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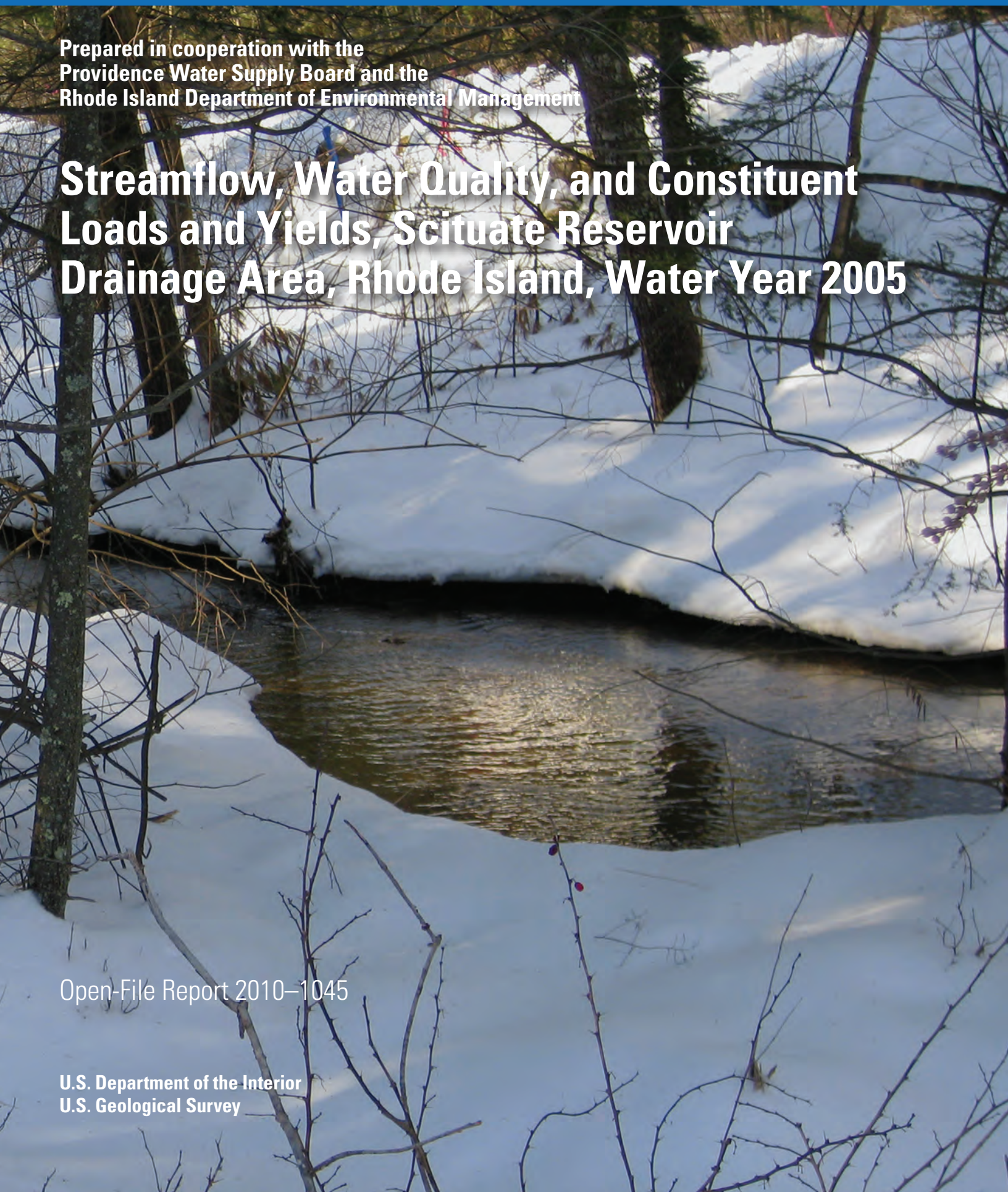
Streamflow, Water Quality, and Constituent Loads and Yields, Scituate Reservoir Drainage Area, Rhode Island, Water Year 2005



Open-File Report 2010–1045

U.S. Department of the Interior
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Cover. Photograph shows Bear Tree Brook in winter.

Streamflow, Water Quality, and Constituent Loads and Yields, Scituate Reservoir Drainage Area, Rhode Island, Water Year 2005

By Robert F. Breault and Jean P. Campbell

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U.S. Department of the Interior
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 2005

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) 2005 (October 1, 2004, to September 30, 2005). Water-quality samples were also collected at 37 sampling stations in the Scituate Reservoir drainage area by the Providence Water Supply Board during WY 2005 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 2005.

The largest tributary to the reservoir (the Ponaganset River, which was monitored by the USGS) contributed about 30 cubic feet per second (ft^3/s) to the reservoir during WY 2005. For the same time period, annual mean streamflows[1] measured (or estimated) for the other monitoring stations in this study ranged from about 0.42 to 19 ft^3/s. Together, tributary streams (equipped with instrumentation capable of continuously monitoring specific conductance) transported about 1,300,000 kilograms (kg) of sodium and 2,000,000 kg of chloride to the Scituate Reservoir during WY 2005; sodium and chloride yields for the tributaries ranged from 13,000 to 77,000 kilograms per square mile (kg/mi^2) and from 19,000 to 130,000 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 25.3 milligrams per liter (mg/L), median nitrite concentration was 0.002 mg/L as N, median nitrate concentration was 0.02 mg/L as N, median orthophosphate concentration was 0.07 mg/L as P, and median concentrations of total coliform and *Escherichia coli (E. coli)* bacteria were 23 and 15 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 (93 $kg/d/mi^2$), 16 g/d (6.1 $g/d/mi^2$), 150 g/d (71 $g/d/mi^2$), 530 g/d (250 $g/d/mi^2$), and 1,500 million colony forming units per day (CFU 10^6/d) (630 CFU $10^6/d/mi^2$) and 420 CFU 10^6/d (290 CFU $10^6/d/mi^2$), respectively.

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

Introduction

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

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

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

This report presents data on streamflow, water quality, and loads and yields of selected constituents for water year[2] (WY) 2005 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 2005 also are presented, and these data were used to calculate loads and yields of selected water-quality constituents (table 1).

[2] October 1, 2004, to September 30, 2005.

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 2005 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, 2006a). Error associated with measured streamflows in Peeptoad Brook and Ponaganset River was generally within about 15 percent (U.S. Geological Survey, 2006b); 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, 2004, to September 30, 2005.

