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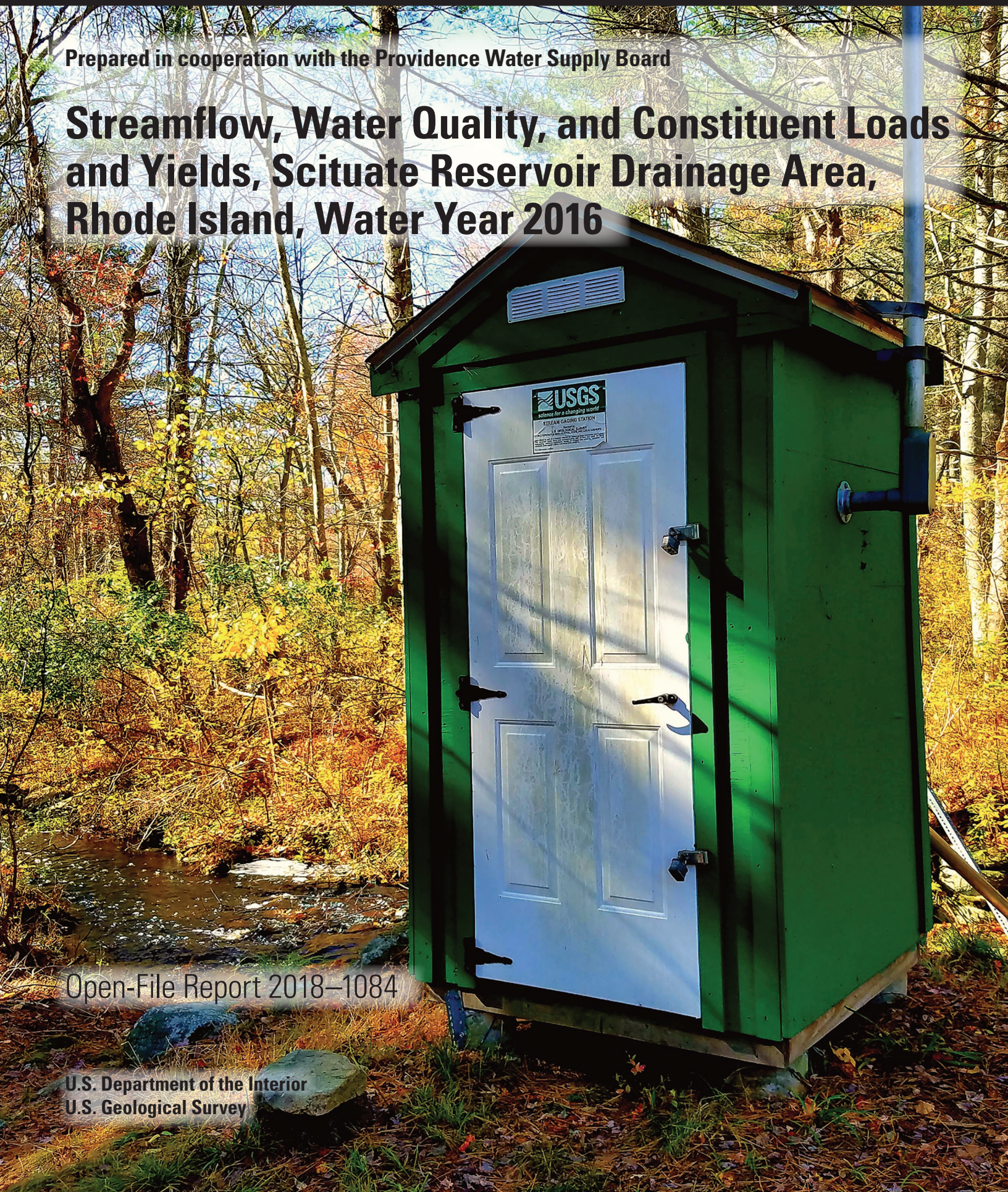
Streamflow, Water Quality, and Constituent Loads and Yields, Scituate Reservoir Drainage Area, Rhode Island, Water Year 2016



Open-File Report 2018–1084

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

Cover. U.S. Geological Survey streamgage at Quonopaug Brook at State Route 116 near North Scituate, Rhode Island; photograph by the U.S. Geological Survey.

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By Kirk P. Smith

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U.S. Geological Survey
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U.S. Geological Survey, Reston, Virginia: 2018

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Suggested citation:
Smith, K.P., 2018, Streamflow, water quality, and constituent loads and yields, Scituate Reservoir drainage area, Rhode Island, water year 2016: U.S. Geological Survey Open-File Report 2018–1084, 32 p., https://doi.org/10.3133/ofr20181084.

ISSN 2331-1258 (online)

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Conversion Factors

U.S. customary units to International System of Units

Multiply	By	To obtain
mile (mi)	1.609	kilometer (km)
square mile (mi^2)	2.590	square kilometer (km^2)
cubic foot per second (ft^3/s)	0.02832	cubic meter per second (m^3/s)
ton, short (2,000 lb)	0.9072	metric ton (t)

Datum

Horizontal coordinate information is referenced to North American Datum of 1983 (NAD 83).

Supplemental Information

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

Loads of chemical constituents in water are given in kilograms (kg), and daily loads are given in grams per day (g/d), kilograms per day (kg/d), kilograms per year (kg/yr), or million colony forming units per day (MCFU/d).

Yields are given in grams per day per square mile ($g/d/mi^2$), kilograms per day per square mile ($kg/d/mi^2$), kilograms per year per square mile ($kg/yr/mi^2$), or million colony forming units per day per square mile ($MCFU/d/mi^2$).

Abbreviations

E. coli	*Escherichia coli*
MOVE.1	Maintenance of Variance Extension type 1
NWIS	National Water Information System
PWSB	Providence Water Supply Board
RIDEM	Rhode Island Department of Environmental Management
USGS	U.S. Geological Survey
WY	water year

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Abstract

As part of a long-term cooperative program to monitor water quality within the Scituate Reservoir watershed, the U.S. Geological Survey in cooperation with the Providence Water Supply Board collected streamflow and water-quality data at the Scituate Reservoir and tributaries. Streamflow and concentrations of chloride and sodium estimated from records of specific conductance were used to calculate loads of chloride and sodium during water year (WY) 2016 (October 1, 2015, through September 30, 2016) for tributaries to the Scituate Reservoir, Rhode Island. Streamflow was measured or estimated by the U.S. Geological Survey following standard methods at 23 streamgages; 14 of these streamgages are equipped with instrumentation capable of continuously monitoring water level, specific conductance, and water temperature. Water-quality samples were collected by the Providence Water Supply Board at 34 sampling stations that also include 14 continuous-record streamgages maintained by the U.S. Geological Survey during WY 2016 as part of a long-term sampling program; all stations are in the Scituate Reservoir drainage area. Water-quality data collected by the Providence Water Supply Board 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 2016.

The largest tributary to the reservoir, the Ponaganset River, which was monitored by the U.S. Geological Survey, contributed a mean streamflow of 18 cubic feet per second to the reservoir during WY 2016. For the same period, annual mean streamflows measured (or estimated) for the other monitoring stations in this study ranged from about 0.27 to about 12 cubic feet per second. Together, tributaries equipped with instrumentation capable of continuously monitoring specific conductance transported about 2,100,000 kilograms of chloride and 1,300,000 kilograms of sodium to the Scituate Reservoir during WY 2016; chloride and sodium yields for the tributaries ranged from 14,000 to 95,000 kilograms per square mile and from 8,600 to 56,000 kilograms per square mile, respectively.

At the stations where water-quality samples were collected by the Providence Water Supply Board, the medians of the median concentrations were 27.9 milligrams per liter for chloride, 0.002 milligram per liter as nitrogen for nitrite, 0.13 milligram per liter as nitrogen for nitrate, 0.07 milligram per liter as phosphate for orthophosphate, and 700 and 10 colony forming units per 100 milliliters for total coliform bacteria and *Escherichia coli* (*E. coli*), respectively. The medians of the median daily loads of chloride, nitrite nitrogen, nitrate nitrogen, orthophosphate, and total coliform and *E. coli* bacteria were 170 kilograms per day, 8.9 grams per day, 570 grams per day, 320 grams per day, 41,000 million colony forming units per day, and 680 million colony forming units per day. The medians of the median yields of chloride, nitrite nitrogen, nitrate nitrogen, orthophosphate, total coliform, and *E. coli* bacteria were 53 kilograms per day per square mile, 4.7 grams per day per square mile, 130 grams per day per square mile, 165 grams per day per square mile, 23,000 million colony forming units per day per square mile, and 340 million colony forming units per day per square mile, respectively.

Introduction

The Scituate Reservoir is the primary source of drinking water for more than 60 percent of the population of Rhode Island. The Scituate Reservoir drainage area consists of six subbasins and covers an area of about 94 square miles in parts of the towns of Cranston, Foster, Glocester, Johnston, and Scituate, Rhode Island (fig. 1). Information about the water quality of the reservoir and its tributaries is important for management of the water supply and for the protection of human health. The Providence Water Supply Board (PWSB), 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 60 years.

Since 1993, the U.S. Geological Survey (USGS) has been cooperating with the PWSB and the Rhode Island Department of Environmental Management (RIDEM) to measure

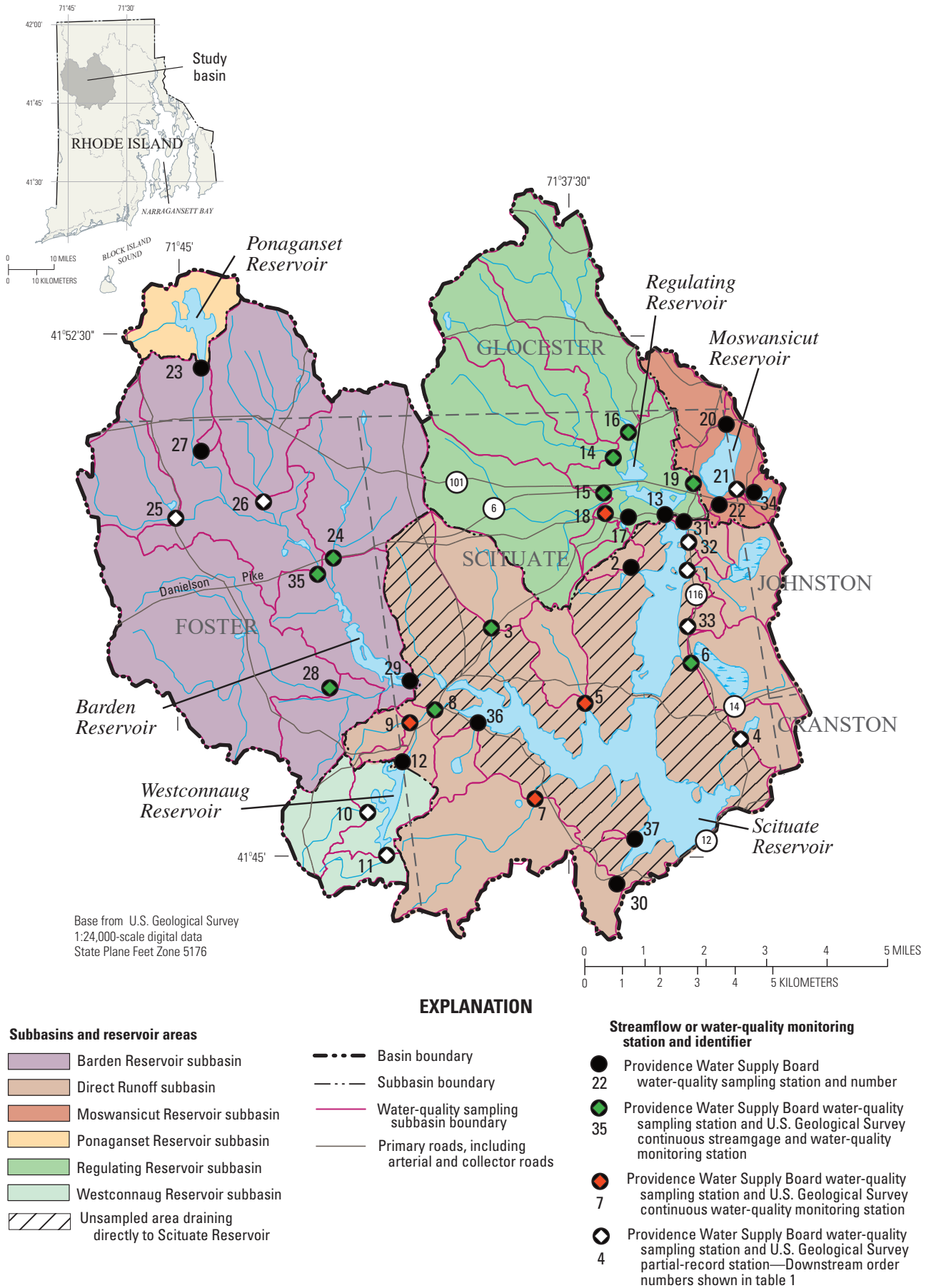

Figure 1. Locations of tributary-reservoir subbasins and stations in the Scituate Reservoir drainage area, Rhode Island, in water year 2016.

streamflow in tributaries to the Scituate Reservoir. Streamflow has been continuously measured at 10 streamgages in the drainage area (table 1) since 2009 by the USGS. Streamflow also was continuously measured at four streamgages during 2009–14 and periodically measured at nine additional streamgages on tributaries in the drainage area. At the 13 streamgages without continuous flow data (partial-record streamgages; table 1), daily mean[1] 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 since 2009 (table 1). Equations that relate specific conductance to concentrations of chloride and sodium in stream water were developed as part of previous cooperative studies of the USGS and PWSB (Nimiroski and Waldron, 2002; Smith, 2015b, 2018a). These equations used together with measured (or estimated) streamflows allow for nearly continuous estimation of chloride and sodium loads to the reservoir.

