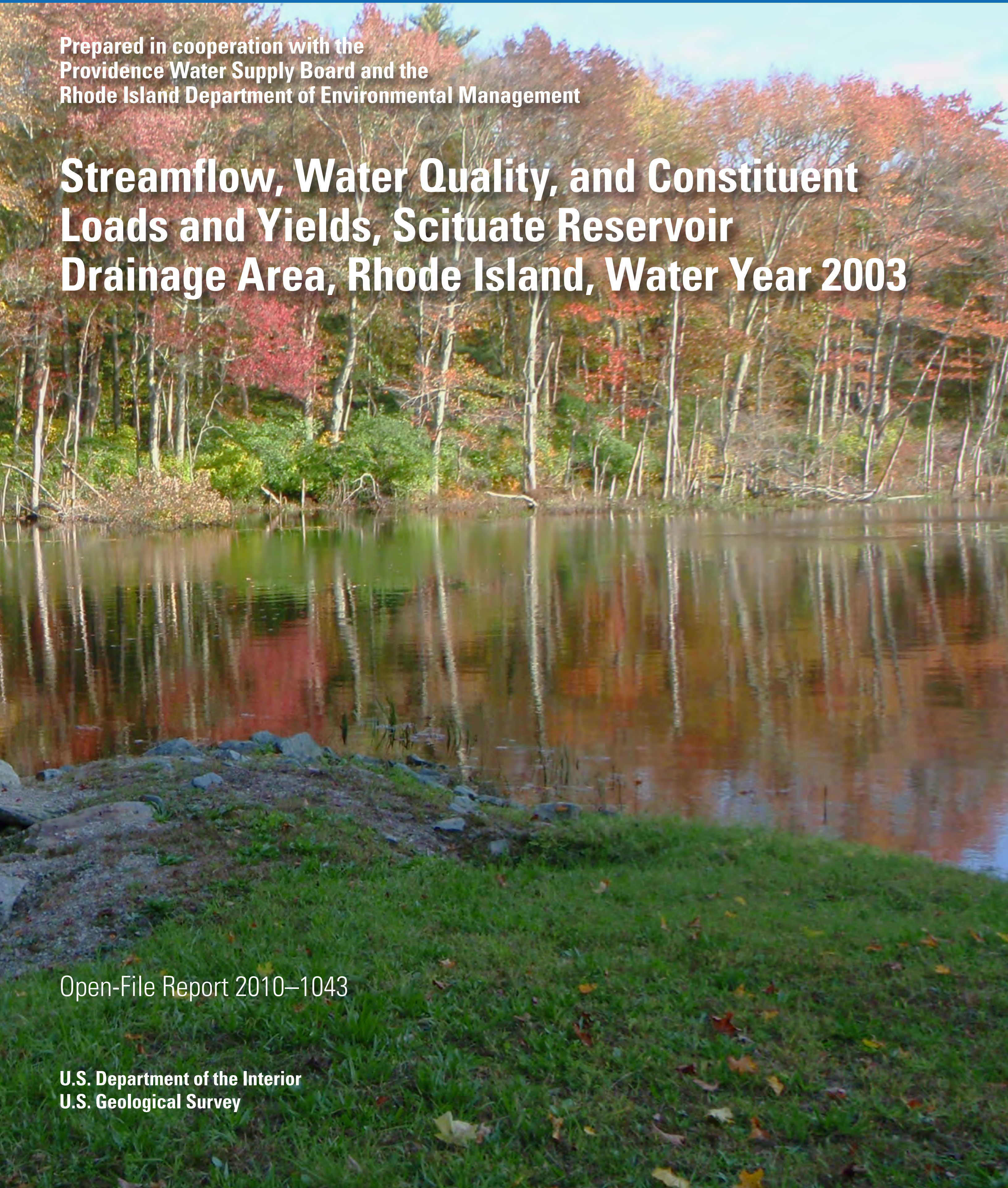

Prepared in cooperation with the
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Streamflow, Water Quality, and Constituent Loads and Yields, Scituate Reservoir Drainage Area, Rhode Island, Water Year 2003

Open-File Report 2010–1043

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

Cover. Photograph shows Willow Hollow Dam in autumn.

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U.S. Department of the Interior
KEN SALAZAR, Secretary

U.S. Geological Survey
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Conversion Factors

Multiply	By	To obtain
	Area	
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)
	Mass	
ton, short (2,000 lb)	907.2	kilogram (kg)
ton, short (2,000 lb)	907,200	gram (kg)

Concentrations of chemical constituents in water are given either in milligrams per liter (mg/L) or colony forming units per 100 milliliters (CFU/100 mL).

Loads of chemical constituents in water are given either in grams or kilograms (or millions of colony forming units for bacteria) per day, month, or year and yields in grams or kilograms (or millions of colony forming units for bacteria) per day, month, or year per square mile.

Streamflow, Water Quality, and Constituent Loads and Yields, Scituate Reservoir Drainage Area, Rhode Island, Water Year 2003

By Robert F. Breault and Jean P. Campbell

Abstract

Streamflow and water-quality data were collected by the U.S. Geological Survey (USGS) or the Providence Water Supply Board, Rhode Island's largest drinking-water supplier. Streamflow was measured or estimated by the USGS following standard methods at 23 streamgage stations; 10 of these stations were also equipped with instrumentation capable of continuously monitoring specific conductance. Streamflow and concentrations of sodium and chloride estimated from records of specific conductance were used to calculate instantaneous (15-minute) loads of sodium and chloride during water year (WY) 2003 (October 1, 2002, to September 30, 2003). Water-quality samples were also collected at 37 sampling stations in the Scituate Reservoir drainage area by the Providence Water Supply Board during WY 2003 as part of a long-term sampling program. Water-quality data are summarized by using values of central tendency and are used, in combination with measured (or estimated) streamflows, to calculate loads and yields (loads per unit area) of selected water-quality constituents for WY 2003.

The largest tributary to the reservoir (the Ponaganset River, which was monitored by the USGS) contributed about 31 cubic feet per second (ft^3/s) to the reservoir during WY 2003. For the same time period, annual mean streamflows[1] measured (or estimated) for the other monitoring stations in this study ranged from about 0.44 to 20 ft^3/s. Together, tributary streams (equipped with instrumentation capable of continuously monitoring specific conductance) transported about 1,200,000 kilograms (kg) of sodium and 1,900,000 kg of chloride to the Scituate Reservoir during WY 2003; sodium and chloride yields for the tributaries ranged from 10,000 to 61,000 kilograms per square mile (kg/mi^2) and from 15,000 to 100,000 kg/mi^2, respectively.

At the stations where water-quality samples were collected by the Providence Water Supply Board, the median of the median chloride concentrations was 21.3 milligrams per liter (mg/L), median nitrite concentration was 0.002 mg/L as N, median nitrate concentration was 0.02 mg/L as N, median orthophosphate concentration was 0.06 mg/L as P, and median concentrations of total coliform and *Escherichia coli (E. coli)* bacteria were 38 and 9 CFU/100 mL (colony forming units per 100 milliliters), respectively. The medians of the median daily loads (and yields) of chloride, nitrite, nitrate, orthophosphate, and total coliform and *E. coli* bacteria were 140 kg/d (67 $kg/d/mi^2$), 15 g/d (6.5 $g/d/mi^2$), 140 g/d (62 $g/d/mi^2$), 340 g/d (180 $g/d/mi^2$), and 2,200 million colony forming units per day ($CFU \times 10^6/d$) (1,200 $CFU \times 10^6/d/mi^2$) and 940 $CFU \times 10^6/d$ (490 $CFU \times 10^6/d/mi^2$), respectively.

[1] The arithmetic mean of the individual daily mean discharges for the year noted or for the designated period.

Introduction

The Scituate Reservoir is the primary source of drinking water for more than 60 percent of the population of Rhode Island. It covers about 94 mi^2 in parts of the towns of Cranston, Foster, Glocester, Johnston, and Scituate, R.I. (fig. 1). Information about the water quality of the reservoir and its tributary streams is important for management of the water supply and for the protection of human health. The Providence Water Supply Board (Providence Water), the agency responsible for the management and distribution of the Scituate Reservoir water supply, has been monitoring and assessing water quality in the reservoir and reservoir drainage area for more than 50 years.

Since 1993, the U.S. Geological Survey (USGS) has been cooperating with Providence Water and the Rhode Island Department of Environmental Management (RIDEM) to measure streamflow in tributaries to the Scituate Reservoir. Streamflow has been continuously measured at 2 streamgage stations in the drainage area and has been periodically measured at 21 additional stations on tributaries in the drainage area. At these 21 partial-record stations, continuous streamflow records have been estimated by using methods developed by the USGS (Hirsch, 1982). More recently (since 2000), the USGS also has been continuously measuring specific conductance at 10 monitoring stations. Equations that relate specific conductance to concentrations of sodium and chloride in streamwater also were developed as part of a previous USGS/Providence Water cooperative study (Nimiroski and Waldron, 2002). These equations, updated here and used together with measured (or estimated) streamflows, allow for nearly continuous estimation of sodium and chloride loads to the reservoir (Nimiroski and Waldron, 2002).

Currently (2009), Providence Water regularly collects water-quality samples from 37 tributary streams, either monthly or quarterly. Occasionally, samples are collected from other streams or stations as needed. Water-quality results are summarized by monitoring station and constituent or parameter in annual reports published by Providence Water. In addition, over the past 10 years, USGS reports have compiled and tabulated streamflow (measured or estimated by USGS) and water-quality data (collected by Providence Water; Breault and others, 2000; Nimiroski and others, 2008).

This report presents data on streamflow, water quality, and loads and yields of selected constituents for water year[2] (WY) 2003 in the Scituate Reservoir drainage area. These data were collected as part of studies done by the USGS in cooperation with Providence Water and the RIDEM. A summary of measured and estimated streamflows is presented for the 2 continuous-record and 21 partial-record streamgage stations in the drainage area. Estimated monthly loads and annual loads (and yields) of sodium and chloride are presented for the 10 stations at which specific conductance is continuously monitored by the USGS. Summary statistics for water-quality data collected by Providence Water at 37 sampling stations during WY 2003 also are presented, and these data were used to calculate loads and yields of selected water-quality constituents (table 1).

[2] October 1, 2002, to September 30, 2003.

Streamflow Data Collection and Estimation

Streamflow and water-quality data were collected by the USGS or Providence Water. Streamflow was measured or estimated by the USGS at 23 streamgage stations. Measured and estimated streamflows are necessary to estimate water volume and water-quality constituent loads and yields from tributary basins. At continuous-record streamgage stations, stream stage is measured every 15 minutes. Streamflow is computed with a stage-discharge relation (or rating), which is developed on the basis of periodic manual measurements. Daily mean streamflow at a station is calculated by dividing the total volume of water that passes the station each day by 86,400, the number of seconds in a day. Periodic manual streamflow measurements at partial-record gaging stations are used with concurrent continuous-record measurements from stations in hydrologically similar drainage areas to estimate a continuous record at the partial-record site. Specifically, continuous streamflow records for the 21 partial-record sites in the Scituate Reservoir drainage area were estimated by using the Maintenance of Variance Extension type 1 (MOVE.1) method, as described by Ries and Friesz (2000); data needed to estimate streamflows at partial-record sites were retrieved from the USGS National Water Inventory System (NWIS; http://waterdata.usgs.gov/nwis/) and formatted. Streamflows were estimated by MOVE.1 method by using a suite of USGS-developed computer programs (Granato, 2008). Errors for estimated streamflows are expressed as the upper and lower 90-percent confidence limits, as described by Tasker and Driver (1988) (table 2); there is a 90-percent chance that streamflow is somewhere between the upper and lower 90-percent confidence limits.

