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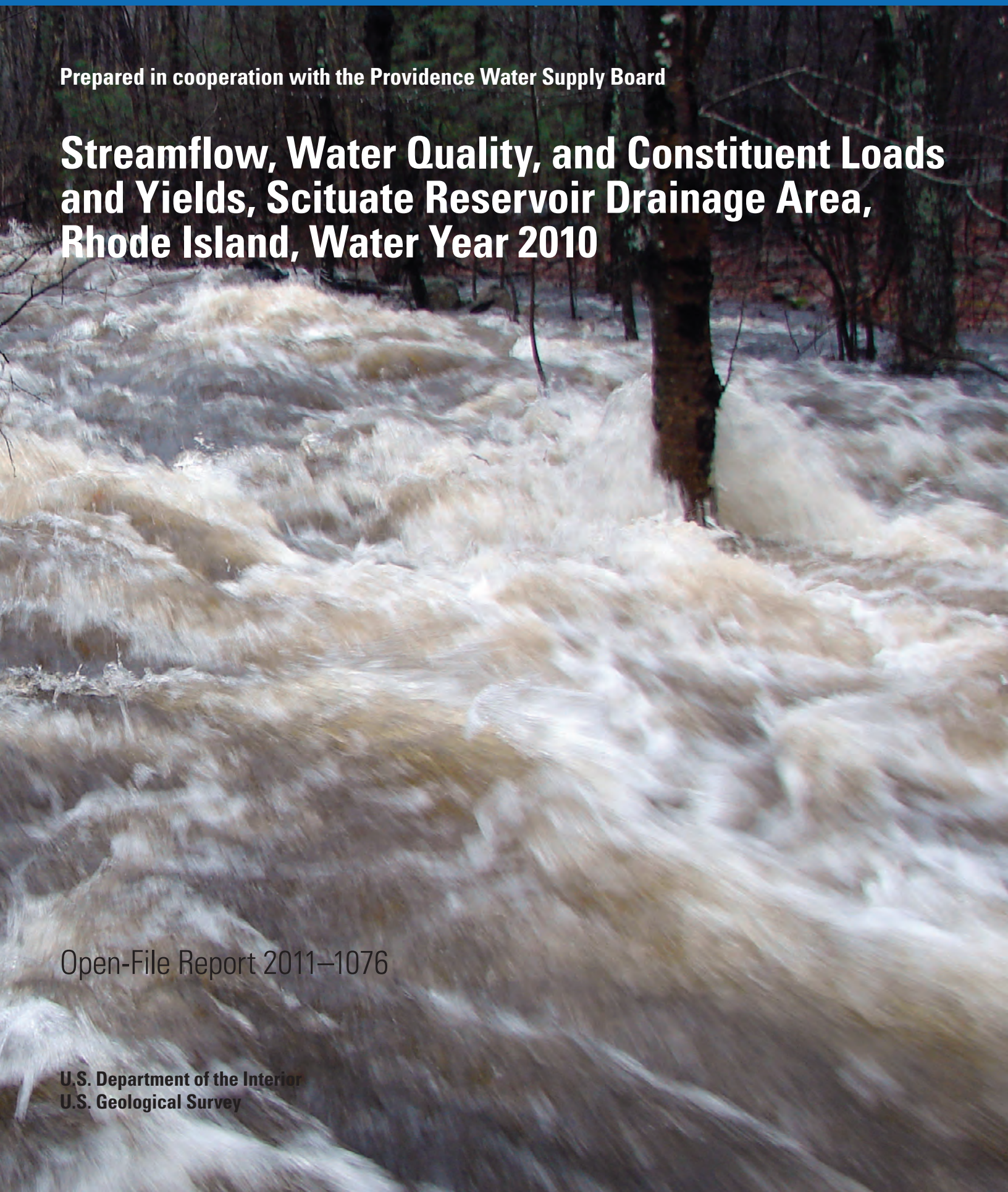

Prepared in cooperation with the Providence Water Supply Board

Streamflow, Water Quality, and Constituent Loads and Yields, Scituate Reservoir Drainage Area, Rhode Island, Water Year 2010

Open-File Report 2011–1076

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

Cover. Photograph of Cork Brook near U.S. Geological Survey monitoring station 01115280, March 30, 2010.

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

U.S. Geological Survey
Marcia K. McNutt, Director

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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 (g)

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

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 2010

By Kirk P. Smith and Robert F. Breault

Abstract

Streamflow and water-quality data were collected by the U.S. Geological Survey (USGS) or the Providence Water Supply Board (PWSB), Rhode Island's largest drinking-water supplier. Streamflow was measured or estimated by the USGS following standard methods at 23 streamgages; 14 of these streamgages were also equipped with instrumentation capable of continuously monitoring specific conductance and water temperature. Streamflow and concentrations of sodium and chloride estimated from records of specific conductance were used to calculate loads of sodium and chloride during water year (WY) 2010 (October 1, 2009, to September 30, 2010). Water-quality samples also were collected at 37 sampling stations by the PWSB and at 14 monitoring stations by the USGS during WY 2010 as part of a long-term sampling program; all stations are in the Scituate Reservoir drainage area. Water-quality data collected by PWSB 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 2010.

The largest tributary to the reservoir (the Ponaganset River, which was monitored by the USGS) contributed a mean streamflow of about 39 cubic feet per second (ft^3/s) to the reservoir during WY 2010. For the same time period, annual mean[1] streamflows measured (or estimated) for the other monitoring stations in this study ranged from about 0.7 to 27 ft^3/s. Together, tributary streams (equipped with instrumentation capable of continuously monitoring specific conductance) transported about 1,500,000 kilograms (kg) of sodium and 2,500,000 kg of chloride to the Scituate Reservoir during WY 2010; sodium and chloride yields for the tributaries ranged from 11,000 to 66,000 kilograms per square mile (kg/mi^2) and from 18,000 to 110,000 kg/mi^2, respectively.

At the stations where water-quality samples were collected by the PWSB, the median of the median chloride concentrations was 20.2 milligrams per liter (mg/L), median nitrite concentration was 0.002 mg/L as nitrogen (N), median nitrate concentration was 0.01 mg/L as N, median orthophosphate concentration was 0.06 mg/L as phosphorus, and median concentrations of total coliform and *Escherichia coli* (*E. coli*) bacteria were 93 and 16 colony forming units per 100 milliliters (CFU/100mL), respectively. The medians of the median daily loads (and yields) of chloride, nitrite, nitrate, orthophosphate, and total coliform and *E. coli* bacteria were 170 kg/d (73 $kg/d/mi^2$), 11 g/d (5.3 $g/d/mi^2$), 74 g/d (39 $g/d/mi^2$), 340 g/d (170 $g/d/mi^2$), 5,700 million colony forming units per day ($CFU\times10^6/d$) (2,300 $CFU\times10^6/d/mi^2$), and 620 $CFU\times10^6/d$ (440 $CFU\times10^6/d/mi^2$), 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. Since 2008, streamflow has been continuously measured at 14 streamgages in the drainage area and has been periodically measured at 9 additional streamgages on tributaries in the drainage area. At these nine partial-record streamgages, daily mean streamflow has been estimated by using methods developed by the USGS (Hirsch, 1982). The USGS also has been continuously measuring specific conductance at 14 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.

Currently (2010), Providence Water regularly collects water-quality samples from 37 tributary streams, either monthly or quarterly. Occasionally, samples are collected from other streams or streamgages, 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) 2010 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 14 continuous-record and 9 partial-record streamgages in the drainage area. Estimated monthly loads and annual loads (and yields) of sodium and chloride are presented for the 14 streamgages at which specific conductance is continuously monitored by the USGS. Summary statistics for water-quality data collected by Providence Water for 37 sampling stations during WY 2010 also are presented, and these data were used to calculate loads and yields of selected water-quality constituents (table 1).

[2] October 1, 2009, to September 30, 2010.

Streamflow Data Collection and Estimation

Streamflow and water-quality data were collected by the USGS or Providence Water (table 1). Streamflow was measured or estimated by the USGS at 23 streamgages. Measured and estimated streamflows are necessary to estimate water volume and water-quality constituent loads and yields from tributary basins. At continuous-record streamgages, stream stage is measured every 10 minutes at most streamgages. Streamflow is computed with a stage-discharge relation (or rating), which is developed on the basis of periodic manual measurements of streamflow. Daily mean streamflow at a streamgage is calculated by dividing the total volume of water that passes the streamgage each day by 86,400, the number of seconds in a day. Periodic manual streamflow measurements at partial-record streamgages are used with concurrent continuous-record measurements from streamgages in hydrologically similar drainage areas to estimate a continuous record at the partial-record stremagage. Specifically, continuous streamflow records for the nine 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 using MOVE.1 method with 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 streamgages were operated and maintained by the USGS during WY 2010 in cooperation with RIDEM (USGS streamgage number 01115098) and Providence Water (fig. 1 and table 1). Streamflow data for these streamgages were collected at 10 or 15-minute intervals (near-real-time streamflow data), were updated at 1-hour intervals on the World Wide Web (WWW), and are available through the NWIS Web Interface (NWIS Web; U.S. Geological Survey, 2007). Error associated with measured streamflows was generally within about 15 percent (U.S. Geological Survey, unpublished data); upper and lower 90-percent confidence limits calculated by methods described by the National Institute of Standards and Technology/SEmiconductor MAnufacturing TECHnology (2003) are shown in table 2.

