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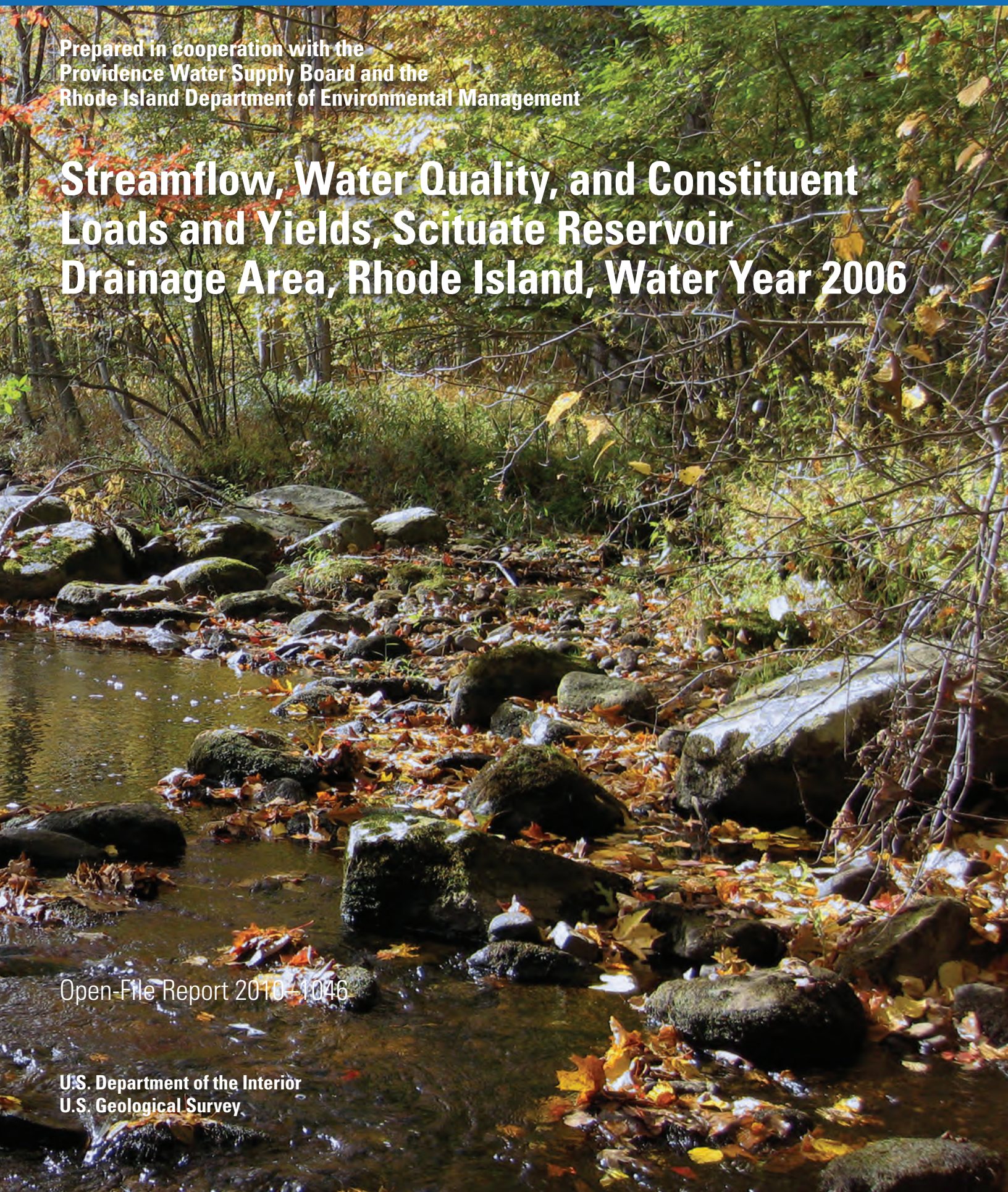
Streamflow, Water Quality, and Constituent Loads and Yields, Scituate Reservoir Drainage Area, Rhode Island, Water Year 2006



Open-File Report 2010–1046

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

Cover. Photograph shows Rush Brook in autumn.

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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 2006

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) 2006 (October 1, 2005, to September 30, 2006). Water-quality samples were also collected at 37 sampling stations in the Scituate Reservoir drainage area by the Providence Water Supply Board during WY 2006 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 2006.

The largest tributary to the reservoir (the Ponaganset River, which was monitored by the USGS) contributed about 42 cubic feet per second (ft^3/s) to the reservoir during WY 2006. For the same time period, annual mean streamflows[1] measured (or estimated) for the other monitoring stations in this study ranged from about 0.60 to 26 ft^3/s. Together, tributary streams (equipped with instrumentation capable of continuously monitoring specific conductance) transported about 1,600,000 kilograms (kg) of sodium and 2,500,000 kg of chloride to the Scituate Reservoir during WY 2006; sodium and chloride yields for the tributaries ranged from 15,000 to 100,000 kilograms per square mile (kg/mi^2) and from 22,000 to 180,000 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 24.6 milligrams per liter (mg/L), median nitrite concentration was 0.001 mg/L as N, median nitrate concentration was 0.02 mg/L as N, median orthophosphate concentration was 0.07 mg/L as P, and median concentrations of total coliform and *Escherichia coli* (*E. coli*) bacteria were 43 and 23 colony forming units per 100 milliliters (CFU/100 mL), respectively. The medians of the median daily loads (and yields) of chloride, nitrite, nitrate, orthophosphate, and total coliform and *E. coli* bacteria were 230 kg/d (81 $kg/d/mi^2$), 17 g/d (4.4 $g/d/mi^2$), 130 g/d (50 $g/d/mi^2$), 470 g/d (210 $g/d/mi^2$), and 2,100 million colony forming units per day (CFU 10^6/d) (1,300 CFU $10^6/d/mi^2$) and 670 CFU 10^6/d (420 CFU 106/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) 2006 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 2006 also are presented, and these data were used to calculate loads and yields of selected water-quality constituents (table 1).

[2] October 1, 2005, to September 30, 2006.

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 2006 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 (U.S. Geological Survey, 2007); upper and lower 90-percent confidence limits calculated by methods described by the National Institute of