Continuous-record streamgage stations were operated and maintained by the USGS during WY 2003 on Peeptoad Brook (USGS station number 01115098 and Providence Water station number 16, in cooperation with RIDEM) and on the Ponaganset River (USGS station number 01115187 and Providence Water station number 35, in cooperation with Providence Water; fig. 1 and table 1). Streamflow data for these two gaging stations were collected at 15-minute intervals (near-real-time streamflow data), were updated at 2-hour intervals on the World Wide Web (WWW), and are available through the NWIS Web Interface (NWIS Web; U.S. Geological Survey, 2006). Error associated with measured streamflows in Peeptoad Brook and Ponaganset River was generally within about 15 percent (Socolow and others, 2004); upper and lower 90-percent confidence limits calculated by methods described by the National Institute of Standards and

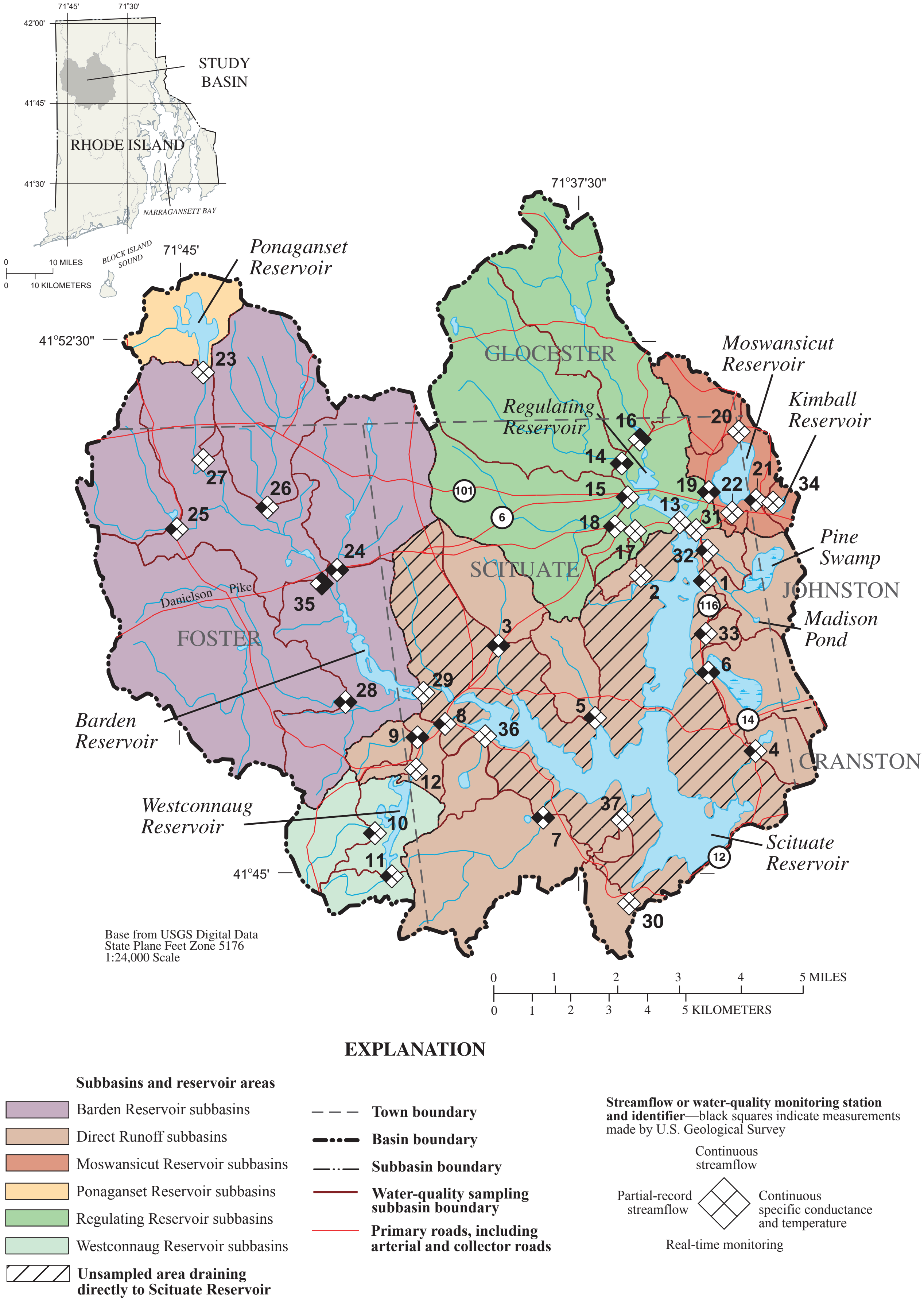

Figure 1. Locations of tributary-reservoir subbasins and streamgage and water-quality monitoring stations in the Scituate Reservoir drainage area, Rhode Island.

Table 1. Providence Water Supply Board water-quality sampling stations, water-quality samples, and available streamflow and continuous monitoring stations by tributary reservoir subbasin, in the Scituate Reservoir drainage area, Rhode Island, October 1, 2002, to September 30, 2003.

[PW, Providence Water; USGS, U.S. Geological Survey; no., number; mi^2, square miles; QW, water quality; M, monthly; Q, quarterly;Y, yes; N, no; Na, sodium; Cl, chloride; --, none; Alternate station names given for stations where different historical names were used for the same sampling location by Providence Water.]

PW station no.	USGS station no.	Station name	Drainage area (mi^2)	Station active during study period	Frequency of QW sample collection	Number of samples collected by Providence Water[1]	Daily estimated Na and Cl loads	Estimated streamflow calculated
		Barden Reservior subbasin						
24	01115190	Dolly Cole Brook	4.90	Y	M	11	Y	Y
25	01115200	Shippee Brook	2.35	Y	Q	3	N	Y
26	01115185	Windsor Brook	4.32	Y	Q	4	N	Y
27	011151845	Unnamed Tributary to Ponaganset River (Unnamed Brook B, Unnamed Brook West of Windsor Brook)	0.10	Y	Q	3	N	N
28	01115265	Barden Reservoir (Hemlock Brook)	8.72	Y	M	11	Y	Y
29	01115271	Ponaganset River (Barden Stream)	33.0	Y	M	2	N	N
35	01115187	Ponaganset River	14.0	Y	M	12	Y	N
		Direct Runoff subbasin						
1	01115180	Brandy Brook	1.57	Y	M	12	N	Y
2	01115181	Unnamed Tributary #2 to Scituate Reservoir (Unnamed Brook North of Bullhead Brook)	0.15	Y	Q	2	N	N
3	01115280	Cork Brook	1.79	Y	M	10	Y	Y
4	01115400	Kent Brook (Betty Pond Stream)	0.85	Y	M	11	N	Y
5	01115184	Spruce Brook	1.22	Y	Q	4	N	Y
6	01115183	Quonapaug Brook	1.96	Y	M	10	Y	Y
7	01115297	Wilbur Hollow Brook	4.32	Y	M	12	Y	Y
8	01115276	Westconnaug Brook (Westconnaug Reservoir)	5.18	Y	M	2	N	Y
9	01115275	Bear Tree Brook	0.62	Y	Q	4	Y	Y
30	01115350	Unnamed Tributary #4 to Scituate Reservoir (Coventry Brook, Knight Brook)	0.78	Y	Q	4	N	N
31	01115177	Toad Pond	0.04	Y	Q	2	N	N
32	01115178	Unnamed Tributary #1 to Scituate Reservoir (Pine Swamp Brook)	0.45	Y	Q	3	N	Y
33	01115182	Unnamed Tributary #3 to Scituate Reservoir (Hall's Estate Brook)	0.28	Y	Q	3	N	Y
36	--	Outflow from King Pond	0.77	Y	Q	4	N	N
37	--	Fire Tower Stream	0.15	Y	Q	4	N	N

Table 1. Providence Water Supply Board water-quality sampling stations, water-quality samples, and available streamflow and continuous monitoring stations by tributary reservoir subbasin, in the Scituate Reservoir drainage area, Rhode Island, October 1, 2002, to September 30, 2003.—Continued

[PW, Providence Water; USGS, U.S. Geological Survey; no., number; mi², square miles; QW, water quality; M, monthly; Q, quarterly; Y, yes; N, no; Na, sodium; Cl, chloride; --, none; Alternate station names given for stations where different historical names were used for the same sampling location by Providence Water.]

PW station no.	USGS station no.	Station name	Drainage area (mi^2)	Station active during study period	Frequency of QW sample collection	Number of samples collected by Providence Water[1]	Daily estimated Na and Cl loads	Estimated streamflow calculated
		Moswansicut Reservoir subbasin						
19	01115170	Moswansicut Reservoir (Moswansicut Stream North, Moswansicut Pond)	3.25	Y	M	7	Y	Y
20	01115160	Unnamed Tributary #1 to Moswansicut Reservoir (Blanchard Brook)	1.18	Y	M	10	N	N
21	01115165	Unnamed Tributary #2 to Moswansicut Reservoir (Brook from Kimball Reservoir)	0.29	Y	Q	3	N	Y
22	01115167	Moswansicut Reservoir (Moswansicut Stream South)	0.22	Y	M	10	N	N
34	01115164	Kimball Stream	0.27	Y	Q	4	N	N
		Ponaganset Reservoir subbasin						
23	011151843	Ponaganset Reservoir	1.92	Y	M	11	N	N
		Regulating Reservoir subbasin						
13	01115176	Regulating Reservoir	22.1	Y	M	11	N	N
14	01115110	Huntinghouse Brook	6.23	Y	M	11	Y	Y
15	01115114	Regulating Reservoir (Rush Brook)	4.70	Y	M	10	N	Y
16	01115098	Peeptoad Brook (Harrisdale Brook)	4.96	Y	M	12	Y	N
17	01115119	Dexter Pond (Paine Pond)	0.22	Y	Q	2	N	N
18	01115120	Unnamed Tributary to Regulating Reservoir (Unnamed Brook A)	0.28	Y	Q	2	N	Y
		Westconnaug Reservoir subbasin						
10	01115274	Westconnaug Brook	1.48	Y	M	10	N	Y
11	01115273	Unnamed Tributary to Westconnaug Reservoir (Unnamed Brook south of Westconnaug Reservoir)	0.72	Y	Q	3	N	Y
12	011152745	Unnamed Tributary to Westconnaug Brook (Unnamed Brook north of Westconnaug Reservoir)	0.16	Y	Q	2	N	N

[1] Not all samples were analyzed for all water-quality properties or constituents.

Table 2. Measured or estimated annual mean streamflow for tributary streams in the Scituate Reservoir drainage area, Rhode Island, October 1, 2002, through September 30, 2003.