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

PW station no.	USGS station no.	Station name	Drainage area (mi²)	Station active during study period	Frequency of QW sample collection	Number of samples collected by Providence Water[1]	Daily estimated Na and Cl loads	Estimated streamflow calculated
		Barden Reservior subbasin						
24	01115190	Dolly Cole Brook	4.90	Y	M	11	Y	Y
25	01115200	Shippee Brook	2.35	Y	Q	3	N	Y
26	01115185	Windsor Brook	4.32	Y	Q	3	N	Y
27	011151845	Unnamed Tributary to Ponaganset River (Unnamed Brook B, Unnamed Brook West of Windsor Brook)	0.10	Y	Q	2	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	10	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	1	N	N
3	01115280	Cork Brook	1.79	Y	M	10	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	8	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	1	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	2	N	Y
36	--	Outflow from King Pond	0.77	Y	Q	3	N	N
37	--	Fire Tower Stream	0.15	Y	Q	3	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, 2004, to September 30, 2005.—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	11	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	2	N	Y
22	01115167	Moswansicut Reservoir (Moswansicut Stream South)	0.22	Y	M	11	N	N
34	01115164	Kimball Stream	0.27	Y	Q	2	N	N
		Ponaganset Reservoir subbasin						
23	011151843	Ponaganset Reservoir	1.92	Y	M	11	N	N
		Regulating Reservoir subbasin						
13	01115176	Regulating Reservoir	22.1	Y	M	11	N	N
14	01115110	Huntinghouse Brook	6.23	Y	M	10	Y	Y
15	01115114	Regulating Reservoir (Rush Brook)	4.70	Y	M	10	N	Y
16	01115098	Peeptoad Brook (Harrisdale Brook)	4.96	Y	M	12	Y	N
17	01115119	Dexter Pond (Paine Pond)	0.22	Y	Q	3	N	N
18	01115120	Unnamed Tributary to Regulating Reservoir (Unnamed Brook A)	0.28	Y	Q	1	N	Y
		Westconnaug Reservoir subbasin						
10	01115274	Westconnaug Brook	1.48	Y	M	9	N	Y
11	01115273	Unnamed Tributary to Westconnaug Reservoir (Unnamed Brook south of Westconnaug Reservoir)	0.72	Y	Q	3	N	Y
12	011152745	Unnamed Tributary to Westconnaug Brook (Unnamed Brook north of Westconnaug reservoir)	0.16	Y	Q	1	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, 2004, through September 30, 2005.

[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	11	39	3.0	2.2
25	01115200	Shippee Brook	8.8	30	2.6	3.8
26	01115185	Windsor Brook	9.7	35	2.7	2.2
28	01115265	Barden Reservoir (Hemock Brook)	19	50	7.4	2.2
35	01115187	Ponaganset River	30	33	26	2.1
		Direct Runoff subbasin				
1	01115180	Brandy Brook	3.1	7.4	1.3	2.0
3	01115280	Cork Brook	4.0	9.3	1.7	2.2
4	01115400	Kent Brook (Betty Pond Stream)	2.4	21	0.27	2.8
5	01115184	Spruce Brook	3.6	15	0.88	2.9
6	01115183	Quonapaug Brook	5.0	15	1.7	2.5
7	01115297	Wilbur Hollow Brook	10	43	2.5	2.4
8	01115276	Westconnaug Brook (Westconnaug Reservoir)	7.4	15	3.8	1.4
9	01115275	Bear Tree Brook	1.4	2.6	0.76	2.3
32	01115178	Unnamed Tributary #1 to Scituate Reservoir (Pine Swamp Brook)	0.60	1.1	0.33	1.3
33	01115182	Unnamed Tributary #3 to Scituate Reservoir (Hall's Estate Brook)	0.94	2.4	0.36	3.4
		Moswansicut Reservoir subbasin				
19	01115170	Moswansicut Reservoir (Moswansicut Stream North, Moswansicut Pond)	7.1	30	1.7	2.2
21	01115165	Unnamed Tributary #2 to Moswansicut Reservoir (Blanchard Brook)	0.72	3.1	0.17	2.5
		Regulating Reservoir subbasin				
14	01115110	Huntinghouse Brook	14	46	4.5	2.3
15	01115115	Regulating Reservoir (Rush Brook)	10	34	3.2	2.2
16	01115098	Peeptoad Brook (Harrisdale Brook)	11	12	9.8	2.2
18	01115120	Unnamed Tributary to Regulating Reservoir	0.42	1.0	0.17	1.5
		Westconnaug Reservoir subbasin				
10	01115274	Westconnaug Brook	4.1	13	1.3	2.8
11	01115273	Unnamed Tributary to Westconnaug Reservoir (Unnamed Brook South of Westconnaug Reservoir)	4.1	13	1.3	5.7

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.

