North Dakota

During the winter of 1993–94, above-average precipitation in Montana resulted in deeper than normal snowpacks in river basins that drain east into North Dakota. In January 1994, record snowfalls occurred in much of the western part of North Dakota. During February and March, additional snowfalls of several inches added to the ever-increasing snowpack. By early March, a rapid warm-up caused snowmelt and ice jams to occur on several rivers and streams in eastern Montana and western North Dakota. Flooding occurred along the Yellowstone River (fig. 46). High water flowed eastward into the Missouri River and caused record stages along the way. A maximum daily gage height of 26.60 feet for the period of record occurred on March 8, 1994, on the Missouri River near Williston (streamgage 06330000, table 35). About 10,000 acres of prime farmland were flooded in the northwestern part of the State. Property and crop damage in eastern Montana and western North Dakota were estimated to be about $5 million (National Oceanic and Atmospheric Administration, 1994b).

During the spring of 1996, alternating warm and cold periods resulted in multiple snowmelt discharges in February, March, and April over all of the State except the northeastern one-third. By having the snowmelt runoff in three separate months rather than one, few record discharges resulted.

Excessive runoff in the upper Sheyenne River Basin primarily occurred during April 1996. Because of the sudden increase of runoff into Lake Ashtabula, high release rates were required to avoid an uncontrolled flow through the emergency spillway. A peak stage of 36.46 feet occurred on April 20, 1996, at the Sheyenne River below Baldhill Dam (streamgage 05058000, table 35), which is 0.20 foot higher than the previous record set in 1979. A peak stage of 19.20 feet occurred on April 13, 1996, on the Sheyenne River at Lisbon (streamgage 05058700, table 35), which is 0.16 foot higher than the previous record set in 1975.

The harsh winter of 1996–97, combined with the 1997 spring floods, caused the worst natural disaster in recent history for North Dakota, eastern South Dakota, and western Minnesota. Above-normal snowfall in central and eastern North Dakota during the winter of 1996–97 and a blizzard on April 5–6, 1997, caused the worst flooding in the Red River of the North and Missouri River Basins in more than 100 years.

The heaviest snowfalls occurred along the main stems of the Red River of the North and the Missouri River and were about 300 percent greater than normal. About 117 inches of

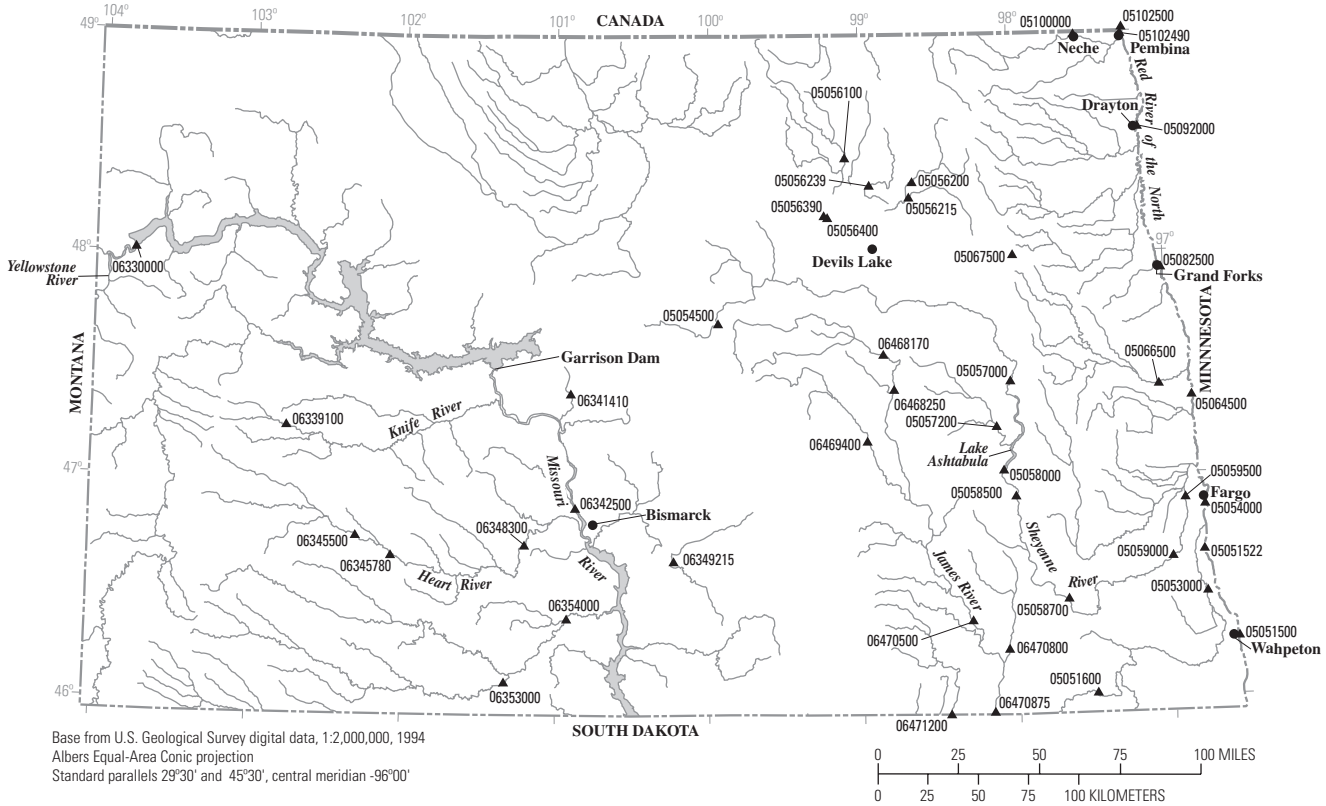

Figure 46. Location of streamgages with significant floods during 1994–98 water years for North Dakota.

snow were recorded in Fargo, 96 inches in Grand Forks, and 101 inches in Bismarck (National Oceanic and Atmospheric Administration, 1996a). Elsewhere in the region, snowfalls were well above seasonal averages. Melting of the snowpack and thawing of ice began in late March on rivers and streams in the southern and western parts of the State. Flows were inhibited by a blizzard that occurred on April 5–6, 1997. The blizzard brought a severe drop in temperatures, winds up to 70 miles per hour, and up to 2 feet of snow with drifts many feet higher in several areas. In southeastern North Dakota, the blizzard was preceded by wind-driven rain and sleet. The wind and ice toppled trees and power lines, leaving thousands of people without power for days. Thousands of people were forced to flee their homes, some permanently, as floodwaters and severe weather caused over $5 billion in damage to the region (National Oceanic and Atmospheric Administration, 1997b).

The Red River of the North is one of the few rivers in the United States to flow directly north into Canada. The basin flood plain lies in a glacial lakebed and is relatively flat (less than 0.5-foot drop in elevation per mile in the reach downstream from Grand Forks, North Dakota). Because of the flat basin, the shallow river channel, and the northerly flow, the timing of spring thaw and snowmelt can greatly aggravate flooding in the basin. Snow and ice in the headwaters of the Red River of the North begin to melt first, when areas downstream remain largely frozen. The melt pattern can cause ice jams to form, and substantial backwater can occur as flow moves northward toward a still-frozen river channel.

Two peak stages occurred in Wahpeton, which is located in the southern part of the Red River of the North Basin. On April 6, 1997, the stage of the Red River of the North at Wahpeton (streamgage 05051500, table 35) was 19.42 feet, which is 1.47 feet higher than the record set in 1989. Because of the additional moisture from the April 5–6, 1997, blizzard, a record flow of 12,800 cubic feet per second and corresponding stage of 19.25 feet was recorded 9 days later. On April 17, 1997, the peak stage of the Red River of the North at Fargo (streamgage 05054000, table 35), about 96 river miles north of Wahpeton, was 39.57 feet, and the peak flow was 28,000 cubic feet per second. On April 18, 1997, the peak stage at Fargo was 39.72 feet, which exceeded the record set 100 years earlier, and the peak flow was 27,700 cubic feet per second.

High flows continued to move downstream in the Red River of the North. On April 18, 1997, the peak stage of the Red River of the North at Grand Forks (streamgage 05082500, table 35) was 52.04 feet, which is 1.84 feet higher than the record set in 1897, and the peak flow was 137,000 cubic feet per second. The peak flow was unusual because it resulted from the convergence of flows from the Red Lake River in Minnesota, flows from the main channel, and breakout flows from the Red River of the North that were conveyed by old Red River of the North oxbows. Breakout flows occurred upstream from Grand Forks when plugs in the upstream end of the oxbows either were overtopped or washed away, which caused a flow of about 25,000 cubic feet per second to arrive at the confluence of the Red Lake River and the Red River of the North at Grand Forks. The flow of 25,000 cubic feet per second coincided with the peak flow of the two rivers. To compound problems in Grand Forks, a fire on April 19, 1997, demolished several buildings in the flooded city. The flooding made it extremely difficult for firefighters to reach the fires and put them out. Except for emergency personnel, Grand Forks and its sister city, East Grand Forks, Minnesota, were completely evacuated at this time.

On April 24, 1997, the peak stage at the Red River of the North at Drayton (streamgage 05092000, table 35) was 45.55 feet, which is 1.89 feet higher than the record set in 1979, and the peak flow was 124,000 cubic feet per second. At the Pembina River at Neche (streamgage 05100000, table 35), the peak stage was 24.51 feet, which is 0.87 foot higher than the record set in 1979, and the flow was 12,800 cubic feet per second. Six days later, the peak flow was 15,100 cubic feet per second, and the stage was 24.20 feet. On April 27, 1997, USGS personnel measured 141,000 cubic feet per second in the Red River of the North at Pembina (streamgage 05102490, table 35), which is located about 2 miles upstream from the international boundary with Canada. The previous maximum discharge of this century at the Canadian streamgage, Red River at Emerson, Manitoba (streamgage 05102500), located about 1 mile downstream from the border was 95,500 cubic feet per second on May 13, 1950.

Devils Lake Basin is a 3,810-square-mile closed subbasin within the Red River of the North Basin. Devils Lake discharges no water until the lake level reaches 1,459 feet above NAVD 88, the lowest natural outlet elevation. Since 1993, the lake level has risen rapidly in response to above-normal precipitation and runoff. The rising water has inundated homes, businesses, and agricultural lands and has caused roads to be closed or raised in elevation. On April 16, 1997, Devils Lake reached 1,438.4 feet above NAVD 88, equaling the previous record set in 1867. Because of the excessive runoff during the spring of 1997, the lake level continued rising to a maximum daily elevation of 1,442.97 feet above NAVD 88 on July 26, 1997, the highest level in at least 130 years (Wiche, 1998). In 1997, record peak stages or flows occurred at several streamgages within the Devils Lake Basin (table 35).

Flooding also occurred in the Missouri River Basin during 1997. Heavy snowpacks in North Dakota, Montana, and South Dakota caused high flows throughout the basin. Flow in the Missouri River main stem is controlled by six dams. Garrison Dam, located in central North Dakota about 75 river miles north of Bismarck, was completed in 1953. On July 13, 1997, the peak stage of the Missouri River at Bismarck, North Dakota (streamgage 06342500, table 35), was 14.00 feet, which is 0.58 foot less than the post-Garrison Dam record set on December 18, 1979. The peak flow of 59,500 cubic feet per second on July 25, 1997, was maintained for several weeks by U.S. Army Corps of Engineer personnel to accommodate the high water moving through the system. Although high flow on the Missouri River main stem caused little damage in North Dakota, the high flows on tributaries to the Missouri River, such as the Knife, Heart, and James Rivers, caused flooding in several communities in North Dakota. New records for peak stage and peak

flow occurred at several streamgages in the upper Missouri River Basin during the spring of 1997 (table 35).

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Wiche, G.J., 1998, Lake levels, streamflow, and surface-water quality in the Devils Lake area, North Dakota, through 1997: U.S. Geological Survey Fact Sheet 033–98, 4 p.

Table 35. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in North Dakota.

[mi^2, square miles; ft, feet above an arbitrary datum; ft^3/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. 46)	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)
05051500	Red River of the North at Wahpeton, ND	4,010	1897, 1942–98	1997 1997	19.25 19.42	12,800 --	4/15/97	19.25	12,800	Y	100
05051522	Red River of the North at Hickson, ND	4,300	1976–98	1997 1997	36.85 37.60	13,300 --	4/14/97	36.85	13,300	Y	50–150
05051600	Wild Rice River near Rutland, ND	546	1960–98	1997	10.11	2,700	4/3/97 6/29/98	10.11 8.40	2,700 1,590	N N	100 25
05053000	Wild Rice River near Abercrombie, ND	2,080	1897, 1933–98	1969 1897	24.58 27.50	9,540 --	4/16/97	25.40	9,470	Y	25
05054000	Red River of the North at Fargo, ND	6,800	1882, 1897, 1902–98	1997 1997	39.57 39.72	28,000 27,700	4/17/97 4/18/97	39.57 39.72	28,000 27,700	Y Y	50–100 50–100
05054500	Sheyenne River above Harvey, ND	424	1956–98	1979 1996	9.45 10.30	1,000 570	4/12/96	10.30	570	N	10–25
05056100	Mauvais Coulee near Cando, ND	387	1954, 1956–90, 1992–98	1997	11.68	3,000	4/21/97	11.68	3,000	N	10–50
05056200	Edmore Coulee near Edmore, ND	382	1956–98	1997	87.95	1,830	4/24/97	87.95	1,830	N	10–50
05056215	Edmore Coulee tributary near Webster, ND	148	1988–89, 1991–98	1997 1993	74.41 75.06	1,390 1,330	4/25/97 8/2/93	74.41 75.06	1,390 1,330	N N	-- --
05056239	Starkweather Coulee near Webster, ND	310	1980–98	1997 1987	7.75 8.50	782 570	4/27/97	7.75	782	N	25–100
05056390	Little Coulee near Brinsmade, ND	350	1976–89, 1992–97	1997	11.47	439	4/26/97	11.47	439	N	--
05056400	Big Coulee near Churchs Ferry, ND	2,510	1950–89, 1992–97	1997	9.26	2,280	4/23/95 5/4/97	7.62 9.26	1,450 2,280	Y Y	-- 25–100
05057000	Sheyenne River near Cooperstown, ND	6,470	1945–98	1950 1996	18.69 19.13	7,830 6,760	4/18/96	19.13	6,760	N	25
05057200	Baldhill Creek near Dazey, ND	691	1950, 1956–98	1979	17.78	9,000	4/3/97	11.56	2,780	N	10–25

Table 35. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in North Dakota.—Continued

[mi^2, square miles; ft, feet above an arbitrary datum; ft^3/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. 46)	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)
05058000	Sheyenne River below Baldhill Dam, ND	7,470	1948, 1950–98	1996	36.46	5,460	4/20/96	36.46	5,460	Y	10–25
05058500	Sheyenne River at Valley City, ND	7,810	1882, 1897, 1919, 1938–75, 1980–98	1996 1882	18.78 20.00	5,250 --	4/21/96 4/19/97	18.78 18.01	5,250 4,810	Y Y	25 10–25
05058700	Sheyenne River at Lisbon, ND	8,190	1950, 1957–98	1997 1975	19.29	5,670	4/23/97 4/13/96	19.29 19.20	5,670 5,060	Y Y	10–25 10–25
05059000	Sheyenne River near Kindred, ND	8,800	1947, 1950–98	1997 1997	21.38 22.33	5,970 3,600	4/30/96 4/27/97	20.65 21.38	5,100 5,970	Y Y	10–25 25–50
05059500	Sheyenne River at West Fargo, ND	8,870	1903–06, 1919, 1930–94, 1996–98	1997 1997	22.68 22.90	4,810 --	5/2/96 4/19/97	-- 22.68	4,240 4,810	Y Y	-- --
05064500	Red River of the North at Halstad, MN	21,800	1936–37, 1942–98	1997	40.74	71,500	4/19/97	40.74	71,500	Y	100–200
05066500	Goose River at Hillsboro, ND	1,203	1882, 1897, 1904, 1916, 1931–98	1979	16.76	14,800	4/6/97	15.62	8,520	N	10–25
05067500	Marsh River near Shelly, MN	151	1944–98	1979 1997	23.36 25.45	4,880 4,300	4/18/97	25.45	4,300	N	10–25
05082500	Red River of the North at Grand Forks, ND	30,100	1882–1998	1997 1997	52.04 54.35	137,000 114,000	4/21/96 4/18/97 4/22/97	45.93 52.04 54.35	58,400 137,000 114,000	Y Y Y	10–25 100–200
05092000	Red River of the North at Drayton, ND	34,800	1897, 1936–37, 1941–98	1997	45.55	124,000	4/24/97	45.55	124,000	Y	100–200
05100000	Pembina River at Neche, ND	3,410	1904–08, 1910–15, 1919–98	1997 1997	24.20 24.51	15,100 12,800	4/23/95 4/27/97	23.30 24.20	8,500 15,100	N N	10–25 50–100

Table 35. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in North Dakota.—Continued

[mi^2, square miles; ft, feet above an arbitrary datum; ft^3/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. 46)	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)
05102490	Red River of the North at Pembina, ND	36,400	1985–98	1997	794.39	141,000	4/26/97	794.39	141,000	Y	100–200
							4/26/96	790.95	66,400	Y	10–25
05102500	Red River of the North at Emerson, Manitoba	40,200	1913–98	1997	92.41	133,000	4/26/97	92.41	133,000	Y	100–200
							4/26/96	89.10	66,700	Y	10–25
06339100	Knife River at Manning, ND	205	1968–98	1997	17.05	3,600	3/21/97	17.05	3,600	N	10–25
06341410	Turtle Creek above Washburn, ND	350	1987–98	1996	7.28	954	3/12/96	7.28	954	N	--
06342500	Missouri River at Bismarck, ND	186,400	1929–98	1952	27.90	500,000	7/13/97	14.00	59,100	Y	50–100
							7/25/97	13.98	59,500	Y	50–100
06345500	Heart River near Richardton, ND	1,240	1905–21, 1938, 1943–98	1950 1912	28.05 38.50	23,400 4,500	3/23/97	--	13,000	Y	25–50
06345780	Heart River above Lake Tschida near Glen Ullin, ND	1,530	1988–98	1997 1997	-- 26.74	11,500 4,540	3/22/97	--	11,500	Y	--
06348300	Heart River at Stark Bridge near Judson, ND	2,930	1989–98	1997	21.90	18,000	3/23/97	21.90	18,000	Y	--
06349215	Long Lake Creek above Long Lake near Moffit, ND	280	1989–98	1997	12.99	3,200	3/29/97	12.99	3,200	N	--
06353000	Cedar Creek near Raleigh, ND	1,750	1939, 1962–98	1997	17.05	14,600	3/24/97	17.05	14,600	N	50–100
06354000	Cannonball River at Breien, ND	4,100	1906–08, 1912–18, 1922, 1924, 1928–98	1950	22.30	94,800	3/25/97	20.82	31,100	N	10–25
06468170	James River near Grace City, ND	1,060	1969–98	1997	14.77	4,000	4/3/97	14.77	4,000	N	10–20
06468250	James River above Arrowwood Lake near Kensal, ND	1,200	1986–98	1997	13.00	4,700	4/5/97	13.00	4,700	N	--
06469400	Pipestem Creek near Pingree, ND	700	1974–98	1997 1995	11.37 11.70	3,400 3,180	4/19/97	11.37	3,400	N	10–25
06470500	James River at Lamoure, ND	4,390	1950–98	1969	16.17	6,800	4/1/97	16.09	6,500	Y	15–45

Table 35. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in North Dakota.—Continued

[mi^2, square miles; ft, feet above an arbitrary datum; ft^3/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. 46)	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)
06470800	Bear Creek near Oakes, ND	365	1977–98	1998	11.75	1,730	6/28/98	11.75	1,730	N	10–25
06470875	James River at Dakota Lake Dam near Ludden, ND	5,480	1982–98	1997	17.86	7,500	4/6/97	17.86	7,500	Y	25–100
06471200	Maple River at North Dakota-South Dakota State line, ND	716	1957–98	1969 1997	15.22 16.19	5,930 5,300	3/29/97	16.19	5,300	N	20–45

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

Ohio

Two to 3 inches of rain (National Oceanic and Atmospheric Administration, 1994a) on top of saturated ground produced widespread flooding of streams, streets, basements, and poor drainage areas in northeastern Ohio during the middle of April 1994. Damage was near $25 million, and one death occurred (National Oceanic and Atmospheric Administration, 1994b).

Nearly stationary thunderstorms in central and northern Ohio resulted in rainfall totals of 4 to 11 inches during August 7–9, 1995 (National Oceanic and Atmospheric Administration, 1995a). Damage from the August flooding was more than $13 million (National Oceanic and Atmospheric Administration, 1995b).

As a result of rain and melted snow in Ohio, Pennsylvania, and West Virginia, the Ohio River (fig. 47) crested 3 to 6 feet above flood stage from Marietta to Ironton during January 19–30, 1996. Damage from this flood was more than $10 million, but no lives were lost (National Oceanic and Atmospheric Administration, 1996a). The Ohio River at Cincinnati (National Oceanic and Atmospheric Administration, 1996b) eventually crested 5.3 feet above flood stage at a stage of 57.3 feet during the evening of January 24. This was the highest crest in Cincinnati since March 1979.

Showers and thunderstorms dumped 4 to 12 inches of rain across southern Ohio during March 1–3, 1997 (National Oceanic and Atmospheric Administration 1997a). Five people were killed by the flooding in Ohio from this storm, and there was more than $200 million in damage (National Oceanic and Atmospheric Administration, 1997b). Sixteen counties were declared Federal disaster areas. The Ohio River rose rapidly reaching a crest stage of 59.8 feet (9.8 feet above flood stage) at Portsmouth (National Oceanic and Atmospheric Administration, 1997b) on March 4. Farther downstream at Meldahl Dam (National Oceanic and Atmospheric Administration, 1997b), the river crested at 61.3 feet (10.3 feet above flood stage) on March 6. In Cincinnati, the Ohio River crested at 64.7 feet on March 5 (National Oceanic and Atmospheric Administration, 1997b). Many towns were flooded from Portsmouth to Cincinnati, and thousands of people were evacuated from their homes for several days.

Severe thunderstorms bringing damaging winds and torrential rains affected much of east-central Ohio, western Pennsylvania, and northern West Virginia during June 26–30, 1998. These storms caused eight deaths and several injuries, along with more than $98 million in damage across Ohio. Damage to crops was an additional $70 million (National Oceanic and Atmospheric Administration, 1998b). Travel across this area was nearly impossible, as many roads were underwater. Four streamgages recorded the highest discharge of record during this June flood, and two more peaks of record occurred during local floods from intense thunderstorms in August 1998 (table 36). The August 1998 floods caused more than $3 million in damage (National Oceanic and Atmospheric Administration, 1998b).

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.

EXPLANATION

03237280 ▲ **Streamgage and number**

Figure 47. Location of streamgages with significant floods during 1994–98 water years for Ohio.

Table 36. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Ohio.

[mi^2, square miles; ft, feet above an arbitrary datum; ft^3/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. 47)	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)
03097550	Mahoning River at Ohio Edison Power Plant at Niles, OH	854	1988–98	1994	13.35	9,760	4/13/94	13.35	9,760	Y	--
03098600	Mahoning River below West Avenue at Youngstown, OH	978	1988–98	1994	15.44	11,900	4/13/94	15.44	11,900	Y	--
03102950	Pymatuning Creek at Kinsman, OH	96.7	1966–96	1986	12.40	2,740	1/19/96	12.28	2,560	N	10–25
03111548	Wheeling Creek below Blaine, OH	97.7	1983–87, 1989–98	1998	8.21	5,470	6/28/98	8.21	5,470	N	10
03115400	Little Muskingum River at Bloomfield, OH	210	1959–81, 1996–98	1998	30.78	32,300	6/28/98	30.78	32,300	N	>100
03117000	Tuscarawas River at Massillon, OH	518	1939–98	1969	16.43	10,700	4/13/94	12.77	6,490	Y	--
03118000	Main Branch Nimishillen Creek at Canton, OH	43.1	1942–98	1959 1994	6.50 6.62	2,470 1,810	4/13/94	6.62	1,810	N	25–50
03141500	Seneca Fork below Senecaville Dam near Senecaville, OH	118	1939–91, 1995–96, 1998	1998 1949	9.51 10.35	977 718	6/28/98	9.51	977	Y	--
03142000	Wills Creek at Cambridge, OH	406	1927–28, 1938–98	1998	26.91	11,400	6/29/98	26.91	11,400	Y	50–100
03159540	Shade River near Ter, OH	156	1966–98	1997	31.44	15,600	3/2/97	31.44	15,600	N	>100
03202000	Raccoon Creek at Adamsville, OH	585	1916–35, 1937, 1939–85, 1992–98	1968 1997	28.69 29.11	20,000 16,500	3/3/97	29.11	16,500	N	25–50
03220000	Mill Creek near Bellepoint, OH	178	1913, 1943–98	1997 1913	14.45 18.00	21,800 --	6/2/97	14.45	21,800	N	>100

Table 36. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Ohio.—Continued

[mi^2, square miles; ft, feet above an arbitrary datum; ft^3/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. 47)	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)
03227500	Scioto River at Columbus, OH	1,629	1913, 1921–98	1959	27.22	68,200	6/2/97	24.78	43,800	Y	--
03228300	Big Walnut Creek at Sunbury, OH	101	1989–98	1997 1991	11.20 11.86	6,700 5,690	6/1/97	11.20	6,700	N	--
03230500	Big Darby Creek at Darbyville, OH	534	1922–36, 1938–98	1959	17.94	49,000	6/3/97	15.62	23,700	N	25–50
03237280	Upper Twin Creek at McGaw, OH	12.2	1960, 1964–98	1960	11.62	7,320	3/2/97	10.01	4,430	N	50–100
03237500	Ohio Brush Creek near West Union, OH	387	1927–35, 1941–98	1997	31.15	77,700	3/2/97	31.15	77,700	N	>100
03262000	Loramie Creek at Lockington, OH	257	1913, 1916–98	1913	91.60	25,600	8/8/95	84.59	6,130	Y	--
03262700	Great Miami River at Troy, OH	926	1958, 1963–88, 1991–98	1995 1958	16.02 16.40	21,700 21,000	8/8/95	16.02	21,700	Y	--
04178000	Saint Joseph River near Newville, IN	610	1947–96, 1998	1996	17.74	10,400	5/18/96	17.74	10,400	N	--
04185440	Unnamed tributary to Lost Creek near Farmers, OH	4.23	1986–98	1998	7.59	1,770	8/25/98	7.59	1,770	N	--
04195500	Portage River at Woodville, OH	428	1913, 1929–35, 1940–98	1913	17.00	17,000	8/27/98	13.98	11,500	N	25
04197170	Rock Creek at Tiffin, OH	34.6	1983–86, 1988–98	1998	8.96	2,640	8/26/98	8.96	2,640	N	--
04199155	Old Womans Creek at Berlin Road near Huron, OH	22.1	1988–94, 1996–98	1997	11.81	1,940	2/27/97	11.81	1,940	N	--
04207200	Tinkers Creek at Bedford, OH	83.9	1963–98	1969	10.10	7,220	8/13/94	9.81	6,750	N	>100

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

Oklahoma

High water along the Neosho River in northeastern Oklahoma forced the evacuation of about 50 homes in Miami (fig. 48). Most areas of Oklahoma received locally intense rain and large hail from thunderstorms on April 1995 (National Oceanic and Atmospheric Administration, 1995a). Severe thunderstorms with a 3-day rainfall of about 8 inches in many areas moved across Oklahoma intermittently during both May and June 1995 (National Oceanic and Atmospheric Administration, 1995a). Runoff from the intense rains caused flash floods on small streams and larger regional floods in the larger basins. Flood-prone areas of Guthrie, Kingfisher, and Miami were inundated. On June 7, 1995, the Red River near Terral (streamgage 07315500, table 37) reached its highest discharge since records began in 1935. Sixteen of the 23 significant floods for Oklahoma during the 1994 through 1998 water years occurred during May and June 1995. Damage was more than $5 million (National Oceanic and Atmospheric Administration, 1995b).

Widespread excessive rainfall caused flooding in September 1996 due to two storm systems—the remnants of the Pacific Tropical Storm Fausto during the middle of the month and a frontal system that produced localized flash flooding and caused five deaths at the end of the month. Flooding associated with Fausto was most notable in west-central Oklahoma in the Clinton area with more than 6 inches of rain (National Oceanic and Atmospheric Administration, 1996a). Severe flash flooding occurred in northeastern Oklahoma on September 25–26, 1996, with more than 8 inches of rain in many areas (National Oceanic and Atmospheric Administration, 1996a). One person drowned in Pryor; a mother and three children died near Tahlequah when their car was swept off a road (National Oceanic and Atmospheric Administration, 1996b).

Slow-moving thunderstorms moved repeatedly over parts of northern and western Oklahoma causing extensive flash flooding during September 22–23, 1997. Rainfall amounts were about 9 inches at some locations (National Oceanic and Atmospheric Administration, 1997a), causing severe localized flooding in Cherokee, Tipton, Hobart, and west of Clinton. Flooding also occurred along the Salt Fork of the Arkansas River near Tonkawa and the Chikaskia River near Blackwell (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.

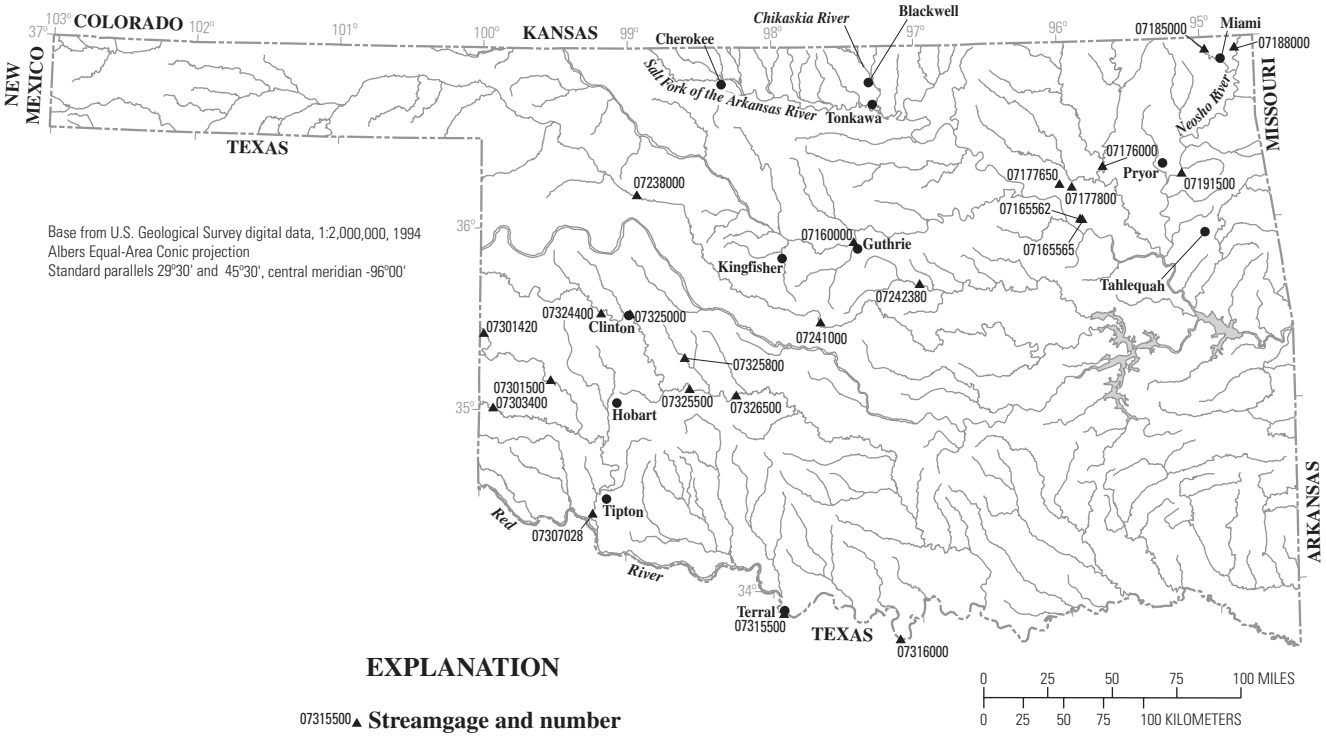

Figure 48. Location of streamgages with significant floods during 1994–98 water years for Oklahoma.

Table 37. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Oklahoma.

