Prepared in cooperation with the New Jersey Department of Environmental Protection

Trends in the Quality of Water in New Jersey Streams, Water Years 1998–2007

Scientific Investigations Report 2010–5088

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

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By R. Edward Hickman and Bonnie J. Gray

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U.S. Geological Survey
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Conversion Factors and Datums

Multiply	By	To obtain
	Area	
square mile (mi^2)	259.0	hectare (ha)
square mile (mi^2)	2.590	square kilometer (km^2)
	Flow rate	
cubic foot per second (ft^3/s)	0.02832	cubic meter per second (m^3/s)

Horizontal coordinates of water-quality stations are referenced to North American Datum of 1927 (NAD 27) or to the North American Datum of 1983 (NAD 83). Maps are referenced to the North American Datum of 1983.

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

Concentrations of chemical constituents in water are given in milligrams per liter (mg/L).

Trends in the Quality of Water in New Jersey Streams, Water Years 1998–2007

By R. Edward Hickman and Bonnie J. Gray

Abstract

Trends were determined in flow-adjusted values of selected water-quality characteristics measured year-round during water years 1998–2007 (October 1, 1997, through September 30, 2007) at 70 stations on New Jersey streams. Water-quality characteristics included in the analysis are dissolved oxygen, pH, total dissolved solids, total phosphorus, total organic nitrogen plus ammonia, and dissolved nitrate plus nitrite. In addition, trend tests also were conducted on measurements of dissolved oxygen made only during the growing season, April to September. Nearly all the water-quality data analyzed were collected by the New Jersey Department of Environmental Protection and the U.S. Geological Survey as part of the New Jersey Department of Environmental Protection Ambient Surface-Water Quality Monitoring Network.

Monotonic trends in flow-adjusted values of water quality were determined by use of procedures in the ESTREND computer program. A 0.05 level of significance was selected to indicate a trend. Results of tests were not reported if there were an insufficient number of measurements or insufficient number of detected concentrations, or if the results of the tests were affected by a change in data-collection methods.

Trends in values of dissolved oxygen, pH, and total dissolved solids were identified using the Seasonal Kendall test. Trends or no trends in year-round concentrations of dissolved oxygen were determined for 66 stations; decreases at 4 stations and increases at 0 stations were identified. Trends or no trends in growing-season concentrations of dissolved oxygen were determined for 65 stations; decreases at 4 stations and increases at 4 stations were identified. Tests of pH values determined trends or no trends at 26 stations; decreases at 2 stations and increases at 3 stations were identified. Trends or no trends in total dissolved solids were reported for all 70 stations; decreases at 0 stations and increases at 24 stations were identified.

Trends in total phosphorus, total organic nitrogen plus ammonia, and dissolved nitrate plus nitrite were identified by use of Tobit regression. Two sets of trend tests were conducted —one set with all measurements and a second set with all measurements except the most extreme outlier if one could be identified. The result of the test with all measurements is reported if the results of the two tests are equivalent. The result of the test without the outlier is reported if the results of the two tests are not equivalent.

Trends or no trends in total phosphorus were determined for 69 stations. Decreases at 12 stations and increases at 5 stations were identified. Of the five stations on the Delaware River included in this study, decreases in concentration were identified at four.

Trends or no trends in total organic nitrogen plus ammonia were determined for 69 stations. Decreases and increases in concentrations were identified at six and nine stations, respectively.

Trends or no trends in dissolved nitrate plus nitrite were determined for 66 stations. Decreases and increases in concentration were identified at 4 and 19 stations, respectively.

Introduction

The Ambient Surface Water-Quality Monitoring Network (ASWQMN) program has been operated by the New Jersey Department of Environmental Protection (NJDEP) in cooperation with the U.S. Geological Survey (USGS) since 1985. Under this program, water-quality samples have been collected from streams at stations throughout the State and analyzed for water-quality characteristics. Of particular interest to the NJDEP is the quality of streams that either drain areas of targeted land-use types or are located in the downstream portions of each NJDEP water region. A total of 119 stations on nontidal streams are sampled as part of the ASWQMN; as many as 115 are sampled in any given water year (October 1 to September 30, numbered for the year in which it ends). Sampled stations include 4 on the Delaware River main stem, 7 background stations located in areas largely unaffected by human activity, and 23 watershed integrator stations with relatively large drainage basins that contain multiple land uses. There are also 43 land-use-indicator stations; the drainage basin of each is composed mostly of a single type of land use.

Fifteen of these stations are designated as undeveloped, 9 as agricultural, 13 as urban, and 6 as mixed land uses. In addition, 42 statewide-status stations are chosen randomly every 2 years.

Each ASWGMN station is sampled four times a water year, once in each of the following periods: November to December, February to March, May to June, and August to September. Physical characteristics and concentrations of filtered and unfiltered nutrients, filtered organic carbon, and total dissolved solids are determined on samples of the water column. Unfiltered water samples are analyzed for recoverable trace elements at selected sites during February to March and August to September. Filtered samples of the water column collected during May and June are analyzed for pesticides, and bed-sediment samples collected during low-flow conditions during August and September are analyzed for nutrients and trace elements at these selected sites. These data were published annually for water years 1998 to 2005 in USGS reports titled "Water Resources Data-New Jersey." The data for the 2006 and 2007 water years are now available on the World Wide Web and can be accessed at *http://wdr.water.usgs.gov/*.

The USGS, in cooperation with the NJDEP, conducted a study to determine whether there have been monotonic trends in the water quality of the streams of New Jersey. The period of study is water years 1998–2007 (October 1, 1997 through September 30, 2007). A monotonic trend is an underlying change in one direction (either an increase or a decrease) in the value of a variable over the period of study; this change may occur during a short time or throughout the period of study.

Water-quality data for 70 stations were analyzed. The data analyzed were collected almost entirely by the ASWQMN. The following water-quality characteristics were selected for trend analysis by the NJDEP, in cooperation with the USGS: dissolved oxygen, pH, total dissolved solids, total phosphorus, total organic nitrogen plus ammonia, and dissolved nitrate plus nitrite. Year-round measurements of each characteristic and those of dissolved oxygen made only during the growing season, April to September, were analyzed for trends.

The approach was to use procedures in the ESTREND computer program (Schertz and others, 1991) to identify monotonic trends in flow-adjusted values of each water-quality characteristic at each station. Flow-adjusted values are values of water quality which have been modified to remove some of the variation in water quality due to the variation in streamflow.

Purpose and Scope

This report presents the results of an analysis to identify monotonic trends in selected water-quality characteristics at stations on New Jersey streams at which a sufficient number of measurements of water quality were made during water years 1998–2007. Summary statistics of the values of each water-quality characteristic at each station, and results of trend tests in flow-adjusted values, are presented in figures and tables. Results of trend tests are compared to results from previous studies of trends in the quality of New Jersey streams. Results are not reported if they were affected by changes in the methods of collection.

Description of Study Area

New Jersey is geologically divided into northern and southern regions by the Fall Line (fig. 1) which is marked by a series of waterfalls along river courses (Watt, 2000). The land to the north of the Fall Line is underlain by sedimentary and crystalline bedrock, is higher in elevation, and varies more in elevation than land to the south. The land to the south is underlain by gravel, sand, silt, and clay.

Land use varies considerably throughout New Jersey (fig. 1). Much of the urban land lies close to the Fall Line, around New York City in the northeastern part of the State, and along the Atlantic Coast. Agricultural land tends to be present in the western half of the State, and forest is concentrated in the northwest and southeast.

Previous Studies

Two previous studies reported on trends in the water quality measured for the ASWQMN in streams throughout New Jersey. Both studies used the procedures in ESTREND (Schertz and others, 1991) to identify trends in water-quality values unadjusted for streamflow and in flow-adjusted values of water quality.

The first report by Hay and Campbell (1990) identified changes in water-quality characteristics during two periods of record—water years 1976–86 and water years 1980–86. Trends tests were conducted on values of 48 water-quality characteristics measured at 86 water-quality stations. Results were not reported if more than a few percent of the measurements were nondetects. Trends were identified at a 0.1 level of significance.

The second report by Hickman and Barringer (1999) identified changes in water-quality characteristics during water years 1986–95. Trends tests were conducted on 24 water-quality characteristics measured at 83 water-quality stations. Trends were identified at a 0.05 level of significance.

In addition, Sprague and others (2009) reported trends in total phosphorus, total nitrogen, and nitrate at 20 stations on streams in New Jersey as part of their study of selected stations across the United States during the period 1993–2003. Trends in flow-adjusted concentrations and in concentrations not adjusted for flow were estimated with a parametric multiple-regression analysis by use of the program LOADEST (Runkel and others, 2004).

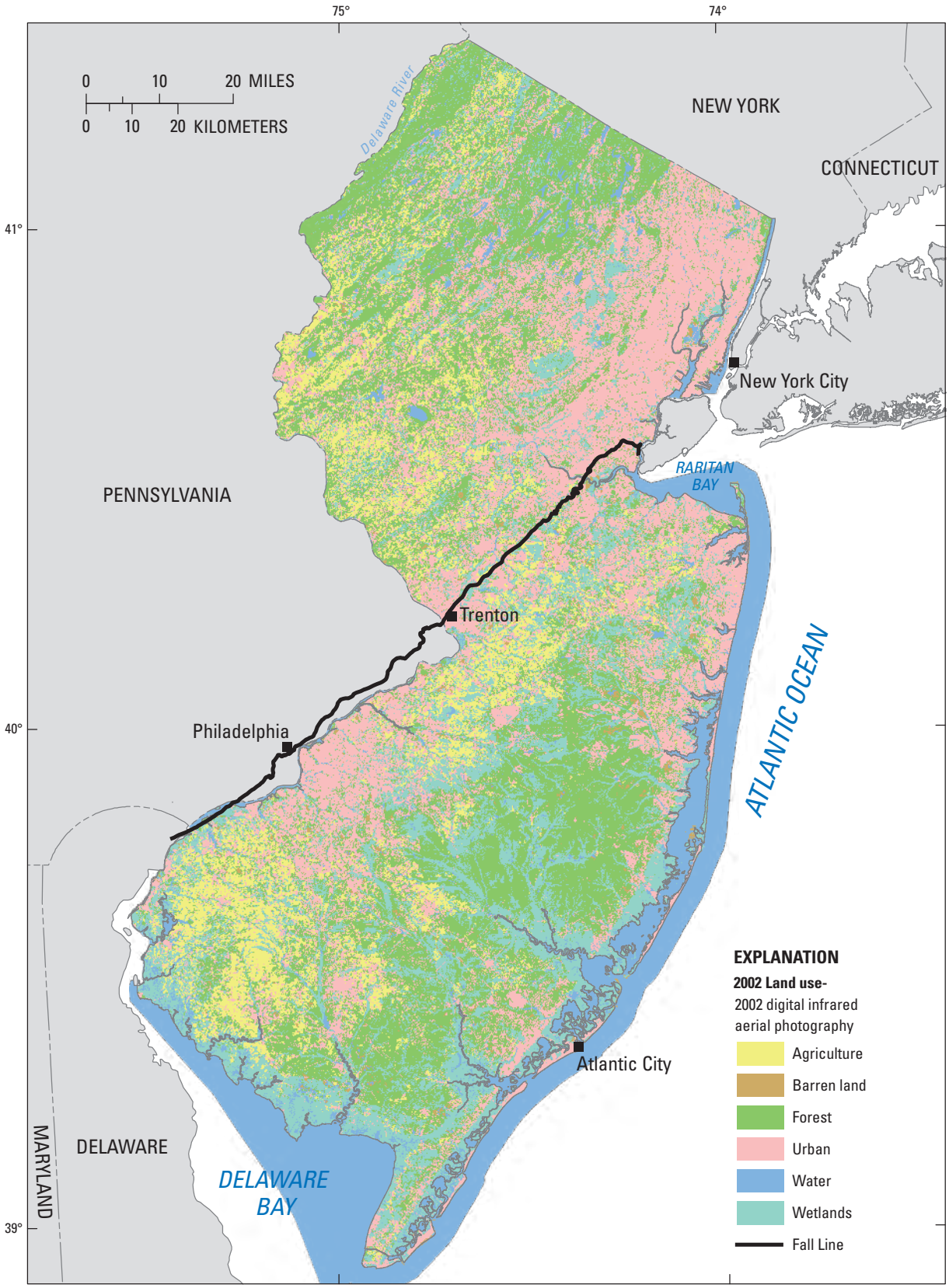

Figure 1. Land use and the Fall Line in New Jersey.

Study Methods and Design

Water-quality data discussed in this report were retrieved from the USGS National Water Information System (NWIS) computer database (described in Mathey, 1998) and are available to the public at the USGS NWIS Web site (*http://waterdata.usgs.gov/nj/nwis/qw/*). These data also have been published in data reports for water years 1998 to 2005 (Deluca and others, 1999–2006); reports for water years 2002 to 2005 can be found (as "pdf" files) at the Web site *http://pubs.usgs.gov/wdr/#NJ* .

Site data sheets containing the water-quality data for each station during water years 2006 and 2007 are available at the Web site *http://wdr.water.usgs.gov/* as "pdf" files. Each site data sheet contains the water-quality data for one station for one water year.

Field and Laboratory Measurements

Field measurements and sample collection at each station were conducted by personnel of either the USGS or the NJDEP. The agency that collected information at each station is listed in table 1.

Stations Included in this Study

The 70 water-quality stations included in this study are listed in table 1 and shown in figure 2. In this report, the water-quality stations in tables are grouped by the five NJDEP water regions (New Jersey Department of Environmental Protection, 1997, fig. 2), and maps include the water regions so that the reader can easily locate the stations. All stations, but one, were sampled as part of the ASWQMN and were selected because there have been sufficient water-quality measurements for trend analysis (see below).

The one station not in the network, the Delaware River at Trenton, N.J. (01463500), was included to provide a more complete understanding of trends of the main stem Delaware River (table 1; fig. 2). This station was sampled by the USGS either (1) as part of the USGS National Water-Quality Assessment (NAWQA) Program or (2) in cooperation with the Delaware River Basin Commission.

These stations (table 1; fig. 2) are characterized by 15 or more measurements of water quality, 1 or more measurements in the first 2 water years of the period of study, and 1 or more measurements in the last 2 water years. Also, there is a value of instantaneous streamflow associated with each of these water-quality measurements. These characterizations approximate the data requirements necessary for running trend tests in ESTREND.

The stations can be divided on the basis of the size of the drainage basins. The drainage basins of most stations used in the study range from 1.07 to 762 square miles and lie entirely within New Jersey or within New Jersey and adjacent parts of southern New York (fig. 2; table 1). Five stations have drainage basins that range in size from 3,480 to 6,780 square miles. These stations are on the main stem Delaware River, and their basins include large areas of New York and Pennsylvania.

Field and Laboratory Methods

Field methods are described in the USGS National Field Manual (U.S. Geological Survey, variously dated). At each station, a composite sample of streamwater was collected at multiple points across the stream using either an open bottle or DH-81 sampler when wading, or an open bottle, D-95, or DH-95 sampler when sampling from a bridge. This composite sample was then split into subsamples using either a churn or cone splitter. Subsamples to be analyzed for total dissolved solids and dissolved nitrate plus nitrite were filtered.

The methods used to measure dissolved oxygen concentration at ASWQMN stations differed between the two agencies. The USGS reported the median of measurements at five or more points across the stream; measurements were made with an YSI model 58 water-quality meter until the beginning of water year 2002 and an YSI 600 QS water-quality meter during the rest of the period of study. The NJDEP reported the concentration at the centroid of streamflow; measurements were made with an YSI model 58 throughout the period of study.

The methods used as part of the ASWQMN to measure pH during the period of study also differed between the two agencies; in addition, the USGS changed its methods during the beginning of water year 2002. Through water year 2001, the USGS measured pH from a subsample of the composite using an Orion PerpHect Ross Combination pH Electrode with an epoxy body. Starting at the beginning of water year 2002, the USGS reported the median of pH measured at five or more points across the stream with a YSI 600 QS meter (during water years 2002–07). Throughout the period of study, the NJDEP measured pH from a subsample of the composite with a Beckman Coulter low-maintenance, gel-filled combination electrode.

Field methods used by the USGS to measure dissolved oxygen and pH at the station on the Delaware River at Trenton, N.J. (01463500), were different than those used at ASWQMN stations. Values of dissolved oxygen and pH were measured with an YSI 6820 or YSI 6920 meter at about 12 points across the river; the reported value of each water-quality characteristic is the median of the measured values.

Concentrations of total dissolved solids, total phosphorus, total organic nitrogen plus ammonia, and dissolved nitrate plus nitrite were determined in subsamples sent to USGS laboratories in either Lakewood, Colorado, or Ocala, Florida; methods of analysis are listed in table 2. Methods for determining concentrations of total phosphorus and total organic nitrogen plus ammonia changed during the period of study. For total phosphorus, the Kjeldahl sample digestion was replaced with a persulfate digestion. Three methods of determination were used for total organic nitrogen plus ammonia, the last of which

Base from U.S. Geological Survey digital line graph files, 1:24,000, Universal Transverse Mercator projection, Zone 18, NAD83

Figure 2. Locations of water-quality stations and New Jersey Department of Environmental Protection water regions in New Jersey.

Table 1. Water-quality stations included in this study of trends in the quality of water in New Jersey streams, water years 1998–2007.

[Stations are grouped by New Jersey Deparment of Environmental Protection water regions; all stations were sampled as part of the NJDEP Ambient Surface Water-Quality Monitoring Network unless otherwise indicated; Latitude in degrees minutes seconds; Longitude in degrees minutes seconds; NAD27, North American Datum of 1927; NAD83, North American Datum of 1983; Drainage area is in square miles; NJDEP, New Jersey Department of Environmental Protection; USGS, U.S. Geological Survey]

Station number	Station name	Latitude	Longitude	Datum for latitude/ longitude	Hydrologic unit code	Drainage area	Collecting agency	Streamflow measurements from continuous streamgage at station
	Passaic Water Region							
01377000	Hackensack River at Rivervale, N.J.	405957	0735921	NAD83	02030103	58.00	NJDEP	Yes
01378560	Coles Brook at Hackensack, N.J.	405440	0740225	NAD83	02030103	7.00	USGS	No
01378780	Primrose Brook at Morristown National Historical Park, N.J.	404554	0743147	NAD83	02030103	1.07	USGS	No
01379200	Dead River near Millington, N.J.	403859	0743127	NAD83	02030103	20.80	USGS	No
01380100	Beaver Brook at Rockaway, N.J.	405408	0743005	NAD83	02030103	22.20	USGS	No
01381800	Whippany River near Pine Brook, N.J.	405042	0742050	NAD83	02030103	68.50	NJDEP	Yes
01382000	Passaic River at Two Bridges, N.J.	405350	0741622	NAD83	02030103	361.00	USGS	No
01382500	Pequannock River at Macopin Intake Dam, N.J.	410106	0742404	NAD83	02030103	63.70	NJDEP	Yes
01387500	Ramapo River near Mahwah, N.J.	410553	0740946	NAD83	02030103	120.00	NJDEP	Yes
01388500	Pompton River at Pompton Plains, N.J.	405811	0741655	NAD83	02030103	355.00	NJDEP	Yes
01389500	Passaic River at Little Falls, N.J.	405305	0741334	NAD83	02030103	762.00	USGS	Yes
01391500	Saddle River at Lodi, N.J.	405325	0740450	NAD83	02030103	54.60	NJDEP	Yes
	Raritan Water Region							
01394500	Rahway River near Springfield, N.J.	404115	0741842	NAD83	02030104	25.50	NJDEP	Yes
01395000	Rahway River at Rahway, N.J.	403708	0741700	NAD83	02030104	40.90	NJDEP	Yes
01396660	Mulhockaway Creek at Van Syckel, N.J.	403851	0745808	NAD83	02030105	11.80	NJDEP	Yes
01398000	Neshanic River at Reaville, N.J.	402824	0744940	NAD83	02030105	25.70	NJDEP	Yes
01398102	South Branch Raritan River at South Branch, N.J.	403249	0744147	NAD83	02030105	265.00	USGS	No
01399780	Lamington River at Burnt Mills, N.J.	403805	0744112	NAD83	02030105	100.00	USGS	No
01400000	North Branch Raritan River near Raritan, N.J.	403414	0744045	NAD83	02030105	190.00	NJDEP	Yes
01400640	Millstone River near Grovers Mill, N.J.	401848	0743521	NAD83	02030105	42.60	USGS	No
01401400	Heathcote Brook at Kingston, N.J.	402210	0743658	NAD83	02030105	9.00	USGS	No
01402000	Millstone River at Blackwells Mills, N.J.	402830	0743433	NAD83	02030105	258.00	NJDEP	Yes
01403385	Bound Brook at Route 28 at Middlesex, N.J.	403451	0742957	NAD83	02030105	23.90	USGS	No
01405340	Manalapan Brook at Federal Road near Manalapan, N.J.	401746	0742352	NAD83	02030105	20.90	USGS	No

Table 1. Water-quality stations included in this study of trends in the quality of water in New Jersey streams, water years 1998–2007.—Continued

[Stations are grouped by New Jersey Deparment of Environmental Protection water regions; all stations were sampled as part of the NJDEP Ambient Surface Water-Quality Monitoring Network unless otherwise indicated; Latitude in degrees minutes seconds; Longitude in degrees minutes seconds; NAD27, North American Datum of 1927; NAD83, North American Datum of 1983; Drainage area is in square miles; NJDEP, New Jersey Department of Environmental Protection; USGS, U.S. Geological Survey]

Station number	Station name	Latitude	Longitude	Datum for latitude/ longitude	Hydrologic unit code	Drainage area	Collecting agency	Streamflow measurements from continuous streamgage at station
	Atlantic Coastal Water Region							
01408000	Manasquan River at Squankum, N.J.	400941	0740917	NAD83	02040301	44.00	NJDEP	Yes
01408009	Mingamahone Brook near Earle, N.J.	401245	0741006	NAD83	02040301	3.32	USGS	No
01408100	North Branch Metedeconk River at Lakewood, N.J.	400635	0741309	NAD83	02040301	19.40	USGS	No
01408500	Toms River near Toms River, N.J.	395911	0741324	NAD83	02040301	123.00	NJDEP	Yes
01408830	Cedar Creek at Cedar Crest, N.J.	395350	0741859	NAD83	02040301	20.10	USGS	No
01409387	Mullica River at outlet of Atsion Lk at Atsion, N.J.	394425	0744336	NAD83	02040301	26.70	USGS	No
0140940950	Blue Anchor Brook at Elm, N.J.	394117	0745005	NAD83	02040301	4.86	USGS	No
01409416	Hammonton Creek at Wescoatville, N.J.	393802	0744304	NAD83	02040301	9.57	USGS	No
01409500	Batsto River at Batsto, N.J.	393830	0743901	NAD83	02040301	67.80	USGS	Yes
01409815	West Branch Wading River at Maxwell, N.J.	394030	0743227	NAD83	02040301	85.90	USGS	No
01410150	East Branch Bass River near New Gretna, N.J.	393723	0742629	NAD83	02040301	8.11	NJDEP	Yes
01411035	Hospitality Branch at Blue Bell Road near Cecil, N.J.	393840	0745909	NAD83	02040302	4.51	USGS	No
01411110	Great Egg Harbor River at Weymouth, N.J.	393050	0744647	NAD83	02040302	154.00	USGS	No
01411196	Babcock Creek near Mays Landing, N.J.	392808	0744133	NAD83	02040302	16.30	USGS	No
01411400	Fishing Creek at Rio Grande, N.J.	390139	0745347	NAD83	02040206	2.29	USGS	No
01411444	West Creek near Leesburg, N.J.	391536	0745441	NAD83	02040206	6.64	USGS	No
	Upper Delaware Water Region							
01367625	Wallkill River at Sparta, N.J.	410225	0743747	NAD83	02020007	5.88	USGS	No
01367770	Wallkill River near Sussex, N.J.	411138	0743431	NAD83	02020007	60.80	USGS	No
01367800	Papakating Creek at Pellettown, N.J.	410946	0744031	NAD83	02020007	15.80	NJDEP	part
01368820	Double Kill at Wawayanda, N.J.	411113	0742512	NAD83	02020007	6.46	USGS	No
01438500	Delaware River at Montague, N.J.	411833	0744743	NAD83	02040104	3,480.00	NJDEP	Yes
01440000	Flat Brook near Flatbrookville, N.J.	410622	0745709	NAD83	02040104	64.00	NJDEP	Yes
01442760	Dunnfield Creek at Dunnfield, N.J.	405814	0750734	NAD83	02040104	3.56	USGS	No
01443000	Delaware River at Portland, Pa.	405526	0750546	NAD27	02040105	4,165.00	USGS	No
01443500	Paulins Kill at Blairstown, N.J.	405851	0745712	NAD83	02040105	126.00	NJDEP	Yes
01446400	Pequest River at Belvidere, N.J.	404945	0750443	NAD83	02040105	157.00	USGS	No

Table 1. Water-quality stations included in this study of trends in the quality of water in New Jersey streams, water years 1998–2007.—Continued

[Stations are grouped by New Jersey Deparment of Environmental Protection water regions; all stations were sampled as part of the NJDEP Ambient Surface Water-Quality Monitoring Network unless otherwise indicated; Latitude in degrees minutes seconds; Longitude in degrees minutes seconds; NAD27, North American Datum of 1927; NAD83, North American Datum of 1983; Drainage area is in square miles; NJDEP, New Jersey Department of Environmental Protection; USGS, U.S. Geological Survey]

Station number	Station name	Latitude	Longitude	Datum for latitude/ longitude	Hydrologic unit code	Drainage area	Collecting agency	Streamflow measurements from continuous streamgage at station
	Upper Delaware Water Region							
01457400	Musconetcong River at Riegelsville, N.J.	403533	0751110	NAD83	02040105	156.00	USGS	No
01457500	Delaware River at Riegelsville, N.J.	403541	0751123	NAD83	02040105	6,328.00	NJDEP	No
01458570	Nishisakawick Creek near Frenchtown, N.J.	403239	0750247	NAD83	02040105	10.10	USGS	No
01461000	Delaware River at Lumberville, Pa.	402427	0750216	NAD27	02040105	6,598.00	NJDEP	No
01463500	Delaware River at Trenton, N.J. (not part of the NJDEP Ambient Surface Water-Quality Monitoring Network)	401318	0744641	NAD83	02040105	6,780.00	USGS	Yes
01463850	Miry Run at Route 533 at Mercerville, N.J.	401449	0744112	NAD83	02040105	10.70	USGS	No
01464020	Assunpink Creek at Peace Street at Trenton, N.J.	401302	0744607	NAD83	02040105	91.40	USGS	Yes
	Lower Delaware Water Region							
01411466	Indian Branch near Malaga, N.J.	393527	0750335	NAD83	02040206	6.50	USGS	No
01411500	Maurice River at Norma, N.J.	392944	0750437	NAD83	02040206	112.00	NJDEP	Yes
01411955	Gravelly Run at Laurel Lake, N.J.	392014	0750303	NAD83	02040206	3.19	USGS	No
01412800	Cohansey River at Seeley, N.J.	392821	0751520	NAD83	02040206	28.00	USGS	Yes
01464504	Crosswicks Creek at Groveville Road at Groveville, N.J.	401002	0744039	NAD83	02040201	98.00	USGS	No
01464515	Doctors Creek at Allentown, N.J.	401037	0743556	NAD83	02040201	17.40	USGS	No
01465893	Little Creek at Chairville, N.J.	395353	0744718	NAD83	02040202	6.32	USGS	No
01466500	McDonalds Branch in Byrne State Forest, N.J.	395306	0743019	NAD83	02040202	2.35	NJDEP	Yes
01467005	North Branch Rancocas Creek at Iron Works Park at Mount Holly, N.J.	395935	0744653	NAD83	02040202	140.00	USGS	No
01467150	Cooper River at Haddonfield, N.J.	395411	0750117	NAD83	02040202	17.00	NJDEP	Yes
01467359	North Branch Big Timber Creek at Glendora, N.J.	395004	0750401	NAD83	02040202	18.80	USGS	No
01477120	Raccoon Creek near Swedesboro, N.J.	394426	0751533	NAD83	02040202	26.90	NJDEP	Yes
01482500	Salem River at Woodstown, N.J.	393838	0751949	NAD83	02040206	14.60	NJDEP	Yes

Table 2. References for methods of laboratory analyses of selected water-quality characteristics measured by the Ambient Surface-Water Quality Monitoring Network, New Jersey, water years 1998–2007.

