

Summary of Surface-Water Hydrologic Conditions in New Jersey Water Year 2008

The United States Geological Survey (USGS), in cooperation with Federal, State, and local agencies, collects a large amount of data pertaining to the water resources of New Jersey each water year. These data, accumulated over many water years, constitute a valuable database for developing an improved understanding of the water resources of the State.

During water year 2008, the USGS New Jersey Water Science Center maintained and published records for 109 continuous-record discharge-gaging stations, 107 crest-stage partial-record stations, 24 continuous-record tidal gaging stations, 32 tidal crest-stage gages, 21 reservoirs, and 42 diversions. Discharge measurements also were made at 313 low-flow and miscellaneous sites during the water year. Published records are included in the report “Water Resources Data for the United States, Water Year 2008” and can be accessed online at <http://wdr.water.usgs.gov/>. The locations of continuous-record gaging stations in New Jersey are shown in figure 1.

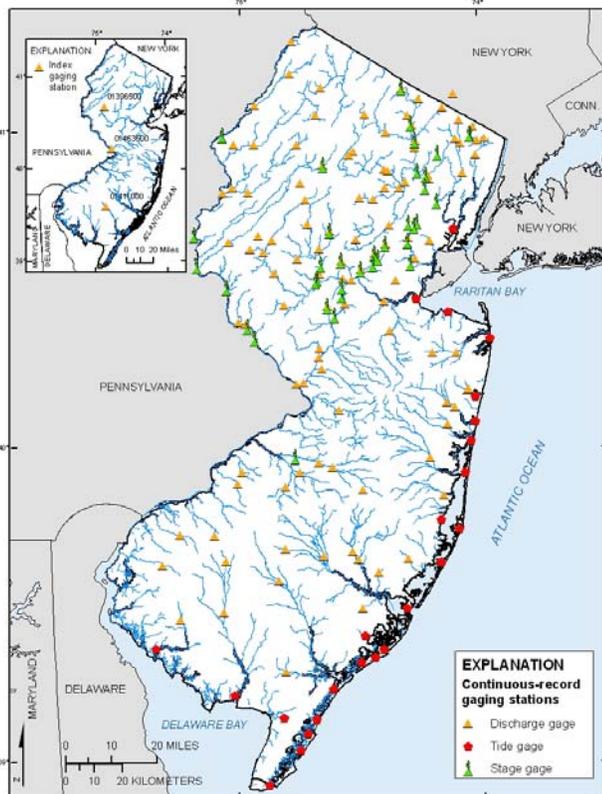


Figure 1. Locations of continuous-record gaging stations.

To demonstrate streamflow conditions in New Jersey during water year 2008, monthly and annual mean discharges at selected continuous gaging stations are compared to period of record monthly and annual means. Other flow characteristics discussed for selected sites include water year instantaneous peak flows with associated recurrence intervals and water year

lowest daily mean flow with associated percent flow duration. Monthly and annual precipitation data for New Jersey also are discussed.

Streamflow

Three gaging stations, located in north, central, and south New Jersey, on the South Branch Raritan River, the Delaware River, and the Great Egg Harbor River, respectively, are considered index stations for statewide streamflow conditions. A map with the locations of the index stations is shown in the inset in figure 1. Monthly mean discharges at the index station on the