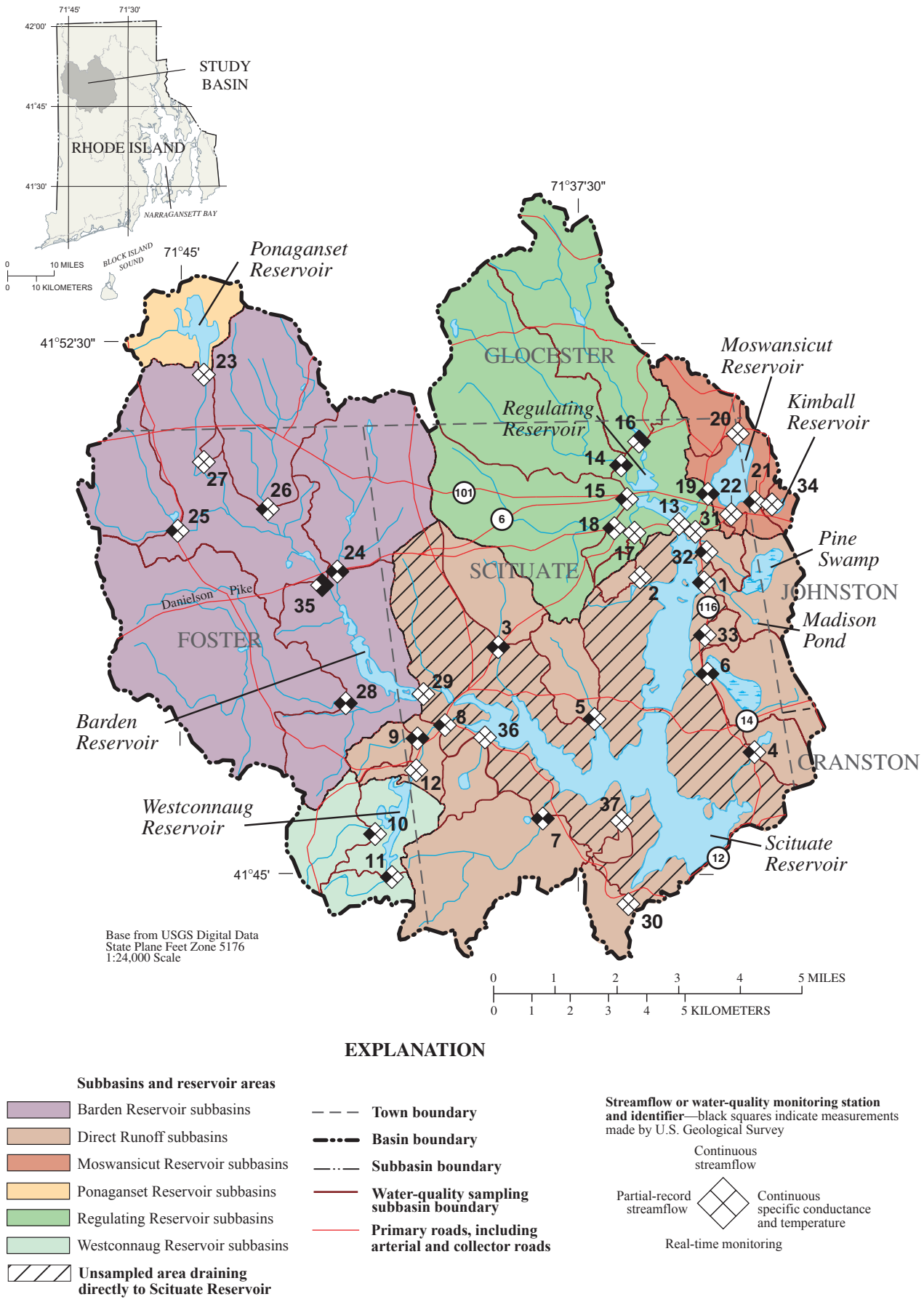

Figure 1. Locations of tributary-reservoir subbasins and streamgage and water-quality monitoring stations in the Scituate Reservoir drainage area, Rhode Island.

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, 2005, to September 30, 2006.

[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	4	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	12	Y	Y
29	01115271	Ponaganset River (Barden Stream)	33.0	Y	M	11	N	N
35	01115187	Ponaganset River	14.0	Y	M	11	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	3	N	N
3	01115280	Cork Brook	1.79	Y	M	11	Y	Y
4	01115400	Kent Brook (Betty Pond Stream)	0.85	Y	M	12	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	10	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	4	N	Y
33	01115182	Unnamed Tributary #3 to Scituate Reservoir (Hall's Estate Brook)	0.28	Y	Q	4	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, 2005, to September 30, 2006.—Continued

[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
		Moswansicut Reservoir subbasin						
19	01115170	Moswansicut Reservoir (Moswansicut Stream North, Moswansicut Pond)	3.25	Y	M	10	Y	Y
20	01115160	Unnamed Tributary #1 to Moswansicut Reservoir (Blanchard Brook)	1.18	Y	M	11	N	N
21	01115165	Unnamed Tributary #2 to Moswansicut Reservoir (Brook from Kimball Reservoir)	0.29	Y	Q	4	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	12	N	N
		Regulating Reservoir subbasin						
13	01115176	Regulating Reservoir	22.1	Y	M	12	N	N
14	01115110	Huntinghouse Brook	6.23	Y	M	11	Y	Y
15	01115114	Regulating Reservoir (Rush Brook)	4.70	Y	M	11	N	Y
16	01115098	Peeptoad Brook (Harrisdale Brook)	4.96	Y	M	11	Y	N
17	01115119	Dexter Pond (Paine Pond)	0.22	Y	Q	4	N	N
18	01115120	Unnamed Tributary to Regulating Reservoir (Unnamed Brook A)	0.28	Y	Q	3	N	Y
		Westconnaug Reservoir subbasin						
10	01115274	Westconnaug Brook	1.48	Y	M	12	N	Y
11	01115273	Unnamed Tributary to Westconnaug Reservoir (Unnamed Brook south of Westconnaug Reservoir)	0.72	Y	Q	4	N	Y
12	011152745	Unnamed Tributary to Westconnaug Brook (Unnamed Brook north of Westconnaug Reservoir)	0.16	Y	Q	4	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, 2005, through September 30, 2006.

[PW, Providence Water; USGS, U.S. Geological Survey; 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	15	54	4.2	3.1
25	01115200	Shippee Brook	13	45	3.8	5.5
26	01115185	Windsor Brook	14	50	3.8	3.2
28	01115265	Barden Reservoir (Hemlock Brook)	26	68	10	3.0
35	01115187	Ponaganset River	42	47	36	3.0
		Direct Runoff subbasin				
1	01115180	Brandy Brook	3.9	9.2	1.7	2.5
3	01115280	Cork Brook	5.4	13	2.3	3.0
4	01115400	Kent Brook (Betty Pond Stream)	3.6	32	0.41	4.2
5	01115184	Spruce Brook	4.9	20	1.2	4.0
6	01115183	Quonapaug Brook	6.6	19	2.3	3.4
7	01115297	Wilbur Hollow Brook	14	58	3.4	3.2
8	01115276	Westconnaug Brook (Westconnaug Reservoir)	8.6	17	4.3	1.7
9	01115275	Bear Tree Brook	1.7	3.1	0.89	2.7
32	01115178	Unnamed Tributary #1 to Scituate Reservoir (Pine Swamp Brook)	0.75	1.3	0.42	1.7
33	01115182	Unnamed Tributary #3 to Scituate Reservoir (Hall's Estate Brook)	1.4	3.7	0.54	5.0
		Moswansicut Reservoir subbasin				
19	01115170	Moswansicut Reservoir (Moswansicut Stream North, Moswansicut Pond)	9.3	39	2.2	2.9
21	01115165	Unnamed Tributary #2 to Moswansicut Reservoir (Blanchard Brook)	0.90	3.9	0.21	3.1
		Regulating Reservoir subbasin				
14	01115110	Huntinghouse Brook	21	66	6.4	3.3
15	01115115	Regulating Reservoir (Rush Brook)	15	49	4.5	3.1
16	01115098	Peeptoad Brook (Harrisdale Brook)	14	16	13	2.9
18	01115120	Unnamed Tributary to Regulating Reservoir	0.60	1.5	0.24	2.1
		Westconnaug Reservoir subbasin				
10	01115274	Westconnaug Brook	5.7	18	1.8	3.8
11	01115273	Unnamed Tributary to Westconnaug Reservoir (Unnamed Brook South of Westconnaug Reservoir)	5.8	19	1.8	8.1

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):

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

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

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.