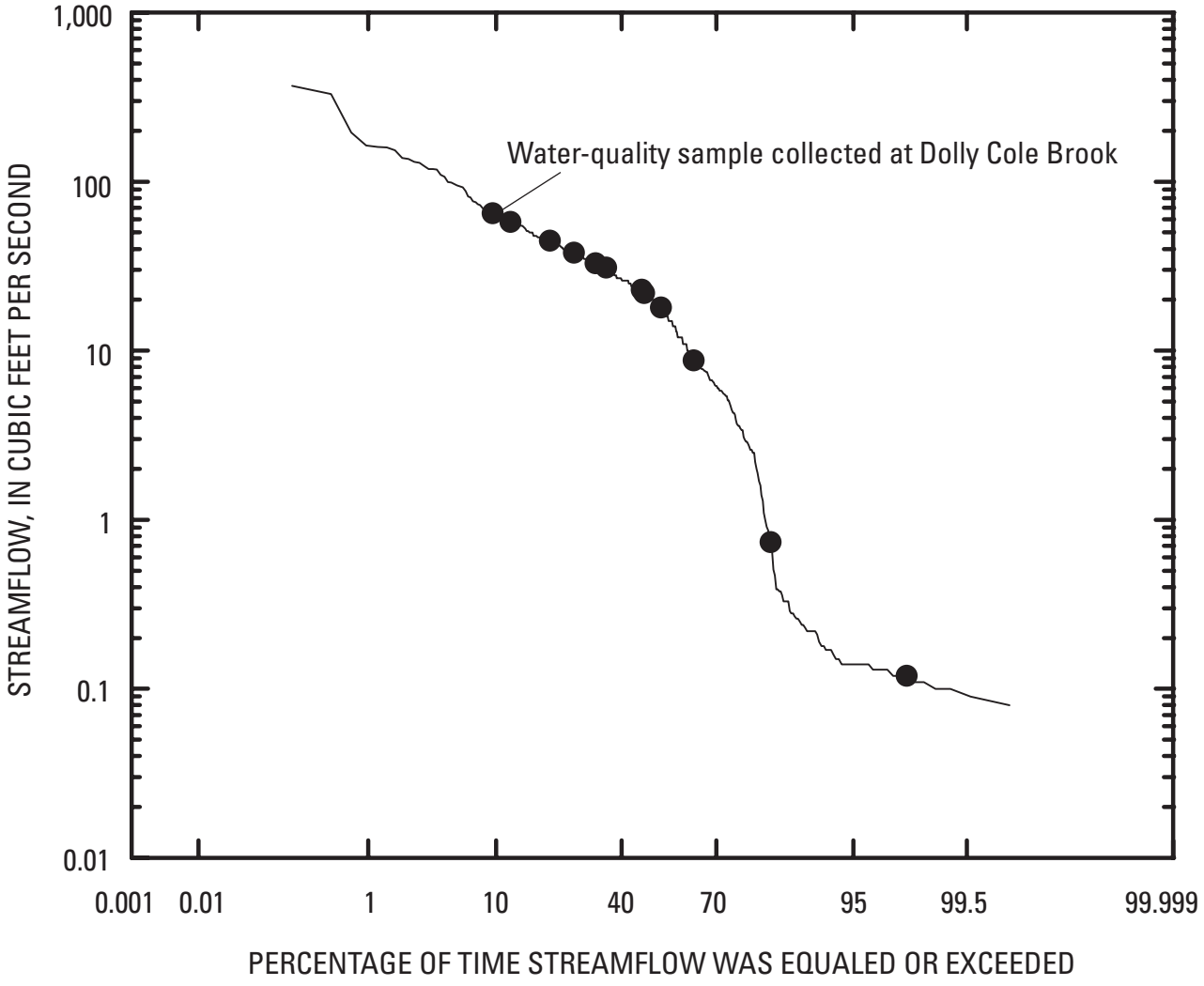

Figure 2. Flow-duration curve for the U.S. Geological Survey continuous streamgage station on Ponaganset River at South Foster (station 01115187) for water year 2005 and streamflow measurements at the Ponaganset River gaging station on the dates when water-quality samples were collected at Dolly Cole 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 2005. 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 2005 (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 2005, annual mean streamflow was 30 ft^3/s (fig. 3; U.S. Geological Survey, 2006b). 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 2005 was 11 ft^3/s (U.S. Geological Survey, 2006b).

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 2005 was slightly above average (48 ft^3/s; U.S. Geological Survey, 2006b). Annual mean streamflows estimated for partial-record monitoring stations are given in table 2. Estimated annual mean streamflows at partial record stations ranged from 0.42 to 19 ft^3/s. Annual mean streamflows normalized by drainage area ranged from 1.3 to 5.7 $ft^3/s/mi^2$ (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 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.

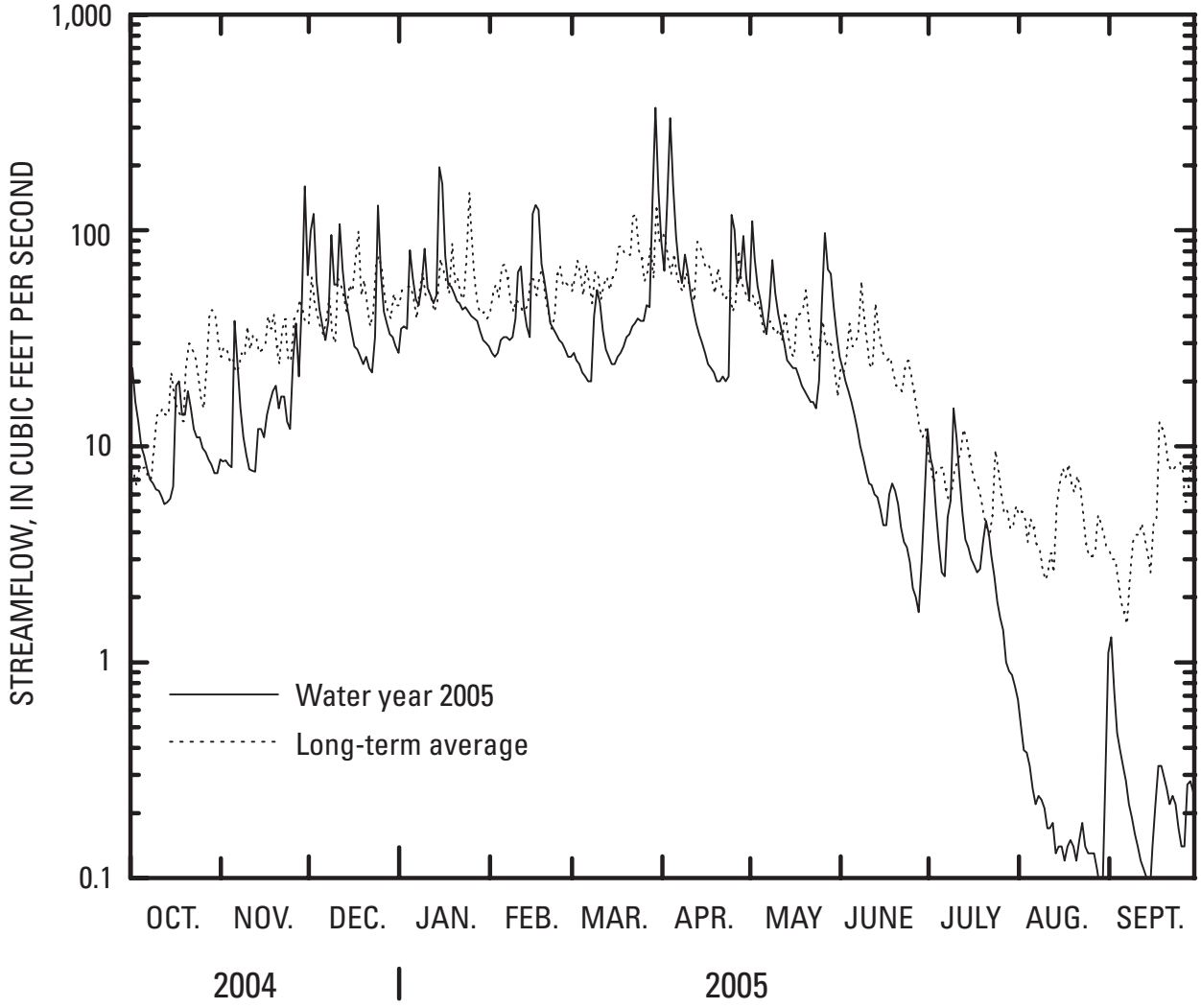

Figure 3. Measured daily mean streamflow for the U.S. Geological Survey continuous-record gaging station on the Ponaganset River at South Foster (station 01115187) in the Scituate Reservoir drainage area, Rhode Island, for October 1, 2004, through September 30, 2005 (solid line), and mean daily streamflow 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 5.0 to 77.5 mg/L, and estimated monthly mean chloride concentrations ranged from 7.2 to 142 mg/L. The highest monthly mean concentrations of sodium and chloride were measured at station 9 (Bear Tree Brook) in August 2005 (77.5 and 142 mg/L, respectively) (table 4). The highest annual mean[4] concentrations of sodium and chloride were measured at station 9 (Bear Tree Brook) at 38.2 and 66.0 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 1,300,000 kg (about 1,433 tons) of sodium and 2,000,000 kg (about 2,204 tons) of chloride from tributary streams—equipped with instrumentation capable of continuously monitoring specific conductance—during WY 2005. The highest sodium and chloride loads in WY 2005—250,000 and 380,000 kg, respectively—were measured at the Ponaganset River station (Providence Water Station Number 35) (table 5). Monthly sodium and chloride loads were highest at all stations in April, with two exceptions (table 6). Monthly sodium and chloride loads were highest in January at the Huntinghouse Brook station and in May at the Bear Tree Brook station, respectively. The totals of the April loads of sodium and chloride accounted for about 20 percent of the annual load for each constituent. The highest annual sodium and chloride yields were 77,000 and 130,000 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 6.8; the median of the medians among all stations was 6.1. Median values of color ranged from 12 to 150 platinum cobalt units (PCU); the median among all stations was 41 PCU. Median values of turbidity ranged from 0.2 to 4.6 nephelometric turbidity units (NTU); the median among all stations was 0.5 NTU. Median alkalinity values in tributary streams were low, ranging from 2.0 to 23 mg/L as $CaCO_3$; the median among all stations was 5.3 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, 2004, through September 30, 2005.

