

# Summary of Surface-Water Hydrologic Conditions in New Jersey Water Year 2006

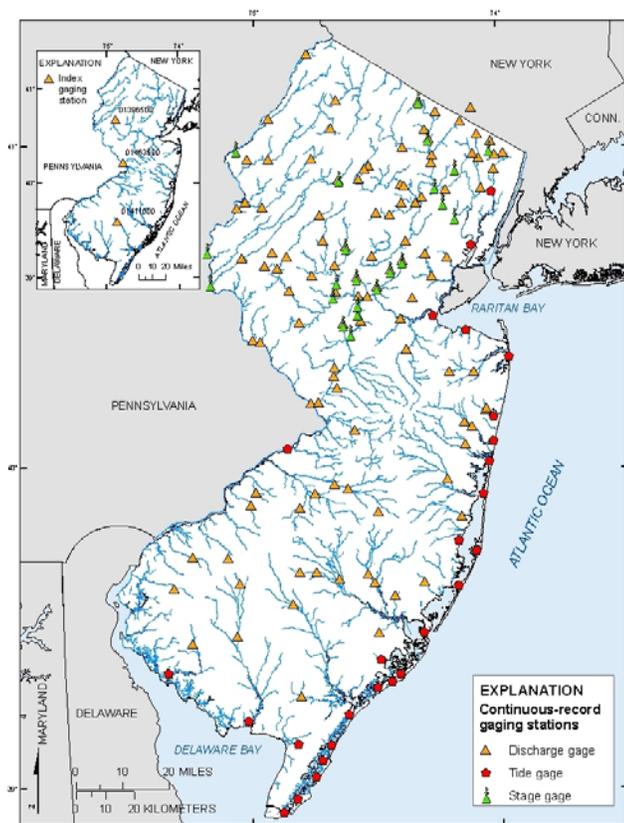
The U.S. Geological Survey (USGS), in cooperation with Federal, State, and local agencies, collects a large amount of data pertaining to the water resources in New Jersey each water year. These data, accumulated over many water years, constitute a valuable database for developing an improved understanding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

During water year 2006, the USGS New Jersey Water Science Center maintained and published records for 108 continuous discharge gaging stations, 114 crest-stage partial-record stations, 28 tidal gaging stations, 31 tidal crest-stage gages, 21 reservoirs, and 42 diversions. Discharge measurements were made at 298 low-flow and miscellaneous sites during the water year. Published records are included in Water Resources Data for the United States, Water Year 2006 and can be accessed online at <http://pubs.water.usgs.gov/wdr2006>. The locations of continuous-record gaging stations in New Jersey are shown in figure 1.

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.

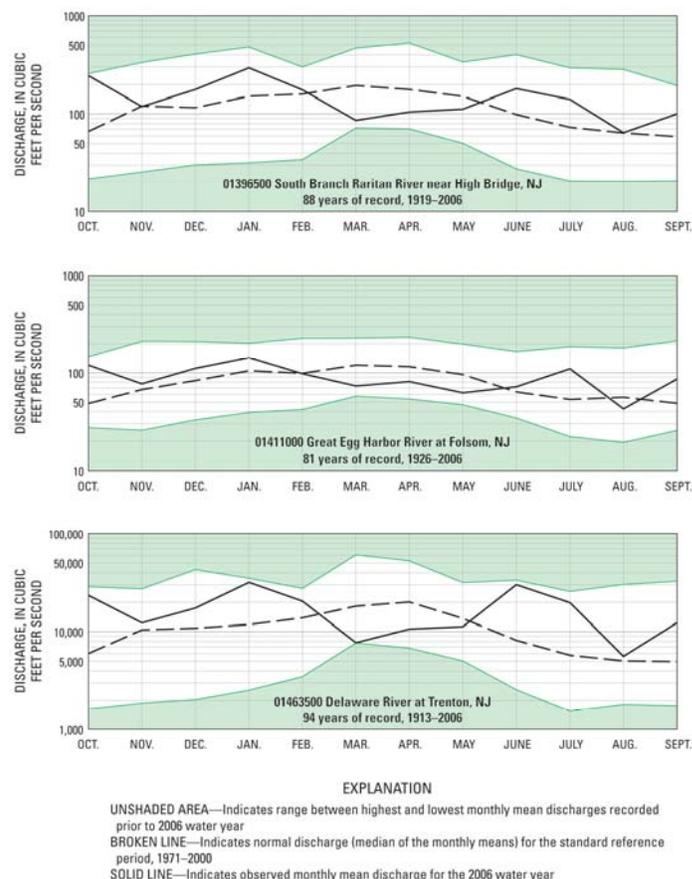
## Streamflow

Three gaging stations, located in north, south, and central New Jersey, on the South Branch Raritan River, the Great Egg Harbor River, and the Delaware 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 stations on the South Branch Raritan River and the Delaware River were above or close to average from October through February and June through September and below average from March through May, during water year 2006 (fig. 2). Monthly mean discharges at the index station on the Great Egg Harbor River were above or close to average from October through February, June, July



