



Brushy Brook

Watershed Description

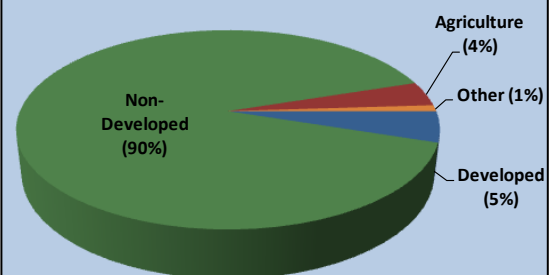
This **TMDL** applies to the Brushy Brook assessment unit (RI0008040R-03B), a 2.6-mile long stream located in Hopkinton, RI (Figure 1). The Town of Hopkinton is located in the southwestern corner of the state and is bordered to the east by Connecticut, to the north by Exeter, RI, and to the south by Westerly, RI. Brushy Brook is located in the northern section of town. The Brushy Brook watershed is presented in Figure 2 with land use types indicated.

The east branch of Brushy Brook begins just north of Dawley Swamp in the southern portion of Exeter, RI. The brook flows south into the Town of Hopkinton and through the Arcadia Management Area. The brook then crosses Dye Hill Road and empties into Locustville Pond. The west branch of Brushy Brook begins in a wetland area in southwest Exeter, at the foothills of Dye Hill in the Arcadia Management Area. The brook flows southeast into Hopkinton and flows parallel to Kenny Hill Road. The brook then crosses Woody Hill Road and Dye Hill Road, flows into a small unnamed pond, and eventually empties into Locustville Pond. The brook flows through the Whispering Pines Campground downstream of its crossing with Dye Hill Road, just upstream of Saw Mill Road. This branch of Brushy Brook is impaired from Saw Mill Road to Locustville Pond.

The Brushy Brook watershed covers 4.3 square miles. Non-developed areas, including the Arcadia Management Area, occupy a large portion (90%) of the watershed. Developed uses (including residential uses) occupy approximately 5%. Agricultural land uses occupy 4% and other land uses combine to occupy 1%.

Assessment Unit Facts **(RI0008040R-03B)**

- **Town:** Hopkinton
- **Impaired Segment Length:** 2.6 miles
- **Classification:** Class B
- **Direct Watershed:** 4.3 mi² (2757 acres)
- **Impervious Cover:** 4.3%
- **Watershed Planning Area:** Wood – Pawcatuck (#23)