[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	25.0	15.7	19.7	12.6	17.0	11.0	17.8	11.5	20.6	13.1	24.7	15.5
28	01115265	Barden Reservoir (Hemock Brook)	21.2	13.5	15.5	10.1	12.8	8.5	14.1	9.2	14.2	9.3	15.5	10.1
35	01115187	Ponaganset River	18.6	12.0	17.5	10.3	11.9	7.9	12.4	8.3	13.6	8.9	16.0	9.5
Direct Runoff subbasin														
3	01115280	Cork Brook	35.8	21.9	27.6	17.2	22.5	14.2	27.6	17.2	32.1	19.8	34.6	21.2
6	01115183	Quonapaug Brook	33.4	20.5	27.2	17.0	24.0	15.1	31.6	19.5	33.2	20.4	40.3	24.3
7	01115297	Wilbur Hollow Brook	8.7	5.9	8.7	6.0	7.2	5.0	8.2	5.7	8.0	5.5	8.4	5.8
9	01115275	Bear Tree Brook	81.8	46.7	65.7	38.1	52.8	31.2	49.5	29.4	45.0	26.9	54.4	32.1
Moswansicut Reservoir subbasin														
19	01115170	Moswansicut Reservoir (Moswansicut Stream North, Moswansicut Pond)	40.6	24.5	39.3	23.8	39.0	23.6	39.8	24.1	42.4	25.5	40.8	24.6
Regulating Reservoir subbasin														
14	01115110	Huntinghouse Brook	14.4	9.5	10.5	7.1	13.3	8.8	12.1	8.0	10.8	7.2	9.9	6.7
16	01115098	Peeptoad Brook (Harrisdale Brook)	41.5	25.0	40.3	24.3	32.2	19.8	29.7	18.4	34.0	20.8	38.3	23.2
Scituate Reservoir basin														
		Average	32.1	19.5	27.2	16.6	23.3	14.5	24.3	15.1	25.4	15.8	28.3	17.3

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	23.8	15.0	25.3	15.9	27.9	17.4	30.9	19.1	27.1	16.9	31.1	19.2
28	01115265	Barden Reservoir (Hemock Brook)	17.7	11.4	18.3	11.7	23.7	15.0	27.8	17.3	28.6	17.8	31.3	19.3
35	01115187	Ponaganset River	16.1	9.7	17.5	10.9	19.4	12.1	21.3	13.4	33.8	19.4	29.6	18.1
Direct Runoff subbasin														
3	01115280	Cork Brook	31.4	19.4	32.9	20.2	32.2	19.8	36.5	22.2	40.7	24.5	47.6	28.3
6	01115183	Quonapaug Brook	39.3	23.8	35.1	21.4	42.0	25.3	53.0	31.3	83.7	47.3	124	68.2
7	01115297	Wilbur Hollow Brook	10.2	6.9	10.9	7.3	12.1	8.0	11.5	7.7	16.5	10.7	20.7	13.2
9	01115275	Bear Tree Brook	63.1	36.7	78.9	45.2	98.1	55.2	114	63.3	142	77.5	132	72.5
Moswansicut Reservoir subbasin														
19	01115170	Moswansicut Reservoir (Moswansicut Stream North, Moswansicut Pond)	41.6	25.1	43.5	26.1	47.0	28.0	44.0	26.4	40.6	24.5	46.7	27.9
Regulating Reservoir subbasin														
14	01115110	Huntinghouse Brook	8.0	5.5	11.4	7.7	14.2	9.3	16.7	10.8	17.3	11.2	16.1	10.5
16	01115098	Peeptoad Brook (Harrisdale Brook)	32.9	20.2	38.3	23.3	37.2	22.6	31.9	19.7	32.3	19.9	40.7	24.6
Scituate Reservoir basin														
		Average	28.4	17.4	31.2	19.0	35.4	21.3	38.7	23.1	46.2	27.0	51.9	30.2

Table 5. Annual mean chloride and sodium concentrations, loads, and yields by sampling station in the Scituate Reservoir drainage area, Rhode Island, October 1, 2004, through September 30, 2005.

[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	21.7	13.8	210,000	130,000	43,000	27,000
28	01115265	Barden Reservoir (Hemock Brook)	15.9	10.3	270,000	180,000	31,000	20,000
35	01115187	Ponaganset River	14.4	9.4	380,000	250,000	27,000	18,000
		Direct Runoff subbasin						
3	01115280	Cork Brook	30.3	18.7	110,000	66,000	60,000	37,000
6	01115183	Quonapaug Brook	34.4	21.0	150,000	94,000	78,000	48,000
7	01115297	Wilbur Hollow Brook	9.0	6.1	84,000	57,000	19,000	13,000
9	01115275	Bear Tree Brook	66.0	38.2	82,000	48,000	130,000	77,000
		Moswansicut Reservoir subbasin						
19	01115170	Moswansicut Reservoir, (Moswansicut Stream North, Moswansicut Pond)	41.2	24.9	260,000	160,000	80,000	49,000
		Regulating Reservoir subbasin						
14	01115110	Huntinghouse Brook	10.7	7.2	140,000	93,000	22,000	15,000
16	01115098	Peeptoad Brook, (Harrisdale Brook)	34.6	21.2	340,000	210,000	68,000	41,000
		Scituate Reservoir basin						
			Average		Total		Average	
			27.8	17.1	2,000,000	1,300,000	56,000	34,000

Table 6. Monthly estimated chloride and sodium loads by sampling station in the Scituate Reservoir drainage area, Rhode Island, October 1, 2004, through September 30, 2005.