Water-quality characteristic	Comment	Reference for method of laboratory determination
Total dissolved solids	For period of study	Fishman and Friedman (1989)
Total phosphorus	From the beginning of the period of study through December 31, 2002	Patton and Truitt (1992)
	January 1, 2003, to the end of the period of study	Patton and Kryskalla (2003)
Total organic nitrogen plus ammonia	From the beginning ot the period of study to October 1, 1999	Fishman and Friedman (1989)
	October 1, 1999 to about December, 2002	Patton and Truitt (2000)
	From about December, 2002, to the end of the period of study	Calculated[1] from laboratory-reported concentrations of dissolved organic nitrogen plus ammonia (Fishman, 1993) and total particulate nitrogen (U.S. Environmental Protection Agency, 1997)
Dissolved nitrate plus nitrite	For period of study	Fishman (1993)

[1] Method of calculation is described in the text.

consisted of calculation from concentrations of dissolved organic nitrogen plus ammonia and total particulate nitrogen.

Each concentration value determined at USGS laboratories consists of a remark code and a numeric value. An uncensored value (remark code = “ “) indicates that the concentration was reliably determined to be greater than or equal to the laboratory reporting level. An estimated value (remark code = “E”) indicates that the analyte was detected but could not be reliably quantified by the laboratory. A nondetect value (remark code = ”<”) indicates that the concentration was less than the reporting level. For a given characteristic, the reporting level sometimes changed during the period of study as a result of changes in methods or reporting protocols or because of the presence of substances in the sample that interfered with the analysis.

Instantaneous streamflow was measured at the time of each water-quality measurement or was estimated using methods described in Rantz and others (1982). Some streamflow values were taken from the records of the continuous streamgages at some of the stations (table 1). Values of streamflow at the station on the Delaware River at Lumberville, Pa. (01461000), were estimated from the record of the streamgage at the Delaware River at Trenton, N.J. (01463500).

Development of Data Sets to be Analyzed

Some of the water-quality values retrieved from the NWIS database were modified in order to provide a more accurate determination of trends than those that would have been calculated from unmodified values. These modifications are described below.

Recensoring of some Nondetect Values

For some nondetect values, the USGS National Water Quality Laboratory set laboratory reporting levels to twice the long-term method detection limit. This practice was used to minimize the probability of having a false positive and is discussed in Oblinger-Childress and others (1999). The authors note, however, that this practice also complicates interpretation of the data; results of statistical methods calculated with nondetects reported with laboratory reporting levels are biased.

To avoid this bias, laboratory reporting levels for nondetect values were set back to the long-term method detection level (half the laboratory reporting level). This was one action as suggested in Helsel (2005) to avoid bias.

Calculation of Total Organic Nitrogen plus Ammonia

As noted in table 2, some values of total organic nitrogen plus ammonia (*TKN*) were not determined by the laboratory but were calculated by summing concentrations of dissolved organic nitrogen plus ammonia (*DKN*) and total particulate nitrogen (*TPN*). The set of rules used for this calculation follows.

1. If *DKN* and *TPN* were both detected, the value of *TKN* was determined by summing the numeric values of *DKN* and *TPN*. The remark code for the *TKN* value was set to "E" if the value of either *DKN* or *TPN* was estimated.

2. If either *DKN* or *TPN* was not detected and the other was detected, then:

   (a) The ratio (*R*) was determined from the following equation:

   $$R = 100 * (TPN\,(TPN + DKN)), \qquad (1)$$

   where

   R = ratio, in percent;
   TPN = numeric value of total particulate nitrogen, in mg/L as N; and
   DKN = numeric value of dissolved organic nitrogen plus ammonia, in mg/L as N.

   (b) If *DKN* was detected, *TPN* was not detected, and the ratio, *R*, was less than or equal to 10 percent, *TKN* was determined as follows:
   (i) numeric value of *TKN* was set equal to the numeric value of *DKN*, and
   (ii) remark code of *TKN* was set to the remark code for *DKN*.

   (c) If *DKN* was not detected or the ratio, *R*, was greater than 10 percent, *TKN* was determined as follows:

   (i) $$TKN = DKN + TPN, \qquad (2)$$

   where

   TKN = numeric value of total organic nitrogen plus ammonia, in mg/L as N;
   DKN = numeric value of dissolved organic nitrogen plus ammonia, in mg/L as N; and
   TPN = numeric value of total particulate nitrogen, in mg/L as N.

   (ii) remark code for *TKN* was set to "<".

Selection of One Measurement in each Season of each Water Year

For each water-quality characteristic, the number of water-quality measurements at each station was limited so that the summary statistics and results of trend tests were comparable among all stations. Four water-quality measurements were made in a water year at most stations included in this study. As a result, the water-quality measurements at each station were limited to four in a water year, one measurement in each of the seasonal months: October to December, January to March, April to June, and July to September. If there was more than one measurement of a water-quality characteristic at a station in any season in any water year, the measurement closest to the middle of the season was selected; the remaining measurements were not included in the analysis. For dissolved oxygen, a separate data set for the growing season was created by selecting one measurement in each of two seasons, April to June and July to September, in each water year.

Calculation of Summary Statistics

Summary statistics for the values of each water-quality characteristic at each station were determined from the measurements used for trend analysis (one measurement in each of four seasons over 10 water years). Statistics include the number of measurements; the number of nondetect measurements; the maximum reporting level for nondetect values; the minimum and maximum measured values; and the 25th percentile, median, and 75th percentile values. Summary statistics for dissolved oxygen were calculated only from year-round measurements.

The 25th percentile, median, and 75th percentile values of a water-quality characteristic at a station were determined if nondetect values accounted for less than 80 percent of the measured values at a station. One of three methods was used to determine these statistics for a water-quality characteristic at a station; that method was selected on the basis of the percentage of measurements made up of nondetect values. If there were no nondetect values, these statistics were calculated by use of the Univariate procedure (SAS Institute, Inc., 1999a) which ordered the values from smallest to largest.

If one or more measurements of a water-quality characteristic at a station were nondetects and if 50 percent or fewer of the measurements were nondetects, the Kaplan-Meier method (described in Helsel, 2005) was used to determine the 25th percentile, median, and 75th percentile values at that station. Kaplan-Meier is a standard method for estimating summary statistics on "survival" data, which are composed of uncensored values and right-censored values ("greater thans"). To use this method, the set of water-quality values was converted to a survival data set by subtracting all the values from a constant equal to twice the largest water-quality value.

Summary statistics were determined on this survival data set by use of the Lifetest procedure (SAS Institute, Inc., 1999b). The resulting summary statistics were converted back to the original water-quality data set by subtracting them from the constant.

If nondetect measurements accounted for greater than 50 percent and less than 80 percent of the values at a station, the Regression on Order Statistics (ROS) method (described in Helsel, 2005) was used to determine the 25th percentile, median, and 75th percentile values at that station. This method is based on developing a linear relation between the logarithms of water-quality values as a function of normal quantiles. Calculations were done with a computer program obtained from the "Practical Statistics for the Sciences" website accessed July 19, 2005, at *http://www.practicalstats.com/*.

Identification of Trends in Water Quality

Procedures of the ESTREND program (Schertz and others, 1991) used to identify monotonic trends in flow-adjusted concentrations of water quality were obtained from version 3.2 of the USGS library for S-PLUS (David Lorenz, U.S. Geological Survey, written commun., 2008), a commercial statistical software package produced by the Insightful Corporation (accessed at *http://www.insightful.com/* on August 20, 2008). The features of the USGS library used for this study are essentially the same as those in version 2.1 described in Slack and others (2003) and at the website *http://water.usgs.gov/software/S-PLUS/* (accessed August 8, 2008).

Three types of results are produced by the trend tests—the trend slope, the level of significance of the trend slope, and the summary. The trend slope is the "per year" change in the flow-adjusted water-quality values during water years 1998–2007. Each trend slope is expressed (1) in units of the water-quality characteristic and (2) as a percentage of a representative value (described below) of the water-quality characteristic. In some cases, only the direction of the slope is reported as "+" (indicating the value tended to increase over time) or "-" (indicating the value tended to decrease over time).

The level of significance of the trend slope indicates the probability that the trend slope is actually different from zero. A trend is not considered to exist if the level of significance of the trend test is greater than 0.05. The value of the summary result for each of these tests is "no trend."

A trend is considered to exist if the level of significance of the trend test is less than or equal to 0.05. If the trend slope is negative, the results indicate a monotonic decrease in flow-adjusted values of water quality during water years 1998–2007, and the value of the summary result for each of these tests is "Decrease." If the trend slope is positive, the results indicate a monotonic increase in flow-adjusted values of water quality during this period, and the value of the summary result is "Increase."

Seasonal Kendall Test

The Seasonal Kendall test (described in Schertz and others, 1991) was used to identify trends in flow-adjusted values of dissolved oxygen, pH, and total dissolved solids; tests were conducted on the year-round values of all three characteristics as well as on dissolved oxygen concentrations measured during the growing season. This nonparametric test compares flow-adjusted water-quality values measured in each season throughout the period of study, and then calculates the trend in water quality from the results for all seasons included in the test.

For each Seasonal Kendall test, ESTREND set the representative value to be the median of water-quality values included in the test. These median values were computed with the Kaplan-Meier method (previously discussed) and, in some cases, may be slightly different than the medians presented in the tables of summary statistics, which were calculated separately and, possibly, with a different method.

The first step in running the Seasonal Kendall test on values of a water-quality characteristic at a station is to determine flow-adjusted values of water quality. To do this, a relation between untransformed values of water quality and instantaneous streamflow was developed. Flow-adjusted values are the differences between measured values and the values from the relation between water quality and streamflow.

Two methods were used to develop the relations between water quality and streamflow. Most relations were equations determined from linear regression; the form of these equations is given below:

$$C = B_0 + B_1 * \log(Q), \tag{3}$$

where

log = natural logarithm;
C = value of the water-quality characteristic, in water-quality units;
B_0 = intercept;
B_1 = coefficient for instantaneous streamflow; and
Q = instantaneous streamflow, in cubic feet per second.

A second method, LOESS smoothing (described in Schertz and others, 1991), was used in place of linear regression if the relation from LOESS smoothing appeared (from inspection of plots) to represent the overall relation between water quality and streamflow better than the relation from linear regression.

The results of the trend tests on pH were not reported if the results appeared to have been affected by a change in the methods of measurement. The apparent change in pH values due to the change in methods of measurement is discussed below.

Results of trend tests for dissolved oxygen and pH are not presented if analyses clearly indicated that the results of the trend test were affected by a systematic change in time of measurement during the period of study. This effect was considered to exist if (1) there was a correlation between the values of water quality and the time of measurement and (2) there was a trend in the time of measurement. The correlation between values of water quality and the time of measurement was identified from Kendall's tau correlation (described in Helsel and Hirsch, 1992); the level of significance and the direction of each relation (whether water quality increased or decreased with increasing time of measurement) were determined. Trends in time of measurement were identified with the Seasonal Kendall trend test; however, times of measurement were not adjusted for streamflow. The direction of the trend slope (increase or decrease) and the level of significance of the trend slope also were determined.

Tobit Regression

Tobit regression (described in Helsel and Hirsch, 1992, and in Cohn, 1988) was used to identify trends in flow-adjusted values of total phosphorus, total organic nitrogen plus ammonia, and dissolved nitrate plus nitrite at each station. Tobit regression was used because there were nondetect values of each of these water-quality characteristics at some stations, and Tobit regression can incorporate the information in nondetect values as well as the information in uncensored values. Tobit regressions were conducted if there were 15 or more uncensored or estimated water-quality measurements at a station.

Using Tobit regression, an equation relating values of a water-quality characteristic at a station to year, streamflow, and season was developed. The form of this equation is given below.

$$\log(C) = B_0 + (B_1 * Year) + (B_2 * \log(Q)) + (B_3 * \cos(2\pi * Year)) + (B_4 * \sin(2\pi * Year)), \quad (4)$$

where

log = natural logarithm;
C = value water-quality characteristic, in water-quality units;
B_0 = intercept;
B_1 = coefficient for Year;
Year = decimal years from October 1, 1997;
B_2 = coefficient for instantaneous streamflow;
Q = instantaneous streamflow, in cubic feet per second;
B_3 = coefficient for first seasonal term;
cos = cosine;
B_4 = coefficient for second seasonal term;
sin = sine.

Trend slopes (in units of water quality per year and percent of mean per year) were calculated from the value of the coefficient for "*Year*" (B_1) by use of the equations below (Helsel and Hirsch, 1992). The level of significance of the trend slopes is the level of significance of B_1. The mean of water-quality values, from which the trend slope in water-quality units per year at each station was calculated, was determined by use of Regression on Order Statistics.

$$Trend_{qw} = C_{mean} * (\exp(B_1) - 1), \quad (5)$$

where

$Trend_{qw}$ = trend slope, in water-quality units per year;
C_{mean} = mean of water-quality characteristic, in water-quality units;
exp = exponent; and
B_1 = coefficient for *Year* in equation 4.

$$Trend_{pct} = 100 * (\exp(B_1) - 1), \quad (6)$$

where

$Trend_{pct}$ = trend slope, in percent of mean concentration per year;
exp = exponent; and
B_1 = coefficient for *Year* in equation 4.

For each of the three water-quality characteristics, two trend tests were conducted on the data from most stations. One test was conducted on all measurements; a second test was conducted on all measurements, except the most extreme outlying point if such a point could be identified from plots of influence values as a function of date (David Lorenz, U.S. Geological Survey, written commun., 2008).

Comparison of Trends from this Study with Trends from Previous Studies

Trends from this study were compared to the trends from studies conducted for New Jersey streams during water years 1980–86 (Hay and Campbell, 1990) and water years 1986–95 (Hickman and Barringer, 1999). For each water-quality characteristic, the percentages of the stations included in each study and that have a trend are shown in a bar chart. Also, the results of trend tests in a water-quality characteristic at selected stations are shown in a table with the results from the previous studies. Only trends identified by Hay and Campbell at the 0.05 level of significance were considered in this comparison.

These comparisons did not always include the same water-quality variables in all three studies. Table 3 lists the water-quality characteristics studied by Hay and Campbell (1990) and Hickman and Barringer (1999) that were compared with water-quality characteristics from this report. Trends in flow-adjusted concentrations of total phosphorus and dissolved nitrate plus nitrite were, in general, not determined by Hay and Campbell (1990).

Comparison of pH Values before and after a Change in Field Methods

A rank-sum test was used to determine whether pH values collected at each station prior to October 1, 2001, were, as a group, different from the group of measurements made at that station following this date. This nonparametric test is described in Helsel and Hirsch (1992). Differences were considered to exist at the 0.05 level of significance.

Table 3. Water-quality characteristics included in the study of water years 1998–2007 and in previous studies of trends of the quality of New Jersey streams.

[All analyses shown are in flow-adjusted values; n.a., trends in corresponding water-quality characteristic were not available]

Water years 1998–2007	Were compared with the results of trend analyses in	
	Hay and Campbell (1990), water years 1980–86	Hickman and Barringer (1999), water years 1986–95
Dissolved oxygen, in milligrams per liter	Dissolved oxygen, in milligrams per liter	Dissolved oxygen, in milligrams per liter
pH, in standard units	pH, in standard units	pH, in standard units
Total dissolved solids, in milligrams per liter	Sum of dissolved constituents, in milligrams per liter	Total dissolved solids, in milligrams per liter
Total phosphorus, in milligrams per liter as P	n.a.	Total phosphorus, in milligrams per liter as P
Total organic nitrogen plus ammonia, in milligrams per liter as N	Total organic nitrogen, in milligrams per liter as N	Total organic nitrogen, in milligrams per liter as N
Dissolved nitrate plus nitrite, in milligrams per liter as N	n.a.	Total nitrate, in milligrams per liter as N

Trends in the Quality of Water in New Jersey Streams

Summary statistics and results of trend tests are listed in tables at the end of this report. Information on dissolved oxygen is given in tables 4 (summary statistics), 5a (trend test results for year-round measurements), 5b (trend test results for growing-season measurements), and 5c (selected trend test results for year-round and growing-season measurements). Information on pH is given in tables 6 (summary statistics) and 7 (trend test results), on total dissolved solids in tables 8 (summary statistics) and 9 (trend test results), on total phosphorus in tables 10 (summary statistics) and 11 (trend test results), on total organic nitrogen plus ammonia in tables 12 (summary statistics) and 13 (trend test results), and on dissolved nitrate plus nitrite in tables 14 (summary statistics) and 15 (trend test results). (Tables 4–15 are at the end of the report.)

Summary statistics are presented for measurements of a water-quality characteristic at a station even if the measurements were deemed not suitable to test for a trend because the reader may find the statistics useful. Each table of summary statistics contains an indication of whether trend results are presented for a station. Reasons why results of trend tests are not presented are discussed below.

Only a small change in level of significance determined whether or not a trend was identified. For example, a level of significance of 0.051 indicates no trend, but a level of significance of 0.050 indicates a trend. For their own purposes and with caution, readers may consider a trend to be indicated by a different level of significance.

Trends Determined from the Seasonal Kendall Test

Trends in dissolved oxygen, pH, and total dissolved solids were identified from the Seasonal Kendall test. As an example, the application of the Seasonal Kendall trend test to total dissolved solids at the water-quality station on the Whippany River near Pine Brook, N.J. (01381800), is shown in figures 3A, 3B, and 3C. Measured concentrations of total dissolved solids as a function of streamflow are shown in figure 3A, along with concentrations predicted from a least-squares regression equation (shown in the figure) relating these concentrations to streamflow. Flow-adjusted concentrations were determined by subtracting (1) concentrations predicted from the equation from (2) measured concentrations; these flow-adjusted concentrations are shown in figure 3B as a function of date.

The result of the Seasonal Kendall test indicates that flow-adjusted concentrations at the water-quality station on the Whippany River near Pine Brook, N.J. (01381800), increased during the period of study (table 9). The level of significance of the trend slope (0.014) is less than 0.05 and indicates that there was a trend in the flow-adjusted concentrations. The trend slope, 9.6 milligrams per liter per year, is magnitude of this trend (fig. 3B). The trend slope and concentrations are shown as a function of date in figure 3C.

Dissolved Oxygen

Results of trend tests of year-round flow-adjusted measurements of dissolved oxygen are presented for 66 stations (table 5a; fig. 4A). Decreases in concentrations over the period of study were identified at four stations; the slopes of these trends range from -0.13 to -0.255 milligrams per liter per year (-1.3 to -3.2 percent of median concentrations per year). Increases in concentrations over the period of study were not identified at any station. Summary statistics for year-round measurements of dissolved oxygen are listed in table 4.

Results of trend tests of growing-season flow-adjusted measurements of dissolved oxygen are presented for 65 stations (table 5b; fig. 4B). Decreases in concentrations over the period of study were identified at four stations; the slopes of these trends range from -0.100 to -0.354 milligrams per liter per year (-1.3 to -5.8 percent of medians per year). Increases in concentrations over the period of study were identified at four stations; the slopes of these trends range from 0.085 to 0.13 milligrams per liter per year (1 to 1.6 percent of median concentrations per year).

More trends in dissolved oxygen were identified from growing-season measurements (8 stations) than from year-round measurements (4 stations) (table 5c). This was expected because growing-season measurements are more likely than year-round measurements to show the effects of biological and chemical processes removing or adding oxygen to a stream. During the growing season, water temperatures are usually greater than, and the rates of streamflow are usually less than, the corresponding values during the nongrowing season (October–March). As a result, dissolved oxygen concentrations during the growing season are more likely to differ in saturation than are concentrations during the nongrowing season and, by extension, year-round concentrations. The station on the Delaware River at Riegelsville, N.J. (01457500), was the only station for which trends were identified for both year-round and growing-season measurements; both trends indicate decreasing concentrations over the period of study.

Results of trend tests of year-round measurements of dissolved oxygen at four stations and in growing-season measurements at five stations were not presented because these results were clearly affected by a trend in time of measurement of dissolved oxygen (tables 5a and 5b, respectively). The results of those tests for trends in dissolved oxygen were set to “n.d.” because (1) there was a trend in times of measurement and (2) dissolved oxygen correlated with the time of measurement.

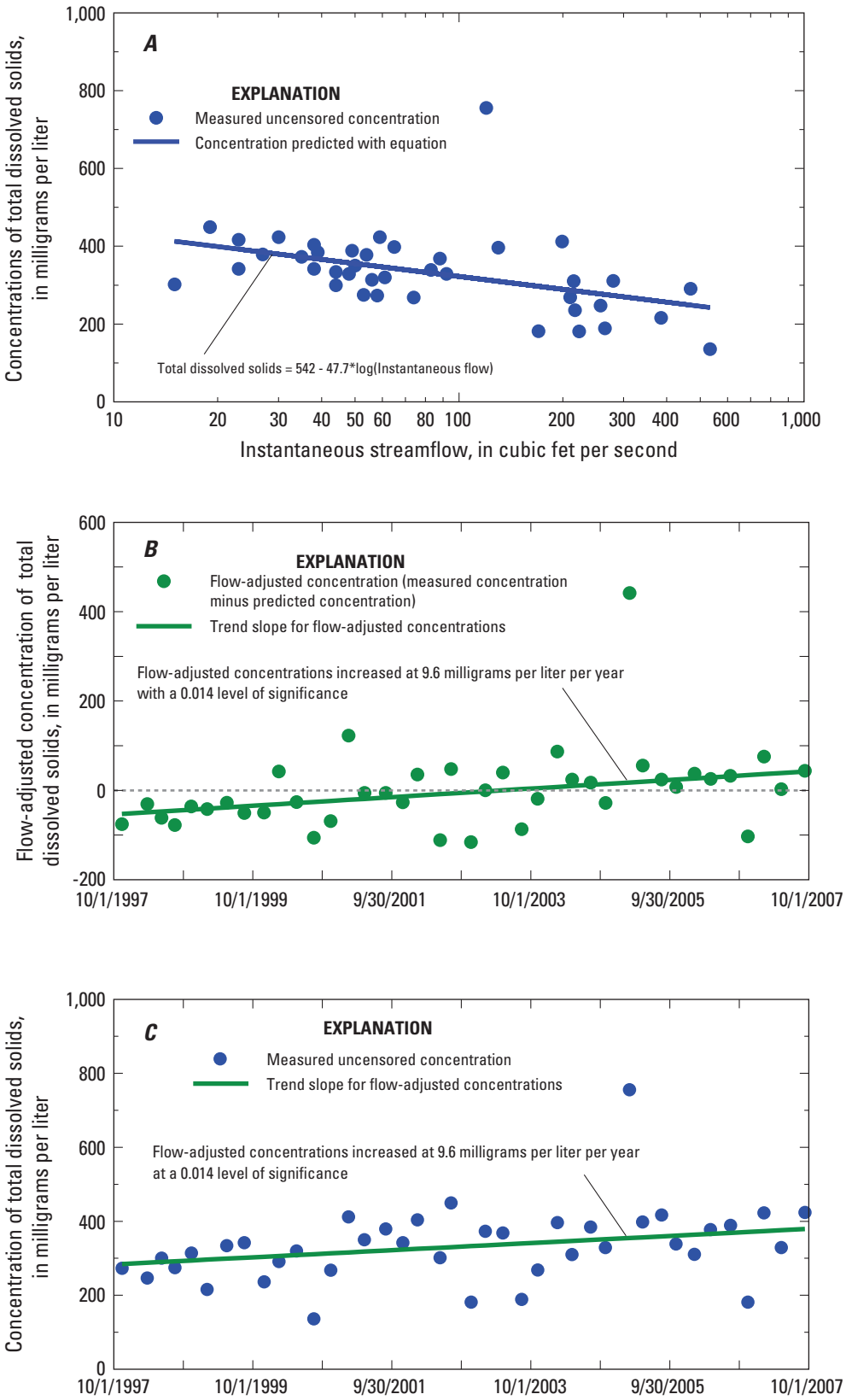

Figure 3. Results of the Seasonal Kendall trend test for concentrations of total dissolved solids at the water-quality station on the Whippany River near Pine Brook, N.J. (01381900), water years 1998–2007, (*A*) concentrations as a function of streamflow, (*B*) flow-adjusted concentrations and trend slope as a function of date, and (*C*) concentrations and trend slope as a function of date.

Base from U.S. Geological Survey digital line graph files, 1:24,000, Universal Transverse Mercator projection, Zone 18, NAD83

Figure 4. Trends in (*A*) year-round concentrations of dissolved oxygen and (*B*) growing-season (April–September) concentrations of dissolved oxygen at water-quality stations on streams in New Jersey, water years 1998–2007.

Base from U.S. Geological Survey digital line graph files, 1:24,000, Universal Transverse Mercator projection, Zone 18, NAD83

Figure 4. Trends in (*A*) year-round concentrations of dissolved oxygen and (*B*) growing-season (April–September) concentrations of dissolved oxygen at water-quality stations on streams in New Jersey, water years 1998–2007.—Continued

The consideration of trends in time of measurement was included in this study because (1) most of the measurements considered in this report were made during the morning or early afternoon and (2) dissolved oxygen concentrations measured during this period typically increase with time of day as a result of increasing photosynthesis as sunlight increases following sunrise. Values of dissolved oxygen at the water-quality station on the Delaware River at Trenton, N.J. (01463500), show this pattern (fig. 5).

The correlation between dissolved oxygen concentrations and time of measurement tends to support the theory that increasing photosynthesis during the day has been causing increased dissolved oxygen at some stations. Year-round concentrations at 11 stations increased with increasing time of measurement (table 5a); concentrations did not decrease at any station. When growing-season measurements were tested, concentrations at 17 stations increased with increasing time of measurement (table 5b); concentrations decreased at 2 stations.

As an example, the result of the trend test of growing-season dissolved oxygen at the station on Flat Brook near Flatbrookville, N.J. (01440000), clearly shows the effect of a trend in times of measurement. The result of the trend test of dissolved oxygen indicates that concentrations decreased over the period of study (fig. 6). However, because dissolved oxygen concentrations increased with time of measurement (table 5b), and the times of measurement decreased over the period of study (table 5b), the decrease in dissolved oxygen during the period of study can be attributed to the times of measurement, which are earlier during the second half of the period of study than those during the first half.

Results of trend tests of year-round flow-adjusted values of dissolved oxygen determined in this current study and the results of corresponding values from Hay and Campbell (1990) and Hickman and Barringer (1999) are shown for comparison in figure 7 and table 16. Neither of the previous studies looked for trends in times of measurement.

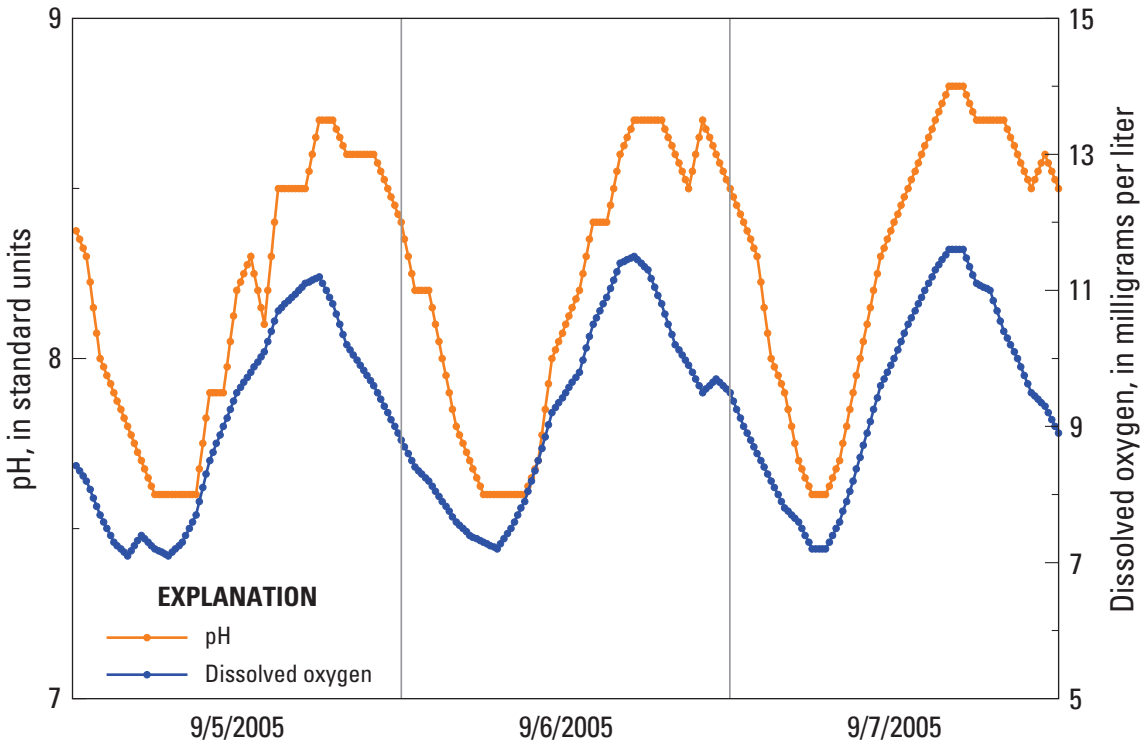

Figure 5. Values of pH and dissolved oxygen measured continually at the water-quality station on the Delaware River at Trenton, N.J. (01463500), September 5–7, 2005.