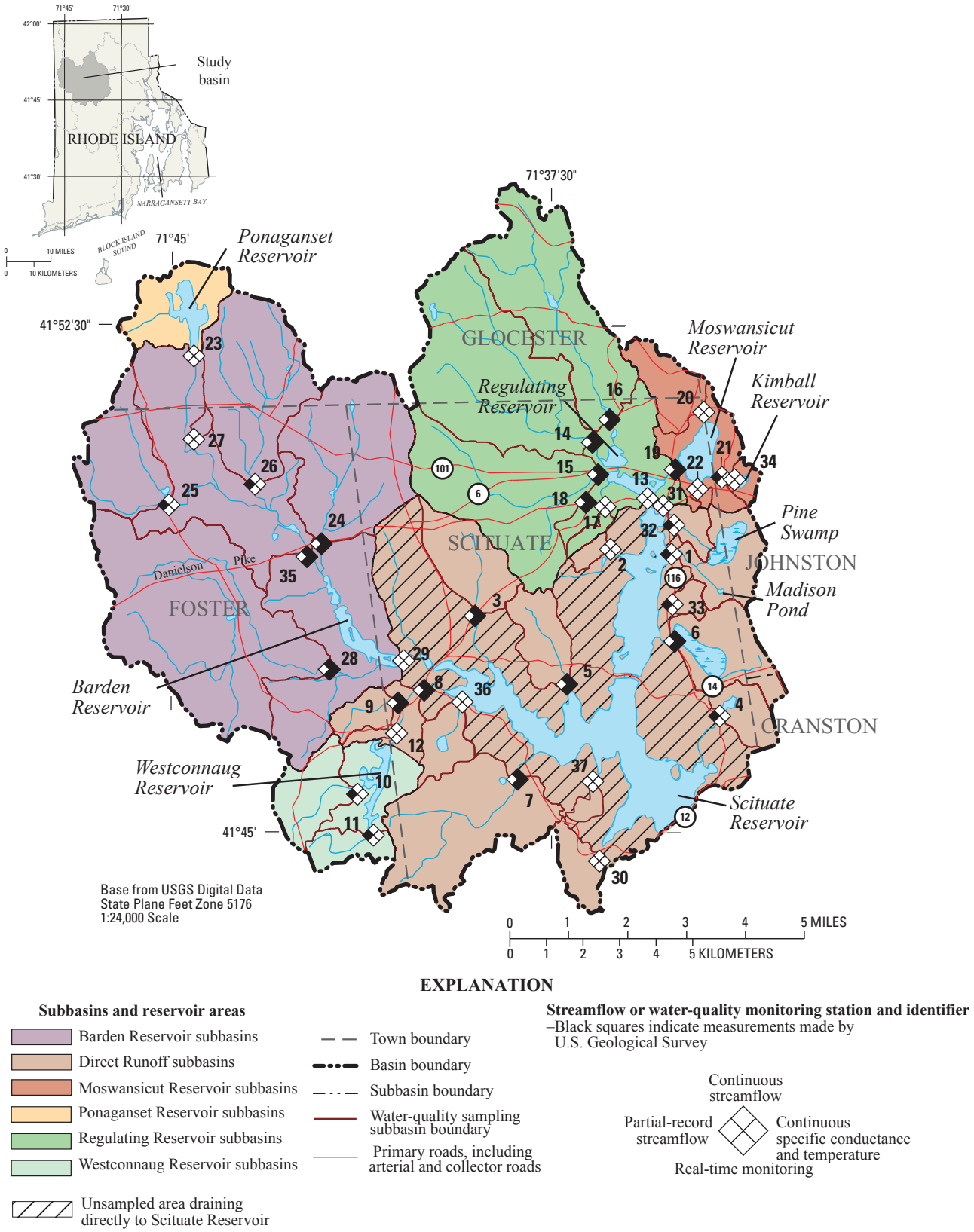

Figure 1. Locations of tributary-reservoir subbasins and streamgage and water-quality monitoring stations in the Scituate Reservoir drainage area, Rhode Island.

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, 2009, to September 30, 2010.

[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)	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	M	10	Y	N
25	01115200	Shippee Brook	2.35	Q	4	N	Y
26	01115185	Windsor Brook	4.32	Q	4	N	Y
27	011151845	Unnamed Tributary to Ponaganset River (Unnamed Brook B, Unnamed Brook West of Windsor Brook)	0.10	Q	3	N	N
28	01115265	Barden Reservoir (Hemlock Brook)	8.72	M	11	Y	N
29	01115271	Ponaganset River (Barden Stream)	33.0	M	9	N	N
35	01115187	Ponaganset River	14.0	M	10	Y	N
		Direct Runoff subbasin					
1	01115180	Brandy Brook	1.57	M	12	N	Y
2	01115181	Unnamed Tributary #2 to Scituate Reservoir (Unnamed Brook North of Bullhead Brook)	0.15	Q	2	N	N
3	01115280	Cork Brook	1.79	M	11	Y	N
4	01115400	Kent Brook (Betty Pond Stream)	0.85	M	11	N	Y
5	01115184	Spruce Brook	1.22	Q	4	Y	N
6	01115183	Quonapaug Brook	1.96	M	10	Y	N
7	01115297	Wilbur Hollow Brook	4.32	M	12	Y	N
8	01115276	Westconnaug Brook (Westconnaug Reservoir)	5.18	M	10	Y	N
9	01115275	Bear Tree Brook	0.62	Q	4	Y	N
30	01115350	Unnamed Tributary #4 to Scituate Reservoir (Coventry Brook, Knight Brook)	0.78	Q	4	N	N
31	01115177	Toad Pond	0.04	Q	2	N	N
32	01115178	Unnamed Tributary #1 to Scituate Reservoir (Pine Swamp Brook)	0.45	Q	4	N	Y
33	01115182	Unnamed Tributary #3 to Scituate Reservoir (Hall's Estate Brook)	0.28	Q	4	N	Y
36	--	Outflow from King Pond	0.77	Q	4	N	N
37	--	Fire Tower Stream	0.15	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, 2009, to September 30, 2010.—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)	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	M	10	Y	N
20	01115160	Unnamed Tributary #1 to Moswansicut Reservoir (Blanchard Brook)	1.18	M	7	N	N
21	01115165	Unnamed Tributary #2 to Moswansicut Reservoir (Brook from Kimball Reservoir)	0.29	Q	4	Y	Y
22	01115167	Moswansicut Reservoir (Moswansicut Stream South)	0.22	M	10	N	N
34	01115164	Kimball Stream	0.27	Q	3	Y	N
		Ponaganset Reservoir subbasin					
23	011151843	Ponaganset Reservoir	1.92	M	8	N	N
		Regulating Reservoir subbasin					
13	01115176	Regulating Reservoir	22.1	M	10	N	N
14	01115110	Huntinghouse Brook	6.23	M	9	Y	N
15	01115114	Regulating Reservoir (Rush Brook)	4.70	M	10	N	N
16	01115098	Peeptoad Brook (Harrisdale Brook)	4.96	M	10	Y	N
17	01115119	Dexter Pond (Paine Pond)	0.22	Q	2	N	N
18	01115120	Unnamed Tributary to Regulating Reservoir (Unnamed Brook A)	0.28	Q	2	Y	N
		Westconnaug Reservoir subbasin					
10	01115274	Westconnaug Brook	1.48	M	9	N	Y
11	01115273	Unnamed Tributary to Westconnaug Reservoir (Unnamed Brook south of Westconnaug Reservoir)	0.72	Q	3	N	Y
12	011152745	Unnamed Tributary to Westconnaug Brook (Unnamed Brook north of Westconnaug Reservoir)	0.16	Q	3	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, 2009, through September 30, 2010.

[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)	Annual mean streamflow ($ft^3/s/mi^2$)
		Barden Reservoir subbasin				
24	01115190	Dolly Cole Brook	12	15	10	2.5
25	01115200	Shippee Brook	5.5	47	0.7	2.4
26	01115185	Windsor Brook	21	49	8.8	4.8
28	01115265	Barden Reservoir (Hemlock Brook)	27	35	19	3.1
35	01115187	Ponaganset River	40	47	33	2.9
		Direct Runoff subbasin				
1	01115180	Brandy Brook	3.7	7.5	1.9	2.4
3	01115280	Cork Brook	4.6	5.5	3.7	2.8
4	01115400	Kent Brook (Betty Pond Stream)	2.9	14	0.6	3.5
5	01115184	Spruce Brook	3.8	4.8	2.8	3.1
6	01115183	Quonapaug Brook	5.6	6.4	4.9	2.9
7	01115297	Wilbur Hollow Brook	12	14	9.1	2.7
8	01115276	Westconnaug Brook (Westconnaug Reservoir)	8.2	9.3	7.2	1.6
9	01115275	Bear Tree Brook	1.8	2.1	1.6	3.0
32	01115178	Unnamed Tributary #1 to Scituate Reservoir (Pine Swamp Brook)	0.9	2.0	0.4	2.1
33	01115182	Unnamed Tributary #3 to Scituate Reservoir (Hall's Estate Brook)	1.3	3.4	0.5	4.8
		Moswansicut Reservoir subbasin				
19	01115170	Moswansicut Reservoir (Moswansicut Stream North, Moswansicut Pond)	10	11	9	3.1
21	01115165	Unnamed Tributary #2 to Moswansicut Reservoir (Blanchard Brook)	0.9	4	0.2	3.2
		Regulating Reservoir subbasin				
14	01115110	Huntinghouse Brook	16	20	13	2.6
15	01115115	Regulating Reservoir (Rush Brook)	11	14	8.8	2.4
16	01115098	Peeptoad Brook (Harrisdale Brook)	16	18	14	3.3
18	01115120	Unnamed Tributary to Regulating Reservoir (Unnamed Brook A)	0.7	0.8	0.5	2.4
		Westconnaug Reservoir subbasin				
10	01115274	Westconnaug Brook	6.8	18	3	4.6
11	01115273	Unnamed Tributary to Westconnaug Reservoir (Unnamed Brook South of Westconnaug Reservoir)	3.1	7.1	1.4	4.4

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 or partial records of specific conductance from 14 of the 23 streamgages. Water-quality samples were collected monthly or quarterly at 37 sampling stations in the Scituate Reservoir drainage area by Providence Water during WY 2010, as part of a long-term sampling program. Daily loads of bacteria, chloride, nitrite, nitrate, and orthophosphate were calculated for 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 10- or 15-minute intervals at the 14 monitoring stations (fig. 1). Measurements were made by using an instream probe and standard USGS methods for continuous streamwater-quality monitoring (Wagner and others, 2006).

