Road near Charlotte, NC	6.95	1963–98	1995	11.03	3,470	8/27/95 7/27/98	11.03 10.64	3,470 3,230	N N	50 25–50
02146750	McAlpine Creek below McMullen Creek near Pineville, NC	92.4	1975–98	1995	19.40	12,500	8/27/95	19.40	12,500	N	200
02146900	Twelve Mile Creek near Waxhaw, NC	76.5	1949, 1961–98	1995 1949	21.94 23.60	9,970 --	8/27/95	21.94	9,970	N	50–100
02152100	First Broad River near Casar, NC	60.5	1960–95, 1997–98	1995 1976	15.58 16.70	7,790 7,760	1/14/95	15.58	7,790	N	10–25
03161000	South Fork New River near Jefferson, NC	205	1916, 1925–26, 1929–41, 1943–98	1940	22.50	52,800	1/15/95	13.73	21,000	N	50
03439000	French Broad River at Rosman, NC	67.9	1908–09, 1916, 1928, 1936–89, 1991–98	1965	14.95	13,500	8/17/94	14.12	11,500	N	50

Table 34. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in North Carolina.—Continued

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Streamgage number (fig. 45)	Streamgage name	Total drainage (mi ²)	Maximum stage and discharge for period of record through 1998 water year				Significant floods 1994–98 water years				
			Period of record (water years)	Water year	Stage (ft)	Discharge (ft ³ /s)	Date (month/ day/year)	Stage (ft)	Discharge (ft ³ /s)	Regulated during flood ¹	Recurrence interval (years)
03441000	Davidson River near Brevard, NC	40.4	1876, 1916, 1919, 1921–90, 1924–98	1928 1994	11.80 12.08	8,400 7,620	8/17/94	12.08	7,620	N	25–50
03443000	French Broad River at Blantyre, NC	296	1875–76, 1880, 1893, 1899, 1901–02, 1905–06, 1910, 1916, 1919, 1921–98	1965 1916	25.50 27.10	30,000 --	8/18/94 1/8/98	23.81 22.61	21,200 19,400	N N	50 25–50
03450000	Beetree Creek near Swannanoa, NC	5.46	1927–75, 1978, 1980–81, 1986, 1988–98	1940	6.20	1,370	8/17/94	5.75	1,040	N	50–100
03456100	West Fork Pigeon River at Bethel, NC	58.4	1981–98	1994	12.63	11,700	8/17/94	12.63	11,700	Y	25–50
03456500	East Fork Pigeon River near Canton, NC	51.5	1955–98	1973	11.19	12,000	8/17/94	10.70	11,100	N	10–25
03460000	Cataloochee Creek near Cataloochee, NC	49.2	1935–52, 1963–98	1963	8.08	5,080	3/27/94	7.55	4,280	N	10–25
03463300	South Toe River near Celo, NC	43.3	1958–98	1978	17.41	32,900	8/17/94	10.49	15,600	N	10–25
03479000	Watauga River near Sugar Grove, NC	92.1	1916, 1940–98	1940	29.60	50,800	1/14/95	20.46	20,500	N	25
03509000	Scott Creek above Sylva, NC	51.0	1940, 1942–75, 1993–95	1994 1973	6.77 8.78	4,440 2,800	3/27/94	6.77	4,440	N	200
03513000	Tuckasegee River at Bryson City, NC	655	1898–1982, 1984–95, 1997–98	1940	15.96	61,600	3/28/94	14.25	33,300	Y	10–25

Table 34. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in North Carolina.—Continued

[mi², square miles; ft, feet above an arbitrary datum; ft³/s, cubic feet per second; --, not determined or not applicable; >, greater than; <, less than. Source: Recurrence intervals calculated from U.S. Geological Survey data. Other data from U.S. Geological Survey reports or databases]

Streamgage number (fig. 45)	Streamgage name	Total drainage (mi ²)	Maximum stage and discharge for period of record through 1998 water year				Significant floods 1994–98 water years				
			Period of record (water years)	Water year	Stage (ft)	Discharge (ft ³ /s)	Date (month/ day/year)	Stage (ft)	Discharge (ft ³ /s)	Regulated during flood ¹	Recurrence interval (years)
03550000	Valley River at Tomotla, NC	104	1898,	1907	20.50	18,000	3/27/94	17.10	11,900	N	25–50
			1905–09, 1915–17, 1919–98	1898	21.20	20,000	2/16/95	17.15	12,100	N	50

¹Regulated during flood: N, no; Y, yes.