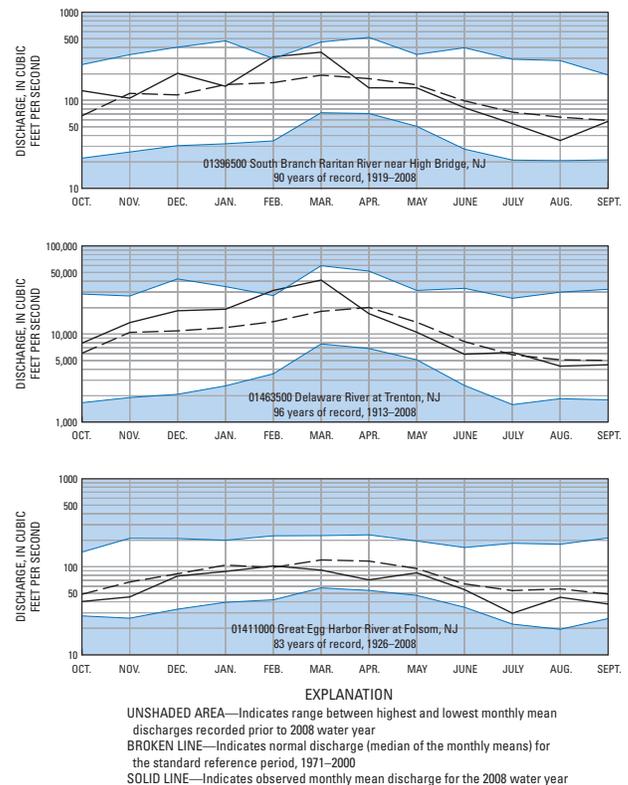


Figure 2. Monthly mean discharge at index gaging stations.

South Branch Raritan River were above average in October, December, February, and March; the rest of the water year the monthly mean discharges were near or below average (fig. 2). Monthly mean discharges at the index station on the Delaware River were above average during October through March and in July. Monthly mean discharges at the index station on the Great Egg Harbor River were near or below average the entire water year. Annual mean discharges at the index gaging stations located in north and central New Jersey were above the annual mean for the period of record, whereas the annual mean discharge at the index gaging station located in south New

Jersey was below the annual mean for the period of record (fig. 3). This marks the first time in 6 years that one of these index stations had an annual mean discharge that was below the annual mean for the period of record.

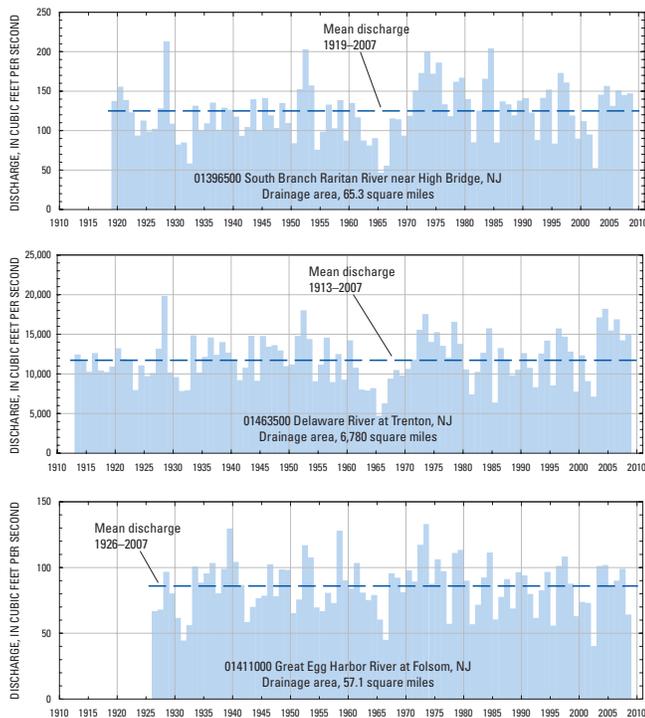


Figure 3. Annual mean discharge at index gaging stations.

Streamflow at the index station in northern New Jersey (South Branch Raritan River near High Bridge) averaged 147 ft³/s for the water year, which is 120 percent of the 1919-2007 average. Peak flow for the water year was 2,810 ft³/s on March 9; 20 percent annual probability of exceedance. The lowest daily mean flow was 26 ft³/s, recorded on September 4 and 5, which is about the 97-percent flow duration.

Streamflow at the index station in central New Jersey (Delaware River at Trenton) averaged 15,010 ft³/s for the water year, which is 127 percent of the 1913-2007 average. Peak flow for the water year was 108,000 ft³/s on March 10; 33 percent annual probability of exceedance. The lowest daily mean flow was 3,000 ft³/s, recorded on October 8, which is about the 92-percent flow duration. The Delaware River is substantially regulated by reservoirs and diversions.