In 2016, the PWSB regularly, either monthly or quarterly, collected water-quality samples from 34 tributaries within the Scituate Reservoir drainage area. Compiled and tabulated streamflow (measured or estimated by the USGS) and water-quality data (collected by the PWSB) have been published in Breault and others (2000), Nimiroski and others (2008), Breault (2010), Breault and Campbell (2010a–d), Breault and Smith (2010), Smith and Breault (2011), Smith (2013, 2014, 2015a,b, 2016, 2018a–c).

This report presents data on streamflow, water quality, and loads and yields of selected constituents for water year (WY)[2] 2016 in the Scituate Reservoir drainage area. These data were collected as part of studies done by the USGS in cooperation with the PWSB and the RIDEM. A summary of measured and estimated streamflows is presented for the 10 continuous-record and 13 partial-record streamgages in the drainage area. Estimated monthly and annual loads and yields of chloride and sodium are presented for the 14 streamgages at which specific conductance is continuously monitored by the USGS. Summary statistics for water-quality data collected by the PWSB for 34 of the 37 sampling stations (table 1) during WY 2016 also are presented, and these data were used to calculate loads and yields of selected water-quality constituents.

Streamflow Data Collection and Estimation

Streamflow was measured or estimated by the USGS at 23 streamgages (table 1). Measured and estimated streamflows are necessary to estimate water volume and water-quality constituent loads and yields from tributary basins. Stream stage was measured every 10 minutes at most continuous-record streamgages. Streamflow was computed with a stage-discharge relation (known as a rating), which was developed on the basis of periodic manual measurements of streamflow. Daily mean streamflow at a streamgage was calculated by dividing the total volume of water that passed the streamgage each day by 86,400 (the number of seconds in a day). Periodic manual streamflow measurements at partial-record streamgages were used concurrently with continuous-record measurements from streamgages in nearby hydrologically similar drainage areas to estimate a continuous daily record at the partial-record streamgages. Specifically, continuous-streamflow records for the 13 partial-record sites in the Scituate Reservoir drainage area (table 1) were estimated by using the Maintenance of Variance Extension type 1 (MOVE.1) method, as described by Ries and Friesz (2000) and Smith (2015b); data needed to estimate streamflows at partial-record sites were retrieved from the USGS National Water Information System (NWIS; U.S. Geological Survey, 2016). The upper and lower 90-percent confidence limits for the estimated mean annual streamflows, as described by Tasker and Driver (1988), are listed in table 2. These data indicate that there is a 90-percent chance that the estimated mean annual streamflow is between the upper and lower 90-percent confidence limits.

Continuous-record streamgages were operated and maintained by the USGS during WY 2016 in cooperation with RIDEM (USGS streamgage 01115187) and the PWSB (fig. 1; 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 internet, and are available through the NWIS web interface (U.S. Geological Survey, 2016). Error associated with measured streamflows was generally within about 15 percent as noted in the annual water year summary for each USGS streamgage.

Water-Quality Data Collection and Analysis

Water-quality data were collected by the USGS and the PWSB. Concentrations of sodium and chloride were estimated by the USGS from continuous records of specific conductance from 14 of the 21 streamgages. Water-quality samples were collected monthly or quarterly at 34 sampling stations in the Scituate Reservoir drainage area by the PWSB during WY 2016 as part of a long-term sampling program (table 1).

Data Collected by the U.S. Geological Survey

The USGS collected and analyzed specific conductance data at the 14 continuous-record streamgages (fig. 1; table 1). Measurements of specific conductance were recorded automatically at 10- or 15-minute intervals at each streamgage.

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

[2]A water year is the period between October 1 and September 30 and is designated by the year in which it ends.

Table 1. Providence Water Supply Board water-quality sampling stations, water-quality samples, and available streamflow and specific conductance monitoring in the Scituate Reservoir drainage area, Rhode Island, from October 1, 2015, to September 30, 2016.

[Alternate station names are listed in parentheses for stations where different historical names were used for the same sampling location by the Providence Water Supply Board (PWSB). Locations of stations are shown on figure 1. USGS, U.S. Geological Survey; mi², square mile; QW, water quality; Na, sodium; Cl, chloride; M, monthly; Q, quarterly; Y, yes; N, no; Continuous, recorded at 10- or 15-minute intervals; --, none]

PWSB station number	USGS station number	Station name	Drainage area (mi²)	Frequency of QW sample collection	Number of samples collected by Providence Water[1]	Daily estimated Na and Cl loads	Streamflow availability	Specific conductance availability
		Barden Reservoir subbasin						
24	01115190	Dolly Cole Brook	4.90	M	12	Y	Continuous	Continuous
25	01115200	Shippee Brook	2.35	Q	3	N	Estimated	None
26	01115185	Windsor Brook	4.32	Q	2	N	Estimated	None
27	011151845	Unnamed tributary to Ponaganset River (unnamed brook B, unnamed brook west of Windsor Brook)	0.10	Q	2	N	None	None
28	01115265	Barden Reservoir (Hemlock Brook)	8.72	M	12	Y	Continuous	Continuous
29	01115271	Ponaganset River (Barden Stream)	33.0	M	9	N	None	None
35	01115187	Ponaganset River	14.0	M	10	Y	Continuous	Continuous
		Direct Runoff subbasin						
1	01115180	Brandy Brook	1.57	M	12	N	Estimated	None
2	01115181	Unnamed tributary #2 to Scituate Reservoir (unnamed brook north of Bullhead Brook)	0.15	Q	1	N	None	None
3	01115280	Cork Brook	1.79	M	11	Y	Continuous	Continuous
4	01115400	Kent Brook (Betty Pond Stream)	0.85	M	9	N	Estimated	None
5	01115184	Spruce Brook	1.22	Q	3	Y	Estimated	Continuous
6	01115183	Quonapaug Brook	1.96	M	10	Y	Continuous	Continuous
7	01115297	Wilbur Hollow Brook	4.32	M	12	Y	Estimated	Continuous
8	01115276	Westconnaug Brook (Westconnaug Reservoir)	5.18	M	8	Y	Continuous	Continuous
9	01115275	Bear Tree Brook	0.62	Q	2	Y	Estimated	Continuous
30	01115350	Unnamed tributary #4 to Scituate Reservoir (Coventry Brook, Knight Brook)	0.78	Q	1	N	None	None
31	01115177	Toad Pond	0.04	Q	0	N	None	None
32	01115178	Unnamed tributary #1 to Scituate Reservoir (Pine Swamp Brook)	0.45	Q	2	N	Estimated	None
33	01115182	Unnamed tributary #3 to Scituate Reservoir (Halls Estate Brook)	0.28	Q	2	N	Estimated	None
36	--	Outflow from King Pond	0.77	Q	3	N	None	None
37	--	Fire Tower Stream	0.15	Q	3	N	None	None

Table 1. Providence Water Supply Board water-quality sampling stations, water-quality samples, and available streamflow and specific conductance monitoring in the Scituate Reservoir drainage area, Rhode Island, from October 1, 2015, to September 30, 2016. —Continued

[Alternate station names are listed in parentheses for stations where different historical names were used for the same sampling location by the Providence Water Supply Board (PWSB). Locations of stations are shown on figure 1. USGS, U.S. Geological Survey; mi², square mile; QW, water quality; Na, sodium; Cl, chloride; M, monthly; Q, quarterly; Y, yes; N, no; Continuous, recorded at 10- or 15-minute intervals; --, none]

PWSB station number	USGS station number	Station name	Drainage area (mi²)	Frequency of QW sample collection	Number of samples collected by Providence Water[1]	Daily estimated Na and Cl loads	Streamflow availability	Specific conductance availability
		Moswansicut Reservoir subbasin						
19	01115170	Moswansicut Reservoir (Moswansicut Stream North, Moswansicut Pond)	3.25	M	10	Y	Continuous	Continuous
20	01115160	Unnamed tributary #1 to Moswansicut Reservoir (Blanchard Brook)	1.18	M	9	N	None	None
21	01115165	Unnamed tributary #2 to Moswansicut Reservoir (brook from Kimball Reservoir)	0.29	Q	1	N	Estimated	None
22	01115167	Moswansicut Reservoir (Moswansicut Stream South)	0.22	M	7	N	None	None
34	01115164	Kimball Stream	0.27	Q	1	N	None	None
		Ponaganset Reservoir subbasin						
23	011151843	Ponaganset Reservoir	1.92	M	8	N	None	None
		Regulating Reservoir subbasin						
13	01115176	Regulating Reservoir	22.1	M	8	N	None	None
14	01115110	Huntinghouse Brook	6.23	M	10	Y	Continuous	Continuous
15	01115114	Rush Brook	4.70	M	11	Y	Continuous	Continuous
16	01115098	Peeptoad Brook (Harrisdale Brook)	4.96	M	11	Y	Continuous	Continuous
17	01115119	Dexter Pond (Paine Pond)	0.22	Q	0	N	None	None
18	01115120	Unnamed tributary to Regulating Reservoir (unnamed brook A)	0.28	Q	0	N	Estimated	Continuous
		Westconnaug Reservoir subbasin						
10	01115274	Westconnaug Brook	1.48	M	10	N	Estimated	None
11	01115273	Unnamed tributary to Westconnaug Reservoir (unnamed brook south of Westconnaug Reservoir)	0.72	Q	2	N	Estimated	None
12	011152745	Unnamed tributary to Westconnaug Brook (unnamed brook north of Westconnaug Reservoir)	0.16	Q	3	N	None	None

[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, from October 1, 2015, through September 30, 2016.

[Alternate station names are listed in parentheses for stations where different historical names were used for the same sampling location by the Providence Water Supply Board (PWSB). Locations of stations are shown on figure 1. USGS, U.S. Geological Survey; ft^3/s, cubic foot per second; $ft^3/s/mi^2$, cubic foot per second per square mile]

PWSB station number	USGS station number	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	6.0	6.8	5.2	1.2
25	01115200	Shippee Brook	3.5	12	1.0	1.5
26	01115185	Windsor Brook	5.4	22	1.3	1.2
28	01115265	Barden Reservoir (Hemlock Brook)	12	14	11	1.4
35	01115187	Ponaganset River	18	20	16	1.3
		Direct Runoff subbasin				
1	01115180	Brandy Brook	1.8	3.3	1.0	1.2
3	01115280	Cork Brook	2.2	2.5	1.8	1.2
4	01115400	Kent Brook (Betty Pond Stream)	0.99	4.7	0.21	1.2
5	01115184	Spruce Brook	1.6	3.2	0.85	1.3
6	01115183	Quonapaug Brook	2.7	3.0	2.4	1.4
7	01115297	Wilbur Hollow Brook	5.7	11	3.0	1.3
8	01115276	Westconnaug Brook (Westconnaug Reservoir)	6.8	7.5	6.2	1.3
9	01115275	Bear Tree Brook	1.1	2.0	0.67	1.9
32	01115178	Unnamed tributary #1 to Scituate Reservoir (Pine Swamp Brook)	0.45	0.89	0.22	1.0
33	01115182	Unnamed tributary #3 to Scituate Reservoir (Halls Estate Brook)	0.27	0.77	0.10	0.97
		Moswansicut Reservoir subbasin				
19	01115170	Moswansicut Reservoir (Moswansicut Stream North, Moswansicut Pond)	3.3	3.7	3.0	1.0
21	01115165	Unnamed tributary #2 to Moswansicut Reservoir (Blanchard Brook)	0.47	1.0	0.21	1.6
		Regulating Reservoir subbasin				
14	01115110	Huntinghouse Brook	7.6	8.7	6.4	1.2
15	01115115	Rush Brook	6.0	7.0	5.0	1.3
16	01115098	Peeptoad Brook (Harrisdale Brook)	6.7	7.6	5.7	1.3
18	01115120	Unnamed tributary to Regulating Reservoir (unnamed brook A)	0.36	1.5	0.09	1.3
		Westconnaug Reservoir subbasin				
10	01115274	Westconnaug Brook	1.6	2.8	0.87	1.0
11	01115273	Unnamed tributary to Westconnaug Reservoir (unnamed brook south of Westconnaug Reservoir)	0.93	1.6	0.54	1.3

Measurements were made by using an instream probe and standard USGS methods for continuous water-quality monitoring at streams (Wagner and others, 2006). The specific conductance measurement data are available through the NWIS web interface (U.S. Geological Survey, 2016).

Concentrations of chloride and sodium were estimated from continuous measurements of specific conductance by using equations that were developed by the USGS to relate specific conductance to concentrations of chloride and sodium, as follows:

$$C_{Cl} = SPC^{m} \times b \text{ and} \quad (1)$$

$$C_{Na} = SPC^{m} \times b, \quad (2)$$

where

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

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

SPC is the specific conductance, in microsiemens per centimeter;

m is the slope from the MOVE.1 analysis (table 3); and

b is the intercept from the MOVE.1 analysis (table 3).

These regression equations were developed by using the MOVE.1 method (also known as the line of organic correlation; Helsel and Hirsch, 2002) on the basis of concurrent

Table 3. Regression equation coefficients used to estimate concentrations of chloride and sodium from values of specific conductance for U.S. Geological Survey monitoring stations in the Scituate Reservoir drainage area, Rhode Island, from October 1, 2015, through September 30, 2016.