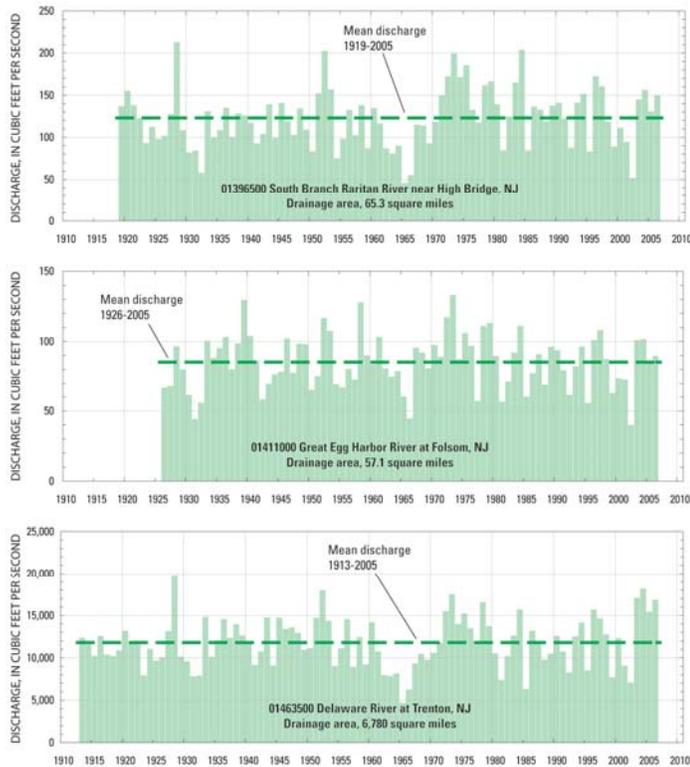
**Figure 1.** Locations of continuous-record gaging stations.

To illustrate streamflow conditions in New Jersey during water year 2006, monthly and annual mean discharges at selected continuous gaging stations are compared to period of record monthly and annual means in the text that follows. Other



**Figure 2.** Monthly mean discharge at index gaging stations.

August, during water year 2006 (fig. 2). Annual mean discharge at each index gaging station was above the annual mean for the period of record for the fourth consecutive year (fig. 3).



**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 150 ft<sup>3</sup>/s for the water year, which is 122 percent of the 1919-2005 average. Peak flow for the water year was 2,910 ft<sup>3</sup>/s on October 9 and June 28; the recurrence interval is about 7 years. The lowest daily mean flow was 18 ft<sup>3</sup>/s, recorded October 5-6, which is less than the 99-percent flow duration.

Streamflow at the index station in southern New Jersey (Great Egg Harbor River at Folsom) averaged 89.9 ft<sup>3</sup>/s for the water year, which is 105 percent of the 1926-2005 average. Peak flow for the water year was 338 ft<sup>3</sup>/s on October 15; the recurrence interval is about 3 years. The lowest daily mean flow was 22 ft<sup>3</sup>/s, recorded on October 3-4, which is less than the 99-percent flow duration.

Streamflow at the index station in central New Jersey (Delaware River at Trenton) averaged 16,880 ft<sup>3</sup>/s for the water year, which is 143 percent of the 1913-2005 average. Peak flow for the water year was 237,000 ft<sup>3</sup>/s on June 29; the recurrence interval is 70 years. The lowest daily mean flow was 2,720 ft<sup>3</sup>/s, recorded on October 1, which is about the 93-percent flow duration. The Delaware River is substantially regulated by reservoirs and diversions.

Several floods and flash floods occurred during the 2006 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 are listed in table 1, as documented by the National Oceanic and Atmospheric Administration's National Weather Service (NWS) (<http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms>). The most widespread events

this water year occurred on October 8-15 as a result of two storm systems. Many surface-water gages throughout the State recorded peak-of-year discharges during this period. The first storm system that affected the region occurred during October 8-9 and was due to a slow moving cold front coupled with moisture from the remnants of Tropical Storm Tammy. The second storm produced heavy rain as a result of a low pressure system situated southeast of New Jersey during October 11-14. The Office of the New Jersey State Climatologist reported October 2005 as being the wettest month on record for the State of New Jersey since the State began keeping records in 1895.