[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	2,600	1,700	9,300	5,900	22,000	14,000	29,000	18,000	27,000	17,000	38,000	24,000
28	01115265	Barden Reservoir (Hemock Brook)	5,400	3,400	14,000	9,200	30,000	20,000	40,000	26,000	32,000	21,000	41,000	26,000
35	01115187	Ponaganset River	15,000	9,600	26,000	17,000	45,000	30,000	53,000	35,000	43,000	29,000	57,000	37,000
Direct Runoff subbasin														
3	01115280	Cork Brook	1,700	1,000	5,000	3,100	11,000	6,800	16,000	10,000	15,000	9,300	19,000	12,000
6	01115183	Quonapaug Brook	2,600	1,600	6,700	4,100	15,000	9,200	23,000	14,000	20,000	12,000	27,000	16,000
7	01115297	Wilbur Hollow Brook	1,300	880	4,400	3,000	9,200	6,400	13,000	8,600	9,900	6,800	12,000	8,200
9	01115275	Bear Tree Brook	5,000	2,800	6,200	3,600	8,100	4,800	8,300	4,900	6,400	3,800	8,600	5,000
Moswansicut Reservoir subbasin														
19	01115170	Moswansicut Reservoir (Moswansicut Stream North, Moswansicut Pond)	5,200	3,200	14,000	8,700	34,000	20,000	40,000	24,000	35,000	21,000	38,000	23,000
Regulating Reservoir subbasin														
14	01115110	Huntinghouse Brook	1,600	1,100	6,300	4,300	23,000	15,000	26,000	17,000	18,000	12,000	21,000	14,000
16	01115098	Peeptoad Brook (Harrisdale Brook)	8,200	4,900	22,000	14,000	43,000	26,000	46,000	29,000	43,000	27,000	55,000	33,000
Scituate Reservoir basin														
		Total	49,000	30,000	120,000	73,000	240,000	150,000	290,000	190,000	250,000	160,000	320,000	200,000

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	49,000	31,000	27,000	17,000	4,600	2,800	1,700	1,000	160	100	140	85
28	01115265	Barden Reservoir (Hemock Brook)	61,000	39,000	36,000	23,000	8,900	5,600	3,900	2,400	590	370	500	310
35	01115187	Ponaganset River	72,000	47,000	51,000	33,000	11,000	6,900	6,400	4,100	540	330	610	380
Direct Runoff subbasin														
3	01115280	Cork Brook	23,000	14,000	13,000	8,100	2,300	1,400	920	560	130	80	120	71
6	01115183	Quonapaug Brook	34,000	20,000	18,000	11,000	4,600	2,700	2,300	1,400	610	340	700	390
7	01115297	Wilbur Hollow Brook	19,000	13,000	12,000	8,000	2,600	1,700	960	640	210	140	210	130
9	01115275	Bear Tree Brook	11,000	6,300	11,000	6,500	6,800	3,800	5,300	2,900	3,000	1,700	2,500	1,400
Moswansicut Reservoir subbasin														
19	01115170	Moswansicut Reservoir (Moswansicut Stream North, Moswansicut Pond)	49,000	30,000	32,000	20,000	8,300	5,000	3,300	2,000	590	360	550	330
Regulating Reservoir subbasin														
14	01115110	Huntinghouse Brook	23,000	16,000	16,000	11,000	2,600	1,700	910	590	86	56	58	38
16	01115098	Peeptoad Brook (Harrisdale Brook)	59,000	36,000	44,000	27,000	10,000	6,100	3,700	2,300	730	450	730	440
Scituate Reservoir basin														
		Total	400,000	250,000	260,000	160,000	61,000	38,000	30,000	18,000	6,700	3,900	6,100	3,500

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 23 CFU/100 mL for total coliform bacteria and 15 CFU/100 mL for *E. coli* bacteria. Median concentration of total coliform (2,400 CFU/100 mL) was greatest at the Unnamed Tributary #2 to Scituate Reservoir (Providence Water Station 2). Median concentrations of *E. coli* bacteria (1,200 CFU/100 mL) were greatest at Unnamed Tributary #4 to Scituate Reservoir (Providence Water Station 30) and Bear Tree Brook (9) (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 9 (Bear Tree 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 81 to 33,000 CFU 10^6/d, and median daily yields ranged from 42 to 46,000 CFU 10^6/d/mi^2. The median daily loads for *E. coli* for the entire drainage area ranged from 29 to 28,000 CFU 10^6/d, and median daily yields ranged from 6.8 to 45,000 CFU 10^6/d/mi^2 (table 8).

Chloride

The highest median chloride concentration (113 mg/L) was measured in the Direct Runoff subbasin at the Toad Pond station (31) (table 7). Median daily chloride loads and yields varied among monitoring stations in the drainage area (table 8); the median chloride yield for the overall drainage area was about 93 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 (460 kg/d/mi^2); this yield is slightly larger than the annual mean chloride yield (130,000 kg/yr/mi^2 (table 5) or about 360 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 0.002 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 (0.005 mg/L as N and 0.23 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 (0.15 mg/L as P) was measured at Unnamed Tributary #2 to Moswansicut Reservoir (21). Nutrient loadings from the Ponaganset River (35) into the Scituate Reservoir—nitrite (110 g/d), nitrate (860 g/d), and orthophosphate (5,100 g/d)—were the largest of all the sampled stations. The largest median daily yield for nitrite (18 g/d/mi^2) was determined for Quonapaug Brook (6), and the largest median daily yields for orthophosphate (920 g/d/mi^2) and nitrate (950 g/d/mi^2) were determined for Bear Tree Brook (9) (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, 2004, through September 30, 2005.

[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	5.9	45	0.5	23	23	3.3	25.5	0.002	0.01	0.06
25	01115200	Shippee Brook	5.9	34	0.4	9	<3	3.0	12.2	0.001	0.01	0.05
26	01115185	Windsor Brook	6.1	30	0.4	<3	<3	4.3	25.4	0.002	0.03	0.10
27	011151845	Unnamed Tributary to Ponaganset River (Unnamed Brook B, Unnamed Brook West of Windsor Brook)	5.7	21	0.3	14	5	3.6	6.0	0.001	0.02	0.14
28	01115265	Barden Reservoir (Hemlock Brook)	5.7	100	0.5	43	22	3.2	25.3	0.002	0.02	0.08
29	01115271	Ponaganset River (Barden Stream)	5.8	42	0.6	4	4	2.9	20.5	0.002	0.01	0.05
35	01115187	Ponaganset River	6.1	41	0.6	23	23	3.4	21.1	0.002	0.02	0.07
					Direct Runoff subbasin							
1	01115180	Brandy Brook	6.7	67	1.1	140	31	8.5	8.4	0.002	0.02	0.09
2	01115181	Unnamed Tributary #2 to Scituate Reservoir (Unnamed Brook North of Bullhead Brook)	6.1	24	0.5	2,400	23	4.3	--	0.001	0.07	0.02
3	01115280	Cork Brook	6.3	32	0.3	23	3	4.5	38.6	0.001	0.04	0.09
4	01115400	Kent Brook (Betty Pond Stream)	6.2	27	0.5	23	14	6.6	4.5	0.001	0.02	0.07
5	01115184	Spruce Brook	6.1	47	0.5	33	10	4.7	24.2	0.002	0.05	0.11
6	01115183	Quonapaug Brook	6.3	98	1.7	460	59	7.4	34.8	0.002	0.01	0.09
7	01115297	Wilbur Hollow Brook	6.1	81	1.2	19	4	5.3	11.4	0.003	0.02	0.06
8	01115276	Westconnaug Brook (Westconnaug Reservoir)	5.8	22	0.4	<3	<3	3.0	13.5	0.001	0.01	0.04
9	01115275	Bear Tree Brook	6.3	29	0.4	1,200	1,200	6.2	66.9	0.003	0.13	0.14
30	01115350	Unnamed Tributary #4 to Scituate Reservoir (Coventry Brook, Knight Brook)	5.9	65	0.4	1,200	1,200	4.0	27.3	0.003	0.01	0.05
31	01115177	Toad Pond	6.4	130	4.6	240	93	23	113	0.006	0.02	0.09
32	01115178	Unnamed Tributary #1 to Scituate Reservoir (Pine Swamp Brook)	6.4	110	0.8	14	14	7.8	8.1	0.002	0.01	0.05
33	01115182	Unnamed Tributary #3 to Scituate Reservoir (Hall's Estate Brook)	6.1	31	0.3	14	14	6.5	11.3	0.002	0.04	0.10
36	--	Outflow from King Pond	6.6	32	0.3	240	240	4.8	3.0	0.001	0.02	0.01
37	--	Fire Tower Stream	5.9	22	0.2	43	15	3.9	4.1	0.001	0.03	0.06