[USGS, U.S. Geological Survey; PW, Providence Water; no., number; ft^3/s, cubic feet per second; $ft^3/s/mi^2$, cubic feet per second per square mile]

PW station no.	USGS station no.	Station name	Annual mean streamflow (ft^3/s)	Upper 90-percent confidence interval (ft^3/s)	Lower 90-percent confidence interval (ft^3/s)	Normalized annual mean streamflow (ft^3/mi^2)
		Barden Reservoir subbasin				
24	01115190	Dolly Cole Brook	11	41	3.2	2.3
25	01115200	Shippee Brook	9.1	31	2.6	3.9
26	01115185	Windsor Brook	10	36	2.8	2.3
28	01115265	Barden Reservoir (Hemock Brook)	20	53	7.8	2.3
35	01115187	Ponaganset River	31	34	28	2.2
		Direct Runoff subbasin				
1	01115180	Brandy Brook	3.4	7.9	1.4	2.1
3	01115280	Cork Brook	4.1	9.8	1.8	2.3
4	01115400	Kent Brook (Betty Pond Stream)	2.5	22	0.28	2.9
5	01115184	Spruce Brook	3.8	15	0.93	3.1
6	01115183	Quonapaug Brook	5.3	15	1.8	2.7
7	01115297	Wilbur Hollow Brook	11	46	2.7	2.6
8	01115276	Westconnaug Brook (Westconnaug Reservoir)	7.9	16	4.0	1.5
9	01115275	Bear Tree Brook	1.5	2.8	0.81	2.4
32	01115178	Unnamed Tributary #1 to Scituate Reservoir (Pine Swamp Brook)	0.64	1.1	0.36	1.4
33	01115182	Unnamed Tributary #3 to Scituate Reservoir (Hall's Estate Brook)	0.96	2.5	0.37	3.4
		Moswansicut Reservoir subbasin				
19	01115170	Moswansicut Reservoir (Moswansicut Stream North, Moswansicut Pond)	7.6	32	1.8	2.3
21	01115165	Unnamed Tributary #2 to Moswansicut Reservoir (Blanchard Brook)	0.77	3.3	0.18	2.6
		Regulating Reservoir subbasin				
14	01115110	Huntinghouse Brook	15	48	4.7	2.4
15	01115115	Regulating Reservoir (Rush Brook)	11	36	3.3	2.3
16	01115098	Peeptoad Brook (Harrisdale Brook)	12	13	11	2.3
18	01115120	Unnamed Tributary to Regulating Reservoir	0.44	1.1	0.18	1.6
		Westconnaug Reservoir subbasin				
10	01115274	Westconnaug Brook	4.4	14	1.4	2.9
11	01115273	Unnamed Tributary to Westconnaug Reservoir (Unnamed Brook South of Westconnaug Reservoir)	4.3	14	1.3	5.9

Water-Quality Data Collection and Analysis

Water-quality data were collected by the USGS or Providence Water. Concentrations of sodium and chloride were estimated (by USGS) from continuous records of specific conductance from 10 of the 23 streamgage stations. Water-quality samples were collected monthly or quarterly at 35 of 37 sampling stations in the Scituate Reservoir drainage area by Providence Water during WY 2002, as part of a long-term sampling program. Daily loads of chloride, bacteria, nitrate, nitrite, and orthophosphate were calculated at 23 monitoring stations where streamflow data were collected by USGS and water-quality samples were collected by Providence Water. Yields were calculated by dividing load by drainage area.

Data Collected by the U.S. Geological Survey

Water quality was monitored in a periodic water-quality sampling program that included measurements by automatic specific-conductance probes. The USGS collected and analyzed the specific conductance. Specific conductance was measured by the USGS at 15-minute intervals at the 10 monitoring stations, including the 2 continuous streamgage stations and 8 partial-record sites (fig. 1). Measurements were made by using an instream probe and standard USGS methods for continuous streamwater-quality monitoring (Wagner and others, 2006). Specific conductance data for the 10 monitoring stations were published in the USGS Annual Data Report for WY 2002 (Socolow and others, 2003).

Concentrations of sodium and chloride were estimated from continuous measurements of specific conductance by using equations that were developed by the USGS to relate specific conductance to concentrations of sodium and chloride (equations 1 and 2). These regression equations were developed by the MOVE.1 method (also known as the line of organic correlation; Helsel and Hirsch, 1992) on the basis of concurrent measurements of specific conductance along with sodium and chloride concentrations measured in water-quality samples collected from tributary streams in the Scituate Reservoir drainage area (Marcus Waldron, U.S. Geological Survey, written comm., 2008):

$$C_{Na} = \left(Spc^{1.1794}\right) \quad 0.05240 \text{ and} \qquad (1)$$

$$C_{Cl} = \left(Spc^{1.2828}\right) \quad 0.05063, \qquad (2)$$

where

- C_{Na} is the sodium concentration, in milligrams per liter;
- C_{Cl} is the chloride concentration, in milligrams per liter; and
- *Spc* is the specific conductance, in microsiemens per centimeter.

MOVE.1 was chosen for regression analysis to maintain variance (Hirsch and Gilroy, 1984). Some missing values of specific conductance were estimated. In these cases, seasonal (July to October; November to June) averages were used for estimated values of specific conductance.

Data Collected by the Providence Water Supply Board

Water-quality samples were collected at 35 of 37 monitoring stations by Providence Water. Sampling was monthly at 18 monitoring stations and quarterly at another 17 stations (table 1) during WY 2002. Water-quality samples were not collected during specific weather conditions; rather, a strictly periodic water-quality sampling schedule was followed so that water-quality samples would be representative of various weather conditions. However, sometimes samples could not be collected because streams at the sampling stations were dry or frozen. When possible, water-quality samples were collected by dipping the sample bottle into the stream at the center of flow (Richard Blodgett, Providence Water Supply Board, written commun., 2005). Samples were transported on ice to the water-quality laboratory of Providence Water at the P.J. Holton Water Purification Plant in Scituate, R.I. Water-quality properties and constituent concentrations were measured by using unfiltered water samples. These water-quality properties included pH, temperature, acidity, alkalinity, color, turbidity, and concentrations of chloride, nitrite, nitrate, orthophosphate, and bacteria (*Escherichia coli (E. coli)* and total coliform). More information on sample-collection, analytical, and quality-control procedures can be found in the Providence Water Quality Assurance Program Manual (Providence Water Supply Board Water Quality Laboratory, 2003).

Providence Water collected samples during a wide range of flow conditions. The daily mean flow-duration curve for the Ponaganset River at South Foster (USGS station number 01115187) for WY2002 is shown in figure 2. The curve represents the percentage of time that each flow was exceeded at this station. The flows at this station on days when water-quality samples were collected at a representative station (Dolly Cole Brook, fig. 2) are represented by the plotted points superimposed on the curve. Samples were collected at flow durations ranging from the 1st percentile to the 90th percentile; this range indicates that water-quality samples collected in WY 2002 represent a wide range of flow conditions during that water year.

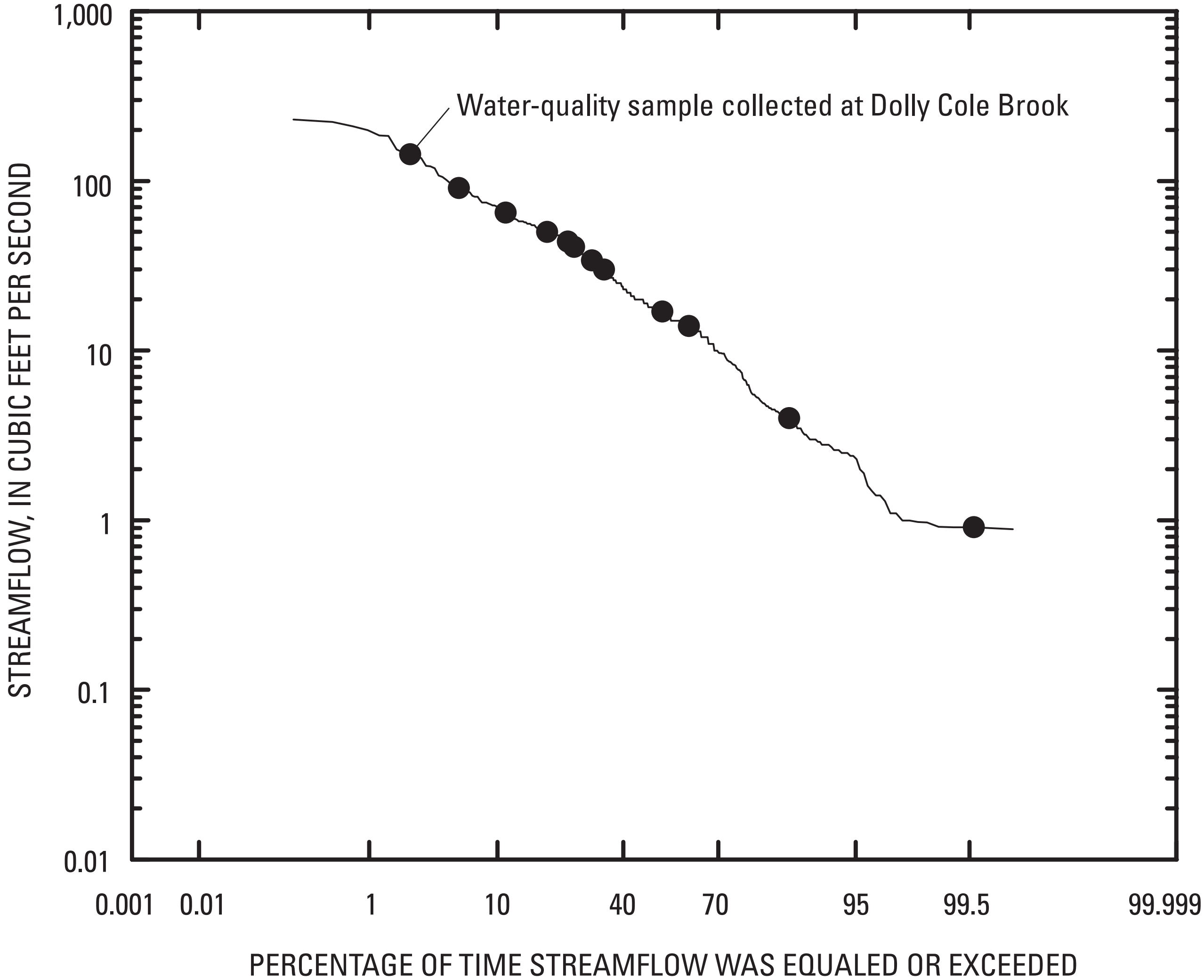

Figure 2. Flow-duration curve for the U.S. Geological Survey continuous streamgage station on Ponaganset River at South Foster (station 01115187) for water year 2003 and streamflow measurements at the Ponaganset River gaging station on the dates when water-quality samples were collected at Dolly Cole Brook (shown as points).

Estimating Daily, Monthly, and Annual Loads and Yields

Daily, monthly, and annual sodium and chloride loads in kilograms were estimated for all sampling sites for which streamflow (periodic or continuous) and continuous specific-conductance data were available during WY 2003. Daily sodium and chloride loads were estimated by multiplying daily (flow-weighted) concentrations of sodium and chloride in milligrams per liter by daily discharge (in liters per day) and added by month or water year. Daily flow-weighted concentrations of sodium and chloride were calculated by multiplying instantaneous flows by concurrent concentrations of sodium and chloride (estimated from measurements of specific conductance) for each day and dividing by the total flow for that day.

Daily loads of water-quality constituents (in samples collected by Providence Water) were calculated for all sampling dates during WY 2003 (table 3, at back of report) for which periodic or continuous streamflow data were available (table 1). These loads were calculated by multiplying constituent concentrations in milligrams per liter or colony forming units (CFU) per 100 milliliters in single samples multiplied by the daily discharge (in liters per day) for the day on which each sample was collected. The flows, which in most cases were estimates, were assumed to be representative of the flow at the time of the sample collection. Loads in grams or kilograms (or millions of CFUs for bacteria) per day and yields in grams or kilograms (or millions of CFUs for bacteria) per day per square mile were calculated for bacteria, chloride, nitrite, nitrate, and orthophosphate from this water-quality data. Censored data (or concentrations reported as less than method detection limits) were replaced with one-half the method detection limit.