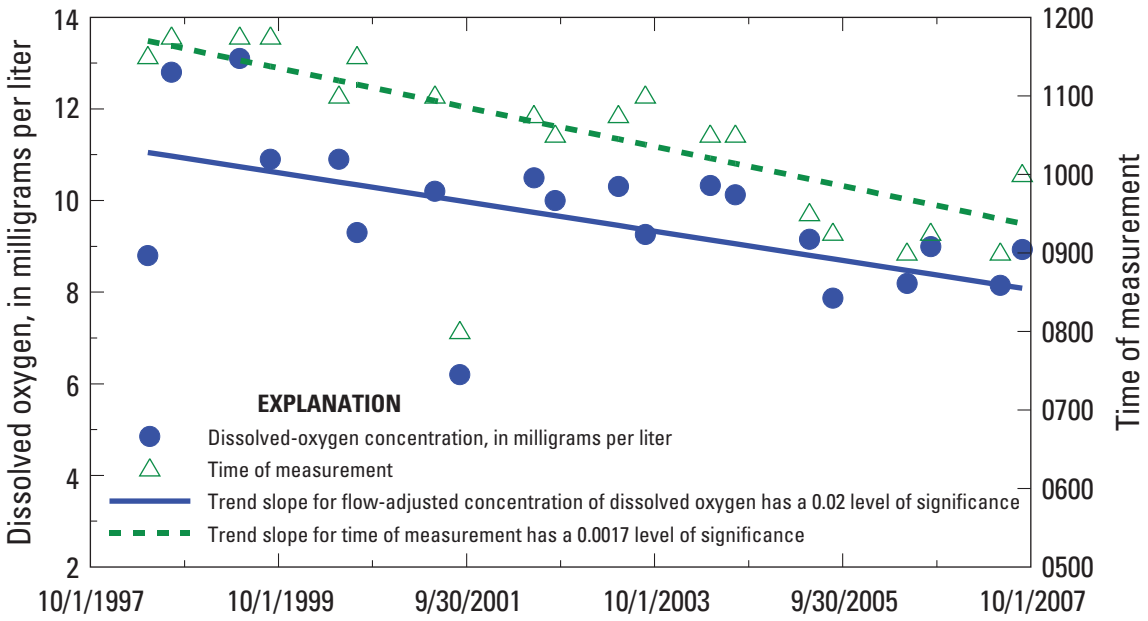

Figure 6. Growing-season concentrations of dissolved oxygen and times of measurement as a function of date at the water-quality station on Flat Brook near Flatbrookville, N.J. (01440000), water years 1998–2007.

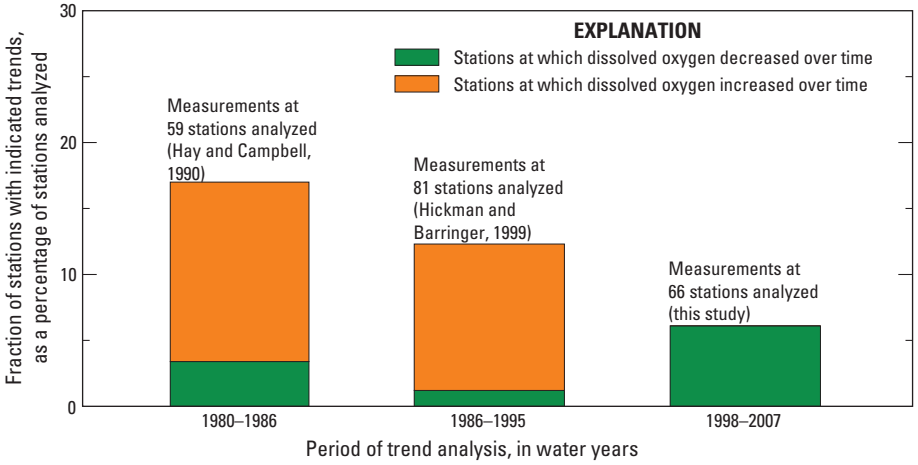

Figure 7. Fraction of water-quality stations on streams in New Jersey with trends in year-round flow-adjusted concentrations of dissolved oxygen during water years 1980–86, 1986–95, and 1998–2007.

Table 16. Results of trend tests on flow-adjusted concentrations of dissolved oxygen during water years 1998–2007 and earlier periods at selected water-quality stations on New Jersey streams.

[Stations are listed if results were determined for the current and one previous study; --, no trend in flow-adjusted concentrations of dissolved oxygen during the period of study was identified at a 0.05 level of significance; **Decrease**, dissolved oxygen decreased during the period of study; **Increase**, dissolved oxygen increased during the period of study; n.d., not determined]

Station number	Station name	Results of trend analyses on year-round flow-adjusted concentrations of dissolved oxygen		
		Water years 1980–1986 (Hay and Campbell, 1990)[1]	Water years 1986–1995 (Hickman and Barringer, 1999)	Water years 1998–2007 (this study)
	Passaic Water Region			
01377000	Hackensack River at Rivervale, N.J.	--	--	--
01381800	Whippany River near Pine Brook, N.J.	**Increase**	--	--
01382000	Passaic River at Two Bridges, N.J.	n.d.	**Increase**	--
01382500	Pequannock River at Macopin Intake Dam, N.J.	n.d.	--	--
01387500	Ramapo River near Mahwah, N.J.	--	--	--
01389500	Passaic River at Little Falls, N.J.	--	**Increase**	--
01391500	Saddle River at Lodi, N.J.	**Decrease**	--	--
	Raritan Water Region			
01395000	Rahway River at Rahway, N.J.	--	--	--
01396660	Mulhockaway Creek at Van Syckel, N.J.	--	--	--
01398000	Neshanic River at Reaville, N.J.	**Increase**	--	--
01399780	Lamington River at Burnt Mills, N.J.	**Increase**	**Increase**	--
01402000	Millstone River at Blackwells Mills, N.J.	n.d.	--	--
01405340	Manalapan Brook at Federal Road near Manalapan, N.J.	--	--	--
	Atlantic Coastal Water Region			
01408000	Manasquan River at Squankum, N.J.	n.d.	--	--
01408500	Toms River near Toms River, N.J.	--	--	--
01409387	Mullica River at outlet of Atsion Lake at Atsion, N.J.	--	--	--
01409416	Hammonton Creek at Wescoatville, N.J.	--	--	--
01409500	Batsto River at Batsto, N.J.	--	--	--
01409815	West Branch Wading River at Maxwell, N.J.	--	n.d.	--
01410150	East Branch Bass River near New Gretna, N.J.	**Increase**	**Decrease**	--
01411110	Great Egg Harbor River at Weymouth, N.J.	n.d.	--	--
	Upper Delaware Water Region			
01367770	Wallkill River near Sussex, N.J.	--	--	--
01438500	Delaware River at Montague, N.J.	n.d.	--	**Decrease**
01443000	Delaware River at Portland, Pa.	n.d.	--	--
01443500	Paulins Kill at Blairstown, N.J.	--	--	--
01457400	Musconetcong River at Riegelsville, N.J.	n.d.	--	--
01457500	Delaware River at Riegelsville, N.J.	n.d.	--	**Decrease**
01461000	Delaware River at Lumberville, Pa.	n.d.	--	--
01463500	Delaware River at Trenton, N.J.	--	--	--
	Lower Delaware Water Region			
01412800	Cohansey River at Seeley, N.J.	--	--	--
01464515	Doctors Creek at Allentown, N.J.	n.d.	--	--
01466500	McDonalds Branch in Byrne State Forest, N.J.	--	--	--
01467150	Cooper River at Haddonfield, N.J.	n.d.	--	**Decrease**
01477120	Raccoon Creek near Swedesboro, N.J.	--	--	--
01482500	Salem River at Woodstown, N.J.	--	--	--

[1] Although Hay and Campbell (1990) considered trends to be significant at the 0.1 level, trends significant at the 0.05 level were identified in their report.

pH

Results of trend tests of pH were determined for 26 stations (table 7; fig. 8). Decreases in value were identified at two stations; the slopes of these trends fall in the range of -0.019 to -0.028 pH units per year (-0.3 to -0.4 percent of median pH per year). Increases in values were identified at three stations; the slopes of these trends fall in the range of 0.017 to 0.069 pH units per year (0.2 to 0.9 percent of median pH per year). Summary statistics for pH are listed in table 6.

Results of trend tests of pH are not presented for ASWQMN stations sampled by USGS personnel because an examination of time-series plots of pH values measured by USGS personnel indicated a step decrease near the start of water year 2002, which is apparently related to the change in USGS field methods previously discussed. The existence of this step decrease was verified by the results of a rank-sum test to compare values of pH measured prior to October 1, 2001, at a station to pH values at that station following that date. Results of these tests indicate that, at the 43 stations sampled by USGS personnel (other than 01463500), pH values following October 1, 2001, were less than prior pH values at 26 stations (60 percent) and greater than prior pH values at 0 stations. The results for the same tests at the 26 stations sampled by NJDEP personnel were quite different; pH values following October 1, 2001, were less than prior pH values at two stations (8 percent) and greater than prior pH values at two stations (8 percent). In response to this analysis, results of trend tests of pH for USGS-sampled stations (other than 01463500) were set to "n.d." (table 7).

Results of the trend test in pH at the station on the Cooper River at Haddonfield, N.J. (01467150) are not reported because they were affected by a trend in time of measurement (table 7). Values of pH, like those of dissolved oxygen, typically vary diurnally because of the effects of photosynthesis (see figure 6 as an example). The effect of a trend in time of measurement on results of trends in pH values was examined as previously described for dissolved oxygen. The station on the Cooper River was the only station sampled by NJDEP at which there was a trend in time of pH measurement and a correlation between time of measurement and pH value.

Results of this study and those of previous studies are shown in figure 9 and table 17 for comparison. The fraction of stations with trends in pH during water years 1998–2007 was greater than the fraction of stations identified as having trends in the two previous studies (fig. 9). The number of stations analyzed for trends in pH in this study is far fewer than the number analyzed in the previous studies.

Total Dissolved Solids

Results of trend tests of total dissolved solids are reported for all 70 stations. Trends were identified at 24 stations (table 9; figure 10). All trends indicate increasing concentrations during the period of study; the slopes of these trends range from 0.6 to 12.9 milligrams per liter per year (0.9 to 5.3 percent of median concentrations). Increasing concentrations were identified at both stations (01394500 and 01395000) on the Rahway River. Summary statistics for total dissolved solids are listed in table 8.

Results of trend analysis of measurements of dissolved solids in this study and those of previous studies (Hay and Campbell, 1990; Hickman and Barringer, 1999) are shown in figure 11 for comparison. The fraction of stations at which concentrations of total dissolved solids increased during water years 1998–2007 (34 percent) is greater than the corresponding fraction of stations with increasing concentrations during water years 1980–86 (24 percent) and water years 1986–95 (26 percent). The trend tests for water years 1980–86 were conducted on the sums of dissolved solids, which are very similar to values of total dissolved solids. Results of trend tests for individual stations are presented in table 18.

Base from U.S. Geological Survey digital line graph files, 1:24,000, Universal Transverse Mercator projection, Zone 18, NAD83

Figure 8. Trends in pH at water-quality stations on streams in New Jersey, water years 1998–2007.

Table 17. Results of trend tests on flow-adjusted values of pH during water years 1998–2007 and earlier periods at selected water-quality stations on New Jersey streams.

[Stations are listed if results were determined for the current and one previous study; --, no trend in flow-adjusted values of pH during the period of study was identified at a 0.05 level of significance; **Decrease**, pH values decreased during the period of study; **Increase**, pH values increased during the period of study; n.d., not determined]

Station number	Station name	Results of trend tests on flow-adjusted values of pH		
		Water years 1980–1986 (Hay and Campbell, 1990)[1]	Water years 1986–1995 (Hickman and Barringer, 1999)	Water years 1998–2007 (this study)
	Passaic Water Region			
01377000	Hackensack River at Rivervale, N.J.	--	--	--
01381800	Whippany River near Pine Brook, N.J.	--	--	--
01382500	Pequannock River at Macopin Intake Dam, N.J.	n.d.	--	--
01387500	Ramapo River near Mahwah, N.J.	**Increase**	--	--
01391500	Saddle River at Lodi, N.J.	--	--	--
	Raritan Water Region			
01394500	Rahway River near Springfield, N.J.	--	--	**Increase**
01395000	Rahway River at Rahway, N.J.	--	--	--
01396660	Mulhockaway Creek at Van Syckel, N.J.	--	**Increase**	--
01398000	Neshanic River at Reaville, N.J.	**Increase**	--	--
01402000	Millstone River at Blackwells Mills, N.J.	n.d.	**Increase**	--
	Atlantic Coastal Water Region			
01408000	Manasquan River at Squankum, N.J.	n.d.	--	**Decrease**
01408500	Toms River near Toms River, N.J.	--	**Increase**	**Increase**
01410150	East Branch Bass River near New Gretna, N.J.	--	--	--
	Upper Delaware Water Region			
01438500	Delaware River at Montague, N.J.	n.d.	--	**Decrease**
01440000	Flat Brook near Flatbrookville, N.J.	n.d.	--	--
01443500	Paulins Kill at Blairstown, N.J.	--	--	--
01457500	Delaware River at Riegelsville, N.J.	n.d.	--	--
01461000	Delaware River at Lumberville, Pa.	n.d.	--	**Increase**
01463500	Delaware River at Trenton, N.J.	--	--	--
	Lower Delaware Water Region			
01411500	Maurice River at Norma, N.J.	--	--	--
01466500	McDonalds Branch in Byrne State Forest, N.J.	--	--	--
01477120	Raccoon Creek near Swedesboro, N.J.	**Decrease**	--	--
01482500	Salem River at Woodstown, N.J.	--	--	--

[1] Although Hay and Campbell (1990) considered trends to be significant at the 0.1 level, trends significant at the 0.05 level were identified in their report.

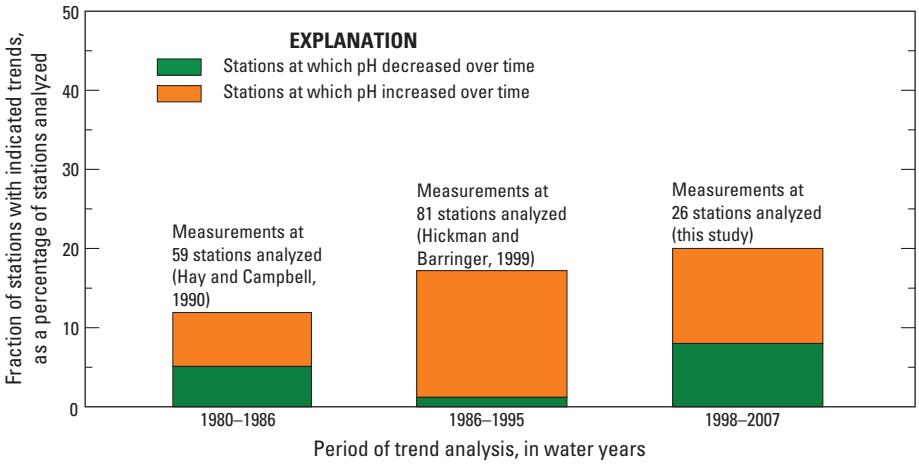

Figure 9. Fraction of water-quality stations on streams in New Jersey with trends in flow-adjusted values of pH during water years 1980–86, 1986–95, and 1998–2007.

Base from U.S. Geological Survey digital line graph files, 1:24,000, Universal Transverse Mercator projection, Zone 18, NAD83

Figure 10. Trends in concentrations of total dissolved solids at water-quality stations on streams in New Jersey, water years 1998–2007.

Table 18. Results of trend tests on flow-adjusted concentrations of dissolved solids during water years 1998–2007 and earlier periods at selected water-quality stations on New Jersey streams.

[Stations are listed if results were determined for the current and one previous study; --, no trend in flow-adjusted concentrations of dissolved solids during the period of study was identified at a 0.05 level of significance; **Decrease**, concentrations of dissolved solids decreased during the period of study; **Increase**, concentrations of dissolved solids increased during the period of study; n.d., not determined]

Station number	Station name	Results of trend tests on flow-adjusted concentrations of dissolved solids		
		Sum of dissolved constituents, water years 1980–1986 (Hay and Campbell, 1990)[1]	Total dissolved solids, water years 1986–1995 (Hickman and Barringer, 1999)	Total dissolved solids, water years 1998–2007 (this study)
	Passaic Water Region			
01377000	Hackensack River at Rivervale, N.J.	n.d.	--	--
01381800	Whippany River near Pine Brook, N.J.	n.d.	--	**Increase**
01382000	Passaic River at Two Bridges, N.J.	n.d.	**Increase**	--
01387500	Ramapo River near Mahwah, N.J.	n.d.	--	--
01389500	Passaic River at Little Falls, N.J.	--	**Increase**	--
01391500	Saddle River at Lodi, N.J.	n.d.	--	**Increase**
	Raritan Water Region			
01394500	Rahway River near Springfield, N.J.	n.d.	--	**Increase**
01395000	Rahway River at Rahway, N.J.	n.d.	--	**Increase**
01396660	Mulhockaway Creek at Van Syckel, N.J.	--	**Increase**	--
01398000	Neshanic River at Reaville, N.J.	--	--	--
01399780	Lamington River at Burnt Mills, N.J.	--	--	**Increase**
01405340	Manalapan Brook at Federal Road near Manalapan, N.J.	--	--	**Increase**
	Atlantic Coastal Water Region			
01408500	Toms River near Toms River, N.J.	--	n.d.	**Increase**
01409416	Hammonton Creek at Wescoatville, N.J.	--	--	**Increase**
01409500	Batsto River at Batsto, N.J.	--	**Decrease**	--
01409815	West Branch Wading River at Maxwell, N.J.	--	n.d.	--
01410150	East Branch Bass River near New Gretna, N.J.	--	n.d.	**Increase**
01411110	Great Egg Harbor River at Weymouth, N.J.	n.d.	--	**Increase**
	Upper Delaware Water Region			
01367770	Wallkill River near Sussex, N.J.	**Increase**	--	--
01443000	Delaware River at Portland, Pa.	n.d.	--	--
01443500	Paulins Kill at Blairstown, N.J.	**Increase**	--	--
01457400	Musconetcong River at Riegelsville, N.J.	n.d.	**Increase**	--
01461000	Delaware River at Lumberville, Pa.	n.d.	--	--
01463500	Delaware River at Trenton, N.J.	**Increase**	--	--
	Lower Delaware Water Region			
01411500	Maurice River at Norma, N.J.	--	--	--
01412800	Cohansey River at Seeley, N.J.	--	**Increase**	--
01464515	Doctors Creek at Allentown, N.J.	n.d.	--	--
01466500	McDonalds Branch in Byrne State Forest, N.J.	--	n.d.	--
01477120	Raccoon Creek near Swedesboro, N.J.	--	--	**Increase**
01482500	Salem River at Woodstown, N.J.	--	--	**Increase**

[1] Although Hay and Campbell (1990) considered trends to be significant at the 0.1 level, trends significant at the 0.05 level were identified in their report.

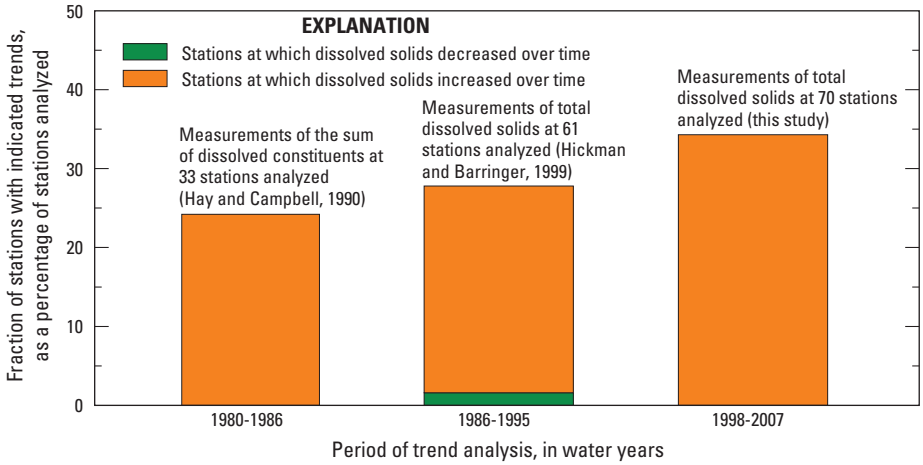

Figure 11. Fraction of water-quality stations with trends in flow-adjusted concentrations of dissolved solids during water years 1980–86, 1986–95, and 1998–2007.

Trends determined from Tobit Regression

Trends in flow-adjusted values of total phosphorus, total organic nitrogen plus ammonia, and dissolved nitrate plus nitrite were identified by use of tests with Tobit regression. For measurements of each water-quality characteristic at each station, the result presented is that of either the test with all water-quality measurements or the test with all measurements except the extreme outlier. If the results of the two tests were equivalent—either no trend, increasing values of water quality, or decreasing values of water quality, the result presented is from the test with all measurements. If the results of the two tests were not equivalent, the result presented is that from the test without the extreme outlier.

Tests were conducted with and without the most extreme outlier for two reasons. First, an extreme outlier may cause the residuals from the Tobit regression to be unevenly distributed, and the results of the regression are likely to be less accurate the less evenly distributed the residuals are. Second, this approach reduces the probability that the identification of a trend is due only to the influence of a single extreme outlier.

As an example, the application of Tobit regression to all measurements of total organic nitrogen plus ammonia at the water-quality station on the Pequannock River at the Macopin Intake Dam (01382500) is shown in figures 12A and 12B. Measured concentrations as a function of concentrations predicted with the equation produced by Tobit regression are shown in figure 12A.

The result of the Tobit regression trend test indicates that flow-adjusted concentrations of total organic nitrogen plus ammonia at the water-quality station on the Pequannock River at the Macopin Intake Dam (01382500) increased during the period of study (table 13). The level of significance of the trend slope (0.001) is the level of significance of the coefficient for "*Year*" in equation 4. The trend slope for the flow-adjusted concentrations was determined to be 0.036 milligrams per liter as nitrogen (N) per year from the value of the coefficient for "*Year*" from equation 4 (0.0915) and equation 5. Given that the level of significance of the trend slope is less than 0.05, flow-adjusted concentrations of total organic nitrogen plus ammonia at this station (01382500) increased during the period of study at the rate of change indicated by the trend slope. Measured concentrations, the concentrations predicted with equation 4, and the trend slope as a function of date are shown in figure 12B.

Total Phosphorus

Results of trend tests of total phosphorus are reported for 69 stations (table 11 and fig. 13). A trend test was not conducted on values of total phosphorus at the water-quality station on McDonalds Branch in Byrne State Forest, N.J. (01466500), because there were an insufficient number of uncensored or estimated concentrations. Summary statistics for total phosphorus are listed in table 10.

Trends in total phosphorus concentration over the period of study were identified at 17 stations (table 11). Decreasing concentrations were identified for 12 stations; the slopes for these trends range from -0.001 to -0.055 milligrams per liter as phosphorus (P) per year (-3.0 to -12.1 percent of mean concentrations per year). Increasing concentrations were identified for five stations; slopes for these trends range from 0.002 to 0.011 milligrams per liter as P per year (5.9 to 8.6 percent of mean concentrations per year).

For two reaches with two or more stations each, decreasing concentrations of total phosphorus over the period

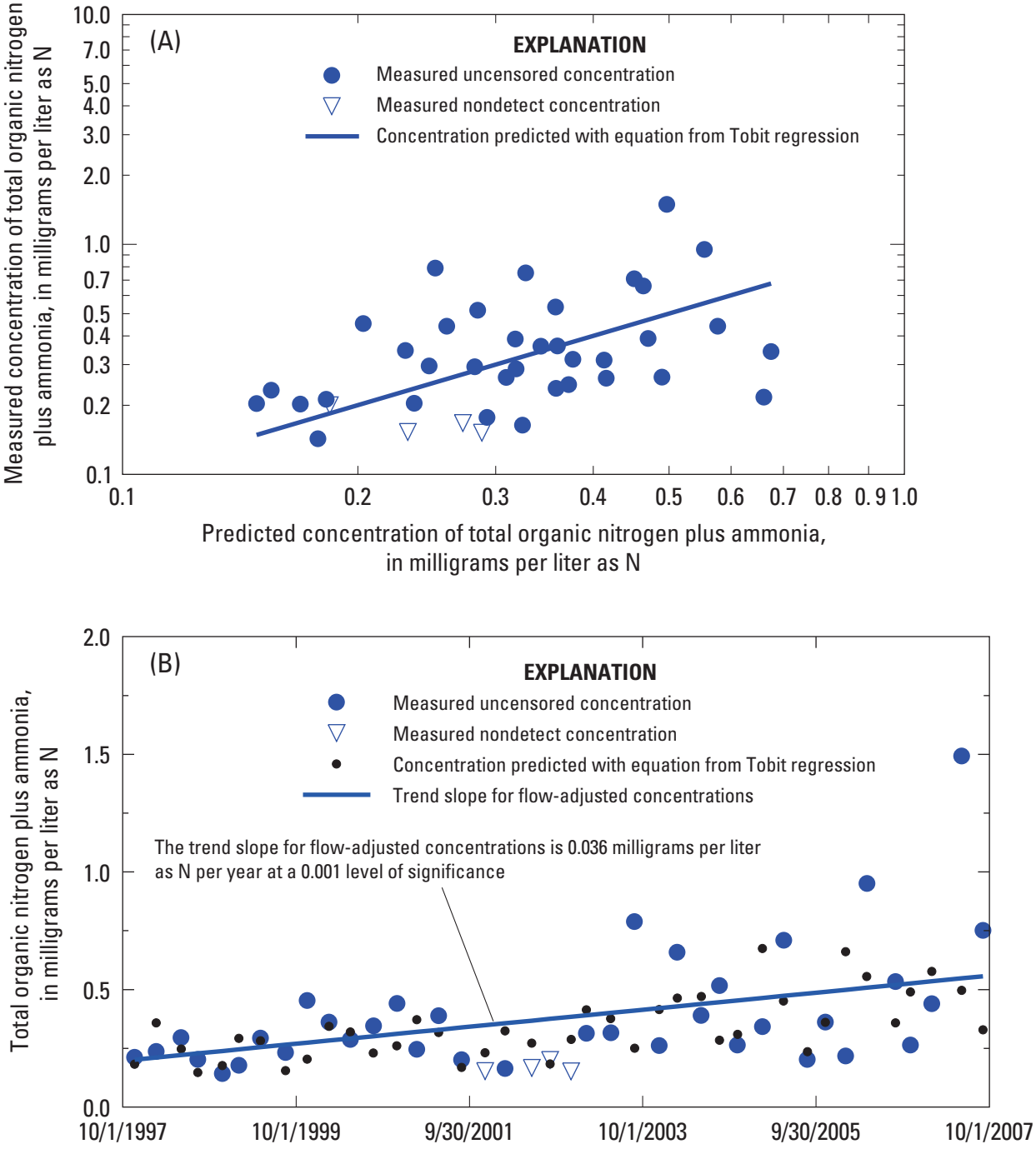

Figure 12. Results of trend analysis with Tobit regression for total organic nitrogen plus ammonia at the water-quality station on the Pequannock River at the Macopin Intake Dam, N.J. (01382500), water years 1998–2007, (*A*) measured concentrations as a function of predicted concentrations and (*B*) measured and predicted concentrations and trend slope as a function of date.

of study were identified (table 11 and fig. 13). One reach extends from the station on the Whippany River near Pine Brook, N.J. (01381800), to the station on the Passaic River at Two Bridges, N.J. (01382000); decreasing concentrations were identified at both stations. The other reach is the Delaware River; four of the five stations were identified as having decreasing concentrations. These stations are located at Montague, N.J. (01438500), Riegelsville, N.J. (01457500), Lumberville, Pa. (01461000), and Trenton, N.J. (01463500).