Watershed Land Uses

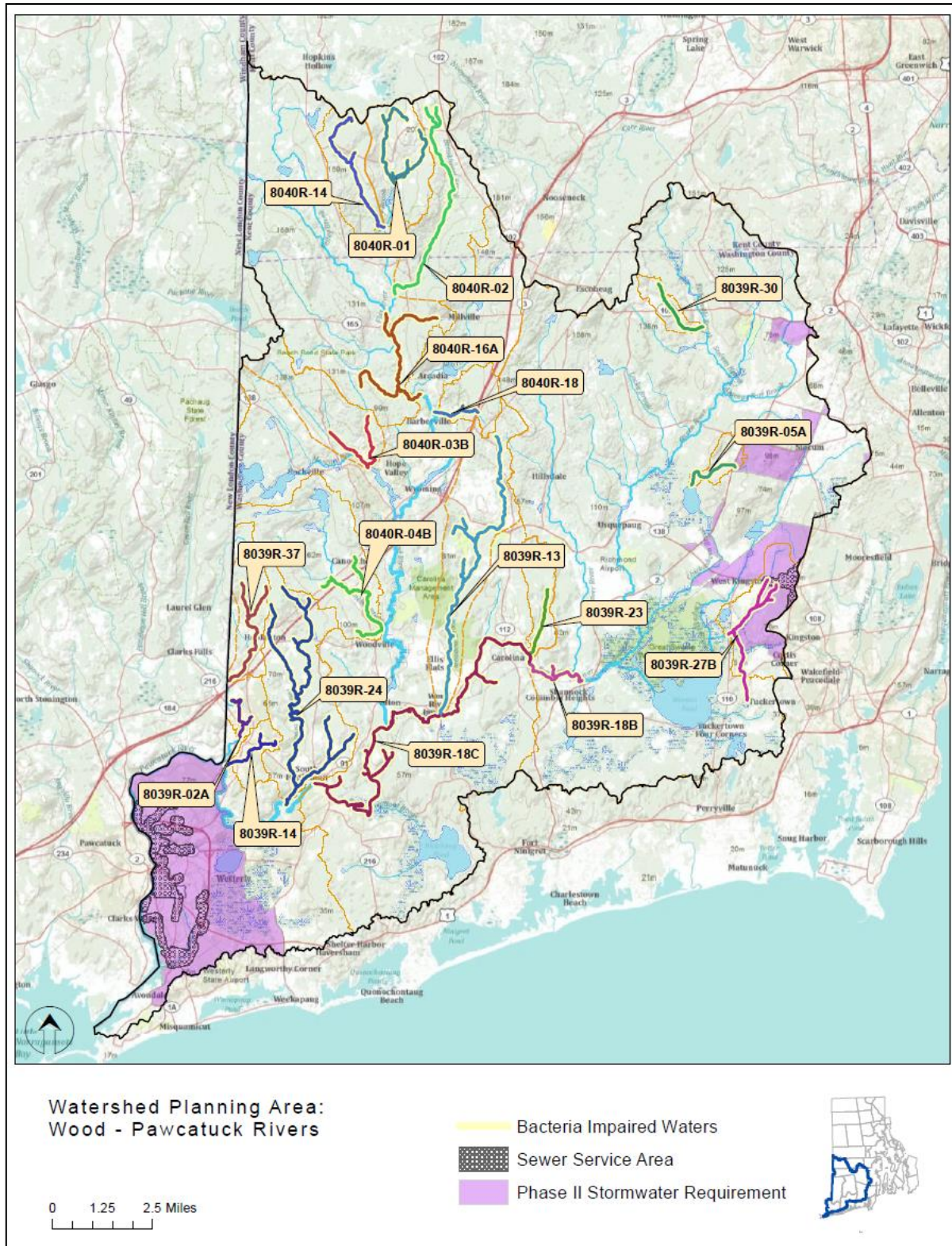


Figure 1: Map of the Wood-Pawcatuck Watershed Planning Area with impaired segments addressed by the Statewide Bacteria TMDL, sewer service areas, and stormwater regulated zones.