**Table 1.** Floods and flash floods in New Jersey in water year 2006, by date and county. (From the National Oceanic and Atmospheric Administration's National Weather Service at <http://www4.ncdc.noaa.gov/cgi-win/wwcgi.dll?wwevent~storms>)

Date	Location by County
Oct 8-9, 2005	Bergen, Camden, Essex, Gloucester, Hudson, Hunterdon, Mercer, Middlesex, Morris, Passaic, Somerset, Sussex, Union, Warren
Oct 12-14, 2005	Bergen, Burlington, Essex, Hudson, Hunterdon, Mercer, Middlesex, Monmouth, Morris, Ocean, Somerset, Warren
Nov 30, 2005	Somerset
Dec 16, 2005	Bergen, Morris, Somerset
Jan 3, 2006	Camden, Somerset
Jan 18, 2006	Morris, Somerset, Sussex
May 12, 2006	Bergen, Essex, Passaic
Jun 2-3, 2006	Bergen, Camden
Jun 24-25, 2006	Burlington, Camden, Cape May, Cumberland, Gloucester, Monmouth, Passaic
Jun 27-29, 2006	Camden, Hudson, Hunterdon, Mercer, Somerset, Sussex, Warren
Jul 21-22, 2006	Bergen, Cumberland, Essex, Hudson, Hunterdon, Middlesex, Morris, Passaic, Somerset, Union
Jul 27, 2006	Gloucester
Aug 10, 2006	Bergen, Essex
Aug 24, 2006	Bergen
Aug 27-29, 2006	Camden, Cape May, Cumberland
Sep 2-3, 2006	Monmouth, Ocean,
Sep 5, 2006	Camden
Sep 15, 2006	Ocean

A major flood occurred on the main stem of the Delaware River on June 28-30, 2006, due to several days of heavy rain throughout the Delaware River Basin. The NWS reported a total of 3-8 inches of rain fell during the storm along the Delaware River Basin in New Jersey, and more than 10 inches of rain fell in parts of the Upper Delaware River Basin in New York State. Peak discharges at gaging stations along the Delaware River were the second to fourth highest for the period of record, with recurrence intervals of 70 years. Flooding on the main stem of the Delaware River had occurred in each of the past 2 water years on April 3-5, 2005 and September 18-20, 2004. Peak discharges from the April event have recurrence intervals ranging from 55 to greater than 100 years, and peak discharges from the September event have recurrence intervals ranging from 40 to 70 years.

The Office of the New Jersey State Climatologist reported that regarding precipitation, February and March were ranked as the 10<sup>th</sup> and 1<sup>st</sup> driest months, respectively, for the period of record (table 2); however, no drought watches were issued by the State of New Jersey during the 2006 water year. A drought watch is antecedent to a drought warning or emergency and

indicates that the New Jersey Department of Environmental Protection is closely monitoring drought indicators including precipitation, streamflow, reservoir contents, ground-water levels, and water demands. Under a drought watch, the public is asked to voluntarily cut back on water use.

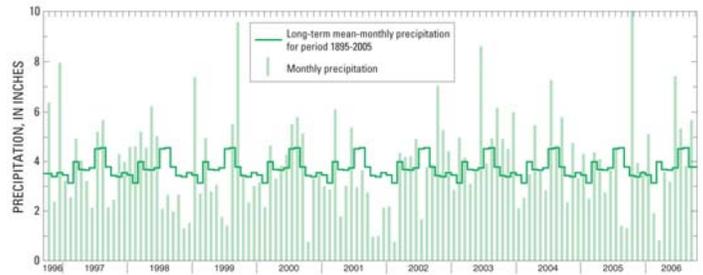
**Table 2.** Ranking of monthly precipitation values in New Jersey for water year 2006 in relation to the period of record, water years 1896-2006. Monthly precipitation are spatially weighted averages from many stations throughout the State. (From the Office of the New Jersey State Climatologist at [http://climate.rutgers.edu/stateclim\\_v1/data/njihistprecip.html](http://climate.rutgers.edu/stateclim_v1/data/njihistprecip.html))

Month of water year	Total Precipitation, in inches	Ranking
Oct 2005	11.98	The wettest
Nov 2005	3.94	38th wettest
Dec 2005	3.63	47th wettest
Jan 2006	5.13	16th wettest
Feb 2006	1.91	10th driest
Mar 2006	0.81	The driest
Apr 2006	3.59	54th wettest
May 2006	3.18	49th driest
Jun 2006	7.43	5th wettest
Jul 2006	5.35	35th wettest
Aug 2006	3.83	48th driest
Sep 2006	5.69	18th wettest