The fraction of stations with trends in total phosphorus during water years 1998–2007 was smaller than the fraction of stations with trends during water years 1986–95 (fig. 14). Results for only those stations included in both studies are listed in table 19. Corresponding values for water years 1980–86 are not available.

Total Organic Nitrogen plus Ammonia

Results of trend tests of total organic nitrogen plus ammonia are reported for 69 stations (table 13 and fig. 15). Results for the water-quality station on Dunnfield Creek at Dunnfield, N.J. (01442760), are not presented because an insufficient number of uncensored or estimated values were available. Summary statistics for total organic nitrogen plus ammonia are listed in table 12.

Trends in concentrations of total organic nitrogen plus ammonia were identified at 15 stations (table 13). Concentrations decreased over the period of study at six stations; the slopes of these trends range from -0.008 to -0.093 milligrams per liter as N per year (-2.5 to -11.1 percent of mean values per year) (table 13; fig. 15). Concentrations increased during the period of study at nine stations; the slopes of these trends range from 0.005 to 0.041 milligrams per liter as N per year (1.8 to 11.4 percent of mean values per year).

The fraction of stations with trends in total organic nitrogen plus ammonia during water years 1998–2007 and those from previous studies of total organic nitrogen during water years 1980–86 and total organic nitrogen plus ammonia during water years 1986–95 are shown in figure 16. Concentrations of total organic nitrogen typically are similar to concentrations of total organic nitrogen plus ammonia at many stations. Results of trend analyses for individual stations included in this and in one or more of the two previous studies are listed in table 20.

Dissolved Nitrate plus Nitrite

Of the 70 stations, results of trend tests of dissolved nitrate plus nitrite are presented for 66 (table 15; fig. 17). Trend tests were not conducted on four stations because an insufficient number of uncensored concentrations were available. Summary statistics for dissolved nitrate plus nitrite are listed in table 14.

Trends indicating decreasing concentrations during the period of study were identified at four stations (table 15; fig. 17); slopes of these trends range from -0.009 to -0.256 milligrams per liter as N per year (-3.1 to -6.7 percent of mean values per year). Trends indicating increasing concentrations during the period of study were identified at 19 stations; slopes of these trends range from 0.009 to 0.117 milligrams per liter as N per year (2.2 to 8 percent of mean values per year).

The fraction of stations with trends in dissolved nitrate plus nitrite during water years 1998–2007 and the fraction of stations with trends in total nitrate during water years 1986–95 (Hickman and Barringer, 1999) are shown in figure 18. Concentrations of total nitrate are likely to be close to concentrations of dissolved nitrate plus nitrite. Results for stations included in this study and in Hickman and Barringer (1999) are listed in table 21.

Summary of Trends by Station

A summary of the results for the six water-quality characteristics are presented in table 22 (at end of report) so that the reader can compare the results of all water-quality characteristics at a station. The table includes the results of tests of both year-round and growing-season values of dissolved oxygen.

Base from U.S. Geological Survey digital line graph files, 1:24,000, Universal Transverse Mercator projection, Zone 18, NAD83

Figure 13. Trends in concentrations of total phosphorus at water-quality stations on streams in New Jersey, water years 1998–2007.

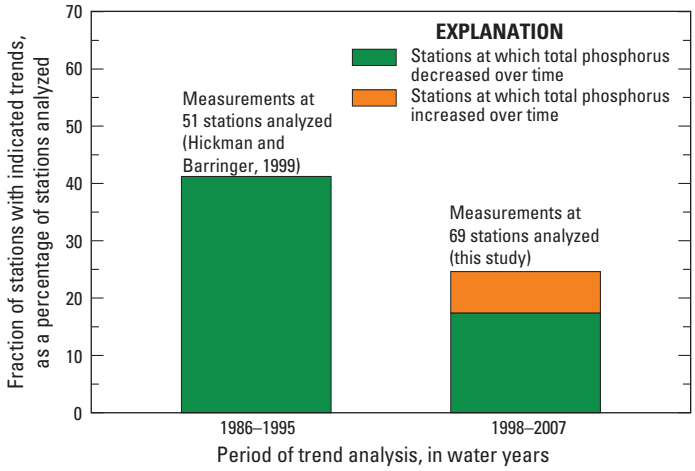

Figure 14. Fraction of water-quality stations with trends in flow-adjusted concentrations of total phosphorus during water years 1986–95 and 1998–2007.

Table 19. Results of trend tests on flow-adjusted concentrations of total phosphorus during water years 1998–2007 and water years 1986–1995 at selected water-quality stations on New Jersey streams.

[Stations are listed if results were determined for the current and the previous study; --, no trend in flow-adjusted concentrations of total phosphorus during the period of study was identified at a 0.05 level of significance; **Decrease**, total phosphorus decreased during the period of study]

Station number	Station name	Results of trend tests on flow-adjusted concentrations of total phosphorus	
		Water years 1986–1995 (Hickman and Barringer, 1999)	Water years 1998–2007 (this study)
	Passaic Water Region		
01377000	Hackensack River at Rivervale, N.J.	--	--
01381800	Whippany River near Pine Brook, N.J.	**Decrease**	**Decrease**
01382000	Passaic River at Two Bridges, N.J.	--	**Decrease**
01387500	Ramapo River near Mahwah, N.J.	--	--
01389500	Passaic River at Little Falls, N.J.	--	--
01391500	Saddle River at Lodi, N.J.	**Decrease**	--
	Raritan Water Region		
01394500	Rahway River near Springfield, N.J.	--	--
01395000	Rahway River at Rahway, N.J.	--	--
01398000	Neshanic River at Reaville, N.J.	--	--
01399780	Lamington River at Burnt Mills, N.J.	--	--
01402000	Millstone River at Blackwells Mills, N.J.	--	--
01405340	Manalapan Brook at Federal Road near Manalapan, N.J.	--	--
	Atlantic Coastal Water Region		
01408000	Manasquan River at Squankum, N.J.	--	--
01409416	Hammonton Creek at Wescoatville, N.J.	**Decrease**	--
	Upper Delaware Water Region		
01457500	Delaware River at Riegelsville, N.J.	--	**Decrease**
01461000	Delaware River at Lumberville, Pa.	--	**Decrease**
01463500	Delaware River at Trenton, N.J.	--	**Decrease**
	Lower Delaware Water Region		
01464515	Doctors Creek at Allentown, N.J.	**Decrease**	--
01467150	Cooper River at Haddonfield, N.J.	**Decrease**	--
01477120	Raccoon Creek near Swedesboro, N.J.	--	--
01482500	Salem River at Woodstown, N.J.	--	--

Base from U.S. Geological Survey digital line graph files, 1:24,000, Universal Transverse Mercator projection, Zone 18, NAD83

Figure 15. Trends in concentrations of total organic nitrogen plus ammonia at water-quality stations on streams in New Jersey, water years 1998–2007.

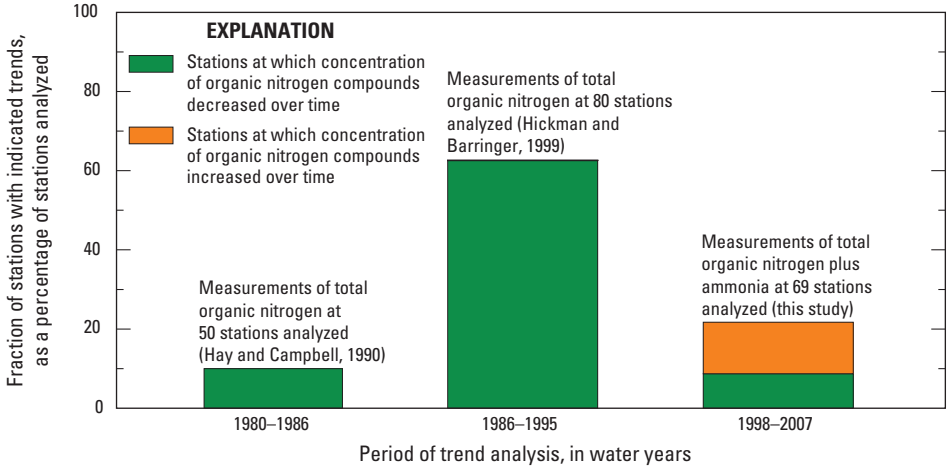

Figure 16. Fraction of water-quality stations with trends in flow-adjusted concentrations of organic nitrogen compounds during water years 1980–86, 1986–95, and 1998–2007.

Table 20. Results of trend tests on flow-adjusted concentrations of organic nitrogen compounds during water years 1998–2007 and earlier periods at selected water-quality stations on New Jersey streams.

[Stations are listed if results were determined for the current and one previous study; --, no trend in flow-adjusted concentrations of organic nitrogen compound during the period of study was identified at a 0.05 level of significance; **Decrease**, concentrations of organic nitrogen compound decreased during the period of study; **Increase**, concentrations of organic nitrogen compound increased during the period of study; n.d., not determined]

Station number	Station name	Results of trend tests on flow-adjusted concentrations of organic nitrogen compounds		
		Total organic nitrogen, water years 1980–1986 (Hay and Campbell, 1990)[1]	Total organic nitrogen, water years 1986–1995 (Hickman and Barringer, 1999)	Total organic nitrogen plus ammonia, water years 1998–2007 (this study)
	Passaic Water Region			
01377000	Hackensack River at Rivervale, N.J.	--	**Decrease**	--
01381800	Whippany River near Pine Brook, N.J.	n.d.	--	--
01382000	Passaic River at Two Bridges, N.J.	n.d.	**Decrease**	--
01382500	Pequannock River at Macopin Intake Dam, N.J.	n.d.	--	**Increase**
01387500	Ramapo River near Mahwah, N.J.	--	--	--
01389500	Passaic River at Little Falls, N.J.	--	**Decrease**	**Decrease**
01391500	Saddle River at Lodi, N.J.	--	--	**Decrease**
	Raritan Water Region			
01394500	Rahway River near Springfield, N.J.	--	**Decrease**	--
01395000	Rahway River at Rahway, N.J.	--	--	--
01396660	Mulhockaway Creek at Van Syckel, N.J.	--	**Decrease**	--
01398000	Neshanic River at Reaville, N.J.	--	**Decrease**	--
01399780	Lamington River at Burnt Mills, N.J.	n.d.	**Decrease**	--
01402000	Millstone River at Blackwells Mills, N.J.	n.d.	**Decrease**	--
01405340	Manalapan Brook at Federal Road near Manalapan, N.J.	n.d.	**Decrease**	--
	Atlantic Coastal Water Region			
01408000	Manasquan River at Squankum, N.J.	n.d.	**Decrease**	**Increase**
01408500	Toms River near Toms River, N.J.	--	**Decrease**	--
01409387	Mullica River at outlet of Atsion Lake at Atsion, N.J.	n.d.	**Decrease**	--
01409416	Hammonton Creek at Wescoatville, N.J.	--	**Decrease**	--
01409500	Batsto River at Batsto, N.J.	--	**Decrease**	--
01410150	East Branch Bass River near New Gretna, N.J.	--	--	--
01411110	Great Egg Harbor River at Weymouth, N.J.	n.d.	--	**Increase**
	Upper Delaware Water Region			
01367770	Wallkill River near Sussex, N.J.	--	--	--
01438500	Delaware River at Montague, N.J.	n.d.	--	--
01440000	Flat Brook near Flatbrookville, N.J.	n.d.	--	--
01443000	Delaware River at Portland, Pa.	n.d.	--	**Increase**
01443500	Paulins Kill at Blairstown, N.J.	**Decrease**	**Decrease**	**Decrease**
01457400	Musconetcong River at Riegelsville, N.J.	n.d.	**Decrease**	**Decrease**
01457500	Delaware River at Riegelsville, N.J.	n.d.	**Decrease**	--
01461000	Delaware River at Lumberville, Pa.	n.d.	**Decrease**	--
01463500	Delaware River at Trenton, N.J.	--	**Decrease**	--
	Lower Delaware Water Region			
01411500	Maurice River at Norma, N.J.	--	**Decrease**	**Increase**
01412800	Cohansey River at Seeley, N.J.	--	**Decrease**	--
01464515	Doctors Creek at Allentown, N.J.	n.d.	--	--
01467150	Cooper River at Haddonfield, N.J.	n.d.	**Decrease**	**Increase**
01477120	Raccoon Creek near Swedesboro, N.J.	--	**Decrease**	--
01482500	Salem River at Woodstown, N.J.	--	**Decrease**	--
01477120	Raccoon Creek near Swedesboro, N.J.	--	**Decrease**	--
01482500	Salem River at Woodstown, N.J.	--	**Decrease**	--

[1] Although Hay and Campbell (1990) considered trends to be significant at the 0.1 level, trends significant at the 0.05 level were identified in their report.

Base from U.S. Geological Survey digital line graph files, 1:24,000, Universal Transverse Mercator projection, Zone 18, NAD83

Figure 17. Trends in concentrations of dissolved nitrate plus nitrite at water-quality stations on streams in New Jersey, water years 1998–2007.

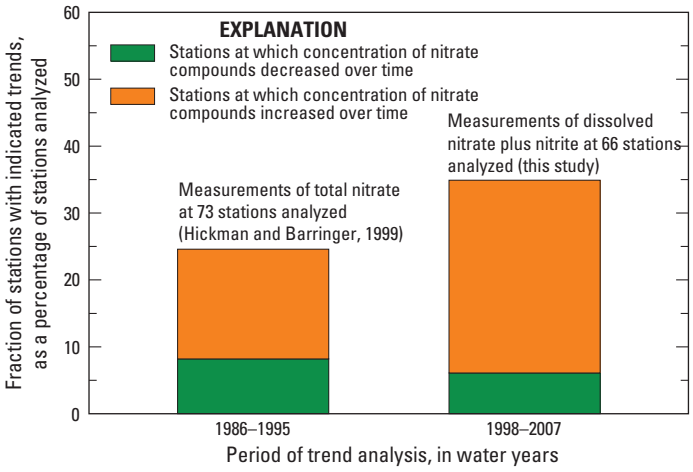

Figure 18. Fraction of water-quality stations with trends in flow-adjusted concentrations of nitrate compounds during water years 1986–95 and 1998–2007.

Table 21. Results of trend tests on flow-adjusted concentrations of nitrate compounds during water years 1998–2007 and water years 1986–1995 at selected water-quality stations on New Jersey streams.

[Stations are listed if results were determined for the current and previous study; --, no trend in flow-adjusted concentrations of the nitrate compound during the period of study was identified at a 0.05 level of significance; **Decrease**, nitrate compound decreased during the period of study; **Increase**, nitrate compound increased during the period of study; n.d., not determined]

Station number	Station name	Results of trend tests on flow-adjusted concentrations of nitrate compounds	
		Total nitrate, water years 1986–1995 (Hickman and Barringer, 1999)	Dissolved nitrate plus nitrite, water years 1998–2007 (this study)
	Passaic Water Region		
01377000	Hackensack River at Rivervale, N.J.	--	--
01381800	Whippany River near Pine Brook, N.J.	**Increase**	--
01382000	Passaic River at Two Bridges, N.J.	**Increase**	--
01382500	Pequannock River at Macopin Intake Dam, N.J.	--	--
01387500	Ramapo River near Mahwah, N.J.	--	--
01389500	Passaic River at Little Falls, N.J.	**Increase**	--
01391500	Saddle River at Lodi, N.J.	**Increase**	**Increase**
	Raritan Water Region		
01394500	Rahway River near Springfield, N.J.	--	--
01395000	Rahway River at Rahway, N.J.	--	--
01396660	Mulhockaway Creek at Van Syckel, N.J.	--	**Increase**
01399780	Lamington River at Burnt Mills, N.J.	--	--
01402000	Millstone River at Blackwells Mills, N.J.	**Increase**	--
01405340	Manalapan Brook at Federal Road near Manalapan, N.J.	--	**Increase**
	Atlantic Coastal Water Region		
01408000	Manasquan River at Squankum, N.J.	--	--
01408500	Toms River near Toms River, N.J.	**Increase**	**Increase**
01409416	Hammonton Creek at Wescoatville, N.J.	--	**Increase**
01411110	Great Egg Harbor River at Weymouth, N.J.	--	**Increase**
	Upper Delaware Water Region		
01367770	Wallkill River near Sussex, N.J.	--	**Decrease**
01438500	Delaware River at Montague, N.J.	--	--
01443000	Delaware River at Portland, Pa.	--	--
01443500	Paulins Kill at Blairstown, N.J.	--	--
01457400	Musconetcong River at Riegelsville, N.J.	--	**Increase**
01457500	Delaware River at Riegelsville, N.J.	--	--
01461000	Delaware River at Lumberville, Pa.	--	--
01463500	Delaware River at Trenton, N.J.	--	--
	Lower Delaware Water Region		
01411500	Maurice River at Norma, N.J.	--	**Increase**
01412800	Cohansey River at Seeley, N.J.	**Increase**	**Increase**
01464515	Doctors Creek at Allentown, N.J.	--	--
01467150	Cooper River at Haddonfield, N.J.	**Decrease**	**Increase**
01477120	Raccoon Creek near Swedesboro, N.J.	--	--

Table 22. Results of trend tests on flow-adjusted values of six water-quality characteristics at water-quality stations on New Jersey streams, water years 1998–2007.

[--, no trend in flow-adjusted values of the water-quality characteristic during the period of study was identified at a 0.05 level of significance; **Decrease**, values of the water-quality characteristic decreased during the period of study; **Increase**, values of the water-quality characteristic increased during the period of study; n.d., not determined]

Station number	Station name	Results of trend tests on flow-adjusted values of water-quality characteristics (water-quality measurements are year-round unless otherwise indicated)						
		Dissolved oxygen		pH	Total dissolved solids	Total phosphorus	Total organic nitrogen plus ammonia	Dissolved nitrate plus nitrite
		Year round	Growing season (April–September)					
	Passaic Water Region							
01377000	Hackensack River at Rivervale, N.J.	--	--	--	--	--	--	--
01378560	Coles Brook at Hackensack, N.J.	--	--	n.d.	--	--	--	--
01378780	Primrose Brook at Morristown National Historical Park, N.J.	--	--	n.d.	--	--	--	--
01379200	Dead River near Millington, N.J.	--	--	n.d.	**Increase**	**Decrease**	--	**Decrease**
01380100	Beaver Brook at Rockaway, N.J.	--	--	n.d.	--	--	--	**Increase**
01381800	Whippany River near Pine Brook, N.J.	--	--	--	**Increase**	**Decrease**	--	--
01382000	Passaic River at Two Bridges, N.J.	--	**Decrease**	n.d.	--	**Decrease**	--	--
01382500	Pequannock River at Macopin Intake Dam, N.J.	--	--	--	--	--	**Increase**	--
01387500	Ramapo River near Mahwah, N.J.	--	--	--	--	--	--	--
01388500	Pompton River at Pompton Plains, N.J.	**Decrease**	n.d.	--	--	--	--	**Increase**
01389500	Passaic River at Little Falls, N.J.	--	--	n.d.	--	--	**Decrease**	--
01391500	Saddle River at Lodi, N.J.	--	--	--	**Increase**	--	**Decrease**	**Increase**
	Raritan Water Region							
01394500	Rahway River near Springfield, N.J.	n.d.	n.d.	**Increase**	**Increase**	--	--	--
01395000	Rahway River at Rahway, N.J.	--	--	--	**Increase**	--	--	--
01396660	Mulhockaway Creek at Van Syckel, N.J.	--	--	--	--	--	--	**Increase**
01398000	Neshanic River at Reaville, N.J.	--	--	--	--	--	--	--
01398102	South Branch Raritan River at South Branch, N.J.	--	--	n.d.	**Increase**	--	--	--
01399780	Lamington River at Burnt Mills, N.J.	--	--	n.d.	**Increase**	--	--	--
01400000	North Branch Raritan River near Raritan, N.J.	n.d.	--	--	**Increase**	--	--	**Increase**
01400640	Millstone River near Grovers Mill, N.J.	--	--	n.d.	--	**Decrease**	--	--
01401400	Heathcote Brook at Kingston, N.J.	--	--	n.d.	**Increase**	--	--	--
01402000	Millstone River at Blackwells Mills, N.J.	--	--	--	--	--	--	--
01403385	Bound Brook at Route 28 at Middlesex, N.J.	--	--	n.d.	--	**Decrease**	--	--
01405340	Manalapan Brook at Federal Road near Manalapan, N.J.	--	--	n.d.	**Increase**	--	--	**Increase**

Table 22. Results of trend tests on flow-adjusted values of six water-quality characteristics at water-quality stations on New Jersey streams, water years 1998–2007.—Continued

[--, no trend in flow-adjusted values of the water-quality characteristic during the period of study was identified at a 0.05 level of significance; **Decrease**, values of the water-quality characteristic decreased during the period of study; **Increase**, values of the water-quality characteristic increased during the period of study; n.d., not determined]

Station number	Station name	Results of trend tests on flow-adjusted values of water-quality characteristics (water-quality measurements are year-round unless otherwise indicated)						
		Dissolved oxygen		pH	Total dissolved solids	Total phosphorus	Total organic nitrogen plus ammonia	Dissolved nitrate plus nitrite
		Year round	Growing season (April–September)					
	Atlantic Coastal Water Region							
01408000	Manasquan River at Squankum, N.J.	--	--	**Decrease**	**Increase**	--	**Increase**	--
01408009	Mingamahone Brook near Earle, N.J.	--	--	n.d.	--	**Increase**	**Increase**	--
01408100	North Branch Metedeconk River at Lakewood, N.J.	--	--	n.d.	**Increase**	--	--	**Increase**
01408500	Toms River near Toms River, N.J.	--	**Decrease**	**Increase**	**Increase**	**Decrease**	--	**Increase**
01408830	Cedar Creek at Cedar Crest, N.J.	--	**Increase**	n.d.	--	--	--	n.d.
01409387	Mullica River at outlet of Atsion Lake at Atsion, N.J.	--	--	n.d.	--	--	--	--
0140940950	Blue Anchor Brook at Elm, N.J.	--	--	n.d.	**Increase**	--	--	--
01409416	Hammonton Creek at Wescoatville, N.J.	--	--	n.d.	**Increase**	--	--	**Increase**
01409500	Batsto River at Batsto, N.J.	--	**Increase**	n.d.	--	--	--	**Increase**
01409815	West Branch Wading River at Maxwell, N.J.	--	--	n.d.	--	**Increase**	--	n.d.
01410150	East Branch Bass River near New Gretna, N.J.	--	**Increase**	--	**Increase**	--	--	n.d.
01411035	Hospitality Branch at Blue Bell Road near Cecil, N.J.	--	--	n.d.	--	--	--	**Decrease**
01411110	Great Egg Harbor River at Weymouth, N.J.	--	--	n.d.	**Increase**	--	**Increase**	**Increase**
01411196	Babcock Creek near Mays Landing, N.J.	--	--	n.d.	--	--	--	**Increase**
01411400	Fishing Creek at Rio Grande, N.J.	--	--	n.d.	--	**Increase**	--	--
01411444	West Creek near Leesburg, N.J.	--	--	n.d.	--	--	--	--
	Upper Delaware Water Region							
01367625	Wallkill River at Sparta, N.J.	--	--	n.d.	--	**Increase**	--	--
01367770	Wallkill River near Sussex, N.J.	--	n.d.	n.d.	--	--	--	**Decrease**
01367800	Papakating Creek at Pellettown, N.J.	--	--	--	--	--	**Decrease**	--
01368820	Double Kill at Wawayanda, N.J.	--	--	n.d.	--	--	--	--
01438500	Delaware River at Montague, N.J.	**Decrease**	--	**Decrease**	--	**Decrease**	--	--
01440000	Flat Brook near Flatbrookville, N.J.	n.d.	n.d.	--	--	--	--	--
01442760	Dunnfield Creek at Dunnfield, N.J.	--	--	n.d.	--	--	n.d.	--
01443000	Delaware River at Portland, Pa.	--	--	n.d.	--	--	**Increase**	--

Table 22. Results of trend tests on flow-adjusted values of six water-quality characteristics at water-quality stations on New Jersey streams, water years 1998–2007.—Continued

[--, no trend in flow-adjusted values of the water-quality characteristic during the period of study was identified at a 0.05 level of significance; **Decrease**, values of the water-quality characteristic decreased during the period of study; **Increase**, values of the water-quality characteristic increased during the period of study; n.d., not determined]

Station number	Station name	Results of trend tests on flow-adjusted values of water-quality characteristics (water-quality measurements are year-round unless otherwise indicated)						
		Dissolved oxygen		pH	Total dissolved solids	Total phosphorus	Total organic nitrogen plus ammonia	Dissolved nitrate plus nitrite
		Year round	Growing season (April–September)					
	Upper Delaware Water Region							
01443500	Paulins Kill at Blairstown, N.J.	--	--	--	--	--	**Decrease**	--
01446400	Pequest River at Belvidere, N.J.	--	**Increase**	n.d.	--	--	--	--
01457400	Musconetcong River at Riegelsville, N.J.	--	--	n.d.	--	**Decrease**	**Decrease**	**Increase**
01457500	Delaware River at Riegelsville, N.J.	**Decrease**	**Decrease**	--	--	**Decrease**	--	--
01458570	Nishisakawick Creek near Frenchtown, N.J.	--	--	n.d.	--	--	--	--
01461000	Delaware River at Lumberville, Pa.	--	--	**Increase**	--	**Decrease**	--	--
01463500	Delaware River at Trenton, N.J.	--	--	--	--	**Decrease**	--	--
01463850	Miry Run at Route 533 at Mercerville, N.J.	--	n.d.	n.d.	**Increase**	--	--	--
01464020	Assunpink Creek at Peace Street at Trenton, N.J.	--	--	n.d.	**Increase**	**Decrease**	**Decrease**	--
	Lower Delaware Water Region							
01411466	Indian Branch near Malaga, N.J.	--	--	n.d.	--	--	--	**Increase**
01411500	Maurice River at Norma, N.J.	n.d.	--	--	--	--	**Increase**	**Increase**
01411955	Gravelly Run at Laurel Lake, N.J.	--	--	n.d.	--	--	--	--
01412800	Cohansey River at Seeley, N.J.	--	--	n.d.	--	--	--	**Increase**
01464504	Crosswicks Creek at Groveville Road at Groveville, N.J.	--	--	n.d.	**Increase**	--	--	**Increase**
01464515	Doctors Creek at Allentown, N.J.	--	--	n.d.	--	--	--	--
01465893	Little Creek at Chairville, N.J.	--	--	n.d.	--	--	**Increase**	--
01466500	McDonalds Branch in Byrne State Forest, N.J.	--	**Decrease**	--	--	n.d.	--	n.d.
01467005	North Branch Rancocas Creek at Iron Works Park at Mount Holly, N.J.	--	--	n.d.	--	**Increase**	**Increase**	**Decrease**
01467150	Cooper River at Haddonfield, N.J.	**Decrease**	--	n.d.	**Increase**	--	**Increase**	**Increase**
01467359	North Branch Big Timber Creek at Glendora, N.J.	--	--	n.d.	**Increase**	--	--	**Increase**
01477120	Raccoon Creek near Swedesboro, N.J.	--	--	--	**Increase**	--	--	--
01482500	Salem River at Woodstown, N.J.	--	--	--	**Increase**	--	--	--

Summary and Conclusions

Trends in flow-adjusted values of selected water-quality characteristics measured year-round during water years 1998–2007 were determined for 70 stations on New Jersey streams. Water-quality characteristics included in the analysis are dissolved oxygen, pH, total dissolved solids, total phosphorus, total organic nitrogen plus ammonia, and dissolved nitrate plus nitrite. Trend tests also were conducted on measurements of dissolved oxygen made only during the growing season, April–September. Nearly all of the water-quality data analyzed were collected by the NJDEP and the USGS as part of the New Jersey Department of Environmental Protection Ambient Surface-Water Quality Monitoring Network.