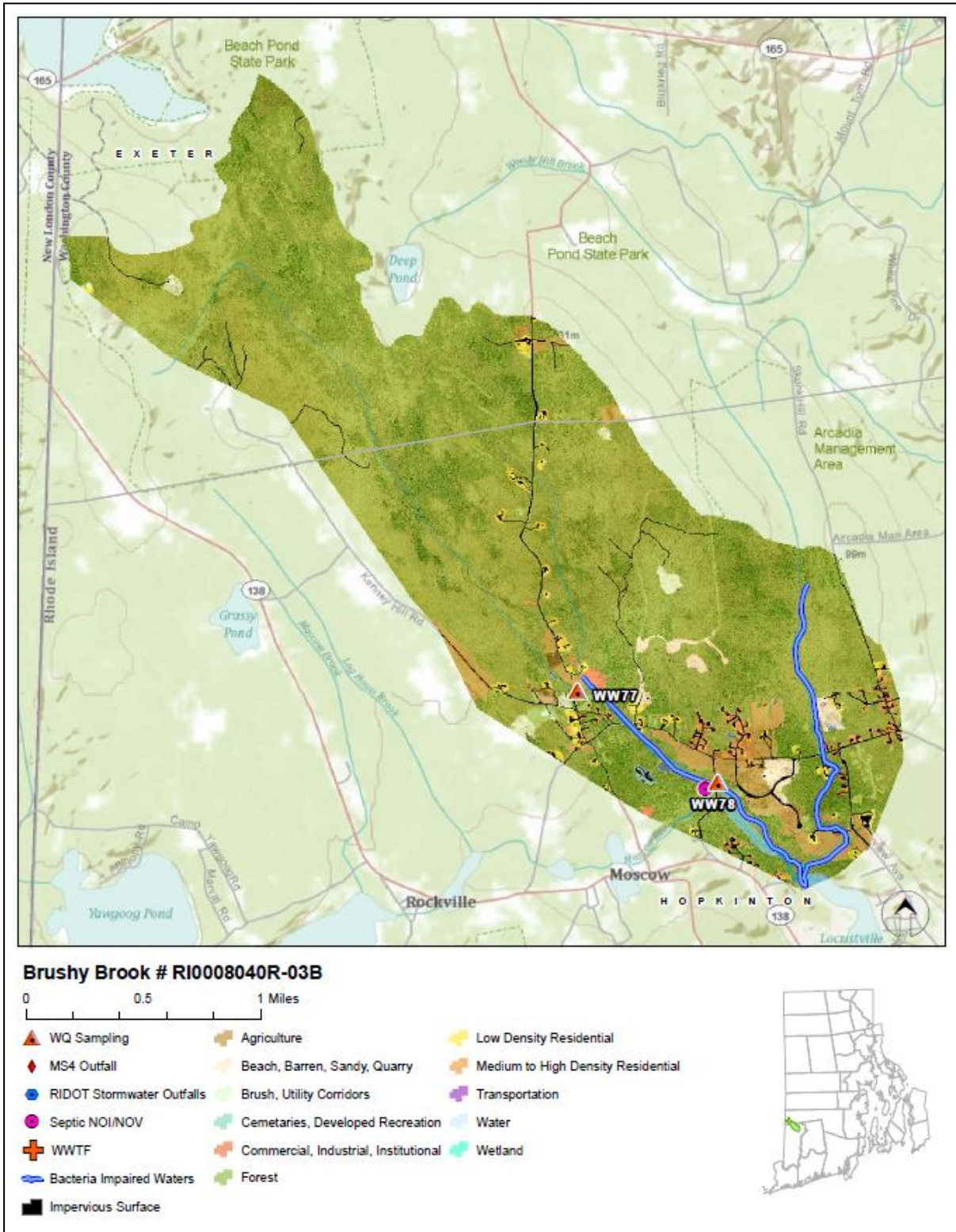


Figure 2: Map of Brushy Brook Watershed with impaired segment, sampling locations, and land cover indicated.

Why is a TMDL Needed?

Brushy Brook is a Class B fresh water stream, and its applicable designated uses are primary and secondary contact recreation and fish and wildlife habitat (RIDEM, 2009). From 2003-2005, water samples were collected from two sampling locations (WW77 and WW78) and analyzed for the indicator bacteria, fecal coliform. The water quality criteria for fecal coliform, along with bacteria sampling results from 2003-2005 and associated statistics are presented in Table 1. The geometric mean and 90th percentile value were calculated for both stations and exceeded water quality criteria for the 90th percentile value at station WW78. Samples at WW77 did not exceed the water quality criteria for fecal coliform bacteria.



Figure 3: Partial aerial view of the Brushy Brook watershed. (Source: Google Maps)

To aid in identifying possible bacteria sources, the geometric mean and 90th percentile value was also calculated for each station for wet-weather and dry-weather sample days, where appropriate. Wet-weather values exceeded water quality standards for fecal coliform at station WW78. Possible dry and wet weather sources are described in the sections below. Potential sources include improperly operating onsite wastewater treatment systems (OWTS), wastes from agriculture activities, as well as wastes from waterfowl, wildlife, and domestic pets. In wet weather, these sources can be carried to the brook in stormwater runoff.

Due to the elevated bacteria measurements presented in Table 1, Brushy Brook does not meet Rhode Island's bacteria water quality standards, was identified as impaired, and was placed on the 303(d) list (RIDEM, 2008). The Clean Water Act requires that all 303(d) listed waters undergo a TMDL assessment that describes the impairments and identifies the measures needed to restore water quality. The goal is for all waterbodies to comply with state water quality standards.

Potential Bacteria Sources

There are several potential sources of bacteria in the Brushy Brook watershed including malfunctioning septic systems, waterfowl, wildlife, and domestic animal waste, and stormwater runoff from developed areas.

Onsite Wastewater Treatment Systems

All residents in the Brushy Brook watershed rely on onsite wastewater treatment systems (OWTS) such as cesspools and septic systems. Failing OWTS can be significant sources of bacteria by allowing improperly treated waste to reach surface waters (RI HEALTH, 2003). If systems are improperly sized, malfunctioning, or in soils poorly suited for septic waste disposal, microorganisms such as bacteria, can easily enter surface water (USEPA, 2002).