Annual mean discharges for water year 2006 and mean annual discharges for the period of record at 44 selected gaging stations that had 40 years or more of continuous record are shown in table 3. The differences are listed as percent difference, and range from -12.7 to 94.0 percent. For 42 of the 44 sites, annual mean discharges were above the period of record mean. During the 2005, 2004, and 2003 water years, annual mean discharges at most of the selected gaging stations were above the historical mean. In contrast, during the 2002 and 2001 water years, annual mean discharges at most of the selected gaging stations were below 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.

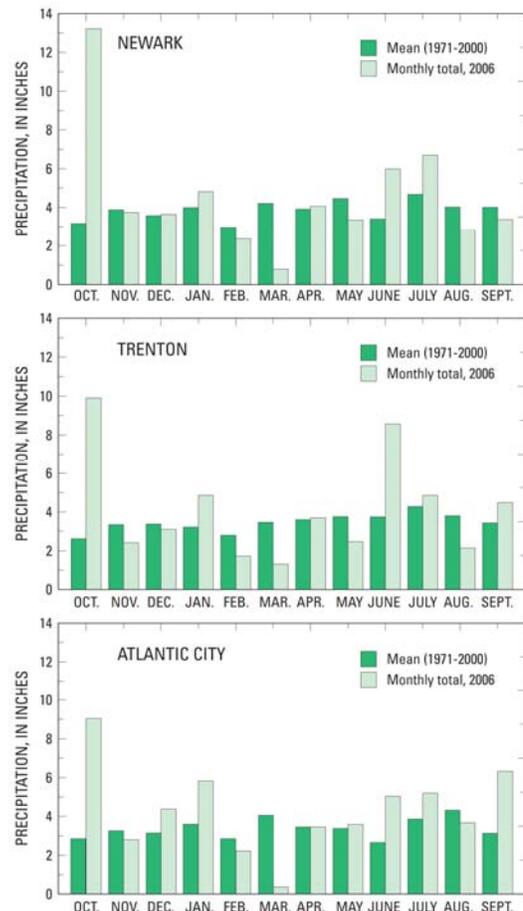
## Precipitation

Monthly spatially weighted average-precipitation values using data from several dozen stations throughout New Jersey, along with the statewide long-term monthly means (water years 1896-2005), can be accessed at [http://climate.rutgers.edu/stateclim\\_v1/data/njihistprecip.html](http://climate.rutgers.edu/stateclim_v1/data/njihistprecip.html). For water year 2006, the spatially weighted values for 7 of 12 months were above the long-term mean (October through January, June, July, and September, as shown in figure 4). Water year 2006 is the 11<sup>th</sup> wettest for the period of record. The statewide spatially weighted average-precipitation total was 56.47 inches, which is 11.46 inches more than the long-term mean-annual precipitation from 1896 to 2005. The average annual precipitation for New Jersey is approximately 45 inches. Rankings of monthly precipitation in New Jersey for water year 2006 as compared to water years 1896-2005 are listed in table 2.



**Figure 4.** Monthly precipitation for water years 1997-2006 in New Jersey and long-term mean-monthly precipitation for period 1895-2005. (Long-term mean-monthly and monthly precipitation are spatially weighted averages for several dozen stations throughout the State).

Three National Oceanic and Atmospheric Administration's NWS precipitation stations located in Newark, Trenton, and Atlantic City have been selected as index sites for precipitation. Water year 2006 precipitation totals were above normal at all three index sites. The Newark station recorded 54.88 inches, which is 8.63 inches above normal or 119 percent of the 30-year reference-period (1971-2000) mean. The Trenton station recorded 49.53 inches, which is 8.14 inches above normal or 120 percent of the 30-year mean. The Atlantic City station recorded 51.92 inches, which is 11.33 inches above normal or 128 percent of the 30-year mean. Monthly precipitation at the three NWS stations, along with the 30-year mean, is shown in figure 5.



**Figure 5.** Monthly precipitation at three National Weather Service stations.

**Table 3.** Annual mean discharges for water year 2006 and mean annual discharges for the period of record at selected gaging stations with 40 years or more of continuous record.