Streamflow

Monitoring streamflow is necessary to measure the volume of water and estimate constituent loads to the Scituate Reservoir. The Ponaganset River is the largest monitored tributary to the Scituate Reservoir. Mean streamflow at the gaging station on the Ponaganset River (USGS station number 01115187) for the entire time period of its operation (mean of the daily mean streamflows for the period of record, WY 1994–2008) was 28 ft^3/s (http://waterdata.usgs.gov/nwis). During WY 2003, annual mean streamflow was 31 ft^3/s (fig. 3; Socolow and others, 2004). Mean streamflow in Peeptoad Brook (USGS station number 01115098), the other continuous streamgage station in the Scituate Reservoir drainage area (01115098), for its period of record (WY 1994–2008) was 10 ft^3/s (http://waterdata.usgs.gov/nwis). Annual mean streamflow in Peeptoad Brook during WY 2003 was 12 ft^3/s (Socolow and others, 2004).

The 15-year periods of record at these two streamgage stations are shorter than time periods typically used to represent long-term average conditions. However, comparison with a nearby station having a period of record from WY 1940–2008 (Quinsigamond River at North Grafton, Mass., USGS station number 01110000) indicates that the distribution of streamflows regionally during the study period with respect to the long-term average flow at that station (42 ft^3/s; wdr.water.usgs.gov/) was similar to the distribution at Ponaganset River and Peeptoad Brook; the annual mean flow in WY 2003 was about average (46 ft^3/s; Socolow and others, 2004). Annual mean streamflows estimated for partial-record monitoring stations are given in table 2. Estimated annual mean streamflows at partial record stations ranged from 0.44 to 20 ft^3/s. Annual mean streamflows normalized by drainage area ranged from 1.4 to 5.9 $ft^3/s/mi^2$ (table 2).

Water Quality and Constituent Loads and Yields

Water-quality conditions in the Scituate Reservoir drainage area are described by summary statistics for water-quality properties, constituent concentrations, and estimated constituent loads and yields. Loads and yields characterize the rates at which masses of constituents are transferred to the reservoir by tributary streams. In the case of loads, streams with higher flows tend to have higher loads because the greater volume of water carries more of the constituent to the reservoir per unit time. Yields represent the constituent load per unit of drainage area and are calculated by dividing the load estimated for a monitoring station by the drainage area to the station. Yields are useful for comparison among sites of different drainage-area sizes because the effects of basin size and, therefore, total streamflow volume are attenuated. Yields are useful for examining potential differences among basin properties that may contribute to reservoir quality.

Summary statistics include means and medians. For some purposes, median values are more appropriate because they are less likely to be affected by high or low concentrations (or outliers). Medians are especially important to use for summarizing a relatively limited number of values. In contrast, continuously monitored streamflow and sodium and chloride loads (estimated from measurements of specific conductance), which include a large number of values, are better summarized in terms of means because a large data set is more resistant to the effects of outliers. Mean values also are particularly appropriate for characterizing loads, because outlier values, which typically represent large flows, are important to include when representing the delivery of constituent masses to receiving waters.

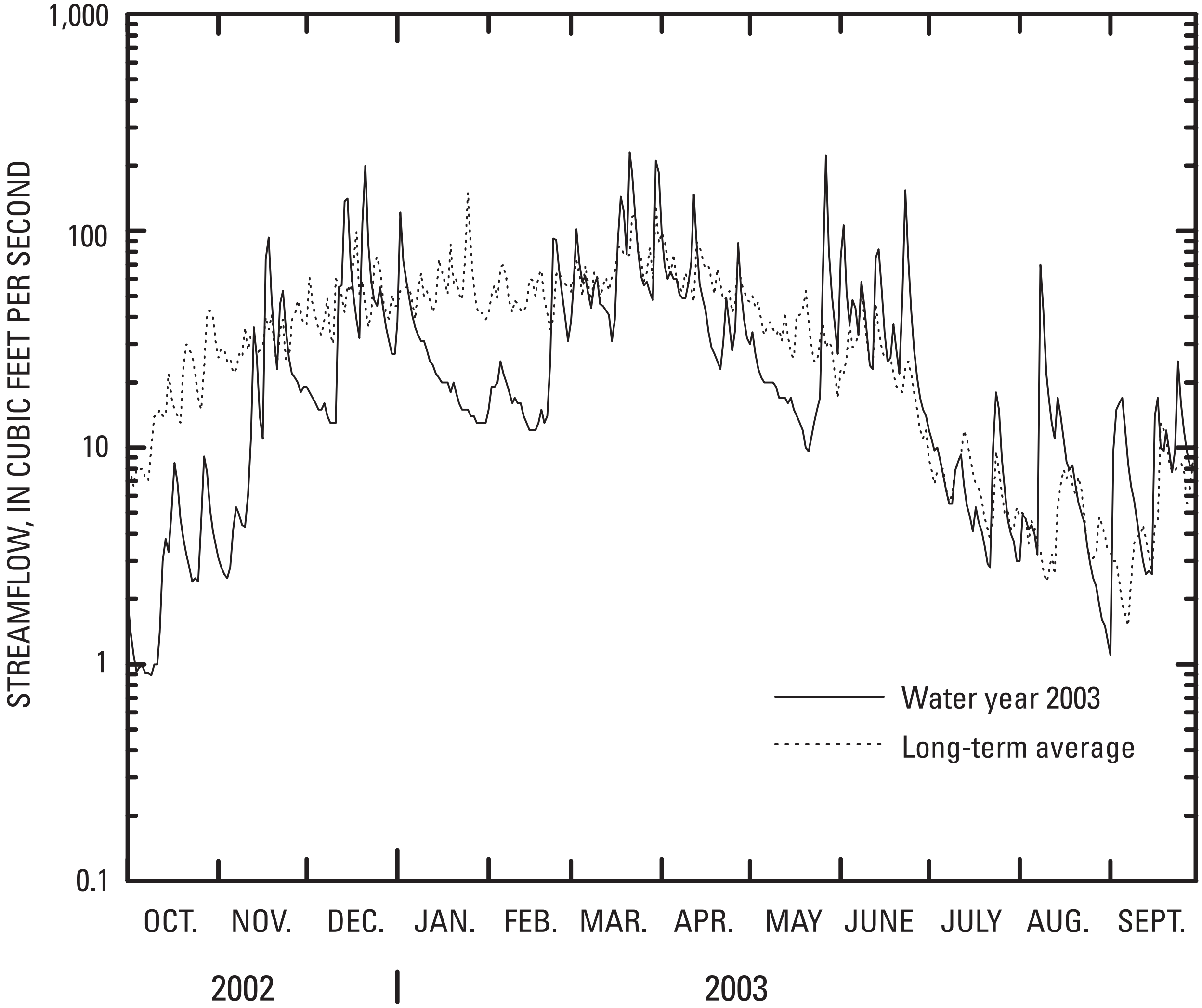

Figure 3. Measured daily mean streamflow for the U.S. Geological Survey continuous-record gaging station on the Ponaganset River at South Foster (station 01115187) in the Scituate Reservoir drainage area, Rhode Island, for October 1, 2002, through September 30, 2003 (solid line), and mean daily streamflow for March 22, 1994, through July 13, 2008 (dotted line).

Sodium and Chloride Loads and Yields Estimated from Specific-Conductance Monitoring Data

Sodium and chloride are constituents of special concern in the Scituate Reservoir drainage area; they are major constituents of road salt used for deicing, and several major roadways cross the drainage basin. State Routes 12 and 14 cut across the main body of the reservoir, and State Route 116 parallels the eastern limb (fig. 1). A recent study by the USGS, in cooperation with Providence Water, indicates that tributary streams in basins with state-maintained roads have substantially higher concentrations of sodium and chloride, presumably because of deicing activities (Nimiroski and Waldron, 2002). In addition, sodium is a constituent of potential concern for human health; some persons on restrictive diets need to limit their intake of sodium.

Estimated monthly mean[3] sodium concentrations in tributary streams of the Scituate Reservoir drainage area ranged from 3.6 to 42.2 mg/L, and estimated monthly mean chloride concentrations ranged from 5.0 to 73.3 mg/L. The highest monthly mean concentrations of sodium and chloride were measured at station 9 (Bear Tree Brook) in October 2002 (42.2 and 73.3 mg/L, respectively) (table 4). The highest annual mean[4] concentrations of sodium and chloride were measured at station 9 (Bear Tree Brook) at 28.3 and 47.6 mg/L, respectively (table 5). These high values are not surprising because the waters that pass this station contain sodium and chloride from a formerly uncovered salt storage pile (Nimiroski and Waldron, 2002).

The Scituate Reservoir received about 1,200,000 kg (about 1,323 tons) of sodium and 1,900,000 kg (about 2,094 tons) of chloride from tributary streams—equipped with instrumentation capable of continuously monitoring specific conductance—during WY 2003. The highest sodium and chloride loads in WY 2003—240,000 kg and 360,000 kg, respectively—were measured at the Ponaganset River station (Providence Water Station Number 35) (table 5). Monthly sodium and chloride loads were highest at all stations in March (table 6). The totals of the March loads of sodium and chloride accounted for about 21 percent of the annual load for each constituent. The highest annual sodium and chloride yields were 61,000 and 100,000 kg/mi^2, respectively, and were measured at Bear Tree Brook (station 9; table 5).

Uncertainties associated with measuring streamflow and specific conductance and with sodium and chloride sample collection, preservation, and analysis produce uncertainties in load and yield estimates. The load and yield estimates presented in the text and tables are estimated to be the most likely values for loads and yields of sodium and chloride coming from tributary streams or their drainage basins. It may be best to discuss loads and yields in terms of a range within which the true values lie; however, the most probable values of loads and yields are presented for ease of discussion and presentation. The range within which the true values lie depends on the uncertainties in individual measurements of streamflow and concentration, which are difficult to quantify with available information. It is commonly assumed that the uncertainties associated with estimating streamflow affect load and yield calculations more than the error associated with measuring specific conductance and (or) chemical analysis. The most probable values of loads and yields presented in the tables and text are sufficient for planning-level analysis of water quality in tributary streams and their drainage basins.

Physical and Chemical Properties and Daily Loads and Yields Estimated from Data Collected by the Providence Water Supply Board

Physical and Chemical Properties

Physical and chemical properties including pH, turbidity, alkalinity, specific conductance, and color were routinely measured to characterize water quality from each basin (table 7). Specifically, pH is a measure of the acidity of the water; color can be an indirect measure of the amount of organic carbon dissolved in the water column; turbidity is an indirect measure of suspended particles; and alkalinity is a measure of the acid-neutralizing capacity of water.

The median pH in tributary streams in the Scituate Reservoir drainage area ranged from 5.1 to 7.5; the median of the medians among all stations was 6.0. Median values of color ranged from 10 to 160 platinum cobalt units (PCU); the median among all stations was 35 PCU. Median values of turbidity ranged from 0.2 to 2.3 nephelometric turbidity units (NTU); the median among all stations was 0.5 NTU. Median alkalinity values in tributary streams were low, ranging from 1.8 to 14 mg/L as $CaCO_3$; the median among all stations was 4.2 mg/L as $CaCO_3$ (table 7).

[3] Monthly mean concentrations were calculated by dividing the total monthly load by the total discharge for the month.

[4] Annual mean concentrations were calculated by dividing the total annual load by the total discharge for the year.

Table 4. Monthly mean concentrations of chloride and sodium estimated from continuous measurements of specific conductance in the Scituate Reservoir drainage area, Rhode Island, October 1, 2002, through September 30, 2003.