[Locations of stations are shown on figure 1. U.S. Geological Survey (USGS) parameter codes: specific conductance, 90095; chloride, 00940; sodium, 00930. PWSB, Providence Water Supply Board]

PWSB station number	USGS station number	Samples used in analyses		Chloride			Sodium		
		Sample data range (month/day/year)	Sample count	Slope	Intercept	Standard error of regressions (percent)	Slope	Intercept	Standard error of regressions (percent)
24	01115190	03/08/2000; 03/29/2005; 01/22/2009 to 07/06/2017	26	1.2571	0.06894	3.8	1.2244	0.04913	7.3
28	01115265	03/28/2001; 03/30/2005; 01/22/2009 to 07/06/2017	26	1.2270	0.07901	5.5	1.1326	0.07443	9.0
35	01115187	03/28/2001; 03/29/2005; 01/22/2009 to 07/06/2017	26	1.2428	0.07282	6.3	1.1751	0.06094	8.4
3	01115280	03/08/2000; 03/30/2005; 01/22/2009 to 07/19/2017	26	1.2217	0.07704	4.9	1.0722	0.09611	7.8
5	01115184	03/05/2009 to 07/20/2017	23	1.2558	0.06221	6.5	1.0813	0.08318	6.1
6	01115183	03/08/2000; 03/30/2005; 01/22/2009 to 07/20/2017	34	1.1920	0.07872	6.7	1.2291	0.03842	9.2
7	01115297	03/28/2001; 03/30/2005; 01/22/2009 to 07/20/2017	25	1.0552	0.13303	6.3	0.89330	0.16852	8.6
8	01115276	01/22/2009 to 07/19/2017	23	1.1016	0.13513	4.9	1.0463	0.10969	5.9
9	01115275	03/08/2000; 03/30/2005; 01/22/2009 to 07/20/2017	25	1.0600	0.17564	4.2	1.0734	0.09639	5.6
19	01115170	03/08/2000; 03/29/2005; 01/22/2009 to 07/20/2017	29	1.2410	0.06537	4.0	1.1927	0.04976	4.7
14	01115110	03/28/2001; 03/29/2005; 01/22/2009 to 07/19/2017	30	1.2030	0.07202	12	1.0670	0.07766	11
15	01115114	01/22/2009 to 07/20/2017	31	1.1748	0.09355	4.0	1.0885	0.08810	7.5
16	01115098	03/28/2001; 03/29/2005; 01/22/2009 to 07/20/2017	27	1.2748	0.05402	6.9	1.0919	0.08072	9.6
18	01115120	01/22/2009 to 07/19/2017	18	1.2098	0.07604	4.5	1.0879	0.08393	5.1

measurements of specific conductance[3] along with chloride[4] and sodium[5] concentrations measured in water-quality samples collected by the USGS from tributaries in the Scituate Reservoir drainage area (U.S. Geological Survey, 2016).

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, values of specific conductance were estimated by proportional distribution between recorded values.

Data Collected by the Providence Water Supply Board

Water-quality samples were collected by the PWSB at 34 of the 37 fixed stations on tributaries draining to the Scituate Reservoir during WY 2016. Sampling visits typically are conducted monthly at 19 stations and quarterly at another 15 stations (table 1). No quarterly water samples were collected at Toad Pond (PWSB station 31), Dexter Pond (PWSB station 17), and unnamed tributary to Regulating Reservoir (PWSB station 18) during WY 2016.

Water-quality samples were not collected during specific weather conditions; instead, 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 tributaries at the sampling stations were dry or frozen. When possible, water-quality samples were collected by dipping the sample bottle into the tributary at the center of flow (Richard Blodgett, PWSB, written commun., 2005). Samples were transported on ice to the PWSB water-quality laboratory at the P.J. Holton Water Purification Plant in Scituate. Water-quality properties and constituent concentrations were measured by using unfiltered water samples. These water-quality properties included pH, alkalinity, color, turbidity, and concentrations of chloride, nitrite, nitrate, orthophosphate, and bacteria (*Escherichia coli* [*E. coli*] and total coliform); the data are published in Smith (2018c). Analytical methods used for the determination of values or concentrations of pH, color, turbidity, alkalinity, and chloride are documented by Eaton and others (2017). Concentrations of nitrite and nitrate were determined by U.S. Environmental Protection Agency method 353.2 (U.S. Environmental Protection Agency, 1993). Concentrations of orthophosphate were determined by the Hach PhosVer Method (Hach Method 8048; Hach Company, 2000). Before August 2016, Standard Method 9222 was used for the determination of concentrations of bacteria in water samples, and thereafter, Standard Method 9223 was used for the determination of concentrations of bacteria (Eaton and others, 2017).

Water-quality samples were collected by the PWSB during a wide range of flow conditions. The daily mean flow-duration curve for Rush Brook near Elmdale Road near North Scituate (USGS streamgage 01115114) for WY 2016 is shown in figure 2. The curve represents the percentage

[3]Specific conductance is USGS parameter code 90095.

[4]Chloride is USGS parameter code 00940.

[5]Sodium is USGS parameter code 00930.

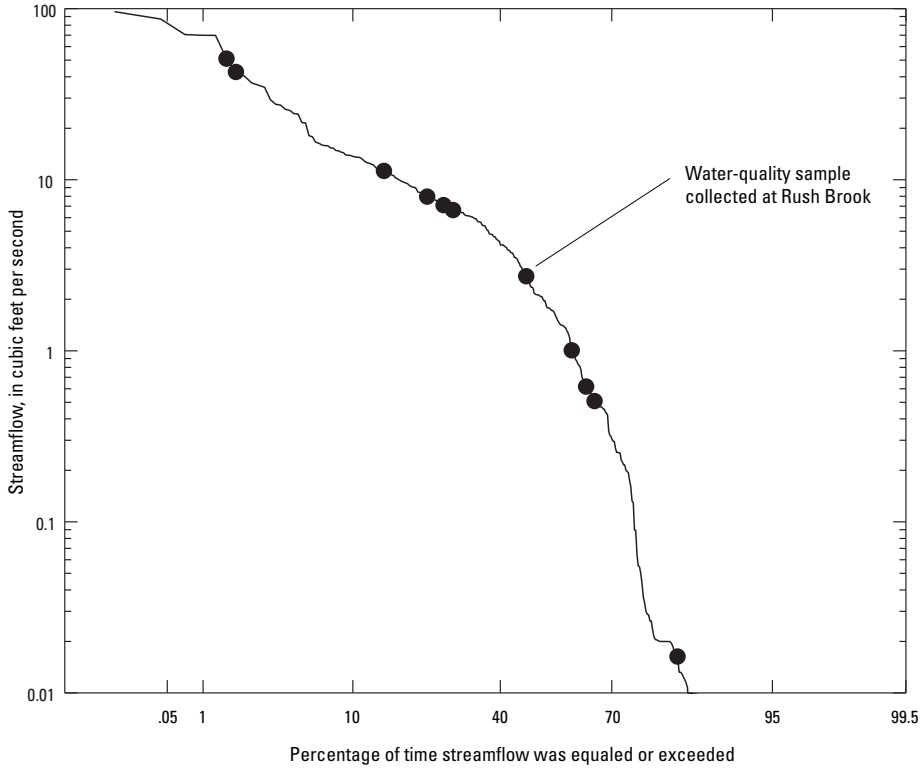

Figure 2. Flow-duration curve and streamflow on the dates (represented by points) when water-quality samples were collected for the U.S. Geological Survey continuous streamgage on Rush Brook near Elmdale Road North Scituate (01115114), Rhode Island, in water year 2016. Location of station is shown on figure 1.

of time that each flow duration was equaled or exceeded at this station; the flows at this station on days when water-quality samples were collected are represented by the plotted points superimposed on the curve. Samples were collected at flow durations ranging from the 1.5 percentile to the 84th percentile; this range indicates that the water-quality samples collected in WY 2016 represented a wide range of flow conditions during that water year. About 15 percent of the flows at this station were equal to or less than 0.01 cubic foot per second (ft^3/s) during WY 2016.

Estimating Daily, Monthly, and Annual Loads and Yields

Daily, monthly, and annual chloride and sodium loads (in kilograms) were estimated for all streamgages for which continuous-streamflow and specific-conductance data were available for WY 2016. Daily flow-weighted concentrations of chloride and sodium were calculated by multiplying instantaneous flows by concurrent concentrations of chloride and sodium (estimated from measurements of specific conductance) for each day and dividing by the total flow for that day. At the four continuous monitoring stations, where instantaneous flow was unavailable (table 1), daily mean concentrations of chloride and sodium were calculated from the daily mean value of specific conductance for each day. The latter method may result in less accurate concentrations because instantaneous measurements of specific conductance may change (decrease or increase) with surface water runoff; however, the variability of instantaneous measurements of specific conductance at these streamgages was generally small and daily mean values did not differ substantially from daily flow-weighted values estimated during prior water years when instantaneous flow data were available. Daily loads of chloride and sodium were estimated by multiplying daily concentrations of chloride and sodium (in milligrams per liter) by daily discharge (in liters per day). Daily data were summed to estimate monthly or annual loads.

Daily loads of water-quality constituents (in samples collected by the PWSB) were calculated for all sampling dates during WY 2016 (table 4, in 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 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 million colony forming units, kilograms, or grams per day) and yields (in million colony forming units, kilograms, or grams per day per square mile) were calculated for bacteria, chloride, nitrite, nitrate, and orthophosphate. Censored data (concentrations reported as less than method detection limits) were replaced with concentrations equal to one-half the method detection limit.

Streamflow

Monitoring streamflow is a necessary step 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 annual streamflow at the streamgage on the Ponaganset River (PWSB station 35; USGS streamgage 01115187) for the entire period of its operation (mean of the annual mean streamflows for the period of record, WY 1994–2015) before WY 2016 was about 29 ft^3/s (U.S. Geological Survey, 2016). During WY 2016, annual mean streamflow of 18 ft^3/s was lower than the mean of the annual mean streamflows for the period of record. Daily mean streamflow was often below the 10th percentile for the daily mean streamflows for the period of record (fig. 3) for much of September through December 2015 and for lesser periods through WY 2016 (fig. 3). Streamflow recovered to more typical rates of flow during the winter of WY 2016, with short periods exceeding the 90th percentile for the daily mean streamflows for the period of record later in WY 2016. Mean annual streamflow at the Peeptoad Brook streamgage (PWSB station 16, streamgage 01115098), the other long-term continuous-record streamgage in the Scituate Reservoir drainage area, for its period of record (WY 1994–2015) before WY 2016 was about 10.5 ft^3/s (U.S. Geological Survey, 2016). Annual mean streamflow at the Peeptoad Brook streamgage during WY 2016 also was lower at 6.7 ft^3/s than the mean annual streamflow for its period of record.

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 tributaries. In the case of loads, tributaries with high flows tend to have high loads because the greater volume of water can carry more of the constituent to the reservoir per unit time than tributaries with low flows. Yields represent the constituent load per unit of drainage area and are calculated by dividing the load estimated for a streamgage by the drainage area for the monitoring station. Yields are useful for comparison among streamgages that have different drainage areas because the effects of basin size and therefore total streamflow volume are attenuated. Yields also are useful for examining potential differences among basin properties that may contribute to water quality in the reservoir.

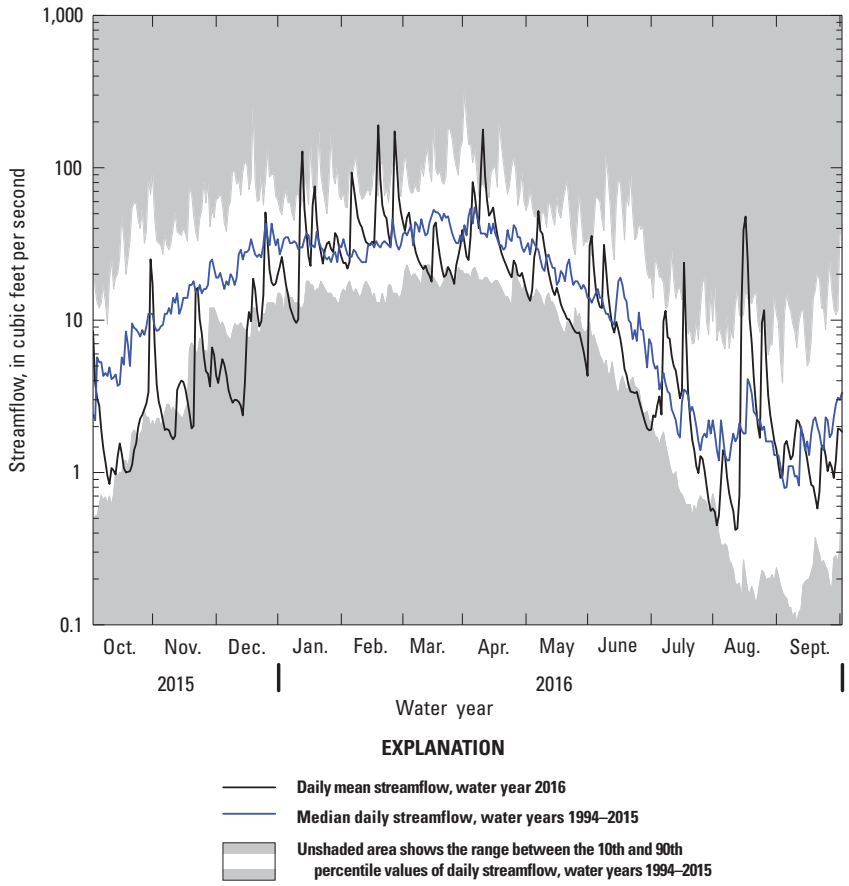

Figure 3. Measured daily mean streamflow for October 1, 2015, through September 30, 2016, and the 10th percentile, median, and 90th percentile values of daily streamflow for October 1, 1994, through September 30, 2015, for the U.S. Geological Survey continuous-record streamgage on the Ponaganset River at South Foster (01115187) in the Scituate Reservoir drainage area, Rhode Island. Location of station is shown on figure 1.