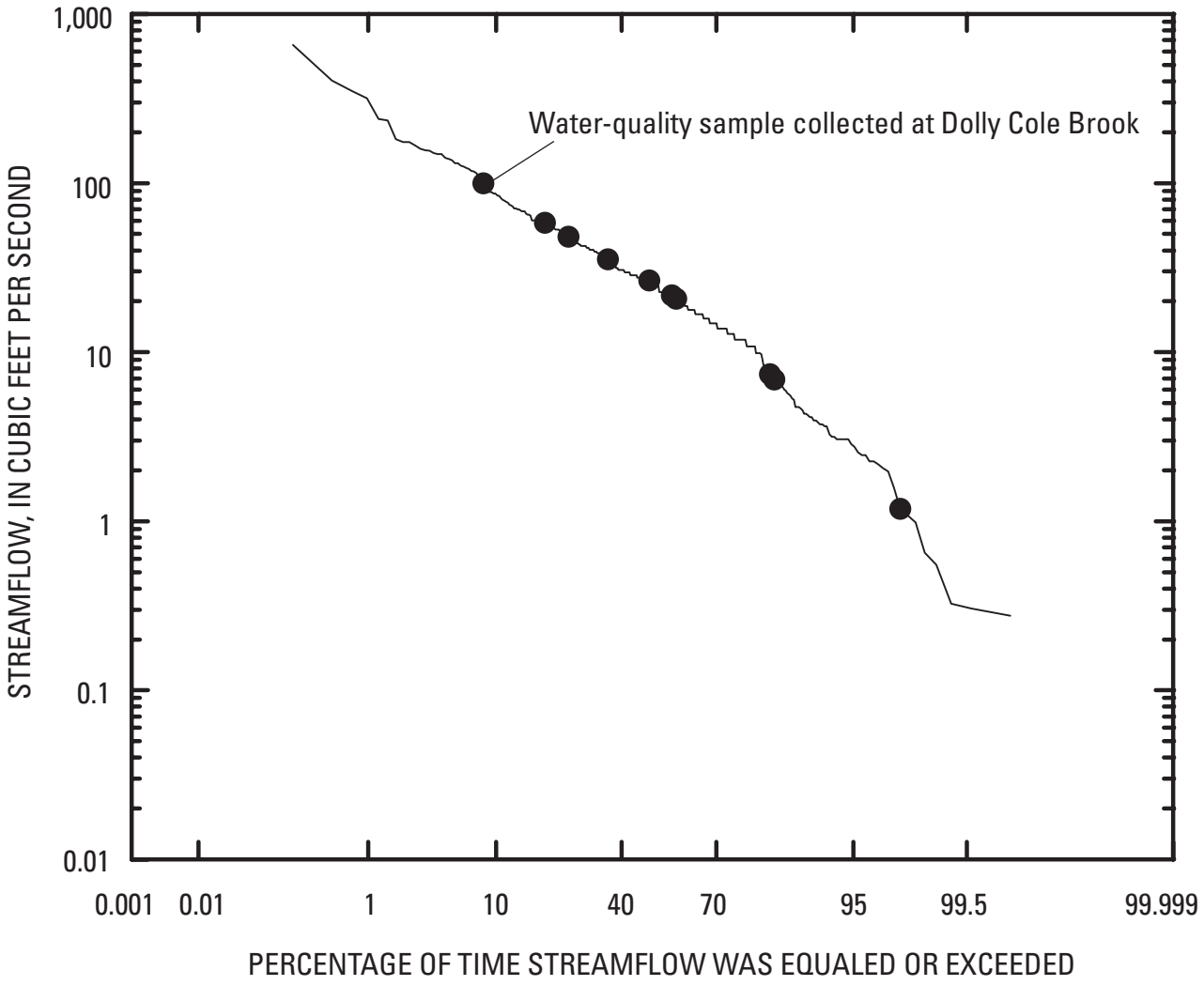

Figure 2. Flow-duration curve for the U.S. Geological Survey continuous streamgage station on Ponaganset River at South Foster (station 01115187) for water year 2006 and streamflow measurements at the Ponaganset River gaging station on the dates when water-quality samples were collected at Dolly Cole 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 2006. 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 2006 (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 2006, annual mean streamflow was 42 ft^3/s (fig. 3; U.S. Geological Survey, 2007). Mean streamflow in Peeptoad Brook (01115098), the other continuous streamgage station in the Scituate Reservoir drainage area (USGS station number 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 2006 was 14 ft^3/s (U.S. Geological Survey, 2007).

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 2006 was considerably higher than average (67 ft^3/s; U.S. Geological Survey, 2007). Annual mean streamflows estimated for partial-record monitoring stations are given in table 2. Estimated annual mean streamflows at partial record stations ranged from 0.60 to 26 ft^3/s. Annual mean streamflows normalized by drainage area ranged from 1.7 to 8.1 $ft^3/s/mi^2$ (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.