Streamflow at the index station in southern New Jersey (Great Egg Harbor River at Folsom) averaged 64.2 ft³/s for the water year, which is 75 percent of the 1925-2007 average. Peak flow for the water year was 170 ft³/s on February 16; 50 percent annual probability of exceedance. The lowest daily mean flow was 18 ft³/s, recorded August 7, which is less than the 99-percent flow duration.

There were several floods and flash floods during the 2008 water year primarily due to heavy rainfall. Some snowmelt during the winter months may have exacerbated the flooding especially in the northern counties. The dates of the events and the affected counties, as documented by the National Oceanic and Atmospheric Administration’s National Weather Service (NWS) (<http://www4.ncdc.noaa.gov/cgi-win/wwwcgi.dll?wwevent~storms>), are listed in table 1. Most of the 23 reports of flooding by date were a result of isolated summertime

thunderstorms that only affected one or two counties. The most widespread reports of flooding in the 2008 water year occurred on February 13-14, March 8-9, and September 6-7. Counties in the northern half of the State were hardest hit for all three of these events. Tropical Storm Hanna was responsible for the heavy rain and flooding on September 6-7, which had the most impressive precipitation total, but occurred during a relatively dry stretch when streams were at base flow, somewhat reducing the affects of flooding. Although there were several documented flood events and some abnormally dry conditions, this water year was a relatively average year for streamflow.

Table 1. Floods and flash floods (excluding coastal floods) in New Jersey in water year 2008, by date and county. (From the National Oceanic and Atmospheric Administration’s National Weather Service at <http://www4.ncdc.noaa.gov/cgi-win/wwwcgi.dll?wwevent~storms>)

Date	Location by County
Oct 11, 2007	Union
Oct 27, 2007	Hunterdon, Somerset
Dec 23, 2007	Bergen, Morris, Somerset
Feb 1, 2008	Passaic, Somerset
Feb 13, 2008	Bergen, Hudson, Hunterdon, Morris, Passaic, Somerset, Sussex, Union, Warren
Feb 18, 2008	Morris
Mar 5, 2008	Morris, Somerset, Sussex, Warren
Mar 8, 2008	Bergen, Camden, Essex, Hunterdon, Mercer, Morris, Somerset, Warren
Mar 20, 2008	Somerset
Jun 14, 2008	Monmouth
Jun 22, 2008	Bergen
Jun 29, 2008	Middlesex
Jul 6, 2008	Burlington
Jul 8, 2008	Sussex
Jul 23, 2008	Bergen, Essex
Aug 2, 2008	Bergen
Aug 6, 2008	Bergen
Aug 10, 2008	Gloucester, Salem
Aug 11, 2008	Bergen, Essex, Union
Aug 15, 2008	Bergen
Sep 6, 2008	Bergen, Burlington, Essex, Hudson, Middlesex, Morris, Passaic, Union, Warren
Sep 9, 2008	Bergen, Camden, Middlesex, Morris, Somerset
Sep 28, 2008	Middlesex

The Office of the New Jersey State Climatologist reported that precipitation for November, January, April, June, July, and August were ranked as the 32nd, 20th, 37th, 49th, 36th, and 17th driest, respectively, for the period of record (table 2). The Office of the New Jersey State Climatologist Drought Severity scale ranges from D0 (abnormally dry) to D4 (exceptional drought). The southern half of New Jersey was classified moderate drought (D1) to abnormally dry (D0) from October to early December. Extreme southern New Jersey was classified abnormally dry (D0) through the middle of February. The northwest portion of New Jersey was classified abnormally dry (D0) from the middle of June through the middle of July. The central and southern portions of the State were primarily classified as abnormally dry (D0) from late July through September with a short period of moderate drought (D1) in extreme southern New Jersey in early September; however no drought warnings were issued by the State of New Jersey during water year 2008.