[mi^2, square miles; ft, feet above an arbitrary datum; ft^3/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. 48)	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)
07160000	Cimarron River near Guthrie, OK	16,892	1935, 1937–76, 1983–98	1957 1987	18.58 20.71	158,000 116,000	6/10/95	17.18	93,300	N	15–20
07165562	Haikey Creek at 101st Street South at Tulsa, OK	17.8	1988–98	1995	17.42	6,470	4/10/95	17.42	6,470	N	10
07165565	Little Haikey Creek at 101st Street South at Tulsa, OK	5.45	1987–98	1995	16.82	1,930	6/29/95	16.82	1,930	N	10
07176000	Verdigris River near Claremore, OK	6,534	1935–98	1943	55.05	182,000	7/7/95	29.76	40,800	Y	10
07177650	Flat Rock Creek at Cincinnati Avenue at Tulsa, OK	8.20	1987–98	1995	12.82	4,220	6/9/95	12.82	4,220	N	10–25
07177800	Coal Creek at Tulsa, OK	7.53	1989–98	1995	14.18	5,190	6/23/95	14.18	5,190	N	10–25
07185000	Neosho River near Commerce, OK	5,876	1904, 1927, 1935, 1938, 1939–98	1951	34.03	267,000	4/13/94	25.67	106,000	Y	50
07188000	Spring River near Quapaw, OK	2,510	1935, 1939–98	1993	46.60	230,000	4/13/94	34.38	107,000	N	15–20
07191500	Neosho River near Chouteau, OK	11,534	1927, 1937–58, 1961, 1963–98	1943	45.00	400,000	6/11/95	36.29	164,000	Y	30–35
07238000	North Canadian River near Seiling, OK	12,261	1924, 1946–98	1951 1924	15.61 16.40	33,000 --	9/23/97	14.86	7,200	Y	25–35

Table 37. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Oklahoma.—Continued

[mi^2, square miles; ft, feet above an arbitrary datum; ft^3/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. 48)	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)
07241000	North Canadian River below Lake Overholser near Oklahoma City, OK	13,222	1921, 1923–24, 1952–68, 1969–72, 1973–87, 1988–98	1924	40.90	135,000	6/11/95	25.05	19,500	Y	15–20
07242380	Deep Fork near Warwick, OK	532	1983–98	1983 1995	22.05 21.28	28,700 34,600	6/9/95	21.28	34,600	Y	25
07301420	Sweetwater Creek near Sweetwater, OK	424	1986–98	1995	15.89	1,940	6/3/95	15.89	1,940	N	10–25
07301500	North Fork Red River near Carter, OK	2,337	1904–07, 1928, 1930–32, 1935, 1938–98	1959 1995	13.42 15.08	53,400 34,800	6/4/95	15.08	34,800	N	30-35
07303400	Elm Fork of North Fork Red River near Carl, OK	416	1959–79, 1995–98	1995	18.80	62,300	6/3/95	18.80	62,300	N	>100
07307028	North Fork Red River near Tipton, OK	4,691	1985–98	1993	19.18	51,200	6/6/95	18.41	40,700	Y	25–50
07315500	Red River near Terral, OK	28,723	1935, 1938–80, 1981–83, 1986–91, 1993–98	1995 1987	30.56 32.65	236,000 225,000	6/7/95	30.56	236,000	Y	>100
07316000	Red River near Gainesville, TX	30,782	1935–98	1987	40.08	265,000	6/13/95	36.63	169,000	Y	10–15
07324400	Washita River near Foss, OK	1,551	1956–58, 1961–87, 1989–98	1958 1959	16.90 23.40	3,660 --	9/15/96	21.24	2,990	Y	75–85
07325000	Washita River near Clinton, OK	1,977	1934–98	1934	33.90	90,000	9/15/96	26.24	10,800	Y	30–35

Table 37. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Oklahoma.—Continued

[mi^2, square miles; ft, feet above an arbitrary datum; ft^3/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. 48)	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)
07325500	Washita River at Carnegie, OK	3,129	1913, 1921, 1923–24, 1934–36, 1937–98	1949 1995	26.21 31.50	50,000 40,200	6/5/95	31.50	40,200	Y	40–45
07325800	Cobb Creek near Eakly, OK	132	1968–98	1995 1986	22.05 24.38	12,000 10,000	6/4/95	22.05	12,000	N	25
07326500	Washita River at Anadarko, OK	3,656	1902–08, 1924–25, 1935–37, 1993–98	1995	25.37	52,800	6/6/95	25.37	52,800	Y	50–55

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

Oregon

A subtropical, moisture-laden Pacific front stalled over northwestern Oregon on November 10, 1995. Storm total rainfall ranged from about 3 inches in the Willamette River Valley to 4 inches in the Cascade Range and 5 inches in the Coast Range. The most serious damages occurred in the Portland area and along the Zig Zag River in the foothills of Mt. Hood (fig. 49) (National Oceanic and Atmospheric Administration, 1995b).

Runoff from excessive rains and melting mountain snow caused major floods on many northern and eastern Oregon rivers beginning on February 6, 1996. The first rivers reached flood stage on the morning of February 6 when the most intense rain was still falling. Streamflow measured at 27 streamgages set all-time high river discharges, and 4 more set stage records during February 1996 (table 38). Many smaller ungaged streams also left their banks during this period. Statewide damage was estimated at over $400 million, with an estimated 5,000 homes destroyed, and seven people lost their lives as a direct result of flooding (National Oceanic and Atmospheric Administration, 1996b). Most rivers had receded to below flood stage by February 14; however, the lower Willamette River fluctuated around flood stage, and the downstream reaches of the Columbia River remained above flood stage until the end of February.

Moist southwest flow aloft produced moderate to excessive rain and strong winds over southwestern and northern Oregon during November 17–21, 1996. Storm total rainfall ranged from 8 to 12 inches on the coast with local amounts near 20 inches, while 3 to 7 inches of rain fell inland (National Oceanic and Atmospheric Administration, 1996a). Flooding was extensive in southwestern Oregon. The rainfall amount and rate produced numerous mudslides into homes and across highways. Many highways were closed due to slides, and the northbound lane of I–5 near Roseburg collapsed. Major rivers, such as the downstream reaches of the Willamette River, remained above flood stage until November 23. Damage estimates were nearly $45 million, and there were five deaths from drowning (National Oceanic and Atmospheric Administration, 1996b).

A series of storm systems dumped excessive amounts of rain over southern Oregon during December 7–10, 1996. A 24-hour rainfall total of 4 to 8 inches fell along the coast and 2 to 6 inches inland (National Oceanic and Atmospheric Administration, 1996a). Most major rivers and many of the small streams in southwest Oregon flooded. Mudslides and flooding closed many roads and highways. Damage was over $8 million (National Oceanic and Atmospheric Administration, 1996b).

A warm southwest flow pushed temperatures above 60 ^{o}F on New Years Eve Day, 1997, with the freezing level lifting to elevations above 10,000 feet. Melting snow and copious rain drove rivers and streams well above flood stage across southern Oregon from New Years Day to January 5, with widespread flooding through January 3. The total basin rainfall for the New Years Day storm averaged 2 to 4 inches, with rainfall amounts in excess of 8 inches (National Oceanic and Atmospheric Administration, 1997a). Six streamgages recorded their peak of record during this flood (table 38). Damage was nearly $89 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 49. *(A)* Location of streamgages with significant floods during 1994–98 water years for Oregon.

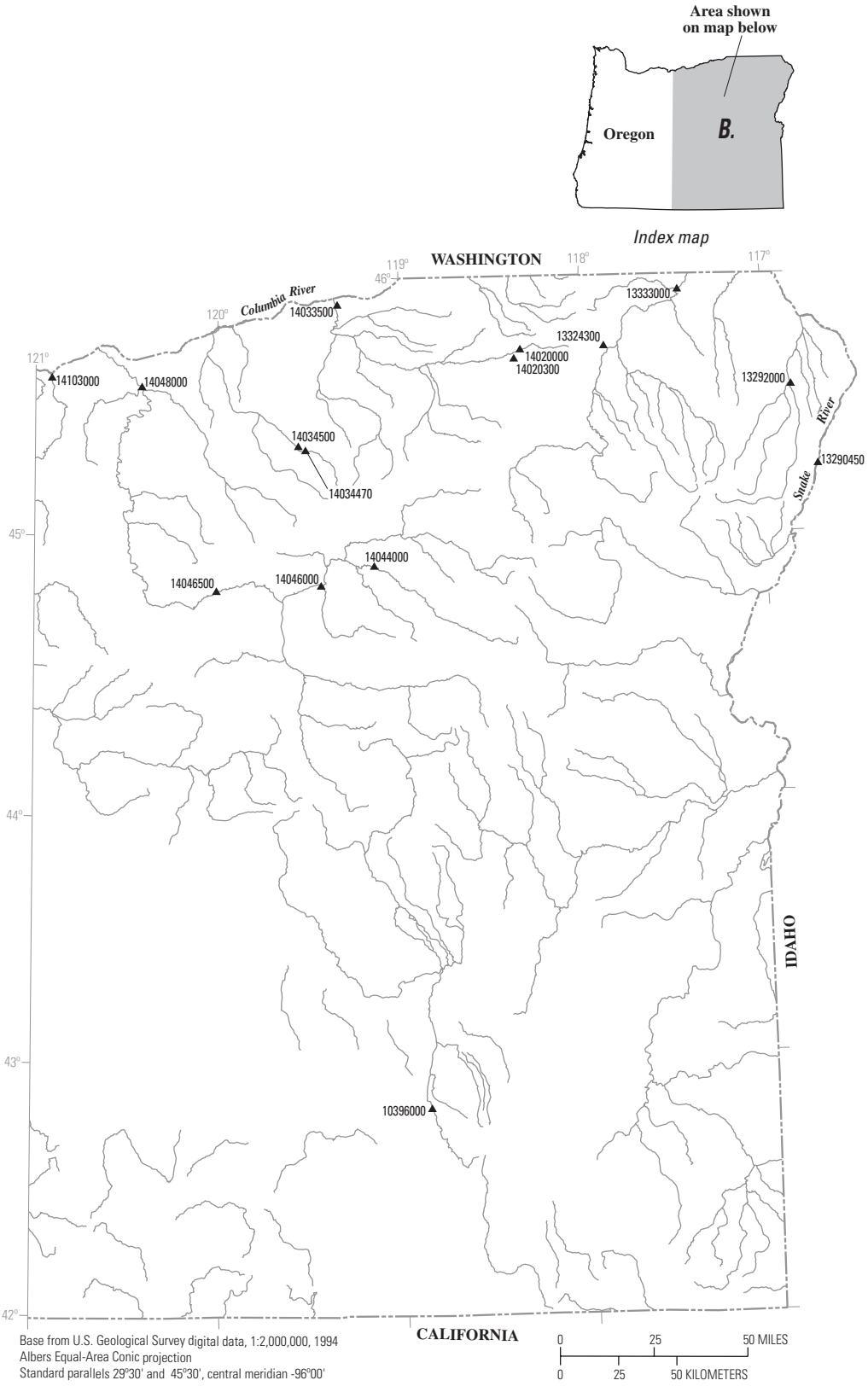

Figure 49. *(B)* Location of streamgages with significant floods during 1994–98 water years for Oregon.—Continued

Table 38. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Oregon.

[mi^2, square miles; ft, feet above an arbitrary datum; ft^3/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. 49)	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)
10396000	Donner Und Blitzen River near Frenchglen, OR	200	1911–16, 1918–21, 1930, 1938–98	1978	7.15	4,270	5/14/98	6.32	3,110	N	15
11501000	Sprague River near Chiloquin, OR	1,580	1921–98	1965	10.37	14,900	1/5/97	9.05	10,800	N	40–50
11502500	Williamson River below Sprague River near Chiloquin, OR	3,000	1917–98	1997 1965	10.27 10.56	17,100 16,100	1/5/97	10.27	17,100	N	75–100
11509500	Klamath River at Keno, OR	3,920	1905–13, 1930–98	1986 1907	12.82 14.40	10,300 5,220	2/22/96 1/3/97	12.41 12.60	9,520 9,870	Y Y	-- --
11510700	Klamath River below John C. Boyle Power Plant near Keno, OR	4,080	1959–98	1996	9.50	11,600	2/21/96 1/3/97	9.50 9.44	11,600 11,400	Y Y	-- --
13290450	Snake River at Hells Canyon Dam, Idaho-Oregon State line, OR	73,300	1966–98	1997	86.17	103,000	1/2/97	86.17	103,000	Y	--
13292000	Imnaha River at Imnaha, OR	622	1929–98	1997	11.44	20,200	1/1/97	11.44	20,200	N	>100
13324300	Lookingglass Creek near Looking Glass, OR	78.3	1983–98	1996	7.41	2,120	2/9/96	7.41	2,120	N	>25
13333000	Grande Ronde River at Troy, OR	3,275	1945–98	1996	13.76	51,800	2/9/96 1/1/97	13.76 12.65	51,800 36,700	N N	>100 25
14020000	Umatilla River above Meacham Creek near Gibbon, OR	131	1933–98	1996 1965	9.40 9.50	6,220 4,910	11/28/95 1/1/97	9.40 8.76	6,220 5,230	N N	50 25
14020300	Meacham Creek at Gibbon, OR	176	1976–98	1996	7.67	5,930	11/28/95	7.67	5,930	N	20
14033500	Umatilla River near Umatilla, OR	2,290	1904–98	1965 1906	10.75 11.00	19,800 19,600	2/10/96	8.49	16,300	Y	30
14034470	Willow Creek above Willow Creek Lake near Heppner, OR	67.6	1983–98	1997	9.60	544	2/1/97	9.60	544	N	10–25

Table 38. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Oregon.—Continued

[mi^2, square miles; ft, feet above an arbitrary datum; ft^3/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. 49)	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)
14034500	Willow Creek at Heppner, OR	96.8	1949, 1952–90, 1992–98	1949 1957	-- 6.15	1,700 812	5/11/95	5.22	333	Y	--
14044000	Middle Fork John Day River at Ritter, OR	515	1930–98	1965	8.39	4,730	1/1/97	8.24	4,540	N	50
14046000	North Fork John Day River at Monument, OR	2,520	1925–98	1965	18.45	33,400	2/9/96 1/1/97	14.63 17.56	21,700 30,400	N N	15 50
14046500	John Day River at Service Creek, OR	5,090	1926, 1930–98	1965	17.85	40,200	1/1/97	16.49	35,200	N	35
14048000	John Day River at McDonald Ferry, OR	7,580	1905–08, 1910–96, 1998	1965	13.59	42,800	2/10/96	13.16	31,300	N	25
14076500	Deschutes River near Culver, OR	2,705	1953–98	1965	10.00	6,680	1/31/97	7.89	3,910	Y	25
14087400	Crooked River below Opal Springs near Culver, OR	4,300	1962–98	1965	9.36	6,660	1/2/97	9.08	6,350	Y	--
14090350	Jefferson Creek near Camp Sherman, OR	27.8	1984–98	1996	3.94	730	2/7/96	3.94	730	N	25–50
14090400	Whitewater River near Camp Sherman, OR	22.8	1983–98	1996 1998	-- 7.37	2,320 683	2/7/96	--	2,320	N	50–100
14091500	Metolius River near Grandview, OR	316	1913, 1922–98	1996	7.38	8,430	2/7/96	7.38	8,430	N	>100
14092500	Deschutes River near Madras, OR	7,820	1924–98	1983	7.70	22,500	2/8/96	7.08	19,100	Y	--
14092750	Shitike Creek at Peters Pasture near Warm Springs, OR	22.9	1983–98	1996	6.66	2,430	2/7/96	6.66	2,430	N	25–50
14092885	Shitike Creek below Wolford Canyon near Warm Springs, OR	75.8	1975–96	1996	7.93	3,600	2/7/96	7.93	3,600	N	50
14095500	Warm Springs River near Simnasho, OR	107	1984–98	1996	6.98	4,670	2/7/96	6.98	4,670	N	50–100

Table 38. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Oregon.—Continued

[mi^2, square miles; ft, feet above an arbitrary datum; ft^3/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. 49)	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)
14096300	Mill Creek near Badger Butte near Warm Springs, OR	26.8	1984–98	1996	8.42	1,300	2/7/96	8.42	1,300	N	25–50
14096850	Beaver Creek below Quartz Creek near Simnasho, OR	145	1984–98	1996	10.57	5,760	2/7/96	10.57	5,760	N	20–30
14097100	Warm Springs River near Kah-neeta Hot Springs, OR	526	1973–98	1996	14.32	22,600	2/7/96	14.32	22,600	N	50–100
14103000	Deschutes River at Moody near Biggs, OR	10,500	1898, 1907–98	1996	12.08	70,300	2/8/96	12.08	70,300	Y	>100
14120000	Hood River at Tucker Bridge near Hood River, OR	279	1898–99, 1914, 1916–17, 1965–75, 1977–98	1965	20.60	33,200	2/7/96	17.11	23,300	N	<25
14137000	Sandy River near Marmot, OR	263	1912–98	1965	17.05	61,400	2/7/96	20.40	48,100	N	75–100
14138800	Blazed Alder Creek near Rhododendron, OR	8.17	1964–98	1965	8.25	2,610	2/7/96	7.05	2,020	N	25
14138850	Bull Run River near Multnomah Falls, OR	47.9	1967–98	1996	13.60	9,140	2/6/96	13.60	9,140	N	30–40
14139700	Cedar Creek near Brightwood, OR	7.93	1965–98	1965	7.20	1,990	2/7/96	5.40	1,720	N	15
14139800	South Fork Bull Run River near Bull Run, OR	15.4	1975–98	1996	9.54	3,630	2/7/96	9.54	3,630	N	50
14140000	Bull Run River near Bull Run, OR	107	1908–98	1965 1996	-- 16.00	25,100 20,200	2/7/96	16.00	20,200	Y	35
14142500	Sandy River below Bull Run River near Bull Run, OR	436	1911–14, 1930–66, 1985–98	1965 1996	22.30 22.59	84,400 68,600	2/7/96	22.59	68,600	Y	50
14145500	Middle Fork Willamette River above Salt Creek near Oakridge, OR	392	1914, 1936–98	1946 1956	12.06 12.71	34,000 33,300	1/2/97	8.38	8,610	Y	--

Table 38. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Oregon.—Continued

[mi^2, square miles; ft, feet above an arbitrary datum; ft^3/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. 49)	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)
14148000	Middle Fork Willamette River below North Fork near Oakridge, OR	924	1912, 1924–98	1946	18.80	81,800	11/19/96	10.34	40,800	Y	--
14150300	Fall Creek near Lowell, OR	118	1964–98	1997	12.48	12,700	11/19/96	12.48	12,700	N	15
14151000	Fall Creek below Winberry Creek near Fall Creek, OR	186	1936–98	1957	18.80	24,700	12/27/96	8.01	4,640	Y	--
14153500	Coast Fork Willamette River below Cottage Grove Dam, OR	104	1939–98	1965	11.83	5,910	12/12/96	9.16	3,420	Y	--
14154500	Row River above Pitcher Creek near Dorena, OR	211	1936–98	1965	18.19	33,100	11/18/96	17.25	30,100	N	100
14157500	Coast Fork Willamette River near Goshen, OR	642	1906–12, 1951–98	1910	19.50	58,500	11/19/96	17.17	33,400	Y	--
14158500	McKenzie River at outlet of Clear Lake, OR	92.4	1913–15, 1948–98	1965 1913	8.15 10.69	3,300 1,130	2/7/96	7.01	2,600	Y	15–20
14158790	Smith River above Smith River Reservoir near Belknap Springs, OR	16.2	1961–98	1965	11.90	5,160	2/7/96	9.48	2,960	N	30
14159500	South Fork McKenzie River near Rainbow, OR	208	1948–98	1957 1946	8.66 9.30	17,600 24,500	2/13/96 1/6/97	5.42 5.39	6,650 6,570	Y Y	-- --
14161500	Lookout Creek near Blue River, OR	24.1	1950–55, 1964–98	1996	10.03	8,000	2/7/96	10.03	8,000	N	>100
14162500	McKenzie River near Vida, OR	930	1925–98	1946	17.70	64,400	2/7/96	10.05	30,900	Y	--
14165000	Mohawk River near Springfield, OR	177	1936–52, 1956, 1964–97	1996	23.11	13,500	2/7/96	23.11	13,500	N	30
14166500	Long Tom River near Noti, OR	89.3	1936–98	1956	20.17	6,990	2/7/96	19.98	6,780	N	25
14178000	North Santiam River below Boulder Creek near Detroit, OR	216	1907–09, 1929–98	1965	13.76	26,700	2/7/96	11.78	24,000	N	60–80

Table 38. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Oregon.—Continued

[mi^2, square miles; ft, feet above an arbitrary datum; ft^3/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. 49)	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)
14182500	Little North Santiam River near Mehama, OR	112	1932–98	1965	16.73	36,000	2/7/96	15.29	33,900	N	60–80
14183000	North Santiam River at Mehama, OR	655	1906–07, 1911–14, 1922–98	1946 1922 1923	15.37 17.50 17.50	76,600 62,900 62,900	2/7/96	13.40	53,800	Y	--
14185000	South Santiam River below Cascadia, OR	174	1936–98	1996 1965	18.11 19.68	31,700 27,600	2/7/96	18.11	31,700	N	50–70
14185900	Quartzville Creek near Cascadia, OR	99.2	1964–98	1965 1996	-- 20.54	36,500 23,700	2/7/96	20.54	23,700	N	25
14187200	South Santiam River near Foster, OR	557	1974–98	1996	18.74	28,700	2/7/96	18.74	28,700	Y	--
14187500	South Santiam River at Waterloo, OR	640	1906, 1924–98	1965	24.50	95,200	2/7/96	13.09	29,200	Y	--
14189000	Santiam River at Jefferson, OR	1,790	1908–16, 1922, 1940–98	1922 1965	22.50 24.22	202,000 197,000	2/7/96	23.25	168,000	Y	--
14190500	Luckiamute River near Suver, OR	240	1906–11, 1941–98	1965	34.52	32,900	2/8/96	33.00	24,800	N	25
14196001	Haskins Creek below reservoir near McMinnville, OR	6.90	1952–98	1996	6.01	1,050	2/8/96	6.01	1,050	Y	>50
14202000	Pudding River at Aurora, OR	479	1929–65, 1994–97	1996	30.72	43,700	2/8/96	30.72	43,700	N	50–100
14202980	Scoggins Creek below Henry Hagg Lake near Gaston, OR	38.8	1975–98	1996 1991	16.88 18.01	2,210 2,050	4/23/96	16.88	2,210	Y	--
14203500	Tualatin River near Dilley, OR	125	1940–98	1965	19.34	17,100	2/8/96	19.06	10,100	Y	--
14206900	Fanno Creek at 56th Avenue at Portland, OR	2.37	1974–78, 1991–98	1996	13.20	733	2/8/96	13.20	733	N	25–50
14207500	Tualatin River at West Linn, OR	706	1929–98	1996	18.32	26,400	2/10/96	18.32	26,400	Y	--

Table 38. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Oregon.—Continued

[mi^2, square miles; ft, feet above an arbitrary datum; ft^3/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. 49)	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)
14209000	Oak Grove Fork above powerplant intake, OR	124	1910–98	1923 1997	5.45 8.52	5,000 2,620	2/7/96	6.18	4,530	Y	--
14209500	Clackamas River above Three Lynx Creek, OR	479	1910–13, 1922–98	1965	21.70	68,200	2/7/96	18.09	46,600	Y	40–50
14210000	Clackamas River at Estacada, OR	671	1909–98	1965 1996	18.36 27.57	86,900 68,900	2/7/96	27.57	68,900	Y	40–50
14211500	Johnson Creek at Sycamore, OR	26.5	1941–98	1965 1997	14.68 15.30	2,620 2,550	2/7/96 11/19/96	14.28 15.30	2,350 2,550	N N	15 25
14301000	Nehalem River near Foss, OR	667	1940–98	1996	29.56	70,300	2/8/96	29.56	70,300	N	>100
14301500	Wilson River near Tillamook, OR	161	1915, 1932–98	1972 1965	16.91 20.26	36,000 32,100	2/8/96	19.51	35,000	N	50
14303200	Tucca Creek near Blaine, OR	3.09	1984–98	1996 1997	4.30 5.09	680 400	2/6/96	4.30	680	N	>50
14305500	Siletz River at Siletz, OR	202	1906–12, 1925–98	1996 1965	24.49 27.32	34,700 32,200	2/7/96	24.49	34,700	N	50
14306340	East Fork Lobster Creek near Alsea, OR	5.70	1984–98	1996	5.37	1,360	2/7/96	5.37	1,360	N	25–50
14308000	South Umpqua River at Tiller, OR	449	1911, 1940–98	1965	25.72	60,200	11/18/96	22.17	46,000	N	25
14308500	Elk Creek near Drew, OR	54.4	1955–82, 1987–98	1995	11.09	9,120	1/9/95	11.09	9,120	N	20–25
14308990	Cow Creek above Galesville Reservoir near Azalea, OR	64.7	1986–98	1995	12.04	6,980	1/9/95	12.04	6,980	N	10–25
14309000	Cow Creek near Azalea, OR	78.0	1928–31, 1933–98	1974	16.40	10,600	1/2/97	9.69	2,490	Y	--
14310000	Cow Creek near Riddle, OR	456	1951, 1955–98	1951	28.50	41,100	1/9/95	26.22	34,400	Y	10

Table 38. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Oregon.—Continued

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Streamgage number (fig. 49)	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)
14314500	Clearwater River above Trap Creek near Toketee Falls, OR	41.6	1928–98	1965 1997	-- 6.92	1,020 768	1/1/97	6.92	768	Y	--
14316000	Fish Creek at Big Camas Ranger Station near Toketee Falls, OR	68.8	1948–98	1965 1956	-- 12.82	12,100 9,880	11/18/96	10.66	6,240	Y	15
14316700	Steamboat Creek near Glide, OR	227	1956–98	1965	25.60	51,000	11/18/96	19.54	31,400	N	20–25
14319850	Gassy Creek near Nonpareil, OR	9.19	1989–98	1997	6.59	1,940	11/18/96	6.59	1,940	N	10–25
14320700	Calapooya Creek near Oakland, OR	210	1956–73, 1987–98	1997	21.62	27,100	11/18/96	21.62	27,100	N	25
14321400	Elk Creek near Elkhead, OR	28.7	1987–98	1997	10.82	6,670	11/18/96	10.82	6,670	N	25–50
14325000	South Fork Coquille River at Powers, OR	169	1917–26, 1929–98	1965	26.51	48,900	11/18/96	21.93	38,500	N	50
14328000	Rogue River above Prospect, OR	312	1909, 1911, 1924–98	1965	11.55	22,400	1/1/97	8.38	12,000	N	20
14330000	Rogue River below Prospect, OR	379	1914–30, 1969–98	1997	8.15	12,200	1/1/97	8.15	12,200	N	25
14332000	South Fork Rogue River near Prospect, OR	83.8	1925–31, 1950–98	1965 1956	-- 8.30	7,010 3,180	12/30/95	7.13	4,030	N	25
14337500	Big Butte Creek near McLeod, OR	245	1946–57, 1968–98	1956 1972	12.75 13.21	8,950 8,170	1/1/97	12.61	7,390	N	15–20
14337600	Rogue River near McLeod, OR	938	1965–98	1965	20.35	74,300	1/7/97	9.01	17,400	Y	--
14338000	Elk Creek near Trail, OR	129	1946–98	1965	18.84	19,200	1/1/97	12.00	11,300	N	15
14357500	Bear Creek at Medford, OR	289	1916–98	1997	14.69	17,600	1/1/97	14.69	17,600	Y	50–100
14359000	Rogue River at Raygold near Central Point, OR	2,053	1906–98	1965 1927	23.43 24.80	131,000 110,000	1/1/97	17.17	70,500	Y	--
14361500	Rogue River at Grants Pass, OR	2,459	1939–98	1965	34.15	152,000	1/1/97	26.49	90,800	Y	--

Table 38. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Oregon.—Continued

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Streamgage number (fig. 49)	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)
14362000	Applegate River near Copper, OR	225	1939–98	1974 1965	25.38 26.00	29,800 29,000	1/1/97	16.23	18,800	Y	--
14362250	Star Gulch near Ruch, OR	16.0	1984–98	1997	5.43	1,050	1/1/97	5.43	1,050	N	>50
14366000	Applegate River near Applegate, OR	483	1939–98	1974	20.41	37,200	1/1/97	17.90	29,700	Y	--
14369500	Applegate River near Wilderville, OR	698	1939–55, 1979–98	1956	20.30	66,500	1/2/97	19.38	44,000	Y	--
14372300	Rogue River near Agness, OR	3,939	1961–98	1965	68.03	290,000	1/2/97	39.60	241,000	Y	--
14400000	Chetco River near Brookings, OR	271	1970–98	1997	28.56	76,100	11/19/96	28.56	76,100	N	50

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

Pennsylvania

Slow-moving thunderstorms with excessive rainfall occurred several times during the summer months of 1994 including the remnants of Tropical Storm Beryl in August. These excessive rains caused small-stream flash flooding across the State. Although no records were set for gage heights or stream discharges, extensive damage occurred from the floods. Total damage was estimated to be nearly $19 million (National Oceanic and Atmospheric Administration, 1994b). There were no deaths caused by the flooding during this period.

Severe flooding occurred near York (fig. 50) on July 4, 1995, as about 4.5 inches of rain fell within 3 hours (National Oceanic and Atmospheric Administration, 1995a). Total damage was estimated at $8 million (National Oceanic and Atmospheric Administration, 1995b). This was the worst flood damage in York since the remnants of Hurricane Eloise in September 1975.

The most disastrous flood in more than 20 years struck Pennsylvania during the early morning of January 19 through the evening of January 21, 1996. Nearly all of Pennsylvania experienced flooding of unusual magnitude beginning in the early morning of January 19 with rapid flooding of headwater basins of western Pennsylvania and ending as major flooding along the rivers of the State on January 20–21. Two major snowstorms set the stage for the great flood. The snowstorm of January 7–8 had been termed the Blizzard of '96 and was followed by a second major storm on January 12–13. Overnight on January 18 and 19, excessive rain fell atop snow that had begun to melt rapidly due to high winds and warm temperatures. Many locations had in excess of 2 inches of rain, with the hardest hit areas receiving 3 inches in less than 12 hours (National Oceanic and Atmospheric Administration, 1996a). Snowpack from the severe January snowstorms held water equivalents of 2 to 4 inches across much of the region, and much of the water was released during the period of excessive rain. Major rivers and streams responded quite rapidly, and ice jams caused significant problems in many areas. The flooding was as bad as that from Hurricane Eloise in 1975 and in a few areas was even worse than the record floods of Hurricane Agnes in 1972. Record discharges were measured at 29 streamgages throughout the State (table 39). In the hardest hit areas of central Pennsylvania, 18 deaths were attributed to the flooding. Many of the deaths occurred when people drove into flooded areas and became stranded. Because of strong winds, temperatures in the teens, and ice-cold water, there was little time to rescue people caught in the flood. Estimates of damage from the flooding and the prior week's blizzard totaled $700 million for the State (National Oceanic and Atmospheric Administration, 1996b). An estimated $760 million also was lost to commerce during the 2 weeks. The Pennsylvania Department of Transportation further estimated damage to roads and bridges at $500 million (National Oceanic and Atmospheric Administration, 1996b).

Intense thunderstorms over southern Pennsylvania produced as much as 12 inches of rainfall during the evening of June 18, 1996. Major flash floods caused more than $26 million in damage, and three persons lost their lives. Slow-moving thunderstorms caused flash flooding during the early morning of July 19, with 4 to 6 inches of rainfall over northwestern Pennsylvania (National Oceanic and Atmospheric Administration, 1996a). The greatest damage occurred near and west of Punxsutawney. More than $225 million in damage to homes, businesses, roads, and bridges occurred from this storm, and there were two deaths (National Oceanic and Atmospheric Administration, 1996b).

Tropical moisture left behind by the remnants of Hurricane Fran was a major contributor to the torrential downpours from thunderstorms in south-central Pennsylvania, southwest of Harrisburg, on September 8, 1996. As much as 10 inches of rainfall within a 3-hour period caused widespread flash flooding and resulted in the deaths of two persons and about $20 million dollars in property damage (National Oceanic and Atmospheric Administration, 1996b). A little more than a week later 7 inches of rainfall caused flash flooding near Erie (National Oceanic and Atmospheric Administration, 1996a), where $5 million in damage occurred (National Oceanic and Atmospheric Administration, 1996b).

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.

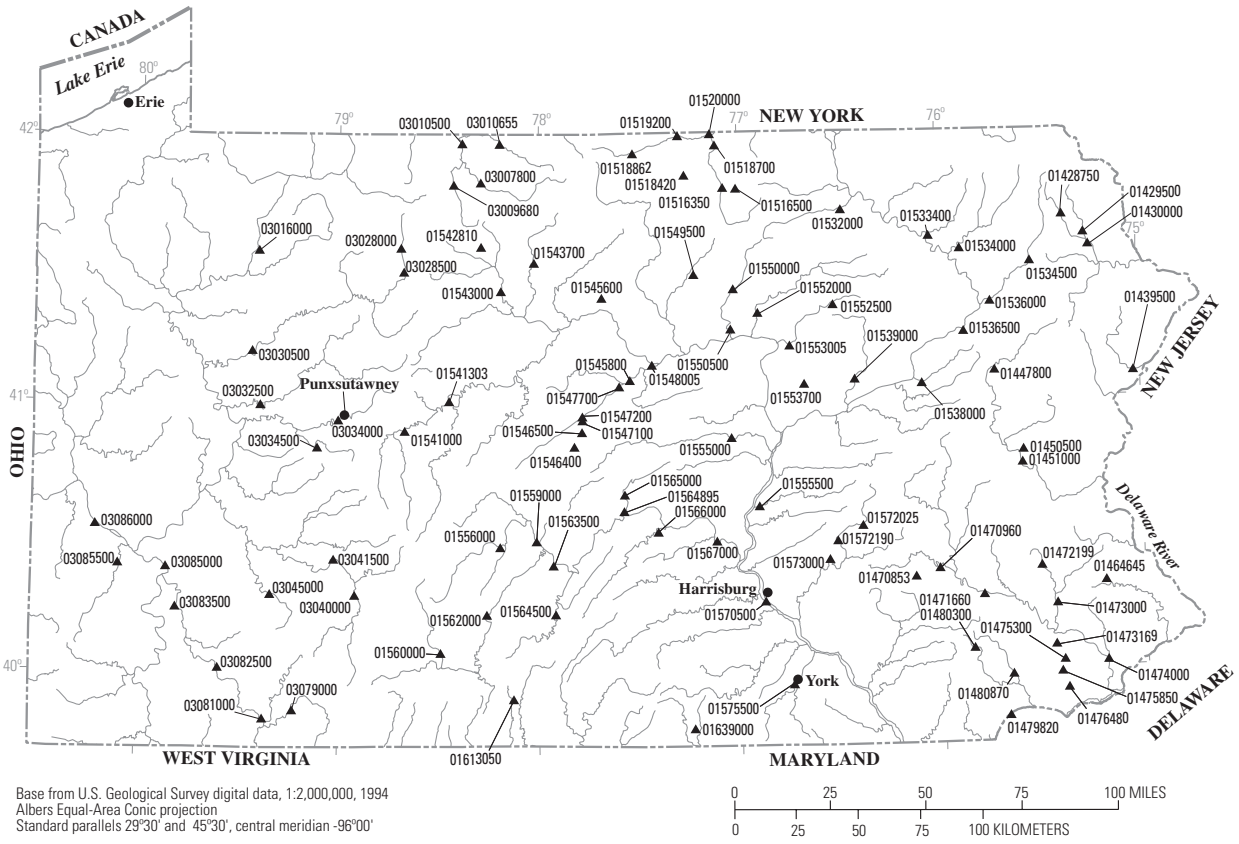

Figure 50. Location of streamgages with significant floods during 1994–98 water years for Pennsylvania.