[USGS, U.S. Geological Survey; PW, Providence Water; no., number; mg/L, milligrams per liter; Cl, chloride; Na, sodium; the average root mean square error of the regression estimates for sodium and chloride are 1.2 and 0.06, respectively; monthly mean concentrations were calculated by dividing the monthly load by the total discharge for the month]

PW station no.	USGS station no.	Station name	Oct.		Nov.		Dec.		Jan.		Feb.		Mar.	
			Cl (mg/L)	Na (mg/L)	Cl (mg/L)	Na (mg/L)	Cl (mg/L)	Na (mg/L)	Cl (mg/L)	Na (mg/L)	Cl (mg/L)	Na (mg/L)	Cl (mg/L)	Na (mg/L)
		Barden Reservoir subbasin												
24	01115190	Dolly Cole Brook	30.6	18.9	19.7	12.6	15.3	10.0	16.1	10.5	19.4	12.4	22.5	14.3
28	01115265	Barden Reservoir (Hemock Brook)	26.6	16.6	16.0	10.4	11.3	7.5	13.5	8.9	15.2	10.0	13.7	9.0
35	01115187	Ponaganset River	21.2	13.3	18.2	10.0	11.1	7.2	10.1	6.4	11.8	7.8	13.2	8.5
		Direct Runoff subbasin												
3	01115280	Cork Brook	33.5	20.5	21.9	13.9	20.3	13.0	22.7	14.4	26.0	16.3	30.7	18.9
6	01115183	Quonapaug Brook	45.6	27.2	23.6	14.9	22.6	14.3	25.2	15.8	31.0	19.1	26.1	16.3
7	01115297	Wilbur Hollow Brook	14.6	9.6	8.4	5.8	6.0	4.2	7.9	5.4	8.9	6.1	7.2	5.0
9	01115275	Bear Tree Brook	73.3	42.2	46.2	27.5	39.6	23.9	45.8	27.4	52.7	31.1	41.5	25.0
		Moswansicut Reservoir subbasin												
19	01115170	Moswansicut Reservoir (Moswansicut Stream North, Moswansicut Pond)	30.1	18.6	29.2	18.1	31.4	19.4	32.5	20.0	34.1	20.9	32.8	20.2
		Regulating Reservoir subbasin												
14	01115110	Huntinghouse Brook	22.0	13.9	12.8	8.5	7.5	5.2	7.1	4.9	7.0	4.8	5.0	3.6
16	01115098	Peeptoad Brook (Harrisdale Brook)	27.3	17.0	31.4	19.3	31.3	19.3	32.5	20.0	39.7	24.0	34.2	20.9
		Scituate Reservoir basin												
		Average	32.5	19.8	22.7	14.1	19.6	12.4	21.3	13.4	24.6	15.3	22.7	14.2

PW station no.	USGS station no.	Station name	Apr.		May		June		July		Aug.		Sep.	
			Cl (mg/L)	Na (mg/L)	Cl (mg/L)	Na (mg/L)	Cl (mg/L)	Na (mg/L)	Cl (mg/L)	Na (mg/L)	Cl (mg/L)	Na (mg/L)	Cl (mg/L)	Na (mg/L)
		Barden Reservoir subbasin												
24	01115190	Dolly Cole Brook	24.5	15.4	24.0	15.1	21.0	13.4	26.0	16.2	18.5	11.9	22.0	14.0
28	01115265	Barden Reservoir (Hemock Brook)	15.5	10.1	17.8	11.5	14.8	9.7	24.0	15.1	17.9	11.5	19.9	12.7
35	01115187	Ponaganset River	15.5	9.9	16.1	9.5	14.1	9.2	17.1	11.0	15.8	9.7	17.6	11.2
		Direct Runoff subbasin												
3	01115280	Cork Brook	31.9	19.7	28.9	17.9	27.4	17.1	27.8	17.3	26.8	16.7	33.6	20.6
6	01115183	Quonapaug Brook	29.7	18.4	28.8	17.9	27.5	17.1	35.2	21.5	31.3	19.2	41.1	24.8
7	01115297	Wilbur Hollow Brook	8.7	5.9	9.2	6.2	8.0	5.5	10.3	7.0	10.0	6.8	11.1	7.5
9	01115275	Bear Tree Brook	43.4	26.1	38.2	23.1	42.5	25.5	64.7	37.6	65.9	38.2	65.4	38.0
		Moswansicut Reservoir subbasin												
19	01115170	Moswansicut Reservoir (Moswansicut Stream North, Moswansicut Pond)	35.5	21.7	37.1	22.6	37.1	22.6	35.3	21.5	32.1	19.8	38.8	23.6
		Regulating Reservoir subbasin												
14	01115110	Huntinghouse Brook	5.8	4.1	7.1	4.9	6.7	4.7	11.7	7.8	8.5	5.8	11.8	7.9
16	01115098	Peeptoad Brook (Harrisdale Brook)	34.2	21.0	37.1	22.6	31.3	19.3	29.1	18.1	29.1	18.1	32.0	19.7
		Scituate Reservoir basin												
		Average	24.5	15.2	24.4	15.1	23.0	14.4	28.1	17.3	25.6	15.8	29.3	18.0

Table 5. Annual mean chloride and sodium concentrations, loads, and yields by sampling station in the Scituate Reservoir drainage area, Rhode Island, October 1, 2002, through September 30, 2003.

USGS, U.S. Geological Survey; PW, Providence Water; no., number; mg/L, milligrams per liter; kg, kilograms; kg/mi², kilograms per square mile; Cl, chloride; Na, sodium; annual mean concentrations were calculated by dividing the annual load by the total discharge for the year.]

PW station no.	USGS station no.	Station name	Concentration		Load		Yield	
			Cl (mg/L)	Na (mg/L)	Cl (kg)	Na (kg)	Cl (kg/mi²)	Na (kg/mi²)
		Barden Reservoir subbasin						
24	01115190	Dolly Cole Brook	21.0	13.3	210,000	140,000	43,000	28,000
28	01115265	Barden Reservoir (Hemock Brook)	14.9	9.8	270,000	180,000	31,000	20,000
35	01115187	Ponaganset River	13.3	8.8	360,000	240,000	26,000	17,000
		Direct Runoff subbasin						
3	01115280	Cork Brook	27.5	17.1	100,000	63,000	57,000	35,000
6	01115183	Quonapaug Brook	27.6	17.2	130,000	81,000	67,000	41,000
7	01115297	Wilbur Hollow Brook	8.1	5.6	80,000	55,000	19,000	13,000
9	01115275	Bear Tree Brook	47.6	28.3	63,000	38,000	100,000	61,000
		Moswansicut Reservoir subbasin						
19	01115170	Moswansicut Reservoir, (Moswansicut Stream North, Moswansicut Pond)	34.1	20.9	230,000	140,000	71,000	43,000
		Regulating Reservoir subbasin						
14	01115110	Huntinghouse Brook	6.8	4.7	91,000	63,000	15,000	10,000
16	01115098	Peeptoad Brook, (Harrisdale Brook)	33.4	20.5	350,000	210,000	70,000	43,000
		Scituate Reservoir basin						
			Average		**Total**		**Average**	
			23.4	14.6	1,900,000	1,200,000	50,000	31,000

Table 6. Monthly estimated chloride and sodium loads, by sampling station, in the Scituate Reservoir drainage area, Rhode Island, October 1, 2002, through September 30, 2003.

[USGS, U.S. Geological Survey; PW, Providence Water; no., number; Cl, chloride; Na, sodium; kg, kilogram]

PW station no.	USGS station no.	Station name	Oct.		Nov.		Dec.		Jan.		Feb.		Mar.	
			Cl (kg)	Na (kg)	Cl (kg)	Na (kg)	Cl (kg)	Na (kg)	Cl (kg)	Na (kg)	Cl (kg)	Na (kg)	Cl (kg)	Na (kg)
Barden Reservoir subbasin														
24	01115190	Dolly Cole Brook	450	280	9,600	6,100	20,000	13,000	12,000	8,100	12,000	8,000	52,000	33,000
28	01115265	Barden Reservoir (Hemock Brook)	1,200	750	14,000	9,400	25,000	17,000	20,000	13,000	18,000	12,000	53,000	35,000
35	01115187	Ponaganset River	5,100	3,200	25,000	16,000	40,000	27,000	20,000	14,000	21,000	14,000	80,000	53,000
Direct Runoff subbasin														
3	01115280	Cork Brook	250	160	4,000	2,500	9,500	6,100	6,700	4,200	6,200	3,900	25,000	15,000
6	01115183	Quonapaug Brook	690	410	5,700	3,600	13,000	8,200	9,700	6,100	9,900	6,100	25,000	16,000
7	01115297	Wilbur Hollow Brook	410	270	4,200	2,900	7,300	5,100	6,300	4,400	5,900	4,000	15,000	10,000
9	01115275	Bear Tree Brook	2,100	1,200	3,900	2,300	5,200	3,100	5,600	3,300	5,500	3,200	7,900	4,800
Moswansicut Reservoir subbasin														
19	01115170	Moswansicut Reservoir (Moswansicut Stream North, Moswansicut Pond)	870	540	10,000	6,400	25,000	15,000	18,000	11,000	16,000	9,800	44,000	27,000
Regulating Reservoir subbasin														
14	01115110	Huntinghouse Brook	290	180	8,100	5,400	14,000	9,400	7,000	4,900	5,700	4,000	16,000	11,000
16	01115098	Peeptoad Brook (Harrisdale Brook)	1,200	750	17,000	10,000	38,000	24,000	28,000	17,000	28,000	17,000	70,000	43,000
Scituate Reservoir basin														
		Total	13,000	7,800	100,000	65,000	200,000	130,000	130,000	87,000	130,000	82,000	390,000	250,000

PW station no.	USGS station no.	Station name	Apr.		May		June		July		Aug.		Sep.	
			Cl (kg)	Na (kg)	Cl (kg)	Na (kg)	Cl (kg)	Na (kg)	Cl (kg)	Na (kg)	Cl (kg)	Na (kg)	Cl (kg)	Na (kg)
Barden Reservoir subbasin														
24	01115190	Dolly Cole Brook	43,000	27,000	20,000	13,000	29,000	18,000	4,200	2,600	5,700	3,600	3,800	2,400
28	01115265	Barden Reservoir (Hemock Brook)	47,000	31,000	28,000	18,000	36,000	24,000	9,200	5,800	11,000	7,000	7,900	5,100
35	01115187	Ponaganset River	60,000	39,000	33,000	22,000	47,000	31,000	9,100	5,900	11,000	7,400	12,000	7,900
Direct Runoff subbasin														
3	01115280	Cork Brook	20,000	12,000	9,000	5,600	14,000	8,500	2,000	1,200	3,200	2,000	2,500	1,500
6	01115183	Quonapaug Brook	23,000	14,000	12,000	7,400	17,000	11,000	3,900	2,400	5,300	3,200	4,700	2,900
7	01115297	Wilbur Hollow Brook	14,000	9,800	7,800	5,300	11,000	7,200	2,300	1,500	3,400	2,300	2,500	1,700
9	01115275	Bear Tree Brook	7,500	4,500	4,800	2,900	6,500	3,900	4,700	2,700	5,100	2,900	4,600	2,700
Moswansicut Reservoir subbasin														
19	01115170	Moswansicut Reservoir (Moswansicut Stream North, Moswansicut Pond)	39,000	24,000	22,000	14,000	33,000	20,000	6,400	3,900	8,100	5,000	7,200	4,400
Regulating Reservoir subbasin														
14	01115110	Huntinghouse Brook	14,000	9,500	7,600	5,200	12,000	8,300	2,100	1,400	3,200	2,200	2,300	1,500
16	01115098	Peeptoad Brook (Harrisdale Brook)	57,000	35,000	34,000	21,000	43,000	26,000	8,100	5,000	11,000	7,000	9,200	5,600
Scituate Reservoir basin														
		Total	320,000	210,000	180,000	110,000	250,000	160,000	52,000	33,000	67,000	43,000	57,000	36,000

Constituent Concentrations and Daily Loads and Yields

Fecal indicator bacteria, chloride, and nutrients like phosphorus and nitrogen are commonly detected in natural water; at elevated concentrations, these constituents can render water unfit for the intended use. Fecal indicator bacteria, which are found in the intestines of warm-blooded animals, may indicate impairment from sewage contamination or from livestock or wildlife that defecate in or near the stream margin. Chloride originates in tributary streamwater from precipitation, weathering, or human activities like waste disposal and road deicing. Sources of nutrients in tributary streamwater include atmospheric deposition, leaching of naturally occurring organic material, discharge of groundwater that is enriched in nutrients from septic-system leachate, and runoff contaminated with fertilizer or animal waste. The ultimate intended use of water in the tributary streams is drinking water, which must meet specific water-quality standards. For this reason, Providence Water and the USGS closely monitor concentrations of these constituents in tributary streams. Median concentrations, loads, and yields of water-quality constituents are given in tables 7 and 8.