Monotonic trends in flow-adjusted values of water quality were determined by use of procedures of the ESTREND computer program. A 0.05 level of significance was selected to indicate a trend.

Trends in dissolved oxygen were identified with the Seasonal Kendall test. Tests of year-round values are reported for 66 stations; decreases and increases in concentration were identified at 4 and 0 stations, respectively. Tests of growing-season values are reported for 65 stations; decreases and increases in concentration were identified at 4 and 4 stations, respectively. Results of tests of year-round measurements and growing-season measurements are not reported for four and five stations, respectively, because these results were clearly affected by a trend in time of measurement.

Trends in pH were identified with the Seasonal Kendall test. Results are presented for 26 stations; decreasing and increasing values were identified at 2 and 3 stations, respectively. Results are not presented for ASWQMN stations sampled by the USGS because an examination of the pH values measured by the USGS indicated that they were affected by a change in field methods during the period of study. Results at one station are not presented because they were affected by a trend in time of measurement.

Trends in total dissolved solids were identified with the Seasonal Kendall test. Results are presented for 70 stations; decreases and increases in concentration were identified at 0 and 24 stations, respectively.

Trends in total phosphorus, total organic nitrogen plus ammonia, and dissolved nitrate plus nitrite were identified by use of Tobit regression. Tests were conducted on all measurements at each station and were repeated without the most extreme outlying point. The results presented are those from tests conducted on all measurements if the results of the two tests were equivalent. Otherwise, the results presented are those of the tests without the single outlier.

Results of tests of total phosphorus are presented for 69 stations. Decreases and increases in concentration were identified at 12 and 5 stations, respectively. Of the five stations on the Delaware River included in this study, decreases in concentration were identified at four.

Results of tests of total organic nitrogen plus ammonia are presented for 69 stations. Decreases and increases in concentration during the period of study were identified at six and nine stations, respectively.

Results of tests of dissolved nitrate plus nitrite are presented for 66 stations. Decreases and increases in concentration were identified at 4 and 19 stations, respectively.

Results of this study are compared with results of two previous studies of trends in the water quality of streams throughout New Jersey—one for water years 1980–86 and one for water years 1986-95. For example, the fractions of stations with trends in total dissolved solids or sum of dissolved solids were compared. Trends of increasing concentrations were identified at 24 percent of the stations analyzed during water years 1980–86, 26 percent of the stations analyzed during water years 1986–95, and 34 percent of stations analyzed during water years 1998–2007.

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Table 4. Summary statistics for dissolved oxygen at water-quality stations on New Jersey streams, water years 1998–2007.

[n.a., not applicable]

Station number	Results of trend tests presented	Number of measure-ments	Nondetect measurements			Statistic, in milligrams per liter				
			Number	Percent of all measure-ments	Maximum reporting level, in milligrams per liter	Minimum	25th percentile	Median	75th percentile	Maximum
Passaic Water Region										
01377000	Yes	39	0	0	n.a.	3.7	6.6	7.7	9.5	14.3
01378560	Yes	39	0	0	n.a.	4.1	6.4	7.3	10.2	15.6
01378780	Yes	39	0	0	n.a.	8.3	9.4	10.7	12.2	14.6
01379200	Yes	39	0	0	n.a.	3.6	6.6	7.8	10.7	13.2
01380100	Yes	40	0	0	n.a.	6.6	7.5	8.9	11.4	14.1
01381800	Yes	40	0	0	n.a.	1.8	6.9	7.8	10.0	13.2
01382000	Yes	39	0	0	n.a.	4.2	5.9	8.6	11.2	16.0
01382500	Yes	40	0	0	n.a.	6.9	8.2	10.4	13.3	15.0
01387500	Yes	40	0	0	n.a.	5.8	7.4	8.8	11.9	15.2
01388500	Yes	40	0	0	n.a.	6.5	8.4	9.7	12.2	14.7
01389500	Yes	38	0	0	n.a.	5.6	8.1	9.3	12.5	14.6
01391500	Yes	40	0	0	n.a.	4.5	6.1	7.8	9.1	13.3
Raritan Water Region										
01394500	No	40	0	0	n.a.	3.3	5.6	6.7	9.6	14.9
01395000	Yes	40	0	0	n.a.	3.5	6.5	7.6	10.7	13.3
01396660	Yes	40	0	0	n.a.	8.3	9.4	11.0	12.9	14.4
01398000	Yes	39	0	0	n.a.	4.8	7.9	10.6	12.9	17.2
01398102	Yes	40	0	0	n.a.	5.9	8.5	10.4	12.5	15.8
01399780	Yes	39	0	0	n.a.	7.3	9.4	12.8	14.1	17.3
01400000	No	39	0	0	n.a.	6.6	8.7	10.4	13.1	14.6
01400640	Yes	36	0	0	n.a.	5.5	7.6	9.3	11.7	13.5
01401400	Yes	40	0	0	n.a.	6.8	8.0	8.7	11.6	14.3
01402000	Yes	40	0	0	n.a.	2.9	5.7	7.6	11.0	13.0
01403385	Yes	40	0	0	n.a.	3.8	5.3	7.2	11.0	14.9
01405340	Yes	40	0	0	n.a.	7.4	8.5	9.8	12.4	14.4
Atlantic Coastal Water Region										
01408000	Yes	40	0	0	n.a.	7.0	8.2	9.4	10.5	12.3
01408009	Yes	40	0	0	n.a.	6.6	7.9	8.6	9.6	12.5
01408100	Yes	40	0	0	n.a.	5.0	7.5	9.1	11.6	13.8
01408500	Yes	40	0	0	n.a.	6.3	7.7	8.6	11.2	13.5
01408830	Yes	40	0	0	n.a.	7.6	8.5	9.8	11.8	13.3
01409387	Yes	40	0	0	n.a.	6.0	7.6	9.4	11.9	13.0
0140940950	Yes	40	0	0	n.a.	4.3	8.0	9.4	11.8	15.3
01409416	Yes	39	0	0	n.a.	5.8	7.2	8.1	10.4	12.2
01409500	Yes	37	0	0	n.a.	6.4	7.9	9.2	10.8	13.4
01409815	Yes	39	0	0	n.a.	6.4	8.0	8.9	11.2	12.9
01410150	Yes	40	0	0	n.a.	5.5	6.5	7.8	9.6	11.6

Table 4. Summary statistics for dissolved oxygen at water-quality stations on New Jersey streams, water years 1998–2007.—Continued

[n.a., not applicable]

Station number	Results of trend tests presented	Number of measure-ments	Nondetect measurements			Statistic, in milligrams per liter				
			Number	Percent of all measure-ments	Maximum reporting level, in milligrams per liter	Minimum	25th percentile	Median	75th percentile	Maximum
Atlantic Coastal Water Region										
01411035	Yes	40	0	0	n.a.	5.2	7.4	8.2	10.5	12.5
01411110	Yes	40	0	0	n.a.	7.3	8.2	9.0	11.4	13.2
01411196	Yes	40	0	0	n.a.	6.1	7.5	8.2	10.0	12.0
01411400	Yes	40	0	0	n.a.	2.9	5.3	8.0	9.6	12.6
01411444	Yes	35	0	0	n.a.	2.8	6.5	8.8	10.4	12.2
Upper Delaware Water Region										
01367625	Yes	39	0	0	n.a.	7.3	8.7	10.6	12.3	14.8
01367770	Yes	39	0	0	n.a.	6.1	7.5	8.7	12.1	14.8
01367800	Yes	34	0	0	n.a.	8.0	9.3	10.7	13.2	14.4
01368820	Yes	38	0	0	n.a.	3.6	7.3	9.7	12.3	14.3
01438500	Yes	40	0	0	n.a.	6.9	8.5	9.9	12.0	14.3
01440000	No	40	0	0	n.a.	6.2	9.3	10.9	12.7	15.2
01442760	Yes	39	0	0	n.a.	8.5	9.7	11.3	12.6	14.9
01443000	Yes	39	0	0	n.a.	7.4	8.3	11.1	13.7	15.8
01443500	Yes	40	0	0	n.a.	6.2	8.7	10.5	13.1	16.2
01446400	Yes	40	0	0	n.a.	8.6	10.0	11.2	13.5	17.3
01457400	Yes	40	0	0	n.a.	8.3	9.5	11.0	13.4	15.5
01457500	Yes	40	0	0	n.a.	6.6	8.4	10.4	11.7	14.0
01458570	Yes	40	0	0	n.a.	5.7	9.1	11.8	13.8	16.5
01461000	Yes	39	0	0	n.a.	6.7	8.1	9.7	12.2	15.2
01463500	Yes	36	0	0	n.a.	7.6	9.0	10.6	13.2	16.2
01463850	Yes	40	0	0	n.a.	1.2	5.0	7.3	10.6	12.9
01464020	Yes	40	0	0	n.a.	7.0	8.1	9.5	11.8	13.5
Lower Delaware Water Region										
01411466	Yes	38	0	0	n.a.	3.8	6.1	7.5	9.4	12.2
01411500	No	36	0	0	n.a.	5.8	7.1	8.3	10.4	12.8
01411955	Yes	40	0	0	n.a.	5.6	7.6	8.8	10.2	12.6
01412800	Yes	38	0	0	n.a.	6.4	7.8	9.2	10.8	14.1
01464504	Yes	39	0	0	n.a.	6.7	7.9	9.3	11.7	14.8
01464515	Yes	40	0	0	n.a.	1.9	6.1	8.9	11.9	14.3
01465893	Yes	38	0	0	n.a.	5.8	7.3	8.7	11.2	12.9
01466500	Yes	40	0	0	n.a.	2.0	2.7	3.4	6.2	9.4
01467005	Yes	39	0	0	n.a.	6.4	8.4	9.9	12.1	14.2
01467150	Yes	39	0	0	n.a.	4.6	6.8	7.9	10.5	12.7
01467359	Yes	40	0	0	n.a.	3.5	5.9	8.2	11.2	13.6
01477120	Yes	40	0	0	n.a.	5.3	7.6	8.8	11.4	13.2
01482500	Yes	40	0	0	n.a.	5.2	8.0	9.5	11.8	15.8

Table 5a. Results of trend tests on year-round flow-adjusted concentrations of dissolved oxygen at water-quality stations on New Jersey streams, water years 1998–2007.

[--, no trend in flow-adjusted concentrations of dissolved oxygen during the period of study was identified at a 0.05 level of significance; **Decrease**, dissolved oxygen decreased during the period of study; n.d., not determined; results of trend tests of flow-adjusted concentrations of dissolved oxygen are not presented if concentration of dissolved oxygen correlated with time of measurement and if there was a trend in time of measurement; -- (c), no correlation at the 0.05 level of significance was identified between concentration of dissolved oxygen and time of measurement; Increase (c), dissolved oxygen increased with increasing time of measurement; -- (t), no trend in time of measurement during the period of study was identified at a 0.05 level of significance; Decrease (t), time of measurement decreased during the period of study; Increase (t), time of measurement increased during period of study; +, trend slope indicates that the time of measurement tended to increase during the period of study; -, trend slope indicates that the time of measurement tended to decrease during the period of study]

Station number	Results of Seasonal Kendall trend tests of flow-adjusted concentrations of dissolved oxygen					Results of tests to assess the effects of trends in times of measurement on the results of trend tests of flow-adjusted concentrations of dissolved oxygen				
	Summary result	Trend slope				Kendall tau tests for correlation of dissolved oxygen and time of measurement		Seasonal Kendall trend tests of time of measurement of dissolved oxygen		
		Level of significance	In milligrams per liter per year	In percent of median value per year (median value in milligrams per liter)		Summary result	Level of significance	Summary result	Trend slope: Level of significance	Trend slope: Direction
Passaic Water Region										
01377000	--	0.070	-0.156	-2.0	(7.7)	-- (c)	0.062	-- (t)	0.058	-
01378560	--	0.287	-0.059	-0.8	(7.4)	-- (c)	0.390	-- (t)	1.000	n.d.
01378780	--	0.364	0.036	0.3	(10.8)	-- (c)	0.120	-- (t)	0.552	-
01379200	--	0.931	0.010	0.1	(7.8)	-- (c)	0.065	-- (t)	0.622	+
01380100	--	0.505	-0.051	-0.6	(8.9)	-- (c)	0.953	-- (t)	0.843	+
01381800	--	0.610	-0.025	-0.3	(7.9)	-- (c)	0.762	-- (t)	0.849	n.d.
01382000	--	0.824	-0.078	-0.9	(8.6)	-- (c)	0.163	-- (t)	0.806	+
01382500	--	0.355	-0.118	-1.1	(10.6)	-- (c)	0.887	-- (t)	0.184	n.d.
01387500	--	0.364	0.095	1.1	(9)	-- (c)	0.081	-- (t)	0.834	n.d.
01388500	**Decrease**	0.042	-0.130	-1.3	(9.7)	-- (c)	0.236	Decrease (t)	0.025	-
01389500	--	0.679	-0.038	-0.4	(9.3)	-- (c)	0.228	-- (t)	0.285	-
01391500	--	0.390	0.049	0.6	(7.9)	-- (c)	0.111	-- (t)	0.599	+
Raritan Water Region										
01394500	n.d.	n.d.	n.d.	n.d.	(n.d.)	Increase (c)	0.035	Decrease (t)	0.008	-
01395000	--	0.053	-0.160	-2.0	(7.9)	Increase (c)	0.007	-- (t)	0.661	-
01396660	--	0.376	-0.028	-0.3	(11.1)	-- (c)	0.254	-- (t)	0.309	n.d.
01398000	--	0.111	-0.181	-1.7	(10.8)	-- (c)	0.156	Decrease (t)	0.038	-
01398102	--	0.148	-0.166	-1.6	(10.4)	-- (c)	0.870	-- (t)	0.866	+
01399780	--	0.567	0.076	0.6	(12.8)	Increase (c)	0.003	-- (t)	0.450	-
01400000	n.d.	n.d.	n.d.	n.d.	(n.d.)	Increase (c)	0.010	Decrease (t)	0.026	-
01400640	--	0.520	-0.032	-0.3	(9.3)	-- (c)	0.293	-- (t)	0.234	+
01401400	--	0.128	0.097	1.1	(8.8)	Increase (c)	0.028	-- (t)	0.553	-
01402000	--	0.068	-0.176	-2.3	(7.7)	-- (c)	0.160	Decrease (t)	0.002	-
01403385	--	0.679	-0.036	-0.5	(7.3)	-- (c)	0.207	-- (t)	0.670	-
01405340	--	0.790	0.034	0.3	(9.9)	-- (c)	0.216	-- (t)	0.106	-

Table 5a. Results of trend tests on year-round flow-adjusted concentrations of dissolved oxygen at water-quality stations on New Jersey streams, water years 1998–2007.—Continued

[--, no trend in flow-adjusted concentrations of dissolved oxygen during the period of study was identified at a 0.05 level of significance; **Decrease**, dissolved oxygen decreased during the period of study; n.d., not determined; results of trend tests of flow-adjusted concentrations of dissolved oxygen are not presented if concentration of dissolved oxygen correlated with time of measurement and if there was a trend in time of measurement; -- (c), no correlation at the 0.05 level of significance was identified between concentration of dissolved oxygen and time of measurement; Increase (c), dissolved oxygen increased with increasing time of measurement; -- (t), no trend in time of measurement during the period of study was identified at a 0.05 level of significance; Decrease (t), time of measurement decreased during the period of study; Increase (t), time of measurement increased during period of study; +, trend slope indicates that the time of measurement tended to increase during the period of study; -, trend slope indicates that the time of measurement tended to decrease during the period of study]

Station number	Results of Seasonal Kendall trend tests of flow-adjusted concentrations of dissolved oxygen					Results of tests to assess the effects of trends in times of measurement on the results of trend tests of flow-adjusted concentrations of dissolved oxygen				
	Summary result	Trend slope				Kendall tau tests for correlation of dissolved oxygen and time of measurement		Seasonal Kendall trend tests of time of measurement of dissolved oxygen		
		Level of significance	In milligrams per liter per year	In percent of median value per year (median value in milligrams per liter)		Summary result	Level of significance	Summary result	Trend slope: Level of significance	Trend slope: Direction
Atlantic Coastal Water Region										
01408000	--	0.295	-0.083	-0.9	(9.5)	-- (c)	0.077	Decrease (t)	0.002	-
01408009	--	0.901	0.015	0.2	(8.6)	-- (c)	0.752	-- (t)	0.489	-
01408100	--	0.694	0.026	0.3	(9.1)	-- (c)	0.138	-- (t)	0.091	+
01408500	--	0.067	-0.099	-1.1	(8.6)	-- (c)	0.677	-- (t)	0.062	-
01408830	--	0.913	-0.001	0.0	(9.9)	-- (c)	0.123	-- (t)	0.773	+
01409387	--	0.501	-0.046	-0.5	(9.6)	-- (c)	0.362	-- (t)	0.055	-
0140940950	--	0.294	-0.058	-0.6	(9.6)	-- (c)	0.115	-- (t)	0.676	-
01409416	--	0.668	-0.019	-0.2	(8.1)	-- (c)	0.080	Decrease (t)	0.039	-
01409500	--	1.000	-0.002	0.0	(9.2)	-- (c)	0.740	-- (t)	0.185	-
01409815	--	0.369	-0.040	-0.5	(8.9)	-- (c)	0.601	-- (t)	0.464	-
01410150	--	0.126	0.092	1.2	(7.9)	-- (c)	0.981	Decrease (t)	0.043	-
01411035	--	0.810	-0.021	-0.2	(8.5)	-- (c)	0.252	Decrease (t)	0.040	-
01411110	--	0.831	-0.013	-0.1	(9.1)	-- (c)	0.119	-- (t)	0.838	n.d.
01411196	--	0.680	0.032	0.4	(8.3)	-- (c)	0.779	-- (t)	1.000	n.d.
01411400	--	0.883	-0.038	-0.5	(8)	-- (c)	0.349	Increase (t)	0.029	+
01411444	--	0.960	0.004	0.0	(8.9)	-- (c)	0.989	-- (t)	0.198	-
Upper Delaware Water Region										
01367625	--	0.710	0.032	0.3	(10.6)	-- (c)	0.932	-- (t)	0.099	-
01367770	--	0.173	0.101	1.2	(8.7)	-- (c)	0.060	-- (t)	0.060	+
01367800	--	0.087	-0.256	-2.3	(10.9)	Increase (c)	0.031	-- (t)	0.153	-
01368820	--	0.886	0.028	0.3	(10)	-- (c)	0.241	Increase (t)	0.038	+
01438500	**Decrease**	0.050	-0.140	-1.4	(10)	-- (c)	0.355	-- (t)	0.181	-
01440000	n.d.	n.d.	n.d.	n.d.	(n.d.)	Increase (c)	0.000	Decrease (t)	0.001	-
01442760	--	0.077	-0.113	-1.0	(11.3)	-- (c)	0.593	-- (t)	0.516	+
01443000	--	0.053	-0.031	-0.3	(11.1)	-- (c)	0.127	-- (t)	0.673	-

Table 5a. Results of trend tests on year-round flow-adjusted concentrations of dissolved oxygen at water-quality stations on New Jersey streams, water years 1998–2007.—Continued

[--, no trend in flow-adjusted concentrations of dissolved oxygen during the period of study was identified at a 0.05 level of significance; **Decrease**, dissolved oxygen decreased during the period of study; n.d., not determined; results of trend tests of flow-adjusted concentrations of dissolved oxygen are not presented if concentration of dissolved oxygen correlated with time of measurement and if there was a trend in time of measurement; -- (c), no correlation at the 0.05 level of significance was identified between concentration of dissolved oxygen and time of measurement; Increase (c), dissolved oxygen increased with increasing time of measurement; -- (t), no trend in time of measurement during the period of study was identified at a 0.05 level of significance; Decrease (t), time of measurement decreased during the period of study; Increase (t), time of measurement increased during period of study; +, trend slope indicates that the time of measurement tended to increase during the period of study; -, trend slope indicates that the time of measurement tended to decrease during the period of study]

Station number	Results of Seasonal Kendall trend tests of flow-adjusted concentrations of dissolved oxygen					Results of tests to assess the effects of trends in times of measurement on the results of trend tests of flow-adjusted concentrations of dissolved oxygen				
	Summary result	Trend slope				Kendall tau tests for correlation of dissolved oxygen and time of measurement		Seasonal Kendall trend tests of time of measurement of dissolved oxygen		
		Level of significance	In milligrams per liter per year	In percent of median value per year (median value in milligrams per liter)		Summary result	Level of significance	Summary result	Trend slope: Level of significance	Trend slope: Direction
Upper Delaware Water Region										
01443500	--	0.308	-0.115	-1.1	(10.7)	Increase (c)	0.029	-- (t)	0.197	-
01446400	--	0.053	0.108	1.0	(11.2)	Increase (c)	0.011	-- (t)	0.288	+
01457400	--	0.750	-0.014	-0.1	(11.1)	-- (c)	0.861	-- (t)	0.125	-
01457500	**Decrease**	0.005	-0.179	-1.7	(10.4)	-- (c)	0.735	Decrease (t)	0.025	-
01458570	--	0.163	0.244	2.1	(11.8)	-- (c)	0.529	-- (t)	0.245	+
01461000	--	0.071	-0.085	-0.9	(9.8)	-- (c)	0.850	-- (t)	0.058	-
01463500	--	0.886	-0.008	-0.1	(10.8)	-- (c)	0.216	-- (t)	0.256	-
01463850	--	0.088	-0.208	-2.7	(7.6)	-- (c)	0.665	Decrease (t)	0.011	-
01464020	--	0.496	0.049	0.5	(9.5)	-- (c)	0.744	-- (t)	0.121	+
Lower Delaware Water Region										
01411466	--	0.743	0.020	0.3	(7.5)	-- (c)	0.127	-- (t)	0.053	-
01411500	n.d.	n.d.	n.d.	n.d.	(n.d.)	Increase (c)	0.033	Decrease (t)	0.036	-
01411955	--	0.411	0.071	0.8	(8.9)	Increase (c)	0.045	-- (t)	0.849	+
01412800	--	0.739	-0.020	-0.2	(9.4)	-- (c)	0.441	-- (t)	0.361	-
01464504	--	0.875	-0.017	-0.2	(9.3)	-- (c)	0.594	-- (t)	0.091	+
01464515	--	0.850	0.049	0.6	(8.9)	-- (c)	0.086	-- (t)	0.235	-
01465893	--	0.514	-0.067	-0.8	(8.7)	-- (c)	0.442	-- (t)	0.637	+
01466500	--	0.076	-0.117	-3.5	(3.4)	-- (c)	0.526	Decrease (t)	0.022	-
01467005	--	0.179	0.091	0.9	(10.2)	-- (c)	0.716	-- (t)	0.198	-
01467150	**Decrease**	0.039	-0.255	-3.2	(7.9)	-- (c)	0.076	Decrease (t)	0.016	-
01467359	--	0.169	0.178	2.2	(8.3)	-- (c)	0.762	-- (t)	0.881	-
01477120	--	0.688	0.041	0.5	(8.8)	-- (c)	0.980	-- (t)	0.167	n.d.
01482500	--	0.693	-0.088	-0.9	(9.5)	-- (c)	0.064	-- (t)	0.850	n.d.

Table 5b. Results of trend tests on growing-season flow-adjusted concentrations of dissolved oxygen at water-quality stations on New Jersey streams, water years 1998–2007.

[Growing season is April–September; --, no trend in flow-adjusted concentration of dissolved oxygen during the period of study was identified at a 0.05 level of significance; **Decrease**, dissolved oxygen decreased during the period of study; **Increase**, dissolved oxygen increased during the period of study; n.d., not determined; results of trend tests of flow-adjusted concentrations of dissolved oxygen are not presented if concentrations of dissolved oxygen correlated with time of measurement and if there was a trend in time of measurement; -- (c), no correlation at the 0.05 level of significance was identified between concentrations of dissolved oxygen and time of measurement; Decrease (c), dissolved oxygen decreased with increasing time of measurement; Increase (c), dissolved oxygen increased with increasing time of measurement; -- (t), no trend in time of measurement during the period of study was identified at a 0.05 level of significance; Decrease (t), time of measurement decreased during the period of study; Increase (t), time of measurement increased during the period of study; +, trend slope indicates that the time of measurement tended to increase during the period of study; -, trend slope indicates that the time of measurement tended to decrease during the period of study]

Station number	Results of Seasonal Kendall trend tests of flow-adjusted concentrations of dissolved oxygen					Results of tests to assess the effects of trends in time of measurement on the results of trend tests of flow-adjusted concentrations of dissolved oxygen				
	Summary result	Trend slope				Kendall tau tests for correlation of dissolved oxygen and time of measurement		Seasonal Kendall trend tests of time of measurement of dissolved oxygen		
		Level of significance	In milligrams per liter per year	In percent of median value per year (median value in milligrams per liter)		Summary result	Level of significance	Summary result	Trend slope: Level of significance	Trend slope: Direction
Passaic Water Region										
01377000	--	0.176	-0.137	-2.1	(6.7)	-- (c)	0.163	Decrease (t)	0.049	-
01378560	--	0.313	-0.094	-1.5	(6.4)	-- (c)	0.325	-- (t)	0.101	+
01378780	--	0.429	0.050	0.5	(9.5)	-- (c)	0.482	-- (t)	0.082	-
01379200	--	0.260	-0.097	-1.5	(6.6)	-- (c)	0.479	-- (t)	0.555	+
01380100	--	0.298	-0.055	-0.7	(7.6)	-- (c)	0.311	-- (t)	0.350	+
01381800	--	0.544	-0.029	-0.4	(6.9)	-- (c)	0.298	-- (t)	0.775	n.d.
01382000	**Decrease**	0.010	-0.354	-5.8	(6.1)	-- (c)	0.068	-- (t)	0.605	-
01382500	--	0.956	0.006	0.1	(8.3)	-- (c)	0.170	-- (t)	0.158	n.d.
01387500	--	0.951	-0.007	-0.1	(7.5)	-- (c)	0.618	-- (t)	0.843	n.d.
01388500	n.d.	n.d.	n.d.	n.d.	(n.d.)	Increase (c)	0.031	Decrease (t)	0.034	-
01389500	--	0.240	-0.093	-1.1	(8.2)	Increase (c)	0.016	-- (t)	0.323	-
01391500	--	0.110	0.110	1.8	(6.1)	Increase (c)	0.038	-- (t)	0.625	+
Raritan Water Region										
01394500	n.d.	n.d.	n.d.	n.d.	(n.d.)	Increase (c)	0.001	Decrease (t)	0.038	-
01395000	--	0.123	-0.085	-1.3	(6.5)	Increase (c)	0.015	-- (t)	1.000	n.d.
01396660	--	0.949	-0.007	-0.1	(9.4)	-- (c)	0.083	-- (t)	0.113	-
01398000	--	1.000	-0.005	-0.1	(7.9)	-- (c)	0.738	-- (t)	0.118	-
01398102	--	0.107	-0.167	-1.9	(8.7)	-- (c)	0.103	-- (t)	0.335	-
01399780	--	0.229	0.141	1.5	(9.6)	Increase (c)	0.016	-- (t)	0.737	-
01400000	--	1.000	0.006	0.1	(8.7)	Increase (c)	0.011	-- (t)	0.121	-
01400640	--	0.702	0.015	0.2	(7.7)	Increase (c)	0.022	-- (t)	1.000	-
01401400	--	0.063	0.114	1.4	(8)	-- (c)	0.081	-- (t)	0.425	+
01402000	--	0.087	-0.179	-3.1	(5.7)	-- (c)	0.206	Decrease (t)	0.002	-
01403385	--	0.638	-0.033	-0.6	(5.3)	-- (c)	0.794	-- (t)	0.280	-
01405340	--	0.544	-0.052	-0.6	(8.7)	-- (c)	0.871	-- (t)	1.000	-