Concentrations of sodium and chloride were estimated from continuous or periodic 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 by the USGS from tributary streams in the Scituate Reservoir drainage area (U.S. Geological Survey, 2001):

$$C_{Cl} = \left(Spc^{1.2106}\right) \times 0.07554 \text{ and} \quad (1)$$

$$C_{Na} = \left(Spc^{1.1721}\right) \times 0.05390, \quad (2)$$

where

C_{Cl} is the chloride concentration, in milligrams per liter;

C_{Na} is the sodium concentration, in milligrams per liter; and

Spc is the specific conductance, in microseimens 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, monthly averages were used for estimated values of specific conductance.

Data Collected by the Providence Water Supply Board

Water-quality samples were collected at 37 monitoring stations by Providence Water. Sampling was monthly at 19 monitoring stations and quarterly at another 18 stations (table 1) during WY 2010. 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 WY 2010 is shown in figure 2. The curve represents the percentage of time that each flow was exceeded at this streamgage. The flows at this streamgage on days when water-quality samples were collected at a representative streamgage (Dolly Cole Brook, fig. 2) are represented by the plotted points superimposed on the curve. Samples were collected at flow durations ranging from the 4th percentile to the 91st percentile; this range indicates that water-quality samples collected in WY 2010 represent a wide range of flow conditions during that water year.

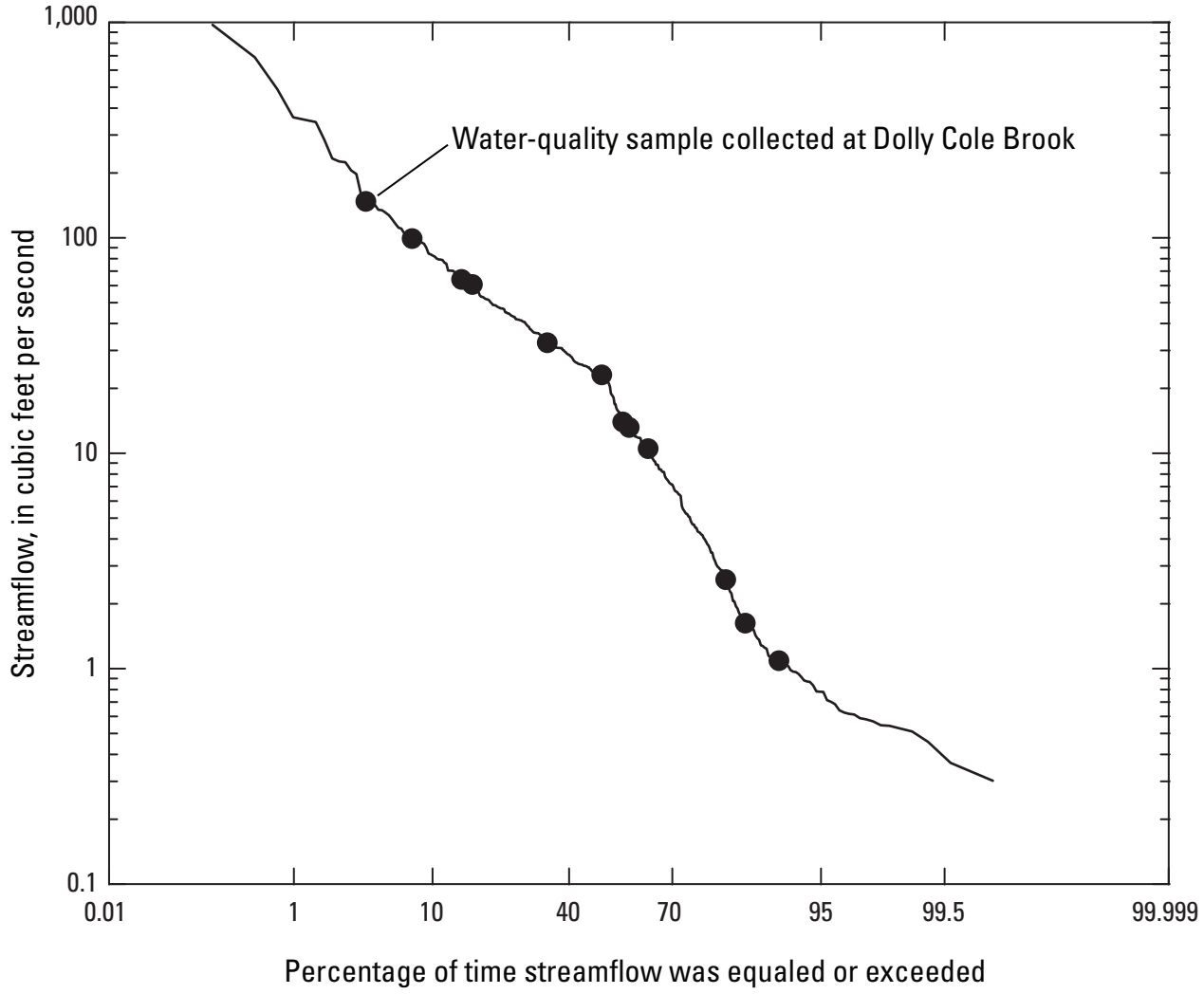

Figure 2. Flow-duration curve for the U.S. Geological Survey continuous streamgage on Ponaganset River at South Foster (streamgage 01115187) for water year 2010 and streamflow measurements at the Ponaganset River streamgage on the dates when water-quality samples were collected at Dolly Cole Brook (shown 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 2010. 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 2010 (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 or colony forming units (CFU) per liter in single samples by the daily discharge (in liters per day) for the day on which each sample was collected. The flows, which in some 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 daily streamflow at the streamgage on the Ponaganset River (USGS streamgage number 01115187) for the entire time period of its operation (mean of the daily mean streamflows for the period of record, WY 1994–2009) prior to WY 2010 was 28 ft^3/s (http://waterdata.usgs.gov/nwis). During WY 2010, annual mean streamflow was 39 ft^3/s (fig. 3). Mean streamflow in Peeptoad Brook (01115098), the other long-term continuous-record streamgage in the Scituate Reservoir drainage area (USGS station number 01115098), for its period of record (WY 1994–2009) prior to WY 2010 was 10 ft^3/s (http://waterdata.usgs.gov/nwis). Annual mean streamflow in Peeptoad Brook during WY 2010 was 16 ft^3/s.

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 can carry 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.