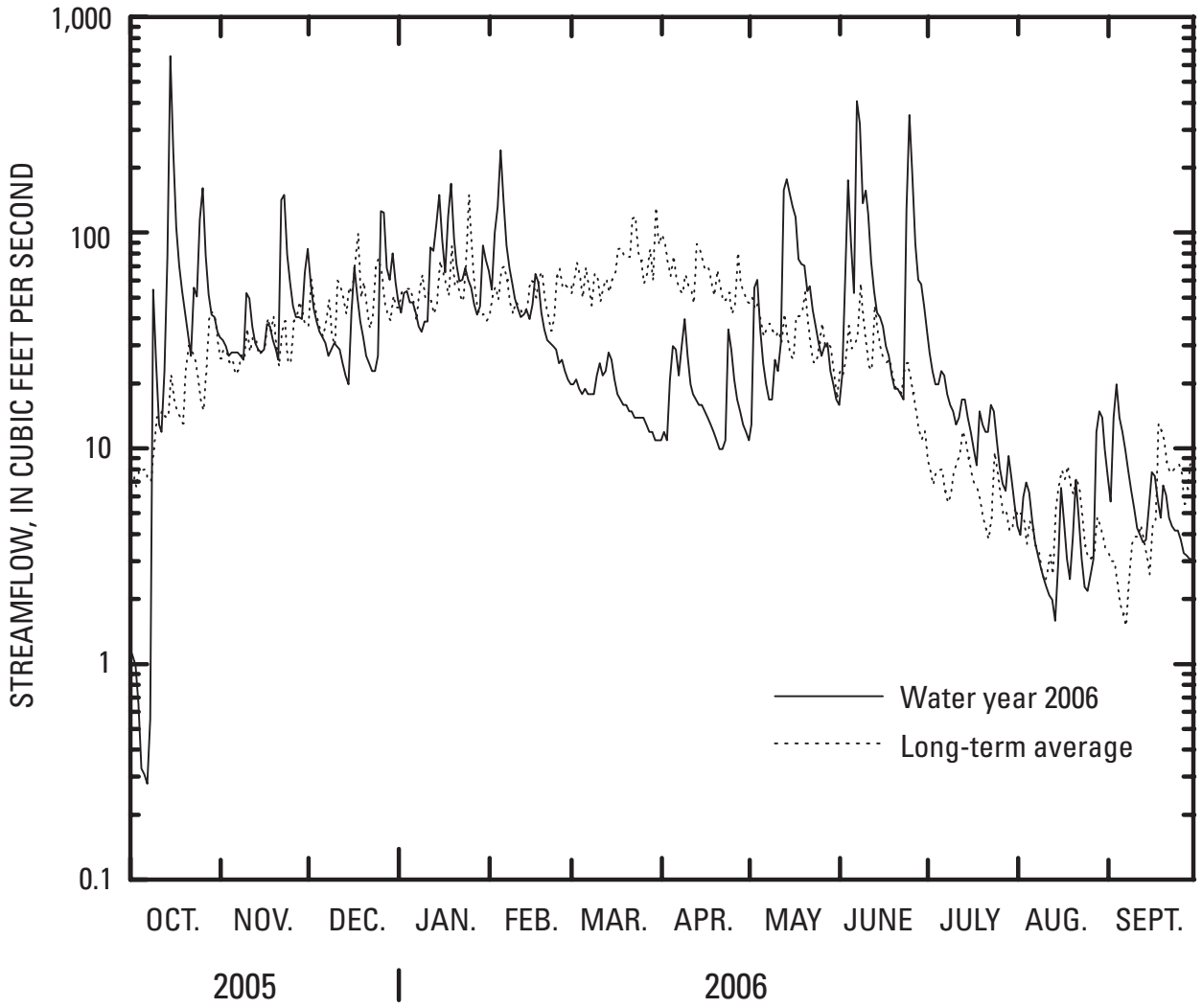

Figure 3. Measured daily mean streamflow for the U.S. Geological Survey continuous-record gaging station on the Ponaganset River at South Foster (station 01115187) in the Scituate Reservoir drainage area, Rhode Island, for October 1, 2005, through September 30, 2006 (solid line), and mean daily streamflow 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 4.0 to 73.2 mg/L, and estimated monthly mean chloride concentrations ranged from 5.7 to 133 mg/L. The highest monthly mean concentrations of sodium and chloride were measured at station 9 (Bear Tree Brook) in August 2006 (73.2 and 133 mg/L, respectively) (table 4). The highest annual mean[4] concentrations of sodium and chloride were measured at station 9 (Bear Tree Brook) at 42.8 and 74.6 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 1,600,000 kg (about 1,763 tons) of sodium and 2,500,000 kg (about 2,755 tons) of chloride from tributary streams—equipped with instrumentation capable of continuously monitoring specific conductance—during WY 2006. The highest sodium and chloride loads in WY 2006—330,000 and 500,000 kg, respectively—were measured at the Ponaganset River station (Providence Water Station Number 35) (table 5). Monthly sodium and chloride loads were highest in January (at four stations), June (three stations), October (two stations), and May (one station) (table 6). These sodium and chloride loads accounted for about 4, 8, 0.5, and 4 percent of the annual load for each constituent, respectively. The highest annual sodium and chloride yields were 100,000 and 180,000 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 5.2 to 6.7; the median of the medians among all stations was 6.1. Median values of color ranged from 17 to 190 platinum cobalt units (PCU); the median among all stations was 40 PCU. Median values of turbidity ranged from 0.2 to 1.3 nephelometric turbidity units (NTU); the median among all stations was 0.4 NTU. Median alkalinity values in tributary streams were low, ranging from 2.2 to 13 mg/L as $CaCO_3$; the median among all stations was 4.6 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, 2005, through September 30, 2006.

[PW, Providence Water; USGS, U.S. Geological Survey; 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	20.0	12.8	21.4	13.6	21.4	13.6	22.4	14.2	21.5	13.7	24.9	15.7
28	01115265	Barden Reservoir (Hemlock Brook)	18.2	11.7	17.7	11.4	14.9	9.8	14.8	9.7	14.6	9.6	20.5	13.1
35	01115187	Ponaganset River	20.7	9.4	15.4	9.8	14.4	9.4	14.9	9.5	13.5	8.7	16.2	10.4
Direct Runoff subbasin														
3	01115280	Cork Brook	22.8	14.4	24.8	15.6	25.7	16.1	27.5	17.1	24.4	15.3	28.5	17.7
6	01115183	Quonapaug Brook	49.4	29.4	26.9	16.8	27.7	17.2	30.0	18.5	27.0	16.8	32.8	20.2
7	01115297	Wilbur Hollow Brook	8.1	5.6	10.3	7.0	8.7	5.9	8.7	6.0	8.8	6.0	11.3	7.5
9	01115275	Bear Tree Brook	57.7	33.7	73.2	42.1	74.2	42.6	63.9	37.2	62.3	36.3	90.1	51.1
Moswansicut Reservoir subbasin														
19	01115170	Moswansicut Reservoir (Moswansicut Stream North, Moswansicut Pond)	35.2	21.5	36.7	22.3	40.6	24.5	41.6	25.1	41.4	25.0	42.1	25.4
Regulating Reservoir subbasin														
14	01115110	Huntinghouse Brook	8.3	5.7	8.2	5.6	6.9	4.8	7.3	5.0	7.9	5.4	11.6	7.7
16	01115098	Peeptoad Brook (Harrisdale Brook)	29.2	18.1	28.8	17.9	30.5	18.8	30.9	19.1	29.7	18.4	33.3	20.4
Scituate Reservoir basin														
		Average	27.0	16.2	26.3	16.2	26.5	16.3	26.2	16.2	25.1	15.5	31.1	18.9

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	26.1	16.3	19.5	12.5	13.5	8.9	19.6	12.5	29.3	18.1	27.7	17.3
28	01115265	Barden Reservoir (Hemlock Brook)	18.7	12.0	13.4	8.8	11.2	7.5	17.0	11.0	25.8	16.2	26.5	16.5
35	01115187	Ponaganset River	18.2	11.5	14.9	8.8	11.2	6.3	14.1	9.1	18.3	11.6	21.4	13.2
Direct Runoff subbasin														
3	01115280	Cork Brook	32.9	20.2	23.8	15.0	17.0	11.0	23.0	14.5	28.0	17.4	36.3	22.2
6	01115183	Quonapaug Brook	37.0	22.5	28.2	17.5	23.2	14.6	34.4	21.1	58.7	34.4	52.1	30.8
7	01115297	Wilbur Hollow Brook	11.7	7.8	8.2	5.6	8.5	5.8	11.5	7.7	15.3	10.0	14.2	9.3
9	01115275	Bear Tree Brook	89.1	50.5	72.6	41.8	58.3	34.2	97.9	55.1	133	73.2	130	71.2
Moswansicut Reservoir subbasin														
19	01115170	Moswansicut Reservoir (Moswansicut Stream North, Moswansicut Pond)	40.8	24.7	40.1	24.3	38.1	23.1	28.6	17.7	33.3	20.4	37.6	22.9
Regulating Reservoir subbasin														
14	01115110	Huntinghouse Brook	11.4	7.6	7.4	5.1	5.7	4.0	10.0	6.8	13.9	9.1	15.4	10.1
16	01115098	Peeptoad Brook (Harrisdale Brook)	36.3	22.1	30.4	18.8	20.3	12.9	24.2	15.2	27.0	16.8	28.1	17.5
Scituate Reservoir basin														
		Average	32.2	19.5	25.9	15.8	20.7	12.8	28.0	17.1	38.3	22.7	38.9	23.1

Table 5. Annual mean chloride and sodium concentrations, loads, and yields by sampling station in the Scituate Reservoir drainage area, Rhode Island, October 1, 2005, through September 30, 2006.

[PW, Providence Water; USGS, U.S. Geological Survey; 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	19.6	12.6	270,000	170,000	54,000	35,000
28	01115265	Barden Reservoir (Hemlock Brook)	15.1	9.8	350,000	230,000	40,000	26,000
35	01115187	Ponaganset River	13.5	8.9	500,000	330,000	36,000	24,000
Direct Runoff subbasin								
3	01115280	Cork Brook	23.6	14.9	110,000	72,000	63,000	40,000
6	01115183	Quonapaug Brook	30.9	19.0	180,000	110,000	93,000	57,000
7	01115297	Wilbur Hollow Brook	9.0	6.1	110,000	77,000	26,000	18,000
9	01115275	Bear Tree Brook	74.6	42.8	110,000	63,000	180,000	100,000
Moswansicut Reservoir subbasin								
19	01115170	Moswansicut Reservoir, (Moswansicut Stream North, Moswansicut Pond)	38.9	23.6	320,000	200,000	100,000	60,000
Regulating Reservoir subbasin								
14	01115110	Huntinghouse Brook	7.5	5.2	140,000	95,000	22,000	15,000
16	01115098	Peeptoad Brook, (Harrisdale Brook)	28.4	17.6	360,000	220,000	73,000	45,000
Scituate Reservoir basin								
			Average		Total		Average	
			26.1	16.0	2,500,000	1,600,000	68,000	42,000

Table 6. Monthly estimated chloride and sodium loads by sampling station in the Scituate Reservoir drainage area, Rhode Island, October 1, 2005, through September 30, 2006.