The Whispering Pines Campground represents a potential bacteria sources contributing to the impairment. The Whispering Pines Campground is located on 43 acres between Woody Hill Road and Saw Mill Road. The campground contains 212 campsites for tents or recreational vehicles and 4 cabins. Approximately two-thirds of the campsites are rented by the season. In addition to public restrooms and laundry facilities, some of the campsites have sewage disposal utilizing various disposal methods. One of the two sampling stations on Brushy Brook is located upstream of the Whispering Pines Campground, while the other is downstream. Fecal coliform at the station downstream of the Campground exceeded the water quality criteria, while the upstream station did not, indicating that the bacteria source is between these two stations.

Waterfowl, Wildlife, and Domestic Animal Waste

Most of the northern portion of the Brushy Brook watershed is located in the Arcadia Management Area. Wildlife, including waterfowl, may be a significant bacteria source to surface waters. With the construction of roads and drainage systems, these wastes may no longer be retained on the landscape, but instead may be conveyed via stormwater to the nearest surface water. As such these physical land alterations can exacerbate the impact of these natural sources on water quality.

Residential development is concentrated in the southern portion of the watershed near Locustville Pond. Waste from domestic animals, such as dogs, in these residential neighborhoods may also be contributing to bacteria concentrations in Brushy Brook.

Developed Area Stormwater Runoff

The Brushy Brook watershed has an impervious cover of approximately 4.3%. Impervious cover is defined as land surface areas, such as roofs and roads that force water to run off land surfaces, rather than infiltrating into the soil. Impervious cover provides a useful metric for the potential for adverse stormwater impacts. While runoff from impervious areas in these portions of the watershed may be contributing bacteria to Brushy Brook, as discussed in Section 6.3 of the Core TMDL Document, as a general rule, impaired streams with watersheds having less than 10% impervious cover are assumed to be caused by sources other than urbanized stormwater runoff.

Existing Local Management and Recommended Next Steps

Additional bacteria data collection would be beneficial to support identification of sources of potentially harmful bacteria in the Brushy Brook watershed. These activities could potentially include sampling at several different locations and under different weather conditions (e.g., wet and dry). Field reconnaissance surveys focused on stream buffers, stormwater runoff, and other source identification may also be beneficial.

Based on existing ordinances and previous investigations, the following steps are recommended to support water quality goals.

Onsite Wastewater Management

All residents of the Brushy Brook watershed rely on OWTS (septic systems or cesspools). The Town of Hopkinton has a draft Onsite Wastewater Management Plan that provides a framework for managing the OWTS. As part of the onsite wastewater management planning process, Hopkinton should adopt ordinances to establish enforceable mechanisms to ensure that existing OWTS are properly operated and maintained. RIDEM recommends that all communities create an inventory of onsite systems through mandatory inspections. Inspections help encourage proper maintenance and identify failed and sub-standard systems. Policies that govern the eventual replacement of sub-standard OWTS within a reasonable time frame should be adopted. The Rhode Island Wastewater Information System (RIWIS) can help develop an initial inventory of OWTS and can track voluntary inspection and pumping programs (RIDEM, 2010b).

The Town of Hopkinton is not eligible for the Community Septic System Loan Program (CSSLP). The CSSLP program provides low-interest loans to residents to help with maintenance and replacement of OWTS. It is recommended that the town develop a program to assist citizens with the replacement of older and failing systems.

Dry-weather data at station WW78 suggest that OWTS from the Whispering Pines Campground are a source of the bacteria impairment to Brushy Brook. The DEM Office of Compliance and Inspection (OC&I) has received complaints about the Campground since 2003. In 2008, OC&I conducted a detailed inspection of the site as a follow-up to the 2003 actions and in response to new complaints. Many violations were found during the inspection. In April 2009, OC&I issued a Notice of Intent to Enforce to the owner. As of March 2011, two of four planned OWTS have been installed at the Campground. The remaining two OWTS will be installed over the next two years. The owner has been instructed to pump all systems as necessary to prevent overflows to the surface and to re-write the camp rules to clearly state the wastewater disposal methods. These rules include a prohibition on greywater discharges. Also, at some campsites, there are pipes that go into the ground. These pipes are only allowed until they fail. Once failure occurs, campers must use the 'honey wagon' or offload sewage at the dump station. The owner has also removed subsurface wastewater drainage pipes from one camping area. It is expected that continuing to fix the sewage disposal problems at the Whispering Pines Campground will improve water quality along Brushy Brook.