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, 2004, through September 30, 2005.—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)	6.8	20	0.7	15	3	8.3	39.8	0.002	0.04	0.04
20	01115160	Unnamed Tributary #1 to Moswansicut Reservoir (Blanchard Brook)	5.9	110	0.5	75	75	5.4	46.4	0.003	0.01	0.09
21	01115165	Unnamed Tributary #2 to Moswansicut Reservoir (Brook from Kimball Reservoir)	6.5	62	0.8	110	12	11	42.1	0.002	0.09	0.15
22	01115167	Moswansicut Reservoir (Moswansicut Stream South)	6.5	37	1.4	1,100	75	14	58.9	0.005	0.23	0.09
34	01115164	Kimball Stream	6.4	45	0.8	12	12	11	45.3	0.003	<0.01	0.06
Ponaganset Reservoir subbasin												
23	011151843	Ponaganset Reservoir	5.7	12	0.3	2	<3	2.3	11.4	0.001	0.02	0.03
Regulating Reservoir subbasin												
13	01115176	Regulating Reservoir	6.7	29	0.6	<3	3	7.3	37.2	0.001	0.02	0.04
14	01115110	Huntinghouse Brook	6.4	34	0.5	170	23	5.5	11.0	0.001	0.02	0.08
15	01115115	Regulating Reservoir (Rush Brook)	6.5	47	0.7	75	43	6.6	46.7	0.002	0.02	0.07
16	01115098	Peeptoad Brook (Harrisdale Brook)	6.5	34	0.7	140	23	9.2	39.2	0.002	0.02	0.04
17	01115119	Dexter Pond (Paine Pond)	5.9	56	0.5	4	<3	6.6	32.0	0.001	0.02	0.06
18	01115120	Unnamed Tributary to Regulating Reservoir (Unnamed Brook A)	6.5	45	0.6	15	15	10	73.5	0.001	0.01	0.11
Westconnaug Reservoir subbasin												
10	01115274	Westconnaug Brook	5.2	26	0.2	23	23	2.0	28.0	0.001	0.02	0.06
11	01115273	Unnamed Tributary to Westconnaug Reservoir (Unnamed Brook South of Westconnaug Reservoir)	5.5	150	0.5	210	23	3.6	7.7	0.003	0.01	0.13
12	011152745	Unnamed Tributary to Westconnaug Brook (Unnamed Brook north of Westconnaug reservoir)	5.2	60	1.2	43	23	4.1	21.0	0.002	0.05	0.01
Scituate Reservoir basin												
		Median	6.1	41	0.5	23	15	5.3	25.3	0.002	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, 2004, through September 30, 2005.

[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	2,700	560	1,100	220	600	120	29	5.9	290	59	1,300	260
25	01115200	Shippee Brook	1,500	630	250	100	230	97	16	7.0	82	35	330	140
26	01115185	Windsor Brook	180	42	29	6.8	30	6.8	2.0	0.45	59	14	130	29
28	01115265	Barden Reservoir	6,500	740	2,000	230	630	73	51	5.8	200	23	1,600	190
35	01115187	Ponaganset River	7,000	500	4,800	340	1,100	81	110	7.7	860	61	5,100	360
Direct Runoff subbasin														
1	01115180	Brandy Brook	4,300	2,800	3,400	2,100	80	51	20	12	130	82	530	340
3	01115280	Cork Brook	220	120	160	88	230	130	10	5.8	150	86	290	160
4	01115400	Kent Brook	1,300	1,500	73	86	20	24	4.0	4.7	60	71	240	290
5	01115184	Spruce Brook	2,600	2,100	270	220	110	93	9.5	7.8	200	170	250	210
6	01115183	Quonapaug Brook	16,000	8,000	7,000	3,600	530	270	36	18	140	72	1,100	550
7	01115297	Wilbur Hollow Brook	740	170	530	120	210	48	44	10	310	71	1,100	260
8	01115276	Westconnaug Brook	420	81	420	81	330	63	28	5.4	290	57	970	190
9	01115275	Bear Tree Brook	29,000	46,000	28,000	45,000	280	460	7.4	12	590	950	570	920
32	01115178	Unnamed Tributary #1 to Scituate Reservoir (Pine Swamp Brook)	120	270	120	270	10	23	1.9	4.1	13	29	51	110
33	01115182	Unnamed Tributary #3 to Scituate Reservoir (Hall's Estate Brook)	98	350	98	350	26	91	2.3	8.2	110	400	140	490
Moswansicut Reservoir subbasin														
19	01115170	Moswansicut Reservoir (Moswansicut Stream North, Moswansicut Pond)	480	150	400	120	760	230	38	12	680	210	950	290

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, 2004, through September 30, 2005.—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)	840	2,900	91	310	47	160	2.3	7.9	130	440	210	710
Regulating Reservoir subbasin														
14	01115110	Huntinghouse Brook	33,000	5,300	8,000	1,300	240	38	25	4.1	490	79	1,900	300
15	01115115	Regulating Reservoir (Rush Brook)	16,000	3,400	6,700	1,400	780	170	21	4.6	400	85	670	140
16	01115098	Peeptoad Brook (Harrisdale Brook)	12,000	2,400	6,000	1,200	770	160	30	6.1	310	63	760	150
18	01115120	Unnamed Tributary to Regulating Reservoir (Unnamed Brook A)	81	290	81	290	40	140	0.54	1.9	5.4	19	59	210
Westconnaug Reservoir subbasin														
10	01115274	Westconnaug Brook	520	350	520	350	410	280	14	9.4	75	50	370	250
11	01115273	Unnamed Tributary to Westconnaug Reservoir (Unnamed Brook South of Westconnaug Reservoir)	3,400	4,700	340	470	6.0	8.4	2.3	3.3	3.9	5.4	39	54
Scituate Reservoir basin														
		Median	1,500	630	420	290	230	93	16	6.1	150	71	530	250

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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, 2004, through September 30, 2005.