[PW, Providence Water; USGS, U.S. Geological Survey; 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	38,000	24,000	23,000	15,000	27,000	17,000	43,000	27,000	35,000	22,000	7,900	5,000
28	01115265	Barden Reservoir (Hemlock Brook)	55,000	36,000	35,000	23,000	34,000	22,000	49,000	32,000	40,000	27,000	14,000	9,000
35	01115187	Ponaganset River	73,000	48,000	49,000	32,000	50,000	33,000	76,000	50,000	54,000	36,000	21,000	14,000
Direct Runoff subbasin														
3	01115280	Cork Brook	15,000	9,400	10,000	6,300	12,000	7,400	19,000	12,000	14,000	8,900	3,700	2,300
6	01115183	Quonapaug Brook	37,000	22,000	14,000	8,700	16,000	10,000	25,000	16,000	19,000	12,000	6,400	3,900
7	01115297	Wilbur Hollow Brook	13,000	9,000	11,000	7,500	11,000	7,300	16,000	11,000	13,000	8,900	4,400	2,900
9	01115275	Bear Tree Brook	8,000	4,700	10,000	5,900	11,000	6,400	12,000	6,700	9,500	5,500	8,400	4,800
Moswansicut Reservoir subbasin														
19	01115170	Moswansicut Reservoir (Moswansicut Stream North, Moswansicut Pond)	36,000	22,000	27,000	17,000	34,000	21,000	49,000	29,000	41,000	25,000	13,000	7,800
Regulating Reservoir subbasin														
14	01115110	Huntinghouse Brook	23,000	16,000	12,000	8,000	11,000	7,900	19,000	13,000	17,000	12,000	4,200	2,800
16	01115098	Peeptoad Brook (Harrisdale Brook)	45,000	28,000	33,000	20,000	39,000	24,000	55,000	34,000	44,000	27,000	16,000	9,600
Scituate Reservoir basin														
		Total	340,000	220,000	220,000	140,000	240,000	160,000	360,000	230,000	290,000	180,000	99,000	62,000

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	9,200	5,800	34,000	22,000	39,000	26,000	6,500	4,200	1,100	660	1,300	780
28	01115265	Barden Reservoir (Hemlock Brook)	14,000	8,900	40,000	26,000	51,000	34,000	12,000	7,700	2,600	1,700	3,200	2,000
35	01115187	Ponaganset River	24,000	16,000	55,000	36,000	66,000	45,000	16,000	10,000	6,700	4,300	9,800	6,300
Direct Runoff subbasin														
3	01115280	Cork Brook	4,700	2,900	15,000	9,300	17,000	11,000	3,100	2,000	500	310	770	470
6	01115183	Quonapaug Brook	7,700	4,700	21,000	13,000	26,000	16,000	6,700	4,100	1,900	1,100	2,000	1,200
7	01115297	Wilbur Hollow Brook	4,900	3,300	13,000	8,900	20,000	14,000	4,500	3,000	930	610	1,000	670
9	01115275	Bear Tree Brook	8,400	4,700	12,000	6,800	11,000	6,400	9,000	5,000	5,600	3,100	5,400	3,000
Moswansicut Reservoir subbasin														
19	01115170	Moswansicut Reservoir (Moswansicut Stream North, Moswansicut Pond)	13,000	7,900	42,000	25,000	57,000	35,000	8,700	5,400	1,900	1,200	2,500	1,500
Regulating Reservoir subbasin														
14	01115110	Huntinghouse Brook	4,700	3,200	18,000	12,000	24,000	17,000	3,900	2,700	490	320	710	460
16	01115098	Peeptoad Brook (Harrisdale Brook)	18,000	11,000	48,000	30,000	46,000	30,000	11,000	7,100	2,400	1,500	2,800	1,800
Scituate Reservoir basin														
		Total	110,000	68,000	300,000	190,000	360,000	230,000	81,000	51,000	24,000	15,000	30,000	18,000

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 43 CFU/100 mL for total coliform bacteria and 23 CFU/100 mL for *E. coli* bacteria. Median concentrations of total coliform and *E. coli* bacteria were greatest (2,400 CFU/100 mL for both) at the Unnamed Tributary #2 to Scituate Reservoir (Providence Water Station 2) (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 yields were at station 6 (Quonapaug Brook) 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 daily loads of total coliform bacteria for the entire Scituate Reservoir drainage area ranged from 35 to 65,000 CFU 10^6/day, and median daily yields ranged from 24 to 22,000 CFU 10^6/day/mi^2. The median daily loads for *E. coli* for the entire drainage area ranged from 18 to 13,000 CFU 10^6/day, and median daily yields ranged from 34 to 4,500 CFU 10^6/day/mi^2 (table 8).

Chloride

The highest median chloride concentration (74.9 mg/L) was measured in the Direct Runoff subbasin at the Bear Tree Brook station (9) (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 81 kg/d/mi^2. Ponaganset River (35) had the largest median daily chloride load (1,100 kg/d), whereas the largest median daily chloride yield was determined for Bear Tree Brook (9) (370 kg/d/mi^2); this yield is lower than the annual mean chloride yield (180,000 kg/yr/mi^2 (table 5) or about 490 kg/d/mi^2) measured at that station by using continuously measured specific-conductance records.

Nutrients

Median concentrations of nitrite and nitrate (table 7) were 0.001 and 0.02 mg/L as N, respectively. Relatively high concentrations of nitrite and nitrate at some monitoring sites, such as Moswansicut Reservoir (22) in the Moswansicut Reservoir subbasin (0.007 mg/L as N and 0.16 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 0.07 mg/L as P. The maximum median concentration of orthophosphate (0.39 mg/L as P) was measured at Toad Pond (31). Nutrient loadings from the Ponaganset River (35) into the Scituate Reservoir—nitrite (88 g/d), nitrate (1,300 g/d), and orthophosphate (1,600 g/d)—were among the largest of all the sampled stations. Median daily orthophosphate loads for WY 2006 were larger at only two stations, Wilbur Hollow Brook (7; 2,000 g/d) and Regulating Reservoir (15; 2,300 g/d). The largest median daily nutrient yield for nitrite (26 g/d/mi^2) was determined at Unnamed Tributary to Westconnaug Reservoir (11), for nitrate (770 g/d/mi^2) at Bear Tree Brook (9), and for orthophosphate (690 g/d/mi^2) at Quonapaug Brook (6) (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, 2005, through September 30, 2006.