Table 5b. Results of trend tests on growing-season flow-adjusted concentrations of dissolved oxygen at water-quality stations on New Jersey streams, water years 1998–2007.—Continued

[Growing season is April–September; --, no trend in flow-adjusted concentration of dissolved oxygen during the period of study was identified at a 0.05 level of significance; **Decrease**, dissolved oxygen decreased during the period of study; **Increase**, dissolved oxygen increased during the period of study; n.d., not determined; results of trend tests of flow-adjusted concentrations of dissolved oxygen are not presented if concentrations of dissolved oxygen correlated with time of measurement and if there was a trend in time of measurement; -- (c), no correlation at the 0.05 level of significance was identified between concentrations of dissolved oxygen and time of measurement; Decrease (c), dissolved oxygen decreased with increasing time of measurement; Increase (c), dissolved oxygen increased with increasing time of measurement; -- (t), no trend in time of measurement during the period of study was identified at a 0.05 level of significance; Decrease (t), time of measurement decreased during the period of study; Increase (t), time of measurement increased during the period of study; +, trend slope indicates that the time of measurement tended to increase during the period of study; -, trend slope indicates that the time of measurement tended to decrease during the period of study]

Station number	Results of Seasonal Kendall trend tests of flow-adjusted concentrations of dissolved oxygen					Results of tests to assess the effects of trends in time of measurement on the results of trend tests of flow-adjusted concentrations of dissolved oxygen				
	Summary result	Trend slope				Kendall tau tests for correlation of dissolved oxygen and time of measurement		Seasonal Kendall trend tests of time of measurement of dissolved oxygen		
		Level of significance	In milligrams per liter per year	In percent of median value per year (median value in milligrams per liter)		Summary result	Level of significance	Summary result	Trend slope: Level of significance	Trend slope: Direction
Atlantic Coastal Water Region										
01408000	--	0.461	-0.076	-0.9	(8.3)	-- (c)	0.426	Decrease (t)	0.007	-
01408009	--	0.730	0.011	0.1	(7.9)	-- (c)	0.922	-- (t)	0.839	-
01408100	--	0.282	0.108	1.4	(7.6)	-- (c)	0.126	-- (t)	0.148	+
01408500	**Decrease**	0.018	-0.104	-1.3	(7.8)	-- (c)	0.583	Decrease (t)	0.014	-
01408830	**Increase**	0.020	0.085	1.0	(8.5)	-- (c)	0.555	-- (t)	0.526	+
01409387	--	0.854	-0.005	-0.1	(7.6)	-- (c)	0.672	-- (t)	0.139	-
0140940950	--	0.104	-0.072	-0.9	(8.1)	-- (c)	0.474	-- (t)	0.517	+
01409416	--	0.922	0.024	0.3	(7.2)	-- (c)	0.083	-- (t)	0.267	-
01409500	**Increase**	0.050	0.130	1.6	(7.9)	-- (c)	0.587	-- (t)	0.434	-
01409815	--	0.302	0.020	0.3	(8)	-- (c)	0.157	-- (t)	1.000	n.d.
01410150	**Increase**	0.047	0.105	1.6	(6.7)	-- (c)	0.946	Decrease (t)	0.021	-
01411035	--	0.869	-0.027	-0.4	(7.6)	Increase (c)	0.045	-- (t)	0.310	-
01411110	--	0.509	-0.024	-0.3	(8.2)	-- (c)	0.552	-- (t)	0.291	-
01411196	--	0.447	0.040	0.5	(7.6)	-- (c)	0.239	-- (t)	0.799	+
01411400	--	0.432	0.117	2.1	(5.6)	-- (c)	0.718	-- (t)	0.070	+
01411444	--	0.199	-0.167	-2.5	(6.7)	-- (c)	0.649	-- (t)	0.077	-
Upper Delaware Water Region										
01367625	--	0.076	0.123	1.4	(8.7)	-- (c)	0.833	-- (t)	0.132	-
01367770	n.d.	n.d.	n.d.	n.d.	(n.d.)	Increase (c)	0.003	Increase (t)	0.014	+
01367800	--	0.164	-0.128	-1.4	(9.3)	-- (c)	0.651	Decrease (t)	0.039	-
01368820	--	0.115	0.166	2.3	(7.2)	-- (c)	0.542	Increase (t)	0.021	+
01438500	--	0.085	-0.111	-1.3	(8.5)	-- (c)	0.359	-- (t)	0.160	-
01440000	n.d.	n.d.	n.d.	n.d.	(n.d.)	Increase (c)	0.000	Decrease (t)	0.002	-
01442760	--	0.123	-0.095	-1.0	(10)	-- (c)	0.536	-- (t)	0.951	+

Table 5b. Results of trend tests on growing-season flow-adjusted concentrations of dissolved oxygen at water-quality stations on New Jersey streams, water years 1998–2007.—Continued

[Growing season is April–September; --, no trend in flow-adjusted concentration of dissolved oxygen during the period of study was identified at a 0.05 level of significance; **Decrease**, dissolved oxygen decreased during the period of study; **Increase**, dissolved oxygen increased during the period of study; n.d., not determined; results of trend tests of flow-adjusted concentrations of dissolved oxygen are not presented if concentrations of dissolved oxygen correlated with time of measurement and if there was a trend in time of measurement; -- (c), no correlation at the 0.05 level of significance was identified between concentrations of dissolved oxygen and time of measurement; Decrease (c), dissolved oxygen decreased with increasing time of measurement; Increase (c), dissolved oxygen increased with increasing time of measurement; -- (t), no trend in time of measurement during the period of study was identified at a 0.05 level of significance; Decrease (t), time of measurement decreased during the period of study; Increase (t), time of measurement increased during the period of study; +, trend slope indicates that the time of measurement tended to increase during the period of study; -, trend slope indicates that the time of measurement tended to decrease during the period of study]

Station number	Results of Seasonal Kendall trend tests of flow-adjusted concentrations of dissolved oxygen					Results of tests to assess the effects of trends in time of measurement on the results of trend tests of flow-adjusted concentrations of dissolved oxygen				
	Summary result	Trend slope				Kendall tau tests for correlation of dissolved oxygen and time of measurement		Seasonal Kendall trend tests of time of measurement of dissolved oxygen		
		Level of significance	In milligrams per liter per year	In percent of median value per year (median value in milligrams per liter)		Summary result	Level of significance	Summary result	Trend slope: Level of significance	Trend slope: Direction
Upper Delaware Water Region										
01443000	--	0.550	-0.053	-0.6	(8.3)	Increase (c)	0.037	-- (t)	1.000	n.d.
01443500	--	0.700	0.082	0.9	(8.7)	Increase (c)	0.022	-- (t)	0.648	n.d.
01446400	**Increase**	0.037	0.115	1.1	(10.1)	-- (c)	0.579	-- (t)	0.598	+
01457400	--	0.489	-0.026	-0.3	(9.8)	-- (c)	0.672	-- (t)	0.196	-
01457500	**Decrease**	0.003	-0.207	-2.4	(8.6)	-- (c)	0.192	-- (t)	0.053	-
01458570	--	0.176	0.185	2.0	(9.3)	-- (c)	0.379	-- (t)	0.289	+
01461000	--	0.185	-0.132	-1.6	(8.2)	-- (c)	0.233	-- (t)	0.090	-
01463500	--	0.820	0.018	0.2	(9.2)	-- (c)	0.499	-- (t)	0.779	n.d.
01463850	n.d.	n.d.	n.d.	n.d.	(n.d.)	Increase (c)	0.023	Decrease (t)	0.032	-
01464020	--	0.956	0.003	0.0	(8.2)	-- (c)	0.648	-- (t)	1.000	n.d.
Lower Delaware Water Region										
01411466	--	0.330	-0.156	-2.6	(6)	-- (c)	0.360	-- (t)	0.212	-
01411500	--	0.080	-0.182	-2.5	(7.4)	Increase (c)	0.027	-- (t)	0.148	-
01411955	--	0.799	-0.017	-0.2	(7.7)	Increase (c)	0.029	-- (t)	0.371	+
01412800	--	0.875	-0.016	-0.2	(7.8)	-- (c)	0.304	-- (t)	0.905	-
01464504	--	0.563	-0.039	-0.5	(7.9)	Decrease (c)	0.003	-- (t)	0.654	+
01464515	--	0.374	0.046	0.7	(6.4)	Decrease (c)	0.044	-- (t)	1.000	n.d.
01465893	--	0.802	-0.022	-0.3	(7.5)	-- (c)	0.399	-- (t)	0.105	+
01466500	**Decrease**	0.030	-0.100	-3.5	(2.8)	-- (c)	0.099	-- (t)	0.164	-
01467005	--	0.803	-0.034	-0.4	(8.4)	Increase (c)	0.003	-- (t)	0.618	-
01467150	--	0.182	-0.147	-2.2	(6.8)	-- (c)	0.057	-- (t)	0.076	-
01467359	--	0.758	-0.030	-0.5	(6.1)	-- (c)	0.345	-- (t)	0.403	-
01477120	--	0.773	0.044	0.6	(7.7)	-- (c)	0.203	-- (t)	0.943	n.d.
01482500	--	0.766	0.025	0.3	(8)	-- (c)	0.601	-- (t)	0.806	-

Table 5c. Results of trend tests on flow-adjusted concentrations of year-round and growing-season dissolved oxygen at selected water-quality stations on New Jersey streams, water years 1998–2007.

[Stations included are those at which a trend was identified in either year-round or growing-season concentrations at a 0.05 level of significance; --, no trend in flow-adjusted concentrations of dissolved oxygen during the period of study was identified at a 0.05 level of significance; **Decrease**, concentrations of dissolved oxygen decreased during the period of study; **Increase**, concentrations of dissolved oxygen increased during the period of study; n.d., not determined]

Station number	Station name	Results of trend tests in flow-adjusted concentrations of dissolved oxygen	
		Year-round measurements	Growing-season measurements (April–September)
	Passaic Water Region		
01382000	Passaic River at Two Bridges, N.J.	--	**Decrease**
01388500	Pompton River at Pompton Plains, N.J.	**Decrease**	n.d.
	Raritan Water Region		
	(none)		
	Atlantic Coastal Water Region		
01408500	Toms River near Toms River, N.J.	--	**Decrease**
01408830	Cedar Creek at Cedar Crest, N.J.	--	**Increase**
01409500	Batsto River at Batsto, N.J.	--	**Increase**
01410150	East Branch Bass River near New Gretna, N.J.	--	**Increase**
	Upper Delaware Water Region		
01438500	Delaware River at Montague, N.J.	**Decrease**	--
01446400	Pequest River at Belvidere, N.J.	--	**Increase**
01457500	Delaware River at Riegelsville, N.J.	**Decrease**	**Decrease**
	Lower Delaware Water Region		
01466500	McDonalds Branch in Byrne State Forest, N.J.	--	**Decrease**
01467150	Cooper River at Haddonfield, N.J.	**Decrease**	--

Table 6. Summary statistics for pH at water-quality stations on New Jersey streams, water years 1998–2007.

[n.a., not applicable]

Station number	Results of trend tests presented	Number of measure-ments	Nondetect measurements			Statistic, in standard units				
			Number	Percentage of all measurements	Maximum reporting level, in standard units	Minimum	25th percentile	Median	75th percentile	Maximum
Passaic Water Region										
01377000	Yes	40	0	0	n.a.	7.1	7.6	7.7	7.8	8.1
01378560	No	39	0	0	n.a.	6.7	7.3	7.5	7.7	8.5
01378780	No	39	0	0	n.a.	6.3	6.9	7.2	7.5	7.7
01379200	No	40	0	0	n.a.	6.2	7.0	7.3	7.5	8.4
01380100	No	39	0	0	n.a.	6.1	6.8	7.0	7.4	8.0
01381800	Yes	40	0	0	n.a.	6.9	7.3	7.4	7.6	8.1
01382000	No	40	0	0	n.a.	6.8	7.2	7.3	7.5	8.8
01382500	Yes	40	0	0	n.a.	7.3	7.5	7.6	7.6	8.0
01387500	Yes	40	0	0	n.a.	7.3	7.6	7.7	7.8	8.1
01388500	Yes	40	0	0	n.a.	7.3	7.5	7.6	7.8	8.8
01389500	No	40	0	0	n.a.	7.0	7.4	7.6	7.8	8.2
01391500	Yes	39	0	0	n.a.	7.2	7.5	7.7	7.8	8.2
Raritan Water Region										
01394500	Yes	40	0	0	n.a.	7.2	7.5	7.6	7.7	8.1
01395000	Yes	40	0	0	n.a.	7.4	7.6	7.8	7.9	8.4
01396660	Yes	40	0	0	n.a.	7.4	7.7	7.8	7.9	8.3
01398000	Yes	38	0	0	n.a.	6.9	7.7	8.0	8.2	9.1
01398102	No	40	0	0	n.a.	6.8	7.5	7.6	8.1	9.3
01399780	No	39	0	0	n.a.	7.0	7.5	7.7	8.2	9.3
01400000	Yes	40	0	0	n.a.	7.4	7.6	7.8	7.9	8.3
01400640	No	33	0	0	n.a.	5.9	6.4	6.8	7.1	7.4
01401400	No	40	0	0	n.a.	6.1	6.5	6.8	7.0	8.5
01402000	Yes	39	0	0	n.a.	6.9	7.2	7.4	7.6	8.2
01403385	No	40	0	0	n.a.	6.6	7.2	7.4	7.6	7.9
01405340	No	39	0	0	n.a.	4.3	5.9	6.5	6.8	7.9
Atlantic Coastal Water Region										
01408000	Yes	39	0	0	n.a.	6.5	6.9	7.2	7.4	7.7
01408009	No	39	0	0	n.a.	5.4	5.9	6.2	6.5	7.1
01408100	No	38	0	0	n.a.	4.2	6.2	6.4	6.6	7.2
01408500	Yes	40	0	0	n.a.	4.4	5.4	5.8	6.0	6.4
01408830	No	39	0	0	n.a.	3.3	4.3	4.6	4.9	5.6
01409387	No	40	0	0	n.a.	3.7	4.1	4.5	4.9	5.7
0140940950	No	40	0	0	n.a.	6.0	6.4	6.7	6.9	7.6
01409416	No	40	0	0	n.a.	5.1	5.8	6.2	6.5	7.2
01409500	No	37	0	0	n.a.	4.2	4.9	5.3	5.6	5.8
01409815	No	40	0	0	n.a.	3.6	4.0	4.2	4.4	4.7
01410150	Yes	40	0	0	n.a.	4.1	4.3	4.4	4.5	4.8
01411035	No	40	0	0	n.a.	4.2	5.5	5.8	6.1	6.5
01411110	No	39	0	0	n.a.	3.7	5.0	5.8	6.2	6.6
01411196	No	38	0	0	n.a.	3.1	4.0	4.5	4.9	5.8
01411400	No	38	0	0	n.a.	5.6	6.3	6.6	6.8	7.3
01411444	No	35	0	0	n.a.	3.2	3.9	4.0	4.3	4.6

Table 6. Summary statistics for pH at water-quality stations on New Jersey streams, water years 1998–2007.—Continued

[n.a., not applicable]

Station number	Results of trend tests presented	Number of measure-ments	Nondetect measurements			Statistic, in standard units				
			Number	Percentage of all measurements	Maximum reporting level, in standard units	Minimum	25th percentile	Median	75th percentile	Maximum
Upper Delaware Water Region										
01367625	No	40	0	0	n.a.	7.0	7.9	8.1	8.2	8.4
01367770	No	38	0	0	n.a.	7.4	7.7	7.8	7.9	8.2
01367800	Yes	36	0	0	n.a.	6.4	7.6	7.8	7.9	8.2
01368820	No	37	0	0	n.a.	6.6	7.3	7.4	7.6	7.8
01438500	Yes	40	0	0	n.a.	6.7	7.2	7.3	7.4	8.1
01440000	Yes	40	0	0	n.a.	7.3	7.7	7.9	8.0	8.2
01442760	No	39	0	0	n.a.	5.5	6.2	6.6	6.8	7.6
01443000	No	37	0	0	n.a.	6.1	7.0	7.3	7.6	8.6
01443500	Yes	40	0	0	n.a.	7.6	8.1	8.2	8.2	8.4
01446400	No	40	0	0	n.a.	7.8	8.1	8.3	8.4	8.7
01457400	No	40	0	0	n.a.	7.1	7.9	8.1	8.2	8.5
01457500	Yes	40	0	0	n.a.	7.4	7.6	7.8	7.9	8.3
01458570	No	39	0	0	n.a.	6.6	7.5	7.7	8.0	8.9
01461000	Yes	36	0	0	n.a.	6.8	7.8	7.9	8.2	8.8
01463500	Yes	39	0	0	n.a.	6.9	7.5	7.8	8.2	9.1
01463850	No	40	0	0	n.a.	5.5	6.2	6.4	6.7	6.9
01464020	No	40	0	0	n.a.	6.1	7.0	7.1	7.4	7.8
Lower Delaware Water Region										
01411466	No	39	0	0	n.a.	3.3	4.1	4.4	4.7	5.6
01411500	Yes	36	0	0	n.a.	5.2	6.2	6.4	6.6	7.0
01411955	No	40	0	0	n.a.	3.4	4.2	4.6	5.1	5.4
01412800	No	39	0	0	n.a.	5.6	6.4	6.6	6.9	7.1
01464504	No	38	0	0	n.a.	6.5	6.8	7.1	7.2	7.6
01464515	No	39	0	0	n.a.	6.2	6.8	6.9	7.1	7.3
01465893	No	39	0	0	n.a.	3.5	4.0	4.3	4.8	6.6
01466500	Yes	40	0	0	n.a.	3.9	4.1	4.2	4.3	4.5
01467005	No	39	0	0	n.a.	5.0	5.9	6.4	6.6	7.5
01467150	No	40	0	0	n.a.	6.5	7.0	7.1	7.4	8.4
01467359	No	40	0	0	n.a.	6.2	6.6	6.8	7.0	7.5
01477120	Yes	40	0	0	n.a.	6.5	7.0	7.2	7.3	7.7
01482500	Yes	39	0	0	n.a.	6.4	7.0	7.4	7.6	9.3

Table 7. Results of trend tests on flow-adjusted values of pH at water-quality stations on New Jersey streams, water years 1998–2007.

[--, no trend in flow-adjusted values of pH during the period of study was identified at a 0.05 level of significance; **Decrease**, pH decreased during the period of study; **Increase**, pH increased during the period of study; n.d., not determined; results of trend tests of flow-adjusted values of pH are not presented if (a) pH values were affected by a change in field methods or (b) pH correlated with time of measurement and there was a trend in time of measurement; -- (c), no correlation at the 0.05 level of significance was identified between values of pH and time of measurement; Decrease (c), pH decreased with increasing time of measurement; -- (t), no trend in time of measurement during the period of study was identified at a 0.05 level of significance; Decrease (t), time of measurement decreased during the period of study; +, trend slope indicates that the time of measurement tended to increase during the period of study; -, trend slope indicates that the time of measurement tended to decrease during the period of study]

Station number	Results of Seasonal Kendall trend tests of flow-adjusted values of pH					Results of tests to assess the effects of trends in time of measurement on the results of trend tests of flow-adjusted values of pH				
	Summary result	Trend slope				Kendall tau tests for correlation of pH and time of measurement		Seasonal Kendall trend tests of time of measurement of pH		
		Level of significance	In standard units per year	In percent of median value per year (median value in standard units)		Summary result	Level of significance	Summary result	Trend slope: Level of significance	Trend slope: Direction
Passaic Water Region										
01377000	--	0.481	0.005	0.1	(7.7)	-- (c)	0.463	Decrease (t)	0.050	-
01378560	n.d.	n.d.	n.d.	n.d.	(n.d.)	n.d.	n.d.	n.d.	n.d.	n.d.
01378780	n.d.	n.d.	n.d.	n.d.	(n.d.)	n.d.	n.d.	n.d.	n.d.	n.d.
01379200	n.d.	n.d.	n.d.	n.d.	(n.d.)	n.d.	n.d.	n.d.	n.d.	n.d.
01380100	n.d.	n.d.	n.d.	n.d.	(n.d.)	n.d.	n.d.	n.d.	n.d.	n.d.
01381800	--	0.084	0.016	0.2	(7.4)	-- (c)	0.568	-- (t)	0.849	n.d.
01382000	n.d.	n.d.	n.d.	n.d.	(n.d.)	n.d.	n.d.	n.d.	n.d.	n.d.
01382500	--	0.168	-0.007	-0.1	(7.6)	-- (c)	0.785	-- (t)	0.184	n.d.
01387500	--	0.296	-0.013	-0.2	(7.7)	-- (c)	0.557	-- (t)	0.834	n.d.
01388500	--	0.186	-0.032	-0.4	(7.6)	-- (c)	0.167	Decrease (t)	0.025	-
01389500	n.d.	n.d.	n.d.	n.d.	(n.d.)	n.d.	n.d.	n.d.	n.d.	n.d.
01391500	--	0.125	0.037	0.5	(7.7)	-- (c)	0.258	-- (t)	0.645	+
Raritan Water Region										
01394500	**Increase**	0.044	0.017	0.2	(7.6)	-- (c)	0.480	Decrease (t)	0.008	-
01395000	--	0.187	0.019	0.2	(7.8)	-- (c)	0.584	-- (t)	0.661	-
01396660	--	0.884	0.000	0.0	(7.8)	-- (c)	0.799	-- (t)	0.309	n.d.
01398000	--	0.097	0.041	0.5	(8)	-- (c)	0.713	Decrease (t)	0.048	-
01398102	n.d.	n.d.	n.d.	n.d.	(n.d.)	n.d.	n.d.	n.d.	n.d.	n.d.
01399780	n.d.	n.d.	n.d.	n.d.	(n.d.)	n.d.	n.d.	n.d.	n.d.	n.d.
01400000	--	0.211	0.014	0.2	(7.8)	-- (c)	0.712	Decrease (t)	0.026	-
01400640	n.d.	n.d.	n.d.	n.d.	(n.d.)	n.d.	n.d.	n.d.	n.d.	n.d.
01401400	n.d.	n.d.	n.d.	n.d.	(n.d.)	n.d.	n.d.	n.d.	n.d.	n.d.
01402000	--	0.055	-0.022	-0.3	(7.4)	-- (c)	0.223	Decrease (t)	0.003	-
01403385	n.d.	n.d.	n.d.	n.d.	(n.d.)	n.d.	n.d.	n.d.	n.d.	n.d.
01405340	n.d.	n.d.	n.d.	n.d.	(n.d.)	n.d.	n.d.	n.d.	n.d.	n.d.

Table 7. Results of trend tests on flow-adjusted values of pH at water-quality stations on New Jersey streams, water years 1998–2007.—Continued

[--, no trend in flow-adjusted values of pH during the period of study was identified at a 0.05 level of significance; **Decrease**, pH decreased during the period of study; **Increase**, pH increased during the period of study; n.d., not determined; results of trend tests of flow-adjusted values of pH are not presented if (a) pH values were affected by a change in field methods or (b) pH correlated with time of measurement and there was a trend in time of measurement; -- (c), no correlation at the 0.05 level of significance was identified between values of pH and time of measurement; Decrease (c), pH decreased with increasing time of measurement; -- (t), no trend in time of measurement during the period of study was identified at a 0.05 level of significance; Decrease (t), time of measurement decreased during the period of study; +, trend slope indicates that the time of measurement tended to increase during the period of study; -, trend slope indicates that the time of measurement tended to decrease during the period of study]

Station number	Results of Seasonal Kendall trend tests of flow-adjusted values of pH					Results of tests to assess the effects of trends in time of measurement on the results of trend tests of flow-adjusted values of pH				
	Summary result	Trend slope				Kendall tau tests for correlation of pH and time of measurement		Seasonal Kendall trend tests of time of measurement of pH		
		Level of significance	In standard units per year	In percent of median value per year (median value in standard units)		Summary result	Level of significance	Summary result	Trend slope: Level of significance	Trend slope: Direction
Atlantic Coastal Water Region										
01408000	**Decrease**	0.025	-0.028	-0.4	(7.2)	-- (c)	0.848	Decrease (t)	0.002	-
01408009	n.d.	n.d.	n.d.	n.d.	(n.d.)	n.d.	n.d.	n.d.	n.d.	n.d.
01408100	n.d.	n.d.	n.d.	n.d.	(n.d.)	n.d.	n.d.	n.d.	n.d.	n.d.
01408500	**Increase**	0.048	0.039	0.7	(5.8)	-- (c)	0.145	-- (t)	0.062	-
01408830	n.d.	n.d.	n.d.	n.d.	(n.d.)	n.d.	n.d.	n.d.	n.d.	n.d.
01409387	n.d.	n.d.	n.d.	n.d.	(n.d.)	n.d.	n.d.	n.d.	n.d.	n.d.
0140940950	n.d.	n.d.	n.d.	n.d.	(n.d.)	n.d.	n.d.	n.d.	n.d.	n.d.
01409416	n.d.	n.d.	n.d.	n.d.	(n.d.)	n.d.	n.d.	n.d.	n.d.	n.d.
01409500	n.d.	n.d.	n.d.	n.d.	(n.d.)	n.d.	n.d.	n.d.	n.d.	n.d.
01409815	n.d.	n.d.	n.d.	n.d.	(n.d.)	n.d.	n.d.	n.d.	n.d.	n.d.
01410150	--	0.511	-0.006	-0.1	(4.4)	-- (c)	0.342	Decrease (t)	0.043	-
01411035	n.d.	n.d.	n.d.	n.d.	(n.d.)	n.d.	n.d.	n.d.	n.d.	n.d.
01411110	n.d.	n.d.	n.d.	n.d.	(n.d.)	n.d.	n.d.	n.d.	n.d.	n.d.
01411196	n.d.	n.d.	n.d.	n.d.	(n.d.)	n.d.	n.d.	n.d.	n.d.	n.d.
01411400	n.d.	n.d.	n.d.	n.d.	(n.d.)	n.d.	n.d.	n.d.	n.d.	n.d.
01411444	n.d.	n.d.	n.d.	n.d.	(n.d.)	n.d.	n.d.	n.d.	n.d.	n.d.
Upper Delaware Water Region										
01367625	n.d.	n.d.	n.d.	n.d.	(n.d.)	n.d.	n.d.	n.d.	n.d.	n.d.
01367770	n.d.	n.d.	n.d.	n.d.	(n.d.)	n.d.	n.d.	n.d.	n.d.	n.d.
01367800	--	0.961	0.000	0.0	(7.8)	-- (c)	0.711	-- (t)	0.103	-
01368820	n.d.	n.d.	n.d.	n.d.	(n.d.)	n.d.	n.d.	n.d.	n.d.	n.d.
01438500	**Decrease**	0.037	-0.019	-0.3	(7.3)	-- (c)	0.164	-- (t)	0.181	-
01440000	--	0.079	0.019	0.2	(7.9)	-- (c)	0.163	Decrease (t)	0.001	-
01442760	n.d.	n.d.	n.d.	n.d.	(n.d.)	n.d.	n.d.	n.d.	n.d.	n.d.
01443000	n.d.	n.d.	n.d.	n.d.	(n.d.)	n.d.	n.d.	n.d.	n.d.	n.d.
01443500	--	0.229	0.010	0.1	(8.2)	-- (c)	0.338	-- (t)	0.197	-

Table 7. Results of trend tests on flow-adjusted values of pH at water-quality stations on New Jersey streams, water years 1998–2007.—Continued

[--, no trend in flow-adjusted values of pH during the period of study was identified at a 0.05 level of significance; **Decrease**, pH decreased during the period of study; **Increase**, pH increased during the period of study; n.d., not determined; results of trend tests of flow-adjusted values of pH are not presented if (a) pH values were affected by a change in field methods or (b) pH correlated with time of measurement and there was a trend in time of measurement; -- (c), no correlation at the 0.05 level of significance was identified between values of pH and time of measurement; Decrease (c), pH decreased with increasing time of measurement; -- (t), no trend in time of measurement during the period of study was identified at a 0.05 level of significance; Decrease (t), time of measurement decreased during the period of study; +, trend slope indicates that the time of measurement tended to increase during the period of study; -, trend slope indicates that the time of measurement tended to decrease during the period of study]

Station number	Results of Seasonal Kendall trend tests of flow-adjusted values of pH					Results of tests to assess the effects of trends in time of measurement on the results of trend tests of flow-adjusted values of pH				
	Summary result	Trend slope				Kendall tau tests for correlation of pH and time of measurement		Seasonal Kendall trend tests of time of measurement of pH		
		Level of significance	In standard units per year	In percent of median value per year (median value in standard units)		Summary result	Level of significance	Summary result	Trend slope: Level of significance	Trend slope: Direction
Upper Delaware Water Region										
01446400	n.d.	n.d.	n.d.	n.d.	(n.d.)	n.d.	n.d.	n.d.	n.d.	n.d.
01457400	n.d.	n.d.	n.d.	n.d.	(n.d.)	n.d.	n.d.	n.d.	n.d.	n.d.
01457500	--	0.075	0.027	0.4	(7.8)	-- (c)	0.568	Decrease (t)	0.025	-
01458570	n.d.	n.d.	n.d.	n.d.	(n.d.)	n.d.	n.d.	n.d.	n.d.	n.d.
01461000	**Increase**	0.002	0.069	0.9	(7.9)	Decrease (c)	0.006	-- (t)	0.062	-
01463500	--	0.374	0.023	0.3	(7.8)	-- (c)	0.184	-- (t)	0.053	-
01463850	n.d.	n.d.	n.d.	n.d.	(n.d.)	n.d.	n.d.	n.d.	n.d.	n.d.
01464020	n.d.	n.d.	n.d.	n.d.	(n.d.)	n.d.	n.d.	n.d.	n.d.	n.d.
Lower Delaware Water Region										
01411466	n.d.	n.d.	n.d.	n.d.	(n.d.)	n.d.	n.d.	n.d.	n.d.	n.d.
01411500	--	0.568	0.015	0.2	(6.4)	-- (c)	0.408	Decrease (t)	0.036	-
01411955	n.d.	n.d.	n.d.	n.d.	(n.d.)	n.d.	n.d.	n.d.	n.d.	n.d.
01412800	n.d.	n.d.	n.d.	n.d.	(n.d.)	n.d.	n.d.	n.d.	n.d.	n.d.
01464504	n.d.	n.d.	n.d.	n.d.	(n.d.)	n.d.	n.d.	n.d.	n.d.	n.d.
01464515	n.d.	n.d.	n.d.	n.d.	(n.d.)	n.d.	n.d.	n.d.	n.d.	n.d.
01465893	n.d.	n.d.	n.d.	n.d.	(n.d.)	n.d.	n.d.	n.d.	n.d.	n.d.
01466500	--	0.804	0.000	0.0	(4.2)	-- (c)	0.820	Decrease (t)	0.022	-
01467005	n.d.	n.d.	n.d.	n.d.	(n.d.)	n.d.	n.d.	n.d.	n.d.	n.d.
01467150	n.d.	n.d.	n.d.	n.d.	(n.d.)	Decrease (c)	0.018	Decrease (t)	0.017	-
01467359	n.d.	n.d.	n.d.	n.d.	(n.d.)	n.d.	n.d.	n.d.	n.d.	n.d.
01477120	--	0.628	0.007	0.1	(7.2)	-- (c)	0.207	-- (t)	0.167	n.d.
01482500	--	0.147	0.050	0.7	(7.4)	-- (c)	0.155	-- (t)	0.968	n.d.