Table 39. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Pennsylvania.

[mi^2, square miles; ft, feet above an arbitrary datum; ft^3/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. 50)	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)
01428750	West Branch Lackawaxen River near Aldenville, PA	40.6	1975–98	1996	8.00	4,340	1/19/96	8.00	4,340	N	25–50
01429500	Dyberry Creek near Honesdale, PA	64.6	1944–98	1952	14.60	15,500	1/20/96	7.32	2,600	Y	<10
01430000	Lackawaxen River near Honesdale, PA	164	1942, 1949–69, 1974–82, 1984–94, 1996–98	1942	24.50	34,000	1/19/96	8.49	7,180	Y	<10
01439500	Bush Kill at Shoemakers, PA	117	1909–98	1955	13.95	23,400	1/27/96	7.01	4,990	N	>10
01447800	Lehigh River below Frances E. Walter Reservoir near White Haven, PA	290	1955, 1958–98	1955 1958	-- 9.85	54,200 13,800	1/29/96	8.79	11,500	Y	<10
01450500	Aquashicola Creek at Palmerton, PA	76.7	1940–98	1945	13.63	11,700	1/19/96	12.64	9,760	N	50–100
01451000	Lehigh River at Walnutport, PA	889	1942, 1947–98	1955 1942	17.68 20.60	77,800 --	1/19/96	12.32	40,100	Y	25
01464645	North Branch Neshaminy Creek below Lake Galena near New Britain, PA	16.2	1986–98	1997	4.77	2,060	10/19/96	4.77	2,060	Y	10–25
01470853	Furnace Creek at Robesonia, PA	4.18	1983–98	1994 1984	3.79 4.70	537 227	11/28/93	3.79	537	N	10–25
01470960	Tulpehocken Creek at Blue Marsh damsite near Readin, PA	175	1965–98	1972	18.70	16,100	12/6/93	7.73	4,060	Y	<10
01471660	Schuylkill River at Birdsboro, PA	976	1984–94, 1996	1996	157.59	27,900	1/20/96	157.59	27,900	N	<10
01472199	West Branch Perkiomen Creek at Hillegass, PA	23.0	1982–98	1996 1989	6.34 9.55	4,610 1,190	1/19/96	6.34	4,610	N	25–50
01473000	Perkiomen Creek at Graterford, PA	279	1915–98	1935	18.26	39,900	1/19/96	16.45	32,500	N	25–50

Table 39. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Pennsylvania.—Continued

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Streamgage number (fig. 50)	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)
01473169	Valley Creek at Pennsylvania Turnpike Bridge near Valley Forge, PA	20.8	1983–98	1997	10.54	2,200	10/19/96	10.54	2,200	N	<10
01474000	Wissahickon Creek at mouth, Philadelphia, PA	64.0	1966–98	1973	7.92	6,870	1/19/96	7.60	6,240	N	<10
01475300	Darby Creek at Waterloo Mills near Devon, PA	5.15	1972–97	1997	6.87	1,920	10/19/96	6.87	1,920	N	25
01475850	Crum Creek near Newtown Square, PA	15.8	1977–98	1997	9.62	2,380	10/19/96	9.62	2,380	N	10–25
01476480	Ridley Creek at Media, PA	30.5	1987–95, 1997–98	1994	9.93	3,700	1/28/94	9.93	3,700	N	10–25
01479820	Red Clay Creek near Kennett Square, PA	28.3	1988–98	1996	9.22	3,760	1/19/96	9.22	3,760	N	10–25
01480300	West Branch Brandywine Creek near Honey Brook, PA	18.7	1960–98	1996	11.62	8,920	1/19/96	11.62	8,920	N	>25
01480870	East Branch Brandywine Creek below Downingtown, PA	89.9	1972–98	1997	12.60	6,700	10/19/96	12.60	6,700	Y	10–25
01516350	Tioga River near Mansfield, PA	153	1972, 1975, 1977–98	1996 1975	18.87 20.13	38,900 18,000	1/19/96	18.87	38,900	N	<50
01516500	Corey Creek near Mainesburg, PA	12.2	1955–98	1972	10.44	5,580	8/18/94	10.15	4,970	N	50–100
01518420	Crooked Creek below Catlin Hollow at Middlebury Center, PA	74.3	1985–98	1997	51.93	15,300	11/08/96	51.93	15,300	N	<25
01518700	Tioga River at Tioga Junction, PA	446	1976–98	1976	22.12	48,000	8/18/94	15.42	11,200	Y	10
01518862	Cowanesque River at Westfield, PA	90.6	1984–98	1996	11.10	13,000	1/19/96	11.10	13,000	N	10–25
01519200	Cowanesque River at Elkland, PA	235	1980–98	1996	30.20	28,000	1/19/96	30.20	28,000	N	25–50

Table 39. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Pennsylvania.—Continued

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Streamgage number (fig. 50)	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)
01520000	Cowanesque River near Lawrenceville, PA	298	1952–98	1975	18.13	43,700	1/23/96	12.41	6,580	Y	<10
01532000	Towanda Creek near Monroeton, PA	215	1914–98	1972 1996	16.90 20.86	74,000 67,900	1/19/96	20.86	67,900	N	>100
01533400	Susquehanna River at Meshoppen, PA	8,720	1977–98	1996	36.34	226,000	1/20/96	36.34	226,000	N	>25
01534000	Tunkhannock Creek near Tunkhannock, PA	383	1914–98	1996	19.97	30,300	1/19/96	19.97	30,300	N	>25
01534500	Lackawanna River at Archbald, PA	108	1940–98	1942	10.58	9,510	1/19/96	9.32	7,190	Y	<50
01536000	Lackawanna River at Old Forge, PA	332	1939–98	1955	20.05	31,000	1/19/96	15.58	22,300	Y	50
01536500	Susquehanna River at Wilkes Barre, PA	9,960	1787, 1807, 1809, 1833, 1865, 1891-1998	1972	40.91	345,000	1/20/96	34.45	221,000	N	10–25
01538000	Wapwallopen Creek near Wapwallopen, PA	43.8	1920–98	1972	11.04	5,410	1/19/96	10.35	4,650	N	<100
01539000	Fishing Creek near Bloomsburg, PA	274	1936, 1939–98	1972	15.18	30,900	1/19/96	12.86	21,300	N	<25
01541000	West Branch Susquehanna River at Bower, PA	315	1889, 1914–98	1936	19.74	31,500	7/19/96	17.24	22,000	N	50–100
01541303	West Branch Susquehanna River at Hyde, PA	474	1964, 1979–98	1964	18.10	19,400	1/19/96	11.16	7,630	Y	<10
01542810	Waldy Run near Emporium, PA	5.24	1964–98	1967	6.32	828	1/19/96	6.24	698	N	50
01543000	Driftwood Branch Sinnemahoning Creek at Sterling Run, PA	272	1914–98	1942	14.70	47,800	1/19/96	11.17	26,700	N	>25
01543700	First Fork Sinnemahoning Creek at Wharton, PA	182	1984–98	1996	15.37	15,400	1/19/96	15.37	15,400	N	50
01545600	Young Womans Creek near Renovo, PA	46.2	1965–98	1972	7.98	5,370	8/18/94	6.92	3,890	N	>25

Table 39. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Pennsylvania.—Continued

[mi^2, square miles; ft, feet above an arbitrary datum; ft^3/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. 50)	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)
01545800	West Branch Susquehanna River at Lock Haven, PA	3,345	1975–98	1996	25.76	93,900	1/20/96	25.76	93,900	N	25–50
01546400	Spring Creek at Houserville, PA	58.5	1985–98	1996	10.05	2,370	1/19/96	10.05	2,370	N	>50
01546500	Spring Creek near Axemann, PA	87.2	1936, 1941–98	1936	8.60	8,400	1/19/96	6.42	3,490	N	>25
01547100	Spring Creek at Milesburg, PA	142	1967–98	1972	13.20	8,170	1/19/96	10.78	4,780	N	<25
01547200	Bald Eagle Creek below Spring Creek at Milesburg, PA	265	1956–98	1972	11.67	21,300	1/19/96	10.47	16,800	N	25–50
01547700	Marsh Creek at Blanchard, PA	44.1	1956–98	1984	7.85	6,900	1/19/96	7.43	5,890	N	<50
01548005	Bald Eagle Creek near Beech Creek Station, PA	562	1985–98	1996	15.62	12,600	1/19/96	15.62	12,600	Y	10–25
01549500	Blockhouse Creek near English Center, PA	37.7	1936, 1941–98	1972	9.34	6,260	1/19/96	8.84	5,540	N	>25
01550000	Lycoming Creek near Trout Run, PA	173	1914–98	1996	22.68	32,000	1/19/96	22.68	32,000	N	>100
01550500	Lycoming Creek near Williamsport, PA	268	1909–12, 1988–90, 1995–98	1996	18.69	45,000	1/19/96	18.69	45,000	N	--
01552000	Loyalsock Creek at Loyalsockville, PA	443	1926–98	1996	17.93	55,800	1/19/96	17.93	55,800	N	>100
01552500	Muncy Creek near Sonestown, PA	23.8	1936, 1941–98	1972 1936	8.94 9.30	8,260 --	1/19/96	8.70	7,560	N	<50
01553005	Muncy Creek near Muncy, PA	209	1989–98	1996	20.57	43,000	1/19/96	20.57	43,000	N	--
01553700	Chillisquaque Creek at Washingtonville, PA	51.3	1980–98	1996	11.27	3,770	1/19/96	11.27	3,770	N	<25
01555000	Penns Creek at Penns Creek, PA	301	1930–98	1972	14.85	34,600	1/19/96	13.74	25,300	N	>50
01555500	East Mahantango Creek near Dalmatia, PA	162	1930–93, 1995–98	1972	26.62	69,900	1/19/96	17.47	21,200	N	<50

Table 39. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Pennsylvania.—Continued

[mi^2, square miles; ft, feet above an arbitrary datum; ft^3/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. 50)	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)
01556000	Frankstown Branch Juniata River at Williamsburg, PA	291	1889, 1917–98	1936 1996	18.58 19.35	30,000 17,800	1/19/96	19.35	17,800	N	>25
01559000	Juniata River at Huntingdon, PA	816	1896–98, 1900–22, 1924–29, 1931–38, 1942–98	1936	21.87	81,000	1/19/96	15.95	36,500	N	<25
01560000	Dunning Creek at Belden, PA	172	1936, 1940–98	1977 1936	14.15 17.81	19,400 16,900	1/19/96	13.46	15,700	N	50
01562000	Raystown Branch Juniata River at Saxton, PA	756	1889, 1912–98	1936	24.54	80,500	1/20/96	19.63	45,800	N	50–100
01563500	Juniata River at Mapleton Depot, PA	2,030	1936, 1938–98	1936	38.20	165,000	1/20/96	22.47	57,600	Y	10–25
01564500	Aughwick Creek near Three Springs, PA	205	1889, 1939–98	1996	20.85	32,600	1/19/96	20.85	32,600	N	>100
01564895	Juniata River at Lewistown, PA	2,519	1989–98	1996	31.64	74,400	1/20/96	31.64	74,400	Y	--
01565000	Kishacoquillas Creek at Reedsville, PA	164	1936, 1940–70, 1972, 1984–85, 1989–98	1972	16.17	16,400	1/19/96	14.20	12,400	N	50
01566000	Tuscarora Creek near Port Royal, PA	214	1889, 1912–58, 1972, 1988–90, 1996–98	1996 1972	21.27 25.10	25,000 --	9/7/96	21.27	25,000	N	>100
01567000	Juniata River at Newport, PA	3,354	1889, 1899–1998	1889	35.90	209,000	1/20/96	24.69	103,000	Y	10–25

Table 39. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Pennsylvania.—Continued

[mi^2, square miles; ft, feet above an arbitrary datum; ft^3/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. 50)	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)
01570500	Susquehanna River at Harrisburg, PA	24,100	1787, 1846, 1865, 1868, 1886, 1889, 1891–1998	1972	32.57	1,020,000	1/21/96	24.66	568,000	N	>25
01572025	Swatara Creek near Pine Grove, PA	116	1989–98	1994	14.17	5,880	11/28/93	14.17	5,880	N	--
01572190	Swatara Creek near Inwood, PA	167	1989–98	1994	16.20	9,510	11/28/93	16.20	9,510	N	--
01573000	Swatara Creek at Harper Tavern, PA	337	1919–98	1972	23.72	66,700	1/20/96	15.67	19,800	N	10–25
01575500	Codorus Creek near York, PA	222	1933, 1940–98	1972	26.36	30,000	1/19/96	14.91	9,890	Y	<10
01613050	Tonoloway Creek near Needmore, PA	10.7	1963–93, 1995–96, 1998	1972 1996	9.17 9.48	1,300 1,250	1/19/96	9.48	1,250	N	25
01639000	Plum Run at Round Top, PA	1.65	1933, 1942–98	1996	25.42	24,400	6/19/96	25.42	24,400	N	--
03007800	Allegheny River at Port Allegany, PA	248	1975–98	1996	15.37	12,600	1/19/96	15.37	12,600	N	50–100
03009680	Potato Creek at Smethport, PA	160	1975–97	1996	13.19	8,160	1/19/96	13.19	8,160	N	<25
03010500	Allegheny River at Eldred, PA	550	1916–98	1972	29.05	65,400	1/20/96	21.88	20,600	N	10–25
03010655	Oswayo Creek at Shinglehouse, PA	98.7	1972, 1975–98	1996	12.74	4,660	1/19/96	12.74	4,660	N	50
03016000	Allegheny River at West Hickory, PA	3,660	1942–84, 1986–95, 1997–98	1956	17.20	101,000	1/8/98	11.19	43,100	Y	10
03028000	West Branch Clarion River at Wilcox, PA	63.0	1954–98	1996	10.23	5,590	1/19/96	10.23	5,590	N	>25
03028500	Clarion River at Johnsonburg, PA	204	1942, 1946–94, 1996–98	1996 1942	10.14 16.70	12,800 --	1/19/96	10.14	12,800	Y	>100

Table 39. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Pennsylvania.—Continued

[mi^2, square miles; ft, feet above an arbitrary datum; ft^3/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. 50)	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)
03030500	Clarion River near Piney, PA	951	1936, 1948–98	1972	28.24	74,500	7/19/96	25.22	62,400	N	50–100
03032500	Redbank Creek at Saint Charles, PA	528	1910–93, 1995–98	1996	23.90	66,300	7/19/96	23.90	66,300	N	>100
03034000	Mahoning Creek at Punxsutawney, PA	158	1936, 1939–98	1996	18.38	20,400	7/19/96	18.38	20,400	N	>100
03034500	Little Mahoning Creek at McCormick, PA	87.4	1940–98	1996	14.46	10,600	7/19/96	14.46	10,600	N	>100
03040000	Stonycreek River at Ferndale, PA	451	1914–36, 1939–98	1936 1977	-- 23.21	59,000 48,000	1/19/96	17.64	41,600	N	50–100
03041500	Conemaugh River at Seward, PA	715	1936, 1939–98	1977	27.06	115,000	1/19/96	20.68	59,900	N	>25
03045000	Loyalhanna Creek at Kingston, PA	172	1940–98	1955	15.80	29,700	1/19/96	13.37	18,200	N	25–50
03079000	Casselman River at Markleton, PA	382	1915–98	1955 1936	14.06 16.40	50,000 35,800	1/19/96	13.26	45,000	N	>100
03081000	Youghiogheny River below Confluence, PA	1,029	1936, 1941–98	1936	21.60	85,000	1/19/96	17.74	48,500	Y	<100
03082500	Youghiogheny River at Connellsville, PA	1,326	1860, 1888, 1891–99, 1901–98	1955	21.96	103,000	1/19/96	18.65	65,300	Y	25–50
03083500	Youghiogheny River at Sutersville, PA	1,715	1921–98	1955	32.50	108,000	1/19/96	28.19	84,100	Y	<50
03085000	Monongahela River at Braddock, PA	7,337	1936, 1939–98	1996 1972	29.07 31.39	210,000 180,000	1/20/96	29.07	210,000	Y	<50
03085500	Chartiers Creek at Carnegie, PA	257	1916–33, 1936, 1941–98	1956	17.37	13,500	1/28/94	11.94	11,800	N	<25
03086000	Ohio River at Sewickley, PA	19,500	1934–98	1936	34.75	574,000	1/20/96	33.34	372,000	Y	<25

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

Puerto Rico

Thunderstorms developed over the north-central interior slopes of Puerto Rico on November 9, 1995, dumping 6.70 inches of rain at Corozal (fig. 51). One nonofficial rain gage recorded 13.50 inches of rain (National Oceanic and Atmospheric Administration, 1995a). Civil defense agencies reported numerous mudslides in and around Corozal. Río Cibuco below Corozal (streamgage 50038320, table 40) reached its highest discharge since records began in 1970.

Rainfall amounts associated with the eastern circulation of Hurricane Hortense produced widespread flooding and caused 21 deaths across the interior sections of Puerto Rico on September 9–10, 1996. The eastern interior municipalities received as much as 22 inches of rain (National Oceanic and Atmospheric Administration, 1996a). Creeks and streams island-wide reached very high stages and produced very serious flooding. Seven streamgages measured their peak of record during this flood (table 40). Río Grande de Loíza at Caguas (streamgage 50055000, table 40) had its largest discharge since 1945.

During September 20–22, 1998, Hurricane Georges passed directly over Puerto Rico with wind gusts as high as 150 miles per hour and rainfall amounts up to 27 inches (National Oceanic and Atmospheric Administration, 1998a). Total damage was over $2 billion from the wind and rain, but no lives were lost (National Oceanic and Atmospheric Administration, 1998b). Ten streamgages recorded their largest discharges (table 40).

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.

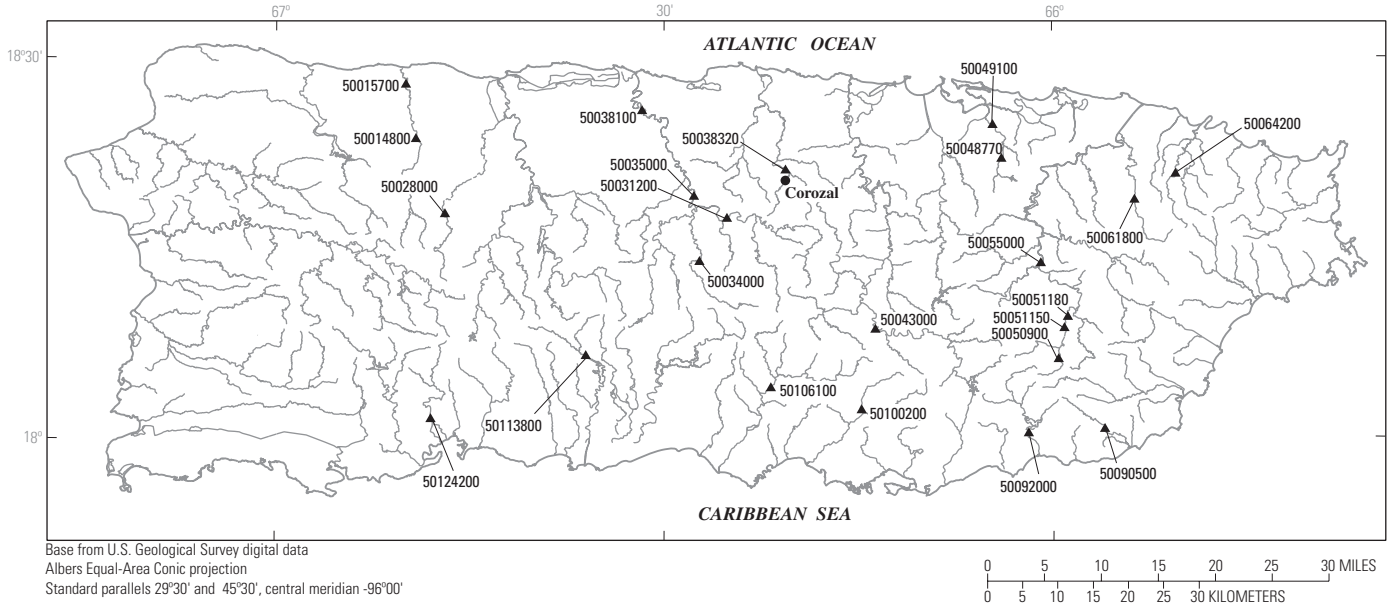


Figure 51. Location of streamgages with significant floods during 1994–98 water years for Puerto Rico.

Table 40. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Puerto Rico.

[mi^2, square miles; ft, feet above an arbitrary datum; ft^3/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. 51)	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)
50014800	Rio Camuy near Bayaney, PR	--	1984–98	1998	21.69	11,600	9/22/98	21.69	11,600	N	>50
50015700	Rio Camuy near Hatillo, PR	--	1984–96	1996	25.18	11,400	9/10/96	25.18	11,400	N	10–25
50028000	Rio Tanama near Utuado, PR	18.4	1960–98	1998	21.24	23,500	9/22/98	21.24	23,500	N	>100
50031200	Rio Grande de Manati near Morovis, PR	55.2	1965–98	1985 1971	17.89 20.30	48,000 35,000	9/10/96	18.83	47,700	N	40–50
50034000	Rio Bauta near Orocovis, PR	16.7	1970–82, 1989–98	1998	25.93	28,200	9/22/98	25.93	28,200	N	50–100
50035000	Rio Grande de Manati at Ciales, PR	128	1899, 1928, 1932, 1949–53, 1956, 1958–98	1996 1899	25.20 50.00	128,000 --	9/10/96 9/21/98	25.20 22.38	128,000 78,900	N N	50–100 20
50038100	Rio Grande de Manati at Highway 2 near Manati, PR	197	1928, 1932, 1945, 1959–63, 1965–66, 1968–98	1998 1996	34.90 36.39	136,000 --	9/22/98	34.90	136,000	N	40–50
50038320	Rio Cibuco below Corozal, PR	15.1	1970–98	1996	22.35	20,400	11/9/95	22.35	20,400	N	50–100
50043000	Rio de La Plata at Proyecto La Plata, PR	54.8	1960–92, 1996	1992	36.39	73,600	9/10/96	34.10	66,000	N	30–40 --
50048770	Rio Piedras at El Senorial, PR	7.49	1988–98	1996 1988	15.46 16.08	5,390 4,680	9/10/96	15.46	5,390	N	10–25

Table 40. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Puerto Rico.—Continued

[mi^2, square miles; ft, feet above an arbitrary datum; ft^3/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. 51)	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)
50049100	Rio Piedras at Hato Rey, PR	15.2	1970, 1972–74, 1976–82, 1988–98	1996	22.11	10,500	9/10/96	22.11	10,500	N	10–25
50050900	Rio Grande de Loiza at Quebrada Arenas, PR	6.00	1978–98	1998	26.37	45,000	9/21/98	26.37	45,000	N	50–100
50051150	Quebrada Blanca at Jagual, PR	3.25	1985–98	1996	14.64	7,610	9/10/96	14.64	7,610	N	10–25
50051180	Quebrada Salvatierra near San Lorenzo, PR	3.74	1984–98	1996	20.86	15,000	9/10/96	20.86	15,000	N	25–50
50055000	Rio Grande de Loiza at Caguas, PR	89.8	1945, 1960–98	1945	33.20	85,000	9/10/96	32.32	83,000	N	50–100
50061800	Rio Canovanas near Campo Rico, PR	9.84	1968–98	1998	15.90	17,300	9/21/98	15.90	17,300	N	50–100
50064200	Rio Grande near El Verde, PR	7.31	1968–75, 1977–82, 1991–98	1998	19.30	22,000	9/21/98	19.30	22,000	N	50–100
50090500	Rio Maunabo at Lizas, PR	5.38	1971–85, 1991–98	1994	17.46	9,950	9/20/94	17.46	9,950	N	10–25
50092000	Rio Grande de Patillas near Patillas, PR	18.3	1966–98	1992	--	30,900	9/10/96	22.55	22,400	N	30–40
				1998	24.36	--	9/21/98	24.36	--	N	--
50100200	Rio Lapa near Rabo del Buey, PR	10.0	1971, 1989–98	1996	18.65	18,100	9/10/96	18.65	18,100	N	10–25
50106100	Rio Coamo at Coamo, PR	43.5	1987–98	1998	25.94	52,700	9/21/98	25.94	52,700	N	>50
50113800	Rio Cerrillos above Lago Cerrillos near Ponce, PR	11.9	1989–98	1998	12.42	16,200	9/21/98	12.42	16,200	N	10–25
50124200	Rio Guayanilla near Guayanilla, PR	18.9	1981–98	1998	21.88	18,700	9/22/98	21.88	18,700	N	25–50

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

Rhode Island

A strong low-pressure system that moved to the northeast along the Mid-Atlantic Coast on February 18, 1998, brought excessive rainfall, isolated flash floods, and thunderstorms to central and southern Rhode Island. Rainfall totals for this storm ranged from 2.0 to 3.5 inches during a 12-hour period (National Oceanic and Atmospheric Administration, 1998). In Middletown (fig. 52), the Maidford River rose out of its banks and flooded part of a neighborhood.

During June 12–14, 1998, a very slow-moving, complex storm system moved through southeastern New England. The combination of its slow movement and the presence of tropical moisture across the region produced rainfall of 6 to 8 inches over much of Rhode Island. The most excessive rainfall amounts of 7 to 8 inches occurred in the northeast corner of the State (National Oceanic and Atmospheric Administration, 1998). Numerous small streams flooded over their banks. The streamgage on Ten Mile River at Pawtucket Avenue at East Providence (streamgage 01109403, table 41) recorded its peak of record on June 15.

A slow-moving warm front with an abundance of tropical moisture produced several hours of torrential rain with amounts totaling 3 to 6 inches during the morning and early afternoon of June 30, 1998 (National Oceanic and Atmospheric Administration, 1998). During the evening, more thunderstorm activity produced flooding and the highest discharge since 1936 on the Woonasquatucket River at Centerdale (streamgage 01114500, table 41).

Reference

National Oceanic and Atmospheric Administration (NOAA), 1998, Climatological data (by State): Asheville, North Carolina, National Climatic Data Center, various months.

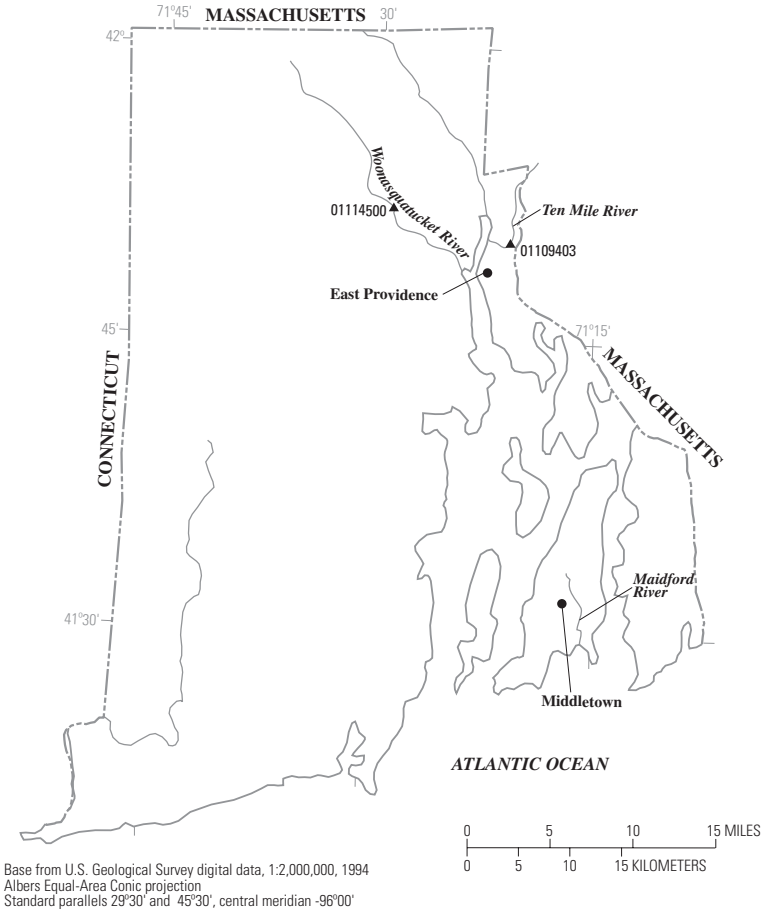


Figure 52. Location of streamgages with significant floods during 1994–98 water years for Rhode Island.

Table 41. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Rhode Island.

[mi^2, square miles; ft, feet above an arbitrary datum; ft^3/s, cubic feet per second. Source: Recurrence intervals calculated from U.S. Geological Survey data. Other data from U.S. Geological Survey reports or databases]

Streamgage number (fig. 52)	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)
01109403	Ten Mile River at Pawtucket Avenue at East Providence, RI	53.1	1987–98	1998	8.50	1,450	6/15/98	8.50	1,450	Y	25
01114500	Woonasquatucket River at Centerdale, RI	38.3	1936, 1942–98	1998 1968	7.26 7.75	1,520 1,440	6/30/98	7.26	1,520	Y	50

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

South Carolina

Excessive rains of more than 6 inches within 24 hours caused flash flooding early the morning of June 27, 1994 (National Oceanic and Atmospheric Administration, 1994a). The flash flooding affected several creeks in and near Lexington (fig. 53) and caused $5.0 million in property damage (National Oceanic and Atmospheric Administration, 1994b).

Rainfall associated with Tropical Storm Beryl totalled 4 or 5 inches in the Piedmont area and 12 inches in the mountains on August 17, 1994 (National Oceanic and Atmospheric Administration, 1994a). This rainfall caused severe flooding near Greenville and Spartanburg. Damage was more than $1.5 million to property and more than $10 million to crops. No deaths were reported (National Oceanic and Atmospheric Administration, 1994b).

Several episodes of intense rainfall during the fall of 1994 caused flash floods and coastal flooding in South Carolina. Record-breaking rains of more than 13 inches in 24 hours fell near Beaufort on October 3, 1994. A 24-hour total of 11.5 inches on northern Hilton Head Island broke the official all-time rainfall records at that location (National Oceanic and Atmospheric Administration, 1994a). Scattered areas of flash flooding were followed by coastal flooding. Excessive rainfall occurred again on October 13 in and around Charleston with 4 to 8 inches falling (National Oceanic and Atmospheric Administration, 1994a). More than $27 million in damage resulted from the flooding (National Oceanic and Atmospheric Administration, 1994b).

