Fresh Meadow Brook and Tributaries

Watershed Description

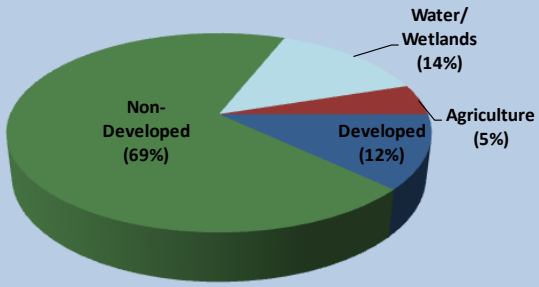
This **TMDL** applies to the Fresh Meadow Brook and tributaries assessment unit (RI0010045R-01), a 6-mile long stream system located in North and South Kingstown, RI (Figure 1). Fresh Meadow Brook and tributaries are located in the southern section of North Kingstown and the northeastern section of South Kingstown. The Fresh Meadow Brook and tributaries watershed is presented in Figure 2 with land use types indicated.

Fresh Meadow Brook originates at the outlet of Indian Lake and flows toward the southwest, and then turns toward the north and joins a major unnamed tributary before flowing toward the west under Broad Rock Road where it joins the Saugatucket River. The headwaters of this major unnamed tributary are in a forested area in the southern portion of North Kingstown. This tributary crosses Route 138 and continues south parallel to the Saugatucket River and Broad Rock Road to where it joins Fresh Meadow Brook.

The Fresh Meadow Brook and tributaries watershed covers 3.5 square miles. As shown in the aerial image of Figure 3, non-developed areas occupy a large portion (69%) of the watershed. Wetlands and other surface waters, including Indian Pond, cover 14%. Developed uses (including residential, commercial, and transportation uses) occupy approximately 12% and agricultural land use uses combine to cover 5%. Impervious surfaces cover a total of 5.3%.

Assessment Unit Facts (RI0010045R-01)

- **Town:** North Kingstown and South Kingstown
- **Impaired Segment Length:** 5 miles
- **Classification:** Class B
- **Direct Watershed:** 3.5 mi^2 (2245 acres)
- **Impervious Cover:** 5.3%
- **Watershed Planning Area:** Saugatucket (#17)