Bacteria

Median concentrations of total coliform and *E. coli* bacteria were above the detection limit (3 CFU/100 mL) at nearly all sites (table 7). Total coliform bacteria concentrations were in most cases equal to or greater than *E. coli* concentrations (as expected because total coliform is more inclusive); the median concentrations among all sites in the drainage basin were equal to 38 CFU/100 mL for total coliform bacteria and 9 CFU/100 mL for *E. coli* bacteria. The median concentration of total coliform bacteria was greatest (780 CFU/100 mL) at the Moswansicut Reservoir (Providence Water Station 22) and the median concentration of *E. coli* bacteria was greatest (1,200 CFU/100 mL) at the Unnamed Tributary #3 to Scituate Reservoir (Providence Water Station 33) (table 7). Concentrations of fecal indicator bacteria in some cases were lowest at monitoring stations immediately downstream from subbasin reservoirs, such as station 23 at the outlet of the Ponaganset Reservoir.

Median daily loads and yields of total coliform and *E. coli* bacteria varied over three orders of magnitude; the highest median daily yield for total coliform was at station 11 (Unnamed Tributary to Westconnaug Reservoir) in the Westconnaug Reservoir subbasin and for *E. coli* was at station 33 (Unnamed Tributary #3 to Scituate Reservoir) in the Direct Runoff subbasin (table 8). Although relatively high for monitoring stations in the Scituate Reservoir subbasin, median daily bacteria yields at this station are low compared to yields of indicator bacteria in sewage-contaminated streamwater or streamwater affected by stormwater runoff in an urban environment (Breault and others, 2002). The median of daily loads of total coliform bacteria for the entire Scituate Reservoir drainage area ranged from 98 to 22,000 CFU 10^6/d, and median daily yields ranged from 61 to 21,000 CFU 10^6/d/mi^2. The median daily loads for *E. coli* for the entire drainage area ranged from 24 to 13,000 CFU 10^6/d, and median daily yields ranged from 20 to 33,000 CFU 10^6/d/mi^2 (table 8).

Chloride

The highest median chloride concentration (117 mg/L) was measured in the Direct Runoff subbasin at the Toad Pond station (31) (table 7). Median daily chloride loads and yields varied among monitoring stations in the drainage area (table 8); the median chloride yield for the overall drainage area was about 67 kg/d/mi^2. Ponaganset River (35) had the largest median daily chloride load (1,600 kg/d), whereas the largest median daily chloride yield was determined for Bear Tree Brook (270 kg/d/mi^2); this yield is the same as the annual mean chloride yield (100,000 kg/yr/mi^2 (table 5) or about 270 kg/d/mi^2) measured at that station by using continuously measured specific-conductance records.

Nutrients

Median concentrations of nitrite and nitrate were 0.002 and 0.02 mg/L as N, respectively (table 7). Relatively high concentrations of nitrite and nitrate at some monitoring sites, such as Moswansicut Reservoir (22) in the Moswansicut Reservoir subbasin (0.005 mg/L as N and 0.32 mg/L, respectively), may have been affected by nitrogen-enriched runoff or groundwater (Nimiroski and others, 2008). The median concentration of orthophosphate for the entire study area (table 7) was 0.06 mg/L as P. The maximum median concentration of orthophosphate (0.47 mg/L as P) was measured at Unnamed Tributary #2 to Scituate Reservoir (2). Nutrient loadings from the Ponaganset River (35) into the Scituate Reservoir—nitrite (110 g/d), nitrate (1,700 g/d), and orthophosphate (6,100 g/d)—were among the largest of all the sampled stations. Median daily nitrate loads for WY 2003 were larger at only one station, Moswansicut Reservoir (19; 1,900 g/d). The largest median daily nutrient yields for nitrite (18 g/d/mi^2) and nitrate (630 g/d/mi^2) were determined for Moswansicut Reservoir (19) and Bear Tree Brook (9), respectively, and for orthophosphate (1,300 g/d/mi^2) at Cork Brook (3) (table 8).

Table 7. Median values for water-quality data collected at Providence Water stations, by tributary reservoir subbasin, in the Scituate Reservoir drainage area, Rhode Island, October 1, 2002, through September 30, 2003.

[Water-quality data are from samples collected and analyzed by Providence Water (PW); USGS, U.S. Geological Survey; no., number; PCU, platinum cobalt units; NTU, nephelometric turbidity units; CFU/100 mL, colony forming units per 100 milliliters; *E. coli*., *Escherichia coli*; mg/L, milligrams per liter; $CaCO_3$, calcium carbonate; N, nitrate; P, phosphorus; --, no data; <, less than]

PW station no.	USGS station no.	Station name	pH (units)	Color (PCU)	Turbidity (NTU)	Total coliform bacteria (CFU/100 mL)	*E. coli* (CFU/ 100 mL)	Alkalinity (mg/L as $CaCO_3$)	Chloride (mg/L)	Nitrite (mg/L as N)	Nitrate (mg/L as N)	Ortho-phosphate (mg/L as P)
		Barden Reservoir subbasin										
24	01115190	Dolly Cole Brook	5.7	45	0.5	23	9	3.0	20.6	0.002	0.02	0.06
25	01115200	Shippee Brook	6.2	33	0.4	23	16	3.9	10.5	0.001	0.02	0.05
26	01115185	Windsor Brook	5.8	33	0.3	49	7	4.0	24.7	0.001	0.05	0.03
27	011151845	Unnamed Tributary to Ponaganset River (Unnamed Brook B, Unnamed Brook West of Windsor Brook)	5.5	26	0.2	4	4	2.6	7.2	0.001	0.07	0.06
28	01115265	Barden Reservoir (Hemlock Brook)	5.6	120	0.4	43	21	2.9	20.4	0.003	<0.01	0.10
29	01115271	Ponaganset River (Barden Stream)	5.8	98	1.0	24	14	4.0	16.3	0.003	<0.01	0.06
35	01115187	Ponaganset River	5.8	37	0.6	23	9	3.0	16.8	0.002	0.02	0.06
		Direct Runoff subbasin										
1	01115180	Brandy Brook	6.6	90	1.0	41	9	8.3	8.6	0.003	0.03	0.07
2	01115181	Unnamed Tributary #2 to Scituate Reservoir (Unnamed Brook North of Bullhead Brook)	5.8	16	0.2	23	<3	3.4	--	0.001	0.09	0.47
3	01115280	Cork Brook	6.2	32	0.3	49	9	4.2	29.8	0.001	0.04	0.08
4	01115400	Kent Brook (Betty Pond Stream)	6.4	27	0.5	23	4	5.6	3.9	0.001	0.01	0.03
5	01115184	Spruce Brook	5.9	35	0.3	24	<3	3.2	17.5	0.002	0.05	0.10
6	01115183	Quonapaug Brook	6.0	130	0.4	97	43	6.5	27.8	0.003	0.03	0.05
7	01115297	Wilbur Hollow Brook	5.8	120	0.6	31	23	5.0	9.5	0.003	<0.01	0.10
8	01115276	Westconnaug Brook (Westconnaug Reservoir)	5.8	18	0.5	<3	<3	2.7	13.4	0.001	0.02	0.04
9	01115275	Bear Tree Brook	6.3	32	0.2	38	<3	5.0	50.6	0.002	0.09	0.07
30	01115350	Unnamed Tributary #4 to Scituate Reservoir (Coventry Brook, Knight Brook)	6.1	36	0.2	4	4	3.4	26.9	0.002	0.02	0.07
31	01115177	Toad Pond	7.5	48	2.3	130	43	12	117	0.003	0.03	0.18
32	01115178	Unnamed Tributary #1 to Scituate Reservoir (Pine Swamp Brook)	6.4	72	0.4	150	120	6.1	11.6	0.002	0.02	0.12
33	01115182	Unnamed Tributary #3 to Scituate Reservoir (Hall's Estate Brook)	5.8	27	0.4	460	1,200	3.6	9.6	0.001	0.02	0.15
36	--	Outflow from King Pond	6.3	22	0.3	24	4	2.9	3.2	0.001	0.01	0.06
37	--	Fire Tower Stream	5.7	21	0.2	<3	<3	2.0	2.7	0.001	0.02	0.02

Table 7. Median values for water-quality data collected at Providence Water stations, by tributary reservoir subbasin, in the Scituate Reservoir drainage area, Rhode Island, October 1, 2002, through September 30, 2003.—Continued

[Water-quality data are from samples collected and analyzed by Providence Water (PW); USGS, U.S. Geological Survey; no., number; PCU, platinum cobalt units; NTU, nephelometric turbidity units; CFU/100 mL, colony forming units per 100 milliliters; *E. coli*., *Escherichia coli*; mg/L, milligrams per liter; $CaCO_3$, calcium carbonate; N, nitrate; P, phosphorus; --, no data; <, less than]

PW station no.	USGS station no.	Station name	pH (units)	Color (PCU)	Turbidity (NTU)	Total coliform bacteria (CFU/100 mL)	*E. coli* (CFU/ 100 mL)	Alkalinity (mg/L as $CaCO_3$)	Chloride (mg/L)	Nitrite (mg/L as N)	Nitrate (mg/L as N)	Ortho-phosphate (mg/L as P)
		Moswansicut Reservoir subbasin										
19	01115170	Moswansicut Reservoir (Moswansicut Stream North, Moswansicut Pond)	6.5	21	0.7	23	4	9.0	30.7	0.002	0.07	0.02
20	01115160	Unnamed Tributary #1 to Moswansicut Reservoir (Blanchard Brook)	5.8	160	0.4	43	25	6.0	42.6	0.005	<0.01	0.06
21	01115165	Unnamed Tributary #2 to Moswansicut Reservoir (Brook from Kimball Reservoir)	6.4	72	0.9	23	5	9.2	31.1	0.002	0.01	0.04
22	01115167	Moswansicut Reservoir (Moswansicut Stream South)	6.4	33	1.2	780	570	14	48.2	0.005	0.32	0.06
34	01115164	Kimball Stream	6.0	68	0.5	120	<3	9.7	38.7	0.002	0.08	0.04
		Ponaganset Reservoir subbasin										
23	011151843	Ponaganset Reservoir	5.3	10	0.4	9	4	1.9	10.9	0.001	0.03	0.06
		Regulating Reservoir subbasin										
13	01115176	Regulating Reservoir	6.4	28	0.6	4	4	7.8	30.9	0.002	0.02	0.06
14	01115110	Huntinghouse Brook	6.3	34	0.5	43	23	4.9	10.0	0.001	0.02	0.06
15	01115115	Regulating Reservoir (Rush Brook)	6.4	54	0.7	49	49	6.9	41.3	0.002	0.04	0.07
16	01115098	Peeptoad Brook (Harrisdale Brook)	6.4	37	0.6	43	16	8.6	35.1	0.002	0.02	0.03
17	01115119	Dexter Pond (Paine Pond)	5.9	57	0.6	550	17	5.0	33.6	0.002	0.01	0.09
18	01115120	Unnamed Tributary to Regulating Reservoir (Unnamed Brook A)	6.4	85	1.0	560	240	12	65.5	0.003	0.01	0.07
		Westconnaug Reservoir subbasin										
10	01115274	Westconnaug Brook	5.1	23	0.2	23	9	1.8	22.1	0.001	0.03	0.07
11	01115273	Unnamed Tributary to Westconnaug Reservoir (Unnamed Brook South of Westconnaug Reservoir)	5.3	120	0.5	150	620	3.4	4.7	0.002	<0.01	0.06
12	011152745	Unnamed Tributary to Westconnaug Brook (Unnamed Brook north of Westconnaug reservoir)	5.9	26	0.6	40	40	4.1	31.2	0.001	0.02	0.11
		Scituate Reservoir basin										
		Median	6.0	35	0.5	38	9	4.2	21.3	0.002	0.02	0.06

Table 8. Median daily loads and yields of bacteria, chloride, nitrite, nitrate, and orthophosphate by tributary reservoir subbasin, in the Scituate Reservoir drainage area, Rhode Island, October 1, 2002, through September 30, 2003.