Table 2. Ranking of monthly precipitation values in New Jersey for water year 2008 in relation to water years 1896-2008 (113 years of record). Monthly precipitation are spatially weighted averages from many stations throughout the State. (From the Office of the New Jersey State Climatologist at http://climate.rutgers.edu/stateclim_v1/data/njihistprecip.html)

Month of water year	Total precipitation, in inches	Ranking
Oct 2007	5.23	20 th wettest
Nov 2007	2.15	32 nd driest
Dec 2007	5.54	15 th wettest
Jan 2008	2.19	20 th driest
Feb 2008	5.13	9 th wettest
Mar 2008	3.75	57 th wettest/driest
Apr 2008	2.91	37 th driest
May 2008	4.63	29 th wettest
Jun 2008	3.34	49 th driest
Jul 2008	3.65	36 th driest
Aug 2008	2.53	17 th driest
Sep 2008	6.27	11 th wettest

Annual mean discharges for water year 2008 and mean annual discharges for the period of record at 48 selected gaging stations that had 40 years or more of continuous record are shown in table 3. The differences in annual mean discharges for water year 2008 are listed as percent difference and range from -34.9 to 45.7 percent. All of the sites with annual mean discharges greater than the period of record mean are located in the northern half of the State, whereas most of the sites with annual mean discharges below the period of record mean are located in the southern half of the state (fig. 4). Annual mean

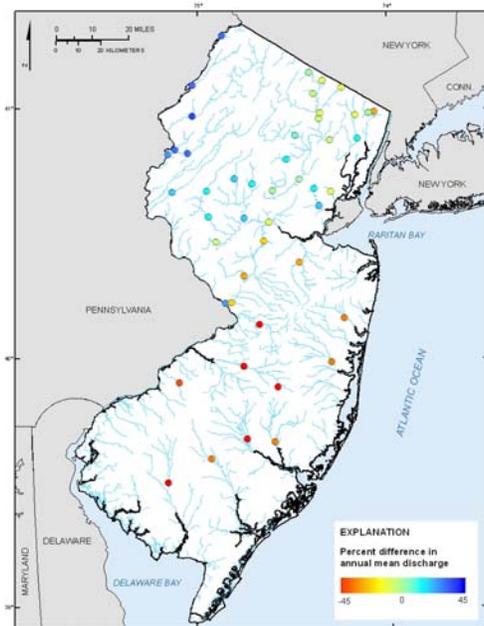


Figure 4. Percent differences between annual mean discharges for water year 2008 and annual mean discharges for the period of record at selected streamflow-gaging stations with 40 years or more of continuous record.

discharges at 27 of the 48 selected gaging stations were above the historical mean for water years 2003-08, marking the sixth consecutive water year during which most of the selected sites had annual mean discharges that exceeded the historical mean.

Several gaging stations that monitor heavily regulated rivers were not included in this comparison because of large artificial deficits related to regulation. The criterion of assessing gaging stations with 40 years or more of record was used in order to encompass at least one of the approximately 30-year drought cycles that New Jersey has experienced.

Precipitation

Monthly spatially weighted average-precipitation values determined using data from several dozen stations throughout New Jersey, along with the statewide long-term monthly means (water years 1896-2007), can be accessed at http://climate.rutgers.edu/stateclim_v1/data/njihistprecip.html. For water year 2008, the spatially weighted values for 5 of 12 months were

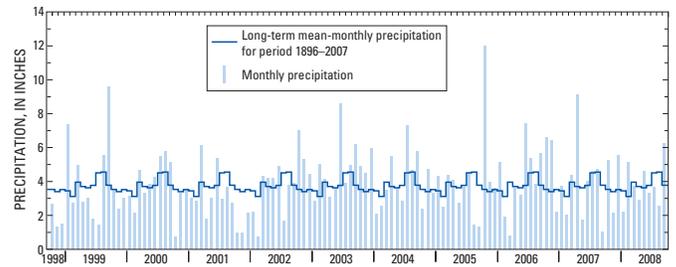


Figure 5. Monthly precipitation for water years 1997-2007 in New Jersey and long-term mean-monthly precipitation for period 1896-2006. (Long-term mean-monthly and monthly precipitation are spatially weighted averages for several dozen stations throughout the State).