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 loads of chloride and sodium (estimated from measurements of specific conductance), which include a large number of values, are better summarized in terms of means because a large dataset is more resistant to the effects of outliers than small datasets. Mean values also are particularly appropriate for characterizing loads because outlier values, which typically represent large flows, are important to include in estimates of constituent masses delivered to receiving waters.

Uncertainties associated with measuring streamflow and specific conductance and with chloride and sodium 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 chloride and sodium inputs from tributaries or their drainage basins, based on the available data and analysis methods. 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. The uncertainties associated with streamflow are commonly assumed to affect load and yield calculations more than the errors associated with measuring specific conductance and (or) chemical analysis, and the uncertainties associated with estimated streamflow are greater than those associated with measured streamflow. The most probable values of loads and yields presented in the tables and text are sufficient for planning-level analysis of water quality in tributaries and their drainage basins.

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

Chloride and sodium 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). Nimiroski and Waldron (2002) indicated that tributaries in basins with State-maintained roads had substantially higher concentrations of chloride and sodium than tributaries in basins with low road density, presumably because of deicing activities. In addition, sodium is a constituent of potential concern for human health; some persons on restricted diets might need to limit intake of sodium.

Estimated monthly mean[6] chloride concentrations in tributaries of the Scituate Reservoir drainage area ranged from 9.3 to 97 milligrams per liter (mg/L), and estimated monthly mean sodium concentrations ranged from 6.2 to 59 mg/L (table 5). The highest monthly mean concentrations of chloride and sodium were estimated to be 97 and 59 mg/L, respectively, at Quonapaug Brook (PWSB station 6) in October 2015 and 91 and 52 mg/L, respectively, at Rush Brook (PWSB station 15) in September 2016. The estimated monthly mean concentrations at all stations were greater during summer and early fall compared with the estimated monthly mean concentrations during the winter months. The highest annual mean[7] concentrations of chloride and sodium were estimated to be 57 and 34 mg/L, respectively, at Bear Tree Brook (table 6). These high concentrations at Bear Tree Brook are the result of residual chloride and sodium leaching from a formerly uncovered salt storage pile to groundwater (Nimiroski and Waldron, 2002) and relatively small surface-water flows. Annual mean concentrations of chloride and sodium estimated to be 54 and 31 mg/L, respectively, at unnamed tributary to Regulating Reservoir and 53 and 31 mg/L, respectively, at Moswansicut Reservoir also were relatively high (table 6). Both of these stations are located in the more developed, northeastern part of the Scituate Reservoir drainage area (fig. 1).

During WY 2016, the Scituate Reservoir received about 2,100,000 kilograms (kg; about 2,300 short tons) of chloride and 1,300,000 kg (about 1,400 short tons) of sodium from tributaries that are equipped with instrumentation capable of continuously monitoring specific conductance. The highest chloride and sodium loads in the drainage area during WY 2016 were estimated to be 380,000 and 230,000 kg, respectively, at the Ponaganset River station (PWSB station 35; table 6). Monthly estimated chloride and sodium loads were highest in February (table 7), except at Wilbur Hollow Brook (PWSB station 7) and Westconnaug Brook (PWSB station 8) where the monthly estimated loads were higher during April and at Peeptoad Brook (PWSB station 16) where the monthly estimated load was highest during January. Monthly estimated chloride and sodium loads for Quonapaug Brook (PWSB station 6) were the same in February and April. From January through April, the sum of the monthly loads of chloride and sodium at each station accounted for 69 percent of the annual load for the monitored area in the Scituate Reservoir drainage area. The highest annual chloride and sodium yields were 95,000 and 56,000 kilograms per square mile, respectively, measured at Bear Tree Brook (PWSB station 9; table 6). During WY 2016, estimated annual loads of chloride and sodium at the continuous monitoring stations were less than the median annual loads for WY 2009–15 at all stations except for Spruce Brook (PWSB station 5; chloride only), Quonapaug Brook (PWSB station 6), Westconnaug Brook (PWSB station 8), and Bear Tree Brook (PWSB station 9) in the Direct Runoff subbasin and Peeptoad Brook (PWSB station 16) in the Regulating Reservoir subbasin (fig. 4).

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

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

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, and color, were routinely measured to characterize water quality in each of the six subbasins in the Scituate Reservoir drainage area (table 8). 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 tributaries in the Scituate Reservoir drainage area ranged from 5.3 to 7.0; the median of the medians for all stations was 6.3. Median values of color ranged from 12 to 140 platinum cobalt units; the median for all stations was 35 platinum cobalt units. Median values of turbidity ranged from 0.27 to 1.8 nephelometric turbidity units; the median for all stations was 0.62 nephelometric turbidity units. Median alkalinity values in tributaries were low, ranging from 2.3 to 15 mg/L as calcium carbonate ($CaCO_3$); the median for all stations was 4.8 mg/L as $CaCO_3$ (table 8).

Constituent Concentrations and Daily Loads and Yields

Fecal indicator bacteria, chloride, and nutrients such as nitrogen and phosphorus are commonly detected in natural water; at elevated concentrations, these constituents can cause or contribute to water-quality impairments. 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 stream water from precipitation, weathering, or human activities such as waste disposal, use of septic systems, and road deicing. Sources of nutrients in tributary stream water include atmospheric deposition, leaching of naturally occurring organic material, discharge of groundwater that is enriched with nutrients from septic-system leachate, and runoff contaminated with fertilizer or animal waste. The ultimate intended use of water in the tributaries is drinking water, which must meet specific water-quality standards. For this reason, the PWSB and the USGS closely monitor concentrations of these constituents in tributaries. Median concentrations, loads, and yields of water-quality constituents are listed in tables 8 and 9.

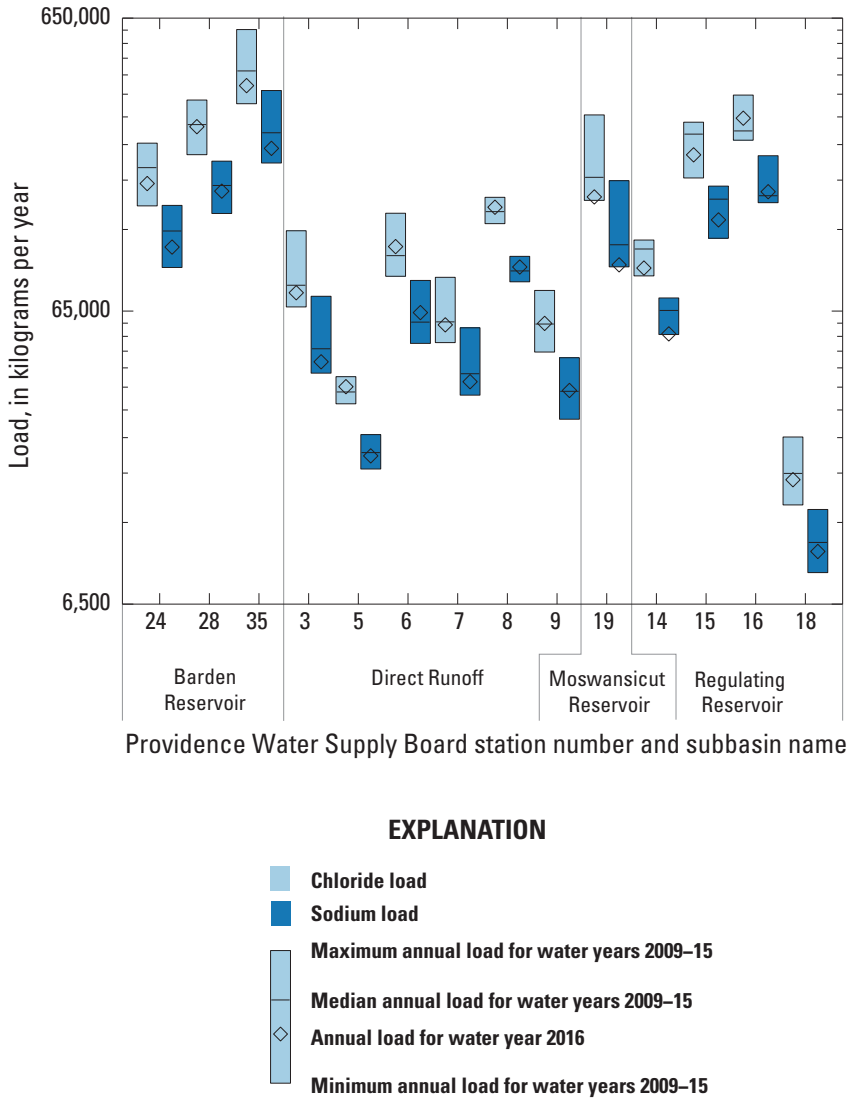

Figure 4. Annual loads of chloride and sodium estimated from streamflow and specific conductance data for water year 2016 and associated minimum, maximum, and median annual loads for water years 2009–15 at 14 Providence Water Supply Board stations in the Scituate Reservoir drainage area, Rhode Island. Location of stations shown on figure 1.

Bacteria

Median concentrations of total coliform bacteria were above the detection limit (10 colony forming units per 100 milliliters [CFU/100 mL]) at all sites (table 8); median concentrations of *E. coli* were equal to or greater than the detection limit of 10 CFU/100 mL before August 2016 and 1 CFU/100 mL thereafter at 14 of the 34 sites for which samples were collected. Total coliform bacteria concentrations were greater than *E. coli* concentrations (as expected because total coliform is more inclusive); the medians of median concentrations for all sites in the drainage area were 700 CFU/100 mL for total coliform bacteria and 10 CFU/100 mL for *E. coli* (table 8). The median concentration of total coliform bacteria was highest at unnamed tributary #2 to Moswansicut Reservoir (PWSB station 21) at 8,400 CFU/100 mL. The highest median concentration of *E. coli* (105 CFU/100 mL) was measured in samples collected at Quonapaug Brook (PWSB station 6) and Huntinghouse Brook (PWSB station 14). Median concentrations of fecal indicator bacteria were lowest at Kimball Stream (PWSB station 34). Median concentrations of *E. coli* were equivalent to or greater than 10 CFU/100 mL at more than half of the sampling stations.

Median daily loads and yields of total coliform bacteria and *E. coli* varied by about two orders of magnitude; the highest median daily yield of total coliform bacteria at 480,000 million colony forming units per day per square mile (MCFU/d/mi^2) and the highest median daily yield of *E. coli* of 4,500 MCFU/d/mi^2 were at unnamed tributary #2 to Moswansicut Reservoir (PWSB station 21; table 9). Although relatively high for sampling stations in the Scituate Reservoir subbasin, median daily bacteria yields at Moswansicut Reservoir are low to moderate for yields of indicator bacteria in sewage-contaminated stream water or stream water 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 730 to 350,000 million colony forming units per day (MCFU/d), and yields ranged from 860 to 480,000 MCFU/d/mi^2; *E. coli* loads ranged from less than 160 to 4,900 MCFU/d, and yields ranged from 89 to 4,500 MCFU/d/mi^2 (table 9).

Chloride and Sodium

The highest median chloride concentration of 92.5 mg/L was measured in the Direct Runoff subbasin at unnamed tributary #2 to Scituate Reservoir (PWSB station 2; table 8). Median daily chloride loads and yields estimated from samples collected by the PWSB varied among monitoring stations in the drainage area (table 9); the median daily chloride yield for monitored areas within the drainage area was 53 kilograms per day per square mile (kg/d/mi^2). Ponaganset River (PWSB station 35) had the largest median daily chloride load at 1,100 kilograms per day. The largest median daily chloride yield was determined to be 370 kg/d/mi^2 at Bear Tree Brook (PWSB station 9). The estimated annual mean yields of chloride and sodium for the drainage areas above the 14 USGS continuous-record streamgages, which represent nearly 66 percent of the Scituate Reservoir drainage area, were 93 and 56 kg/d/mi^2, respectively. These estimated annual mean yields of chloride and sodium for WY 2016 were about 13 percent lower than the estimated annual mean yields of 108 and 64 kg/d/mi^2, respectively, for WY 2015 (Smith, 2018a).

Nutrients

Median concentrations of nitrite and nitrate (table 8) were 0.002 and 0.13 mg/L as nitrogen, respectively. The highest median concentration of nitrite nitrogen was 0.012 mg/L measured in a sample collected at Moswansicut Reservoir (PWSB station 22). The highest median concentration of nitrate nitrogen was 0.65 mg/L measured in a sample collected at unnamed tributary #2 to Scituate Reservoir (PWSB station 2). The median concentration of orthophosphate for the entire study area (table 8) was 0.07 mg/L as phosphate (PO_4). The maximum median concentration of orthophosphate was 0.23 mg/L as PO_4 measured in Kimball Stream (PWSB station 34). Median daily nitrite nitrogen and orthophosphate loads were largest at Ponaganset River (PWSB station 35) at 67 and 2,700 grams per day (g/d), respectively (table 9). Median daily nitrate nitrogen loads were largest at Bear Tree Brook (PWSB station 9) at 2,200 g/d. The largest median daily yields for nitrite and nitrate nitrogen were 9.9 and 3,500 grams per day per square mile (g/d/mi^2), respectively, at Bear Tree Brook. The largest median daily yield for orthophosphate was 660 g/d/mi^2 at Pine Swamp Brook (PWSB station 32; table 9). The medians of median daily loads and yields were 8.9 g/d and 4.7 g/d/mi^2 for nitrite nitrogen, 570 g/d and 130 g/d/mi^2 for nitrate nitrogen, and 320 g/d and 165 g/d/mi^2 for orthophosphate.