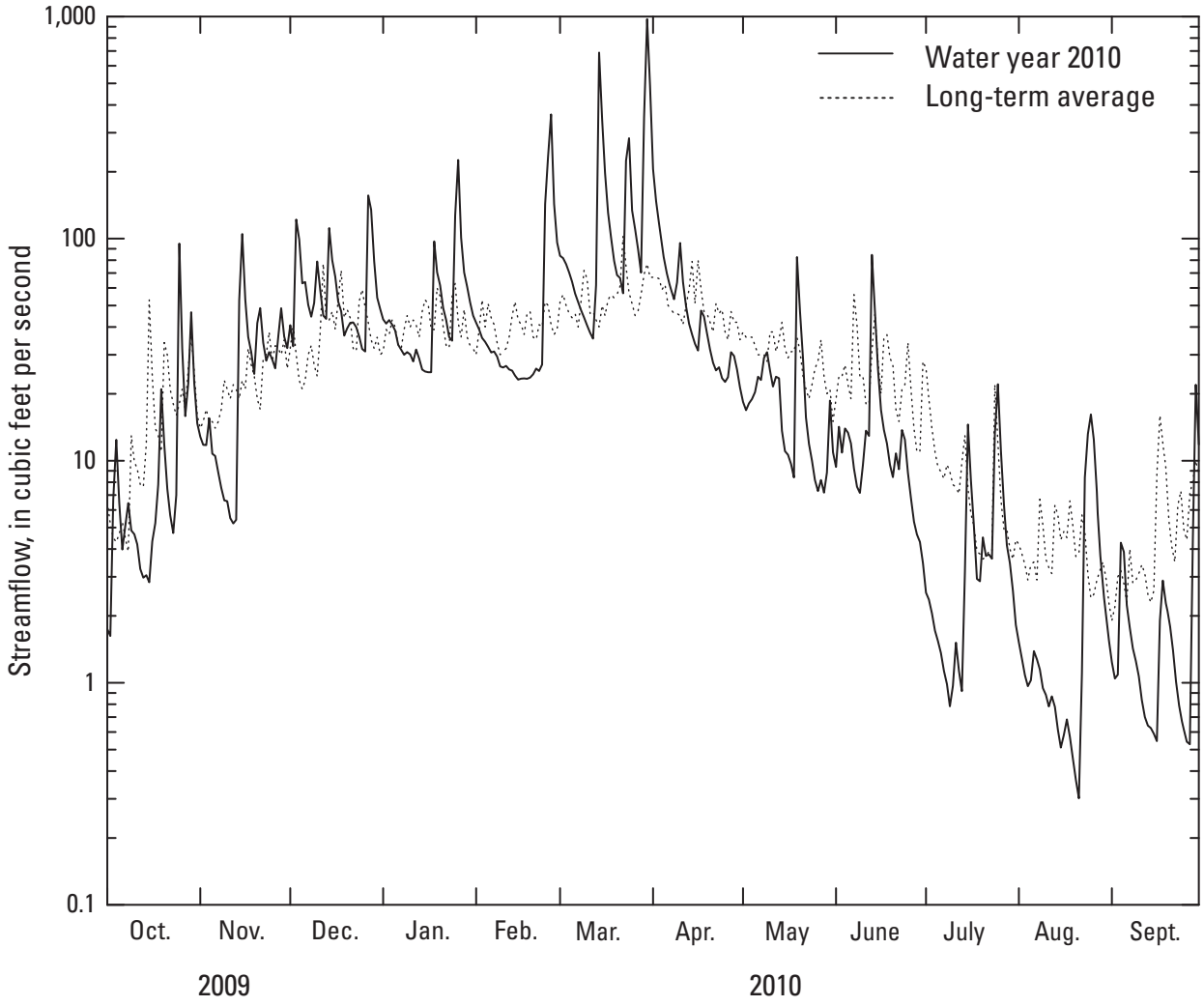

Figure 3. Measured daily mean streamflow for the U.S. Geological Survey continuous-record streamgage on the Ponaganset River at South Foster (streamgage 01115187) in the Scituate Reservoir drainage area, Rhode Island, for October 1, 2009, through September 30, 2010, and mean daily streamflow for March 22, 1994, through June 3, 2009.

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, indicated 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 2.7 to 45.7 mg/L, and estimated monthly mean chloride concentrations ranged from 4.3 to 79.9 mg/L. The highest monthly mean concentrations of sodium and chloride were measured in Bear Tree Brook (Providence Water Station Number 9) in September 2010 (45.7 and 79.9 mg/L, respectively; table 4). The highest annual mean[4] concentrations of sodium and chloride also were measured in Bear Tree Brook, 25.2 and 43.4 mg/L, respectively (table 5). These high concentrations are the result of residual sodium and chloride leaching from a formerly uncovered salt storage pile to groundwater (Nimiroski and Waldron, 2002) and relatively small surface-water flows.

The Scituate Reservoir received about 1,500,000 kg (about 1,700 tons) of sodium and 2,500,000 kg (about 2,800 tons) of chloride from tributary streams—equipped with instrumentation capable of continuously monitoring specific conductance—during WY 2010. The highest sodium and chloride loads in the watershed during WY 2010—260,000 and 430,000 kg, respectively—were measured at the Ponaganset River station (Providence Water Station Number 35; table 5). Monthly estimated sodium and chloride loads were highest in March at 13 stations and in April at one station (Bear Tree Brook; table 6). For these months, the estimated load of sodium and chloride at each station accounted for 11 percent to 35 percent of the annual load for each constituent at the respective stations. The highest annual sodium and chloride yields were 66,000 and 110,000 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 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 5.4 to 6.8; the median of the medians among all stations was 6.2. Median values of color ranged from 14 to 145 platinum cobalt units (PCU); the median among all stations was 39 PCU. Median values of turbidity ranged from 0.2 to 1.9 nephelometric turbidity units (NTU); the median among all stations was 0.6 NTU. Median alkalinity values in tributary streams were low, ranging from 2.4 to 17 mg/L as $CaCO_3$; the median among all stations was 4.8 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, 2009, through September 30, 2010.

[PW, Providence Water; USGS, U.S. Geological Survey; no., number; mg/L, milligrams per liter; Cl, chloride; Na, sodium; the root mean square error of the regression estimate for sodium and chloride is 1.5 and 2.2 mg/L, respectivly; 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	25.1	14.9	21.1	12.6	18.9	11.3	19.6	11.7	22.5	13.4	19.4	11.6
28	01115265	Barden Reservoir (Hemlock Brook)	20.2	12.1	15.7	9.4	12.5	7.6	11.9	7.2	11.9	7.2	8.2	5.0
35	01115187	Ponaganset River	18.6	11.1	16.3	9.8	14.0	8.5	14.1	8.5	13.4	8.1	9.1	5.6
Direct Runoff subbasin														
3	01115280	Cork Brook	33.7	19.8	30.2	17.8	26.1	15.5	30.9	18.2	33.4	19.6	12.4	7.4
5	01115184	Spruce Brook	19.0	11.4	16.7	10.1	14.0	8.4	13.5	8.2	12.6	7.6	8.5	5.2
6	01115183	Quonapaug Brook	41.2	24.1	32.6	19.2	27.8	16.4	28.3	16.7	24.4	14.5	19.1	11.4
7	01115297	Wilbur Hollow Brook	13.2	8.0	10.9	6.7	8.4	5.1	9.3	5.7	8.1	4.9	4.3	2.7
8	01115276	Westconnaug Brook (Westconnaug Reservoir)	23.7	14.1	18.3	11.0	16.2	9.7	17.8	10.7	18.7	11.2	10.0	6.1
9	01115275	Bear Tree Brook	60.7	35.0	53.6	31.0	44.1	25.7	45.9	26.7	42.8	24.9	24.1	14.3
Moswansicut Reservoir subbasin														
19	01115170	Moswansicut Reservoir (Moswansicut Stream North, Moswansicut Pond)	38.4	22.5	38.3	22.4	38.5	22.6	37.8	22.1	35.9	21.0	32.8	19.3
Regulating Reservoir subbasin														
14	01115110	Huntinghouse Brook	13.9	8.4	11.2	6.8	8.8	5.4	8.7	5.4	7.8	4.8	5.7	3.5
15	01115115	Regulating Reservoir (Rush Brook)	34.4	20.2	25.4	15.0	22.1	13.1	24.0	14.3	22.3	13.2	16.0	9.6
16	01115098	Peeptoad Brook (Harrisdale Brook)	38.0	22.3	38.6	22.6	28.6	16.9	27.4	16.2	24.2	14.3	18.7	11.2
18	01115120	Unnamed Tributary to Regulating Reservoir (Unnamed Brook A)	42.0	24.5	36.3	21.3	43.7	25.4	41.0	23.9	44.0	25.6	28.9	16.9
Scituate Reservoir basin														
		Average	30.2	17.7	26.1	15.4	23.1	13.7	23.6	14.0	23.0	13.6	15.5	9.3

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	17.1	10.3	16.7	10.0	16.7	10.0	20.3	12.1	23.1	13.7	22.2	13.3
28	01115265	Barden Reservoir (Hemlock Brook)	14.7	8.8	18.6	11.2	20.3	12.1	26.3	15.6	31.4	18.5	31.8	18.7
35	01115187	Ponaganset River	11.4	6.9	13.6	8.2	14.4	8.7	18.2	10.9	20.5	12.2	19.7	11.8
Direct Runoff subbasin														
3	01115280	Cork Brook	16.8	10.1	22.0	13.1	23.9	14.2	30.0	17.7	39.3	22.9	38.4	22.4
5	01115184	Spruce Brook	11.1	6.7	14.3	8.6	15.5	9.3	19.6	11.7	28.4	16.8	31.2	18.4
6	01115183	Quonapaug Brook	23.3	13.9	27.8	16.4	34.4	20.2	40.4	23.6	57.4	33.2	56.4	32.6
7	01115297	Wilbur Hollow Brook	8.5	5.2	9.5	5.8	13.3	8.0	19.2	11.5	22.1	13.2	17.9	10.7
8	01115276	Westconnaug Brook (Westconnaug Reservoir)	13.8	8.3	19.8	11.8	26.2	15.5	32.5	19.1	32.1	18.9	22.3	13.3
9	01115275	Bear Tree Brook	42.9	25.0	57.0	32.9	67.2	38.6	77.2	44.2	75.8	43.4	79.9	45.7
Moswansicut Reservoir subbasin														
19	01115170	Moswansicut Reservoir (Moswansicut Stream North, Moswansicut Pond)	30.0	17.7	31.3	18.5	32.6	19.2	34.2	20.1	33.5	19.7	33.8	19.8
Regulating Reservoir subbasin														
14	01115110	Huntinghouse Brook	8.3	5.1	10.2	6.2	11.7	7.1	12.2	7.4	18.3	11.0	15.1	9.1
15	01115115	Regulating Reservoir (Rush Brook)	25.2	14.9	36.5	21.4	35.1	20.6	38.9	22.8	61.5	35.5	53.1	30.7
16	01115098	Peeptoad Brook (Harrisdale Brook)	19.6	11.7	25.8	15.3	28.5	16.9	29.5	17.4	30.5	18.0	30.6	18.1
18	01115120	Unnamed Tributary to Regulating Reservoir (Unnamed Brook A)	41.3	24.1	41.8	24.4	30.8	18.1	33.9	19.9	62.4	36.0	48.6	28.2
Scituate Reservoir basin														
		Average	20.3	12.1	24.6	14.6	26.5	15.6	30.9	18.1	38.3	22.4	35.8	20.9

Table 5. Annual mean chloride and sodium concentrations, loads, and yields, by sampling station, in the Scituate Reservoir drainage area, Rhode Island, October 1, 2009, through September 30, 2010.