Table 8. Summary statistics for total dissolved solids at water-quality stations on New Jersey streams, water years 1998–2007.

[n.a., not applicable; <, less than]

Station number	Results of trend tests presented	Number of measure-ments	Nondetect measurements			Statistic, in milligrams per liter				
			Number	Percentage of all measurements	Maximum reporting level, in milligrams per liter	Minimum	25th percentile	Median	75th percentile	Maximum
Passaic Water Region										
01377000	Yes	40	0	0	n.a.	122	229	253	288	425
01378560	Yes	39	0	0	n.a.	76	257	369	434	1,245
01378780	Yes	40	0	0	n.a.	70	84	90	100	109
01379200	Yes	40	0	0	n.a.	140	269	332	387	1,040
01380100	Yes	40	0	0	n.a.	78	106	122	136	168
01381800	Yes	40	0	0	n.a.	136	274	331	387	755
01382000	Yes	40	0	0	n.a.	141	252	314	389	780
01382500	Yes	39	0	0	n.a.	78	94	122	139	218
01387500	Yes	40	0	0	n.a.	105	199	247	305	416
01388500	Yes	40	0	0	n.a.	92	164	228	247	336
01389500	Yes	40	0	0	n.a.	133	229	291	338	645
01391500	Yes	39	0	0	n.a.	199	408	449	500	819
Raritan Water Region										
01394500	Yes	40	0	0	n.a.	123	365	398	460	2,296
01395000	Yes	40	0	0	n.a.	156	276	344	406	651
01396660	Yes	40	0	0	n.a.	113	139	149	159	200
01398000	Yes	38	0	0	n.a.	126	168	192	224	688
01398102	Yes	40	0	0	n.a.	114	146	170	181	279
01399780	Yes	39	0	0	n.a.	72	129	152	172	234
01400000	Yes	40	0	0	n.a.	101	147	167	187	293
01400640	Yes	36	0	0	n.a.	117	147	162	183	237
01401400	Yes	39	0	0	n.a.	100	136	156	193	647
01402000	Yes	39	0	0	n.a.	107	144	183	213	415
01403385	Yes	39	0	0	n.a.	27	218	305	382	652
01405340	Yes	40	0	0	n.a.	76	112	127	140	171
Atlantic Coastal Water Region										
01408000	Yes	40	0	0	n.a.	82	130	150	166	1,307
01408009	Yes	40	0	0	n.a.	56	76	87	98	149
01408100	Yes	40	0	0	n.a.	47	88	101	114	192
01408500	Yes	40	0	0	n.a.	45	59	65	71	85
01408830	Yes	40	0	0	n.a.	15	21	24	27	40
01409387	Yes	40	0	0	n.a.	16	30	34	40	59
0140940950	Yes	40	0	0	n.a.	36	46	51	59	79
01409416	Yes	40	0	0	n.a.	53	76	80	87	105
01409500	Yes	37	0	0	n.a.	19	31	36	42	51
01409815	Yes	40	0	0	n.a.	20	26	28	31	41
01410150	Yes	40	1	3	10	<10	25	29	34	52
01411035	Yes	40	0	0	n.a.	36	46	50	54	70
01411110	Yes	40	0	0	n.a.	25	44	50	59	73
01411196	Yes	40	0	0	n.a.	32	40	47	55	93
01411400	Yes	40	0	0	n.a.	81	106	122	134	213
01411444	Yes	36	0	0	n.a.	23	39	41	49	84

Table 8. Summary statistics for total dissolved solids at water-quality stations on New Jersey streams, water years 1998–2007.—Continued

[n.a., not applicable; <, less than]

Station number	Results of trend tests presented	Number of measure-ments	Nondetect measurements			Statistic, in milligrams per liter				
			Number	Percentage of all measurements	Maximum reporting level, in milligrams per liter	Minimum	25th percentile	Median	75th percentile	Maximum
Upper Delaware Water Region										
01367625	Yes	40	0	0	n.a.	292	343	360	405	480
01367770	Yes	39	0	0	n.a.	195	269	326	362	514
01367800	Yes	36	0	0	n.a.	129	178	206	245	277
01368820	Yes	39	0	0	n.a.	12	128	140	154	179
01438500	Yes	40	0	0	n.a.	37	46	52	58	71
01440000	Yes	39	0	0	n.a.	57	100	110	129	176
01442760	Yes	38	0	0	n.a.	18	23	25	27	31
01443000	Yes	39	0	0	n.a.	47	50	57	63	75
01443500	Yes	40	0	0	n.a.	177	226	249	280	326
01446400	Yes	40	0	0	n.a.	27	263	291	306	348
01457400	Yes	40	0	0	n.a.	124	216	234	250	268
01457500	Yes	40	0	0	n.a.	68	91	110	122	163
01458570	Yes	40	0	0	n.a.	89	105	112	117	136
01461000	Yes	40	0	0	n.a.	61	94	118	129	148
01463500	Yes	39	0	0	n.a.	67	90	114	124	149
01463850	Yes	40	0	0	n.a.	68	100	117	138	285
01464020	Yes	40	0	0	n.a.	101	176	215	248	453
Lower Delaware Water Region										
01411466	Yes	39	0	0	n.a.	29	39	46	56	74
01411500	Yes	36	0	0	n.a.	52	64	70	80	88
01411955	Yes	40	0	0	n.a.	15	21	25	30	56
01412800	Yes	40	0	0	n.a.	86	125	132	140	173
01464504	Yes	39	0	0	n.a.	71	104	115	134	177
01464515	Yes	40	0	0	n.a.	80	111	119	132	157
01465893	Yes	39	0	0	n.a.	51	58	67	74	86
01466500	Yes	40	0	0	n.a.	11	22	27	33	52
01467005	Yes	40	0	0	n.a.	53	77	87	100	135
01467150	Yes	40	0	0	n.a.	98	133	149	179	1,543
01467359	Yes	40	0	0	n.a.	58	102	112	126	406
01477120	Yes	40	0	0	n.a.	105	129	137	145	223
01482500	Yes	40	0	0	n.a.	117	155	160	168	182

Table 9. Results of trend tests on flow-adjusted concentrations of total dissolved solids at water-quality stations on New Jersey streams, water years 1998–2007.

[--, no trend in flow-adjusted concentrations of total dissolved solids during the period of study was identified at a 0.05 level of significance; **Increase**, concentrations of total dissolved solids increased during the period of study]

Station number	Results of Seasonal Kendall trend tests of flow-adjusted concentrations of total dissolved solids				
	Summary result	Trend slope			
		Level of significance	In milligrams per liter per year	In percent of median value per year	(median value in milligrams per liter)
Passaic Water Region					
01377000	--	0.918	-0.4	-0.2	(253)
01378560	--	0.065	15.6	4.2	(369)
01378780	--	0.143	0.5	0.5	(90)
01379200	**Increase**	0.038	8.6	2.6	(332)
01380100	--	0.752	-0.3	-0.2	(122)
01381800	**Increase**	0.014	9.6	2.9	(331)
01382000	--	0.330	2.0	0.6	(314)
01382500	--	0.368	0.7	0.6	(122)
01387500	--	0.078	3.7	1.5	(247)
01388500	--	0.409	2.4	1.0	(228)
01389500	--	0.125	5.6	1.9	(291)
01391500	**Increase**	0.006	9.0	2.0	(449)
Raritan Water Region					
01394500	**Increase**	0.020	9.9	2.5	(398)
01395000	**Increase**	0.048	12.9	3.7	(344)
01396660	--	0.963	0.1	0.0	(149)
01398000	--	0.188	2.6	1.3	(192)
01398102	**Increase**	0.014	2.0	1.2	(170)
01399780	**Increase**	0.033	4.3	2.8	(152)
01400000	**Increase**	0.048	4.9	2.9	(167)
01400640	--	0.176	1.3	0.8	(162)
01401400	**Increase**	0.002	8.3	5.3	(156)
01402000	--	0.052	5.0	2.7	(183)
01403385	--	0.084	6.7	2.2	(305)
01405340	**Increase**	0.002	4.8	3.8	(127)
Atlantic Coastal Water Region					
01408000	**Increase**	0.004	5.7	3.8	(150)
01408009	--	0.191	0.7	0.8	(87)
01408100	**Increase**	0.009	3.9	3.8	(101)
01408500	**Increase**	0.003	1.4	2.2	(65)
01408830	--	0.706	0.1	0.5	(24)
01409387	--	0.141	1.1	3.1	(34)
0140940950	**Increase**	0.041	1.4	2.7	(51)
01409416	**Increase**	0.040	0.9	1.2	(80)
01409500	--	0.404	0.4	1.1	(36)
01409815	--	0.836	0.2	0.6	(28)
01410150	**Increase**	0.048	0.6	1.9	(29)
01411035	--	0.656	-0.2	-0.4	(50)
01411110	**Increase**	0.013	1.1	2.2	(50)
01411196	--	0.053	1.2	2.5	(47)
01411400	--	0.064	-1.6	-1.3	(122)
01411444	--	0.596	0.5	1.1	(42)
Upper Delaware Water Region					
01367625	--	0.977	0.4	0.1	(360)
01367770	--	0.417	1.4	0.4	(326)
01367800	--	0.443	-1.5	-0.7	(206)
01368820	--	0.180	1.6	1.2	(140)
01438500	--	0.276	-0.5	-0.9	(52)
01440000	--	0.409	0.7	0.7	(110)
01442760	--	0.132	0.3	1.2	(25)
01443000	--	0.750	-0.0	0.0	(57)
01443500	--	0.842	-0.4	-0.2	(249)
01446400	--	0.701	0.5	0.2	(291)
01457400	--	0.187	1.1	0.5	(234)
01457500	--	0.196	1.3	1.2	(110)
01458570	--	0.891	-0.2	-0.2	(112)
01461000	--	0.635	0.1	0.1	(118)
01463500	--	0.653	-0.7	-0.6	(114)
01463850	**Increase**	0.004	2.9	2.5	(117)
01464020	**Increase**	0.006	5.4	2.5	(215)
Lower Delaware River Basin					
01411466	--	0.859	0.0	0.1	(46)
01411500	--	0.056	1.6	2.2	(70)
01411955	--	0.978	0.1	0.4	(25)
01412800	--	0.133	1.1	0.9	(132)
01464504	**Increase**	0.050	2.1	1.8	(115)
01464515	--	0.111	1.1	0.9	(119)
01465893	--	0.154	1.2	1.8	(67)
01466500	--	0.650	0.1	0.5	(27)
01467005	--	0.106	-0.6	-0.7	(87)
01467150	**Increase**	0.006	4.9	3.3	(149)
01467359	**Increase**	0.015	2.4	2.1	(112)
01477120	**Increase**	0.016	1.4	1.0	(137)
01482500	**Increase**	0.008	1.5	0.9	(160)

Table 10. Summary statistics for total phosphorus at water-quality stations on New Jersey streams, water years 1998–2007.

[n.a., not applicable; <, less than; E, estimated]

Station number	Results of trend tests presented	Number of measure-ments	Nondetect measurements			Statistic, in milligrams per liter as P				
			Number	Percentage of all measure-ments	Maximum reporting level, in milligrams per liter as P	Minimum	25th percentile	Median	75th percentile	Maximum
Passaic Water Region										
01377000	Yes	39	0	0	n.a.	0.018	0.035	0.046	0.069	0.194
01378560	Yes	38	0	0	n.a.	0.018	0.043	0.069	0.129	0.285
01378780	Yes	40	4	10	0.025	< 0.004	0.006	0.011	0.021	0.064
01379200	Yes	40	0	0	n.a.	0.061	0.306	0.712	1.226	3.467
01380100	Yes	40	3	8	0.025	< 0.01	0.017	0.027	0.041	0.176
01381800	Yes	40	0	0	n.a.	0.051	0.105	0.197	0.294	0.643
01382000	Yes	39	0	0	n.a.	0.138	0.347	0.488	0.761	1.65
01382500	Yes	40	4	10	0.025	< 0.001	0.012	0.018	0.021	E 0.044
01387500	Yes	40	0	0	n.a.	E 0.035	0.083	0.113	0.239	0.749
01388500	Yes	40	0	0	n.a.	0.014	0.036	0.056	0.076	0.168
01389500	Yes	40	0	0	n.a.	0.06	0.208	0.32	0.479	1.319
01391500	Yes	40	0	0	n.a.	0.28	0.467	0.748	1.125	1.776
Raritan Water Region										
01394500	Yes	40	0	0	n.a.	0.02	0.05	0.067	0.102	0.222
01395000	Yes	39	0	0	n.a.	0.018	0.066	0.104	0.123	0.184
01396660	Yes	40	4	10	0.05	< 0.01	0.01	0.012	0.021	0.65
01398000	Yes	39	6	15	0.03	< 0.02	0.027	0.045	0.074	0.196
01398102	Yes	40	0	0	n.a.	0.022	0.057	0.076	0.107	0.286
01399780	Yes	39	1	3	0.025	< 0.025	0.038	0.052	0.09	0.261
01400000	Yes	40	2	5	0.03	< 0.025	0.029	0.048	0.073	0.262
01400640	Yes	36	0	0	n.a.	0.014	0.06	0.092	0.135	0.21
01401400	Yes	39	1	3	0.025	< 0.025	0.016	0.032	0.055	0.16
01402000	Yes	39	0	0	n.a.	0.129	0.187	0.238	0.361	0.811
01403385	Yes	40	0	0	n.a.	0.014	0.066	0.1	0.144	0.303
01405340	Yes	39	0	0	n.a.	0.009	0.053	0.066	0.095	0.433
Atlantic Coastal Water Region										
01408000	Yes	40	2	5	0.025	< 0.025	0.034	0.044	0.064	0.195
01408009	Yes	40	4	10	0.025	< 0.01	0.03	0.039	0.06	0.197
01408100	Yes	40	2	5	0.025	< 0.025	0.032	0.04	0.052	0.093
01408500	Yes	40	5	13	0.025	< 0.01	0.013	0.02	0.03	0.066
01408830	Yes	40	19	48	0.025	< 0.002	0.002	0.003	0.005	0.031
01409387	Yes	40	11	28	0.025	< 0.001	0.005	0.007	0.014	0.047
0140940950	Yes	40	2	5	0.025	< 0.025	0.021	0.032	0.042	0.139
01409416	Yes	40	0	0	n.a.	E 0.032	0.087	0.171	0.226	0.958
01409500	Yes	37	9	24	0.025	< 0.001	0.004	0.009	0.011	0.027
01409815	Yes	40	4	10	0.025	< 0.01	0.02	0.033	0.064	0.12
01410150	Yes	40	20	50	0.025	< 0.001	0.002	0.003	0.003	0.012
01411035	Yes	40	5	13	0.025	< 0.01	0.011	0.017	0.023	E 0.039
01411110	Yes	40	8	20	0.025	< 0.001	0.01	0.014	0.025	0.067
01411196	Yes	40	5	13	0.025	< 0.01	0.007	0.01	0.015	E 0.036
01411400	Yes	40	6	15	0.025	< 0.001	0.011	0.026	0.044	0.088
01411444	Yes	35	7	20	0.025	< 0.001	0.005	0.007	0.009	0.015

Table 10. Summary statistics for total phosphorus at water-quality stations on New Jersey streams, water years 1998–2007.—Continued

[n.a., not applicable; <, less than; E, estimated]

Station number	Results of trend tests presented	Number of measurements	Nondetect measurements			Statistic, in milligrams per liter as P				
			Number	Percentage of all measurements	Maximum reporting level, in milligrams per liter as P	Minimum	25th percentile	Median	75th percentile	Maximum
Upper Delaware Water Region										
01367625	Yes	40	3	8	0.025	< 0.025	0.024	0.031	0.055	0.199
01367770	Yes	39	3	8	0.025	< 0.01	0.023	0.033	0.054	0.107
01367800	Yes	35	3	9	0.025	< 0.025	0.015	0.032	0.043	0.06
01368820	Yes	39	5	13	0.025	< 0.01	0.011	0.015	0.022	E 0.036
01438500	Yes	40	4	10	0.05	< 0.025	0.011	0.017	0.026	0.132
01440000	Yes	40	7	18	0.025	< 0.01	0.006	0.008	0.01	0.025
01442760	Yes	40	20	50	0.025	< 0.001	0.001	0.002	0.005	0.02
01443000	Yes	40	3	8	0.025	< 0.01	0.014	0.017	0.025	0.061
01443500	Yes	40	2	5	0.025	< 0.01	0.019	0.028	0.042	0.065
01446400	Yes	40	0	0	n.a.	0.021	0.039	0.052	0.077	0.329
01457400	Yes	40	5	13	0.025	< 0.01	0.017	0.026	0.043	0.172
01457500	Yes	39	0	0	n.a.	0.024	0.042	0.058	0.073	0.151
01458570	Yes	40	3	8	0.025	< 0.01	0.019	0.03	0.048	0.128
01461000	Yes	40	0	0	n.a.	0.019	0.039	0.05	0.075	0.19
01463500	Yes	39	0	0	n.a.	0.019	0.036	0.061	0.087	0.138
01463850	Yes	37	1	3	0.025	< 0.025	0.038	0.053	0.081	0.419
01464020	Yes	40	0	0	n.a.	0.158	0.304	0.522	0.815	1.762
Lower Delaware Water Region										
01411466	Yes	39	10	26	0.025	< 0.004	0.005	0.008	0.012	0.044
01411500	Yes	36	4	11	0.025	< 0.025	0.009	0.014	0.02	0.04
01411955	Yes	40	9	23	0.025	< 0.001	0.003	0.005	0.007	0.032
01412800	Yes	39	0	0	n.a.	0.028	0.038	0.056	0.079	0.287
01464504	Yes	39	0	0	n.a.	0.011	0.083	0.126	0.193	0.347
01464515	Yes	40	0	0	n.a.	0.004	0.055	0.07	0.097	0.256
01465893	Yes	39	3	8	0.025	< 0.025	0.013	0.022	0.036	0.104
01466500	No	40	32	80	0.05	< 0.001	0.001	0.002	0.002	0.005
01467005	Yes	38	0	0	n.a.	0.04	0.107	0.165	0.241	0.316
01467150	Yes	40	0	0	n.a.	0.018	0.157	0.232	0.287	0.401
01467359	Yes	40	0	0	n.a.	0.028	0.164	0.214	0.246	0.339
01477120	Yes	40	0	0	n.a.	0.018	0.09	0.129	0.182	0.342
01482500	Yes	39	0	0	n.a.	0.035	0.13	0.175	0.238	0.538

Table 11. Results of trend tests on flow-adjusted concentrations of total phosphorus at water-quality stations on New Jersey streams, water years 1998–2007.

[--, no trend in the flow-adjusted concentrations of total phosphorus during the period of study was identified at a 0.05 level of significance ; **Decrease**, total phosphorus decreased during the period of study; **Increase**, total phosphorus increased during the period of study; n.d., not determined]

Station number	Whether a single outlying point was dropped from test	Results of Tobit regression trend tests on flow-adjusted concentrations of total phosphorus				
		Summary result	Trend slope			
			Level of significance	In milligrams per liter as P per year	In percent of mean value per year	(mean value in milligrams per liter as P)
Passaic Water Region						
01377000	No	--	0.414	0.001	1.9	(0.06)
01378560	No	--	0.994	0.000	0.0	(0.092)
01378780	No	--	0.527	0.000	-2.2	(0.016)
01379200	Yes	**Decrease**	0.002	-0.055	-5.9	(0.94)
01380100	No	--	0.184	0.001	3.3	(0.033)
01381800	No	**Decrease**	0.000	-0.022	-9.7	(0.22)
01382000	No	**Decrease**	0.003	-0.027	-4.9	(0.56)
01382500	No	--	0.265	-0.001	-3.7	(0.019)
01387500	No	--	0.585	-0.002	-1.0	(0.19)
01388500	No	--	0.304	-0.001	-2.3	(0.059)
01389500	No	--	0.089	-0.011	-2.8	(0.4)
01391500	No	--	0.977	0.000	0.1	(0.85)
Raritan Water Region						
01394500	No	--	0.227	0.002	2.5	(0.077)
01395000	No	--	0.447	-0.001	-1.5	(0.099)
01396660	No	--	0.107	-0.003	-7.5	(0.035)
01398000	No	--	0.169	-0.003	-5.1	(0.06)
01398102	No	--	0.421	-0.002	-2.2	(0.083)
01399780	No	--	0.113	-0.004	-5.3	(0.07)
01400000	No	--	0.143	-0.003	-4.6	(0.06)
01400640	No	**Decrease**	0.000	-0.012	-12.1	(0.098)
01401400	No	--	0.983	0.000	0.1	(0.041)
01402000	No	--	0.122	-0.009	-2.8	(0.3)
01403385	No	**Decrease**	0.002	-0.008	-7.8	(0.11)
01405340	No	--	0.475	-0.001	-1.9	(0.08)
Atlantic Coastal Water Region						
01408000	No	--	0.973	0.000	-0.1	(0.06)
01408009	No	**Increase**	0.011	0.004	8.6	(0.05)
01408100	No	--	0.873	0.000	0.5	(0.042)
01408500	Yes	**Decrease**	0.034	-0.001	-3.6	(0.024)
01408830	No	--	0.236	0.000	-5.4	(0.007)
01409387	No	--	0.318	-0.001	-4.1	(0.013)
0140940950	No	--	0.432	0.001	1.6	(0.035)
01409416	No	--	0.899	-0.001	-0.4	(0.21)
01409500	No	--	0.120	0.001	6.3	(0.012)
01409815	Yes	**Increase**	0.016	0.003	5.9	(0.045)
01410150	No	--	0.422	0.000	3.5	(0.006)
01411035	No	--	0.205	0.001	2.8	(0.019)
01411110	No	--	0.142	0.001	6.0	(0.019)
01411196	No	--	0.190	0.000	-3.4	(0.013)
01411400	Yes	**Increase**	0.029	0.002	7.0	(0.031)
01411444	No	--	0.149	-0.001	-5.7	(0.009)

Table 11. Results of trend tests on flow-adjusted concentrations of total phosphorus at water-quality stations on New Jersey streams, water years 1998–2007.—Continued

[--, no trend in the flow-adjusted concentrations of total phosphorus during the period of study was identified at a 0.05 level of significance ; **Decrease**, total phosphorus decreased during the period of study; **Increase**, total phosphorus increased during the period of study; n.d., not determined]

Station number	Whether a single outlying point was dropped from test	Results of Tobit regression trend tests on flow-adjusted concentrations of total phosphorus				
		Summary result	Trend slope			
			Level of significance	In milligrams per liter as P per year	In percent of mean value per year	(mean value in milligrams per liter as P)
Upper Delaware Water Region						
01367625	Yes	**Increase**	0.004	0.003	6.0	(0.042)
01367770	No	--	0.136	0.001	2.6	(0.042)
01367800	No	--	0.368	0.001	1.7	(0.031)
01368820	No	--	0.277	0.000	-1.4	(0.018)
01438500	No	**Decrease**	0.002	-0.002	-8.0	(0.026)
01440000	No	--	0.361	0.000	2.2	(0.011)
01442760	No	--	0.248	0.000	-6.8	(0.007)
01443000	No	--	0.989	0.000	0.1	(0.021)
01443500	No	--	0.127	-0.001	-2.6	(0.031)
01446400	No	--	0.147	-0.004	-4.7	(0.078)
01457400	Yes	**Decrease**	0.007	-0.003	-8.5	(0.039)
01457500	Yes	**Decrease**	0.003	-0.003	-4.1	(0.064)
01458570	No	--	0.443	-0.001	-2.1	(0.037)
01461000	No	**Decrease**	0.006	-0.004	-6.1	(0.062)
01463500	No	**Decrease**	0.000	-0.005	-8.1	(0.063)
01463850	No	--	0.190	0.003	4.8	(0.07)
01464020	No	**Decrease**	0.002	-0.018	-3.0	(0.6)
Lower Delaware Water Region						
01411466	No	--	0.053	0.001	5.9	(0.011)
01411500	No	--	0.462	0.000	-1.2	(0.017)
01411955	No	--	0.167	-0.001	-6.2	(0.009)
01412800	No	--	0.386	-0.002	-2.4	(0.07)
01464504	No	--	0.699	0.002	1.1	(0.14)
01464515	No	--	0.328	-0.003	-3.7	(0.081)
01465893	No	--	0.081	0.001	4.7	(0.028)
01466500	n.d.	n.d.	n.d.	n.d.	n.d.	(n.d.)
01467005	No	**Increase**	0.001	0.011	6.7	(0.17)
01467150	No	--	0.754	-0.002	-0.9	(0.22)
01467359	No	--	0.133	-0.008	-4.0	(0.21)
01477120	No	--	0.051	-0.007	-5.1	(0.14)
01482500	No	--	0.873	-0.001	-0.4	(0.19)

Table 12. Summary statistics for total organic nitrogen plus ammonia at water-quality stations on New Jersey streams, water years 1998–2007.