[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	5.8	37	0.5	75	23	3.0	25.0	0.001	0.01	0.06
25	01115200	Shippee Brook	5.5	40	0.3	23	23	4.1	10.6	0.001	0.02	0.24
26	01115185	Windsor Brook	5.9	45	0.3	4	4	3.5	21.9	0.001	0.02	0.15
27	011151845	Unnamed Tributary to Ponaganset River (Unnamed Brook B, Unnamed Brook West of Windsor Brook)	5.7	23	0.3	43	23	3.3	9.8	0.001	0.06	0.07
28	01115265	Barden Reservoir (Hemlock Brook)	5.6	110	0.5	160	49	2.5	24.9	0.002	0.01	0.05
29	01115271	Ponaganset River (Barden Stream)	5.8	48	0.5	4	4	3.0	19.8	0.002	0.03	0.06
35	01115187	Ponaganset River	6.1	48	0.6	23	4	3.3	18.7	0.001	0.02	0.06
Direct Runoff subbasin												
1	01115180	Brandy Brook	6.7	75	1.3	33	7	8.5	11.7	0.002	0.01	0.08
2	01115181	Unnamed Tributary #2 to Scituate Reservoir (Unnamed Brook North of Bullhead Brook)	5.9	19	0.2	2,400	2,400	4.0	--	0.001	0.07	0.03
3	01115280	Cork Brook	6.1	36	0.3	43	4	4.1	31.7	0.001	0.02	0.07
4	01115400	Kent Brook (Betty Pond Stream)	6.3	29	0.4	39	<3	5.9	4.1	0.001	0.02	0.04
5	01115184	Spruce Brook	6.0	54	0.3	68	4	3.6	13.9	0.001	0.07	0.08
6	01115183	Quonapaug Brook	6.2	95	0.6	340	59	7.1	33.7	0.002	0.02	0.10
7	01115297	Wilbur Hollow Brook	6.1	100	0.6	43	23	5.1	11.8	0.002	0.01	0.09
8	01115276	Westconnaug Brook (Westconnaug Reservoir)	5.7	23	0.3	3	<3	2.5	13.2	0.001	0.02	0.06
9	01115275	Bear Tree Brook	6.2	35	0.3	33	23	5.4	74.9	0.001	0.11	0.09
30	01115350	Unnamed Tributary #4 to Scituate Reservoir (Coventry Brook, Knight Brook)	5.9	58	0.4	33	23	3.6	24.3	0.002	0.03	0.10
31	01115177	Toad Pond	6.3	35	0.7	1,200	54	9.8	44.1	0.007	0.38	0.39
32	01115178	Unnamed Tributary #1 to Scituate Reservoir (Pine Swamp Brook)	6.2	56	0.7	120	23	5.6	10.2	0.003	0.04	0.13
33	01115182	Unnamed Tributary #3 to Scituate Reservoir (Hall's Estate Brook)	5.7	38	0.3	23	<3	4.3	14.0	0.001	0.02	0.12
36	--	Outflow from King Pond	6.2	32	0.2	230	<3	3.0	2.5	0.001	0.02	0.31
37	--	Fire Tower Stream	5.7	34	0.2	240	<3	2.7	4.4	0.001	0.03	0.05

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, 2005, through September 30, 2006.—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)	6.7	31	0.9	33	12	8.5	41.1	0.002	0.03	0.04
20	01115160	Unnamed Tributary #1 to Moswansicut Reservoir (Blanchard Brook)	5.9	170	0.3	240	43	4.6	46.6	0.005	<0.01	0.05
21	01115165	Unnamed Tributary #2 to Moswansicut Reservoir (Brook from Kimball Reservoir)	6.3	90	0.6	43	23	10	40.0	0.002	0.07	0.05
22	01115167	Moswansicut Reservoir (Moswansicut Stream South)	6.5	27	1.2	460	160	13	44.1	0.007	0.16	0.07
34	01115164	Kimball Stream	6.3	79	0.8	43	43	9.8	31.9	0.002	<0.01	0.16
Ponaganset Reservoir subbasin												
23	011151843	Ponaganset Reservoir	5.5	17	0.4	14	<3	2.2	11.5	0.001	0.02	0.04
Regulating Reservoir subbasin												
13	01115176	Regulating Reservoir	6.5	34	0.6	4	4	7.6	33.0	0.001	0.01	0.07
14	01115110	Huntinghouse Brook	6.3	30	0.4	240	43	5.8	10.5	0.001	0.01	0.12
15	01115115	Regulating Reservoir (Rush Brook)	6.5	41	0.6	240	23	7.1	49.1	0.001	0.02	0.10
16	01115098	Peeptoad Brook (Harrisdale Brook)	6.4	34	0.8	75	9	8.0	30.7	0.001	0.01	0.07
17	01115119	Dexter Pond (Paine Pond)	5.7	95	0.4	23	23	4.9	34.8	0.001	<0.01	0.15
18	01115120	Unnamed Tributary to Regulating Reservoir (Unnamed Brook A)	6.1	70	0.3	9	9	8.3	58.4	0.001	0.02	0.20
Westconnaug Reservoir subbasin												
10	01115274	Westconnaug Brook	5.2	25	0.2	23	14	2.2	29.1	0.001	0.02	0.04
11	01115273	Unnamed Tributary to Westconnaug Reservoir (Unnamed Brook South of Westconnaug Reservoir)	5.5	190	0.7	1,300	75	3.7	4.9	0.004	0.01	0.07
12	011152745	Unnamed Tributary to Westconnaug Brook (Unnamed Brook north of Westconnaug Reservoir)	5.7	81	1.1	23	23	4.8	44.0	0.002	<0.01	0.04
Scituate Reservoir basin												
		Median	6.1	40	0.4	43	23	4.6	24.6	0.001	0.02	0.07

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, 2005, through September 30, 2006.

[Water-quality data are from samples collected and analyzed by Providence Water (PW); USGS, U.S. Geological Survey; no., number; CFU 10^6/d; millions of colony forming units per day; CFU 10^6/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)	(CFU 10^6/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	16,000	3,300	3,100	630	490	99	24	5.0	160	32	880	180
25	01115200	Shippee Brook	1,100	450	1,100	450	28	12	2.4	1.0	49	21	170	73
26	01115185	Windsor Brook	100	24	150	34	99	23	6.0	1.4	130	31	380	88
28	01115265	Barden Reservoir	12,000	1,400	7,300	830	850	98	66	7.6	240	27	1,500	170
35	01115187	Ponaganset River	12,000	840	4,800	340	1,100	81	88	6.3	1,300	94	1,600	120
Direct Runoff subbasin														
1	01115180	Brandy Brook	2,100	1,300	380	240	72	46	9.5	6.1	57	36	470	300
3	01115280	Cork Brook	3,800	2,100	700	390	230	130	17	9.3	210	120	770	430
4	01115400	Kent Brook	450	530	110	130	8.5	10	1.7	2.0	23	27	80	94
5	01115184	Spruce Brook	1,100	910	85	70	39	32	3.4	2.8	92	76	120	95
6	01115183	Quonapaug Brook	43,000	22,000	8,800	4,500	310	160	27	14	120	61	1,400	690
7	01115297	Wilbur Hollow Brook	24,000	5,600	11,000	2,500	300	69	32	7.3	340	78	2,000	470
8	01115276	Westconnaug Brook	580	110	400	78	310	60	21	4.1	310	60	1,300	240
9	01115275	Bear Tree Brook	930	1,500	240	390	230	370	2.5	4.0	480	770	93	150
32	01115178	Unnamed Tributary #1 to Scituate Reservoir (Pine Swamp Brook)	370	830	190	420	7.9	18	2.0	4.3	22	48	59	130
33	01115182	Unnamed Tributary #3 to Scituate Reservoir (Hall's Estate Brook)	51	180	18	64	12	43	1.2	4.3	34	120	60	210
Moswansicut Reservoir subbasin														
19	01115170	Moswansicut Reservoir (Moswansicut Stream North, Moswansicut Pond)	5,400	1,600	2,200	670	660	200	31	9.4	480	150	680	210

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, 2005, through September 30, 2006.—Continued

[Water-quality data are from samples collected and analyzed by Providence Water (PW); USGS, U.S. Geological Survey; no., number; CFU 10^6/d; millions of colony forming units per day; CFU 10^6/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)	(CFU 10^6/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)
Moswansicut Reservoir subbasin—Continued														
21	01115165	Unnamed Tributary #2 to Moswansicut Reservoir (Brook from Kimball Reservoir)	120	430	120	430	45	160	2.7	9.3	94	320	150	510
Regulating Reservoir subbasin														
14	01115110	Huntinghouse Brook	44,000	7,100	13,000	2,000	240	39	23	3.7	230	37	1,100	180
15	01115115	Regulating Reservoir (Rush Brook)	65,000	14,000	9,600	2,000	590	130	18	3.7	180	37	2,300	480
16	01115098	Peeptoad Brook (Harrisdale Brook)	53,000	11,000	2,600	530	630	130	24	4.9	250	50	1,400	280
18	01115120	Unnamed Tributary to Regulating Reservoir (Unnamed Brook A)	35	130	35	130	23	81	0.39	1.4	7.8	28	78	280
Westconnaug Reservoir subbasin														
10	01115274	Westconnaug Brook	1,200	810	260	180	190	130	6.5	4.4	110	73	320	220
11	01115273	Unnamed Tributary to Westconnaug Reservoir (Unnamed Brook South of Westconnaug Reservoir)	13,000	18,000	670	920	5.2	7.2	18	26	34	48	400	550
Scituate Reservoir basin														
		Median	2,100	1,300	670	420	230	81	17	4.4	130	50	470	210

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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, 2005, through September 30, 2006.