[PW, Providence Water; USGS, U.S. Geological Survey; no., number; mg/L, milligrams per liter; kg, kilograms; kg/mi^2, 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/mi^2)	Na (kg/mi^2)
		Barden Reservoir subbasin						
24	01115190	Dolly Cole Brook	19.8	11.9	230,000	140,000	46,000	28,000
28	01115265	Barden Reservoir (Hemlock Brook)	11.3	6.9	270,000	170,000	31,000	19,000
35	01115187	Ponaganset River	12.3	7.4	430,000	260,000	31,000	19,000
		Direct Runoff subbasin						
3	01115280	Cork Brook	22.8	13.5	92,000	55,000	52,000	31,000
5	01115184	Spruce Brook	11.4	6.9	39,000	23,000	32,000	19,000
6	01115183	Quonapaug Brook	26.1	15.5	130,000	78,000	67,000	40,000
7	01115297	Wilbur Hollow Brook	7.7	4.7	80,000	49,000	19,000	11,000
8	01115276	Westconnaug Brook (Westconnaug Reservoir)	17.3	10.4	130,000	76,000	24,000	15,000
9	01115275	Bear Tree Brook	43.4	25.2	71,000	41,000	110,000	66,000
		Moswansicut Reservoir subbasin						
19	01115170	Moswansicut Reservoir, (Moswansicut Stream North, Moswansicut Pond)	34.3	20.2	300,000	180,000	94,000	55,000
		Regulating Reservoir subbasin						
14	01115110	Huntinghouse Brook	7.8	4.8	110,000	71,000	18,000	11,000
15	01115115	Regulating Reservoir (Rush Brook)	21.9	13.0	220,000	130,000	47,000	28,000
16	01115098	Peeptoad Brook (Harrisdale Brook)	24.5	14.5	350,000	210,000	71,000	42,000
18	01115120	Unnamed Tributary to Regulating Reservoir (Unnamed Brook A)	36.8	21.5	22,000	13,000	80,000	47,000
		Scituate Reservoir basin						
			Average		Total		Average	
			21.3	12.6	2,500,000	1,500,000	52,000	31,000

Table 6. Monthly estimated chloride and sodium loads, by sampling station, in the Scituate Reservoir drainage area, Rhode Island, October 1, 2009, through September 30, 2010.

[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	8,800	5,200	20,000	12,000	24,000	15,000	40,000	24,000	32,000	19,000	75,000	45,000
28	01115265	Barden Reservoir (Hemlock Brook)	17,000	10,000	18,000	11,000	30,000	18,000	26,000	16,000	32,000	19,000	96,000	59,000
35	01115187	Ponaganset River	18,000	11,000	32,000	19,000	65,000	39,000	55,000	33,000	53,000	32,000	120,000	70,000
Direct Runoff subbasin														
3	01115280	Cork Brook	7,500	4,400	10,000	6,100	16,000	9,400	14,000	8,500	16,000	9,700	18,000	11,000
5	01115184	Spruce Brook	2,600	1,500	3,200	1,900	4,800	2,900	3,800	2,300	4,100	2,500	13,000	8,100
6	01115183	Quonapaug Brook	9,900	5,800	12,000	7,100	26,000	15,000	14,000	8,500	14,000	8,300	26,000	16,000
7	01115297	Wilbur Hollow Brook	7,800	4,700	7,700	4,700	9,900	6,100	8,500	5,200	7,600	4,700	17,000	11,000
8	01115276	Westconnaug Brook (Westconnaug Reservoir)	9,500	5,600	9,900	5,900	13,000	7,800	13,000	7,900	13,000	7,800	13,000	7,900
9	01115275	Bear Tree Brook	4,200	2,400	4,800	2,800	6,700	3,900	6,500	3,800	5,900	3,400	11,000	6,700
Moswansicut Reservoir subbasin														
19	01115170	Moswansicut Reservoir (Moswansicut Stream North, Moswansicut Pond)	15,000	8,900	22,000	13,000	37,000	22,000	33,000	20,000	32,000	19,000	91,000	53,000
Regulating Reservoir subbasin														
14	01115110	Huntinghouse Brook	5,600	3,400	11,000	6,500	17,000	10,000	13,000	8,300	14,000	8,500	33,000	21,000
15	01115115	Regulating Reservoir (Rush Brook)	16,000	9,500	21,000	13,000	30,000	18,000	22,000	13,000	28,000	17,000	63,000	38,000
16	01115098	Peeptoad Brook (Harrisdale Brook)	21,000	12,000	30,000	18,000	46,000	27,000	35,000	21,000	32,000	19,000	73,000	44,000
18	01115120	Unnamed Tributary to Regulating Reservoir (Unnamed Brook A)	860	500	1,200	710	3,300	1,900	3,000	1,700	3,300	1,900	6,600	3,900
Scituate Reservoir basin														
		Total	143,760	84,900	202,800	121,710	328,700	196,000	286,800	173,200	286,900	171,800	655,600	394,600

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	14,000	8,600	5,900	3,600	3,100	1,900	1,300	760	780	460	830	490
28	01115265	Barden Reservoir (Hemlock Brook)	29,000	17,000	12,000	7,300	6,400	3,800	2,900	1,700	2,600	1,600	1,700	1,000
35	01115187	Ponaganset River	46,000	28,000	20,000	12,000	15,000	9,100	6,000	3,600	4,300	2,600	3,700	2,200
Direct Runoff subbasin														
3	01115280	Cork Brook	4,000	2,400	2,900	1,800	1,400	810	780	460	400	230	310	180
5	01115184	Spruce Brook	4,200	2,500	1,600	980	590	360	220	130	160	92	120	71
6	01115183	Quonapaug Brook	14,000	8,300	6,400	3,800	3,300	1,900	1,700	980	2,000	1,100	1,800	1,000
7	01115297	Wilbur Hollow Brook	9,500	5,800	4,900	3,000	3,200	1,900	1,600	980	1,400	850	1,000	610
8	01115276	Westconnaug Brook (Westconnaug Reservoir)	14,000	8,600	14,000	8,600	9,800	5,800	4,500	2,600	5,400	3,200	5,200	3,100
9	01115275	Bear Tree Brook	12,000	6,700	7,100	4,100	4,500	2,600	3,300	1,900	2,400	1,400	2,200	1,200
Moswansicut Reservoir subbasin														
19	01115170	Moswansicut Reservoir (Moswansicut Stream North, Moswansicut Pond)	46,000	27,000	13,000	7,600	5,600	3,300	5,000	3,000	2,000	1,200	2,700	1,600
Regulating Reservoir subbasin														
14	01115110	Huntinghouse Brook	12,000	7,100	5,000	3,000	2,700	1,600	820	500	370	220	500	300
15	01115115	Regulating Reservoir (Rush Brook)	19,000	11,000	10,000	6,000	4,900	2,900	3,000	1,800	1,800	1,000	1,200	670
16	01115098	Peeptoad Brook (Harrisdale Brook)	48,000	28,000	40,000	23,000	23,000	14,000	3,700	2,200	1,600	940	2,200	1,300
18	01115120	Unnamed Tributary to Regulating Reservoir (Unnamed Brook A)	3,100	1,800	760	440	210	120	74	43	4.3	2.5	1.4	0.8
Scituate Reservoir basin														
		Total	274,800	162,800	143,560	85,220	83,700	50,090	34,894	20,653	25,214	14,895	23,461	13,722

Constituent Concentrations and Daily Loads and Yields

Fecal indicator bacteria, chloride, and nutrients such as 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 such as waste disposal, use of septic systems, 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 93 CFU/100 mL for total coliform bacteria and 16 CFU/100 mL for *E. coli* bacteria. Median concentrations of total coliform bacteria and *E. coli* bacteria were greatest at Toad Pond (Providence Water Station 31; table 7) at 1,430 and 1,210 CFU/100 mL, respectively. Concentrations of fecal indicator bacteria were lowest at monitoring stations Ponaganset River (Barden Stream, Providence Water Station 29), Westconnaug Brook (Providence Water Station 8), Moswansicut Reservoir (Providence Water Station 19), Kimball Stream (Providence Water Station 34), and Regulating Reservoir (Providence Water Station 13).

Median daily loads and yields of total coliform and *E. coli* bacteria varied over three orders of magnitude; the highest median daily yield was at the Ponaganset River (Providence Water Station 35; 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 all subbasins in the Scituate Reservoir drainage area ranged from 360 to 29,000 CFU×10^6/d, and yields ranged from 69 to 20,000 CFU×10^6/d/mi^2; *E. coli* loads ranged from 57 to 8,700 CFU×10^6/d, and yields ranged from 67 to 5,200 CFU×10^6/d/mi^2 (table 8).