[n.a., not applicable; <, less than;]

Station number	Results of trend tests presented	Number of measure-ments	Nondetect measurements			Statistic, in milligrams per liter as N				
			Number	Percentage of all measurements	Maximum reporting level, in milligrams per liter as N	Minimum	25th percentile	Median	75th percentile	Maximum
Passaic Water Region										
01377000	Yes	39	0	0	n.a.	0.5	0.56	0.69	0.96	1.9
01378560	Yes	38	0	0	n.a.	0.3	0.44	0.53	0.73	1.31
01378780	Yes	40	19	48	0.21	< 0.05	0.06	0.09	0.13	0.3
01379200	Yes	39	0	0	n.a.	0.24	0.39	0.59	0.8	1.66
01380100	Yes	40	1	3	0.14	< 0.14	0.25	0.34	0.39	0.63
01381800	Yes	40	0	0	n.a.	0.43	0.54	0.63	0.77	1.04
01382000	Yes	40	0	0	n.a.	0.36	0.6	0.7	0.78	1.57
01382500	Yes	40	4	10	0.2	< 0.15	0.21	0.3	0.44	1.49
01387500	Yes	40	0	0	n.a.	0.19	0.34	0.47	0.56	4.46
01388500	Yes	40	0	0	n.a.	0.25	0.41	0.51	0.64	1.54
01389500	Yes	40	0	0	n.a.	0.32	0.51	0.61	0.72	1.21
01391500	Yes	40	0	0	n.a.	0.56	0.76	1.02	1.41	3.35
Raritan Water Region										
01394500	Yes	40	1	3	0.14	< 0.14	0.28	0.36	0.54	0.8
01395000	Yes	40	0	0	n.a.	0.27	0.38	0.48	0.61	0.88
01396660	Yes	40	14	35	0.22	< 0.1	0.11	0.13	0.19	1.18
01398000	Yes	39	2	5	0.17	< 0.17	0.27	0.33	0.47	0.81
01398102	Yes	40	2	5	0.15	< 0.14	0.29	0.35	0.47	0.8
01399780	Yes	39	5	13	0.22	< 0.12	0.18	0.31	0.41	1.1
01400000	Yes	40	3	8	0.22	< 0.12	0.24	0.29	0.36	1.11
01400640	Yes	35	0	0	n.a.	0.34	0.43	0.49	0.6	1.32
01401400	Yes	39	2	5	0.2	< 0.2	0.25	0.34	0.49	1.11
01402000	Yes	39	0	0	n.a.	0.39	0.49	0.6	0.77	1.37
01403385	Yes	40	0	0	n.a.	0.42	0.53	0.59	0.68	1.37
01405340	Yes	40	0	0	n.a.	0.18	0.28	0.37	0.44	0.86
Atlantic Coastal Water Region										
01408000	Yes	40	2	5	0.1	< 0.05	0.19	0.29	0.49	1.38
01408009	Yes	40	5	13	0.23	< 0.05	0.13	0.23	0.33	0.9
01408100	Yes	40	0	0	n.a.	0.15	0.3	0.35	0.45	0.72
01408500	Yes	40	0	0	n.a.	0.34	0.44	0.52	0.67	1.01
01408830	Yes	40	13	33	0.19	< 0.05	0.08	0.15	0.21	0.3
01409387	Yes	40	2	5	0.18	< 0.15	0.2	0.29	0.41	0.92
0140940950	Yes	40	0	0	n.a.	0.2	0.36	0.45	0.56	1.25
01409416	Yes	40	0	0	n.a.	0.21	0.32	0.36	0.5	1.55
01409500	Yes	37	3	8	0.2	< 0.13	0.17	0.24	0.33	0.79
01409815	Yes	40	1	3	0.12	< 0.12	0.19	0.24	0.33	0.69
01410150	Yes	40	15	38	0.21	< 0.05	0.09	0.11	0.18	0.38
01411035	Yes	40	1	3	0.11	< 0.11	0.2	0.28	0.4	0.96
01411110	Yes	40	1	3	0.19	< 0.19	0.23	0.32	0.39	0.79
01411196	Yes	40	3	8	0.17	< 0.11	0.22	0.28	0.35	0.53
01411400	Yes	40	0	0	n.a.	0.38	0.56	0.72	0.91	1.28
01411444	Yes	35	0	0	n.a.	0.15	0.29	0.34	0.43	1.09

Table 12. Summary statistics for total organic nitrogen plus ammonia at water-quality stations on New Jersey streams, water years 1998–2007.—Continued

[n.a., not applicable; <, less than;]

Station number	Results of trend tests presented	Number of measure-ments	Nondetect measurements			Statistic, in milligrams per liter as N				
			Number	Percentage of all measurements	Maximum reporting level, in milligrams per liter as N	Minimum	25th percentile	Median	75th percentile	Maximum
Upper Delaware Water Region										
01367625	Yes	40	0	0	n.a.	0.12	0.3	0.37	0.46	1.39
01367770	Yes	39	0	0	n.a.	0.2	0.3	0.38	0.46	0.66
01367800	Yes	36	2	6	0.21	< 0.18	0.25	0.34	0.38	0.73
01368820	Yes	39	0	0	n.a.	0.18	0.26	0.35	0.39	0.49
01438500	Yes	40	7	18	0.2	< 0.12	0.15	0.22	0.26	0.94
01440000	Yes	40	17	43	0.21	< 0.05	0.08	0.13	0.19	0.32
01442760	No	40	27	68	0.12	< 0.04	0.04	0.04	0.07	0.72
01443000	Yes	40	6	15	0.19	< 0.12	0.15	0.19	0.26	0.63
01443500	Yes	40	0	0	n.a.	0.23	0.34	0.38	0.45	0.69
01446400	Yes	40	0	0	n.a.	0.2	0.31	0.36	0.5	1.24
01457400	Yes	40	2	5	0.17	< 0.15	0.29	0.43	0.77	1.61
01457500	Yes	40	2	5	0.27	< 0.13	0.2	0.27	0.31	0.78
01458570	Yes	40	16	40	0.22	< 0.05	0.1	0.15	0.23	0.52
01461000	Yes	40	4	10	0.22	< 0.12	0.23	0.29	0.37	0.64
01463500	Yes	35	0	0	n.a.	0.16	0.24	0.28	0.41	0.95
01463850	Yes	40	0	0	n.a.	0.26	0.46	0.6	0.81	1.61
01464020	Yes	40	0	0	n.a.	0.46	0.6	0.71	0.83	1.08
Lower Delaware Water Region										
01411466	Yes	39	1	3	0.17	< 0.17	0.26	0.32	0.46	0.87
01411500	Yes	36	0	0	n.a.	0.2	0.3	0.39	0.56	1.06
01411955	Yes	40	13	33	0.2	< 0.09	0.11	0.16	0.22	0.45
01412800	Yes	40	0	0	n.a.	0.26	0.37	0.48	0.56	1.61
01464504	Yes	39	0	0	n.a.	0.15	0.27	0.4	0.55	1.07
01464515	Yes	40	0	0	n.a.	0.48	0.73	0.88	1.12	2.77
01465893	Yes	39	0	0	n.a.	0.21	0.36	0.41	0.63	0.88
01466500	Yes	40	14	35	0.21	< 0.05	0.08	0.15	0.2	0.57
01467005	Yes	40	0	0	n.a.	0.4	0.6	0.7	0.78	0.98
01467150	Yes	40	0	0	n.a.	0.37	0.57	0.68	0.83	1.07
01467359	Yes	40	0	0	n.a.	0.25	0.41	0.46	0.56	0.7
01477120	Yes	40	0	0	n.a.	0.29	0.44	0.58	0.78	2.62
01482500	Yes	40	0	0	n.a.	0.69	1.07	1.25	1.49	2.68

Table 13. Results of trend tests on flow-adjusted concentrations of total organic nitrogen plus ammonia at water-quality stations on New Jersey streams, water years 1998–2007.

[--, no trend in flow-adjusted concentrations of total organic nitrogen plus ammonia during the period of study was identified at a 0.05 level of significance; **Decrease**, total organic nitrogen plus ammonia decreased during the period of study; **Increase**, total organic nitrogen plus ammonia increased during the period of study; n.d., not determined]

Station number	Whether a single outlying point was dropped from test	Results of Tobit regression trend tests on flow-adjusted concentrations of total organic nitrogen plus ammonia				
		Summary result	Trend slope			
			Level of significance	In milligrams per liter as N per year	In percent of mean value per year	(mean value in milligrams per liter as N)
Passaic Water Region						
01377000	No	--	0.129	0.021	2.6	(0.81)
01378560	No	--	0.894	0.002	0.2	(0.62)
01378780	No	--	0.399	-0.003	-2.2	(0.13)
01379200	No	--	0.618	-0.005	-0.8	(0.64)
01380100	No	--	0.894	-0.001	-0.2	(0.33)
01381800	No	--	0.398	-0.007	-1.0	(0.67)
01382000	No	--	0.067	-0.012	-1.7	(0.71)
01382500	No	**Increase**	0.001	0.036	9.6	(0.38)
01387500	Yes	--	0.077	0.029	4.9	(0.59)
01388500	No	--	0.061	0.022	3.7	(0.59)
01389500	No	**Decrease**	0.020	-0.019	-2.9	(0.64)
01391500	No	**Decrease**	0.000	-0.093	-7.6	(1.2)
Raritan Water Region						
01394500	No	--	0.806	-0.002	-0.4	(0.42)
01395000	No	--	0.311	-0.007	-1.4	(0.5)
01396660	Yes	--	0.060	-0.008	-4.2	(0.19)
01398000	No	--	0.283	-0.008	-2.2	(0.38)
01398102	No	--	0.427	0.005	1.4	(0.39)
01399780	No	--	0.254	-0.009	-2.7	(0.35)
01400000	No	--	0.437	-0.005	-1.5	(0.35)
01400640	No	--	0.087	0.017	3.1	(0.55)
01401400	No	--	0.793	-0.002	-0.4	(0.4)
01402000	No	--	0.583	0.005	0.8	(0.64)
01403385	No	--	0.845	0.001	0.2	(0.63)
01405340	No	--	0.952	0.000	0.1	(0.38)
Atlantic Coastal Water Region						
01408000	No	**Increase**	0.000	0.041	11.4	(0.36)
01408009	No	**Increase**	0.004	0.020	7.6	(0.26)
01408100	No	--	0.465	0.003	0.9	(0.38)
01408500	No	--	0.054	0.016	2.7	(0.57)
01408830	No	--	0.806	0.001	0.6	(0.17)
01409387	Yes	--	0.113	0.007	2.3	(0.32)
0140940950	No	--	0.439	0.006	1.2	(0.49)
01409416	No	--	0.256	0.009	2.0	(0.45)
01409500	No	--	0.380	0.006	2.1	(0.27)
01409815	Yes	--	0.143	0.006	2.3	(0.28)
01410150	No	--	0.478	0.003	2.0	(0.15)
01411035	No	--	0.798	-0.001	-0.4	(0.33)
01411110	Yes	**Increase**	0.027	0.012	3.5	(0.34)
01411196	No	--	0.340	0.004	1.5	(0.28)
01411400	No	--	0.897	0.001	0.1	(0.74)
01411444	No	--	0.394	-0.007	-1.8	(0.37)

Table 13. Results of trend tests on flow-adjusted concentrations of total organic nitrogen plus ammonia at water-quality stations on New Jersey streams, water years 1998–2007.—Continued

[--, no trend in flow-adjusted concentrations of total organic nitrogen plus ammonia during the period of study was identified at a 0.05 level of significance; **Decrease**, total organic nitrogen plus ammonia decreased during the period of study; **Increase**, total organic nitrogen plus ammonia increased during the period of study; n.d., not determined]

Station number	Whether a single outlying point was dropped from test	Results of Tobit regression trend tests on flow-adjusted concentrations of total organic nitrogen plus ammonia				
		Summary result	Trend slope			
			Level of significance	In milligrams per liter as N per year	In percent of mean value per year	(mean value in milligrams per liter as N)
Upper Delaware Water Region						
01367625	No	--	0.157	-0.012	-2.9	(0.43)
01367770	No	--	0.886	0.000	0.1	(0.4)
01367800	No	**Decrease**	0.039	-0.008	-2.5	(0.33)
01368820	No	--	0.478	0.002	0.7	(0.33)
01438500	No	--	0.406	-0.004	-1.6	(0.25)
01440000	No	--	0.633	-0.002	-0.9	(0.17)
01442760	n.d.	n.d.	n.d.	n.d.	n.d.	(n.d.)
01443000	Yes	**Increase**	0.043	0.005	2.3	(0.21)
01443500	No	**Decrease**	0.012	-0.010	-2.5	(0.4)
01446400	No	--	0.058	-0.016	-3.5	(0.44)
01457400	No	**Decrease**	0.000	-0.059	-11.1	(0.53)
01457500	No	--	0.778	-0.001	-0.5	(0.28)
01458570	No	--	0.789	-0.002	-0.8	(0.2)
01461000	No	--	0.504	-0.004	-1.2	(0.32)
01463500	No	--	0.595	-0.003	-0.9	(0.34)
01463850	No	--	0.071	0.026	4.0	(0.67)
01464020	No	**Decrease**	0.008	-0.018	-2.5	(0.72)
Lower Delaware Water Region						
01411466	No	--	0.385	0.006	1.7	(0.36)
01411500	No	**Increase**	0.006	0.023	5.1	(0.45)
01411955	No	--	0.259	-0.005	-2.9	(0.18)
01412800	No	--	0.463	-0.009	-1.7	(0.54)
01464504	No	--	0.064	0.015	3.5	(0.44)
01464515	No	--	0.532	0.009	0.9	(1)
01465893	Yes	**Increase**	0.016	0.015	3.1	(0.49)
01466500	Yes	--	0.390	0.004	2.3	(0.18)
01467005	Yes	**Increase**	0.032	0.012	1.8	(0.69)
01467150	Yes	**Increase**	0.022	0.018	2.5	(0.7)
01467359	No	--	0.744	0.002	0.4	(0.47)
01477120	No	--	0.611	0.007	1.1	(0.65)
01482500	No	--	0.396	-0.020	-1.5	(1.4)

Table 14. Summary statistics for dissolved nitrate plus nitrite at water-quality stations on New Jersey streams, water years 1998–2007.

[n.a., not applicable; <, less than; E, estimated; n.d., not determined]

Station number	Results of trend tests presented	Number of measurements	Nondetect measurements			Statistic,in milligrams per liter as N				
			Number	Percentage of all measurements	Maximum reporting level, in milligrams per liter as N	Minimum	25th percentile	Median	75th percentile	Maximum
Passaic Water Region										
01377000	Yes	39	0	0	n.a.	0.11	0.32	0.42	0.6	1.27
01378560	Yes	39	0	0	n.a.	0.09	0.73	0.97	1.53	2.16
01378780	Yes	40	0	0	n.a.	0.05	0.25	0.31	0.37	1.59
01379200	Yes	39	0	0	n.a.	1	1.7	2.76	4.78	13.14
01380100	Yes	40	1	3	0.03	< 0.03	0.1	0.16	0.23	0.36
01381800	Yes	40	0	0	n.a.	0.19	1.17	1.94	2.59	5.03
01382000	Yes	39	0	0	n.a.	0.41	1.48	2.44	3.65	6.62
01382500	Yes	40	0	0	n.a.	0.06	0.11	0.18	0.29	0.67
01387500	Yes	40	0	0	n.a.	0.37	0.74	1.08	2.26	4.93
01388500	Yes	40	0	0	n.a.	0.26	0.6	0.79	1.1	2.29
01389500	Yes	40	0	0	n.a.	0.58	1.46	1.98	3.05	7.93
01391500	Yes	40	0	0	n.a.	1.4	4.07	5.06	6.34	9.28
Raritan Water Region										
01394500	Yes	40	0	0	n.a.	0.51	1.16	1.28	1.43	2.01
01395000	Yes	40	0	0	n.a.	0.39	0.75	1.08	1.22	1.61
01396660	Yes	40	0	0	n.a.	0.47	0.66	0.82	0.95	1.42
01398000	Yes	38	3	8	0.05	< 0.02	0.66	1.21	1.56	2.76
01398102	Yes	38	0	0	n.a.	0.39	1.16	1.4	1.64	2.37
01399780	Yes	39	0	0	n.a.	0.06	0.71	0.85	1.11	1.89
01400000	Yes	40	0	0	n.a.	0.21	0.73	0.95	1.1	1.35
01400640	Yes	36	0	0	n.a.	0.95	3.12	3.88	4.73	8.08
01401400	Yes	40	0	0	n.a.	0.22	1.19	2.73	4.07	5.9
01402000	Yes	40	0	0	n.a.	1.13	1.83	2.53	3.21	5.4
01403385	Yes	40	1	3	0.02	< 0.02	0.5	0.85	1.04	1.68
01405340	Yes	40	0	0	n.a.	0.49	0.63	0.78	1.04	2.02
Atlantic Coastal Water Region										
01408000	Yes	39	0	0	n.a.	0.16	0.26	0.45	0.58	0.88
01408009	Yes	40	19	48	0.05	< 0.01	n.d.	0.03	0.06	0.14
01408100	Yes	40	0	0	n.a.	0.14	0.36	0.48	0.65	1.19
01408500	Yes	39	0	0	n.a.	0.11	0.42	0.59	0.72	1.19
01408830	No	40	33	83	0.05	< 0.01	n.d.	n.d.	n.d.	0.13
01409387	Yes	40	3	8	0.05	< 0.02	0.05	0.08	0.09	0.27
0140940950	Yes	39	13	33	0.05	< 0.01	0.02	0.15	0.29	1.13
01409416	Yes	40	0	0	n.a.	0.6	0.82	1.1	2	2.66
01409500	Yes	37	2	5	0.05	< 0.05	0.08	0.11	0.22	0.56
01409815	No	40	35	88	0.05	< 0.01	n.d.	n.d.	n.d.	0.07
01410150	No	40	34	85	0.05	< 0.01	n.d.	n.d.	n.d.	0.28
01411035	Yes	40	0	0	n.a.	0.37	0.65	0.96	1.42	2.04
01411110	Yes	40	0	0	n.a.	0.06	0.38	0.47	0.56	0.74
01411196	Yes	40	0	0	n.a.	0.2	0.41	0.51	0.64	E 0.85
01411400	Yes	40	15	38	0.05	< 0.02	n.d.	0.05	0.14	0.43
01411444	Yes	35	21	60	0.05	< 0.01	0.01	0.02	0.05	0.3

Table 14. Summary statistics for dissolved nitrate plus nitrite at water-quality stations on New Jersey streams, water years 1998–2007.—Continued

[n.a., not applicable; <, less than; E, estimated; n.d., not determined]

Station number	Results of trend tests presented	Number of measurements	Nondetect measurements			Statistic,in milligrams per liter as N				
			Number	Percentage of all measurements	Maximum reporting level, in milligrams per liter as N	Minimum	25th percentile	Median	75th percentile	Maximum
Upper Delaware Water Region										
01367625	Yes	40	0	0	n.a.	0.16	0.37	0.5	0.66	1.4
01367770	Yes	39	0	0	n.a.	0.42	0.68	1.06	1.75	8.98
01367800	Yes	36	0	0	n.a.	0.37	0.57	0.82	1.26	1.76
01368820	Yes	39	14	36	0.05	< 0.01	0.02	0.03	0.09	0.19
01438500	Yes	40	0	0	n.a.	E 0.06	0.16	0.21	0.29	0.43
01440000	Yes	40	12	30	0.05	< 0.02	n.d.	0.07	0.12	0.25
01442760	Yes	40	20	50	0.05	< 0.01	0.01	0.02	0.09	1.1
01443000	Yes	40	1	3	0.03	< 0.03	0.13	0.18	0.26	0.46
01443500	Yes	40	1	3	0.05	< 0.05	0.33	0.55	0.7	1.25
01446400	Yes	40	0	0	n.a.	0.66	1	1.13	1.28	1.5
01457400	Yes	40	0	0	n.a.	0.36	1.68	2.09	2.49	3.34
01457500	Yes	40	0	0	n.a.	0.48	0.82	0.96	1.14	1.6
01458570	Yes	40	0	0	n.a.	0.24	1.37	1.92	2.4	3.09
01461000	Yes	38	0	0	n.a.	0.56	0.8	0.93	1.08	1.4
01463500	Yes	39	0	0	n.a.	0.47	0.66	0.84	0.98	1.3
01463850	Yes	40	0	0	n.a.	E 0.03	0.79	1.06	1.43	3.46
01464020	Yes	40	0	0	n.a.	1.23	2.82	4.06	5.78	9.77
Lower Delaware Water Region										
01411466	Yes	39	0	0	n.a.	0.15	0.35	0.52	0.61	0.72
01411500	Yes	34	0	0	n.a.	0.35	1.45	1.67	1.86	2.45
01411955	Yes	40	1	3	0.01	< 0.01	0.08	0.11	0.13	0.23
01412800	Yes	40	0	0	n.a.	2.5	4.4	4.89	5.47	7
01464504	Yes	39	0	0	n.a.	0.36	0.52	0.7	0.86	1.32
01464515	Yes	40	0	0	n.a.	0.4	0.55	0.8	1.16	1.91
01465893	Yes	39	8	21	0.05	< 0.02	0.04	0.07	0.11	0.29
01466500	No	40	34	85	0.05	< 0.01	n.d.	n.d.	n.d.	0.1
01467005	Yes	40	0	0	n.a.	0.1	0.21	0.25	0.31	0.91
01467150	Yes	40	0	0	n.a.	0.12	0.2	0.29	0.34	0.48
01467359	Yes	40	0	0	n.a.	0.26	0.42	0.5	0.67	1.13
01477120	Yes	40	0	0	n.a.	0.59	1.01	1.22	1.62	3.28
01482500	Yes	40	1	3	0.03	< 0.03	0.53	1.97	2.76	5.45

Table 15. Results of trend tests on flow-adjusted concentrations of dissolved nitrate plus nitrite at water-quality stations on New Jersey streams, water years 1998–2007.

[--, no trend in flow-adjusted concentrations of dissolved nitrate plus nitrite during the period of study was identified at a 0.05 level of significance; **Decrease**, dissolved nitrate plus nitrite decreased during the period of study; **Increase**, dissolved nitrate plus nitrite increased during the period of study; n.d., not determined]

Station number	Whether a single outlying point was dropped from test	Results of Tobit regression trend tests on flow-adjusted concentrations of dissolved nitrate plus nitrite				
		Summary result	Trend slope			
			Level of significance	In milligrams per liter as N per year	In percent of mean value per year	(mean value in milligrams per liter as N)
Passaic Water Region						
01377000	No	--	0.207	0.010	2.1	(0.47)
01378560	No	--	0.715	0.013	1.2	(1.1)
01378780	No	--	0.300	0.009	2.6	(0.33)
01379200	No	**Decrease**	0.001	-0.256	-6.7	(3.8)
01380100	Yes	**Increase**	0.043	0.009	5.2	(0.18)
01381800	No	--	0.496	-0.020	-1.0	(1.9)
01382000	No	--	0.101	-0.063	-2.4	(2.6)
01382500	No	--	0.485	-0.004	-1.7	(0.22)
01387500	No	--	0.951	0.001	0.1	(1.6)
01388500	No	**Increase**	0.009	0.037	4.2	(0.9)
01389500	No	--	0.879	0.005	0.2	(2.3)
01391500	Yes	**Increase**	0.044	0.117	2.2	(5.2)
Raritan Water Region						
01394500	No	--	0.285	-0.018	-1.4	(1.3)
01395000	Yes	--	0.131	0.028	2.7	(1)
01396660	No	**Increase**	0.035	0.021	2.5	(0.84)
01398000	No	--	0.768	-0.016	-1.4	(1.1)
01398102	No	--	0.913	-0.003	-0.2	(1.4)
01399780	No	--	0.140	0.044	5.0	(0.89)
01400000	No	**Increase**	0.003	0.053	5.9	(0.91)
01400640	No	--	0.050	0.121	3.0	(4)
01401400	No	--	0.523	0.020	0.7	(2.7)
01402000	No	--	0.322	0.026	1.0	(2.7)
01403385	No	--	0.431	0.026	3.0	(0.86)
01405340	No	**Increase**	0.007	0.026	3.0	(0.87)
Atlantic Coastal Water Region						
01408000	Yes	--	0.151	0.008	1.8	(0.44)
01408009	No	--	0.497	-0.001	-2.6	(0.046)
01408100	No	**Increase**	0.000	0.041	8.0	(0.51)
01408500	No	**Increase**	0.010	0.018	3.1	(0.6)
01408830	n.d.	n.d.	n.d.	n.d.	n.d.	(n.d.)
01409387	No	--	0.231	0.003	3.1	(0.087)
0140940950	No	--	0.202	0.017	6.6	(0.25)
01409416	No	**Increase**	0.015	0.059	4.3	(1.4)
01409500	No	**Increase**	0.013	0.011	6.9	(0.16)
01409815	n.d.	n.d.	n.d.	n.d.	n.d.	(n.d.)
01410150	n.d.	n.d.	n.d.	n.d.	n.d.	(n.d.)
01411035	No	**Decrease**	0.001	-0.033	-3.2	(1)
01411110	Yes	**Increase**	0.000	0.020	4.3	(0.48)
01411196	No	**Increase**	0.019	0.012	2.4	(0.51)
01411400	No	--	0.220	-0.006	-6.7	(0.096)
01411444	No	--	0.627	0.002	2.8	(0.059)

Table 15. Results of trend tests on flow-adjusted concentrations of dissolved nitrate plus nitrite at water-quality stations on New Jersey streams, water years 1998–2007.—Continued

[--, no trend in flow-adjusted concentrations of dissolved nitrate plus nitrite during the period of study was identified at a 0.05 level of significance; **Decrease**, dissolved nitrate plus nitrite decreased during the period of study; **Increase**, dissolved nitrate plus nitrite increased during the period of study; n.d., not determined]

Station number	Whether a single outlying point was dropped from test	Results of Tobit regression trend tests on flow-adjusted concentrations of dissolved nitrate plus nitrite				
		Summary result	Trend slope			
			Level of significance	In milligrams per liter as N per year	In percent of mean value per year (mean value in milligrams per liter as N)	
Upper Delaware Water Region						
01367625	No	--	0.207	0.010	1.7	(0.57)
01367770	Yes	**Decrease**	0.035	-0.053	-3.4	(1.6)
01367800	No	--	0.816	-0.005	-0.6	(0.92)
01368820	No	--	0.582	-0.002	-2.6	(0.062)
01438500	Yes	--	0.068	-0.008	-3.6	(0.23)
01440000	No	--	0.107	0.005	5.3	(0.09)
01442760	No	--	0.292	0.010	9.5	(0.1)
01443000	No	--	0.897	0.001	0.4	(0.21)
01443500	No	--	0.471	0.012	2.1	(0.54)
01446400	No	--	0.447	0.008	0.7	(1.1)
01457400	No	**Increase**	0.000	0.078	3.8	(2.1)
01457500	No	--	0.278	0.014	1.5	(0.97)
01458570	No	--	0.096	0.051	2.7	(1.9)
01461000	No	--	0.649	0.005	0.5	(0.94)
01463500	No	--	0.876	0.002	0.2	(0.84)
01463850	No	--	0.979	0.001	0.1	(1.1)
01464020	No	--	0.861	0.006	0.1	(4.3)
Lower Delaware Water Region						
01411466	Yes	**Increase**	0.005	0.019	3.9	(0.5)
01411500	Yes	**Increase**	0.006	0.048	3.0	(1.6)
01411955	No	--	0.836	0.001	0.5	(0.11)
01412800	No	**Increase**	0.002	0.164	3.4	(4.9)
01464504	No	**Increase**	0.018	0.026	3.7	(0.7)
01464515	No	--	0.908	0.002	0.2	(0.92)
01465893	No	--	0.320	0.004	4.2	(0.086)
01466500	n.d.	n.d.	n.d.	n.d.	n.d.	(n.d.)
01467005	Yes	**Decrease**	0.037	-0.009	-3.1	(0.28)
01467150	No	**Increase**	0.032	0.012	4.0	(0.29)
01467359	No	**Increase**	0.000	0.023	4.2	(0.55)
01477120	No	--	0.532	0.014	1.0	(1.3)
01482500	No	--	0.885	0.013	0.7	(1.9)

For additional information, write to:
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http://nj.usgs.gov/

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