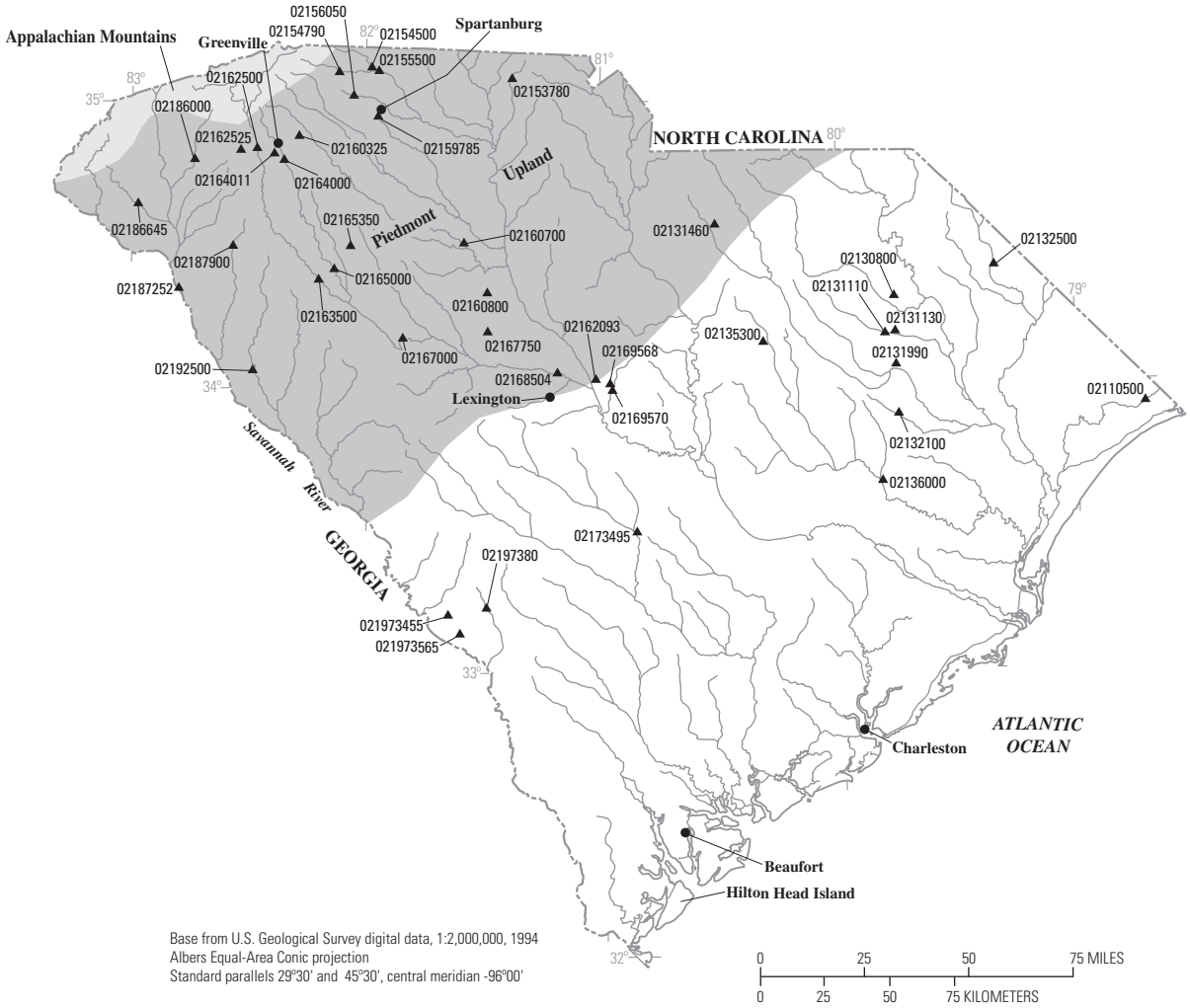
The remnants of Tropical Storm Jerry moved slowly eastward across the State during August 24–28, 1995, and produced unusually excessive rains statewide with amounts mostly varying from 8 to more than 12 inches in some locations (National Oceanic and Atmospheric Administration, 1995a). The excessive rain produced flash flooding in flood-prone areas, general flooding on many rivers, broken dams, flooded streets, homes, and low-lying farmland. Damage was more than $20 million (National Oceanic and Atmospheric Administration, 1995b). Statewide damage to roads and bridges was estimated by the South Carolina Department of Transportation to be $4.5 million. Eleven streamgages recorded their highest discharge ever during this flood (table 42).

A flash flood occurred late in the evening on August 14, 1998, following 4 to 5 inches of rainfall in a short period (National Oceanic and Atmospheric Administration, 1998a). The flash flood affected several creeks near Spartanburg. There were nearly $2.5 million in damage (National Oceanic and Atmospheric Administration, 1998b).

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.



EXPLANATION

02197345▲ Streamgage and number

Figure 53. Location of streamgages with significant floods during 1994–98 water years for South Carolina.

Table 42. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in South Carolina.

[mi^2, square miles; ft, feet above an arbitrary datum; ft^3/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. 53)	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)
02110500	Waccamaw River near Longs, SC	1,110	1951–98	1981 1996	14.87 14.95	16,200 15,800	9/15/96	14.95	15,800	N	10–25
02130800	Backswamp near Darlington, SC	6.22	1976–98	1995	12.21	800	12/24/94	12.21	800	N	50–100
02131110	Jeffries Creek above Florence, SC	46.6	1968–98	1995	10.72	3,220	12/24/94	10.72	3,220	N	50–100
02131130	Gully Branch at Cherokee Road at Florence, SC	1.92	1985–98	1996	6.37	765	9/11/96	6.37	765	N	10–25
02131460	Neds Creek near Kershaw, SC	3.98	1977–78, 1980–82, 1984–86, 1989, 1991–96	1996	6.98	238	6/10/95	6.98	238	N	--
02131990	Carter Creek at Effingham, SC	8.28	1969–84, 1987–98	1995	9.61	1,440	12/24/94	9.61	1,440	N	--
02132100	Two Mile Branch near Lake City, SC	19.0	1976–98	1995	10.19	2,400	12/24/94	10.19	2,400	N	>100
02132500	Little Pee Dee River near Dillon, SC	524	1940–98	1945	14.64	9,810	2/24/95	12.73	6,760	N	25
02135300	Scape Ore Swamp near Bishopville, SC	96.0	1969–98	1991	11.80	4,500	12/24/94	9.86	2,580	N	25–50
02136000	Black River at Kingstree, SC	1,252	1893–1998	1973	19.77	58,000	12/28/94	15.35	22,100	N	10–25
02153780	Clarks Fork Creek near Smyrna, SC	24.1	1981–98	1995	13.77	2,100	8/27/95	13.77	2,100	N	--
02154500	North Pacolet River at Fingerville, SC	116	1931–98	1940	27.13	12,500	8/28/95	21.37	8,160	N	10–25
02154790	South Pacolet River near Campobello, SC	55.4	1989–98	1995	11.33	5,170	8/27/95	11.33	5,170	N	25–50
02155500	Pacolet River near Fingerville, SC	212	1903, 1931–98	1940 1903	22.43 46.00	22,800 --	8/27/95	15.58	13,700	Y	--

Table 42. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in South Carolina.—Continued

[mi^2, square miles; ft, feet above an arbitrary datum; ft^3/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. 53)	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)
02156050	Lawsons Fork Creek at Dewey Plant near Inman, SC	6.46	1980–98	1994 1980	7.33 7.86	563 213	8/17/94	7.33	563	N	--
02159785	Tributary to Fairforest Creek at Spartanburg, SC	.52	1987–98	1994	5.19	243	6/28/94	5.19	243	N	50–100
02160325	Brushy Creek near Greenville, SC	9.05	1986–98	1995	14.10	--	8/27/95	14.10	--	N	--
02160700	Enoree River at Whitmire, SC	444	1974–98	1995	37.32	31,200	8/28/95	37.32	31,200	N	>100
02160800	Second Creek near Pomaria, SC	1.87	1977–89, 1991, 1993–98	1995	8.43	1,090	8/26/95	8.43	1,090	N	--
02162093	Smith Branch at North Main Street at Columbia, SC	5.67	1977–98	1995	11.69	2,120	6/11/95	11.69	2,120	N	10–25
02162500	Saluda River near Greenville, SC	295	1942–78, 1981–82, 1984–98	1950	19.38	11,000	8/27/95	15.59	8,550	N	10–25
02162525	Hamilton Creek (Road 135) near Easley, SC	1.60	1983, 1988–90, 1993–98	1995	8.11	835	8/27/95	8.11	835	N	--
02163500	Saluda River near Ware Shoals, SC	580	1939–98	1995	22.95	20,900	8/27/95	22.95	20,900	N	25–50
02164000	Reedy River near Greenville, SC	48.6	1942–75, 1977, 1987–98	1995	11.88	5,400	8/27/95	11.88	5,400	N	50–100
02164011	Brushy Creek at Grove Road at Greenville, SC	2.82	1985–98	1993	9.18	1,740	1/8/98	7.57	1,250	N	2–5
02165000	Reedy River near Ware Shoals, SC	236	1940–59, 1961–98	1973 1995	15.40 18.71	11,000 9,980	8/28/95	18.71	9,980	N	10–25

Table 42. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in South Carolina.—Continued

[mi^2, square miles; ft, feet above an arbitrary datum; ft^3/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. 53)	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)
02165350	Dirty Creek tributary near Laurens, SC	1.21	1978, 1980, 1984–91, 1993–98	1994 1995	7.27 8.76	252 --	8/27/95	8.76	--	N	--
02167000	Saluda River at Chappells, SC	1,360	1888, 1906–98	1930 1908	31.50 34.70	63,700 --	8/28/95	27.22	38,000	Y	--
02167750	Camping Creek tributary near Prosperity, SC	.52	1974–87, 1989–98	1995 1991	6.64 7.22	135 --	8/27/95	6.64	135	N	50
02168504	Saluda River below Lake Murray Dam near Columbia, SC	2,420	1989–98	1996	15.85	22,000	3/9/96	15.85	22,000	Y	--
02169568	Pen Branch at Columbia, SC	2.26	1986–98	1997	9.10	2,350	7/24/97	9.10	2,350	N	>100
02169570	Gills Creek at Columbia, SC	59.6	1967–98	1979 1997	8.66 9.43	2,880 2,480	7/24/97	9.43	2,480	Y	--
02173495	Sunnyside Canal at Orangeburg, SC	1.07	1986–98	1995	7.38	2,980	1/7/95	7.38	2,980	N	>100
02186000	Twelvemile Creek near Liberty, SC	106	1955–64, 1990–98	1998	13.46	6,730	1/8/98	13.46	6,730	N	25
02186645	Coneross Creek near Seneca, SC	65.4	1989–98	1994	15.26	3,590	8/17/94	15.26	3,590	N	5–10
02187252	Savannah River below Hartwell Lake near Hartwell, GA	2,090	1985–98	1997 1994	12.80 17.18	39,00 --	3/27/97	12.80	39,000	Y	--
02187900	Broadway Creek near Anderson, SC	26.4	1977–79, 1981–82, 1984–98	1995	15.81	2,720	8/27/95	15.81	2,720	N	25–50
02192500	Little River near Mount Carmel, SC	217	1940–79, 1981–82, 1984–85, 1987–98	1940	29.60	20,800	8/27/95	26.46	14,800	N	50–100
021973455	Indian Grave Branch at Savannah River site, SC	2.06	1987–96	1996 1991	3.99 5.90	52 --	6/14/96	3.99	52	Y	--
021973565	Steel Creek at Road A at Savannah River site, SC	--	1985–86, 1988–98	1998 1991	4.32 4.32	602 --	3/9/98	4.32	602	Y	--
02197380	Lower Three Runs below Par Pond at Savannah River site, SC	36.7	1980–82, 1987–98	1998	6.43	603	3/5/98	6.43	603	Y	--

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

South Dakota

Flooding occurred along the James River Basin in South Dakota (fig. 54) through the month of April 1995. Above-normal precipitation in March and April and rapid snowmelt from two significant winter storms in April kept the James River above flood stage throughout the month. Water levels were 3 to 6 feet above flood stage at the beginning of the month and 2 to 9 feet above flood stage at the end of the month. A significant amount of farmland and several roads were flooded throughout the month. Flooding along the James River continued from the end of April through all of May. An all-time record stage was recorded at Huron (streamgage 06476000, table 43) on May 19, and the river farther south reached levels not far below the all-time record. The most excessive and most widespread rain occurred on May 8–9 when 1 to 5 inches fell (National Oceanic and Atmospheric Administration, 1995a). Record streamflow occurred at 20 streamgages throughout South Dakota with many occurring in the Black Hills Region (table 43). More than $3.5 million in damage occurred (National Oceanic and Atmospheric Administration, 1995b).

Late March 1997 flooding from snowmelt of near-record to record snowpack occurred across parts of central and north-central South Dakota and most of northeastern South Dakota through the month of April. Much of the snowpack across northeastern South Dakota melted in the first week of April. The massive amount of water flooded many stretches of county and township roads as well as many State and Federal highways. The inundated sections of roads either were broken up or washed out. Hundreds of culverts were blown out or damaged, and many bridges either were damaged or washed out by ice flows and the high water. Many long-term residents said this was the worst flooding they had seen in their lifetimes. Little precipitation through mid- to late April allowed for a significant reduction in the flooding, although much of the area remained flooded into May. The total damage estimate for the March and April flooding, which included road, home, and sewer- and water-system damage, was $35 million (National Oceanic and Atmospheric Administration, 1997b). The record discharges on the James River in 1995 were nearly doubled during the flood of 1997. The record flooding on the James River in March and April continued a slow recession through the month of May. Thousands of acres of farmland and pastureland remained flooded by the James River through May. As a result, large economic losses were incurred from the inability to plant the flooded acres.

Excessive rain of 2 to 4 inches, with some amounts nearing 5 inches, fell across a large part northeastern South Dakota mainly on the evening of May 11, 1998 (National Oceanic and Atmospheric Administration, 1998a). This round of excessive rain only exacerbated the already extensive flooding occurring from many years of above-normal precipitation. Some residents of Blue Dog Lake said they had never seen the lake so high in more than 35 years of living there. Damage was almost $4 million (National Oceanic and Atmospheric Administration, 1998b).

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.

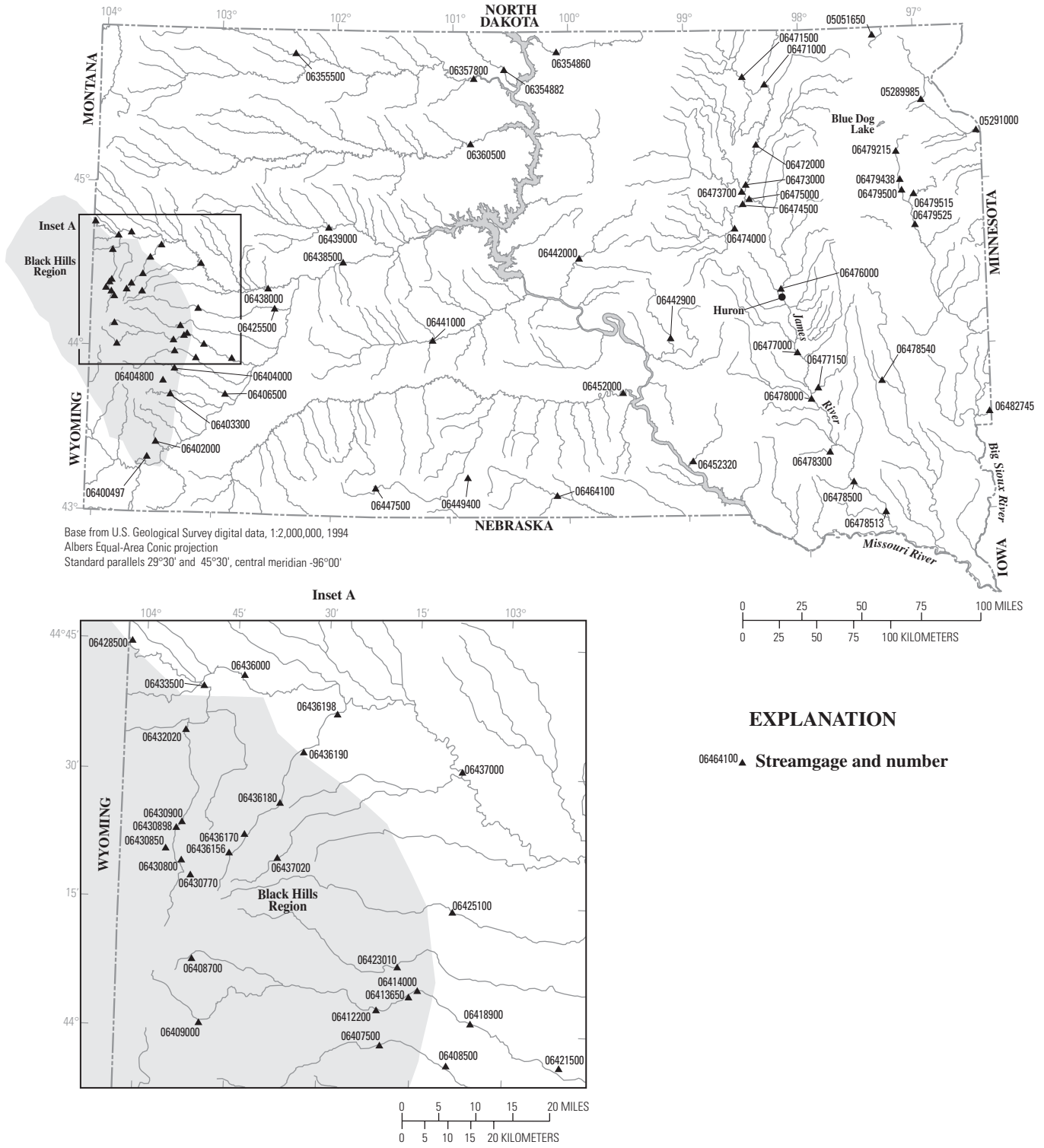


Figure 54. Location of streamgages with significant floods during 1994–98 water years for South Dakota.

Table 43. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in South Dakota.

[mi^2, square miles; ft, feet above an arbitrary datum; ft^3/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. 54)	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)
05051650	La Belle Creek near Veblen, SD	8.74	1988–98	1996	7.34	664	5/18/96	7.34	664	N	5–20
				1997	10.60	100	4/4/97	10.60	100	N	--
05289985	Big Coulee Creek near Peever, SD	12.1	1988–98	1998	7.42	614	5/12/98	7.42	614	N	5–15
				1995	9.08	300	3/11/95	9.08	300	N	--
05291000	Whetstone River near Big Stone City, SD	39	1910–12, 1919, 1931–98	1919	26.00	29,000	4/6/97	14.21	7,930	N	15–25
06354860	Spring Creek near Herreid, SD	440	1963–87, 1989–97	1987	13.38	4,540	3/31/97	12.64	2,680	N	10–20
06354882	Oak Creek near Wakpala, SD	356	1985–98	1997	19.62	7,500	3/27/97	19.62	7,500	N	20–60
06355500	North Fork Grand River near White Butte, SD	1,190	1946–98	1950	20.00	30,900	3/21/97	11.00	4,000	Y	15–20
06357800	Grand River at Little Eagle, SD	5,370	1959–98	1987	19.16	31,000	3/27/97	16.96	20,900	Y	20–35
				1972	21.01	15,000					
06360500	Moreau River near Whitehorse, SD	4,880	1953, 1955–98	1997	26.93	29,700	3/23/97	26.93	29,700	N	25–40
06400497	Cascade Springs near Hot Springs, SD	.47	1977–96	1996	10.82	247	8/9/96	10.82	247	N	>100
06402000	Fall River at Hot Springs, SD	137	1938–98	1947	11.12	8,300	7/19/97	4.36	1,170	Y	20–35
06403300	French Creek above Fairburn, SD	105	1982–98	1995	4.08	1,060	5/8/95	4.08	1,060	N	20–45
06404000	Battle Creek near Keystone, SD	66.0	1946–47, 1962–98	1972	14.50	26,200	5/8/95	7.17	1,690	N	5–10
06404800	Grace Coolidge Creek near Hayward, SD	7.48	1989–98	1995	7.57	337	5/8/95	7.57	337	N	10–20
06406500	Battle Creek below Hermosa, SD	285	1989–98	1995	9.30	1,360	5/9/95	9.30	1,360	N	2–10

Table 43. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in South Dakota.—Continued

[mi^2, square miles; ft, feet above an arbitrary datum; ft^3/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. 54)	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)
06407500	Spring Creek near Keystone, SD	163	1987–98	1995	7.96	913	5/9/95	7.96	913	N	10–20
06408500	Spring Creek near Hermosa, SD	199	1950–98	1972	--	13,400	5/30/96	12.24	6,910	N	35–60
				1996	12.24	6,910					
06408700	Rhoads Fork near Rochford, SD	7.95	1982–98	1997	4.00	10	7/24/97	4.00	10	N	2–10
06409000	Castle Creek near Hill City, SD	79.2	1949–98	1952	5.81	1,120	4/9/96	3.69	271	N	15–20
				1984	6.31	122					
06412200	Rapid Creek above Victoria Creek near Rapid City, SD	355	1989–98	1997	8.38	1,180	6/2/97	8.38	1,180	Y	10–30
06413650	Lime Creek at mouth at Rapid City, SD	10.0	1981–83, 1988–98	1997	4.97	365	6/2/97	4.97	365	N	10–20
06414000	Rapid Creek at Rapid City, SD	410	1905–06, 1943–98	1972	19.66	50,000	6/2/97	11.18	3,190	Y	10–20
06418900	Rapid Creek below sewage treatment plant near Rapid City, SD	452	1982–98	1997	10.05	2,260	6/3/97	10.05	2,260	Y	25–50
06421500	Rapid Creek near Farmingdale, SD	602	1947–58, 1960–98	1972	11.85	7,320	5/27/96	10.77	3,830	Y	30–45
06423010	Boxelder Creek near Rapid City, SD	128	1981–98	1995	33.09	1,080	5/10/95	33.09	1,080	N	10–20
				1996	33.46	1,060	5/31/96	33.46	1,060	N	10–20
06425100	Elk Creek near Rapid City, SD	190	1979–93, 1995–98	1996	12.77	3,120	5/27/96	12.77	3,120	N	5–15
06425500	Elk Creek near Elm Springs, SD	540	1950–98	1952	--	8,540	5/28/96	14.85	7,660	N	10–15
				1997	16.22	3,000					
06428500	Belle Fourche River at Wyoming-South Dakota State line	3,280	1947–98	1995	16.33	6,320	5/10/95	16.33	6,320	Y	40–80
							3/14/96	15.58	5,050	Y	20–35

Table 43. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in South Dakota.—Continued

[mi^2, square miles; ft, feet above an arbitrary datum; ft^3/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. 54)	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)
06430770	Spearfish Creek near Lead, SD	63.5	1989–98	1998	8.39	181	8/20/98	8.39	181	Y	10–20
06430800	Annie Creek near Lead, SD	3.55	1989–98	1995	6.12	270	5/8/95	6.12	270	N	25–55
06430850	Little Spearfish Creek near Lead, SD	25.8	1989–98	1995	--	61	5/10/95	--	61	N	10–25
06430898	Squaw Creek near Spearfish, SD	6.95	1989–98	1995	9.47	860	5/8/95	9.47	860	N	25–100
06430900	Spearfish Creek above Spearfish, SD	139	1989–98	1995	7.42	2,890	5/8/95	7.42	2,890	Y	40–120
06432020	Spearfish Creek below Spearfish, SD	204	1989–98	1995	7.37	1,590	5/9/95	7.37	1,590	Y	25–70
06433500	Hay Creek at Belle Fourche, SD	121	1954–96	1995	10.23	1,280	5/9/95	10.23	1,280	N	40–80
06436000	Belle Fourche River near Fruitdale, SD	4,540	1946–98	1982	14.32	12,700	5/10/95	14.09	12,200	Y	15–35
06436156	Whitetail Creek at Lead, SD	6.15	1989–98	1995	6.67	507	5/8/95	6.67	507	N	20–45
06436170	Whitewood Creek at Deadwood, SD	40.6	1982–95	1995	10.63	3,540	5/8/95	10.63	3,540	N	10–20
06436180	Whitewood Creek above Whitewood, SD	56.3	1983–98	1995	9.06	3,800	5/8/95	9.06	3,800	N	30–60
06436190	Whitewood Creek near Whitewood, SD	77.4	1982–98	1995	6.01	3,930	5/8/95	6.01	3,930	N	15–25
06436198	Whitewood Creek above Vale, SD	102	1983–98	1995	5.72	4,250	5/8/95	5.72	4,250	N	10–20
06437000	Belle Fourche River near Sturgis, SD	5,870	1946–98	1982	19.10	36,400	5/10/95	17.10	20,000	Y	15–25
06437020	Bear Butte Creek near Deadwood, SD	16.6	1989–98	1995	8.34	1,590	5/8/95	8.34	1,590	N	15–30

Table 43. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in South Dakota.—Continued

[mi^2, square miles; ft, feet above an arbitrary datum; ft^3/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. 54)	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)
06438000	Belle Fourche River near Elm Springs, SD	7,210	1927, 1929–98	1964 1927	15.90 21.80	45,100 --	5/27/96	17.28	39,900	Y	15–20
06438500	Cheyenne River near Plainview, SD	21,600	1920, 1927, 1951–81, 1995–98	1996	22.10	69,700	5/28/96	22.10	69,700	Y	30–60
06439000	Cherry Creek near Plainview, SD	1,190	1946–98	1952	22.63	17,500	5/29/96	19.43	9,430	N	15–25
06441000	Bad River near Midland, SD	1,460	1946–98	1967	24.44	29,400	5/29/96	22.99	16,300	N	25–30
06442000	Medicine Knoll Creek near Blunt, SD	317	1917, 1950–97	1991 1917	12.98 15.00	5,000 --	3/28/97	13.15	4,000	N	20–30
06442900	Elm Creek near Gann Valley, SD	381	1988–92, 1994–98	1997	15.58	3,440	3/28/97	15.58	3,440	N	15–40
06447500	Little White River near Martin, SD	310	1932, 1938–40, 1962–98	1997	13.48	1,300	6/4/97	13.48	1,300	N	25–40
06449400	Rosebud Creek at Rosebud, SD	50.8	1975–97	1995	10.53	670	6/23/95	10.53	670	N	15–20
06452000	White River near Oacoma, SD	10,200	1929–98	1952 1994	-- 24.70	51,900 25,000	6/5/97	18.58	33,700	N	15–20
06452320	Platte Creek near Platte, SD	741	1989–98	1995	11.29	2,600	5/11/95	11.29	2,600	N	2–10
06464100	Keya Paha River near Keyapaha, SD	466	1982–98	1997	9.48	1,020	2/20/97	9.48	1,020	N	5–15
06471000	James River at Columbia, SD	5,857	1946–98	1950 1997	16.89 18.63	5,420 4,130	4/30/97	18.63	4,130	Y	25–50
06471500	Elm River at Westport, SD	1,493	1947–98	1969	22.11	12,600	3/30/97	21.56	9,380	N	15–25

Table 43. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in South Dakota.—Continued

[mi^2, square miles; ft, feet above an arbitrary datum; ft^3/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. 54)	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)
06472000	James River near Stratford, SD	8,865	1950–72, 1977, 1995, 1997	1997 1995	19.48 19.86	8,400 --	4/6/97	19.48	8,400	N	>100
06473000	James River at Ashton, SD	9,742	1946–98	1997	25.03	9,150	4/23/97	25.03	9,150	N	70–125
06473700	Snake Creek near Ashton, SD	2,657	1956–72, 1977–79, 1985–89, 1997	1997	20.74	15,000	4/1/97	20.74	15,000	N	60–150
06474000	Turtle Creek near Tulare, SD	1,124	1954–56, 1966–81, 1985–98	1997	18.80	13,500	3/28/97	18.80	13,500	N	30–60
06474500	Turtle Creek at Redfield, SD	1,481	1946–72, 1997	1997	18.32	13,500	3/29/97	18.32	13,500	N	35–70
06475000	James River near Redfield, SD	13,911	1950–98	1997	29.92	17,000	5/15/95 4/3/97	26.26 29.92	9,800 17,000	N N	45–70 >150
06476000	James River at Huron, SD	15,869	1881, 1922, 1929–32, 1944–98	1997	21.28	23,400	5/19/95 4/6/97	16.86 21.28	10,000 23,400	N N	25–40 >250
06477000	James River near Forestburg, SD	17,590	1920, 1922, 1950–98	1997	20.61	25,600	5/18/95 4/6/97	17.08 20.61	13,000 25,600	N N	25–40 >125
06477150	Rock Creek near Fulton, SD	240	1967–79, 1989–98	1997 1993	13.74 14.34	3,120 1,880	3/29/97	13.74	3,120	N	10–20
06478000	James River near Mitchell, SD	19,064	1954–58, 1966–72, 1995, 1997	1997	23.14	28,000	4/7/97	23.14	28,000	N	>100

Table 43. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in South Dakota.—Continued

[mi^2, square miles; ft, feet above an arbitrary datum; ft^3/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. 54)	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)
06478300	Dry Creek near Parkston, SD	97.2	1956–80, 1989–97	1960	12.70	4,210	5/27/95	9.89	2,900	N	15–25
06478500	James River near Scotland, SD	20,653	1929–98	1984	20.45	29,400	5/29/95	19.39	18,100	N	25–35
							4/9/97	19.87	28,000	N	60–100
06478513	James River near Yankton, SD	20,942	1982–98	1997	22.94	28,800	4/9/97	22.94	28,800	N	60–100
				1984	24.34	26,400					
06478540	Little Vermillion River near Salem, SD	78.6	1967–98	1993	11.95	3,300	3/28/97	10.01	1,560	N	20–40
06479215	Big Sioux River near Florence, SD	638	1984–98	1997	9.32	2,000	4/4/97	9.32	2,000	N	15–30
06479438	Big Sioux River near Watertown, SD	1,007	1973–98	1997	12.09	7,820	4/5/97	12.09	7,820	N	45–100
06479500	Big Sioux River at Watertown, SD	1,129	1946–72, 1997	1997	12.49	5,800	4/6/97	12.49	5,800	N	>250
06479515	Willow Creek near Watertown, SD	110	1972–86, 1997	1997	10.93	3,650	4/5/97	10.93	3,650	N	20–60
06479525	Big Sioux River near Castlewood, SD	1,997	1977–98	1997	12.87	4,300	4/11/97	12.87	4,300	N	>150
06482745	Beaver Creek at Valley Springs, SD	104	1986–96	1994	24.89	2,280	6/13/94	24.89	2,280	N	5–15

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

Tennessee

Torrential rainfall of more than 7 inches in some areas occurred across the eastern one-third of Tennessee on March 27, 1994 (National Oceanic and Atmospheric Administration, 1994a) resulting in widespread flash flooding across that part of the State. Record discharges were measured at five streamgages (table 44). Three people were killed due to flash flooding. A 19-year-old man was killed near Sevierville (fig. 55) when he tried to cross a swollen creek. A woman was killed in Seymour when the car she was in washed off the road. In all, nearly 200 people were evacuated, more than 1,000 homes were affected by the floods, numerous roads and bridges were damaged or destroyed, and several mudslides and rockslides occurred. Damage totaled $155 million (National Oceanic and Atmospheric Administration, 1994b).

The Mississippi River went above flood stage on April 12, 1994, at Caruthersville, Missouri, producing flooding in northwest Tennessee. Several roads were closed for a few days due to the flooding. Overnight thunderstorms produced localized flash flooding in western Tennessee on April 28, 1994 (National Oceanic and Atmospheric Administration, 1994a).

Excessive rains across the Midwest forced the Mississippi River and some of its tributaries above flood stage in western Tennessee during the end of May 1995. About 35 miles of roads were underwater, and more than 145,000 acres of crops were flooded (National Oceanic and Atmospheric Administration, 1995b).

Excessive rain fell on ground already saturated from previous rains on August 11, 1996. Seventy-seven homes, 20 businesses, 4 public buildings, and 3 churches were extensively damaged in Chattanooga. Approximately $2 million in damage resulted (National Oceanic and Atmospheric Administration, 1996b).

Excessive rainfall during the first few days of March 1997 along with rivers that were already high caused prolonged flooding along the Mississippi and Tennessee Rivers and their tributaries. The Mississippi River reached levels that had not been seen since 1937. Numerous roads were closed for days. Near Jackson, two persons were killed when their car was swept off a flooded road. One person was killed near Memphis while attempting to cross a flooded bridge. One man also was killed near Union City when he fell out of a boat helping people out of their homes. Total damage was more than $22 million (National Oceanic and Atmospheric Administration, 1997b).

An estimated 8 inches of rain fell at Lawrenceburg on July 13–14, 1998, with 4 inches of rain falling in about 1 hour on July 13 (National Oceanic and Atmospheric Administration, 1998a). Two people were killed, and 20 were injured from the resulting flood. Damage was more than $4 million with 122 homes damaged or destroyed; 13 mobile homes and several small bridges were swept away. The water and sewage plant for Lawrenceburg was left inoperable (National Oceanic and Atmospheric Administration, 1998b).

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.

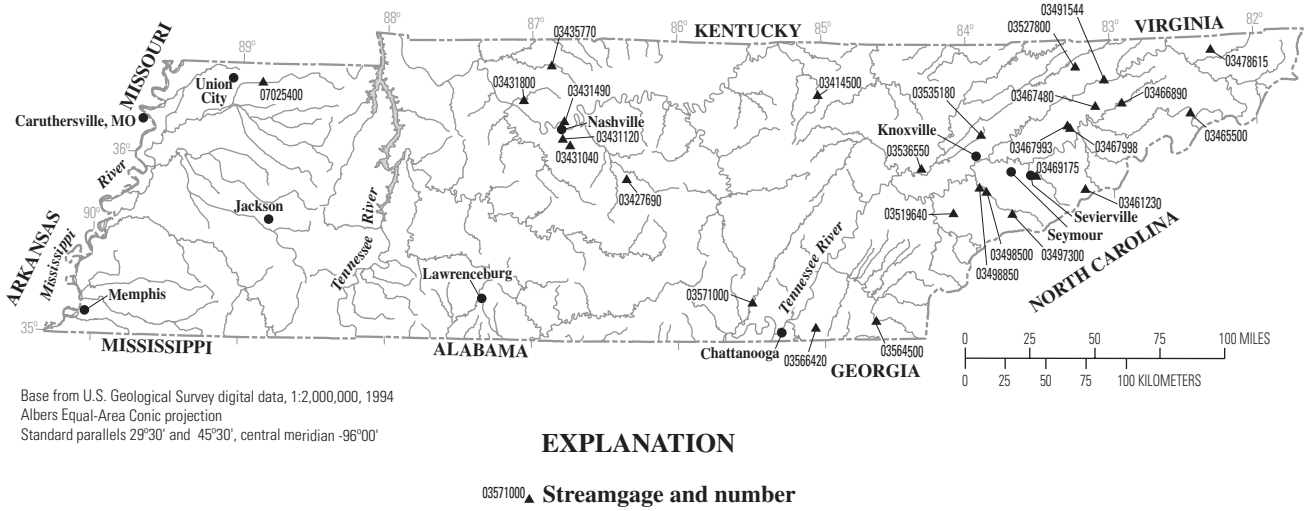


Figure 55. Location of streamgages with significant floods during 1994–98 water years for Tennessee.