Chloride

The highest median chloride concentration (87.6 mg/L) was measured in the Direct Runoff subbasin at the Toad Pond station (Providence Water 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 73 kg/d/mi^2. Ponaganset River (Providence Water Station 35) had the largest median daily chloride load (1,300 kg/d). The largest median daily chloride yield (270 kg/d/mi^2) was determined for Bear Tree Brook (Providence Water Station 9); this yield is similar to the mean daily chloride yield (110,000 kg/yr/mi^2 (table 5) or about 300 kg/d/mi^2) estimated for that station by using continuously measured specific-conductance records.

Nutrients

Median concentrations of nitrite and nitrate (table 7) were 0.002 and 0.01 mg/L as nitrogen (N), respectively. Higher concentrations of nitrite and nitrate at some monitoring sites, such as Moswansicut Reservoir (Providence Water Station 22) in the Moswansicut Reservoir subbasin (0.005 mg/L as N and 0.09 mg/L as N, respectively), may have been affected by nutrient-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 (0.18 mg/L as P) was measured in Unnamed Tributary #1 to Moswansicut Reservoir (Providence Water Station 20). Median daily nutrient loads from the Ponaganset River (Providence Water Station 35) into the Scituate Reservoir—nitrite (74 g/d), nitrate (540 g/d), and orthophosphate (2,200 g/d)—were among the largest for all the sampled stations. Median daily orthophosphate loads for WY 2010 were larger at only one station, Peeptoad Brook (Providence Water Station 16; 4,300 g/d). The largest median daily yield for nitrite (16 g/d/mi^2) was determined for Unnamed Tributary #3 to Scituate Reservoir (Providence Water Station 33). The largest median daily yield for nitrate (370 g/d/mi^2) was determined for Bear Tree Brook (Providence Water Station 9), and the largest median daily yield for orthophosphate (860 g/d/mi^2) was determined for Peeptoad Brook (Providence Water Station 16; 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, 2009, through September 30, 2010.

[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, nitrogen; P, phosphorus; --, no data]

PW station no.	USGS station no.	Station name	Properties			Constituents						
			pH (units)	Color (PCU)	Turbidity (NTU)	Total coliform bacteria (CFU/100mL)	*E. coli* (CFU/100mL)	Alkalinity (mg/L as $CaCO_3$)	Chloride (mg/L)	Nitrite (mg/L as N)	Nitrate (mg/L as N)	Orthophosphate (mg/L as P)
Barden Reservoir subbasin												
24	01115190	Dolly Cole Brook	5.9	65	0.7	113	9	4.6	25.9	0.001	0.01	0.03
25	01115200	Shippee Brook	6.1	37	0.5	551	5	3.7	9.7	0.003	0.01	0.05
26	01115185	Windsor Brook	6.3	35	0.3	1,202	76	4.1	15.3	0.002	0.01	0.05
27	011151845	Unnamed Tributary to Ponaganset River (Unnamed Brook B, Unnamed Brook West of Windsor Brook)	5.7	20	0.2	1,100	2	4.0	14.8	0.001	0.01	0.08
28	01115265	Barden Reservoir (Hemlock Brook)	5.8	75	0.6	75	39	4.6	20.2	0.001	0.01	0.06
29	01115271	Ponaganset River (Barden Stream)	5.9	45	0.6	2	2	4.2	17.6	0.001	0.01	0.06
35	01115187	Ponaganset River	6.0	63	0.7	93	12		18.4	0.001	0.01	0.04
Direct Runoff subbasin												
1	01115180	Brandy Brook	6.7	58	1.1	23	13.5	10	11.9	0.002	0.01	0.08
2	01115181	Unnamed Tributary #2 to Scituate Reservoir (Unnamed Brook North of Bullhead Brook)	6.2	41	0.4	1,320	195	4.0	53.3	0.002	0.02	0.04
3	01115280	Cork Brook	6.2	30	0.3	43	9	4.3	32.3	0.002	0.01	0.05
4	01115400	Kent Brook (Betty Pond Stream)	6.3	30	0.6	23	23	6.0	5.2	0.001	0.01	0.04
5	01115184	Spruce Brook	6.1	45	0.4	84	15	4.2	13.0	0.003	0.01	0.08
6	01115183	Quonapaug Brook	6.3	93	1.4	113	43	10.4	34.6	0.001	0.01	0.06
7	01115297	Wilbur Hollow Brook	6.2	73	0.9	98	49	5.6	10.1	0.002	0.01	0.05
8	01115276	Westconnaug Brook (Westconnaug Reservoir)	5.8	15	0.4	2	2	2.9	11.5	0.001	0.01	0.04
9	01115275	Bear Tree Brook	6.3	32	0.4	58	4	5.2	60.0	0.002	0.11	0.06
30	01115350	Unnamed Tributary #4 to Scituate Reservoir (Coventry Brook, Knight Brook)	6.2	33	0.4	122	43	3.7	16.0	0.002	0.01	0.06
31	1115177	Toad Pond	6.4	31	1.0	1,430	1,210	17	87.6	0.005	0.23	0.09
32	01115178	Unnamed Tributary #1 to Scituate Reservoir (Pine Swamp Brook)	6.5	64	0.8	87	23	6.5	12.2	0.002	0.02	0.05
33	01115182	Unnamed Tributary #3 to Scituate Reservoir (Hall's Estate Brook)	6.0	36	0.4	242	49	3.6	13.7	0.002	0.03	0.07
36	--	Outflow from King Pond	6.3	21	0.4	167	5	4.0	5.3	0.001	0.01	0.07
37	--	Fire Tower Stream	5.8	35	0.3	32	27	3.9	5.0	0.001	0.01	0.07

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, 2009, through September 30, 2010.—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, nitrogen; P, phosphorus; --, no data]

PW station no.	USGS station no.	Station name	Properties			Constituents						
			pH (units)	Color (PCU)	Turbidity (NTU)	Total coliform bacteria (CFU/100mL)	*E. coli* (CFU/100mL)	Alkalinity (mg/L as $CaCO_3$)	Chloride (mg/L)	Nitrite (mg/L as N)	Nitrate (mg/L as N)	Orthophosphate (mg/L as P)
Moswansicut Reservoir subbasin												
19	01115170	Moswansicut Reservoir (Moswansicut Stream North, Moswansicut Pond)	6.7	26	0.8	7	4	9.4	37.2	0.002	0.01	0.06
20	01115160	Unnamed Tributary #1 to Moswansicut Reservoir (Blanchard Brook)	6.1	145	0.7	240	43	8.0	45.3	0.003	0.01	0.18
21	01115165	Unnamed Tributary #2 to Moswansicut Reservoir (Brook from Kimball Reservoir)	6.5	43	1.1	1,212	10	12	36.7	0.003	0.02	0.06
22	01115167	Moswansicut Reservoir (Moswansicut Stream South)	6.6	29	1.9	150	23	13	36.7	0.005	0.09	0.09
34	01115164	Kimball Stream	6.5	35	0.6	2	2	4.2	23.2	0.002	0.02	0.05
Ponaganset Reservoir subbasin												
23	011151843	Ponaganset Reservoir	5.7	14	0.5	16	5	2.4	13.3	0.001	0.01	0.04
Regulating Reservoir subbasin												
13	01115176	Regulating Reservoir	6.5	34	0.8	9	2	7.5	32.3	0.002	0.01	0.04
14	01115110	Huntinghouse Brook	6.3	42	0.5	240	43	5.0	11.4	0.001	0.01	0.04
15	01115115	Regulating Reservoir (Rush Brook)	6.8	55	0.7	68	33	7	40.5	0.001	0.01	0.07
16	01115098	Peeptoad Brook (Harrisdale Brook)	6.4	39	0.9	59	16	8.2	31.9	0.001	0.01	0.08
17	01115119	Dexter Pond (Paine Pond)	5.9	50	0.7	132	12	5.4	27.6	0.002	0.01	0.06
18	01115120	Unnamed Tributary to Regulating Reservoir (Unnamed Brook A)	6.2	43	0.6	23	14	9.7	27.7	0.002	0.045	0.10
Westconnaug Reservoir subbasin												
10	01115274	Westconnaug Brook	5.6	30	0.2	23	23	2.5	23.9	0.001	0.01	0.06
11	01115273	Unnamed Tributary to Westconnaug Reservoir (Unnamed Brook South of Westconnaug Reservoir)	5.4	85	0.6	210	23	4.4	6.0	0.002	0.01	0.07
12	011152745	Unnamed Tributary to Westconnaug Brook (Unnamed Brook north of Westconnaug Reservoir)	5.8	72	1.6	210	43	6.0	39.9	0.002	0.01	0.06
Scituate Reservoir basin												
		Median	6.2	39	0.6	93	16	4.8	20.2	0.002	0.01	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, 2009, through September 30, 2010.