Table 5. Monthly mean concentrations of chloride and sodium estimated from continuous measurements of specific conductance in the Scituate Reservoir drainage area, Rhode Island, from October 1, 2015, through September 30, 2016.

[Alternate station names are listed in parentheses for stations where different historical names were used for the same sampling location by the Providence Water Supply Board (PWSB); locations of stations are shown on figure 1. Monthly mean concentrations were calculated by dividing the monthly load by the total discharge for the month. USGS, U.S. Geological Survey; Cl, chloride; Na, sodium; mg/L, milligram per liter; --, no flow]

PWSB station number	USGS station number	Station name	October		November		December		January		February		March	
			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	50	30	40	24	36	22	30	18	30	18	35	21
28	01115265	Barden Reservoir (Hemlock Brook)	50	29	43	25	33	19	23	14	21	13	26	15
35	01115187	Ponaganset River	35	21	33	20	28	17	22	13	21	13	24	15
Direct Runoff subbasin														
3	01115280	Cork Brook	64	35	59	33	46	26	33	20	36	21	41	24
5	01115184	Spruce Brook	52	27	40	22	30	17	22	13	23	14	23	13
6	01115183	Quonapaug Brook	97	59	79	48	63	38	39	23	39	23	40	24
7	01115297	Wilbur Hollow Brook	26	15	18	11	13	8.2	10	6.4	9.3	6.2	11	7.0
8	01115276	Westconnaug Brook (Westconnaug Reservoir)	33	21	35	22	33	20	21	13	21	13	24	15
9	01115275	Bear Tree Brook	75	44	69	41	61	36	52	30	49	29	56	33
Moswansicut Reservoir subbasin														
19	01115170	Moswansicut Reservoir (Moswansicut Stream North, Moswansicut Pond)	53	31	53	31	52	31	52	30	52	31	53	31
Regulating Reservoir subbasin														
14	01115110	Huntinghouse Brook	21	12	19	11	15	8.9	12	7.4	13	7.7	14	8.1
15	01115114	Regulating Reservoir (Rush Brook)	81	47	68	40	50	30	32	20	36	22	47	28
16	01115098	Peeptoad Brook (Harrisdale Brook)	55	30	55	30	60	33	55	30	47	27	46	26
18	01115120	Unnamed tributary to Regulating Reservoir (Unnamed brook A)	--	--	47	27	58	33	52	30	53	30	59	33
Scituate Reservoir drainage area														
		Average	53	31	47	27	41	24	32	19	32	19	36	21

Table 5. Monthly mean concentrations of chloride and sodium estimated from continuous measurements of specific conductance in the Scituate Reservoir drainage area, Rhode Island, from October 1, 2015, through September 30, 2016.—Continued

[Alternate station names are listed in parentheses for stations where different historical names were used for the same sampling location by the Providence Water Supply Board (PWSB); locations of stations are shown on figure 1. Monthly mean concentrations were calculated by dividing the monthly load by the total discharge for the month. USGS, U.S. Geological Survey; Cl, chloride; Na, sodium; mg/L, milligram per liter; --, no flow]

PWSB station number	USGS station number	Station name	April		May		June		July		August		September	
			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	33	20	35	21	37	22	41	25	44	26	39	24
28	01115265	Barden Reservoir (Hemlock Brook)	22	13	26	16	30	18	38	22	33	19	37	22
35	01115187	Ponaganset River	22	14	25	15	26	16	28	17	28	17	26	16
Direct Runoff subbasin														
3	01115280	Cork Brook	37	22	40	23	40	23	43	25	58	32	60	33
5	01115184	Spruce Brook	20	12	21	13	25	15	35	19	46	25	62	32
6	01115183	Quonapaug Brook	37	22	41	24	44	26	46	27	63	38	82	50
7	01115297	Wilbur Hollow Brook	9.9	6.5	11	7.3	11	7.3	14	8.4	12	7.6	14	8.5
8	01115276	Westconnaug Brook (Westconnaug Reservoir)	23	14	25	16	23	14	35	21	33	20	32	20
9	01115275	Bear Tree Brook	51	30	59	35	74	44	79	47	75	45	80	48
Moswansicut Reservoir subbasin														
19	01115170	Moswansicut Reservoir (Moswansicut Stream North, Moswansicut Pond)	54	31	55	32	56	33	56	33	63	37	62	36
Regulating Reservoir subbasin														
14	01115110	Huntinghouse Brook	13	7.9	15	8.6	17	9.7	17	9.8	16	9.4	15	9.0
15	01115114	Regulating Reservoir (Rush Brook)	38	23	47	28	56	33	87	50	73	42	91	52
16	01115098	Peeptoad Brook (Harrisdale Brook)	45	26	46	26	50	28	54	30	55	30	56	31
18	01115120	Unnamed tributary to Regulating Reservoir (unnamed brook A)	53	30	55	31	57	32	--	--	--	--	--	--
Scituate Reservoir drainage area														
		Average	33	19	36	21	39	23	44	26	46	27	51	29

Table 6. Annual mean chloride and sodium concentrations, loads, and yields for sampling stations in the Scituate Reservoir drainage area, Rhode Island, from October 1, 2015, through September 30, 2016.

[Alternate station names are listed in parentheses for stations where different historical names were used for the same sampling location by the Providence Water Supply Board (PWSB). Locations of stations are shown on figure 1. Annual mean concentrations were calculated by dividing the annual load by the total discharge for the year; annual mean yields were calculated by dividing the sum of individual loads by the sum of the drainage area. USGS, U.S. Geological Survey; Cl, chloride; Na, sodium; mg/L, milligram per liter; kg/yr, kilogram per year; kg/yr/mi^2, kilogram per year per square mile]

PWSB station number	USGS station number	Station name	Concentration		Load		Yield	
			Cl (mg/L)	Na (mg/L)	Cl (kg/yr)	Na (kg/yr)	Cl (kg/yr/mi^2)	Na (kg/yr/mi^2)
		Barden Reservoir subbasin						
24	01115190	Dolly Cole Brook	33	20	180,000	110,000	36,000	22,000
28	01115265	Barden Reservoir (Hemlock Brook)	25	15	280,000	170,000	32,000	19,000
35	01115187	Ponaganset River	24	14	380,000	230,000	27,000	17,000
		Direct Runoff subbasin						
3	01115280	Cork Brook	39	23	75,000	44,000	42,000	24,000
5	01115184	Spruce Brook	24	14	36,000	21,000	29,000	17,000
6	01115183	Quonapaug Brook	45	27	110,000	64,000	55,000	33,000
7	01115297	Wilbur Hollow Brook	11	7.3	58,000	37,000	14,000	8,600
8	01115276	Westconnaug Brook (Westconnaug Reservoir)	24	15	150,000	92,000	28,000	18,000
9	01115275	Bear Tree Brook	57	34	59,000	35,000	95,000	56,000
		Moswansicut Reservoir subbasin						
19	01115170	Moswansicut Reservoir (Moswansicut Stream North, Moswansicut Pond)	53	31	160,000	94,000	49,000	29,000
		Regulating Reservoir subbasin						
14	01115110	Huntinghouse Brook	13	8.0	91,000	54,000	15,000	8,700
15	01115114	Rush Brook	41	25	220,000	130,000	47,000	28,000
16	01115098	Peeptoad Brook (Harrisdale Brook)	49	28	300,000	170,000	60,000	34,000
18	01115120	Unnamed tributary to Regulating Reservoir (unnamed brook A)	54	31	17,000	9,800	62,000	35,000
		Scituate Reservoir drainage area						
			Mean		Total		Mean	
			35	21	2,100,000	1,300,000	34,000	20,000

Table 7. Monthly estimated chloride and sodium loads for sampling stations in the Scituate Reservoir drainage area, Rhode Island, from October 1, 2015, through September 30, 2016.

[Alternate station names are listed in parentheses for stations where different historical names were used for the same sampling location by the Providence Water Supply Board (PWSB). Locations of stations are shown on figure 1. USGS, U.S. Geological Survey; Cl, chloride; Na, sodium; kg, kilogram]

PWSB station number	USGS station number	Station name	October		November		December		January		February		March	
			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	1,900	1,100	6,800	4,100	13,000	7,600	26,000	16,000	44,000	27,000	23,000	14,000
28	01115265	Barden Reservoir (Hemlock Brook)	5,500	3,100	11,000	6,400	25,000	15,000	38,000	23,000	62,000	38,000	32,000	19,000
35	01115187	Ponaganset River	9,000	5,300	11,000	6,700	25,000	15,000	55,000	34,000	86,000	53,000	52,000	32,000
Direct Runoff subbasin														
3	01115280	Cork Brook	1,200	640	2,900	1,600	5,800	3,300	8,700	5,100	18,000	11,000	12,000	6,800
5	01115184	Spruce Brook	890	460	2,000	1,100	3,000	1,700	5,100	3,000	6,700	4,000	4,700	2,800
6	01115183	Quonapaug Brook	4,600	2,800	9,800	5,900	15,000	8,700	13,000	7,900	18,000	10,000	13,000	7,400
7	01115297	Wilbur Hollow Brook	2,900	1,600	5,200	3,100	6,700	4,200	6,900	4,600	8,500	5,600	7,300	4,700
8	01115276	Westconnaug Brook (Westconnaug Reservoir)	4,500	2,800	4,100	2,500	4,700	2,900	16,000	9,900	26,000	16,000	24,000	15,000
9	01115275	Bear Tree Brook	1,700	1,000	1,400	820	1,500	880	6,500	3,800	10,000	5,900	9,100	5,400
Moswansicut Reservoir subbasin														
19	01115170	Moswansicut Reservoir (Moswansicut Stream North, Moswansicut Pond)	630	370	1,300	740	8,200	4,800	23,000	14,000	35,000	21,000	26,000	15,000
Regulating Reservoir subbasin														
14	01115110	Huntinghouse Brook	740	420	1,800	1,000	5,100	3,000	14,000	8,600	23,000	14,000	12,000	7,400
15	01115114	Regulating Reservoir (Rush Brook)	4,100	2,300	9,800	5,700	21,000	12,000	28,000	17,000	52,000	31,000	33,000	20,000
16	01115098	Peeptoad Brook (Harrisdale Brook)	3,700	2,100	4,500	2,500	31,000	17,000	65,000	36,000	49,000	28,000	39,000	22,000
18	01115120	Unnamed tributary to Regulating Reservoir (unnamed brook A)	--	--	45	26	540	300	3,000	1,700	5,800	3,300	1,800	1,000
Scituate Reservoir drainage area														
		Total	41,000	24,000	72,000	42,000	170,000	100,000	310,000	180,000	440,000	270,000	290,000	170,000

Table 7. Monthly estimated chloride and sodium loads for sampling stations in the Scituate Reservoir drainage area, Rhode Island, from October 1, 2015, through September 30, 2016.—Continued

[Alternate station names are listed in parentheses for stations where different historical names were used for the same sampling location by the Providence Water Supply Board (PWSB). Locations of stations are shown on figure 1. USGS, U.S. Geological Survey; Cl, chloride; Na, sodium; kg, kilogram]

PWSB station number	USGS station number	Station name	April		May		June		July		August		September	
			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	37,000	22,000	14,000	8,700	5,100	3,100	2,600	1,600	2,700	1,600	910	550
28	01115265	Barden Reservoir (Hemlock Brook)	50,000	30,000	25,000	15,000	9,200	5,500	1,600	960	14,000	8,200	3,800	2,200
35	01115187	Ponaganset River	70,000	43,000	34,000	21,000	16,000	9,500	8,400	5,100	14,000	8,300	2,600	1,600
Direct Runoff subbasin														
3	01115280	Cork Brook	16,000	9,300	6,600	3,800	1,900	1,100	700	400	1,300	740	360	200.0
5	01115184	Spruce Brook	5,300	3,200	3,500	2,100	1,600	940	1,400	770	1,100	600	570	290
6	01115183	Quonapaug Brook	18,000	10,000	10,000	6,100	3,500	2,100	2,600	1,600	1,200	720	150	94
7	01115297	Wilbur Hollow Brook	9,600	6,300	6,300	4,000	2,300	1,500	2,000	1,200	630	400	98	61
8	01115276	Westconnaug Brook (Westconnaug Reservoir)	28,000	17,000	16,000	9,800	12,000	7,500	4,100	2,500	4,900	3,000	4,300	2,700
9	01115275	Bear Tree Brook	10,000	6,100	6,200	3,700	6,500	3,900	1,700	980	2,000	1,200	1,900	1,100
Moswansicut Reservoir subbasin														
19	01115170	Moswansicut Reservoir (Moswansicut Stream North, Moswansicut Pond)	34,000	20,000	19,000	11,000	8,400	4,900	1,100	620	680	400	550	320
Regulating Reservoir subbasin														
14	01115110	Huntinghouse Brook	20,000	12,000	9,300	5,500	2,400	1,400	1,100	650	480	280	91	53
15	01115114	Regulating Reservoir (Rush Brook)	42,000	26,000	22,000	13,000	6,800	4,000	1,700	990	1,100	620	42	24
16	01115098	Peeptoad Brook (Harrisdale Brook)	62,000	35,000	26,000	15,000	5,800	3,300	5,100	2,800	3,600	2,000	960	530
18	01115120	Unnamed tributary to Regulating Reservoir (unnamed brook A)	4,900	2,800	1,100	620	120	70	--	--	--	--	--	--
Scituate Reservoir drainage area														
		Total	410,000	240,000	200,000	119,000	80,000	50,000	30,000	20,000	48,000	28,000	16,000	10,000

Table 8. Median values for water-quality data collected at Providence Water Supply Board stations in the Scituate Reservoir drainage area, Rhode Island, from October 1, 2015, through September 30, 2016.