above the long-term mean (October, December, February, May, and September, as shown in figure 5). Water year 2008 was the 38th wettest for the period of record. The statewide weighted average-precipitation total for water year 2008 was 47.32 inches, which is 2.26 inches more than the long-term mean-annual precipitation for water years 1896 to 2007. The average annual precipitation for New Jersey is approximately 45 inches. During

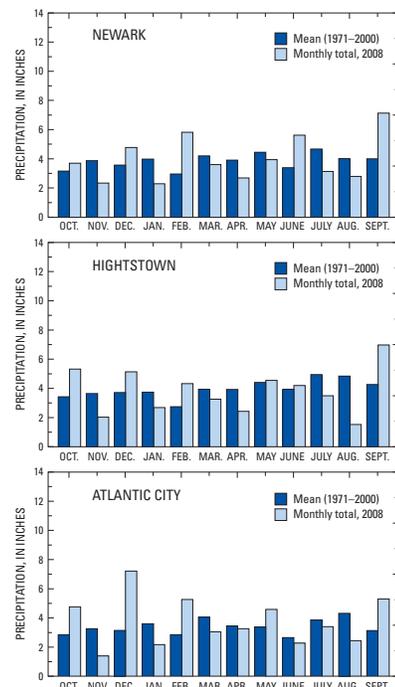


Figure 6. Monthly precipitation at three National Weather Service stations.

Table 3. Annual mean discharges for water year 2008 and mean annual discharges for the period of record at selected gaging stations with 40 years or more of continuous record. [ft³/s, cubic feet per second; mi², square miles]