Table 44. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Tennessee.

[mi^2, square miles; ft, feet above an arbitrary datum; ft^3/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. 55)	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)
03414500	East Fork Obey River near Jamestown, TN	202	1929, 1943–98	1973 1929	30.46 30.70	44,800 --	11/30/96	29.11	39,800	N	25
03427690	Bushman Creek at Pitts Lane Ford near Compton, TN	9.67	1989–98	1996	7.24	2,020	7/21/96	7.24	2,020	N	25
03431040	Sevenmile Creek at Blackman Road near Nashville, TN	12.2	1965–98	1998	10.57	10,500	6/4/98	10.57	10,500	N	>100
03431120	West Fork Browns Creek at Gen Bates Drive at Nashville, TN	3.30	1965–98	1975	7.00	2,110	11/27/94	6.67	1,840	N	10
03431490	Pages Branch at Avondale, TN	2.01	1977–98	1995 1998	6.03 6.32	2,800 1,430	11/27/94	6.03	2,800	N	25
03431800	Sycamore Creek near Ashland City, TN	97.2	1962–87, 1989–98	1989	13.50	18,500	3/3/97	13.45	18,200	N	15–20
03435770	Sulphur Fork Red River above Springfield, TN	65.6	1976–97	1997	14.52	12,100	3/3/97	14.52	12,100	N	10–15
03461230	Caney Creek near Cosby, TN	1.62	1967–98	1996	6.45	275	1/26/96	6.45	275	N	30–35
03465500	Nolichucky River at Embreeville, TN	805	1901, 1921–98	1901	24.00	120,000	1/15/95	15.53	64,000	N	25
03466890	Lick Creek near Albany, TN	172	1985–98	1994	17.41	10,800	3/27/94	17.41	10,800	N	100
03467480	Bent Creek at Taylor Gap, TN	2.18	1986–98	1994	15.56	2,550	3/27/94	15.56	2,550	N	10
03467993	Cedar Creek near Valley Home, TN	2.01	1986–98	1997	13.38	210	4/29/97	13.38	210	N	20–25
03467998	Sinking Fork at White Pine, TN	6.38	1986–98	1998	7.25	1,600	4/17/98	7.25	1,600	N	15–20
03469175	Little Pigeon River above Sevierville, TN	184	1989–98	1994	17.50	19,700	3/28/94	17.50	19,700	N	25–50
03478615	Evans Creek near Blountville, TN	2.50	1984–98	1996	12.68	98	5/25/96	12.68	98	N	5–10

Table 44. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Tennessee.—Continued

[mi^2, square miles; ft, feet above an arbitrary datum; ft^3/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. 55)	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)
03491544	Crockett Creek below Rogersville, TN	4.67	1989–98	1998	5.39	996	4/17/98	5.39	996	N	10–25
03497300	Little River above Townsend, TN	106	1964–98	1994	15.75	27,100	3/27/94	15.75	27,100	N	>100
03498500	Little River near Maryville, TN	269	1875, 1896, 1920, 1951–98	1875 1896	31.00 31.00	50,000 36,000	3/28/94	27.95	42,100	N	100
03498850	Little River near Alcoa, TN	300	1986–98	1994	25.63	28,000	3/28/94 4/19/98	25.63 19.58	28,000 13,000	N N	25–50 --
03519640	Baker Creek near Greenback, TN	16.0	1966–98	1998	10.61	4,100	4/17/98	10.61	4,100	N	50
03527800	Big War Creek at Luther, TN	22.3	1986–98	1998	10.61	4,100	4/17/98	10.61	4,100	N	25–50
03535180	Willow Fork near Halls Crossroads, TN	3.23	1967–98	1998	8.40	990	4/17/98	8.40	990	N	25–30
03536550	Whiteoak Creek below Melton Valley Drive near Oak Ridge, TN	3.28	1985–96	1996	6.55	728	5/26/96	6.55	728	N	10–25
03564500	Ocoee River at Parksville, TN	595	1907, 1912–16, 1922–94	1990 1907	24.76 --	61,800 65,000	3/27/94	22.36	42,000	Y	75–100
03566420	Wolftever Creek near Ooltewah, TN	18.8	1965–98	1973	9.75	7,300	3/28/94	9.08	5,110	N	40–45
03571000	Sequatchie River near Whitwell, TN	402	1867, 1921–94	1991 1867	18.02 19.00	35,400 --	2/11/94	16.68	25,100	N	20–25
07025400	North Fork Obion River near Martin, TN	372	1939–67, 1997–98	1958	23.05	30,300	3/2/97	22.98	27,000	N	25–50

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

Texas

Excessive rains began falling late October 17, 1994, in southeastern Texas from Austin to Livingston (fig. 56). Rainfall amounts overnight ranged from 10 to 18 inches in 16 counties (National Oceanic and Atmospheric Administration, 1994a), and most of these areas experienced flash flooding during the night. During the night, five lives were lost in the flash floods in three separate instances. During the day, September 18, an additional seven people drowned in the flood, bringing the 2-day total to 12 people. On October 19, the storms moved farther south and began affecting the counties along the coast of the Gulf of Mexico. Over the next 2 days, an additional five people died as a result of the floods. Total rainfall for the entire storm generally ranged from 10 to 20 inches, with Liberty recording 30.50 inches of rain during the storm (National Oceanic and Atmospheric Administration, 1994a). Before the flash-flood-producing rains had ended, flooding of rivers, creeks, and bayous had begun and would continue, in some areas, to the end of October.

The Trinity River experienced extensive flooding from just upstream from Lake Livingston to the mouth of the Trinity River at Trinity Bay. A record-high elevation on Lake Livingston was recorded on October 17, which resulted in a record release from the dam of more than 110,000 cubic feet per second. This record release, in combination with an additional inflow of 45,000 cubic feet per second downstream from the dam, led to a record flood along the Trinity River downstream from Lake Livingston. The Trinity River at Liberty (streamgage 08067000, table 45) set a new record crest on October 18, and when a levee system failed, much of the city of Liberty was flooded.

The San Jacinto River and 24 other streamgages in southeast Texas were also at record heights during the flood (table 45). Lake Conroe reached a record elevation on the afternoon of October 17, which resulted in record releases from the lake and also resulted in record flood stages along the San Jacinto River all the way to Lake Houston. The excessive inflow resulted in a record elevation at Lake Houston of 52.76 feet, which is 3 feet higher than the previous record. The uncontrolled spillway at Lake Houston released an estimated 354,000 cubic feet per second into the lower San Jacinto River that flows into the Houston Ship Channel. The tremendous flows caused four fuel pipelines to rupture resulting in a fuel spill in the river and subsequent fires. The floods on the Brazos River lasted until October 27, 1994.

In summary, 17 people lost their lives during the flood, more than 13,000 people had to be evacuated, and more than 22,000 homes received flood damage. Total damage to homes and businesses was approximately $800 million, while another $100 million in damage occurred to roads and bridges throughout southeast Texas (National Oceanic and Atmospheric Administration, 1994b). During the height of the flood, several major highways leading into and out of Houston were impassable due to high water.

On May 5, 1995, more than 3 inches of rain in 30 minutes and as much as 5 inches in 1 hour caused massive flash flooding across the city of Dallas (National Oceanic and Atmospheric Administration, 1995a). Seventeen people drowned, most were in cars trying to cross flooded intersections, low-lying areas, or flooded creeks. The flooding destroyed four single-family homes and damaged 93, destroyed 166 multi-family housing units, and damaged 54 businesses. Excessive rainfall continued into June 1995, especially along the Red River Valley. The peak of 48 years of record occurred on the Red River near Burkburnett (streamgage 07308500, table 45) on June 6, 1995.

Tropical Storm Josephine caused coastal flooding along the upper Texas coast on October 28, 1996. Tides ranged from 2 to 5 feet above predicted levels and caused substantial beach erosion and damaged beach houses and low-lying coastal roads. Seven homes were destroyed, and 75 to 80 homes were damaged. Rainfall of as much as 13 inches in the headwaters of the Nueces River on October 27–28 (National Oceanic and Atmospheric Administration, 1996a) caused the river to rise rapidly. The Nueces River crested at 24.88 feet (13.88 feet above flood stage) just south of Uvalde (streamgage 08192000, table 45). This was the highest reading since 1962. Flooding also occurred along the Frio River due to the excessive rainfall. Total damage was more than $18 million (National Oceanic and Atmospheric Administration, 1996b).

An upper level, low-pressure system was stationary over south-central Texas during June 21–23, 1997. Spiral rain bands around the low repeatedly moved over the same areas, bringing continuous flooding rains. Several river flood warnings were issued along the Llano and Colorado Rivers. The Llano River at Llano (streamgage 08151500, table 45) crested at 38.86 feet. This crest was the highest since 1935. Damage was more than $47 million, and there were three deaths (National Oceanic and Atmospheric Administration, 1997b).

During August 21–26, 1998, Tropical Storm Charley spread excessive rainfall over much of south-central Texas. Thunderstorms produced rainfall rates approaching 5 inches per hour (National Oceanic and Atmospheric Administration, 1998a). Flooding occurred on the Frio, Nueces, and Rio Grande Rivers. Del Rio received nearly all of its average annual precipitation (18 inches) during a 2-day period (National Oceanic and Atmospheric Administration, 1998a). Flooding occurred downstream from Del Rio on the Rio Grande. More than $43 million in damage and 13 deaths resulted from Tropical Storm Charley (National Oceanic and Atmospheric Administration, 1998b).

Tropical Storm Frances came onshore near the same location as Tropical Storm Charley on September 10, 1998. However, Frances tracked to the north over Dallas, dropping from 4 to 12 inches of rainfall in central Texas (National Oceanic and Atmospheric Administration, 1998a). Some significant floods occurred near Houston, and damage primarily was due to high winds and coastal flooding with some inland flooding.

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.

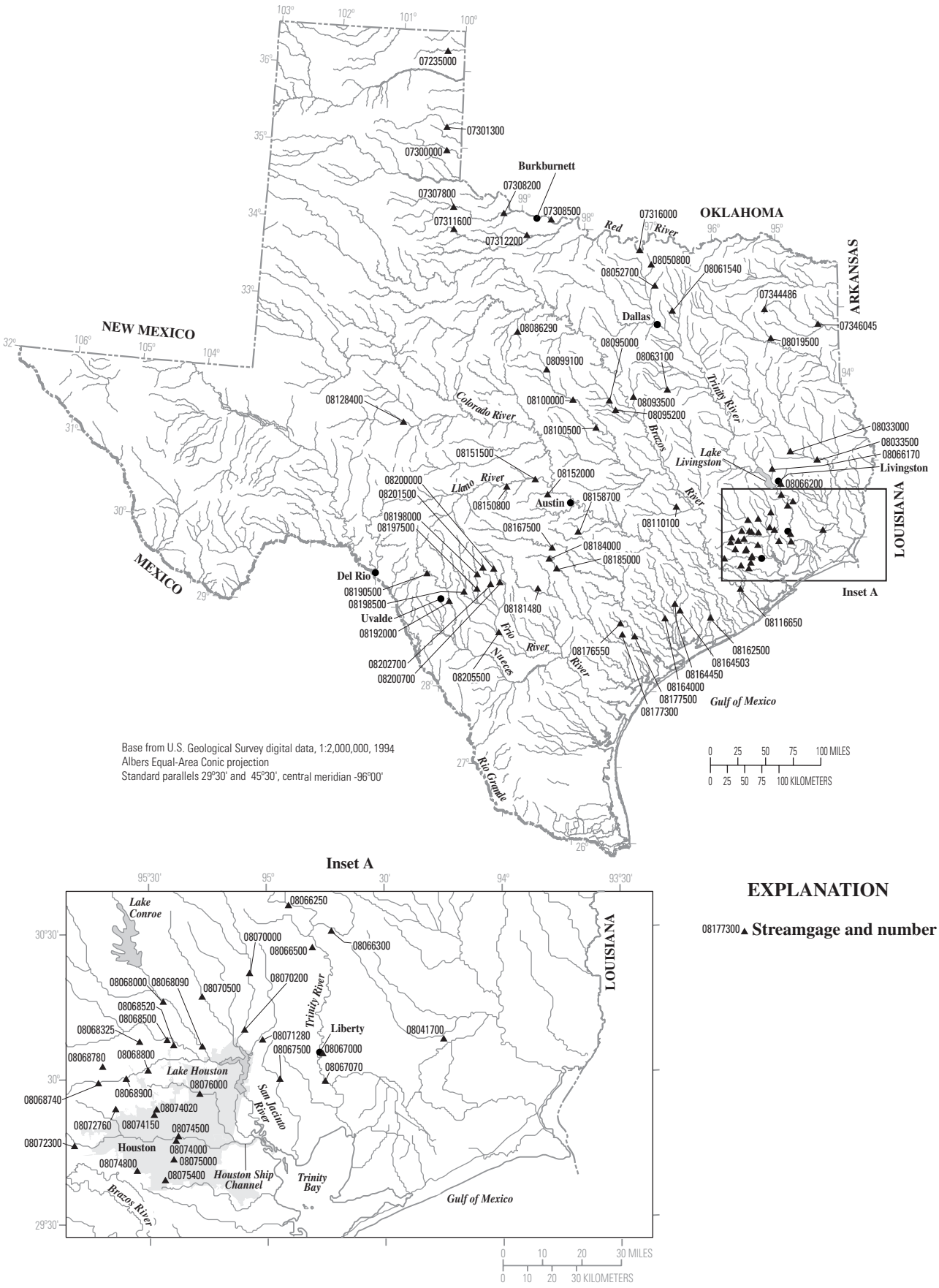


Figure 56. Location of streamgages with significant floods during 1994–98 water years for Texas.

Table 45. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Texas.

[mi^2, square miles; ft, feet above an arbitrary datum; ft^3/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. 56)	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	Recurrence interval (years)
07235000	Wolf Creek at Lipscomb, TX	697	1938–42, 1962–98	1942 1996	11.57 12.44	20,000 10,300	9/19/96	12.44	10,300	Y	10
07300000	Salt Fork Red River near Wellington, TX	1,222	1953–98	1957	19.00	146,000	4/3/97	17.10	81,100	Y	15
07301300	North Fork Red River near Shamrock, TX	1,082	1964–97	1995	8.49	25,600	6/3/95	8.49	25,600	N	>100
07307800	Pease River near Childress, TX	2,754	1960–62, 1968–98	1995	17.12	28,500	6/5/95	17.12	28,500	N	>100
07308200	Pease River near Vernon, TX	3,488	1960–89, 1991, 1993–98	1984	20.15	40,500	8/2/95	19.23	32,800	N	20
07308500	Red River near Burkburnett, TX	20,570	1960–98	1995 1984	16.61 16.90	174,000 166,000	6/6/95	16.61	174,000	N	>100
07311600	North Wichita River near Paducah, TX	540	1962–82, 1995–98	1995	19.76	18,100	6/5/95	19.76	18,100	N	>100
07312200	Beaver Creek near Electra, TX	652	1961–98	1995 1987	34.87 34.94	11,700 11,600	8/3/95	34.87	11,700	Y	75
07316000	Red River near Gainesville, TX	30,782	1936–98	1987	40.08	265,000	6/13/95	36.63	169,000	Y	--
07344486	Brushy Creek at Scroggins, TX	23.4	1979–98	1995	14.96	10,700	11/5/94	14.96	10,700	N	>100
07346045	Black Cypress Bayou at Jefferson, TX	365	1969–98	1988	19.34	11,600	4/29/97	18.88	10,100	N	20
08019500	Big Sandy Creek near Big Sandy, TX	231	1939–98	1945	24.10	24,000	11/7/94	17.89	6,040	Y	5
08033000	Neches River near Diboll, TX	2,724	1884, 1900, 1924–25, 1940–98	1884	21.00	110,000	10/17/94	18.16	44,900	Y	15
08033500	Neches River near Rockland, TX	3,636	1884, 1904–11, 1914–98	1884	34.90	62,000	10/20/94	33.29	42,300	Y	15

Table 45. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Texas.—Continued

[mi^2, square miles; ft, feet above an arbitrary datum; ft^3/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. 56)	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)
08041700	Pine Island Bayou near Sour Lake, TX	336	1968–98	1995	37.50	48,800	10/20/94	37.50	48,800	N	>100
08050800	Timber Creek near Collinsville, TX	38.8	1986–98	1994	14.94	13,300	7/10/94	14.94	13,300	N	20
08052700	Little Elm Creek near Aubrey, TX	75.5	1957–76, 1980–98	1994	18.27	36,200	7/11/94	18.27	36,200	Y	>100
08061540	Rowlett Creek near Sachse, TX	120	1969–98	1998	28.07	32,200	1/5/98	28.07	32,200	N	20
08063100	Richland Creek near Dawson, TX	333	1961–93, 1995–98	1962 1998	21.64 22.61	15,800 3,790	1/6/98	22.61	3,790	Y	--
08066170	Kickapoo Creek near Onalaska, TX	57.0	1966–98	1995	41.85	84,600	10/17/94	41.85	84,600	N	>100
08066200	Long King Creek at Livingston, TX	141	1963–98	1995	30.49	50,900	10/17/94	30.49	50,900	N	>100
08066250	Trinity River near Goodrich, TX	16,844	1966–98	1995	48.97	125,000	10/18/94	48.97	125,000	Y	--
08066300	Menard Creek near Rye, TX	152	1966–98	1995	31.12	13,700	10/17/94	31.12	13,700	N	40
08066500	Trinity River at Romayor, TX	17,186	1924–98	1995	42.70	122,000	10/19/94	42.70	122,000	Y	75
08067000	Trinity River at Liberty, TX	17,468	1940–70, 1973–98	1995	31.00	135,000	10/18/94	31.00	135,000	Y	75
08067070	Coastal Water Authority Canal near Dayton, TX	--	1982–98	1998	3.07	1,220	6/2/98	3.07	1,220	Y	--
08067500	Cedar Bayou near Crosby, TX	64.9	1972–98	1995	28.33	7,800	10/18/94	28.33	7,800	N	>100
08068000	West Fork San Jacinto River near Conroe, TX	828	1913, 1924–27, 1940–98	1995	32.30	115,000	10/18/94	32.30	115,000	Y	50
08068090	West Fork San Jacinto River above Lake Houston near Porter, TX	962	1985–98	1995	40.10	130,000	10/18/94	40.10	130,000	Y	--

Table 45. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Texas.—Continued

[mi^2, square miles; ft, feet above an arbitrary datum; ft^3/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. 56)	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)
08068325	Willow Creek near Tomball, TX	41.0	1984, 1986–87, 1989–98	1998 1995	29.36 31.81	1,920 --	1/7/98	29.36	1,920	N	--
08068500	Spring Creek near Spring, TX	409	1929, 1939–98	1995	44.05	78,800	10/18/94	44.05	78,800	N	>100
08068520	Spring Creek at Spring, TX	419	1929, 1939–95	1995	44.05	78,800	10/18/94	44.05	78,800	N	>100
08068740	Cypress Creek at House-Hahl Road near Cypress, TX	131	1975–98	1995	47.61	5,200	10/19/94	47.61	5,200	N	>100
08068780	Little Cypress Creek near Cypress, TX	41.0	1983–98	1995	81.41	4,520	10/18/94	81.41	4,520	N	25
08068800	Cypress Creek at Grant Road near Cypress, TX	214	1983–98	1995	47.38	10,500	10/18/94	47.38	10,500	N	>100
08068900	Cypress Creek at Stuebner-Airline Road near Westfield, TX	248	1984–85, 1988–98	1995	39.61	11,300	10/19/94	39.61	11,300	N	--
08070000	East Fork San Jacinto River near Cleveland, TX	325	1935, 1940–98	1995	24.57	63,000	10/18/94	24.57	63,000	N	100
08070200	East Fork San Jacinto River near New Caney, TX	388	1985–98	1995	33.00	74,100	10/19/94	33.00	74,100	N	>100
08070500	Caney Creek near Splendora, TX	105	1944–98	1995	26.40	36,000	10/17/94	26.40	36,000	N	>100
08071280	Luce Bayou above Lake Houston near Huffman, TX	218	1985–98	1995	35.08	25,900	10/18/94	35.08	25,900	N	25
08072300	Buffalo Bayou near Katy, TX	63.3	1978–98	1994	38.85	3,780	2/21/94	38.85	3,780	N	50
08072760	Langham Creek at West Little York Road near Addicks, TX	24.6	1981–98	1997 1981	22.62 22.80	1,820 1,000	5/24/97	22.62	1,820	N	10
08074000	Buffalo Bayou at Houston, TX	358	1929, 1936–98	1936	49.00	40,000	9/11/98	36.33	13,400	Y	--
08074020	Whiteoak Bayou at Alabonson Road at Houston, TX	--	1984, 1986–98	1998 1992	48.54 49.58	13,300 8,610	9/11/98	48.54	13,300	N	50

Table 45. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Texas.—Continued

[mi^2, square miles; ft, feet above an arbitrary datum; ft^3/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. 56)	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)
08074150	Cole Creek at Deihl Road, Houston, TX	7.50	1964–86, 1990–98	1998	80.86	2,860	9/11/98	80.86	2,860	N	--
08074500	Whiteoak Bayou at Houston, TX	86.3	1929, 1936–98	1992 1936	50.43 51.50	25,100 14,750	9/11/98	47.06	21,200	N	--
08074800	Keegans Bayou at Roark Road near Houston, TX	12.7	1965–98	1992	75.91	4,880	10/18/94	75.87	4,850	N	--
08075000	Brays Bayou at Houston, TX	94.9	1929, 1936–98	1976	52.13	29,000	10/18/94	51.02	27,000	N	--
08075400	Sims Bayou at Hiram Clarke Street, Houston, TX	20.2	1965–98	1995 1976	54.65 57.12	7,510 4,500	10/18/94	54.65	7,510	N	--
08076000	Greens Bayou near Houston, TX	68.7	1953–98	1989	66.04	16,500	5/24/97	62.77	13,100	N	--
08086290	Big Sandy Creek above Breckenridge, TX	280	1962–98	1982	28.60	80,000	9/15/96	26.53	15,000	N	50
08093500	Aquilla Creek near Aquilla, TX	308	1936, 1939–98	1936	33.00	74,200	12/21/97	28.38	14,200	Y	5
08095000	North Bosque River near Clifton, TX	968	1924–98	1992	38.30	200,000	3/16/98	34.88	137,000	Y	>100
08095200	North Bosque River at Valley Mills, TX	1,146	1960–98	1992	44.60	220,000	3/16/98	39.40	92,000	Y	10
08099100	Leon River near De Leon, TX	479	1961–98	1990	19.00	24,500	6/24/97	16.37	10,500	Y	--
08100000	Leon River near Hamilton, TX	1,891	1925–31, 1962–98	1992	35.02	32,100	2/20/97	33.42	27,200	Y	--
08100500	Leon River at Gatesville, TX	2,342	1908, 1951–98	1992 1908	35.00 35.00	68,000 70,000	2/24/97	31.04	31,000	Y	10
08110100	Davidson Creek near Lyons, TX	195	1963–98	1995	19.33	26,400	10/17/94	19.33	26,400	N	100
08116650	Brazos River near Rosharon, TX	45,339	1967–80, 1984–98	1995 1992	51.82 51.89	84,400 82,700	10/22/94	51.82	84,400	Y	--
08128400	Middle Concho River above Tankersley, TX	2,084	1961–98	1974	24.98	15,500	8/29/96	24.30	14,400	N	25

Table 45. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Texas.—Continued

[mi^2, square miles; ft, feet above an arbitrary datum; ft^3/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. 56)	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)
08150800	Beaver Creek near Mason, TX	215	1964–98	1978	24.00	66,900	10/28/96	19.45	45,900	N	25
08151500	Llano River at Llano, TX	4,197	1935, 1940–98	1935	41.50	380,000	6/23/97	38.86	260,000	N	50
08152000	Sandy Creek near Kingsland, TX	346	1952, 1967–95, 1998	1952	34.20	163,000	5/29/95	31.22	107,000	N	>100
08158700	Onion Creek near Driftwood, TX	124	1941, 1980–94, 1996–98	1997	17.56	10,000	6/9/97	17.56	10,000	N	5
08162500	Colorado River near Bay City, TX	42,240	1940, 1948–98	1960 1940	46.40 46.60	84,100 83,300	10/20/94	38.67	71,100	Y	--
08164000	Lavaca River near Edna, TX	817	1936, 1939–98	1995	35.49	150,000	10/19/94	35.49	150,000	N	>100
08164450	Sandy Creek near Louise, TX	289	1978–98	1995	28.45	24,900	10/19/94	28.45	24,900	N	>100
08164503	West Mustang Creek near Ganado, TX	178	1978–98	1995	28.39	20,000	10/19/94	28.39	20,000	N	>100
08167500	Guadalupe River near Spring Branch, TX	1,315	1923–92, 1994–98	1978	45.25	160,000	6/22/97	45.12	116,000	N	50
08176550	Fifteenmile Creek near Weser, TX	167	1985–98	1997	26.68	19,400	6/21/97	26.68	19,400	N	--
08177300	Perdido Creek at Farm Road 622 near Fannin, TX	28.0	1979–98	1997	17.89	26,510	4/4/97	17.89	26,510	N	25
08177500	Coleto Creek near Victoria, TX	514	1939–54, 1967, 1979–98	1967	42.00	236,000	4/4/97	32.05	50,100	Y	10
08181480	Leon Creek at Interstate Highway 35 at San Antonio, TX	219	1985–98	1997	24.60	27,900	6/22/97	24.60	27,900	N	--
08184000	Cibolo Creek near Bulverde, TX	198	1946–65, 1997	1997 1958	-- 22.50	61,600 21,100	6/22/97	--	61,600	N	>100
08185000	Cibolo Creek at Selma, TX	274	1946–98	1997	29.73	69,600	6/22/97	29.73	69,600	Y	50

Table 45. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Texas.—Continued

[mi^2, square miles; ft, feet above an arbitrary datum; ft^3/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. 56)	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)
08190500	West Nueces River near Brackettville, TX	694	1935, 1940–50, 1957–98	1935	40.00	550,000	10/28/96	30.74	230,000	N	50
08192000	Nueces River below Uvalde, TX	1,861	1928–98	1935	49.40	616,000	10/28/96	24.88	201,000	N	25
08197500	Frio River below Dry Frio River near Uvalde, TX	631	1952–98	1997	25.09	100,000	6/22/97	25.09	100,000	N	50
08198000	Sabinal River near Sabinal, TX	206	1943–98	1958 1997	24.60 28.50	55,200 52,500	6/22/97	28.50	52,500	N	100
08198500	Sabinal River at Sabinal, TX	241	1932, 1953–98	1997	35.86	93,500	6/22/97	35.86	93,500	N	>100
08200000	Hondo Creek near Tarpley, TX	95.6	1932, 1953–98	1997	29.64	76,900	6/22/97	29.64	76,900	N	100
08200700	Hondo Creek at King Waterhole near Hondo, TX	149	1961–98	1997	18.96	63,600	6/22/97	18.96	63,600	N	100
08201500	Seco Creek at Miller Ranch near Utopia, TX	45.0	1958, 1962–98	1997	17.70	64,900	6/22/97	17.70	64,900	N	>100
08202700	Seco Creek at Rowe Ranch near D'Hanis, TX	168	1932, 1961–98	1997	30.62	51,400	6/22/97	30.62	51,400	N	50
08205500	Frio River near Derby, TX	3,429	1916–98	1932	29.45	230,000	6/24/97	21.77	56,400	N	50

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

Utah

A powerful Pacific storm system affected Utah during March 1995. Total storm snowfall in the northern mountains included 25 inches at Alta and 21 inches at Park City (fig. 57). In the southern mountains, Brian Head recorded 38 inches of snow (National Oceanic and Atmospheric Administration, 1995a). In southwestern Utah, the combination of excessive rain, deep snow, and already saturated soils produced significant flooding. Flooding began first on the Santa Clara River after Gunlock Reservoir began to overflow. A record flow of 3,500 cubic feet per second was measured at the Gunlock Reservoir spillway (National Oceanic and Atmospheric Administration, 1995b). Damage estimates to public and private property in Washington County were $1.4 million (National Oceanic and Atmospheric Administration, 1995b). Snowmelt and thunderstorm activity throughout Utah caused 10 streamgages to experience their peak of record (table 46) in 1995.

Intense downpours occurred across southern Utah on September 14, 1996. A flash flood occurred in a portion of White Canyon, about 10 miles northwest of Natural Bridges National Monument. The floodwaters claimed the life of a 16-year-old girl (National Oceanic and Atmospheric Administration, 1996b).

Excessive rains fell in southwest Utah during November 21–22, 1996. Some of the worst flooding in the State's history was reported near Washington. The mountains of southwest Utah received 2 to 4 inches of rainfall, and valley locations had from 1 to 2 inches (National Oceanic and Atmospheric Administration, 1996a). Rainfall rates of as much as 1 inch per hour were measured. Although the damage was more than $5 million, there were only two known injuries. Excessive rains returned in January 1997 to the same part of southwestern Utah, and another $5 million in damage resulted (National Oceanic and Atmospheric Administration, 1997b).

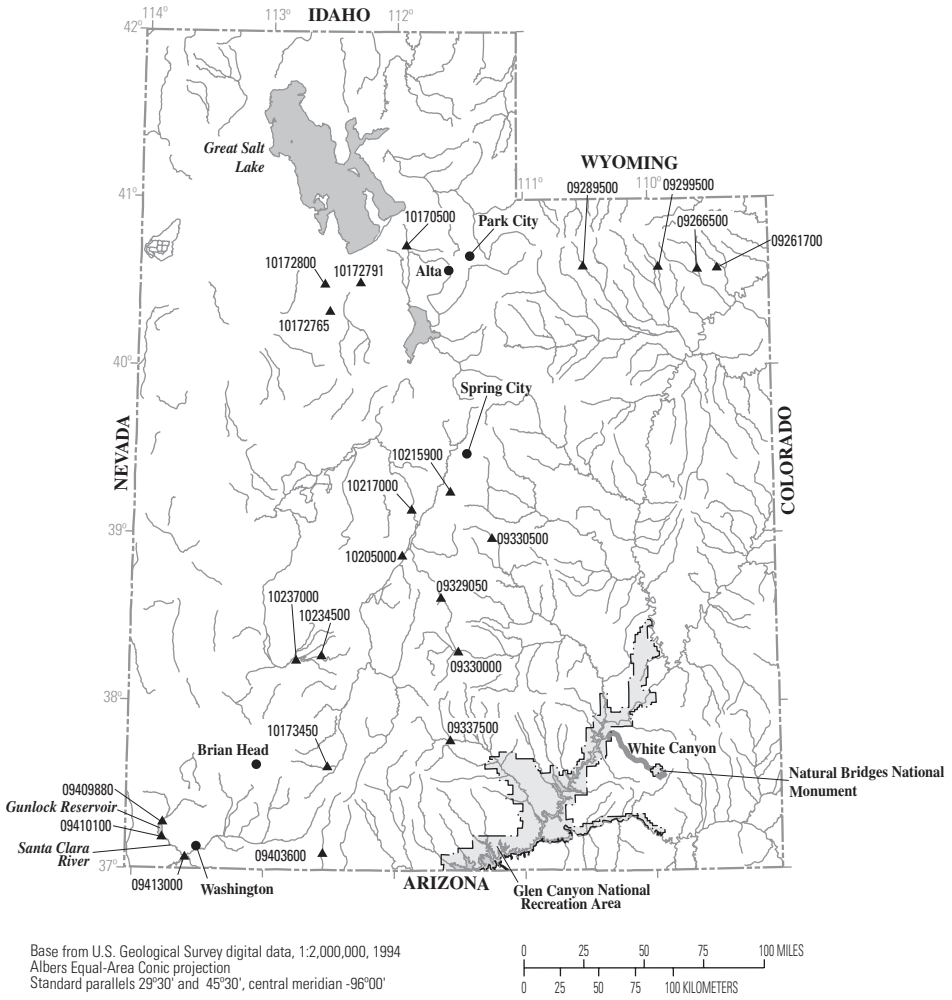
On July 22, 1998, a flash flood moved down Canal Creek Canyon just south of Spring City. Several roads were damaged, and four bridges were washed out. Crops were ruined in the area as well (National Oceanic and Atmospheric Administration, 1998b).

A 10-year-old girl drowned on September 5, 1998, in a flash flood in Ice Cream Canyon, located in the southern part of Glen Canyon National Recreation Area, when 0.87 inch of rain fell in a short period of time in the area (National Oceanic and Atmospheric Administration, 1998b).

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.



EXPLANATION

09403600▲ **Streamgage and number**

Figure 57. Location of streamgages with significant floods during 1994–98 water years for Utah.