[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	11/4/2005	8.9	16,000	5,000	500	22	220	3,700
			12/2/2005	24	140,000	14,000	1,400	59	1,200	12,000
			1/1/2006	18	4,000	660	1,100	44	880	880
			2/3/2006	38	21,000	21,000	2,800	190	460	10,000
			3/3/2006	5.2	31,000	190	370	13	130	890
			4/7/2006	5.6	5,900	210	430	14	140	550
			5/5/2006	13	1,300	1,300	910	32	160	950
			6/2/2006	5.0	56,000	5,300	270	24	240	610
			7/7/2006	8.9	33,000	9,400	490	44	110	870
			8/4/2006	0.53	3,100	3,100	32	2.6	13	78
			9/1/2006	0.69	390	390	52	1.7	34	410
25	01115200	Shippee Brook	10/1/2005	0.01	1.7	1.7	0.22	0.02	0.73	7.3
			1/1/2006	14	7,900	7,900	390	34	340	8,200
			4/21/2006	1.0	1,100	1,100	31	2.4	49	170
			7/21/2006	1.1	--	--	26	--	--	--
26	01115185	Windsor Brook	10/1/2005	0.02	13	13	1.2	0.06	0.28	9.6
			1/1/2006	16	1,600	1,600	640	39	1,600	6,300
			4/21/2006	1.5	150	150	84	3.7	18	220
			7/21/2006	1.7	62	--	110	8.3	250	540
28	01115265	Barden Reservoir	10/1/2005	0.16	9,400	9,400	12	1.2	16	47
			11/8/2005	15	28,000	28,000	930	73	180	11,000
			12/13/2005	15	8,400	3,300	900	110	180	4,000
			1/1/2006	33	19,000	19,000	1,700	81	1,600	4,000
			2/14/2006	29	7,800	7,800	1,900	140	710	3,500
			3/14/2006	14	15,000	510	810	68	1,400	1,700
			4/10/2006	13	76,000	480	960	64	640	1,300
			5/9/2006	12	6,800	6,800	630	59	290	2,100
			6/13/2006	44	2,600,000	2,600,000	1,600	220	540	1,100
			7/11/2006	8.1	480,000	480,000	460	40	99	99
			8/8/2006	0.87	5,100	5,100	69	6.4	11	300
			9/12/2006	0.90	5,300	5,300	62	6.6	11	22
35	01115187	Ponaganset River	11/4/2005	27	160,000	28,000	27	66	1,300	5,900
			12/2/2005	59	33,000	5,800	59	140	1,400	16,000
			1/1/2006	49	18,000	4,800	49	120	3,600	56,000
			2/3/2006	101	9,900	9,900	101	740	2,500	25,000
			3/3/2006	21	12,000	770	21	51	1,500	3,100
			4/7/2006	22	4,800	810	22	54	1,100	540
			5/5/2006	36	1,300	1,300	36	88	440	880
			6/2/2006	22	1,300,000	1,300,000	22	110	2,200	1,100
			7/7/2006	22	40,000	23,000	22	110	270	1,600
			8/4/2006	7.0	3,900	3,900	7.0	34	340	510
			9/1/2006	7.5	1,700	1,700	7.5	18	730	1,500

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, 2005, through September 30, 2006.—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	10/1/2005	0.17	96	96	6.1	0.42	33	37
			11/1/2005	4.5	4,700	440	100	22	55	550
			12/6/2005	4.0	2,300	2,300	91	20	49	680
			1/1/2006	5.4	1,200	200	7.9	13	400	400
			2/7/2006	8.5	1,900	310	230	42	100	830
			3/7/2006	2.5	1,400	92	87	6.1	370	180
			4/4/2006	2.4	4,400	530	74	12	180	470
			5/2/2006	2.4	11,000	230	70	5.9	59	470
			6/6/2006	5.1	140,000	2,900	120	37	62	370
			7/31/2006	0.98	550	550	31	7.2	24	480
			8/9/2006	0.43	790	42	8.4	2.1	5.3	190
			9/5/2006	1.5	88,000	88,000	47	7.3	18	510
3	01115280	Cork Brook	11/3/2005	3.9	8,900	8,900	290	9.5	380	2,200
			12/1/2005	14	51,000	51,000	940	140	340	2,400
			1/1/2006	6.8	3,800	670	670	17	670	830
			2/2/2006	7.2	4,100	700	590	18	1,100	1,200
			3/2/2006	2.0	73	73	160	4.9	730	290
			4/6/2006	2.8	2,900	100	220	6.8	68	340
			5/4/2006	8.6	50,000	50,000	770	21	210	1,500
			6/1/2006	1.7	960	62	42	17	21	42
			7/6/2006	3.5	39,000	39,000	230	17	86	770
			8/3/2006	0.28	1,600	1,600	17	0.68	27	27
			9/7/2006	0.57	320	21	52	1.4	28	130
4	01115400	Kent Brook	10/1/2005	<0.01	4.5	4.5	0.02	<0.01	0.02	0.15
			11/1/2005	2.5	1,400	92	28	6.1	31	180
			12/6/2005	2.0	73	73	20	9.8	150	340
			1/1/2006	3.7	3,500	140	3.6	9.1	270	91
			2/7/2006	10	2,200	370	110	49	120	730
			3/7/2006	0.71	26	26	14	1.7	35	69
			4/4/2006	0.66	180	24	10	1.6	16	16
			5/2/2006	0.68	720	150	6.8	1.7	8.3	150
			6/6/2006	3.4	20,000	1,900	31	8.3	250	330
			7/31/2006	0.09	170	170	0.94	0.69	6.9	28
			8/9/2006	0.02	15	0.59	0.25	0.04	1.2	4.3
			9/5/2006	0.24	14,000	140	1.8	0.59	12	65
5	01115184	Spruce Brook	10/1/2005	0.03	64	14	0.93	0.07	6.2	22
			1/1/2006	6.2	1,100	230	200	15	1,500	150
			4/18/2006	1.1	1,200	110	48	2.7	81	81
			7/18/2006	0.85	5,000	--	30	4.2	100	250