[Water-quality data are from samples collected and analyzed by Providence Water (PW); USGS, U.S. Geological Survey; no., number; CFUx10^6/d; millions of colony forming units per day; CFUx10^6/mi^2, colony forming units per square mile; *E. coli*, *Escherichia coli*; kg/d, kilograms per day; kg/d/mi^2, kilograms per day per square mile; g/d, grams per day; g/d/mi^2, grams per day per square mile]

PW station no.	USGS station no.	Station name	Total coliform bacteria		*E. coli*		Chloride		Nitrite (as N)		Nitrate (as N)		Orthophosphate (as P)	
			(CFU 10^6/d)	(CFU 10^6/mi^2)	(CFUx10^6/d)	(CFU 10^6/mi^2)	(kg/d)	(kg/d/mi^2)	(g/d)	(g/d/mi^2)	(g/d)	(g/d/mi^2)	(g/d)	(g/d/mi^2)
Barden Reservoir subbasin														
24	01115190	Dolly Cole Brook	8,700	1,800	7,000	1,400	750	150	37	7.5	340	70	1,500	310
25	01115200	Shippee Brook	140	61	1,700	720	13	5.5	1.4	0.58	41	17	270	120
26	01115185	Windsor Brook	1,200	280	200	46	88	20	3.7	0.85	270	63	320	73
28	01115265	Barden Reservoir	6,400	740	2,800	330	350	40	56	6.5	100	12	1,300	150
35	01115187	Ponaganset River	22,000	1,600	9,400	670	1,600	110	110	7.9	1,700	120	6,100	440
Direct Runoff subbasin														
1	01115180	Brandy Brook	3,100	2,000	780	490	60	38	17	11	190	120	500	320
3	01115280	Cork Brook	2,000	1,100	790	440	140	76	12	7.0	110	62	2,300	1,300
4	01115400	Kent Brook	210	250	190	230	4.2	4.9	2.7	3.2	13	16	81	95
5	01115184	Spruce Brook	280	230	24	20	65	53	16	13	550	450	330	270
6	01115183	Quonapaug Brook	6,000	3,100	5,400	2,700	250	130	23	12	250	130	360	180
7	01115297	Wilbur Hollow Brook	5,600	1,300	2,200	510	130	31	41	9.4	120	28	960	220
8	01115276	Westconnaug Brook	390	75	390	75	350	67	26	5.0	550	110	1,100	210
9	01115275	Bear Tree Brook	370	600	84	140	170	270	6.7	11	390	630	190	310
32	01115178	Unnamed Tributary #1 to Scituate Reservoir (Pine Swamp Brook)	520	1,200	900	2,000	7.6	17	1.8	4.1	12	27	100	230
33	01115182	Unnamed Tributary #3 to Scituate Reservoir (Hall's Estate Brook)	1,400	4,800	9,100	33,000	7.2	26	2.3	8.1	3.8	14	110	410
Moswansicut Reservoir subbasin														
19	01115170	Moswansicut Reservoir (Moswansicut Stream North, Moswansicut Pond)	4,100	1,200	1,600	480	820	250	59	18	1,900	590	640	200

Table 8. Median daily loads and yields of bacteria, chloride, nitrite, nitrate, and orthophosphate by tributary reservoir subbasin, in the Scituate Reservoir drainage area, Rhode Island, October 1, 2002, through September 30, 2003.—Continued

[Water-quality data are from samples collected and analyzed by Providence Water (PW); USGS, U.S. Geological Survey; no., number; CFUx10^6/d; millions of colony forming units per day; CFUx10^6/mi², colony forming units per square mile; *E. coli*, *Escherichia coli*; kg/d, kilograms per day; kg/d/mi², kilograms per day per square mile; g/d, grams per day; g/d/mi², grams per day per square mile]

PW station no.	USGS station no.	Station name	Total coliform bacteria		*E. coli*		Chloride		Nitrite (as N)		Nitrate (as N)		Orthophosphate (as P)	
			(CFU 10^6/d)	(CFU 10^6/mi²)	(CFUx10^6/d)	(CFU 10^6/mi²)	(kg/d)	(kg/d/mi²)	(g/d)	(g/d/mi²)	(g/d)	(g/d/mi²)	(g/d)	(g/d/mi²)
		Moswansicut Reservoir subbasin—Continued												
21	01115165	Unnamed Tributary #2 to Moswansicut Reservoir (Brook from Kimball Reservoir)	98	340	76	260	33	110	2.1	7.3	6.7	23	21	73
		Regulating Reservoir subbasin												
14	01115110	Huntinghouse Brook	9,400	1,500	3,400	550	160	26	15	2.4	160	26	640	100
15	01115115	Regulating Reservoir (Rush Brook)	6,400	1,400	3,900	830	410	87	17	3.7	140	30	600	130
16	01115098	Peeptoad Brook (Harrisdale Brook)	10,000	2,100	730	150	380	77	16	3.3	340	68	340	68
18	01115120	Unnamed Tributary to Regulating Reservoir (Unnamed Brook A)	2,200	7,800	940	3,400	42	150	1.2	4.4	4.2	15	45	160
		Westconnaug Reservoir subbasin												
10	01115274	Westconnaug Brook	750	500	630	430	150	100	5.1	3.5	130	91	230	160
11	01115273	Unnamed Tributary to Westconnaug Reservoir (Unnamed Brook South of Westconnaug Reservoir)	15,000	21,000	13,000	18,000	1.5	2.1	1.9	2.6	3.2	4.4	57	79
		Scituate Reservoir basin												
		Median	2,200	1,200	940	490	140	67	15	6.5	140	62	340	180

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Table 3. Daily loads of bacteria, chloride, nitrite, nitrate, and orthophosphate by tributary reservoir subbasin in the Scituate Reservoir drainage area, Rhode Island, October 1, 2002, through September 30, 2003.

[Water-quality data are from samples collected and analyzed by Providence Water (PW); USGS, U.S. Geological Survey; no., number; ft^3/s, cubic feet per second; CFU 10^6/d; millions of colony forming units per day; *E. coli*, *Escherichia coli*; kg/d, kilograms per day; g/d, grams per day; --, no data]

PW station no.	USGS station no.	Station name	Date	Daily mean streamflow (ft^3/s)	Total coliform bacteria (CFU 10^6/d)	*E. coli* (CFU 10^6/d)	Chloride (kg/d)	Nitrite (g/d as N)	Nitrate (g/d as N)	Ortho-phosphate (g/d as P)
			Barden Reservoir subbasin							
24	01115190	Dolly Cole Brook	11/20/2002	6.7	12,000	7,000	270	16	--	--
			12/17/2002	13	2,900	2,900	500	32	320	320
			1/6/2003	18	4,000	1,800	750	44	1,300	440
			2/24/2003	46	10,000	10,000	2,900	340	4,500	5,600
			3/18/2003	51	8,700	1,900	4,000	250	5,000	7,500
			4/4/2003	32	1,200	1,200	2,100	78	3,100	12,000
			5/2/2003	15	16,000	1,500	1,000	37	370	6,600
			6/6/2003	21	12,000	12,000	1,200	100	260	1,000
			7/29/2003	1.2	7,000	7,000	7.6	5.9	15	350
			8/15/2003	4.2	7,700	7,700	200	31	100	2,100
			9/5/2003	5.1	300,000	57,000	260	25	250	620
25	01115200	Shippee Brook	10/18/2002	0.06	140	--	1.6	0.15	3.1	7.7
			4/29/2003	14	7,900	3,100	390	34	340	1,400
			7/18/2003	0.56	120	320	13	1.4	41	270
26	01115185	Windsor Brook	10/18/2002	0.13	300	22	11	0.32	9.5	6.4
			1/23/2003	2.1	770	--	120	5.1	36,000	100
			4/29/2003	16	9,000	590	730	39	390	1,200
			7/18/2003	0.90	1,700	200	58	2.2	150	530
28	01115265	Barden Reservoir	10/9/2002	0.20	110	110	11	0.98	44	59
			11/12/2002	4.1	46,000	4,300	270	30	50	100
			12/9/2002	1.2	620	620	59	8.8	59	59
			1/10/2003	23	8,400	8,400	920	56	1,700	560
			3/11/2003	27	990	990	1,300	130	660	7,900
			4/8/2003	40	3,900	3,900	2,100	98	2,000	5,900
			5/13/2003	13	14,000	14,000	830	64	160	4,500
			6/10/2003	29	31,000	2,800	1,300	210	350	9,900
			7/8/2003	3.5	6,400	1,300	240	43	43	860
			8/12/2003	8.4	490,000	490,000	350	140	100	2,100
			9/9/2003	2.7	5,000	1,500	9.2	20	33	1,300
35	01115187	Ponaganset River	10/7/2002	0.91	2,100	200	47	2.2	22	45
			11/20/2002	30	110,000	110,000	1,200	150	--	--
			12/17/2002	50	4,900	4,900	1,600	120	3,700	6,100
			1/6/2003	41	9,000	9,000	1,700	100	2,000	1,000
			2/24/2003	91	51,000	51,000	3,600	1,300	8,900	6,700
			3/18/2003	144	81,000	14,000	5,800	700	3,500	21,000
			4/4/2003	65	6,400	6,400	2,700	160	7,900	13,000
			5/2/2003	34	19,000	3,300	1,500	83	1,700	28,000
			6/6/2003	44	25,000	9,700	1,800	220	540	39,000
			7/29/2003	4.0	230,000	230,000	220	20	200	490
			8/15/2003	14	1,400	1,400	640	68	680	3,800
			9/5/2003	17	1,000,000	190,000	130	42	830	3,300

Table 3. Daily loads of bacteria, chloride, nitrite, nitrate, and orthophosphate by tributary reservoir subbasin in the Scituate Reservoir drainage area, Rhode Island, October 1, 2002, through September 30, 2003.—Continued

[Water-quality data are from samples collected and analyzed by Providence Water (PW); USGS, U.S. Geological Survey; no., number; ft^3/s, cubic feet per second; CFU × 10^6/d; millions of colony forming units per day; *E. coli*, *Escherichia coli*; kg/d, kilograms per day; g/d, grams per day; --, no data]