Table 46. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Utah.

[mi^2, square miles; ft, feet above an arbitrary datum; ft^3/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. 57)	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)
09261700	Big Brush Creek above Red Fleet Reservoir near Vernal, UT	77.2	1980–98	1998 1980	2.09 3.06	384 314	5/22/98	2.09	384	Y	10–25
09266500	Ashley Creek near Vernal, UT	101	1912, 1914–98	1995	5.64	4,100	6/15/95	5.64	4,100	N	~500
09289500	Lake Fork River above Moon Lake near Mountain Home, UT	77.9	1933–34, 1943–55, 1964–98	1995	6.44	2,740	6/27/95	6.44	2,740	N	75–100
09299500	Whiterocks River near Whiterocks, UT	109	1902–03, 1909, 1918–25, 1927, 1930–98	1983	5.28	4,640	6/26/95	6.98	2,820	N	75–90
09329050	Seven Mile Creek near Fish Lake, UT	24	1965–98	1995 1984	3.52 4.03	424 369	6/12/95	3.52	424	N	40–50
09330000	Fremont River near Bicknell, UT	751	1938–43, 1945–58, 1977–97	1997	7.02	1,360	3/21/97	7.02	1,360	Y	50–60
09330500	Muddy Creek near Emery, UT	105	1909, 1911–14, 1949–98	1952	11.14	3,340	8/11/95	10.05	3,140	N	50–60
09337500	Escalante River near Escalante, UT	320	1910–12, 1943–55, 1972–98	1998	11.05	4,550	8/24/98	11.05	4,550	N	35–40
09403600	Kanab Creek near Kanab, UT	198	1979–98	1961	15.70	3,030	1/3/97	7.97	2,300	N	5–10
09409880	Santa Clara River at Gunlock, UT	271	1970–98	1995	8.07	2,830	3/11/95	8.07	2,830	Y	20–30

Table 46. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Utah.—Continued

[mi^2, square miles; ft, feet above an arbitrary datum; ft^3/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. 57)	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)
09410100	Santa Clara River below Winsor Dam near Santa Clara, UT	378	1972–98	1995	20.17	3,460	3/12/95	20.17	3,460	Y	30–40
09413000	Santa Clara River at St. George, UT	541	1951–56, 1985–98	1995	14.60	6,000	3/12/95	14.60	6,000	Y	10–25
10170500	Surplus Canal at Salt Lake City, UT	--	1943–98	1984	8.91	4,410	6/17/98	16.79	3,500	Y	--
10172765	Clover Creek above Big Hollow near Clover, UT	6.71	1985–98	1995	2.26	47	6/6/95	2.26	47	N	20–30
10172791	Settlement Creek above reservoir near Tooele, UT	16.8	1989–98	1995 1990	4.41 4.59	67 7	6/15/95	4.41	67	N	5–10
10172800	South Willow Creek near Grantsville, UT	4.19	1963–98	1998	2.45	118	7/24/98	2.45	118	N	75–100
10173450	Mammoth Creek above West Hatch Ditch near Hatch, UT	105	1965–98	1983	5.13	838	6/14/95	4.79	654	N	5–10
10205000	Sevier River near Sigurd, UT	3,375	1915–98	1922 1995	6.10 8.33	2,400 1,310	6/15/95	8.33	1,310	Y	25–30
10215900	Manti Creek below Dugway Creek near Manti, UT	26.4	1965–74, 1979–98	1995	5.49	705	6/28/95	5.49	705	N	25–30
10217000	Sevier River below San Pitch River near Gunnison, UT	4,921	1918–98	1984 1995	-- 9.17	5,400 3,290	6/15/95	9.17	3,290	Y	40–50
10234500	Beaver River near Beaver, UT	91.0	1914–98	1936 1937	7.27 7.95	1,080 749	6/15/95	3.16	1,050	N	25–30
10237000	Beaver River at Adamsville, UT	303	1914–98	1995 1980	5.52 7.04	1,870 728	6/6/95	5.52	1,870	Y	75–100

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

Vermont

High water occurred at Lake Champlain in northwestern Vermont (fig. 58) starting in April 1994, which resulted in flood damage to homes and roadways, shoreline erosion, and washing of debris into the lake and onto lakeshores. Compared to the record flood in 1993, water levels peaked about 6 inches lower, and there was much less damage. The worst damage occurred on the morning of April 19 when a thick ice pack on the lake broke up as strong south winds pushed masses of ice northward on the lake. The ice caused an estimated $500,000 to $700,000 in damage when it sheared off 11 high-voltage utility poles (National Oceanic and Atmospheric Administration, 1994b).

A cold front moved southeast from Canada during the afternoon of August 4, 1995, and focused the most intense rains across northern Vermont. More than 5.5 inches of rain fell from the remnants of Tropical Storm Dean as a result of tropical moisture moving northeast along the front (National Oceanic and Atmospheric Administration, 1995a). A woman was killed when her car went into a culvert, which had been washed out. Road washouts and closures were reported in many areas across Vermont. Extensive crop damage also was reported. Total damage was more than $5 million (National Oceanic and Atmospheric Administration, 1995b).

A strong storm system moved in from the Great Lakes to Vermont on January 18, 1996. The circulation associated with this storm resulted in above-normal temperatures, strong winds, and flooding due to snowmelt and rainfall. Two deaths were attributed to the flooding. Damage was more than $30 million (National Oceanic and Atmospheric Administration, 1996b).

A very moist and unstable atmosphere remained over Vermont on June 13, 1996. This produced a second straight day of torrential rains from training thunderstorms in the Grafton area, which resulted in disastrous flash flooding. Grafton was completely isolated with all roads becoming impassable. The Saxtons River reached its third highest stage of record. Several bridges were severely damaged, and 14 homes were affected by the flooding with 3 homes sustaining severe damage. Total damage was $1.5 million (National Oceanic and Atmospheric Administration, 1996b).

A cold front stalled across northern Vermont during the morning hours of July 15, 1997, and focused excessive convective rain east of St. Albans during the morning of July 15. This resulted in numerous road and bridge washouts. Extensive flooding of tributary rivers was followed by flooding of larger rivers. Damage in northwestern Vermont was more than $8 million (National Oceanic and Atmospheric Administration, 1997b).

An area of low pressure tracked across New York and New England on June 26–27, 1998. Excessive convective rains fell with 3 to 8 inches across the midsection of Vermont. Extensive flooding occurred, especially along the Mad River, White River, and Ayers Brook (table 47). Damage was $13 million (National Oceanic and Atmospheric Administration, 1998b).

A cold front moved across the region on August 11–12, 1998. With a warm, humid air mass in place, thunderstorms resulted in torrential downpours during the night. Small streams and brooks quickly rose out of their banks. Road flooding was especially severe in St. Albans.

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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.

EXPLANATION

01155500▲ Streamgage and number

Figure 58. Location of streamgages with significant floods during 1994–98 water years for Vermont.

Table 47. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Vermont.

[mi^2, square miles; ft, feet above an arbitrary datum; ft^3/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. 58)	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)
01134500	Moose River at Victory, VT	75.2	1947–98	1973	12.04	4,940	8/6/95	11.72	4,540	N	50–75
01135300	Sleepers River near St. Johnsbury, VT	42.9	1990–98	1998	7.11	7,570	8/12/98	7.11	7,570	--	>100
01139000	Wells River at Wells River, VT	98.4	1941–98	1973	9.82	5,970	7/15/97	8.54	4,560	N	25–50
01139800	East Orange Branch at East Orange, VT	8.95	1958–98	1996	5.42	626	1/19/96	5.42	626	--	10-25
01141500	Ompompanoosuc River at Union Village, VT	130	1928,	1947	9.65	4,800	4/19/97	10.03	2,440	Y	<10
			1941–98	1928	14.50	--	4/6/98	9.97	2,360	Y	<10
01142500	Ayers Brook at Randolph, VT	30.5	1928,	1998	11.93	3,480	6/27/98	11.93	3,480	N	>200
			1940–98	1928	16.00	--					
01144000	White River at West Hartford, VT	690	1915–98	1998	17.38	34,500	6/27/98	17.38	34,500	--	10–25
01150900	Ottauquechee River near West Bridgewater, VT	23.4	1985–98	1996	7.33	1,960	10/22/95	7.33	1,960	N	25
				1987	7.78	1,270					
01153000	Black River at North Springfield, VT	158	1930–98	1938	17.68	15,500	4/6/98	7.93	4,150	Y	--
01155500	West River at Jamaica, VT	179	1947–98	1949	14.87	29,500	4/23/96	9.47	5,840	Y	--
							4/6/98	9.49	5,900	Y	--
04280000	Poultney River below Fair Haven, VT	187	1929–98	1945	24.36	14,800	1/20/96	20.91	10,200	Y	25–50
04280350	Mettawee River near Pawlet, VT	70.2	1985–98	1996	6.31	4,480	1/19/96	6.31	4,480	N	10–25
04288000	Mad River near Moretown, VT	139	1928–98	1928	19.40	23,000	6/27/98	14.13	14,500	N	50
04289000	Little River near Waterbury, VT	111	1936–98	1936	19.38	6,520	8/6/95	14.81	4,410	Y	25–50

Table 47. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Vermont.—Continued

[mi^2, square miles; ft, feet above an arbitrary datum; ft^3/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. 58)	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)
04292000	Lamoille River at Johnson, VT	310	1912–13, 1929–98	1995	19.88	19,000	8/6/95	19.88	19,000	N	>200
04292700	Stone Bridge Brook near Georgia Plains, VT	8.45	1963–74, 1990–98	1996	8.59	1,030	1/19/96	8.59	1,030	N	50–100
04293000	Missisquoi River near North Troy, VT	131	1932–98	1997	13.84	8,940	7/15/97	13.84	8,940	N	50–100
							3/31/98	12.68	8,890	N	50–100
04293500	Missisquoi River near East Berkshire, VT	479	1912–19, 1921–23, 1928–98	1928	23.10	45,000	3/31/98	17.09	20,400	N	25–50

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

Virginia

In February 1994, a developing storm over the southeastern United States brought excessive precipitation to extreme southwestern Virginia after 2 to 3 inches of rain had exacerbated flooding conditions a day earlier. One to three additional inches of rain fell into already swollen creeks, streams, and rivers, creating flash flooding beginning late on February 10 and continuing through February 11 (National Oceanic and Atmospheric Administration, 1994a).

A slow-moving frontal system, with several low-pressure waves riding along it, produced moderate to excessive rainfall during the last week of March 1994. Rainfall totals ranged from 3 to 6 inches across the State, with the largest amounts occurring across the extreme southwestern areas (National Oceanic and Atmospheric Administration, 1994a). The rain, falling on saturated ground, produced widespread flooding across the western one-half of the State, mainly on March 28 and 29. One death occurred northwest of Richmond (fig. 59) when the transportation director for the public schools drowned while checking water depth on area roadways (National Oceanic and Atmospheric Administration, 1994b).

Torrential rainfall caused by thunderstorms in south-central and southwestern Virginia occurred June 22–23, 1995. The storms produced major flash flooding that resulted in two fatalities and three injuries along the Maury, James, Roanoke, and Dan Rivers (fig. 59, inset A). Excessive rainfall continued over the central and northern Shenandoah Valley June 27–28, 1995. The excessive rain, falling on saturated soil, caused catastrophic flooding and flash flooding, resulting in three deaths, at least 20 injured, $50 million in private and public property damage, and nearly $100 million in agricultural damage (National Oceanic and Atmospheric Administration, 1995b). Eight Virginia counties were declared Federal disaster areas. The most severe flooding occurred near Madison, where rainfall at higher elevations exceeded 20 inches in a 12-hour period (National Oceanic and Atmospheric Administration, 1995a). Flooding was most extreme along the Rapidan and Rappahannock River Basins. Flooding along the Rapidan River near Ruckersville (streamgage 01665500, table 48) was deemed to be greater than a 500-year event. Although the streamgage was washed away, a watermark estimate at the Ruckersville site was 31.3 feet, exceeding the previous record set in October 1942 by 10.5 feet. Near Fredericksburg (streamgage 01668000, table 48), the flood stage on the Rappahannock River was exceeded by nearly 7 feet (National Oceanic and Atmospheric Administration, 1995b).

In January 1996, precipitation combined with unseasonably warm, humid air caused nearly all of the snowpack, estimated at between 6 and 15 inches and as much as 2 feet or more at higher elevations, to melt in a 12-hour period (National Oceanic and Atmospheric Administration, 1996a). The unseasonably warm air was drawn northward around the circulation of a deepening storm west of the Appalachian Mountains during January 18–19. The melting snow and additional rainfall produced widespread flooding and flash flooding on January 19. A pre-frontal line of intense showers and embedded thunderstorms moved into the region shortly after dawn on January 19, causing widespread flash flooding. Snowmelt, combined with 1 to 3 inches of rain (some locations received nearly 5 inches) (National Oceanic and Atmospheric Administration, 1996a), caused the worst regional flooding in more than 10 years. Five deaths occurred as a result of the flooding, and damage estimates were more than $67 million (National Oceanic and Atmospheric Administration, 1996b).

On September 5, 1996, Hurricane Fran made landfall on the North Carolina coast near Cape Fear (fig. 45). As a category 3 hurricane, Fran had 115-mile-per-hour sustained winds, a 13-foot storm surge along the Virginia coast, and excessive rains of as much as 16 inches in Virginia and West Virginia. The center of the storm passed from south to north through the center of Virginia. Five deaths occurred from drowning, and property damage estimates from flooding were more than $41 million in Virginia (National Oceanic and Atmospheric Administration, 1996b). Twenty-one streamgages recorded their highest discharge of record during this widespread flood (table 48).

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.

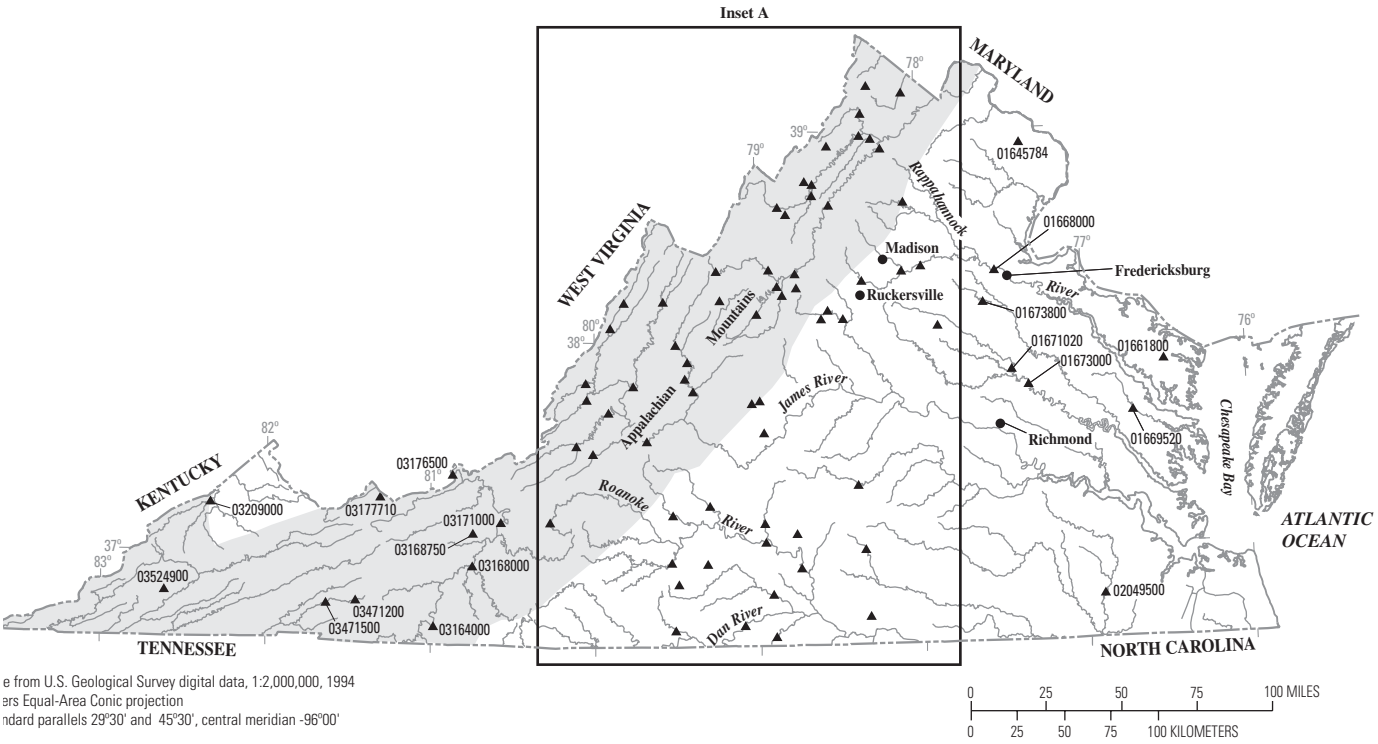
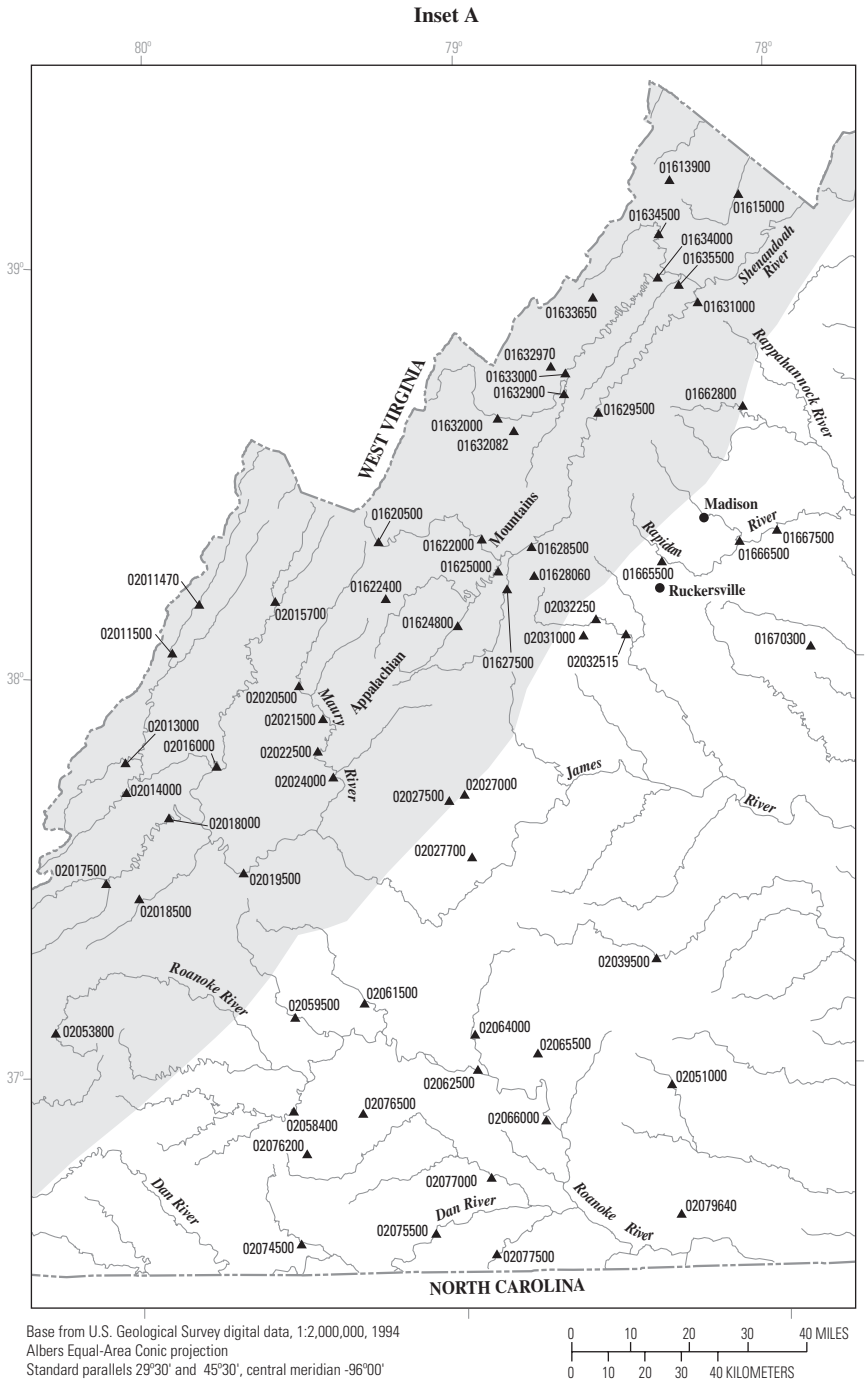


Figure 59. Location of streamgages with significant floods during 1994–98 water years for Virginia.



EXPLANATION

02074500▲ Streamgage and number

Figure 59. Location of streamgages with significant floods during 1994–98 water years for Virginia.—Continued

Table 48. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Virginia.

[mi^2, square miles; ft, feet above an arbitrary datum; ft^3/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. 59)	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)
01613900	Hogue Creek near Hayfield, VA	15.0	1961–98	1996	9.71	4,090	9/6/96	9.71	4,090	N	100–200
01615000	Opequon Creek near Berryville, VA	57.4	1943–97	1988 1943	13.49 18.40	12,600 --	1/19/96	13.30	11,900	N	100
01620500	North River near Stokesville, VA	17.2	1947–98	1949 1986	10.90 19.80	9,530 7,600	9/6/96	9.79	3,750	N	25–50
01622000	North River near Burketown, VA	379	1924, 1927–72, 1976–98	1996	36.70	70,400	9/6/96	36.70	70,400	N	200
01622400	Buffalo Branch tributary O 2 near Christians, VA	.49	1967–96	1996	7.68	244	9/6/96	7.68	244	N	50–100
01624800	Christians Creek near Fisherville, VA	70.1	1968–90, 1992–97	1996	16.14	16,200	9/6/96	16.14	16,200	N	>500
01625000	Middle River near Grottoes, VA	375	1924, 1928–98	1996	35.62	44,300	9/7/96	35.62	44,300	N	200
01627500	South River at Harriston, VA	212	1870, 1878, 1924, 1926–51, 1969–98	1996 1870	15.57 18.80	28,900 --	9/6/96	15.57	28,900	N	100
01628060	White Oak Run near Grottoes, VA	1.94	1980–96	1996	6.25	530	9/6/96	6.25	530	N	--
01628500	South Fork Shenandoah River near Lynnwood, VA	1,084	1931–98	1996	30.84	107,000	9/7/96	30.84	107,000	N	100
01629500	South Fork Shenandoah River near Luray, VA	1,377	1897, 1924, 1926–30, 1936, 1939–51, 1979–98	1996	26.95	112,000	9/7/96	26.95	112,000	N	50–100
01631000	South Fork Shenandoah River at Front Royal, VA	1,642	1900–05, 1931–98	1943	34.80	130,000	9/7/96	32.57	121,000	N	50–100

Table 48. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Virginia.—Continued

[mi^2, square miles; ft, feet above an arbitrary datum; ft^3/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. 59)	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)
01632000	North Fork Shenandoah River at Cootes Store, VA	210	1878, 1889, 1924, 1926–98	1996	27.86	63,400	9/6/96	27.86	63,400	N	>500
01632082	Linville Creek at Broadway, VA	45.5	1986–98	1996	13.23	17,800	9/6/96	13.23	17,800	N	--
01632900	Smith Creek near New Market, VA	93.2	1960–98	1996	17.62	12,400	9/6/96	17.62	12,400	N	50–100
01632970	Crooked Run near Mount Jackson, VA	6.49	1972–96	1996	11.34	5,700	1/19/96	11.34	5,700	N	>500
01633000	North Fork Shenandoah River at Mount Jackson, VA	506	1943–98	1996	22.17	103,000	9/6/96	22.17	103,000	N	>500
01633650	Pughs Run near Woodstock, VA	3.66	1971–96	1996	13.39	1,100	9/6/96	13.39	1,100	N	100
01634000	North Fork Shenandoah River near Strasburg, VA	768	1926–98	1996	32.27	114,000	9/7/96	32.27	114,000	N	>500
01634500	Cedar Creek near Winchester, VA	103	1936, 1938–98	1943	27.00	22,000	9/6/96	23.40	20,800	N	50–100
01635500	Passage Creek near Buckton, VA	87.8	1933–98	1996	15.89	23,000	9/6/96	15.89	23,000	N	200
01645784	Snakeden Branch at Reston, VA	.79	1972–78, 1985–96	1996	7.62	1,050	9/6/96	7.62	1,050	N	50
01661800	Bush Mill Stream near Heathsville, VA	6.82	1964–96	1979	8.52	714	3/3/94	8.10	625	N	25–50
01662800	Battle Run near Laurel Mills, VA	27.6	1959–95, 1998	1995	14.40	9,120	6/27/95	14.40	9,120	N	100
01665500	Rapidan River near Ruckersville, VA	114	1943–81, 1983–96	1995	31.30	106,000	6/27/95	31.30	106,000	N	>500
01666500	Robinson River near Locust Dale, VA	179	1943–98	1995 1996	22.93 23.92	25,400 22,100	6/27/95	22.93	25,400	N	25–50
01667500	Rapidan River near Culpeper, VA	472	1931–98	1995	30.40	59,300	6/28/95	30.40	59,300	N	100
01668000	Rappahannock River near Fredericksburg, VA	1,596	1908–98	1943	25.90	140,000	9/7/96	17.97	74,100	N	25

Table 48. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Virginia.—Continued

[mi^2, square miles; ft, feet above an arbitrary datum; ft^3/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. 59)	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)
01669520	Dragon Swamp at Mascot, VA	108	1982–98	1998	9.39	2,800	2/6/98	9.39	2,800	N	--
01670300	Contrary Creek near Mineral, VA	5.53	1976–96	1994	6.94	7,050	11/28/93	6.94	7,050	N	>500
01671020	North Anna River at Hart Corner near Doswell, VA	463	1980–98	1994	21.80	12,000	3/29/94	21.80	12,000	N	--
01673000	Pamunkey River near Hanover, VA	1,081	1928, 1942–92, 1994–98	1969 1928	31.12 32.60	40,300 --	3/31/94	25.16	21,200	N	25
01673800	Po River near Spotsylvania, VA	77.4	1963–98	1972	19.03	10,900	11/28/93	17.10	8,070	N	50
02011470	Back Creek at Sunrise, VA	76.1	1985–98	1996	11.99	5,690	1/19/96	11.99	5,690	Y	--
02011500	Back Creek near Mountain Grove, VA	134	1913, 1951–98	1996 1913	12.41 17.00	18,400 --	1/19/96	12.41	18,400	Y	--
02013000	Dunlap Creek near Covington, VA	164	1913, 1929–98	1972 1913	15.65 18.00	27,400 --	1/19/96	13.33	17,100	N	50
02014000	Potts Creek near Covington, VA	153	1878, 1913, 1929–56, 1966–81, 1983–98	1986	13.46	15,400	1/19/96	11.32	9,860	N	25
02015700	Bullpasture River at Williamsville, VA	110	1961–98	1986	14.39	22,900	9/6/96	12.50	21,600	N	200
02016000	Cowpasture River near Clifton Forge, VA	461	1913, 1926–98	1913	20.80	45,000	9/7/96	16.91	30,100	N	25–50
02017500	Johns Creek at New Castle, VA	104	1927–98	1935 1972	10.80 12.48	8,000 7,960	1/19/96	11.78	6,760	N	10–25
02018000	Craig Creek at Parr, VA	329	1926–98	1986	24.76	58,500	1/19/96	16.71	21,600	N	25–50
02018500	Catawba Creek near Catawba, VA	34.3	1940, 1944–98	1986	19.19	21,200	6/28/95	11.34	8,640	N	50
02019500	James River at Buchanan, VA	2,075	1878, 1886, 1889, 1893–1998	1986	38.84	179,000	1/20/96	29.24	103,000	Y	--

Table 48. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Virginia.—Continued

[mi^2, square miles; ft, feet above an arbitrary datum; ft^3/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. 59)	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)
02020500	Calfpasture River above Mill Creek at Goshen, VA	144	1939–96	1986	20.23	56,300	9/6/96	16.38	35,800	N	100–200
02021500	Maury River at Rockbridge Baths, VA	329	1929–98	1986	19.19	87,700	9/6/96	14.28	42,000	N	50–100
02022500	Kerrs Creek near Lexington, VA	35.0	1927–98	1950 1995	13.80 15.44	23,000 21,700	6/28/95	15.44	21,700	N	200–500
02024000	Maury River near Buena Vista, VA	646	1936, 1939–98	1969	31.23	105,000	6/28/95	19.48	37,500	N	25–50
02027000	Tye River near Lovingston, VA	92.8	1939–98	1969	29.00	80,000	9/6/96	16.05	17,100	N	50
02027500	Piney River at Piney River, VA	47.6	1949–98	1969	13.80	38,000	9/6/96	12.85	27,400	N	200–500
02027700	Buffalo River tributary near Amherst, VA	.46	1966–78, 1980–96	1985 1996	2.96 7.33	720 196	9/6/96	7.33	196	N	10–25
02031000	Mechums River near White Hall, VA	95.4	1943–51, 1959, 1979–98	1943	30.30	20,000	9/6/96	24.79	14,200	N	25
02032250	Moormans River near Free Union, VA	74.6	1972, 1979–97	1995	22.28	19,100	6/28/95	22.28	19,100	N	25
02032515	South Fork Rivanna River near Charlottesville, VA	260	1979–97	1996	24.39	16,100	9/6/96	24.39	16,100	Y	--
02039500	Appomattox River at Farmville, VA	303	1926–98	1972	29.70	33,100	9/7/96	24.02	17,900	N	25–50
02049500	Blackwater River near Franklin, VA	617	1940, 1942–98	1940	22.00	21,000	2/7/98	15.27	7,250	N	10–25
02051000	North Meherrin River near Lunenburg, VA	55.6	1940, 1947–75, 1977–80, 1982–98	1972 1940	28.30 48.00	14,400 --	9/6/96	22.94	6,390	N	10–25
02053800	South Fork Roanoke River near Shawsville, VA	110	1961–98	1972	11.12	14,200	9/6/96	8.88	9,690	N	10–25
02058400	Pigg River near Sandy Level, VA	350	1964–98	1987	31.12	65,600	9/6/96	27.32	33,700	N	25–50

Table 48. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Virginia.—Continued

[mi^2, square miles; ft, feet above an arbitrary datum; ft^3/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. 59)	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)
02059500	Goose Creek near Huddleston, VA	188	1924, 1926–27, 1930–98	1987	37.49	53,200	6/29/95	25.80	20,400	N	10–25
02061500	Big Otter River near Evington, VA	320	1937–98	1995	29.93	45,900	6/23/95	29.93	45,900	N	50–100
							9/6/96	22.98	29,200	N	25
02062500	Roanoke (Staunton) River at Brookneal, VA	2,415	1878, 1924–76, 1978–98	1940	46.00	130,000	9/7/96	38.78	80,300	Y	--
02064000	Falling River near Naruna, VA	173	1930–34, 1940, 1942–98	1996	36.14	62,800	9/6/96	36.14	62,800	N	>500
02065500	Cub Creek at Phenix, VA	98.0	1940, 1947–98	1996	21.89	15,200	9/6/96	21.89	15,200	N	200–500
02066000	Roanoke (Staunton) River at Randolph, VA	2,977	1878, 1901–13, 1915–98	1940	41.60	150,000	9/7/96	34.94	89,300	Y	--
02074500	Sandy River near Danville, VA	112	1930–98	1940	17.38	23,000	9/6/96	11.06	13,000	N	25
02075500	Dan River at Paces, VA	2,550	1940, 1951–75, 1977–98	1972	33.15	64,800	9/7/96	31.43	56,500	N	25–50
02076200	Bearskin Creek near Chatham, VA	4.06	1967–78, 1980–84, 1986–96	1995	19.90	2,850	6/29/95	19.90	2,850	N	50–100
02076500	Georges Creek near Gretna, VA	9.24	1950–97	1996	10.02	2,260	9/6/96	10.02	2,260	N	50
02077000	Banister River at Halifax, VA	547	1905, 1929–98	1944	40.80	50,000	9/7/96	33.45	23,900	N	25–50
02077500	Hyco River near Denniston, VA	289	1928, 1930–34, 1945, 1951–98	1975 1928	24.27 26.40	10,800 --	9/7/96	23.16	9,430	Y	--
02079640	Allen Creek near Boydton, VA	53.4	1962–96	1996	22.93	6,870	9/6/96	22.93	6,870	N	50

Table 48. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Virginia.—Continued

[mi^2, square miles; ft, feet above an arbitrary datum; ft^3/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. 59)	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)
03164000	New River near Galax, VA	1,131	1930–98	1940	25.70	141,000	1/15/95	15.23	68,700	N	50–100
03168000	New River at Allisonia, VA	2,202	1930–98	1940	23.42	185,000	1/15/95	16.56	108,000	N	100
03168750	Thorne Springs Branch near Dublin, VA	4.77	1957–96	1995 1973	7.41 8.01	3,760 2,200	7/7/95	7.41	3,760	N	>500
03171000	New River at Radford, VA	2,748	1878, 1896–1998	1940	35.96	218,000	1/15/95	24.04	108,000	Y	--
03176500	New River at Glen Lyn, VA	3,768	1878, 1915–98	1878	33.10	240,000	1/16/95	19.83	125,000	Y	--
03177710	Bluestone River at Falls Mills, VA	44.2	1981–97	1996	8.66	1,560	1/27/96	8.66	1,560	N	--
03209000	Pound River below Flannagan Dam near Haysi, VA	221	1920, 1927–98	1929 1957	16.50 18.65	30,000 27,300	4/14/94	7.96	4,240	Y	--
03471200	South Fork Holston River at Teas, VA	31.1	1967–80, 1982–95	1994	17.61	7,660	2/11/94	17.61	7,660	N	200–500
03471500	South Fork Holston River at Riverside near Chilhowie, VA	76.1	1908–09, 1921–31, 1942–98	1978	10.20	9,600	1/15/95	8.68	5,820	N	50
03524900	Stony Creek at Ka, VA	30.9	1981–96	1994	7.81	10,800	3/28/94	7.81	10,800	N	--

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

Washington

Flooding occurred on every major river in western Washington in late November 1995. The Skagit River near Concrete (streamgage 12194000, table 49) had its greatest discharge since 1921. Other major floods were on the Snoqualmie River, which was 7 feet above flood stage, and the Nooksack River, which was 6 feet above flood stage (National Oceanic and Atmospheric Administration, 1995a). Most rivers crested near or at record levels. In the towns of Duvall and Carnation (fig. 60, inset A), 15,000 people were stranded as the flooded rivers covered the few roads in and out of the towns. A state of emergency was declared in 16 counties in the State, and an estimated $3 million was needed for road repairs. Property damage was more than $10 million (National Oceanic and Atmospheric Administration, 1995b). For the month of November, most areas had twice their normal average rainfall, and many areas fell just short of setting records for the wettest November on record (National Oceanic and Atmospheric Administration, 1995a).