[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; *E. coli*, *Escherichia coli*; N, nitrogen; P, phosphorus; 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)	(CFUx10^6/mi^2)	(CFUx10^6/d)	(CFUx10^6/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	13,000	2,700	2,000	410	390	80	17	3.4	72	15	300	61
25	01115200	Shippee Brook	13,000	5,400	190	81	76	32	11	4.7	40	17	280	120
26	01115185	Windsor Brook	15,000	3,500	1,100	240	100	23	9.0	2.1	65	15	270	63
28	01115265	Barden Reservoir	12,000	1,400	6,300	720	300	34	27	3.1	81	9.3	730	84
35	01115187	Ponaganset River	29,000	2,100	8,700	620	1,300	89	74	5.3	540	39	2,200	150
Direct Runoff subbasin														
1	01115180	Brandy Brook	2,300	1,400	380	240	68	43	12	7.4	74	47	210	130
3	01115280	Cork Brook	1,400	780	280	160	210	120	7.1	4.0	80	45	220	120
4	01115400	Kent Brook	470	550	150	180	6.1	7.2	2.0	2.4	20	24	32	38
5	01115184	Spruce Brook	2,200	1,800	390	320	89	73	11	9.2	30	24	460	370
6	01115183	Quonapaug Brook	8,200	4,200	4,800	2,400	320	160	9.4	4.8	58	30	340	170
7	01115297	Wilbur Hollow Brook	7,200	1,600	4,600	1,000	180	40	19	4.4	190	43	1,400	320
8	01115276	Westconnaug Brook	360	69	350	67	240	46	24	4.6	130	24	640	120
9	01115275	Bear Tree Brook	2,000	3,100	83	130	170	270	3.8	6.1	230	370	230	370
32	01115178	Unnamed Tributary #1 to Scituate Reservoir (Pine Swamp Brook)	3,200	7,100	510	1,100	19	42	4.4	10	28	62	93	210
33	01115182	Unnamed Tributary #3 to Scituate Reservoir (Hall's Estate Brook)	2,000	7,100	1,500	5,200	20	71	4.5	16	30	110	160	570
Moswansicut Reservoir subbasin														
19	01115170	Moswansicut Reservoir (Moswansicut Stream North, Moswansicut Pond)	1,200	380	380	120	480	150	26	7.8	130	38	880	270

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, 2009, through September 30, 2010.—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; *E. coli*, *Escherichia coli*; N, nitrogen; P, phosphorus; 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)	(CFUx10^6/mi^2)	(CFUx10^6/d)	(CFUx10^6/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)	5,700	20,000	57	200	49	170	2.7	9.3	31	110	72	250
Regulating Reservoir subbasin														
14	01115110	Huntinghouse Brook	21,000	3,400	8,200	1,300	340	55	27	4.3	190	30	460	74
15	01115115	Regulating Reservoir (Rush Brook)	7,900	1,700	2,100	440	410	87	11	2.3	77	16	390	82
16	01115098	Peeptoad Brook (Harrisdale Brook)	21,000	4,200	5,400	1,100	970	200	32	6.5	430	87	4,300	860
18	01115120	Unnamed Tributary to Regulating Reservoir (Unnamed Brook A)	390	1,400	220	780	45	160	2.5	8.8	74	260	160	580
Westconnaug Reservoir subbasin														
10	01115274	Westconnaug Brook	3,400	2,300	840	570	170	110	10	7	68	46	600	410
11	01115273	Unnamed Tributary to Westconnaug Reservoir (Unnamed Brook South of Westconnaug Reservoir)	5,700	7,900	620	860	33	46	11	15	54	75	480	670
Scituate Reservoir basin														
		Median	5,700	2,300	620	440	170	73	11	5.3	74	39	340	170

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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, 2009, through September 30, 2010.

[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; $CFU \times 10^6/d$, 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 ($CFUx10^6/d$)	*E. coli* ($CFUx10^6/d$)	Chloride (kg/d)	Nitrite (g/d as N)	Nitrate (g/d as N)	Orthophosphate (g/d as P)
Barden Reservoir subbasin										
24	01115190	Dolly Cole Brook	10/02/09	0.34	120	75	19	0.83	4.2	67
			11/06/09	2.9	11,000	500	190	7.1	35	71
			12/04/09	37	140,000	68,000	2,200	91	450	7,200
			01/29/10	22	2,200	2,200	1,000	54	270	540
			02/05/10	8.3	15,000	1,800	590	20	100	610
			03/05/10	20	110,000	110,000	1,400	48	480	1,400
			04/02/10	30	17,000	2,900	2,200	74	370	370
			05/07/10	2.4	140,000	520	170	5.7	29	230
			06/04/10	1.8	10,000	4,000	86	13	43	130
			07/30/10	0.64	670	63	31	3.1	16	110
25	01115200	Shippee Brook	10/16/09	0.92	25,000	200	56	4.5	11	90
			01/15/10	4.1	150	150	95	10	200	610
			04/16/10	5.0	180	180	110	120	61	370
			07/16/10	1.6	93,000	93,000	38	12	19	190
26	01115185	Windsor Brook	10/16/09	0.49	29,000	1,800	14	2.4	6	72
			01/15/10	6.2	230	230	280	15	450	2,000
			04/16/10	8.5	830	310	130	42	100	420
			07/16/10	1.2	70,000	70,000	70	2.9	29	120
28	01115265	Barden Reservoir	10/13/09	2.7	73,000	16,000	210	27	33	400
			11/10/09	5.1	12,000	2,600	240	37	62	1,400
			12/08/09	21	39,000	39,000	1,100	52	260	3,100
			01/12/10	8.7	4,900	850	490	42	420	640
			02/16/10	8.3	4,600	1,800	550	20	100	100
			03/16/10	200	330,000	190,000	5,300	430	2,200	22,000
			04/13/10	19	11,000	700	910	93	230	2,300
			05/11/10	6.6	6,300	6,300	300	16	81	1,900
			06/08/10	2.3	13,000	13,000	96	5.6	28	730
			07/13/10	0.31	18,000	18,000	17	2.3	7.7	46
			09/20/10	0.40	420	88	30	0.98	20	280
35	01115187	Ponaganset River	10/02/09	1.6	3,700	1,700	88	7.9	20	160
			11/06/09	10	24,000	11,000	470	26	130	130
			12/04/09	99	360,000	180,000	5,200	480	2,400	15,000
			01/29/10	61	2,200	2,200	2,100	150	740	1,500
			02/05/10	33	34,000	1,200	1,400	80	400	3,200
			03/05/10	64	17,000	6,300	2,900	160	1,600	7,800
			04/02/10	100	83,000	14,000	7,900	360	3,600	18,000
			05/07/10	23	1,400,000	11,000	1,100	56	280	2,800
			06/04/10	14	72,000	26,000	560	68	680	680
			07/30/10	2.6	9,500	250	120	25	250	32

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, 2009, through September 30, 2010.—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 (CFUx10^6/d)	*E. coli* (CFUx10^6/d)	Chloride (kg/d)	Nitrite (g/d as N)	Nitrate (g/d as N)	Orthophosphate (g/d as P)
				Direct Runoff subbasin						
1	01115180	Brandy Brook	10/06/09	0.87	5,100	920	32	4.3	11	170
			11/03/09	1.9	2,000	190	59	14	23	190
			12/01/09	4.6	450	170	130	34	56	680
			01/05/10	4.4	2,500	160	130	32	430	860
			02/02/10	4.4	2,500	430	130	22	220	220
			03/02/10	7.5	4,200	730	240	9.2	92	180
			04/06/10	6.5	3,700	3,700	180	32	160	1,300
			05/04/10	2.6	1,500	1,500	76	6.4	130	510
			06/01/10	1.6	3,600	900	47	16	120	510
			07/06/10	0.4	210	39	12	2	9.8	88
			08/03/10	0.34	320	320	9.5	0.83	17	75
			09/07/10	0.48	1,800	270	18	2.3	12	47
3	01115280	Cork Brook	10/01/09	0.35	200	200	40	0.86	4.3	77
			11/16/09	6.5	12,000	1,100	520	32	80	1,300
			12/03/09	28	740,000	310,000	1,200	200	340	680
			01/07/10	3.1	3,300	110	210	7.7	380	150
			02/04/10	2.9	110	110	260	7.1	140	350
			03/04/10	5.1	1,100	1,100	390	25	130	1,000
			04/01/10	12	7,000	1,200	1,200	92	150	1,200
			05/06/10	1.3	280	280	83	3.1	31	220
			06/03/10	0.59	1,400	330	40	2.9	58	120
			07/22/10	0.38	2,000	210	37	1.9	4.7	4.7
			09/02/10	0.01	880	55	1.4	0	0.18	0.18
4	01115400	Kent Brook	10/06/09	0.11	250	62	1	0.27	2.7	16
			11/13/09	0.17	96	96	2.8	0.83	2.1	4.2
			12/01/09	2.2	1,200	220	34	5.4	27	480
			01/05/10	2.1	210	77	31	5.1	150	510
			02/02/10	2.1	1,200	77	27	5.1	51	150
			03/02/10	5.4	3,000	200	69	6.6	66	130
			04/06/10	4.1	150	150	300	20	100	700
			05/04/10	0.83	470	470	6.1	2	20	10
			06/01/10	0.33	1,900	190	2.8	1.6	4	32
			07/06/10	0.03	1,600	750	0.25	0.14	0.34	2.7
			09/07/10	0.04	89	22	0.9	0	0.48	6.7
5	01115184	Spruce Brook	10/19/09	2.1	3,800	1,200	100	15	25	510
			01/21/10	3.1	7,000	680	88	7.5	300	980
			04/20/10	2.8	100	100	90	34	34	400
			07/20/10	0.11	590	59	3.5	0.56	1.4	8.4

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, 2009, through September 30, 2010.—Continued