[Water-quality data are from samples collected and analyzed by the Providence Water Supply Board (PWSB); alternate station names are listed in parentheses for stations where different historical names were used for the same sampling location by the PWSB. Locations of stations are shown on figure 1. USGS, U.S. Geological Survey; PCU, platinum cobalt unit; NTU, nephelometric turbidity unit; CFU/100mL, colony forming unit per 100 milliliters; *E. coli*, *Escherichia coli*; mg/L, milligram per liter; $CaCO_3$, calcium carbonate; N, nitrogen; PO_4, phosphate; <, less than; --, no data]

PWSB station number	USGS station number	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 PO_4)
Barden Reservoir subbasin												
24	01115190	Dolly Cole Brook	6.4	36	0.60	2,300	30	4.5	34.5	0.002	<0.05	0.06
25	01115200	Shippee Brook	6.4	33	0.53	1,600	<10	4.3	14.3	0.001	<0.46	0.09
26	01115185	Windsor Brook	6.3	29	0.51	6,000	<20	4.8	37.5	0.002	<0.06	0.11
27	011151845	Unnamed tributary to Ponaganset River (unnamed brook B, Unnamed Brook West of Windsor Brook)	5.3	20	0.38	6,300	<10	2.9	18.9	0.002	0.53	0.11
28	01115265	Barden Reservoir (Hemlock Brook)	5.8	100	0.71	560	<10	4.7	34.1	0.003	0.05	0.09
29	01115271	Ponaganset River (Barden Stream)	6.3	45	0.87	490	<10	4.2	26.6	0.002	<0.05	0.05
35	01115187	Ponaganset River	6.2	39	0.67	1,900	<10	4.0	24.9	0.002	<0.05	0.07
Direct Runoff subbasin												
1	01115180	Brandy Brook	7.0	80	1.1	1,200	20	11	14.2	0.002	0.21	0.07
2	01115181	Unnamed tributary #2 to Scituate Reservoir (unnamed brook north of Bullhead Brook)	5.9	15	0.49	200	<10	4.3	92.5	0.002	0.65	0.05
3	01115280	Cork Brook	6.3	48	0.44	2,400	20	5.0	43.1	0.001	0.15	0.10
4	01115400	Kent Brook (Betty Pond Stream)	6.8	20	0.84	200	<10	7.7	6.1	0.002	<0.05	0.04
5	01115184	Spruce Brook	6.2	40	0.45	520	<10	4.0	19.8	0.002	0.29	0.05
6	01115183	Quonapaug Brook	6.4	69	0.66	1,300	105	8.4	40.5	0.002	0.28	0.07
7	01115297	Wilbur Hollow Brook	6.4	73	0.82	1,900	31	4.1	12.8	0.003	<0.05	0.08
8	01115276	Westconnaug Brook (Westconnaug Reservoir)	6.2	14	0.60	540	<10	3.5	15.6	0.001	<0.05	0.05
9	01115275	Bear Tree Brook	6.4	33	0.75	530	<45	5.8	58.0	0.002	0.56	0.06
30	01115350	Unnamed tributary #4 to Scituate Reservoir (Coventry Brook, Knight Brook)	6.0	32	0.34	360	<10	3.4	29.5	0.002	<0.06	0.03
31	01115177	Toad Pond	--	--	--	--	--	--	--	--	--	--
32	01115178	Unnamed tributary #1 to Scituate Reservoir (Pine Swamp Brook)	6.5	48	0.71	1,100	<40	5.9	16.9	0.002	0.43	0.20
33	01115182	Unnamed tributary #3 to Scituate Reservoir (Halls Estate Brook)	6.1	22	0.32	280	<15	4.9	13.0	0.001	0.17	0.07
36	--	Outflow from King Pond	6.6	20	0.34	690	10	4.0	4.4	0.001	<0.05	0.04
37	--	Fire Tower Stream	5.6	15	0.35	400	30	5.0	3.2	0.001	<0.05	0.11

Table 8. Median values for water-quality data collected at Providence Water Supply Board stations in the Scituate Reservoir drainage area, Rhode Island, from October 1, 2015, through September 30, 2016.—Continued

[Water-quality data are from samples collected and analyzed by the Providence Water Supply Board (PWSB); alternate station names are listed in parentheses for stations where different historical names were used for the same sampling location by the PWSB. Locations of stations are shown on figure 1. USGS, U.S. Geological Survey; PCU, platinum cobalt unit; NTU, nephelometric turbidity unit; CFU/100mL, colony forming unit per 100 milliliters; *E. coli*, *Escherichia coli*; mg/L, milligram per liter; $CaCO_3$, calcium carbonate; N, nitrogen; PO_4, phosphate; <, less than; --, no data]

PWSB station number	USGS station number	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 PO_4)
Moswansicut Reservoir subbasin												
19	01115170	Moswansicut Reservoir (Moswansicut Stream North, Moswansicut Pond)	6.7	17	1.2	710	<10	11	53.9	0.002	0.07	0.05
20	01115160	Unnamed tributary #1 to Moswansicut Reservoir (Blanchard Brook)	5.9	140	0.50	650	<10	6.0	76.3	0.004	0.10	0.14
21	01115165	Unnamed tributary #2 to Moswansicut Reservoir (brook from Kimball Reservoir)	6.6	35	0.87	8,400	80	10	50.3	0.001	0.42	0.10
22	01115167	Moswansicut Reservoir (Moswansicut Stream South)	6.6	18	1.8	710	20	15	59.9	0.012	0.61	0.11
34	01115164	Kimball Stream	6.1	45	0.92	70	<10	12	25.8	0.003	0.13	0.23
Ponaganset Reservoir subbasin												
23	011151843	Ponaganset Reservoir	6.2	12	0.55	210	<10	2.7	20.5	0.001	0.06	0.03
Regulating Reservoir subbasin												
13	01115176	Regulating Reservoir	6.6	29	0.98	990	<10	8.0	45.2	0.002	<0.05	0.04
14	01115110	Huntinghouse Brook	6.4	35	0.64	2,700	105	8.0	15.9	0.002	<0.06	0.07
15	01115114	Rush Brook	6.6	55	1.1	2,100	30	8.2	66.2	0.002	0.05	0.07
16	01115098	Peeptoad Brook (Harrisdale Brook)	6.5	34	0.89	3,700	<10	12	51.3	0.002	0.07	0.05
17	01115119	Dexter Pond (Paine Pond)	--	--	--	--	--	--	--	--	--	--
18	01115120	Unnamed tributary to Regulating Reservoir (unnamed brook A)	--	--	--	--	--	--	--	--	--	--
Westconnaug Reservoir subbasin												
10	01115274	Westconnaug Brook	5.7	23	0.27	190	15	2.3	29.1	0.001	0.05	0.10
11	01115273	Unnamed tributary to Westconnaug Reservoir (unnamed brook south of Westconnaug Reservoir)	5.5	60	0.40	190	10	2.8	5.80	0.002	0.05	0.03
12	011152745	Unnamed tributary to Westconnaug Brook (unnamed brook north of Westconnaug Reservoir)	5.8	48	0.41	490	10	4.4	64.9	0.001	0.05	0.04
Scituate Reservoir drainage area												
		Minimum	5.3	12	0.27	70	<10	2.3	3.2	0.001	<0.05	0.03
		Median	6.3	35	0.62	700	10	4.8	27.9	0.002	0.13	0.07
		Maximum	7.0	140	1.8	8,400	105	15	92.5	0.012	0.65	0.23

Table 9. Median daily loads and yields of bacteria, chloride, nitrite, nitrate, and orthophosphate in the Scituate Reservoir drainage area, Rhode Island, from October 1, 2015, through September 30, 2016.

[Water-quality data are from samples collected and analyzed by the Providence Water Supply Board (PWSB); alternate station names are listed in parentheses for stations where different historical names were used for the same sampling location by the PWSB. Locations of stations are shown on figure 1. USGS, U.S. Geological Survey; MCFU/d; million colony forming units per day; MCFU/d/mi^2, million colony forming units per day per square mile; *E. coli*, *Escherichia coli*; kg/d, kilogram per day; kg/d/mi^2, kilogram per day per square mile; N, nitrogen; PO_4, phosphate; g/d, gram per day; g/d/mi^2, gram per day per square mile; <, less than; --, no data]

PWSB station number	USGS station number	Station name	Total coliform bacteria		*E. coli*		Chloride		Nitrite (as N)		Nitrate (as N)		Orthophosphate (as PO_4)	
			Load (MCFU/d)	Yield (MCFU/d/mi^2)	Load (MCFU/d)	Yield (MCFU/d/mi^2)	Load (kg/d)	Yield (kg/d/mi^2)	Load (g/d)	Yield (g/d/mi^2)	Load (g/d)	Yield (g/d/mi^2)	Load (g/d)	Yield (g/d/mi^2)
Barden Reservoir subbasin														
24	01115190	Dolly Cole Brook	110,000	22,000	1,800	360	190	38	12	2.3	<180	<36	350	70
25	01115200	Shippee Brook	16,000	6,800	<390	<170	120	51	7.8	3.3	<270	<110	700	300
26	01115185	Windsor Brook	190,000	44,000	<2,500	<580	310	71	9.4	2.2	<260	<59	1,200	280
28	01115265	Barden Reservoir	120,000	14,000	<2,200	<250	480	55	45	5.2	530	60	1,600	180
35	01115187	Ponaganset River	330,000	23,000	3,400	240	1,100	80	67	4.8	<1,200	<86	2,700	190
Direct Runoff subbasin														
1	01115180	Brandy Brook	22,000	14,000	310	190	54	34	8.7	5.5	690	440	210	130
3	01115280	Cork Brook	40,000	22,000	580	320	34	19	4.6	2.6	230	130	160	89
4	01115400	Kent Brook	730	860	<210	<250	7.5	8.8	2.9	3.4	<57	<67	23	27
5	01115184	Spruce Brook	28,000	23,000	<270	<220	38	31	11	9.0	1,300	1,100	190	160
6	01115183	Quonapaug Brook	38,000	19,000	2,700	1,400	260	130	18	9.2	1,900	940	330	170
7	01115297	Wilbur Hollow Brook	130,000	30,000	1,800	420	180	41	35	7.9	<880	<200	660	150
8	01115276	Westconnaug Brook	160,000	30,000	<780	<150	180	35	24	4.6	<800	<150	940	180
9	01115275	Bear Tree Brook	22,000	35,000	<1,600	<2,600	230	370	6.2	9.9	2,200	3,500	220	350
32	01115178	Unnamed tributary #1 to Scituate Reservoir (Pine Swamp Brook)	19,000	43,000	<510	<1,100	26	58	2.5	5.4	640	1,400	300	660
33	01115182	Unnamed tributary #3 to Scituate Reservoir (Halls Estate Brook)	3,000	11,000	<160	<560	13	46	1.1	3.8	210	750	81	290
Moswansicut Reservoir subbasin														
19	01115170	Moswansicut Reservoir (Moswansicut Stream North, Moswansicut Pond)	16,000	4,900	330	100	190	60	6.8	2.1	140	43	210	64
21	01115165	Unnamed tributary #2 to Moswansicut Reservoir (brook from Kimball Reservoir)	140,000	480,000	1,300	4,500	84	290	1.7	5.9	700	2,400	170	590

Table 9. Median daily loads and yields of bacteria, chloride, nitrite, nitrate, and orthophosphate in the Scituate Reservoir drainage area, Rhode Island, from October 1, 2015, through September 30, 2016.—Continued

[Water-quality data are from samples collected and analyzed by the Providence Water Supply Board (PWSB); alternate station names are listed in parentheses for stations where different historical names were used for the same sampling location by the PWSB. Locations of stations are shown on figure 1. USGS, U.S. Geological Survey; MCFU/d; million colony forming units per day; MCFU/d/mi^2, million colony forming units per day per square mile; *E. coli*, *Escherichia coli*; kg/d, kilogram per day; kg/d/mi^2, kilogram per day per square mile; N, nitrogen; PO_4, phosphate; g/d, gram per day; g/d/mi^2, gram per day per square mile; <, less than; --, no data]

PWSB station number	USGS station number	Station name	Total coliform bacteria		*E. coli*		Chloride		Nitrite (as N)		Nitrate (as N)		Orthophosphate (as PO_4)	
			Load (MCFU/d)	Yield (MCFU/d/mi^2)	Load (MCFU/d)	Yield (MCFU/d/mi^2)	Load (kg/d)	Yield (kg/d/mi^2)	Load (g/d)	Yield (g/d/mi^2)	Load (g/d)	Yield (g/d/mi^2)	Load (g/d)	Yield (g/d/mi^2)
Regulating Reservoir subbasin														
14	01115110	Huntinghouse Brook	290,000	46,000	4,900	780	140	23	53	8.4	<610	<97	970	150
15	01115114	Regulating Reservoir (Rush Brook)	350,000	74,000	2,000	430	900	190	13	2.8	410	87	700	150
16	01115098	Peeptoad Brook (Harrisdale Brook)	98,000	20,000	440	89	420	85	9.1	1.8	650	130	260	52
18	01115120	Unnamed Tributary to Regulating Reservoir (unnamed brook A)	--	--	--	--	--	--	--	--	--	--	--	--
Westconnaug Reservoir subbasin														
10	01115274	Westconnaug Brook	28,000	19,000	470	310	150	98	4.5	3.0	<100	<69	79	53
11	01115273	Unnamed tributary to Westconnaug Reservoir (unnamed brook south of Westconnaug Reservoir)	42,000	58,000	460	630	21	29	6.4	8.8	170	230	370	510
Scituate Reservoir drainage area														
		Minimum	730	860	<160	89	7.5	8.8	1.1	1.8	<57	<36	23	27
		Median	41,000	23,000	680	340	170	53	8.9	4.7	570	130	320	165
		Maximum	350,000	480,000	4,900	4,500	1,100	370	67	9.9	2,200	3,500	2,700	660

References Cited

Breault, R.F., 2010, Streamflow, water quality, and constituent loads and yields, Scituate Reservoir drainage area, Rhode Island, water year 2002: U.S. Geological Survey Open-File Report 2009–1041, 25 p. [Also available at https://pubs.er.usgs.gov/publication/ofr20091041.]