Watershed Land Uses

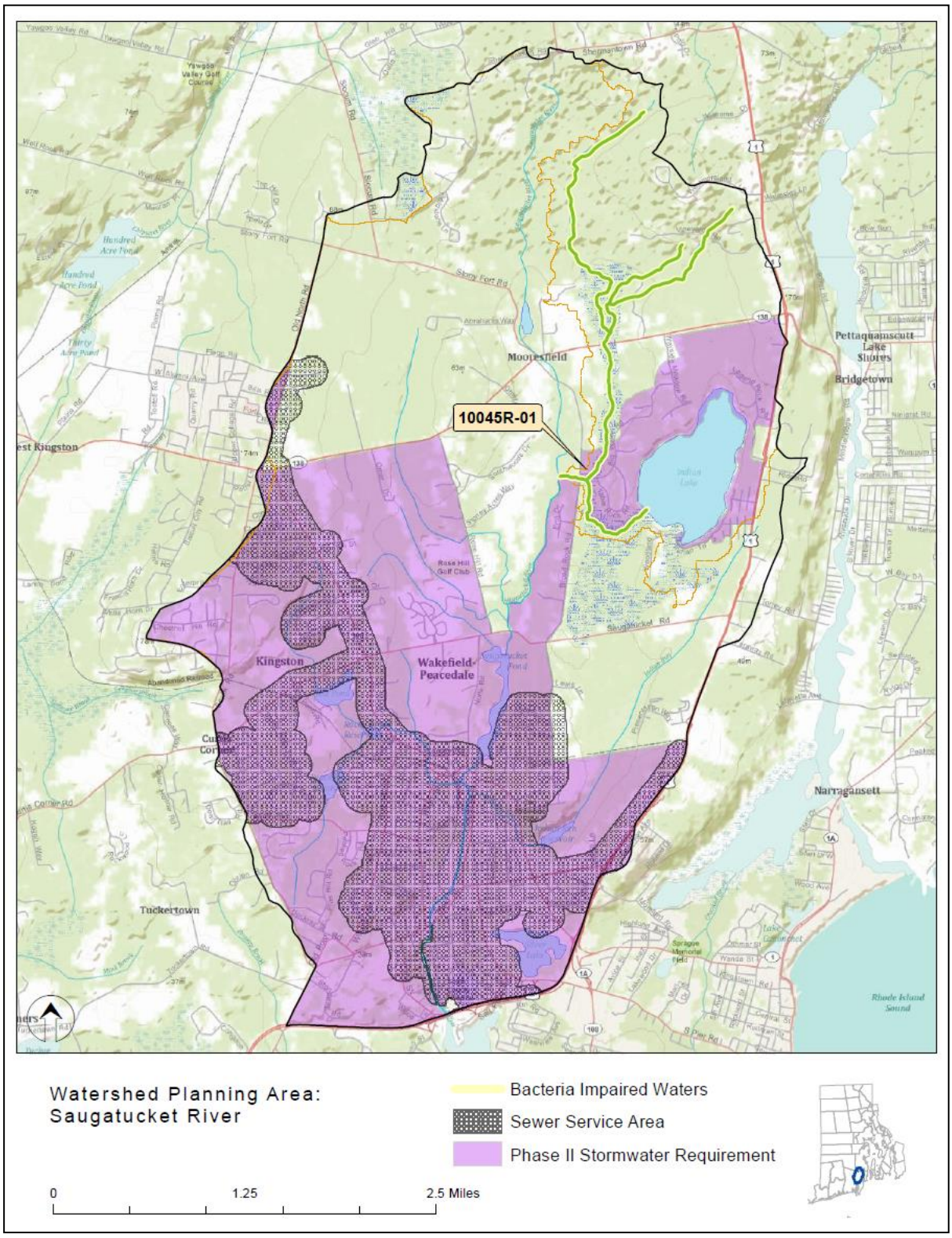


Figure 1: ***Map of the Saugatucket Watershed Planning Area with impaired segment addressed by the Statewide Bacteria TMDL, sewered areas, and stormwater regulated zones.***

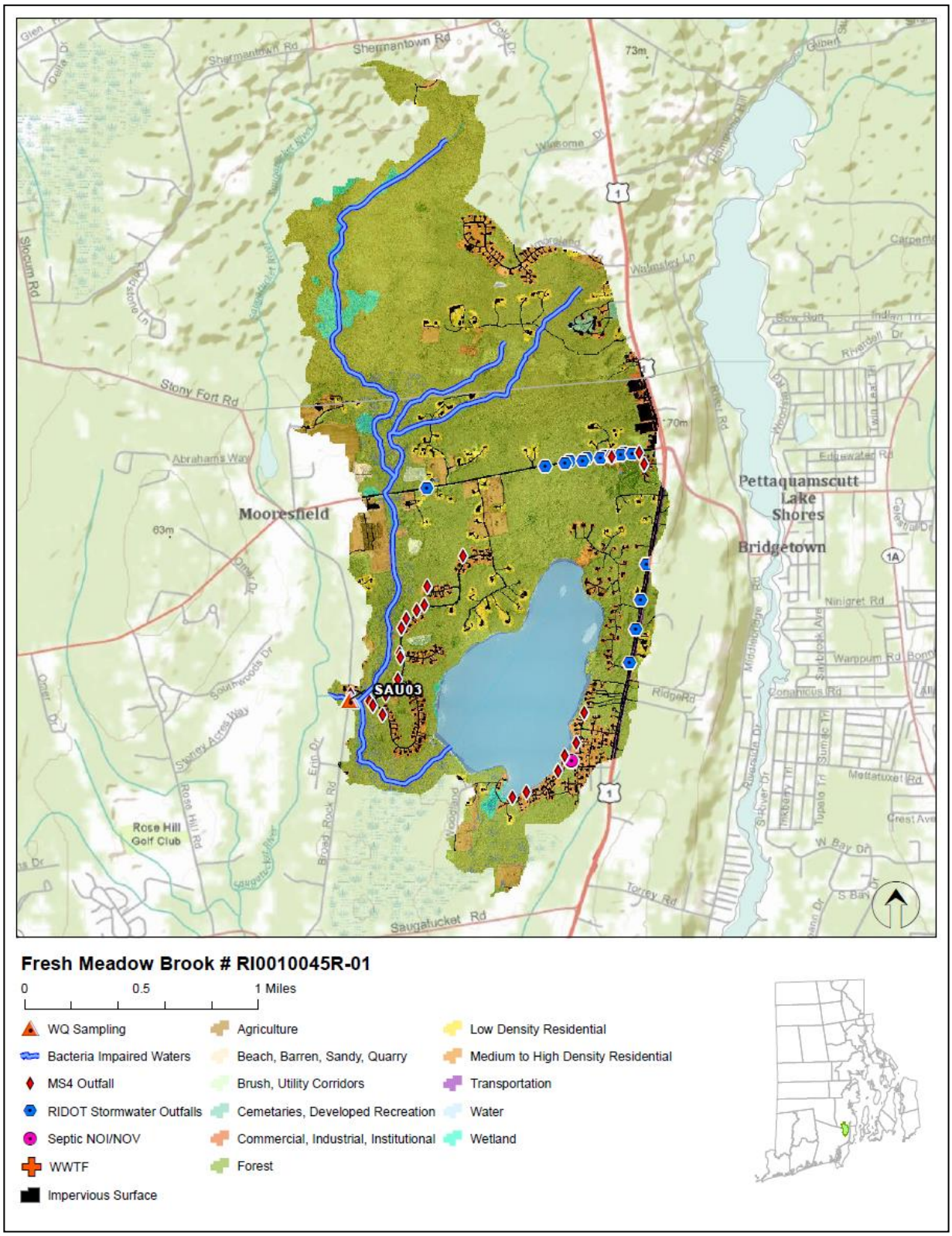


Figure 2: ***Map of the Fresh Meadow Brook and Tributaries watershed with impaired segment, sampling location, and land cover indicated.***

Why is a TMDL Needed?