[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	10/1/2004	5.9	35,000	35,000	370	29	290	870
			11/5/2004	5.8	34,000	34,000	360	43	71	430
			12/3/2004	24	14,000	14,000	1,300	120	590	1,800
			1/7/2005	18	660	660	910	44	440	2,200
			2/4/2005	10	980	980	620	24	980	4,900
			3/4/2005	7.8	290	290	600	38	380	1,700
			4/1/2005	36	7,900	2,600	2,200	88	11,000	3,500
			5/6/2005	11	1,100	1,100	810	27	270	1,100
			6/3/2005	5.2	9,500	9,500	340	25	130	1,300
			7/1/2005	1.2	2,700	680	100	5.9	15	730
			9/2/2005	0.15	770	550	14	0.73	29	70
25	01115200	Shippee Brook	10/15/2004	0.18	2,000	100	5.4	0.44	4.4	31
			1/21/2005	12	440	440	330	29	880	1,500
			4/15/2005	6.7	1,500	250	230	16	82	330
26	01115185	Windsor Brook	10/15/2004	0.32	180	12	20	1.6	3.9	78
			4/15/2005	8.4	310	310	520	21	620	820
			7/15/2005	0.40	15	29	30	2.0	59	130
28	01115265	Barden Reservoir	10/25/2004	2.9	17,000	17,000	170	28	35	280
			11/9/2004	4.4	3,000	2,300	220	32	54	1,100
			12/14/2004	29	330,000	330,000	1,100	140	2,100	6,400
			1/11/2005	35	37,000	1,300	1,400	86	860	6,000
			2/8/2005	18	660	660	980	88	1,300	2,200
			3/8/2005	29	31,000	2,800	1,900	140	2,800	4,300
			4/12/2005	27	9,900	2,000	1,800	66	3,300	5,300
			5/10/2005	27	28,000	15,000	1,400	130	330	5,300
			6/14/2005	3.6	2,000	2,000	290	35	44	880
			7/12/2005	2.9	1,600	1,600	230	28	71	780
			8/9/2005	0.27	1,600	10	22	1.3	13	92
			9/13/2005	0.16	940	1,800	13	0.39	23	31
35	01115187	Ponaganset River	10/1/2004	23	84,000	8,400	990	1,100	560	5,100
			11/5/2004	38	1,000,000	1,000,000	1,600	190	460	5,600
			12/3/2004	58	33,000	33,000	2,000	280	1,400	5,700
			1/7/2005	45	4,400	4,400	1,800	110	1,100	7,700
			3/4/2005	22	810	810	1,100	110	1,600	5,900
			4/1/2005	65	2,400	4,800	2,900	160	9,500	4,800
			5/6/2005	33	1,200	1,200	1,700	81	1,600	4,800
			6/3/2005	18	10,000	10,000	1,000	88	440	8,400
			7/1/2005	8.8	520,000	32,000	520	65	860	860
			8/16/2005	0.12	7,000	700	12	0.9	15	32
			9/2/2005	0.74	420	420	58	3.6	91	380

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, 2004, through September 30, 2005.—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	10/5/2004	1.1	65,000	4,000	26	8.1	13	160
			11/29/2004	11	65,000	65,000	240	81	130	2,200
			12/7/2004	4.0	45,000	3,800	73	20	49	780
			1/4/2005	6.6	180,000	6,900	130	32	1,500	810
			2/1/2005	3.3	320	120	110	16	240	970
			3/1/2005	4.0	390	390	100	20	200	98
			4/5/2005	9.0	5,100	5,100	160	44	220	440
			5/3/2005	5.6	3,200	3,200	86	27	140	1,400
			6/7/2005	2.0	2,100	2,100	56	20	98	590
			7/5/2005	0.71	400	26	19	5.2	120	470
			8/2/2005	0.32	3,600	3,600	4.5	1.6	16	230
			9/6/2005	0.21	12,000	7.7	0.93	0.51	15	130
3	01115280	Cork Brook	10/13/2004	0.21	120	21	22	0.51	15	62
			11/4/2004	0.46	260	17	46	3.4	23	100
			12/17/2004	3.5	340	340	260	8.6	1,500	260
			1/6/2005	6.8	3,800	250	530	17	670	330
			3/3/2005	3.5	130	130	320	26	1,600	1,100
			4/7/2005	9.9	10,000	970	960	24	730	970
			5/5/2005	5.1	190	190	460	12	62	1,000
			6/2/2005	2.5	92	92	210	12	240	1,400
			7/7/2005	0.33	190	73	33	0.81	32	40
			8/4/2005	0.05	3,100	1,400	12	0.39	5.2	14
4	01115400	Kent Brook	10/5/2004	0.13	73	73	0.9	0.32	1.6	6.4
			11/29/2004	17	18,000	18,000	190	42	420	830
			12/7/2004	2.0	3,700	1,100	25	4.9	24	340
			1/4/2005	5.8	3,300	210	65	14	990	850
			2/1/2005	1.3	130	48	17	3.2	95	640
			3/1/2005	2.0	200	73	24	15	150	200
			4/5/2005	12	6,800	6,800	100	29	880	290
			5/3/2005	4.1	2,300	2,300	51	10	100	500
			6/7/2005	0.42	2,500	41	4.6	1.0	5.1	82
			7/5/2005	0.05	110	4.6	0.25	0.11	3.4	29
			8/2/2005	0.01	4.5	4.5	0.039	0.04	0.10	2.0
			9/6/2005	<0.01	34	0.11	0.032	0.07	0.22	0.66
5	01115184	Spruce Brook	10/28/2004	0.47	490	170	34	3.4	34	100
			1/18/2005	7.4	4,200	270	210	18	2,000	180
			4/19/2005	2.8	1,000	270	160	14	270	820
			7/9/2005	1.1	6,500	6,500	68	5.4	130	320
6	01115183	Quonapaug Brook	10/5/2004	0.92	54,000	54,000	68	4.5	23	250
			11/29/2004	24	25,000	14,000	1,500	290	290	5,300
			12/7/2004	5.8	340,000	340,000	470	28	140	2,700
			1/4/2005	12	140,000	22,000	990	59	2,100	4,100
			3/1/2005	5.8	1,300	210	580	57	140	850
			4/5/2005	18	1,800	1,800	1,400	44	2,200	1,300
			5/3/2005	9.2	5,200	5,200	810	45	110	1,800
			6/7/2005	2.0	23,000	2,100	180	20	150	390
			8/2/2005	0.15	8,800	8,800	28	1.5	3.7	37
			9/6/2005	0.08	4,800	920	14	0.40	8.0	16

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, 2004, through September 30, 2005.—Continued