Some of the worst flooding in more than 60 years took place in Washington during February 7–10, 1996. Damage statewide was estimated at $223 million (National Oceanic and Atmospheric Administration, 1996b). The Chehalis, Yakima, Cowlitz, and Klickitat Rivers all had record discharges (table 49). A state of emergency was declared in 13 counties. Overall it was the wettest winter season ever. The normal, winter precipitation at Seattle-Tacoma International Airport (Sea Tac) is 21.11 inches, the previous record was 30.6 inches, and for 1995–96 the total was 32.46 inches (National Oceanic and Atmospheric Administration, 1995a; 1996a). Thirty-eight streamgages had record discharges during February 1996 (table 49).

The 1996–97 winter had excessive precipitation and snowmelt periods that caused flooding throughout the State. In January 1997, the runoff from melting snow and rain caused mudslides and sinkholes in the Seattle area. The cleanup from the mudslides and repairs to roads and bridges was estimated to be $20 million (National Oceanic and Atmospheric Administration, 1997b). Lake Sammamish was about 7 feet above normal, its highest level since 1962, and many lawns and docks were flooded. Flooding occurred in western Washington in February and in eastern Washington during March through May as the deep snowpack melted.

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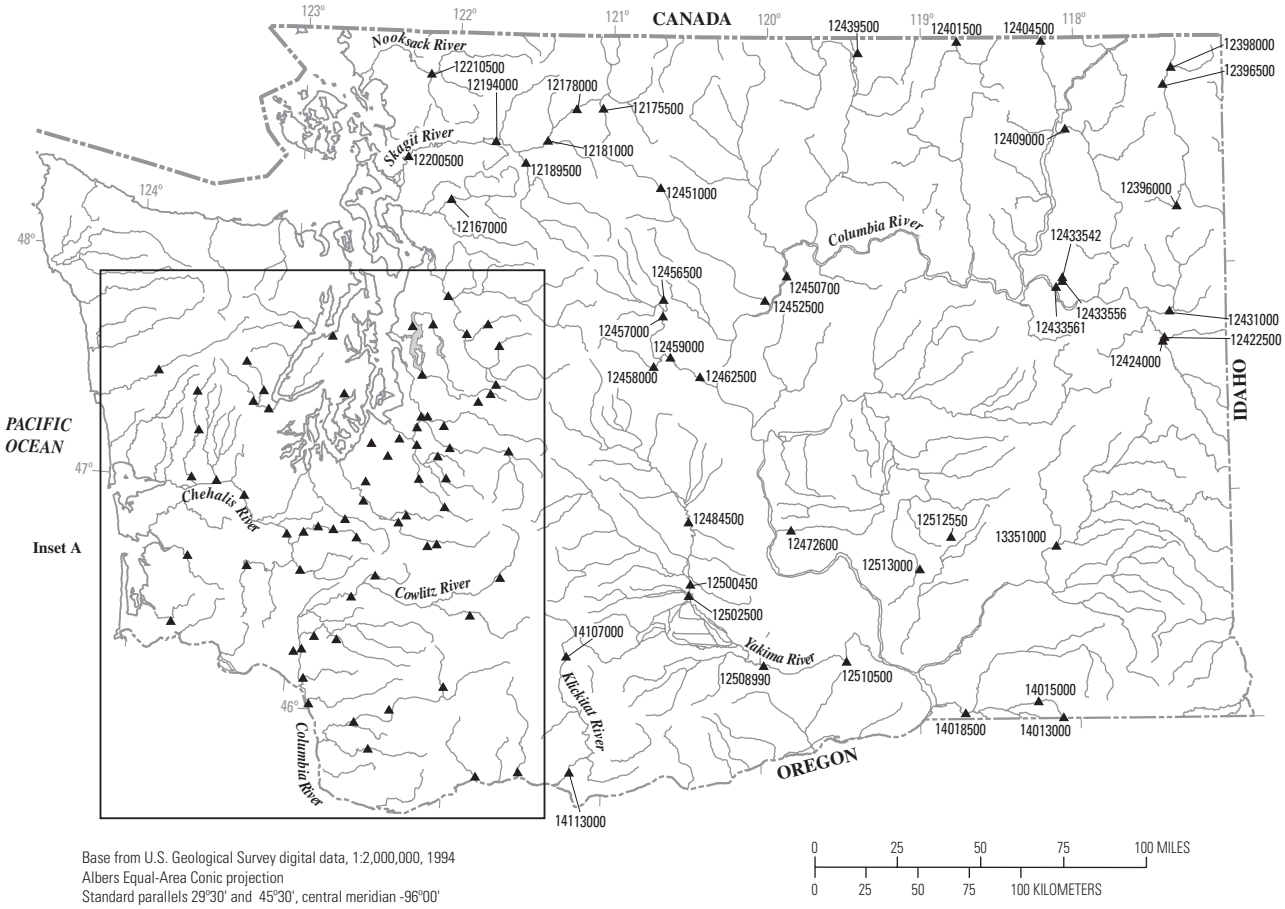
National Oceanic and Atmospheric Administration (NOAA), 1995a–97a, Climatological data (by State): Asheville, North Carolina, National Climatic Data Center, various months.

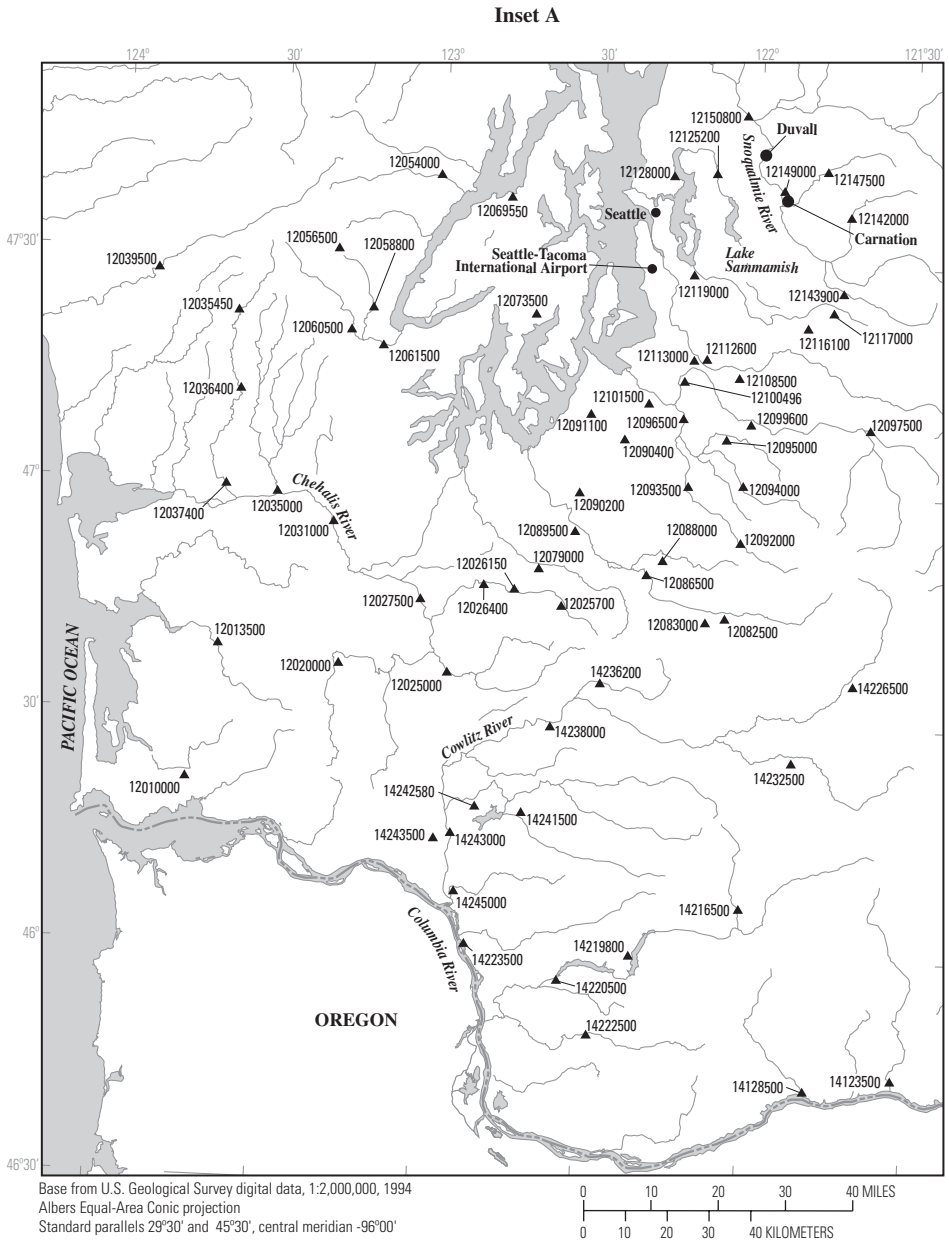
National Oceanic and Atmospheric Administration (NOAA), 1995b–97b, Storm data (by State): Asheville, North Carolina, National Climatic Data Center, various months.



EXPLANATION

12510500▲ **Streamgage and number**

Figure 60. Location of streamgages with significant floods during 1994–98 water years for Washington.



EXPLANATION

14222500▲ **Streamgage and number**

Figure 60. Location of streamgages with significant floods during 1994–98 water years for Washington.—Continued

Table 49. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Washington.

[mi^2, square miles; ft, feet above an arbitrary datum; ft^3/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. 60)	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)
12010000	Naselle River near Naselle, WA	54.8	1930–98	1997	19.26	12,600	3/18/97	19.26	12,600	N	>100
12013500	Willapa River near Willapa, WA	130	1949–56, 1958–59, 1962–98	1995	27.28	14,800	12/20/94 3/19/97	27.28 24.53	14,800 12,100	N N	50–100 10–25
12020000	Chehalis River near Doty, WA	113	1940–98	1996	20.37	28,900	2/8/96	20.37	28,900	N	50–100
12025000	Newaukum River near Chehalis, WA	155	1929–31, 1943–81, 1983–98	1996 1954	13.54 13.62	13,300 7,880	2/8/96	13.54	13,300	N	>100
12025700	Skookumchuck River near Vail, WA	40.0	1968–98	1996	11.24	8,350	2/8/96	11.24	8,350	N	25–50
12026150	Skookumchuck River below Bloody Run Creek near Centralia, WA	65.9	1930–33, 1940–98	1996 1954	13.41 48.59	9,020 6,710	2/8/96	13.41	9,020	Y	--
12026400	Skookumchuck River near Bucoda, WA	112	1968–98	1996	17.87	11,300	2/8/96	17.87	11,300	Y	--
12027500	Chehalis River near Grand Mound, WA	895	1929–98	1996	19.98	74,800	2/9/96	19.98	74,800	N	>100
12031000	Chehalis River at Porter, WA	1,294	1947–85, 1987–98	1996	25.22	80,700	2/9/96	25.22	80,700	N	>100
12035000	Satsop River near Satsop, WA	299	1930–98	1997 1935	38.87 38.90	63,600 46,600	12/20/94 3/19/97	37.28 38.87	50,600 63,600	N N	50–100 >100
12035450	Big Creek near Grisdale, WA	9.57	1973–97	1997 1987	8.17 9.20	4,000 3,340	3/19/97	8.17	4,000	N	25–50
12036400	Schafer Creek near Grisdale, WA	12.1	1987–97	1997	13.57	4,100	3/19/97	13.57	4,100	N	50–100
12037400	Wynoochee River above Black Creek near Montesano, WA	155	1957–98	1997 1957	20.21 20.54	25,600 24,500	3/19/97	20.21	25,600	Y	10–25
12039500	Quinault River at Quinault Lake, WA	264	1910, 1912–22, 1926–98	1910	22.00	52,600	3/19/97	19.72	46,400	N	25–50

Table 49. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Washington.—Continued

[mi^2, square miles; ft, feet above an arbitrary datum; ft^3/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. 60)	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)
12054000	Duckabush River near Brinnon, WA	66.5	1939–98	1996 1950	8.62 10.06	9,240 8,960	12/12/95	8.62	9,240	N	25–50
12056500	North Fork Skokomish River below Staircase Rapids near Hoodsport, WA	57.2	1925–98	1935	14.40	27,000	12/20/94	10.49	14,800	N	10–25
12058800	North Fork Skokomish River below Lower Cushman Dam near Potlatch, WA	--	1989–98	1996	10.97	3,680	12/19/95	10.97	3,680	Y	--
12060500	South Fork Skokomish River near Union, WA	76.3	1932–84, 1996–98	1997 1935	8.98 11.00	24,400 21,600	3/19/97	8.98	24,400	N	50–100
12061500	Skokomish River near Potlatch, WA	227	1934, 1944–98	1991 1997	16.80 17.75	36,600 --	12/10/94 3/19/97	17.48 17.75	30,000 --	Y Y	-- --
12069550	Big Beef Creek near Seabeck, WA	13.8	1970–81, 1994–98	1997	6.97	1,840	1/1/97	6.97	1,840	N	>100
12073500	Huge Creek near Wauna, WA	6.47	1948–69, 1978–98	1991 1997	5.13 5.76	547 526	3/19/97	5.76	526	N	25–50
12079000	Deschutes River near Rainier, WA	89.8	1950–79, 1981–82, 1988–98	1990	17.01	9,600	2/8/96	15.74	7,850	N	25–50
12082500	Nisqually River near National, WA	133	1943–98	1996	12.18	21,200	2/8/96	12.18	21,200	N	50–100
12083000	Mineral Creek near Mineral, WA	75.2	1943–98	1996 1990	12.89 13.56	14,900 13,800	2/8/96	12.89	14,900	N	>100
12086500	Nisqually River at La Grande, WA	292	1907–08, 1910–11, 1920–31, 1945–98	1996	15.30	39,500	2/8/96	15.30	39,500	Y	--

Table 49. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Washington.—Continued

[mi^2, square miles; ft, feet above an arbitrary datum; ft^3/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. 60)	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)
12088000	Ohop Creek near Eatonville, WA	34.5	1928–32, 1942–74, 1993–98	1996	8.76	2,620	2/8/96	8.76	2,620	N	>100
12089500	Nisqually River at McKenna, WA	517	1948–68, 1978–98	1996	17.13	50,000	2/8/96	17.13	50,000	Y	--
12090200	Muck Creek at Roy, WA	86.8	1957–76, 1996	1996 1972	-- 5.40	1,670 692	2/8/96	--	1,670	N	>100
12090400	North Fork Clover Creek near Parkland, WA	6.25	1960–75, 1995–98	1995 1960	10.05 14.78	371 153	2/19/95	10.05	371	N	>100
12091100	Flett Creek at Tacoma, WA	8.01	1960–98	1996	3.08	203	2/8/96	3.08	203	Y	--
12092000	Puyallup River near Electron, WA	92.8	1912–26, 1945–49, 1958–93, 1995–98	1996 1960	10.94 11.90	16,000 10,800	2/8/96	10.94	16,000	N	>100
12093500	Puyallup River near Orting, WA	172	1932–98	1996	11.37	18,300	2/8/96	11.37	18,300	N	>100
12094000	Carbon River near Fairfax, WA	78.9	1930–78, 1991–98	1991 1996	-- 15.85	13,000 12,000	2/8/96	15.85	12,000	N	25–50
12095000	South Prairie Creek at South Prairie, WA	79.5	1950–79, 1988–98	1996	35.14	8,170	2/8/96	35.14	8,170	N	50–100
12096500	Puyallup River at Alderton, WA	438	1916–27, 1944–57, 1996–97	1996	61.15	41,500	2/9/96	61.15	41,500	N	>100
12097500	Greenwater River at Greenwater, WA	73.5	1912, 1930–78, 1993–98	1978	9.80	10,500	2/8/96	8.94	5,900	N	25–50
12099600	Boise Creek at Buckley, WA	15.4	1978–98	1996 1984	4.26 5.18	1,200 972	2/8/96	4.26	1,200	N	25–50
12100496	White River near Auburn, WA	464	1988–98	1996	83.15	15,000	2/10/96	83.15	15,000	Y	--
12101500	Puyallup River at Puyallup, WA	948	1915–98	1934 1918	21.40 34.15	57,000 40,500	2/9/96	29.77	46,700	Y	40

Table 49. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Washington.—Continued

[mi^2, square miles; ft, feet above an arbitrary datum; ft^3/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. 60)	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)
12108500	Newaukum Creek near Black Diamond, WA	27.4	1945–98	1996	3.95	2,640	2/8/96	3.95	2,640	N	>100
12112600	Big Soos Creek above hatchery near Auburn, WA	66.7	1961–98	1996	8.88	4,200	2/9/96	8.88	4,200	N	>100
12113000	Green River near Auburn, WA	399	1937–98	1960	69.75	28,100	2/8/96	63.62	12,400	Y	--
12116100	Canyon Creek near Cedar Falls, WA	.19	1946–98	1976	2.22	131	12/4/95	2.05	107	N	25–50
12117000	Taylor Creek near Selleck, WA	17.2	1957–98	1996 1965	5.53 5.78	3,130 2,730	2/8/96	5.53	3,130	N	50–100
12119000	Cedar River at Renton, WA	184	1907, 1946–50, 1952–98	1991	17.13	10,600	11/30/95	16.04	7,650	Y	--
12125200	Sammamish River near Woodinville, WA	157	1966–98	1997	26.93	2,870	2/9/96 1/1/97	25.76 26.93	2,470 2,870	N N	10–25 50–100
12128000	Thornton Creek near Seattle, WA	12.1	1946, 1962–68, 1996–98	1997	5.26	423	12/31/96	5.26	423	N	--
12142000	North Fork Snoqualmie River near Snoqualmie Falls, WA	64.0	1930–54, 1956–57, 1959–98	1932	17.50	15,800	11/29/95	12.82	14,500	N	10–25
12143900	Boxley Creek near Edgewick, WA	3.64	1982–98	1996	5.20	256	12/3/95	5.20	256	N	10–25
12147500	North Fork Tolt River near Carnation, WA	39.9	1953–65, 1968–98	1960	13.15	9,560	11/29/95	12.74	8,280	N	10–25
12149000	Snoqualmie River near Carnation, WA	603	1930–98	1991	60.70	65,200	2/9/96	60.34	61,600	N	10–25
12150800	Snohomish River near Monroe, WA	1,537	1964–98	1991	25.30	150,000	11/30/95	24.10	132,000	N	25–50
12167000	North Fork Stillaguamish River near Arlington, WA	262	1929–98	1991	15.20	36,700	2/8/96 3/19/97	14.84 14.81	34,600 34,400	N N	10–25 10–25

Table 49. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Washington.—Continued

[mi^2, square miles; ft, feet above an arbitrary datum; ft^3/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. 60)	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)
12175500	Thunder Creek near Newhalem, WA	105	1920–98	1922 1981	-- 14.50	15,400 14,500	11/29/95	12.76	10,900	N	10–25
12178000	Skagit River at Newhalem, WA	1,175	1815, 1856, 1898, 1909–14, 1921–98	1856 1922	-- 94.80	95,000 60,000	12/2/95	91.14	32,300	Y	--
12181000	Skagit River at Marblemount, WA	1,381	1944, 1947–57, 1976–98	1996	13.73	62,300	11/29/95	13.73	62,300	Y	--
12189500	Sauk River near Sauk, WA	714	1912, 1929–98	1981	18.24	98,600	11/8/95	16.57	79,000	N	25–50
12194000	Skagit River near Concrete, WA	2,737	1815, 1856, 1898, 1910, 1918, 1922, 1925–98	1815	69.30	500,000	11/29/95	41.57	160,000	Y	--
12200500	Skagit River near Mount Vernon, WA	3,093	1907, 1941–98	1991	37.37	152,000	11/30/95	37.34	141,000	Y	--
12210500	Nooksack River at Deming, WA	584	1908, 1910, 1932, 1935–48, 1950–98	1932 1908	16.80 20.00	49,300 --	11/29/95	14.80	48,900	N	50–100
12396000	Calispell Creek near Dalkena, WA	68.3	1951–77, 1979–93, 1995–98	1974	14.38	3,190	4/23/96	9.21	1,190	N	10–25
12396500	Pend Oreille River Bel Box Canyon near Ione, WA	24,900	1948, 1953–98	1972	34.54	136,000	6/7/97	34.44	134,000	Y	--
12398000	Sullivan Creek at Metaline Falls, WA	142	1954–68, 1970, 1994–98	1997 1961	4.38 6.20	4,350 2,020	6/1/97	4.38	4,350	N	>100
12401500	Kettle River near Ferry, WA	2,200	1929–98	1948	21.15	21,200	6/1/97	20.85	19,600	N	50–100

Table 49. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Washington.—Continued

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Streamgage number (fig. 60)	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)
12404500	Kettle River near Laurier, WA	3,800	1894, 1930–98	1948 1894	17.25 22.00	35,000 --	5/17/97	15.87	30,800	N	25–50
12409000	Colville River at Kettle Falls, WA	1,007	1923–98	1974 1956	9.84 10.17	3,440 3,230	4/28/97	9.44	2,860	N	25–50
12422500	Spokane River at Spokane, WA	4,290	1891–1998	1894 1934	-- 29.75	49,000 47,800	5/19/97	29.06	42,600	Y	--
12424000	Hangman Creek at Spokane, WA	689	1948–98	1997	14.31	21,200	1/1/97	14.31	21,200	N	50–100
12431000	Little Spokane River at Dartford, WA	665	1929–32, 1947–98	1997	8.27	4,110	3/21/97	8.27	4,110	N	>100
12433542	Blue Creek above Midnite Mine drainage near Wellpinit, WA	6.00	1985–98	1997	3.22	65	3/22/97	3.22	65	N	50–100
12433556	Midnite Mine drainage near Wellpinit, WA	1.30	1985–94,	1997	1.78	6	3/19/97	1.78	6	Y	25–50
12433561	Blue Ceek River near mouth near Wellpinit, WA	19.1	1985–98	1997	4.87	180	3/19/97	4.87	180	Y	25–50
12439500	Okanogan River at Oroville, WA	3,195	1943–98	1997	14.88	3,770	6/7/97	14.88	3,770	Y	--
12450700	Columbia River below Wells Dam, WA	86,100	1968–98	1972	--	402,000	6/12/97	--	362,000	Y	--
12451000	Stehekin River at Stehekin, WA	321	1911–15, 1927–98	1996	29.58	20,900	11/29/95	29.58	20,900	N	>100
12452500	Chelan River at Chelan, WA	924	1904–93, 1995–98	1982 1968	-- --	18,400 18,400	11/30/95	--	17,000	Y	--
12456500	Chiwawa River near Plain, WA	170	1914, 1937–49, 1955–57, 1991–98	1996	9.36	7,030	11/30/95	9.36	7,030	N	25–50
12457000	Wenatchee River at Plain, WA	591	1911–29, 1932–79, 1990–98	1996	14.97	36,100	11/30/95	14.97	36,100	N	>100

Table 49. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Washington.—Continued

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Streamgage number (fig. 60)	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)
12458000	Icicle Creek above Snow Creek near Leavenworth, WA	193	1912–14, 1937–79, 1994–98	1996	16.04	19,800	11/29/95	16.04	19,800	N	>100
12459000	Wenatchee River at Peshastin, WA	1,000	1929–98	1996	17.89	41,300	11/30/95	17.89	41,300	N	>100
12462500	Wenatchee River at Monitor, WA	1,301	1963–98	1996	30.02	47,500	11/30/95	30.02	47,500	N	>100
12472600	Crab Creek near Beverly, WA	4,840	1960–98	1980	6.46	936	1/4/97	5.10	512	Y	--
12484500	Yakima River at Umtanum, WA	1,594	1907–17, 1919–21, 1923, 1925–27, 1929–98	1934 1907	-- 41.20	32,200 41,000	2/9/96	38.77	27,200	Y	--
12500450	Yakima River above Ahtanum Creek at Union Gap, WA	3,479	1967–98	1996	53.88	53,300	2/9/96	53.88	53,300	Y	--
12502500	Ahtanum Creek at Union Gap, WA	173	1908, 1910, 1912–14, 1952, 1960–98	1974 1996	10.36 13.50	3,100 2,660	2/9/96	13.50	2,660	N	50–100
12508990	Yakima River at Mabton, WA	5,359	1971–98	1996	28.18	49,500	2/10/96	28.18	49,500	Y	--
12510500	Yakima River at Kiona, WA	5,615	1878, 1897–1914, 1934–98	1934	21.57	67,000	2/11/96	20.98	49,400	Y	--
12512550	Providence Coulee near Cunningham, WA	52.1	1978–91, 1993–94, 1996–98	1997	16.18	1,000	1/31/97	16.18	1,000	N	>100
12513000	Esquatzel Coulee at Connell, WA	234	1953–94, 1996–98	1956 1997	12.68 19.86	5,560 2,820	1/31/97	19.86	2,820	N	25
13351000	Palouse River at Hooper, WA	2,500	1898–99, 1901–07, 1909–16, 1948, 1951–98	1963	19.13	33,500	2/9/96	17.95	28,000	N	40

Table 49. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Washington.—Continued

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Streamgage number (fig. 60)	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)
14013000	Mill Creek near Walla Walla, WA	59.6	1914–17, 1940–98	1996	20.43	6,350	2/9/96	20.43	6,350	N	>100
14015000	Mill Creek at Walla Walla, WA	95.7	1942–48, 1950–98	1996	6.89	4,190	2/9/96	6.89	4,190	Y	--
14018500	Walla Walla River near Touchet, WA	1,657	1949, 1952–98	1965 1996	18.90 20.58	33,400 32,500	2/10/96	20.58	32,500	N	>100
14107000	Klickitat River above West Fork near Glenwood, WA	151	1945–78, 1992–98	1996	5.70	5,500	2/8/96	5.70	5,500	N	>100
14113000	Klickitat River near Pitt, WA	1,297	1910–12, 1929–98	1996	17.90	51,000	2/8/96	17.90	51,000	N	>100
14123500	White Salmon River near Underwood, WA	386	1916–30, 1936–98	1996	19.16	45,200	2/8/96	19.16	45,200	N	>100
14128500	Wind River near Carson, WA	225	1935–79, 1996–97	1996	23.04	53,600	2/8/96	23.04	53,600	N	>100
14216500	Muddy River below Clear Creek near Cougar, WA	131	1928–34, 1955–73, 1984–98	1996	33.26	30,600	2/8/96	33.26	30,600	N	>100
14219800	Speelyai Creek near Cougar, WA	12.6	1960–98	1963 1996	-- 8.12	3,600 3,300	2/8/96	8.12	3,300	N	10–25
14220500	Lewis River at Ariel, WA	731	1924–98	1934	35.00	129,000	2/8/96	27.38	86,400	Y	--
14222500	East Fork Lewis River near Heisson, WA	125	1930–98	1996	25.26	28,600	2/8/96	25.26	28,600	N	>100
14223500	Kalama River below Italian Creek near Kalama, WA	198	1947–79, 1996	1996 1972	-- 15.80	24,000 17,900	2/8/96	--	24,000	N	>100
14226500	Cowlitz River at Packwood, WA	287	1912–20, 1930–98	1934 1978	13.00 13.73	36,600 36,200	2/8/96	10.86	32,900	N	25–50
14232500	Cispus River near Randle, WA	321	1911–12, 1930–41, 1943–96	1996 1934	11.50 12.70	31,600 20,000	2/8/96	11.50	31,600	N	>100

Table 49. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Washington.—Continued

[mi^2, square miles; ft, feet above an arbitrary datum; ft^3/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. 60)	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)
14236200	Tilton River above Bear Canyon Creek near Cinebar, WA	141	1957–98	1996	17.90	27,100	2/8/96	17.90	27,100	N	50–100
14238000	Cowlitz River below Mayfield Dam, WA	1,400	1912, 1935–98	1996	26.19	68,400	11/28/95	26.19	68,400	Y	--
14241500	South Fork Toutle River at Toutle, WA	120	1940–57, 1996–98	1997 1954	27.01 58.91	15,500 14,300	1/1/97	27.01	15,500	N	--
14242580	Toutle River at Tower Road near Silver Lake, WA	496	1982–98	1996 1983	24.91 28.03	61,800 38,000	2/8/96	24.91	61,800	N	--
14243000	Cowlitz River at Castle Rock, WA	2,238	1927–98	1934 1998	31.60 41.30	139,000 30,800	2/8/96	32.11	112,000	Y	>100
14243500	Delameter Creek near Castle Rock, WA	19.6	1950–69, 1996	1996 1963	-- 6.53	3,500 2,420	2/8/96	--	3,500	N	50–100
14245000	Coweman River near Kelso, WA	119	1950–84, 1996	1996 1978	-- 14.67	11,700 9,940	2/8/96	--	11,700	N	50–100

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

West Virginia

Excessive rains of 2 to 5 inches fell mainly over central and northern West Virginia during February 8–9, 1994 (National Oceanic and Atmospheric Administration, 1994a). Small-stream flooding was widespread late on the night of February 8–9. Moderate to major river flooding occurred along the Tygart Valley, Buckhannon, Cheat, and West Fork Little Kanawha Rivers (fig. 61). The crest on the Tygart Valley River at Philippi (streamgage 03054500, table 50) reached 27.13 feet on February 9, the second highest stage in the 20th century. Damage was more than $6 million (National Oceanic and Atmospheric Administration, 1994b).

A stationary front, combined with an upper level disturbance, caused excessive rains across southern West Virginia on June 27–28, 1995. Six inches of rain caused severe flooding and flash flooding near Summersville (National Oceanic and Atmospheric Administration, 1995a). Four to 6 inches of rain near Princeton flooded and washed out many roads and bridges, stranded motorists in their vehicles, caused mud slides, damaged and destroyed crops, and damaged buildings. Total damage was more than $8 million (National Oceanic and Atmospheric Administration, 1995b).

On January 19, 1996, a combination of unseasonably warm, humid air over a dense snowpack, estimated between 12 and 18 inches and as much as 2 feet at higher elevations (National Oceanic and Atmospheric Administration, 1996a), caused nearly all of the snow to melt in a 12-hour period. The unseasonably warm air was drawn northward around the circulation of a deepening storm west of the Appalachian Mountains on January 18–19. The melting snow, combined with downpours, produced serious flooding over West Virginia. The most serious flooding was reported in the upstream reaches of the Potomac River. Total damage from this flood was estimated to be more than $61 million (National Oceanic and Atmospheric Administration, 1996b). There was one death. The Cheat River, in the northern mountains of West Virginia and one of the flashiest rivers in the country, was the first river to reach flood stage during this widespread flood. Flooding from the Allegheny and Monongahela Rivers in Pennsylvania, met nearly simultaneously in Pittsburgh, Pennsylvania, and then flowed down the Ohio River. Widespread 1- to 2-inch rains, plus runoff from snowmelt in the West Virginia and Maryland mountains, combined to create major flooding along the Ohio River. Six streamgages recorded their highest discharge for their periods of record in West Virginia (table 50) in January 1996. The flood-control projects held water back from the main-stem Ohio River to help reduce flood damage there.

On May 15–16, 1996, training thunderstorms, producing rainfall totals of 2.5 to 3.5 inches in 6 hours (National Oceanic and Atmospheric Administration, 1996a), moved southeast across southern West Virginia. A 57-year-old woman from Whitman died when she tried to leave her home and wade through the floodwaters. Two other women drowned trying to flee their flooded home in Cassity. The Tygart Valley River had significant floods (table 50). Most of the more than $7 million in damage across southern West Virginia was caused by the floodwaters from small streams and creeks (National Oceanic and Atmospheric Administration, 1996b).