Breault, R.F., and Campbell, J.P., 2010a, Streamflow, water quality, and constituent loads and yields, Scituate Reservoir drainage area, Rhode Island, water year 2003: U.S. Geological Survey Open-File Report 2010–1043, 24 p. [Also available at https://pubs.er.usgs.gov/publication/ofr20101043.]

Breault, R.F., and Campbell, J.P., 2010b, Streamflow, water quality, and constituent loads and yields, Scituate Reservoir drainage area, Rhode Island, water year 2004: U.S. Geological Survey Open-File Report 2010–1044, 24 p. [Also available at https://pubs.er.usgs.gov/publication/ofr20101044.]

Breault, R.F., and Campbell, J.P., 2010c, Streamflow, water quality, and constituent loads and yields, Scituate Reservoir drainage area, Rhode Island, water year 2005: U.S. Geological Survey Open-File Report 2010–1045, 24 p. [Also available at https://pubs.er.usgs.gov/publication/ofr20101045.]

Breault, R.F., and Campbell, J.P., 2010d, Streamflow, water quality, and constituent loads and yields, Scituate Reservoir drainage area, Rhode Island, water year 2006: U.S. Geological Survey Open-File Report 2010–1046, 25 p. [Also available at https://pubs.er.usgs.gov/publication/ofr20101046.]

Breault, R.F., and Smith, K.P., 2010, Streamflow, water quality, and constituent loads and yields, Scituate Reservoir drainage area, Rhode Island, water year 2009: U.S. Geological Survey Open-File Report 2010–1275, 24 p. [Also available at https://pubs.er.usgs.gov/publication/ofr20101275.]

Breault, R.F., Sorenson, J.R., and Weiskel, P.K., 2002, Streamflow, water quality, and contaminant loads in the lower Charles River watershed, Massachusetts, 1999–2000: U.S. Geological Survey Water-Resources Investigations Report 2002–4137, 131 p. [Also available at https://pubs.er.usgs.gov/publication/wri024137.]

Breault, R.F., Waldron, M.C., Barlow, L.K., and Dickerman, D.C., 2000, Water-quality conditions in relation to drainage basin characteristics in the Scituate Reservoir basin, Rhode Island, 1982–95: U.S. Geological Survey Water-Resources Investigations Report 2000–4086, 46 p. [Also available at https://pubs.er.usgs.gov/publication/wri004086.]

Eaton, A.D., Braun-Howland, Ellen, and Baxter, T.E., eds., 2017, Standard methods for the examination of water and wastewater (22d ed.): Standard Methods website, variously paged, accessed October 4, 2017, at http://www.standardmethods.org/store/.

Hach Company, 2000, DR/2010 spectrophotometer procedures manual, rev. 2: Loveland, Colo., Hach Company, 657 p.

Helsel, D.R., and Hirsch, R.M., 2002, Statistical methods in water resources: U.S. Geological Survey Techniques of Water-Resources Investigations, book 4, chap. A3, 522 p. [Also available at https://pubs.usgs.gov/twri/twri4a3/.]

Hirsch, R.M., 1982, A comparison of four streamflow record extension techniques: Water Resources Research, v. 18, no. 4, p. 1081–1088. [Also available at https://doi.org/10.1029/WR018i004p01081.]

Hirsch, R.M., and Gilroy, E.J., 1984, Methods of fitting a straight line to data—Examples in water resources: Water Resources Bulletin, v. 20, no. 5, p. 705–711. [Also available at https://doi.org/10.1111/j.1752-1688.1984.tb04753.x.]

Nimiroski, M.T., DeSimone, L.A., and Waldron, M.C., 2008, Water-quality conditions and constituent loads, 1996–2002, and water-quality trends, 1983–2002, in the Scituate Reservoir drainage area, Rhode Island: U.S. Geological Survey Scientific Investigations Report 2008–5060, 55 p. [Also available at https://pubs.er.usgs.gov/publication/sir20085060.]

Nimiroski, M.T., and Waldron, M.C., 2002, Sources of sodium and chloride in the Scituate Reservoir drainage basin, Rhode Island: U.S. Geological Survey Water-Resources Investigations Report 2002–4149, 16 p. [Also available at https://pubs.er.usgs.gov/publication/wri024149.]

Providence Water Supply Board Water Quality Laboratory, 2012, Quality assurance program manual: Providence Water Supply Board, [variously paged].

Ries, K.G., III, and Friesz, P.J., 2000, Methods for estimating low-flow statistics for Massachusetts streams: U.S. Geological Survey Water-Resources Investigations Report 2000–4135, 81 p. [Also available at https://pubs.er.usgs.gov/publication/wri004135.]

Smith, K.P., 2013, Streamflow, water quality, and constituent loads and yields, Scituate Reservoir drainage area, Rhode Island, water year 2011: U.S. Geological Survey Open-File Report 2013–1127, 32 p. [Also available at https://pubs.er.usgs.gov/publication/ofr20131127.]

Smith, K.P., 2014, Streamflow, water quality, and constituent loads and yields, Scituate Reservoir drainage area, Rhode Island, water year 2012: U.S. Geological Survey Open-File Report 2013–1274, 30 p. [Also available at https://doi.org/10.3133/ofr20131274.]

Smith, K.P., 2015a, Streamflow, water quality, and constituent loads and yields, Scituate Reservoir drainage area, Rhode Island, water year 2013: U.S. Geological Survey Open-File Report 2015–1082, 31 p., accessed June 3, 2015, at https://doi.org/10.3133/ofr20151082.

Smith, K.P., 2015b, Water-quality trends in the Scituate reservoir drainage area, Rhode Island, 1983–2012: U.S. Geological Survey Scientific Investigations Report 2015–5058, 57 p. [Also available at https://doi.org/10.3133/sir20155058.]

Smith, K.P., 2016, Streamflow, water quality, and constituent loads and yields, Scituate Reservoir drainage area, Rhode Island, water year 2014: U.S. Geological Survey Open-File Report 2016–1051, 31 p. [Also available at https://doi.org/10.3133/ofr20161051.]

Smith, K.P., 2018a, Streamflow, water quality, and constituent loads and yields, Scituate Reservoir drainage area, Rhode Island, water year 2015: U.S. Geological Survey Open-File Report 2018–1065, 28 p. [Also available at https://doi.org/10.3133/ofr20181065.]

Smith, K.P., 2018b, Water quality data from the Providence Water Supply Board for tributary streams to the Scituate Reservoir, water year 2015: U.S. Geological Survey data release, https://doi.org/10.5066/F7FJ2FR5.

Smith, K.P., 2018c, Water quality data from the Providence Water Supply Board for tributary streams to the Scituate Reservoir, water year 2016: U.S. Geological Survey data release, https://doi.org/10.5066/F7Z60NC5.

Smith, K.P., and Breault, R.F., 2011, Streamflow, water quality, and constituent loads and yields, Scituate Reservoir drainage area, Rhode Island, water year 2010: U.S. Geological Survey Open-File Report 2011–1076, 26 p. [Also available at https://pubs.er.usgs.gov/publication/ofr20111076.]

Tasker, G.D., and Driver, N.E., 1988, Nationwide regression models for predicting urban runoff water quality at unmonitored sites: Water Resources Bulletin, v. 24, no. 5, p. 1091–1101. [Also available at https://doi.org/10.1111/j.1752-1688.1988.tb03026.x.]

U.S. Environmental Protection Agency, 1993, Method 353.2, revision 2.0—Determination of nitrate-nitrite nitrogen by automated colorimetry: U.S. Environmental Protection Agency, [variously paged], accessed June 10, 2016, at https://www.epa.gov/sites/production/files/2015-08/documents/method_353-2_1993.pdf.

U.S. Geological Survey, 2016, Water data for the nation: U.S. Geological Survey National Water Information System web interface, accessed October 9, 2016, at https://doi.org/10.5066/F7P55KJN.

Wagner, R.J., Boulger, R.W., Jr., Oblinger, C.J., and Smith, B.A., 2006, Guidelines and standard procedures for continuous water-quality monitors—Station operation, record computation, and data reporting: U.S. Geological Survey Techniques and Methods, book 1, chap. D3, 8 attachments, accessed April 10, 2006, at https://pubs.er.usgs.gov/publication/tm1D3.

Table 4. Daily loads of bacteria, chloride, nitrite, nitrate, and orthophosphate in the Scituate Reservoir drainage area, Rhode Island, from October 1, 2015, through September 30, 2016.

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PWSB station number	USGS station number	Station name	Date	Daily mean streamflow (ft^3/s)	Total coliform bacteria (MCFU/d)	*E. coli* (MCFU/d)	Chloride (kg/d)	Nitrite (g/d as N)	Nitrate (g/d as N)	Orthophosphate (g/d as PO_4)
Barden Reservoir subbasin										
24	01115190	Dolly Cole Brook	10/02/15	0.37	110,000	6,700	32	0.91	59	120
			11/06/15	1.1	27,000	2,100	120	2.6	<66	290
			12/04/15	2.4	110,000	1,100	170	11	<140	400
			01/04/16	5.8	8,500	1,400	480	14	<350	570
			02/12/16	8.8	64,000	<1,100	630	21	1,600	1,300
			03/11/16	6.8	160,000	<830	510	33	<410	1,300
			04/01/16	6.6	330,000	6,500	590	16	<410	810
			05/06/16	18	2,400,000	130,000	810	860	<1,100	1,300
			06/03/16	2.4	830,000	230,000	200	12	<150	240
			07/15/16	0.94	290,000	2,300	80	6.9	200	140
			08/05/16	0.31	73,000	130	30	1.5	91	38
			09/16/16	0.24	15,000	82	21	0.59	49	23
25	01115200	Shippee Brook	01/25/16	3.2	14,000	<390	120	7.8	6,800	700
			04/29/16	4.4	180,000	3,200	150	11	<270	750
			07/22/16	0.06	16,000	<7.6	1.7	0.30	--	20
26	01115185	Windsor Brook	04/29/16	7	230,000	4,900	560	16	<410	2,300
			07/13/16	0.57	150,000	<69	56.0	2.8	100	110

Table 4. Daily loads of bacteria, chloride, nitrite, nitrate, and orthophosphate in the Scituate Reservoir drainage area, Rhode Island, from October 1, 2015, through September 30, 2016.—Continued

[Water-quality data are from samples collected and analyzed by the Providence Water Supply Board (PWSB); alternate station names are listed in parentheses for stations where different historical names were used for the same sampling location by the PWSB. Shaded areas indicate values that were calculated with concentration data censored at half the detection level. USGS, U.S. Geological Survey; ft^3/s, cubic foot per second; MCFU/d; millions of colony forming units per day; *E. coli*, *Escherichia coli*; kg/d, kilogram per day; g/d, gram per day; N, nitrogen; PO_4, phosphate; <, less than; >, greater than; --, data not available]

PWSB station number	USGS station number	Station name	Date	Daily mean streamflow (ft^3/s)	Total coliform bacteria (MCFU/d)	*E. coli* (MCFU/d)	Chloride (kg/d)	Nitrite (g/d as N)	Nitrate (g/d as N)	Orthophosphate (g/d as PO_4)
			Barden Reservoir subbasin—Continued							
28	01115265	Barden Reservoir (Hemlock Brook)	10/29/15	12	11,000,000	440,000	1,100	88	1,500	2,600
			11/10/15	4.9	30,000	4,800	490	36	600	1,800
			12/08/15	2.8	36,000	2,700	250	20	<170	940
			01/12/16	57	280,000	110,000	2,100	280	7,100	15,000
			02/09/16	29	92,000	<3,500	1,400	140	<1,800	4,200
			03/08/16	13	84,000	<1,600	850	62	<780	2,200
			04/12/16	27	190,000	<3,300	1,400	67	<1,700	2,000
			05/17/16	7.4	190,000	<900	470	54	<450	540
			06/16/16	2.1	690,000	<250	170	25	290	1,400
			07/12/16	0.80	150,000	<98	69	7.8	160	180
			08/09/16	0.08	19,000	2.0	7.1	0.39	35	9.8
			09/13/16	1.1	15,000	130	100	10	230	390
35	01115187	Ponaganset River	12/04/15	5.1	260,000	<620	470	12	<310	620
			01/04/16	15	25,000	<1,800	950	72	<900	2,500
			02/12/16	32	280,000	<3,900	1,800	78	8,500	14,000
			03/11/16	23	530,000	<2,800	1,300	56	33,000	6,100
			04/01/16	25	370,000	6,100	1,500	61	3,200	3,600
			05/06/16	39	2,900,000	<4,700	3,000	190	<2,400	2,800
			06/03/16	14	5,000,000	860,000	830	100	<830	1,700
			07/15/16	24	13,000,000	1,400,000	1,600	350	<1,500	8,200
			08/05/16	0.92	220,000	450	49	6.8	170	250
			09/16/16	0.81	34,000	480	49	4.0	<50	140

Table 4. Daily loads of bacteria, chloride, nitrite, nitrate, and orthophosphate in the Scituate Reservoir drainage area, Rhode Island, from October 1, 2015, through September 30, 2016.—Continued