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PW station no.	USGS station no.	Station name	Date	Daily mean streamflow (ft^3/s)	Total coliform bacteria ($CFUx10^6/d$)	*E. coli* ($CFUx10^6/d$)	Chloride (kg/d)	Nitrite (g/d as N)	Nitrate (g/d as N)	Orthophosphate (g/d as P)
Direct Runoff subbasin—Continued										
6	01115183	Quonapaug Brook	10/06/09	1.3	7,500	7,500	140	6.2	16	750
			11/03/09	3	11,000	3,100	280	7.3	36	36
			12/01/09	4.7	8,600	8,600	380	11	110	1,400
			01/05/10	4.3	7,800	4,500	310	10	420	1,400
			02/02/10	4.3	2,400	160	360	11	53	420
			03/02/10	11	39,000	1,000	920	13	130	260
			04/06/10	9.1	5,100	5,100	640	45	220	2,200
			05/04/10	3.6	3,800	3,800	320	8.8	44	44
			06/01/10	1.3	14,000	14,000	97	3.1	63	63
			09/07/10	0.34	20,000	20,000	39	2.5	4.1	66
7	01115297	Wilbur Hollow Brook	10/01/09	3	18,000	1,700	110	7.3	150	150
			11/16/09	20	530,000	45,000	440	97	480	1,900
			12/03/09	26	710,000	300,000	720	260	320	3,900
			01/07/10	8.3	4,700	4,700	220	41	610	1,200
			02/04/10	7.7	280	280	190	19	190	1,300
			03/04/10	15	16,000	8,500	630	37	180	1,800
			04/01/10	55	31,000	31,000	1,300	270	21,000	5,300
			05/06/10	7.8	4,400	4,400	160	19	190	1,500
			06/03/10	3.8	7,000	7,000	89	19	47	1,500
			07/22/10	1.2	7,300	2,800	38	6.1	180	15
			08/05/10	0.04	150	150	1	0.1	1	0.51
			09/02/10	0.29	860	860	5.3	0.71	7.1	7.1
8	01115276	Westconnaug Brook	10/09/09	3.9	7,100	140	110	9.5	48	570
			11/13/09	3.9	140	140	110	9.6	48	960
			12/18/09	11	400	400	340	27	270	2,100
			01/08/10	9.6	10,000	350	290	24	470	710
			02/12/10	10	370	370	270	49	120	240
			03/12/10	9.1	340	340	270	22	220	1,300
			04/09/10	9.6	350	350	520	47	120	470
			05/14/10	9.8	960	960	210	24	240	1,200
			06/11/10	5.5	200	200	110	27	130	130
			07/09/10	1.6	58	58	41	3.9	19	120
9	01115275	Bear Tree Brook	10/20/09	0.75	4,400	73	130	3.7	370	310
			01/21/10	1.6	3,600	270	210	3.9	580	150
			04/20/10	2.5	93	93	350	31	31	430
			07/20/10	0.54	300	52	53	2.6	92	26

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, 2009, through September 30, 2010.—Continued

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PW station no.	USGS station no.	Station name	Date	Daily mean streamflow (ft^3/s)	Total coliform bacteria ($CFUx10^6/d$)	*E. coli* ($CFUx10^6/d$)	Chloride (kg/d)	Nitrite (g/d as N)	Nitrate (g/d as N)	Orthophosphate (g/d as P)
				Direct Runoff subbasin—Continued						
32	01115178	Unnamed Tributary #1 to Scituate Reservoir (Pine Swamp Brook)	10/15/09	0.12	68	68	3.8	0.29	5.9	5.9
			01/19/10	1.7	6,200	960	52	4.2	370	370
			04/15/10	0.93	200	34	27	4.5	45	140
			07/15/10	0.47	28,000	28,000	11	4.6	11	46
33	01115182	Unnamed Tributary #3 to Scituate Reservoir (Hall's Estate Brook)	10/29/09	1.1	12,000	1,200	22	10	33	330
			01/27/10	3.1	1,700	1,700	96	7.6	300	230
			04/21/10	0.53	19	19	18	1.3	26	91
			07/28/10	0.04	2,300	2,300	1.7	0.2	3.9	5.9
				Moswansicut Reservoir subbasin						
19	01115170	Moswansicut Reservoir (Moswansicut Stream North, Moswansicut Pond)	10/19/09	4.4	2,500	2,500	390	22	54	650
			11/12/09	2.8	17,000	17,000	260	62	140	1,800
			12/10/09	16	29,000	8,800	1,500	38	770	2,300
			01/14/10	5.5	530	200	560	27	130	400
			02/11/10	6.6	1,500	240	610	32	320	1,100
			03/11/10	9.8	960	360	880	24	120	480
			04/08/10	23	2,300	2,300	2,200	110	570	10,000
			05/13/10	4	390	390	91	9.7	48	390
			06/10/10	1.7	62	62	140	8.3	83	1,600
			07/08/10	0.85	480	190	69	4.2	21	21
21	01115165	Unnamed Tributary #2 to Moswansicut Reservoir (Brook from Kimball Reservoir)	10/23/09	0.23	14,000	23	25	0.56	2.8	84
			01/22/10	1.2	44	44	93	26	290	150
			04/23/10	0.81	460	460	72	4	59	59
			07/23/10	0.19	11,000	70	17	1.4	2.3	28

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, 2009, through September 30, 2010.—Continued

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PW station no.	USGS station no.	Station name	Date	Daily mean streamflow (ft^3/s)	Total coliform bacteria ($CFUx10^6/d$)	*E. coli* ($CFUx10^6/d$)	Chloride (kg/d)	Nitrite (g/d as N)	Nitrate (g/d as N)	Orthophosphate (g/d as P)
				Regulating Reservoir subbasin						
14	01115110	Huntinghouse Brook	10/05/09	1.9	21,000	21,000	61	23	23	23
			11/02/09	7.1	13,000	6,700	230	17	86	170
			12/15/09	31	840,000	160,000	700	76	380	4,600
			01/04/10	11	12,000	2,500	340	28	560	1,100
			02/01/10	11	6,200	400	280	27	130	130
			03/15/10	200	1,100,000	1,100,000	3,100	460	4,600	23,000
			04/05/10	23	5,200	5,200	590	57	570	290
			05/03/10	7.7	45,000	8,200	370	19	190	1,500
			06/07/10	1.9	110,000	11,000	53	9.2	46	460
15	01115115	Regulating Reservoir (Rush Brook)	10/05/09	2.2	59,000	8,100	250	11	27	54
			11/02/09	5.7	3,200	560	510	14	70	280
			12/15/09	17	18,000	18,000	970	43	210	2,100
			01/04/10	4.3	25,000	160	430	11	110	960
			02/01/10	3.3	3,500	330	330	8.2	41	490
			03/15/10	100	1,600,000	1,600,000	6,700	350	3,500	24,000
			04/05/10	10	5,800	5,800	410	50	130	130
			05/03/10	3.4	7,700	3,600	410	8.3	83	830
			06/07/10	0.3	8,000	310	34	1.4	14	80
			07/29/10	0.17	94	6	17	0.41	4.1	33
16	01115098	Peeptoad Brook (Harrisdale Brook)	10/05/09	7.1	6,800	260	650	35	87	170
			11/02/09	6	6,300	1,000	650	15.0	74.0	150
			12/15/09	30	17,000	17,000	2,300	150.0	730.0	6,600
			01/04/10	12	61,000	440	940	29.0	580.0	5,200
			02/01/10	12	21,000	6,500	1,000	28.0	280.0	850
			03/15/10	100	3,600,000	1,500,000	6,700	320.0	6,500.0	16,000
			04/05/10	37	21,000	21,000	2,500	180.0	910.0	26,000
			05/03/10	19	11,000	4,200	1,600	47.0	940.0	3,300
			06/07/10	9.4	110,000	9,900	610	23	120	5,500
			07/29/10	0.35	21,000	13	22	0.85	4.3	130
18	01115120	Unnamed Tributary to Regulating Reservoir (Unnamed Brook A)	01/22/10	0.71	400	69	21	1.7	100	260
			04/23/10	0.65	370	370	69	3.2	48.0	64

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Wesconnaug Reservoir subbasin										
10	01115274	Westconnaug Brook	10/13/09	0.27	7,300	150	18	0.66	6.6	13
			11/10/09	0.67	3,900	25	39	1.6	8.2	160
			12/08/09	6.1	3,400	3,400	570	15	150	1,200
			01/12/10	4.1	24,000	2,300	230	10	100	600
			02/16/10	2.9	110	110	170	14	35	780
			03/16/10	34	19,000	19,000	1,500	83.0	3,300	1,700
			04/13/10	5.6	210	210	280	14	68	820
			05/11/10	2.6	1,500	1,500	150	6.4	130	510
			06/08/10	0.8	840	840	16	3.9	20	20
11	01115273	Unnamed Tributary to Westconnaug Reservoir (Unnamed Brook South of Westconnaug Reservoir)	10/27/09	1.1	5,700	620	16	11	13	480
			01/26/10	17	460,000	39,000	160	83	210	2,900
			04/27/10	2.2	1,200	81	33	11	54	380

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For more information concerning this report, contact:

Director
U.S. Geological Survey
Massachusetts-Rhode Island Water Science Center
10 Bearfoot Road
Northborough, MA 01532
dc_ma@usgs.gov

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