Excessive rainfall associated with the remnants of Hurricane Fran on September 6, 1996, caused considerable and in some cases record flooding along rivers and tributaries in the Potomac River Basin. A thin band of 11 to 14 inches of rain (National Oceanic and Atmospheric Administration, 1996a) falling along higher ridges ran off into the South Branch Potomac River. Damage was excessive, especially along the South Branch Potomac. The $5 million in reported property damage included $3.5 million to 227 residences and $1.5 million to public buildings. Two persons died from the floods (National Oceanic and Atmospheric Administration, 1996b).

Showers and thunderstorms hit the western lowlands three separate times during March 1–2, 1997. Rainfall totals of 5 to 7.5 inches were measured (National Oceanic and Atmospheric Administration, 1997a). The full spectrum of flooding occurred. Sixteen West Virginia counties were declared Federal disaster areas. There was more than $13 million in property damage, and three persons drowned in the flooding (National Oceanic and Atmospheric Administration, 1997b).

A series of thunderstorms produced flash floods across central and north-central West Virginia during June 27–30, 1998. Nearly $30 million in damage and two deaths resulted from the flash floods (National Oceanic and Atmospheric Administration, 1998b).

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.

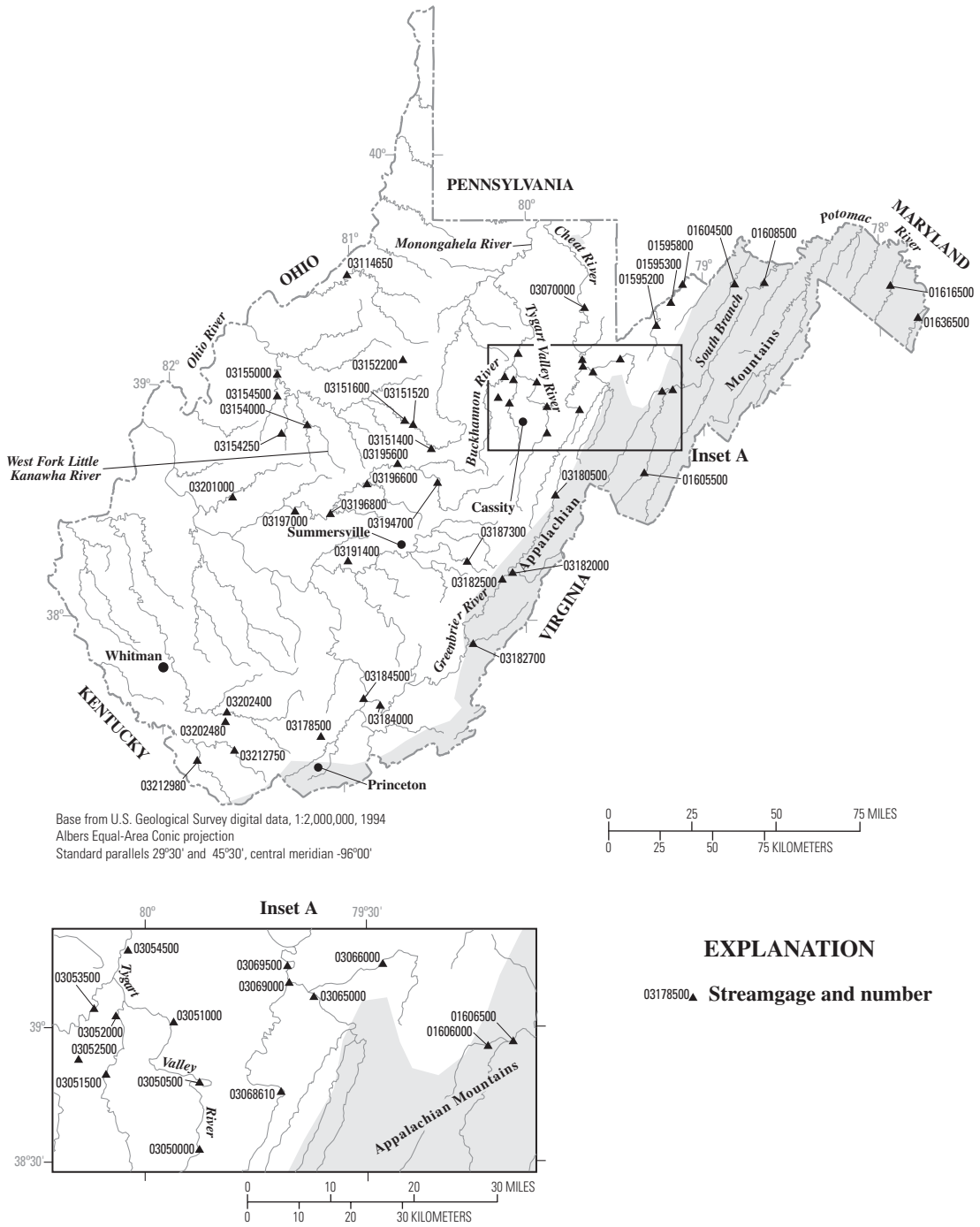

Figure 61. Location of streamgages with significant floods during 1994–98 water years for West Virginia.

Table 50. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in West Virginia.

[mi^2, square miles; ft, feet above an arbitrary datum; ft^3/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. 61)	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)
01595200	Stony River near Mount Storm, WV	249	1962–98	1986	16.41	14,000	9/6/96	12.55	7,750	Y	--
01595300	Abram Creek at Oakmont, WV	42.6	1955, 1957–82, 1996	1996 1955	-- 9.82	17,500 3,830	9/6/96	--	17,500	N	>500
01595800	North Branch Potomac River at Barnum, WV	266	1967–95, 1997–99	1978	13.37	27,100	3/30/95	8.92	8,830	Y	--
01604500	Patterson Creek near Headsville, WV	211	1939–98	1955 1943	12.20 13.00	16,000 15,300	1/19/96	11.97	14,400	N	25–50
01605500	South Branch Potomac River at Franklin, WV	179	1936, 1941–69, 1977–98	1986	22.58	44,000	9/6/96	19.16	34,000	N	200
01606000	North Fork South Branch Potomac River at Cabins, WV	335	1936, 1940–80, 1986, 1996	1986 1949	-- 18.00	90,000 50,000	9/6/96	--	8,000	N	2
01606500	South Branch Potomac River near Petersburg, WV	676	1878, 1924, 1929–98	1986 1949	21.80 22.83	130,000 62,000	9/6/96	22.20	113,000	N	200–500
01608500	South Branch Potomac River near Springfield, WV	1,486	1878, 1900–01, 1904–06, 1929–98	1986	44.22	240,000	9/7/96	34.98	147,000	N	50–100
01616500	Opequon Creek near Martinsburg, WV	273	1906, 1936, 1948–98	1996	18.76	23,400	1/20/96	18.76	23,400	N	50
01636500	Shenandoah River at Millville, WV	3,022	1870, 1896–98, 1900–01, 1903–08, 1924, 1929–98	1943	32.40	230,000	9/8/96	26.84	156,000	N	50–100

Table 50. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in West Virginia.—Continued

[mi^2, square miles; ft, feet above an arbitrary datum; ft^3/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. 61)	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)
03050000	Tygart Valley River near Dailey, WV	185	1916–76, 1986, 1989–98	1986 1932	16.60 17.20	22,000 13,100	5/17/96 6/19/98	15.65 14.65	19,900 15,900	N N	100–200 50
03050500	Tygart Valley River near Elkins, WV	271	1945–98	1986	22.81	23,500	5/17/96	18.66	14,500	N	25–50
03051000	Tygart Valley River at Belington, WV	406	1888, 1908–98	1986	23.65	29,500	2/9/94 5/17/96	19.64 20.19	20,000 21,200	N N	25–50 50
03051500	Middle Fork River at Midvale, WV	122	1916–42, 1986, 1996	1986 1939	-- 18.50	14,000 11,400	5/17/96	--	14,000	N	50–100
03052000	Middle Fork River at Audra, WV	148	1943–79, 1986, 1989–98	1986	15.80	17,100	5/17/96	15.60	16,700	N	50–100
03052500	Sand Run near Buckhannon, WV	14.3	1947–98	1986	8.34	3,200	2/9/94 5/17/96	7.18 7.98	2,120 2,860	N N	10–25 50
03053500	Buckhannon River at Hall, WV	277	1908, 1916–98	1986	16.88	15,000	2/9/94	15.59	13,300	N	25
03054500	Tygart Valley River at Philippi, WV	914	1912, 1941–98	1986	31.83	61,000	2/9/94 5/17/96	27.13 27.50	47,400 48,400	N N	50 50–100
03065000	Dry Fork at Hendricks, WV	349	1941–98	1986	20.74	100,000	1/19/96	14.17	41,000	N	25–50
03066000	Blackwater River at Davis, WV	85.9	1922–98	1986	17.67	12,500	2/9/94	13.60	7,660	N	25–50
03068610	Taylor Run at Bowden, WV	5.06	1974–82, 1992–98	1996	8.00	600	7/31/96	8.00	600	N	25
03069000	Shavers Fork at Parsons, WV	213	1888, 1907, 1911–26, 1941–98	1986	19.86	43,000	5/17/96	14.02	22,500	N	50
03069500	Cheat River near Parsons, WV	722	1844, 1888, 1914–98	1986	24.30	170,000	1/19/96	19.84	90,100	N	100

Table 50. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in West Virginia.—Continued

[mi^2, square miles; ft, feet above an arbitrary datum; ft^3/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. 61)	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)
03070000	Cheat River at Rowlesburg, WV	939	1844, 1888, 1921, 1924–96	1986	34.91	190,000	1/19/96	25.88	114,000	N	100
03114650	Buffalo Run near Little, WV	4.19	1969–77, 1994–98	1996 1998	12.53 13.30	2,420 1,900	7/19/96	12.53	2,420	N	50–100
03151400	Little Kanawha River near Wildcat, WV	112	1975–83, 1986–98	1996	18.47	19,600	7/31/96	18.47	19,600	N	200–500
03151520	Little Kanawha River below Burnsville Dam, WV	163	1977–98	1996 1977	8.19 58.81	2,540 2,530	8/6/96	8.19	2,540	Y	--
03151600	Little Kanawha River at Burnsville, WV	248	1975–83, 1994–98	1996	14.82	6,100	7/31/96	14.82	6,100	Y	--
03152200	Buck Run near Leopold, WV	2.91	1970–77, 1994–98	1998	11.45	1,290	6/28/98	11.45	1,290	N	200–500
03154000	West Fork Little Kanawha River at Rocksdale, WV	205	1929–31, 1938–98	1939 1997	30.30 31.55	20,200 15,000	3/2/97	31.55	15,000	N	25
03154250	Tanner Run at Spencer, WV	2.82	1970–77, 1994–98	1995	8.20	1,520	5/14/95	8.20	1,520	N	50–100
03154500	Reedy Creek near Reedy, WV	79.4	1952–78, 1997	1997	15.37	7,260	3/--/97	15.37	7,260	N	10–25
03155000	Little Kanawha River at Palestine, WV	1,516	1897, 1916–22, 1939–98	1939 1967	32.25 39.14	53,000 50,700	3/2/97	--	48,100	Y	10–25
03178500	Camp Creek near Camp Creek, WV	32.0	1947–71, 1994–98	1996	6.77	5,610	1/19/96	6.77	5,610	N	100
03180500	Greenbrier River at Durbin, WV	133	1944–98	1986	15.82	37,100	5/18/96	15.52	35,600	N	>500
03182000	Knapp Creek at Marlinton, WV	108	1946–58, 1986, 1989, 1994–98	1996	19.55	22,000	1/19/96	19.55	22,000	N	200–500
03182500	Greenbrier River at Buckeye, WV	540	1930–98	1986	23.20	82,000	1/19/96	20.93	61,500	N	100–200

Table 50. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in West Virginia.—Continued

[mi^2, square miles; ft, feet above an arbitrary datum; ft^3/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. 61)	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)
03182700	Anthony Creek near Anthony, WV	144	1972–82, 1996	1996	21.35	27,400	1/23/96	21.35	27,400	N	200–500
03184000	Greenbrier River at Hilldale, WV	1,619	1936–98	1996	26.88	93,000	1/20/96	26.88	93,000	N	100–200
03184500	New River at Hinton, WV	6,256	1937–98	1940	18.97	246,000	1/20/96	10.68	91,700	Y	--
03187300	North Fork Cranberry River near Hillsboro, WV	9.78	1969–82, 1994–98	1996	6.20	2,300	1/19/96	6.20	2,300	N	50
03191400	Laurel Creek near Summersville, WV	4.28	1966–77, 1994–98	1995	13.20	1,900	6/27/95	13.20	1,900	N	500
03194700	Elk River below Webster Springs, WV	266	1861, 1896, 1930–83, 1986–98	1986 1861	17.20 26.34	38,000 --	1/19/96	15.14	28,600	N	50
03195600	Granny Creek at Sutton, WV	6.98	1966–77, 1994–98	1994	14.91	1,650	5/7/94	14.91	1,650	N	50
03196600	Elk River near Frametown, WV	751	1959–98	1996	20.39	30,300	7/31/96 3/1/97	20.39 16.65	30,300 22,800	Y Y	-- --
03196800	Elk River at Clay, WV	992	1916–98	1967	22.80	48,000	3/1/97	21.98	45,100	Y	--
03197000	Elk River at Queen Shoals, WV	1,145	1918, 1929–98	1932 1918	29.20 37.20	72,000 --	3/2/97	25.36	47,000	Y	--
03201000	Pocatalico River at Sissonville, WV	238	1909–16, 1931, 1938–78, 1980, 1997–98	1939 1998	34.40 35.70	15,500 14,600	6/29/98	35.70	14,600	N	25–50
03202400	Guyandotte River near Baileysville, WV	306	1969–98	1977	26.89	36,700	5/16/96	22.18	22,500	N	10–25
03202480	Brier Creek at Fanrock, WV	7.34	1970–77, 1994–98	1996 1977	-- 7.29	1,200 980	5/16/96	--	1,200	N	25
03212750	Tug Fork at Welch, WV	174	1986–98	1996	13.23	6,550	5/16/96	13.23	6,550	N	10
03212980	Dry Fork at Beartown, WV	209	1986–98	1998	11.88	9,840	3/21/98	11.88	9,840	N	10–25

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

Wisconsin

Excessive rainfall from thunderstorms occurred September 15, 1994, across most of north-central Wisconsin and caused flooding on the Lily, Namekagon, Flambeau, and Spirit Rivers (fig. 62). Six streamgages recorded their highest discharges of record (table 51). Damage was more than $62 million (National Oceanic and Atmospheric Administration, 1994b).

Excessive rainfall of 4 to 8 inches fell across most of central and east-central Wisconsin, and parts of northeastern Wisconsin on June 16–18, 1996. Amounts during the 3-day period ranged from 2 to 7 inches in most areas (National Oceanic and Atmospheric Administration, 1996a). Runoff from the excessive rainfall caused rivers to rise, with several peaking well above flood stage. Property damage was more than $23 million, and crop damage estimates amounted to at least $56 million (National Oceanic and Atmospheric Administration, 1996b). Some of the larger lakes recorded their highest levels ever. Lake Monona and Lake Kegonsa eventually reached new record levels on June 19 (National Oceanic and Atmospheric Administration, 1996a). About 1,275 homes had varying amounts of flood damage as rains of 1 to 2 inches fell on saturated soil (National Oceanic and Atmospheric Administration, 1996a; 1996b), resulting in flash flooding in the Madison area. Emergency managers noted that this was the worst flash flooding seen in the Madison area for 30 years. On June 17, 4.51 inches of rain fell at the Madison airport, making it the wettest June day ever. A total of 13.52 inches of rain fell at Port Washington during June 16–18, with a 1-day record maximum rainfall of 7.68 inches occurring on June 18 (National Oceanic and Atmospheric Administration, 1996a).

In extreme southern Wisconsin, rainfall amounts during a 5-hour period on July 18, 1996, generally totaled 10 to 12 inches. As much as 13.50 inches fell about 6 miles northwest of Monroe (National Oceanic and Atmospheric Administration, 1996a). A bridge west of Browntown was washed away as water depths on the road reached 4 feet. Damage was more than $6 million (National Oceanic and Atmospheric Administration, 1996b).

Severe flash flooding occurred in southeastern Wisconsin including Milwaukee as rainfall amounts of as much as 10 inches fell during a 30-hour period ending on June 21, 1997 (National Oceanic and Atmospheric Administration, 1997a). The flash flooding was greater than the 100-year flood (National Oceanic and Atmospheric Administration, 1997b). No one was injured or killed by the floodwaters, thanks to superb rescue efforts by local law enforcement officials and firefighters. About 9,600 homes in the county had minor damage, 137 had major damage, and 15 were destroyed. Property losses were more than $84 million (National Oceanic and Atmospheric Administration, 1997b). Four streamgages recorded their highest discharge ever during this flood (table 51). Areas along and near the Menomonee River experienced moderate to major flooding to nearby roads, homes, and businesses. In Menomonee Falls, several homes had significant structural damage, and about 50 homes had significant damage.

A series of slow-moving thunderstorms produced a total of 6 to 10 inches of rainfall (National Oceanic and Atmospheric Administration, 1998a) and caused flash flooding as they moved through the Janesville and Milton areas on August 5, 1998. Flash floods also hit the area from Sheboygan Falls to Sheboygan during the early morning hours of August 5. Sheboygan had the worst flooding, with estimated damage of about $6 million to roads and bridges. The city school district suffered damage of $1.2 million (National Oceanic and Atmospheric Administration, 1998b).

Flash floods ravaged parts of Milwaukee and the counties to the west during the afternoon and evening hours of August 6, 1998. For Milwaukee, it was the second year in row for devastating floods. The damage was not as bad as that in June 1997, but for the county to the west it was the worst flooding ever. The flash flood was the result of 5 to 9 inches of rain falling in addition to 1 to 3 inches that fell during the previous 2 days. Maximum storm rainfall was 8.90 inches in Milwaukee (National Oceanic and Atmospheric Administration, 1998a). Damage was more than $82 million (National Oceanic and Atmospheric Administration, 1998b). One 13-year-old boy was injured as he was swept into a culvert and submerged for 15 minutes by floodwaters.

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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 62. Location of streamgages with significant floods during 1994–98 water years for Wisconsin.

Table 51. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Wisconsin.

[mi^2, square miles; ft, feet above an arbitrary datum; ft^3/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. 62)	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)
04063700	Popple River near Fence, WI	139	1964–98	1979 1996	4.52 4.70	1,640 1,490	4/26/96	4.70	1,490	N	30–50
04067760	Peshtigo River near Cavour, WI	150	1970–98	1996	15.78	1,600	4/21/96	15.78	1,600	N	20–30
04069700	North Branch Oconto River near Wabeno, WI	34.1	1970–98	1996	14.21	621	4/20/96	14.21	621	N	100
04071800	Pensaukee River near Pulaski, WI	48.8	1961–93, 1995–98	1996 1973	16.96 17.10	1,810 1,700	6/18/96	16.96	1,810	N	25
04074850	Lily River near Lily, WI	45.6	1970–76, 1978–98	1994 1975	10.55 11.00	173 158	9/15/94	10.55	173	N	10–20
04074950	Wolf River at Langlade, WI	463	1968–79, 1981–98	1996	10.40	2,440	4/26/96	10.40	2,440	N	30–50
04078500	Embarrass River near Embarrass, WI	384	1920–85, 1994–98	1965	12.13	7,080	6/19/96	10.81	4,830	N	10–20
04079700	Spaulding Creek near Big Falls, WI	5.57	1959–98	1960	11.64	101	6/18/96	11.56	93	N	25
04086000	Sheboygan River at Sheboygan, WI	418	1917–23, 1951–98	1998	12.02	7,820	8/6/98	12.02	7,820	N	25–30
04086600	Milwaukee River near Cedarburg, WI	607	1982–98	1996	12.88	5,500	6/18/96	12.88	5,500	N	10–25
04087000	Milwaukee River at Milwaukee, WI	696	1915–98	1997	10.00	16,500	6/21/97	10.00	16,500	N	>100
04087030	Menomonee River at Menomonee Falls, WI	34.7	1975–77, 1980–98	1997	8.31	1,500	6/21/97	8.31	1,500	N	25–50
04087088	Underwood Creek at Wauwatosa, WI	18.2	1979–98	1998	13.10	7,500	8/6/98	13.10	7,500	N	50–100
04087100	Honey Creek at Milwaukee, WI	3.26	1959–98	1997	22.70	1,100	6/21/97	22.70	1,100	N	75–100
04087120	Menomonee River at Wauwatosa, WI	123	1962–98	1997	18.64	13,500	6/21/97	18.64	13,500	N	30–50

Table 51. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Wisconsin.—Continued

[mi^2, square miles; ft, feet above an arbitrary datum; ft^3/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. 62)	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)
04087204	Oak Creek at South Milwaukee, WI	25.0	1964–98	1986	9.88	1,140	6/21/97	9.71	1,110	N	30–50
05332500	Namekagon River near Trego, WI	488	1928–70, 1988–98	1941	--	5,200	9/17/94	--	3,060	Y	25–30
05356500	Chippewa River near Bruce, WI	1,650	1914–98	1994 1941	18.12 20.46	29,000 25,800	9/17/94	18.12	29,000	Y	>100
05357360	Bear River near Powell, WI	120	1970–98	1996	13.06	730	4/26/96	13.06	730	N	10–25
05359600	Price Creek near Phillips, WI	16.9	1958–98	1994	17.43	552	9/15/94	17.43	552	N	>100
05360500	Flambeau River near Bruce, WI	1,860	1952–98	1994	12.44	24,100	9/16/94 4/21/96	12.44 10.56	24,100 17,900	Y Y	60–70 15–20
05361400	Hay Creek near Prentice, WI	22.6	1961–98	1994 1967	15.39 15.41	1,650 975	9/16/94	15.39	1,650	N	>100
05361420	Douglas Creek near Prentice, WI	25.2	1970–98	1994	17.66	1,620	9/15/94	17.66	1,620	N	>100
05370900	Spring Creek near Durand, WI	6.45	1962–98	1975	15.71	860	7/7/94	14.10	450	N	10–20
05382200	French Creek near Ettrick, WI	14.7	1960–71, 1989–98	1998 1967	12.14 13.07	2,450 1,300	6/27/98	12.14	2,450	N	25–50
05393500	Spirit River at Spirit Falls, WI	81.6	1942–98	1942	10.00	4,180	9/15/94	8.66	3,990	N	75–100
05395100	Trappe River tributary near Merrill, WI	1.58	1959–98	1995	17.79	396	8/15/95	17.79	396	N	20–25
05397600	Big Sandy Creek near Wausau, WI	11.5	1959–98	1959	15.18	2,120	8/15/95	14.46	1,600	N	30–40
05406491	Garfoot Creek near Cross Plains, WI	5.39	1985–86, 1990–98	1998 1993	6.78 7.57	212 111	3/31/98	6.78	212	N	50–100
05429500	Yahara River near McFarland, WI	327	1931–71, 1974–98	1959 1996	5.82 6.66	867 778	6/19/96	6.66	778	Y	50–60

Table 51. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Wisconsin.—Continued

[mi^2, square miles; ft, feet above an arbitrary datum; ft^3/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. 62)	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)
05431022	Delavan Lake outlet at Borg Road near Delavan, WI	42.1	1984–98	1994 1998	8.27 8.35	473 325	2/22/94	8.27	473	N	10–25
05432300	Rock Branch near Mineral Point, WI	4.83	1959–98	1993	22.63	3,100	5/24/94	17.74	1,570	N	25–35
05433500	Yellowstone River near Blanchardville, WI	28.5	1955–73, 1975–98	1990	11.40	8,500	6/17/96	10.74	5,100	N	10–15

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

Wyoming

Early on the morning of June 7, 1994, 4 to 5 inches of rain fell southwest of Kaycee (National Oceanic and Atmospheric Administration, 1994a) causing flash flooding on the Middle Fork Powder River (fig. 63). Several ranches sustained damage to irrigation equipment and fences. Only minor structural damage was reported at Kaycee.

On June 14, 1995, prolonged flooding occurred in central Wyoming as warm temperatures in the mountains brought a rapid snowmelt. Streams in the Wind River Basin overflowed their banks and caused considerable flooding. The flooding at Riverton occurred on the far south side of town. There was one fatality due to the flooding (National Oceanic and Atmospheric Administration, 1995b).

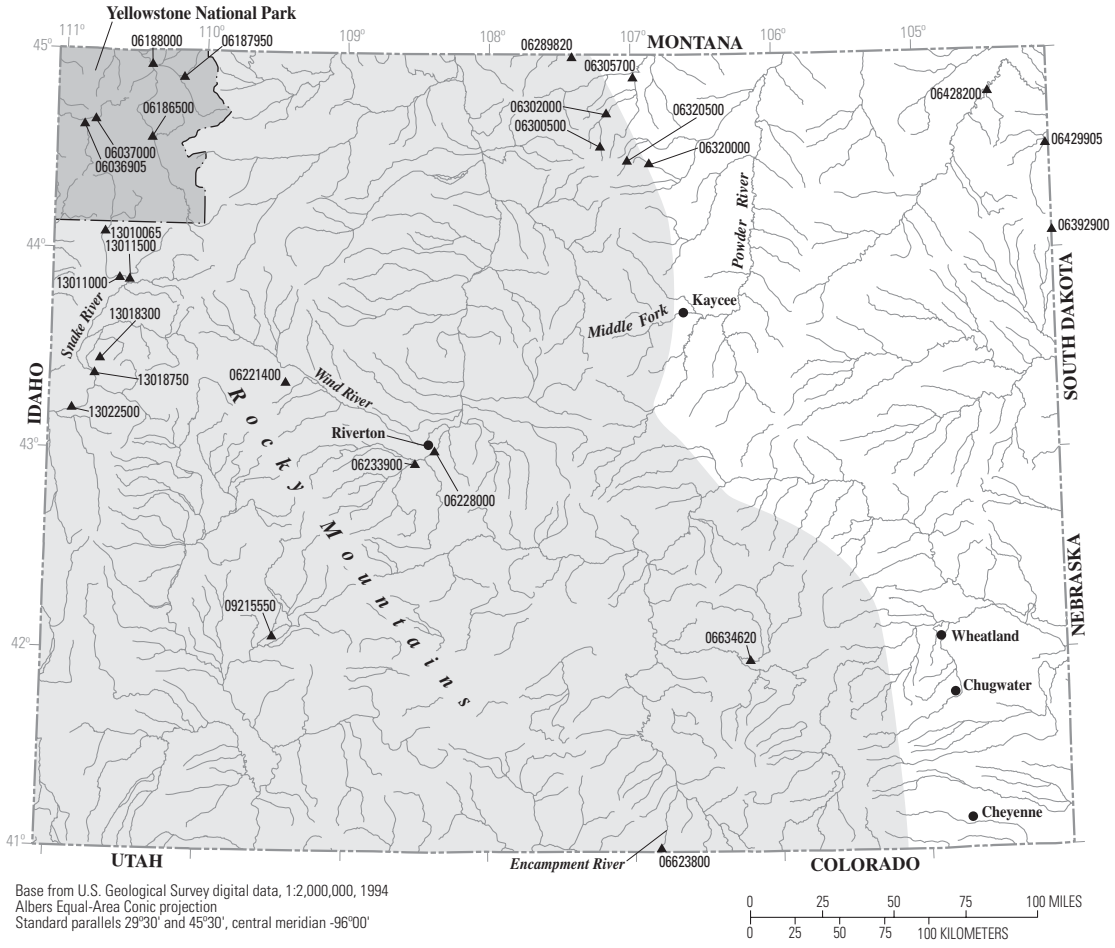
During snowmelt in May 1996 several rivers in Yellowstone National Park had their largest discharge of record (table 52). During July and August of 1996 several episodes of excessive rain caused by thunderstorms resulted in urban flooding in Cheyenne, Wheatland, and Chugwater.

Snowmelt in May and June 1997 caused significant flooding in Wyoming. The Snake River near Alpine, Wyoming (streamgage 13022500, table 52), had its largest discharge since 1937. Floods also occurred on the Wind River at Riverton (streamgage 06228000, table 52) and the Encampment River above Hog Park Creek near Encampment (streamgage 06623800, table 52).

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.



EXPLANATION

06623800▲ **Streamgage and number**

Figure 63. Location of streamgages with significant floods during 1994–98 water years for Wyoming.

Table 52. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Wyoming.

[mi^2, square miles; ft, feet above an arbitrary datum; ft^3/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. 63)	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)
06036905	Firehole River near West Yellowstone, MT	282	1984–96	1996	6.10	2,050	5/18/96	6.10	2,050	N	25–50
06037000	Gibbon River near West Yellowstone, MT	118	1984–96	1996	5.30	1,500	5/18/96	5.30	1,500	N	10–25
06186500	Yellowstone River at Yellowstone Lake outlet, Yellowstone National Park, WY	1,006	1923–82, 1984–86, 1989–98	1997	8.90	9,950	6/28/96 6/18/97	8.25 8.90	8,770 9,950	N N	25–50 50–100
06187950	Soda Butte Creek near Lamar Ranger Station, Yellowstone National Park, WY	99.0	1989–98	1996 1998	5.61 5.87	2,450 997	6/8/96	5.61	2,450	N	10–25
06188000	Lamar River near Tower Falls Ranger Station, Yellowstone National Park, WY	660	1923–69, 1985–86, 1989–98	1996	12.15	19,500	6/6/95 6/10/96 6/5/97	9.95 12.15 11.46	14,000 19,500 17,500	N N N	25–50 >100 100
06221400	Dinwoody Creek above lakes near Burris, WY	88.2	1918, 1956, 1958–78, 1989, 1997–98	1995 1963	4.50 4.57	1,510 1,270	7/13/95 6/9/97	4.50 4.35	1,510 1,490	N N	30–50 20–30
06228000	Wind River at Riverton, WY	2,309	1906, 1908, 1911–98	1935 1997	8.15 10.86	13,300 10,100	6/10/97	10.86	10,100	Y	20
06233900	Popo Agie River near Arapahoe, WY	796	1980–95	1995	10.22	4,760	6/17/95	10.22	4,760	Y	10–25
06289820	East Pass Creek near Dayton, WY	21.7	1983–98	1995 1997	4.47 6.45	511 117	5/9/95	4.47	511	Y	>50
06300500	East Fork Big Goose Creek near Big Horn, WY	20.1	1954–83, 1985–98	1963 1995	3.59 6.69	1,230 1,140	6/15/95	6.69	1,140	N	40–50

Table 52. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Wyoming.—Continued

[mi^2, square miles; ft, feet above an arbitrary datum; ft^3/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. 63)	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)
06302000	Big Goose Creek near Sheridan, WY	120	1930–98	1963	5.83	3,160	6/17/95	4.65	2,090	Y	30
06305700	Goose Creek near Acme, WY	411	1984–98	1995 1994	7.30 7.51	3,330 1,490	6/17/95	7.30	3,330	Y	75–100
06320000	Rock Creek near Buffalo, WY	60.0	1941–98	1997	8.80	2,080	6/8/97	8.80	2,080	Y	30–35
06320500	South Piney Creek at Willow Park, WY	33.6	1946, 1948–57, 1960–72, 1975–83, 1985–98	1963 1997	4.68 5.27	1,620 1,220	6/8/97	5.27	1,220	Y	35–50
06392900	Beaver Creek at Mallo Camp near Four Corners, WY	10.3	1975–80, 1982–83, 1991–96	1994 1975	2.14 5.40	103 21	4/22/94	2.14	103	N	15–30
06428200	Belle Fourche River near Alva, WY	2,948	1989–98	1995	6.76	2,690	5/8/95	6.76	2,690	Y	--
06429905	Sand Creek near Ranch A near Beulah, WY	267	1977–83, 1991–96	1995 1982	3.80 7.35	1,230 514	5/8/95	3.80	1,230	N	>50
06623800	Encampment River above Hog Park Creek near Encampment, WY	72.7	1965–98	1997 1970	4.94 5.01	1,490 1,180	6/2/97	4.94	1,490	N	10
06634620	Little Medicine Bow River at Boles Spring near Medicine Bow, WY	969	1984–97	1997	7.66	1,900	3/20/97	7.66	1,900	N	5
09215550	Big Sandy River below Farson, WY	1,097	1982–98	1995	7.44	1,400	6/18/95	7.44	1,400	Y	--
13010065	Snake River above Jackson Lake at Flagg Ranch, WY	486	1984–97	1996	10.75	15,000	6/5/96	10.75	15,000	N	10–25
13011000	Snake River near Moran, WY	807	1904–67, 1971–97	1918 1943	-- 11.63	15,100 13,300	6/11/97	10.96	12,100	Y	20

Table 52. Maximum stage and discharge for period of record for streamgages having significant floods during 1994–98 water years in Wyoming.—Continued

[mi^2, square miles; ft, feet above an arbitrary datum; ft^3/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. 63)	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)
13011500	Pacific Creek at Moran, WY	169	1918, 1945–75, 1978–97	1983 1997	6.33 7.56	5,350 4,890	6/5/97	7.56	4,890	N	40–60
13018300	Cache Creek near Jackson, WY	10.6	1945–98	1971 1996	3.90 4.30	225 166	6/10/96	4.30	166	N	20
13018750	Snake River below Flat Creek near Jackson, WY	2,627	1978–97	1997	11.66	32,000	6/11/97	11.66	32,000	Y	30–70
13022500	Snake River above reservoir near Alpine, WY	3,465	1937–38, 1953–67, 1971–97	1997 1974	-- 11.96	38,300 28,600	6/11/96 6/11/97	-- --	31,600 38,300	Y Y	20–30 100

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