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

PW station no.	USGS station no.	Station name	Date	Daily mean streamflow (ft^3/s)	Total coliform bacteria (CFU 10^6/d)	*E. coli* (CFU 10^6/d)	Chloride (kg/d)	Nitrite (g/d as N)	Nitrate (g/d as N)	Ortho-phosphate (g/d as P)
Direct Runoff subbasin—Continued										
7	01115297	Wilbur Hollow Brook	10/13/2004	0.73	410	410	3.7	8.9	71	110
			11/4/2004	1.5	1,600	550	37	22	18	220
			12/17/2004	9.8	960	960	190	48	480	960
			1/6/2005	18	6,600	6,600	380	88	440	1,300
			2/3/2005	8.2	300	300	240	40	1,600	3,800
			3/3/2005	9.8	360	360	260	72	1,200	1,400
			4/7/2005	26	15,000	2,500	690	130	1,300	3,200
			5/5/2005	14	510	510	410	68	680	14,000
			6/2/2005	7.1	260	260	230	52	170	1,700
			7/7/2005	1.1	6,500	1,200	34	11	13	160
			8/4/2005	0.21	220	21	8.7	2.1	2.6	21
			9/1/2005	0.40	23,000	1,500	14	20	78	170
8	01115276	Westconnaug Brook	12/10/2004	11	400	400	310	27	540	1,100
			1/14/2005	16	590	590	470	39	390	780
			2/11/2005	12	440	440	390	29	290	1,200
			3/11/2005	9.4	340	340	120	23	230	6,200
			4/8/2005	13	480	950	430	32	320	1,600
			5/13/2005	8.9	330	330	350	22	220	870
			6/10/2005	6.0	220	220	240	29	290	590
			7/8/2005	4.6	450	450	170	11	110	450
9	01115275	Bear Tree Brook	10/19/2004	0.95	56,000	56,000	150	7.0	230	46
			1/18/2005	2.3	1,300	230	340	56	900	680
			4/19/2005	1.6	160	160	280	7.8	270	630
			7/9/2005	1.1	65,000	65,000	290	2.7	910	510
32	01115178	Unnamed Tributary #1 to Scituate Reservoir (Pine Swamp Brook)	10/21/2004	0.27	150	150	6.6	2.6	3.3	59
			1/20/2005	0.93	91	91	14	2.3	23	140
			4/21/2005	0.59	58	58	18	1.4	72	43
			7/21/2005	0.13	3,500	1,500	0.32	0.95	1.6	13
33	01115182	Unnamed Tributary #3 to Scituate Reservoir (Hall's Estate Brook)	10/27/2004	0.04	21	21	1.0	0.18	1.8	12
			4/29/2005	1.8	180	180	50	4.4	220	260
Moswansicut Reservoir subbasin										
19	01115170	Moswansicut Reservoir (Moswansicut Stream North, Moswansicut Pond)	10/14/2004	0.71	750	69	68	5.2	69	35
			11/16/2004	3.3	1,900	120	300	16	810	81
			12/9/2004	14	160,000	160,000	1,300	68	680	1,000
			1/13/2005	14	3,100	3,100	1,300	68	3,400	4,100
			2/10/2005	13	480	480	1,300	64	2,500	950
			3/10/2005	11	400	400	1,000	81	2,700	1,900
			4/14/2005	9.2	340	680	920	45	110	2,500
			5/12/2005	7.8	29,000	8,200	760	38	1,500	1,700
			6/9/2005	2.7	99	99	290	13	260	260
			7/14/2005	0.98	360	360	100	9.6	24	140
			8/11/2005	0.17	96	6.2	18	0.42	8.3	8.3
21	01115165	Unnamed Tributary #2 to Moswansicut Reservoir (Brook from Kimball Reservoir)	10/22/2004	0.28	1,400	160	30	1.4	27	41
			4/22/2005	0.66	240	24	65	3.2	230	370

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, 2004, through September 30, 2005.—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										
14	01115110	Huntinghouse Brook	10/4/2004	1.7	100,000	100,000	47	4.2	42	170
			11/18/2004	4.9	11,000	1,100	160	24	120	600
			12/6/2004	11	65,000	12,000	240	27	540	2,400
			1/3/2005	12	70,000	4,400	360	29	2,100	3,200
			2/7/2005	11	400	400	320	27	1,100	2,700
			3/7/2005	9.0	9,500	2,000	230	22	440	2,000
			4/4/2005	118	220,000	66,000	2,600	290	5,800	8,700
			5/2/2005	37	21,000	21,000	880	91	1,800	1,800
			6/6/2005	4.0	45,000	23,000	110	20	290	680
			7/28/2005	0.16	1,800	360	4.3	1.6	16	130
15	01115115	Regulating Reservoir (Rush Brook)	10/4/2004	1.4	82,000	38,000	160	6.8	34	380
			11/18/2004	3.8	14,000	3,600	430	19	190	740
			12/6/2004	8.2	15,000	15,000	720	60	400	600
			1/3/2005	9.3	17,000	9,800	830	23	910	2,300
			2/7/2005	8.2	3,000	3,000	1,300	20	1,200	2,200
			3/7/2005	6.9	2,500	680	1,100	17	840	510
			4/4/2005	82	86,000	46,000	7,400	200	missing	4,000
			5/2/2005	27	50,000	50,000	2,700	130	1,300	1,300
			6/6/2005	3.1	18,000	3,300	460	23	230	380
			7/28/2005	0.14	3,800	260	19	0.34	1.7	31
16	01115098	Peeptoad Brook (Harrisdale Brook)	10/4/2004	3.0	180,000	8,800	320	15	73	440
			11/18/2004	6.3	1,400	1,400	640	31	310	310
			12/6/2004	11	300,000	65,000	1,100	54	540	1,900
			1/3/2005	12	13,000	6,800	900	29	880	3,500
			2/7/2005	11	6,200	6,200	1,100	54	3,000	1,100
			3/7/2005	9.7	5,500	2,100	930	47	1,900	1,700
			4/4/2005	58	340,000	33,000	5,500	280	4,300	1,400
			5/2/2005	26	150,000	150,000	2,400	64	320	5,100
			6/6/2005	5.5	5,800	5,800	530	27	130	400
			7/28/2005	0.59	330	330	58	1.4	14	14
			8/15/2005	0.28	16,000	160	27	0.68	6.8	21
			9/15/2005	0.19	11,000	200	18	0.46	9.3	19
18	01115120	Unnamed Tributary to Regulating Reservoir (Unnamed Brook A)	4/22/2005	0.22	81	81	40	0.54	5.4	59
Westconnaug Reservoir subbasin										
10	01115274	Westconnaug Brook	10/25/2004	0.49	29,000	520	34	1.2	6.0	60
			11/9/2004	0.77	75	75	53	1.9	19	75
			12/14/2004	6.1	36,000	3,400	410	15	75	900
			1/11/2005	7.5	280	280	430	18	370	370
			3/8/2005	6.1	220	220	430	15	900	1,000
			4/12/2005	5.7	210	420	480	14	700	1,100
			5/10/2005	5.7	3,200	3,200	440	14	700	1,700
			6/14/2005	0.62	36,000	36,000	21	1.5	7.6	110
			7/12/2005	0.49	520	520	31	1.2	24	60
11	01115273	Unnamed Tributary to Westconnaug Reservoir (Unnamed Brook South of Westconnaug Reservoir)	10/26/2004	0.32	180	180	6.0	2.3	3.9	39
			4/26/2005	7.3	37,000	4,100	100	36	360	2,300
			7/26/2005	0.06	3,400	340	1.1	0.43	1.4	24

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