Station number	Station name	Drainage area (mi ²)	Number of years of record	Annual mean	Mean annual	Percent difference
				discharge for 2008 water year (ft ³ /s)	discharge for period of record (ft ³ /s)	
01377000	Hackensack River at Rivervale, NJ	58.0	67	71.6	87.2	-17.9
01377500	Pascack Brook at Westwood, NJ	29.6	74	57.2	54.4	5.1
01379000	Passaic River near Millington, NJ	55.4	87	97.8	91.6	6.8
01379500	Passaic River near Chatham, NJ	100	80	185	173	6.9
01380500	Rockaway River above reservoir, at Boonton, NJ	116	71	256	231	10.8
01381500	Whippany River at Morristown, NJ	29.4	87	63.8	55.0	16.0
01382500	Pequannock River at Macopin Intake Dam, NJ	63.7	85	71.4	49.0	45.7
01383500	Wanaque River at Awosting, NJ	27.1	89	57.7	54.8	5.3
01384500	Ringwood Creek near Wanaque, NJ	19.1	67	33.5	33.6	-0.3
01386000	West Brook Near Wanaque	11.8	48	26.0	24.8	4.8
01387500	Ramapo River near Mahwah, NJ	120	89	226	230	-1.7
01388000	Ramapo River at Pompton Lakes, NJ	160	87	284	289	-1.7
01388500	Pompton River at Pompton Plains, NJ	355	69	513	501	2.4
01389500	Passaic River at Little Falls, NJ	762	110	1,195	1,143	4.5
01390500	Saddle River at Ridgewood, NJ	21.6	51	33.2	34.1	-2.6
01391500	Saddle River at Lodi, NJ	54.6	86	117	101	15.8
01393450	Elizabeth River at Ursino Lake, at Elizabeth, NJ	16.9	87	25.1	26.0	-3.5
01394500	Rahway River near Springfield, NJ	25.5	71	36.5	31.3	16.6
01395000	Rahway River at Rahway, NJ	40.9	86	61.0	50.3	21.3
01396500	South Branch Raritan River near High Bridge, NJ	65.3	90	147	123	19.5
01397000	South Branch Raritan River at Stanton, NJ	147	92	297	250	18.8
01398000	Neshanic River at Reaville, NJ	25.7	78	39.2	38.4	2.1
01398500	North Branch Raritan River near Far Hills, NJ	26.2	85	56.2	48.4	16.1
01399500	Lamington (Black) River near Pottersville, NJ	32.8	87	67.7	56.0	20.9
01400000	North Branch Raritan River near Raritan, NJ	190	85	379	314	20.7
01401000	Stony Brook at Princeton, NJ	44.5	55	57.1	67.7	-15.7
01402000	Millstone River at Blackwells Mills, NJ	258	87	339	386	-12.2
01403060	Raritan River below Calco Dam, at Bound Brook, NJ	785	70	1,194	1,204	-0.8
01405400	Manalapan Brook at Spotswood, NJ	40.7	51	51.9	62.3	-16.7
01408000	Manasquan River at Squankum, NJ	44.0	77	55.5	73.5	-24.5
01408500	Toms River near Toms River, NJ	123	80	159	211	-24.6
01409400	Mullica River near Batsto, NJ	46.7	51	68.4	105	-34.9
01410000	Oswego River at Harrisville, NJ	72.5	78	66.3	85.1	-22.1
01411000	Great Egg Harbor River at Folsom, NJ	57.1	83	64.2	85.2	-24.6
01411500	Maurice River at Norma, NJ	112	76	114	163	-30.1
01438500	Delaware River at Montague, NJ	3,480	69	7,618	5,828	30.7
01440000	Flat Brook near Flatbrookville, NJ	64.0	85	149	112	33.0
01443500	Paulins Kill at Blairstown, NJ	126	86	272	201	35.3
01445500	Pequest River at Pequest, NJ	106	87	212	160	32.5
01446000	Beaver Brook near Belvidere, NJ	36.7	44	71.6	54.6	31.1
01446500	Delaware River at Belvidere, NJ	4,535	86	10,380	7,986	30.0
01457000	Musconetcong River near Bloomsbury, NJ	141	91	299	242	23.6
01463500	Delaware River at Trenton, NJ	6,780	96	15,010	11,880	26.3
01464000	Assunpink Creek at Trenton, NJ	90.6	85	117	135	-13.3
01464500	Crosswicks Creek at Extonville, NJ	81.5	67	90.4	133	-32.0
01466500	McDonalds Branch in Byrne State Forest, NJ	2.35	54	1.41	2.12	-33.5
01467000	North Branch Rancocas Creek at Pemberton, NJ	118	87	116	170	-31.8
01467150	Cooper River at Haddonfield, NJ	17.0	44	23.1	32.8	-29.6

the 2008 water year, September had the highest monthly total with 6.72 inches of precipitation, and November had the lowest monthly total with 2.15 inches. At least 2 inches of precipitation was recorded every month during water year 2008. Rankings of monthly precipitation in New Jersey for water year 2008 in relation to the period of record, water years 1896-2008, are listed in table 2.

Three National Oceanic and Atmospheric Administration's National Weather Service (NWS) precipitation stations located in Newark, Hightstown, and Atlantic City have been selected as index sites for precipitation. Water year 2008 precipitation totals were above normal at the Atlantic City and Newark index sites and below normal at the index site in Hightstown. The Newark station recorded 47.92 inches, which is 1.67 inches above normal or 104 percent of the 30-year reference-period (1971-2000) mean. The Hightstown station recorded 46.06 inches, which is 1.62 inches below normal or 97 percent of the 30-year mean. The Atlantic City station recorded 45.15 inches, which is 4.56 inches above normal or 111 percent of the 30-year mean. Monthly precipitation at the three NWS stations, along with the 30-year mean, is shown in figure 6.

Access to USGS water data

The USGS New Jersey Water Science Center maintains a World Wide Web site, which has water-resource related information for New Jersey; the site can be accessed at <http://nj.usgs.gov/>. Links to other USGS and Federal web sites are also available. Information on the Water Resources Data for the United States, Water Year 2008, can be accessed online at <http://wdr.water.usgs.gov/>.

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