Waterfowl, Wildlife, and Domestic Animal Waste

The Town of Hopkinton should develop education and outreach programs to highlight the importance of picking up after dogs and other pets, and not feeding waterfowl. Animal waste should be disposed of away from any waterway or stormwater system. Hopkinton should work with volunteers to map locations where animal waste is a significant and chronic problem. The town should also evaluate strategies to reduce the impact of animal waste on water quality. This may include installing signage, providing pet waste receptacles or pet waste digester systems in high-use areas, enacting ordinances requiring clean-up of pet waste, and targeting educational and outreach programs in problem areas.

The town and residents can take several measures to minimize waterfowl-related impacts. They can allow tall, coarse vegetation to grow in areas along the shores of Brushy Brook that are frequented by waterfowl. Waterfowl, especially grazers like geese, prefer easy access to the water. Maintaining an uncut vegetated buffer along the shore will make the habitat less desirable to geese and encourage migration. With few exceptions, Part XIV, Section 14.13 of Rhode Island's Hunting Regulations prohibits feeding wild waterfowl at any time in the state of Rhode Island. Educational programs should emphasize that feeding waterfowl, such as ducks, geese, and swans, may contribute to water quality impairments in Brushy Brook and can harm human health and the environment.

Stormwater Management

The Rhode Island Department of Transportation (RIDOT) is a municipal separate storm sewer (MS4) operator (RIPDES permit RIR040036) in the Brushy Brook watershed and has prepared the required

Phase II Stormwater Management Plan (SWMPP) for state-owned roads within the watershed. The Town of Hopkinton is not currently regulated under the Phase II Program.

The Town of Hopkinton does not currently have an ordinance to address illicit discharges. This type of ordinance prohibits illicit discharges to the storm drain system and provides an enforcement mechanism. It is recommended that any stormwater outfalls discharging in the vicinity of the sampling locations be monitored to check for illicit discharges. Illicit discharges can be identified through continued dry weather outfall sampling and microbial source tracking.

RIDOT's SWMPP and its 2011 Compliance Update outline its goals for compliance with the General Permit statewide. It should be noted that RIDOT has chosen to enact the General Permit statewide, not just for the urbanized and densely populated areas that are required by the permit. RIDOT has finished mapping its outfalls throughout the state and is working to better document and expand its catch basin inspection and maintenance programs along with its BMP maintenance program. SWMPPs are being utilized for RIDOT construction projects. RIDOT also funds the University of Rhode Island Cooperative Extension's Stormwater Phase II Public Outreach and Education Project, which provides participating MS4s with education and outreach programs that can be used to address TMDL public education recommendations.

As it is assumed that stormwater runoff is not the major contributor of bacteria to Brushy Brook based on the watershed's imperviousness, RIDOT will have no changes to its Phase II permit requirements and no TMDL Implementation Plan (TMDL IP) will be required at this time.

Land Use Protection

Woodland and wetland areas within the Brushy Brook watershed absorb and filter pollutants from stormwater runoff, and help protect both water quality in the stream and stream channel stability. As these areas represent the majority of the land use in the Brushy Brook watershed, it is important to preserve these undeveloped areas and institute controls on development in the watershed. The Hopkinton Land Trust was established in 2004 and has since protected 875 acres of land through property acquisition and conservation easements (Town of Hopkinton, 2011). The town should work with the land trust to protect more of the undeveloped land in Hopkinton, with a focus on lands around Brushy Brook.

The steps outlined above will support the goal of mitigating bacteria sources and meeting water quality standards in Brushy Brook.