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PWSB station number	USGS station number	Station name	Date	Daily mean streamflow (ft^3/s)	Total coliform bacteria (MCFU/d)	*E. coli* (MCFU/d)	Chloride (kg/d)	Nitrite (g/d as N)	Nitrate (g/d as N)	Orthophosphate (g/d as PO_4)
Direct Runoff subbasin										
1	01115180	Brandy Brook	10/6/2015	0.31	9,500	150	1.8	0.76	320	69
			11/3/2015	0.67	7,200	330	27	3.3	830	150
			12/1/2015	1.3	1,300	<160	50	6.4	830	450
			1/5/2016	1.8	3,000	<220	57	13	960	300
			2/2/2016	2.3	18,000	<280	0.57	11	1,200	57
			3/1/2016	3.4	26,000	8,300	90	17	110	580
			4/5/2016	3.5	140,000	3,400	110	25	1,100	510
			5/3/2016	3.3	100,000	16,000	330	24	810	730
			6/7/2016	2.0	840,000	<250	73	25	550	150
			7/15/2016	0.68	310,000	1,700	60	5.0	400	270
			8/15/2016	1.1	130,000	2,600	37	2.7	570	140
			9/6/2016	0.04	1,400	13	1.4	0.17	16	6.1
3	01115280	Cork Brook	10/01/15	0.22	310,000	5,900	33	<0.27	97	54
			11/05/15	0.21	12,000	100	34	0.51	<13	51
			12/03/15	1.2	25,000	910	160	3.0	150	61
			01/07/16	1.1	2,100	270	27	5.3	640	320
			02/04/16	11	91,000	17,000	860	55	4,100	1,700
			03/03/16	4.8	40,000	<580	410	12	230	700
			04/07/16	36	1,600,000	18,000	3,800	270	12,000	8,900
			05/05/16	6.6	420,000	16,000	640	32	2,900	2,900
			06/02/16	0.95	110,000	<120	22	4.6	230	160
			07/22/16	0.07	18,000	<8.6	8.4	0.17	72	19
			08/04/16	0.05	750	8.6	6.8	0.12	51	16

Table 4. Daily loads of bacteria, chloride, nitrite, nitrate, and orthophosphate in the Scituate Reservoir drainage area, Rhode Island, from October 1, 2015, through September 30, 2016.—Continued

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PWSB station number	USGS station number	Station name	Date	Daily mean streamflow (ft^3/s)	Total coliform bacteria (MCFU/d)	*E. coli* (MCFU/d)	Chloride (kg/d)	Nitrite (g/d as N)	Nitrate (g/d as N)	Orthophosphate (g/d as PO_4)
			Direct Runoff subbasin—Continued							
4	01115400	Kent Brook	10/6/2015	0.02	730	<2.8	0.18	0.056	2.8	1.1
			11/3/2015	0.05	250	25	2.1	0.25	<3.1	16
			12/1/2015	0.09	<11	<11	1.9	0.22	<5.4	13
			1/5/2016	0.42	210	210	7.5	2.1	<26	21
			2/2/2016	0.94	230	<120	0.23	4.6	<58	23
			3/1/2016	2.1	8,600	<250	45	5.0	<130	200
			4/5/2016	3.0	36,000	<360	43	15	<180	580
			5/3/2016	1.2	15,000	290	14	2.9	<73	88
			6/7/2016	0.94	320,000	2,300	14	4.6	<57	92
5	01115184	Spruce Brook	1/22/2016	2.2	28,000	<270	38	11	1,800	490
			4/19/2016	2.6	20,000	<320	130	13	1,300	190
			7/19/2016	0.38	110,000	<46	32	1.8	270	46
6	01115183	Quonapaug Brook	10/06/15	0.2	24,000	2,700	37	0.49	160	88
			11/03/15	0.57	18,000	2,000	11	1.4	350	14
			12/01/15	1.4	13,000	2,400	250	7.0	2,400	240
			01/05/16	2.2	18,000	1,600	290	11	3,100	590
			02/02/16	3.2	15,000	1,500	300	150	3,200	77
			03/01/16	5.3	52,000	2,600	330	26	390	1,000
			04/05/16	5.5	230,000	4,000	550	40	4,000	940
			05/03/16	5.2	160,000	25,000	92	25	3,200	640
			06/07/16	2.6	630,000	65,000	260	39	1,300	320
			08/15/16	1.1	130,000	24,000	150	5.6	390	330

Table 4. Daily loads of bacteria, chloride, nitrite, nitrate, and orthophosphate in the Scituate Reservoir drainage area, Rhode Island, from October 1, 2015, through September 30, 2016.—Continued

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PWSB station number	USGS station number	Station name	Date	Daily mean streamflow (ft^3/s)	Total coliform bacteria (MCFU/d)	*E. coli* (MCFU/d)	Chloride (kg/d)	Nitrite (g/d as N)	Nitrate (g/d as N)	Orthophosphate (g/d as PO_4)
			Direct Runoff subbasin—Continued							
7	01115297	Wilbur Hollow Brook	10/01/15	4.1	8,000,000	740,000	610	40	2,100	700
			11/05/15	1.3	17,000	960	51	3.2	<80	260
			12/03/15	5.9	80,000	<720	180	29	860	430
			01/07/16	3.6	2,700	890	400	8.9	980	620
			02/04/16	17	89,000	25,000	180	85	4,200	1,300
			03/03/16	12	320,000	3,000	260	61	2,200	1,500
			04/07/16	22	790,000	<2,700	690	160	<1,400	4,400
			05/05/16	15	13,000,000	710,000	460	110	<890	3,600
			06/02/16	4.1	870,000	10,000	31	50	<250	4,400
			07/22/16	0.57	170,000	<69	20	1.4	<35	320
			08/04/16	0.20	12,000	720	7.4	1.4	<12	48
			09/01/16	0.16	19,000	130	4.0	1.2	<9.9	91
8	01115276	Westconnaug Brook	11/20/15	4.5	200,000	<550	170	44	870	870
			01/08/16	3.6	<440	<440	130	8.8	970	260
			02/12/16	10	25,000	<1,200	140	25	2,500	1,200
			03/11/16	12	17,000	<1,400	450	29	<720	1,700
			04/08/16	53	710,000	<6,500	2,200	130	<3,200	6,500
			05/13/16	8.2	110,000	<1,000	300	<10	<500	800
			06/10/16	4.2	720,000	<510	180	10	<260	1,000
			08/12/16	4.6	200,000	230	180	23	<280	450

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PWSB station number	USGS station number	Station name	Date	Daily mean streamflow (ft^3/s)	Total coliform bacteria (MCFU/d)	*E. coli* (MCFU/d)	Chloride (kg/d)	Nitrite (g/d as N)	Nitrate (g/d as N)	Orthophosphate (g/d as PO_4)
			Direct Runoff subbasin—Continued							
9	01115275	Bear Tree Brook	1/22/2016	1.5	15,000	3,000	220	3.7	2,600	300
			4/19/2016	1.8	28,000	<210	240	8.6	1,800	130
32	01115178	Unnamed tributary #1 to Scituate Reservoir (Pine Swamp Brook)	1/21/2016	0.55	2,800	940	24	1.3	720	290
			4/21/2016	0.73	36,000	<89	28	3.6	550	300
33	01115182	Unnamed tributary #3 to Scituate Reservoir (Hall's Estate Brook)	01/27/16	0.56	4,000	280	15	1.4	360	140
			04/27/16	0.30	1,900	<36	11	0.72	62	22
			Moswansicut Reservoir subbasin							
19	01115170	Moswansicut Reservoir (Moswansicut Stream North, Moswansicut Pond)	10/08/15	0.08	1,800	20	10	0.39	10	14
			11/12/15	0.27	400	<33	34	0.66	40	26
			12/10/15	0.52	1,500	380	68	2.5	140	38
			01/14/16	8.9	31,000	15,000	1,200	44	2,600	660
			03/10/16	5.6	4,100	<690	710	28	2,200	690
			04/14/16	10.0	120,000	2,500	1,300	49	3,500	490
			05/19/16	2.6	96,000	8,300	350	13	560	380
			06/10/16	2.3	440,000	<280	320	11	<140	510
			07/14/16	0.26	21,000	<32	38	2.5	<16	25
			08/11/16	0.15	11,000	15	21	1.1	<9.2	18
21	01115165	Unnamed tributary #2 to Moswansicut Reservoir (brook from Kimball Reservoir)	04/29/16	0.68	140,000	1,300	84	1.7	700	170

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PWSB station number	USGS station number	Station name	Date	Daily mean streamflow (ft^3/s)	Total coliform bacteria (MCFU/d)	*E. coli* (MCFU/d)	Chloride (kg/d)	Nitrite (g/d as N)	Nitrate (g/d as N)	Orthophosphate (g/d as PO_4)
Regulating Reservoir subbasin										
14	01115110	Huntinghouse Brook	10/02/15	0.15	290,000	13,000	5.4	0.73	34	22
			11/06/15	0.58	35,000	2,300	24	2.8	<35	170
			12/04/15	1.3	50,000	1,600	58	3.2	<79	630
			01/11/16	64	3,100,000	500,000	1,700	470	130,000	11,000
			02/16/16	30	240,000	7,400	7.4	74	13,000	3,700
			03/07/16	10	25,000	<1,300	1,400	50	3,000	1,300
			04/15/16	15	1,000,000	110,000	540	73	<920	2,900
			05/13/16	6.3	1,000,000	<770	220	<7.7	<390	620
			06/06/16	12	7,500,000	840,000	530	120	<730	2,300
			07/08/16	1.5	280,000	<180	65	55	480	260
15	01115114	Rush Brook	10/02/15	0.99	1,100,000	23,000	220	7.3	130	170
			11/06/15	0.62	19,000	300	110	1.5	<38	140
			12/04/15	2.7	87,000	2,000	440	13	<170	470
			01/11/16	42	1,600,000	270,000	2,500	310	10,000	6,200
			02/16/16	52	540,000	13,000	8,500	250	26,000	7,600
			03/07/16	7.1	31,000	1,700	980	17	2,600	700
			04/15/16	7.9	760,000	<970	900	39	1,100	970
			05/02/16	6.6	350,000	15,000	1,000	<8.1	<410	970
			06/06/16	11	6,600,000	380,000	1,400	140	<680	2,500
			07/08/16	0.51	110,000	<62	110	5.0	150	87
			08/05/16	0.02	4,700	120	4.6	0.20	<1.2	3.9

Table 4. Daily loads of bacteria, chloride, nitrite, nitrate, and orthophosphate in the Scituate Reservoir drainage area, Rhode Island, from October 1, 2015, through September 30, 2016.—Continued

[Water-quality data are from samples collected and analyzed by the Providence Water Supply Board (PWSB); alternate station names are listed in parentheses for stations where different historical names were used for the same sampling location by the PWSB. Shaded areas indicate values that were calculated with concentration data censored at half the detection level. USGS, U.S. Geological Survey; ft^3/s, cubic foot per second; MCFU/d; millions of colony forming units per day; *E. coli*, *Escherichia coli*; kg/d, kilogram per day; g/d, gram per day; N, nitrogen; PO_4, phosphate; <, less than; >, greater than; --, data not available]

PWSB station number	USGS station number	Station name	Date	Daily mean streamflow (ft^3/s)	Total coliform bacteria (MCFU/d)	*E. coli* (MCFU/d)	Chloride (kg/d)	Nitrite (g/d as N)	Nitrate (g/d as N)	Orthophosphate (g/d as PO_4)
			Regulating Reservoir subbasin—Continued							
16	01115098	Peeptoad Brook (Harrisdale Brook)	10/2/2015	0.58	98,000	<71	72	1.4	71	85
			11/6/2015	0.38	7,700	<46	57	1.9	<23	110
			12/4/2015	3.2	43,000	780	420	16	780	540
			1/11/2016	89	3,800,000	420,000	13,000	660	22,000	4,400
			3/7/2016	13	65,000	<1,600	750	32	6,800	3,200
			4/15/2016	14	1,300,000	34,000	790	69	3,400	2,400
			5/2/2016	7.5	250,000	1,800	900	<9.1	1,300	550
			6/6/2016	3.6	630,000	<440	420	26	650	260
			7/8/2016	2.6	760,000	<320	340	6.3	<160	190
			8/5/2016	0.41	48,000	40	58	3.0	<25	50
			9/9/2016	0.35	41,000	8.6	44	0.86	<21	34
18	01115120	Unnamed tributary to Regulating Reservoir (unnamed brook A)	--	--	--	--	--	--	--	--
			Westconnaug Reservoir subbasin							
10	01115274	Westconnaug Brook	10/29/2015	3.6	4,900,000	150,000	310	8.8	1,200	88
			12/8/2015	0.72	12,000	180	63	3.5	<44	70
			1/12/2016	5.7	21,000	1,400	370	42	<350	420
			2/9/2016	3.2	14,000	<390	250	7.8	470	390
			3/8/2016	2.2	30,000	540	190	5.4	<130	650
			4/12/2016	4.6	40,000	<560	330	22	<280	670
			5/17/2016	1.2	25,000	<150	100	3.0	<74	60
			6/16/2016	0.27	59,000	1,300	19	0.66	<17	66
			7/12/2016	0.45	99,000	<56	34	1.1	<28	44
			9/13/2016	0.004	130	<1	0.24	0.0095	<0.24	0.38
11	01115273	Unnamed tributary to Westconnaug Reservoir (unnamed brook south of Westconnaug Reservoir)	1/26/2016	1.2	1,200	<150	22	8.9	240	470
			04/26/16	1.6	82,000	760	20	3.8	<95	270

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Publishing support provided by the
Pembroke Publishing Service Center

ISSN 2331-1258 (online)
https://doi.org/10.3133/ofr20181084