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, 2005, through September 30, 2006.—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						
6	01115183	Quonapaug Brook	11/1/2005	6.7	75,000	7,000	470	33	82	1,600
			12/6/2005	5.8	11,000	11,000	380	57	430	4,000
			1/1/2006	8.7	9,200	4,900	730	21	1,300	1,900
			2/7/2006	17	31,000	1,700	1,000	42	420	5,000
			3/7/2006	2.9	3,100	110	240	7.1	710	280
			4/4/2006	2.8	75,000	1,600	240	14	140	480
			5/2/2006	2.8	75,000	75,000	240	14	34	270
			6/6/2006	8.2	42,000	42,000	590	60	100	1,600
			7/31/2006	0.75	44,000	44,000	78	9.2	18	400
			9/5/2006	1.4	82,000	82,000	140	100	68	1,100
7	01115297	Wilbur Hollow Brook	10/1/2005	0.10	--	--	3.4	0.98	4.9	22
			11/3/2005	11	65,000	12,000	320	54	130	3,000
			12/1/2005	35	210,000	210,000	720	600	860	6,000
			1/1/2006	18	480,000	19,000	520	44	440	4,000
			2/2/2006	19	11,000	11,000	530	93	230	4,600
			3/2/2006	6.0	1,300	220	200	15	590	590
			4/6/2006	7.9	1,700	290	280	19	580	970
			5/4/2006	23	24,000	24,000	500	110	560	4,500
			6/1/2006	5.0	290,000	2,800	420	12	490	1,100
			7/6/2006	9.8	58,000	58,000	270	96	120	35,000
			8/3/2006	0.96	540	540	24	9.4	23	160
			9/7/2006	1.8	180	66	54	18	22	310
8	01115276	Westconnaug Brook	10/1/2005	2.0	3,100	3,100	69	4.9	98	340
			11/15/2005	8.3	4,700	300	250	20	410	1,200
			12/15/2005	7.7	750	750	610	19	94	1,100
			1/1/2006	11	400	400	360	54	270	1,300
			2/10/2006	11	400	400	330	27	130	5,900
			3/10/2006	7.8	290	290	300	19	1,100	4,200
			4/24/2006	10	370	370	370	24	240	2,900
			5/12/2006	8.9	330	330	280	22	440	1,300
			6/9/2006	15	88,000	88,000	420	37	370	730
			7/14/2006	7.3	4,100	4,100	210	18	360	360
9	01115275	Bear Tree Brook	10/1/2005	0.23	240	240	33	0.56	17	79
			1/1/2006	2.2	1,200	1,200	360	5.4	810	54
			4/18/2006	1.1	620	40	220	2.7	160	110
			7/18/2006	0.95	56,000	--	230	2.3	790	440
32	01115178	Unnamed Tributary #1 to Scituate Reservoir (Pine Swamp Brook)	10/1/2005	0.03	190	190	1.2	0.08	1.7	12
			1/1/2006	1.0	560	560	18	24	240	1,700
			4/20/2006	0.32	12	12	7.7	1.6	39	86
			7/20/2006	0.32	8,600	--	8.2	2.3	3.9	31

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, 2005, through September 30, 2006.—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						
33	01115182	Unnamed Tributary #3 to Scituate Reservoir (Hall's Estate Brook)	10/1/2005	<0.01	5.9	5.9	0.02	<0.01	0.05	0.39
			1/1/2006	1.4	51	51	46	14	34	410
			4/26/2006	0.49	280	18	17	1.2	36	60
			7/19/2006	0.13	--	--	6.9	--	--	--
				Moswansicut Reservoir subbasin						
19	01115170	Moswansicut Reservoir (Moswansicut Stream North, Moswansicut Pond)	10/1/2005	0.12	7,000	7,000	13	1.5	8.8	21
			11/10/2005	12	44,000	44,000	1,100	29	880	13,000
			12/8/2005	6.5	3,700	3,700	630	32	79	2,700
			1/1/2006	12	2,600	2,600	1,300	59	880	1,200
			2/9/2006	16	17,000	590	1,700	78	1,200	390
			3/9/2006	4.4	160	160	460	22	650	430
			4/13/2006	3.7	140	140	350	9.1	91	720
			5/11/2006	6.5	240	240	690	32	320	640
			6/8/2006	59	110,000	110,000	1,800	430	1,400	4,300
			7/13/2006	4.6	8,400	1,700	380	11	56	230
21	01115165	Unnamed Tributary #2 to Moswansicut Reservoir (Brook from Kimball Reservoir)	10/1/2005	0.03	120	120	2.2	0.17	0.42	0.42
			1/1/2006	1.2	1,300	680	100	8.8	500	150
			4/28/2006	0.55	54	54	66	2.7	94	390
			7/28/2006	0.23	--	--	25	--	--	--
				Regulating Reservoir subbasin						
14	01115110	Huntinghouse Brook	11/7/2005	9.4	550,000	110,000	240	23	230	4,600
			12/5/2005	15	16,000	16,000	530	260	730	1,100
			1/1/2006	24	44,000	44,000	600	120	290	590
			2/6/2006	103	58,000	58,000	2,100	250	10,000	1,300
			3/6/2006	5.7	64,000	560	170	14	700	1,700
			4/3/2006	2.0	1,100	73	57	4.9	98	440
			5/1/2006	3.3	1,900	320	100	8.1	81	480
			6/5/2006	46	270,000	270,000	990	230	1,100	15,000
			7/3/2006	12	70,000	13,000	250	29	150	4,400
			8/7/2006	0.30	18,000	3,400	8.1	0.73	15	120
			9/18/2006	0.35	9,400	640	3.2	0.86	4.3	130
15	01115115	Regulating Reservoir (Rush Brook)	11/7/2005	7.2	420,000	13,000	860	18	180	2,500
			12/5/2005	11	65,000	65,000	560	220	540	2,700
			1/1/2006	17	100,000	9,600	1,500	42	2,100	2,500
			2/6/2006	72	160,000	41,000	4,500	350	7,000	19,000
			3/6/2006	4.4	50,000	160	590	11	750	650
			4/3/2006	1.6	18,000	900	220	3.9	78	230
			5/1/2006	2.6	1,500	570	310	13	32	1,500
			6/5/2006	33	190,000	190,000	2,200	160	400	5,700
			7/3/2006	9.3	100,000	5,200	860	68	110	2,300
			8/7/2006	0.26	15,000	15,000	33	0.64	3.2	70
			9/18/2006	0.30	320	66	46	0.73	29	51

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, 2005, through September 30, 2006. —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)
Regulating Reservoir subbasin—Continued										
16	01115098	Peeptoad Brook (Harrisdale Brook)	11/7/2005	10	110,000	37,000	750	24	120	980
			12/5/2005	14	7,900	7,900	1,400	140	340	3,400
			1/1/2006	19	35,000	29,000	1,500	93	3,700	2,300
			2/6/2006	53	97,000	56,000	4,000	260	5,200	2,600
			3/6/2006	7.0	79,000	260	590	17	1,700	860
			4/3/2006	3.4	120	120	290	17	250	580
			5/1/2006	4.8	5,000	1,100	450	12	59	1,400
			6/5/2006	30	1,800,000	1,800,000	2,100	73	2,200	5,100
			7/3/2006	12	140,000	2,600	630	59	150	3,200
			8/7/2006	0.90	53,000	33	64	2.2	11	310
			9/18/2006	1.0	1,800	98	69	2.4	24	200
18	01115120	Unnamed Tributary to Regulating Reservoir (Unnamed Brook A)	10/1/2005	<0.01	1.1	1.1	0.14	<0.01	0.05	0.42
			1/1/2006	0.70	150	68	100	1.7	51	340
			4/28/2006	0.16	35	35	23	0.39	7.8	78
Westconnaug Reservoir subbasin										
10	01115274	Westconnaug Brook	10/1/2005	0.02	240	240	2.0	0.10	0.26	2.1
			11/8/2005	2.9	1,600	1,600	240	7.1	140	640
			12/13/2005	3.0	1,700	110	230	7.3	150	730
			1/1/2006	7.0	3,900	260	500	17	340	1,900
			2/14/2006	6.1	220	220	360	15	150	450
			3/14/2006	2.7	460	260	190	6.6	200	130
			4/10/2006	2.6	95	95	190	6.4	64	250
			5/9/2006	2.3	84	84	160	5.6	28	390
			6/13/2006	9.5	260,000	5,300	490	23	230	700
			7/11/2006	1.5	8,800	840	72	3.7	73	18
			8/8/2006	0.13	760	760	5.6	0.32	3.2	54
			9/12/2006	0.14	3,800	3,800	0.48	0.34	6.8	1.7
11	01115273	Unnamed Tributary to Westconnaug Reservoir (Unnamed Brook South of Westconnaug Reservoir)	10/1/2005	0.01	590	590	0.14	0.10	0.12	0.98
			1/1/2006	6.8	670	670	140	83	830	1,500
			4/25/2006	4.4	26,000	8,100	4.3	32	54	540
			7/24/2006	0.62	36,000	--	6.1	4.5	15	260

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