[ft<sup>3</sup>/s, cubic feet per second; mi<sup>2</sup>, square miles]

Station number	Station name	Drainage area (mi <sup>2</sup> )	Number of years of record	Annual mean discharge for 2006 water year (ft <sup>3</sup> /s)	Mean annual discharge for period of record (ft <sup>3</sup> /s)	Percent difference
01377000	Hackensack River at Rivervale, NJ	58.0	65	94.1	87.1	8.0
01377500	Pascack Brook at Westwood, NJ	29.6	72	61.8	54.1	14.2
01379000	Passaic River near Millington, NJ	55.4	85	110	91.1	20.7
01379500	Passaic River near Chatham, NJ	100	78	211	173	22.0
01380500	Rockaway River above reservoir, at Boonton, NJ	116	69	285	231	23.4
01381500	Whippany River at Morristown, NJ	29.4	85	72.1	54.7	31.8
01382500	Pequannock River at Macopin Intake Dam, NJ	63.7	83	93.7	48.3	94.0
01383500	Wanaque River at Awosting, NJ	27.1	87	78.9	54.7	44.2
01384500	Ringwood Creek near Wanaque, NJ	19.1	65	47.8	33.6	42.3
01386000	West Brook Near Wanaque	11.8	46	34.7	24.8	39.9
01387500	Ramapo River near Mahwah, NJ	120	87	349	230	51.7
01388000	Ramapo River at Pompton Lakes, NJ	160	85	430	289	48.8
01388500	Pompton River at Pompton Plains, NJ	355	67	803	499	60.9
01389500	Passaic River at Little Falls, NJ	762	108	1,553	1,140	36.2
01390500	Saddle River at Ridgewood, NJ	21.6	49	41.2	34.0	21.2
01391500	Saddle River at Lodi, NJ	54.6	84	150	101	48.5
01393450	Elizabeth River at Ursino Lake, at Elizabeth, NJ	16.9	85	28.0	25.9	8.1
01394500	Rahway River near Springfield, NJ	25.5	69	42.9	30.9	38.8
01395000	Rahway River at Rahway, NJ	40.9	84	70.0	49.6	41.1
01396500	South Branch Raritan River near High Bridge, NJ	65.3	88	150	123	22.0
01397000	South Branch Raritan River at Stanton, NJ	147	90	290	249	16.5
01398000	Neshanic River at Reaville, NJ	25.7	76	53.0	38.2	38.7
01398500	North Branch Raritan River near Far Hills, NJ	26.2	83	60.7	48.1	26.2
01399500	Lamington (Black) River near Pottersville, NJ	32.8	85	65.5	55.8	17.4
01400000	North Branch Raritan River near Raritan, NJ	190	83	393	312	26.0
01401000	Stony Brook at Princeton, NJ	44.5	53	85.9	67.4	27.4
01402000	Millstone River at Blackwells Mills, NJ	258	85	497	385	29.1
01403060	Raritan River below Calco Dam, at Bound Brook, NJ	785	68	1,435	1,199	19.7
01405400	Manalapan Brook at Spotswood, NJ	40.7	49	75.9	62.1	22.2
01408000	Manasquan River at Squankum, NJ	44.0	75	89.1	73.6	21.1
01408500	Toms River near Toms River, NJ	123	78	239	211	13.3
01409400	Mullica River near Batsto, NJ	46.7	49	117	105	11.4
01410000	Oswego River at Harrisville, NJ	72.5	76	76.9	85.2	-9.7
01411000	Great Egg Harbor River at Folsom, NJ	57.1	81	89.9	85.3	5.4
01411500	Maurice River at Norma, NJ	112	74	164	163	0.6
01440000	Flat Brook near Flatbrookville, NJ	64.0	83	172	112	53.6
01443500	Paulins Kill at Blairstown, NJ	126	84	313	200	56.5
01445500	Pequest River at Pequest, NJ	106	85	225	159	41.5
01457000	Musconetcong River near Bloomsbury, NJ	141	89	314	240	30.8
01463500	Delaware River at Trenton, NJ	6,780	94	16,880	11,820	42.8
01464000	Assunpink Creek at Trenton, NJ	90.6	83	166	134	23.9
01464500	Crosswicks Creek at Extonville, NJ	81.5	65	135	134	0.7
01466500	McDonalds Branch in Byrne State Forest, NJ	2.35	52	1.85	2.12	-12.7
01467000	North Branch Rancocas Creek at Pemberton, NJ	118	85	172	170	1.2

## Access to USGS water data

The USGS New Jersey Water Science Center maintains a World Wide Web site of water-resource related information for New Jersey. It 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 2006 can be accessed online at <http://pubs.water.usgs.gov/wdr2006>.

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