PW station no.	USGS station no.	Station name	Date	Daily mean streamflow (ft^3/s)	Total coliform bacteria (CFU × 10^6/d)	*E. coli* (CFU × 10^6/d)	Chloride (kg/d)	Nitrite (g/d as N)	Nitrate (g/d as N)	Ortho-phosphate (g/d as P)
			Direct Runoff subbasin							
1	01115180	Brandy Brook	10/3/2002	0.25	260	92	6.8	0.61	24	12
			11/6/2002	0.71	4,200	4,200	14	1.7	35	35
			12/3/2002	0.67	3,900	25	14	4.9	49	33
			1/8/2003	4.5	2,500	440	94	22	330	220
			2/4/2003	3.1	1,700	680	85	15	610	76
			3/4/2003	6.6	12,000	3,700	140	81	1,100	3,700
			4/1/2003	8.9	2,800	870	200	65	440	1,500
			5/6/2003	3.5	3,300	3,300	74	17	260	1,300
			6/3/2003	6.6	1,500	1,500	120	48	160	1,500
			7/1/2003	2.1	4,800	460	46	21	26	770
			8/5/2003	1.3	350	95	31	9.5	64	190
			9/2/2003	1.8	110,000	110,000	30	18	220	26,000
3	01115280	Cork Brook	10/28/2002	0.19	350	200	13	0.46	19	14
			11/8/2002	0.33	180	97	24	0.81	8.1	32
			12/5/2002	0.19	42	19	11	0.46	110	9.3
			3/17/2003	12	22,000	1,200	1,200	29	3,200	2,300
			4/3/2003	9.9	5,600	970	780	24	2,900	4,400
			5/1/2003	5.1	2,900	1,100	420	12	500	11,000
			6/3/2003	9.5	17,000	2,100	690	46	1,200	3,700
			7/3/2003	1.1	620	620	71	2.7	54	190
			8/7/2003	0.51	1,200	50	--	--	--	--
			9/4/2003	1.9	110,000	110,000	140	14	46	4,000
4	01115400	Kent Brook	11/6/2002	0.05	280	280	0.46	0.11	1.1	0.57
			12/3/2002	0.04	1.5	1.5	0.45	0.10	0.50	1.0
			1/8/2003	2.5	92	92	24	6.1	120	240
			2/4/2003	1.1	40	40	18	2.7	13	81
			3/4/2003	5.8	210	210	33	85	71	1,700
			4/1/2003	11	6,200	1,100	230	27	540	4,300
			5/6/2003	1.5	840	840	3.3	3.7	73	73
			6/3/2003	5.8	3,300	3,300	51	14	280	280
			7/1/2003	0.49	280	110	4.2	1.2	6.0	180
			8/5/2003	0.16	90	16	1.5	0.39	3.9	23
			9/2/2003	0.34	190	190	1.7	0.83	8.3	25
5	01115184	Spruce Brook	10/15/2002	0.08	85	7.9	4.6	0.20	5.9	2.0
			1/14/2003	2.9	280	--	99	14	28,000	430
			4/15/2003	7.4	270	270	290	18	1,100	2,500
			7/15/2003	0.66	3,900	24	31	160	16	240
6	01115183	Quonapaug Brook	11/6/2002	0.47	5,300	1,100	30	1.1	5.7	46
			12/3/2002	0.43	1,600	450	22	2.1	5.3	42
			1/8/2003	6.7	660	660	350	16	1,600	330
			3/4/2003	12	6,800	6,800	890	150	2,600	1,500
			4/1/2003	18	4,000	4,000	1,300	88	1,300	4,400
			5/6/2003	4.8	2,700	2,700	390	23	230	470
			6/3/2003	12	13,000	13,000	730	120	150	290
			7/1/2003	2.3	140,000	140,000	150	28	280	390
			8/5/2003	1.1	12,000	12,000	97	16	270	270
			9/2/2003	1.8	110,000	110,000	130	22	22	1,000

Table 3. Daily loads of bacteria, chloride, nitrite, nitrate, and orthophosphate by tributary reservoir subbasin in the Scituate Reservoir drainage area, Rhode Island, October 1, 2002, through September 30, 2003.—Continued

[Water-quality data are from samples collected and analyzed by Providence Water (PW); USGS, U.S. Geological Survey; no., number; ft^3/s, cubic feet per second; CFU 10^6/d; millions of colony forming units per day; *E. coli*, *Escherichia coli*; kg/d, kilograms per day; g/d, grams per day; --, no data]

PW station no.	USGS station no.	Station name	Date	Daily mean streamflow (ft^3/s)	Total coliform bacteria (CFU 10^6/d)	*E. coli* (CFU 10^6/d)	Chloride (kg/d)	Nitrite (g/d as N)	Nitrate (g/d as N)	Ortho-phosphate (g/d as P)
					Direct Runoff subbasin—Continued					
7	01115297	Wilbur Hollow Brook	10/28/2002	0.66	1,200	690	17	1.6	8.1	16
			11/8/2002	1.1	12,000	2,500	27	11	13	110
			12/5/2002	0.66	65	24	15	3.2	8.1	65
			1/30/2003	3.5	340	130	94	26	600	340
			2/6/2003	8.1	4,600	1,800	220	40	1,400	590
			3/17/2003	30	32,000	32,000	590	73	2,900	8,800
			4/3/2003	26	15,000	15,000	500	130	1,900	7,000
			5/1/2003	14	5,100	5,100	330	68	170	5,500
			6/5/2003	21	20,000	20,000	410	310	260	4,100
			7/3/2003	3.4	1,900	1,900	8.3	42	42	1,300
			8/7/2003	1.7	19,000	370	33	29	21	580
			9/4/2003	5.7	6,000	3,200	170	56	70	6,700
8	01115276	Westconnaug Brook	5/9/2003	9.2	340	340	290	23	230	680
			6/13/2003	12	440	440	400	29	880	1,500
9	01115275	Bear Tree Brook	10/15/2002	0.36	660	13	46	0.88	44	18
			1/14/2003	1.6	59	--	190	7.8	12,000	230
			4/15/2003	2.3	84	84	270	5.6	730	1,000
			7/15/2003	0.86	50,000	190	150	250	21	150
32	01115178	Unnamed Tributary #1 to Scituate Reservoir (Pine Swamp Brook)	10/30/2002	0.11	400	--	3.1	0.54	1.3	5.4
			4/17/2003	0.93	520	520	26	2.3	270	270
			7/17/2003	0.25	15,000	1,300	7.6	1.8	12	100
33	01115182	Unnamed Tributary #3 to Scituate Reservoir (Hall's Estate Brook)	10/23/2002	0.01	56	--	0.13	0.01	0.24	0.37
			4/14/2003	2.4	1,400	88	56	2.9	700	880
			7/23/2003	0.31	8,300	18,000	7.2	2.3	3.8	110
					Moswansicut Reservoir subbasin					
19	01115170	Moswansicut Reservoir (Moswansicut Stream North, Moswansicut Pond)	11/18/2002	26	150,000	59,000	1,900	130	1,900	640
			12/12/2002	12	13,000	13,000	820	59	1,500	150
			1/15/2003	5.9	5,800	220	460	29	430	140
			2/13/2003	3.5	130	130	260	26	680	1,500
			3/20/2003	20	730	730	1,400	98	3,400	980
			4/10/2003	16	1,600	1,600	1,300	78	4,300	1,200
			5/8/2003	7.2	4,100	4,100	570	35	1,900	530
21	01115165	Unnamed Tributary #2 to Moswansicut Reservoir (Brook from Kimball Reservoir)	10/24/2002	0.09	98	--	7.1	0.45	2.3	9.1
			4/25/2003	0.86	32	32	75	2.1	290	21
			7/25/2003	0.55	310	120	33	8.1	6.7	94
					Regulating Reservoir subbasin					
14	01115110	Huntinghouse Brook	11/4/2002	0.28	100	62	7.9	1.4	6.8	27
			12/2/2002	0.62	650	23	14	1.5	7.6	61
			1/2/2003	59	660,000	110,000	1,100	140	4,300	2,900
			2/3/2003	6.1	6,400	3,400	320	15	1,200	150
			3/3/2003	55	31,000	31,000	1,300	270	5,400	19,000
			4/7/2003	29	2,800	2,800	740	71	2,800	5,000
			5/15/2003	6.5	3,700	3,700	160	16	160	640
			6/2/2003	71	130,000	75,000	1,300	350	1,700	16,000
			7/7/2003	1.6	9,400	1,700	8.2	3.9	39	900
			8/4/2003	1.7	100,000	100,000	51	8.3	120	330
			9/15/2003	0.51	30,000	940	10	1.2	25	75

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PW station no.	USGS station no.	Station name	Date	Daily mean streamflow (ft^3/s)	Total coliform bacteria (CFU 10^6/d)	*E. coli* (CFU 10^6/d)	Chloride (kg/d)	Nitrite (g/d as N)	Nitrate (g/d as N)	Ortho-phosphate (g/d as P)
				Regulating Reservoir subbasin—Continued						
15	01115115	Regulating Reservoir (Rush Brook)	11/4/2002	0.24	53	53	5.6	1.2	5.9	23
			12/2/2002	0.52	290	19	45	2.5	51	130
			1/2/2003	42	77,000	77,000	2,200	100	6,200	2,100
			3/3/2003	39	22,000	22,000	3,000	190	5,700	5,700
			4/7/2003	21	4,600	4,600	2,400	51	3,600	5,100
			5/15/2003	5.0	2,800	2,800	630	24	61	860
			6/2/2003	51	94,000	94,000	3,600	370	2,500	6,200
			7/7/2003	1.3	2,400	2,400	170	3.2	220	350
			8/4/2003	1.4	8,200	3,200	180	10	34	100
			9/15/2003	0.43	25,000	25,000	55	1.1	32	95
16	01115098	Peeptoad Brook (Harrisdale Brook)	10/1/2002	0.37	390	210	21	0.91	18	4.5
			11/4/2002	0.87	32	32	55	4.3	11	21
			12/2/2002	1.5	1,600	330	130	7.3	290	110
			1/2/2003	36	410,000	410,000	2,600	88	11,000	2,600
			2/3/2003	7.4	270	270	500	18	2,200	180
			3/3/2003	34	19,000	19,000	3,000	170	10,000	8,300
			4/7/2003	22	810	810	2,000	54	8,100	2,700
			5/15/2003	7.7	750	280	680	38	380	750
			6/2/2003	41	2,400,000	1,100,000	3,300	200	1,000	6,000
			7/7/2003	2.9	33,000	5,300	250	14	71	500
			8/4/2003	3.0	34,000	660	260	15	73	73
			9/15/2003	1.3	76,000	2,400	110	6.4	32	32
18	01115120	Unnamed Tributary to Regulating Reservoir (Unnamed Brook A)	4/25/2003	0.36	79	79	60	0.88	4.4	62
			7/25/2003	0.16	4,300	1,800	25	1.6	3.9	27
				Westconnaug Reservoir subbasin						
10	01115274	Westconnaug Brook	11/12/2002	0.71	750	750	34	3.5	52	69
			12/9/2002	0.19	7.0	7.0	9.7	1.4	37	9.3
			1/10/2003	4.8	180	180	240	12	940	120
			3/24/2003	13	--	--	700	32	950	4,500
			4/8/2003	8.5	310	310	540	10	1,000	420
			5/13/2003	2.6	250	250	200	6.4	190	510
			6/10/2003	6.1	3,400	1,300	440	15	300	1,300
			7/8/2003	0.60	1,100	630	25	1.5	59	88
			8/12/2003	1.6	94,000	94,000	110	3.9	78	350
			9/9/2003	0.46	2,700	2,700	25	1.1	11	110
11	01115273	Unnamed Tributary to Westconnaug Reservoir (Unnamed Brook South of Westconnaug Reservoir)	10/22/2002	0.04	73	--	0.46	0.20	0.49	0.98
			4/22/2003	5.3	19,000	19,000	73	13	130	780
			7/22/2003	0.26	15,000	7,000	1.5	1.9	3.2	57

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For more information concerning this report, contact:

Office of the Deputy Director
U.S. Geological Survey
Rhode Island Subdistrict Office
42 Albion Road, Suite 107
Lincoln, RI 02865
rbreault@usgs.gov

or visit our Web site at:
http://ri.water.usgs.gov

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