Table 1: Brushy Brook Bacteria Data

Waterbody ID: RI0008040R-03B

Watershed Planning Area: 23 – Wood-Pawcatuck

Characteristics: Freshwater, Class B, Primary and Secondary Contact Recreation, Fish and Wildlife Habitat

Impairment: Fecal coliform (MPN/100mL)

Water Quality Criteria for Fecal Coliform:

Geometric Mean: 200 MPN/100 mL

90th Percentile: 400 MPN/100mL

Percent Reduction to meet TMDL: 21% (Include 5% Margin of Safety)

Data: 2003-2005 from RIDEM

Single Sample Fecal Coliform (MPN/100 mL) Results for Brushy Brook (2003-2005) with Geometric Mean and 90th Percentile Statistics

Station Name	Station Location	Date	Result	Wet/Dry	Geometric Mean	90th Percentile
WW77	Woody Hill Road	7/23/2005	104	Dry	27	171
WW77	Woody Hill Road	5/14/2005	1	Dry		
WW77	Woody Hill Road	10/16/2004	132	Wet		
WW77	Woody Hill Road	8/21/2004	134	Dry		
WW77	Woody Hill Road	7/24/2004	182	Dry		
WW77	Woody Hill Road	6/19/2004	180	Wet		
WW77	Woody Hill Road	5/8/2004	2	Dry		
WW77	Woody Hill Road	10/4/2003	14	Wet		
WW77	Woody Hill Road	9/19/2003	55	Wet		
WW77	Woody Hill Road	8/20/2003	79	Wet		
WW77	Woody Hill Road	7/19/2003	58	Wet		
WW77	Woody Hill Road	6/7/2003	10	Dry		
WW77	Woody Hill Road	5/3/2003	2	Dry		

Single Sample Fecal Coliform (MPN/100 mL) Results for Brushy Brook (2003-2005) with Geometric Mean and 90th Percentile Statistics (continued)

Station Name	Station Location	Date	Result	Wet/Dry	Geometric Mean	90th Percentile
WW78	Saw Mill Road	7/23/2005	110	Dry	72	478[†] (21%)*
WW78	Saw Mill Road	5/14/2005	2	Dry		
WW78	Saw Mill Road	10/16/2004	480	Wet		
WW78	Saw Mill Road	8/21/2004	50	Dry		
WW78	Saw Mill Road	7/24/2004	440	Dry		
WW78	Saw Mill Road	6/19/2004	84	Wet		
WW78	Saw Mill Road	5/8/2004	1	Dry		
WW78	Saw Mill Road	10/4/2003	23	Wet		
WW78	Saw Mill Road	9/19/2003	660	Wet		
WW78	Saw Mill Road	8/20/2003	470	Wet		
WW78	Saw Mill Road	7/19/2003	220	Wet		
WW78	Saw Mill Road	6/7/2003	53	Dry		
WW78	Saw Mill Road	5/3/2003	180	Dry		

Shaded cells indicate an exceedance of water quality criteria
 * Includes 5% Margin of Safety
 † Geometric mean used to determine percent reduction

Wet and Dry Weather Geometric Mean Fecal Coliform Values for each Station

Station Name	Station Location	Years Sampled	Number of Samples		Geometric Mean		
			Wet	Dry	All	Wet	Dry
WW77	Woody Hill Road	2003-2005	6	7	27	66	13
WW78	Saw Mill Road	2003-2005	6	7	72	200	30

Shaded cells indicate an exceedance of water quality criteria
 Weather condition determined from rain gage at URI in Kingston, RI

Wet and Dry Weather 90th Percentile Fecal Coliform Values for each Station

Station Name	Station Location	Years Sampled	Number of Samples		90th Percentile Value		
			Wet	Dry	All	Wet	Dry
WW77	Woody Hill Road	2003-2005	6	7	171	156	153
WW78	Saw Mill Road	2003-2005	6	7	478	570	284

Shaded cells indicate an exceedance of water quality criteria
 Weather condition determined from rain gage at URI in Kingston, RI

References

- RIDEM (2008). State of Rhode Island and Providence Plantations 2008 303(d) List – List of Impaired Water Bodies. Rhode Island Department of Environmental Management.
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- RIDEM (2010a). MS4 Compliance Status Report for RI Statewide Bacteria TMDL. Rhode Island Department of Environmental Management.
- RIDEM (2010b). Total Maximum Daily Load Analysis for the Pawcatuck River and Little Narragansett Bay Waters (Bacteria Impairments). Rhode Island Department of Environmental Management.
- RI HEALTH (2003). Aquidneck Island Drinking Water Assessment Results, Source Water Protection Assessment conducted by the University of Rhode Island for the Rhode Island Department of Health, Office of Drinking Water Supply.
- Town of Hopkinton (2010). Town of Hopkinton Comprehensive Plan 5- Year Update. Online:
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