Fresh Meadow Brook and tributaries are a Class B freshwater stream system. Its applicable designated uses are primary and secondary contact recreation and fish and wildlife habitat (RIDEM, 2009). From 2008-2009, water samples were collected from one sampling location (SAU03) and analyzed for the indicator bacteria, enterococci. The water quality criteria for enterococci, along with bacteria sampling results from 2008-2009 and associated statistics are presented in Table 1. The geometric mean was calculated for station SAU03. It exceeded the water quality criteria for enterococci. All samples were collected in dry weather conditions. Possible dry 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.

Figure 3: ***Partial aerial view of the Fresh Meadow Brook and Tributaries watershed (Source: Google Maps)***

Due to the elevated bacteria measurements presented in Table 1, Fresh Meadow Brook and tributaries do not meet Rhode Island's bacteria water quality standards, are identified as impaired, and were 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 Fresh Meadow Brook and tributaries watershed including malfunctioning onsite wastewater treatment systems, stormwater runoff from developed areas, and wildlife and domestic animal waste.

Onsite Wastewater Treatment Systems

All residents in the Fresh Meadow Brook and tributaries watershed rely on onsite wastewater treatment systems (OWTS), such as cesspools and septic systems. A small section of the Town of North Kingstown, located in the Quonset Point/Davisville Industrial Park, and most of the southern portion of South Kingstown use municipal sewer systems. However, the area surrounding Fresh Meadow Brook and its tributaries do not have access to these facilities. Failing OWTS can be significant sources of bacteria by allowing improperly treated waste to reach surface waters (RI HEALTH, 2003).

Most of the unsewered portions of South Kingstown have soils with moderate to severe septic system limitations (Geremia, 2006). 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). As shown in Figure 2, one OWTS Notice of Violation/Notice of Intent to Violate (NOV/NOIs) has been issued by the RIDEM Office of Compliance and Inspection in the Fresh Meadow Brook and tributaries watershed.

South Kingstown enacted a town-wide wastewater management district in 1999, which requires OWTS-owners to inspect OWTS systems to ensure their maintenance and to replace cesspools. The goal of the program is to decrease the amount of ground and surface water contamination from OWTS that do not function properly. Almost 50 percent of the unsewered, residentially zoned land under two acres in South Kingstown has constraints relative to the proper functioning of OWTS. In 1990, according to the Facilities Element of the Comprehensive Plan sixty percent of South Kingstown residents relied on OWTS. The percentage of OWTS users relative to sewer users will continue to increase due to a limited town-wide sewer expansion plan and the location of potentially developable land outside sewer service areas. In 2000, South Kingstown estimated that there were 5,973 OWTS. Based on a record of which houses were constructed prior to 1970, approximately 2,360 systems or 39.5 percent predate OWTS regulations, although some of these of systems have been upgraded over the years.

Developed Area Stormwater Runoff

The Fresh Meadow Brook and tributaries watershed has an impervious cover of 5.3%. 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 developed portions of the watershed may be contributing bacteria to Fresh Meadow Brook and its tributaries, 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.

In accordance with Phase II requirements, RIDOT and the Town of South Kingstown have identified and mapped stormwater outfalls in the Fresh Meadow Brook and tributaries watershed, including those for US Route 1 (US 1). Multiple stormwater outfalls are found in the watershed, particularly along major highways. As stormwater is known to carry a suite of pollutants, including bacteria, stormwater is a likely source of bacterial contamination to Fresh Meadow Brook and tributaries.

Agricultural Activities

Agricultural operations are an important economic activity and landscape feature in the state's rural areas. Agricultural land use only occupies 5% of the land use in the Fresh Meadow Brook and tributaries watershed. However, much of this land is adjacent to either Fresh Meadow Brook or its tributaries, particularly near the intersection of Route 138 and Broad Rock Road in South Kingstown. The Farmer's Daughter is a large plant nursery and vegetable farm located on Route 138 (Mooresfield Road), just west one of the unnamed tributaries to Fresh Meadow Brook. Agricultural runoff may contain multiple pollutants, including bacteria, and may be contributing bacteria to the study area.

Waterfowl, Wildlife, and Domestic Animal Waste

The Fresh Meadow Brook and tributaries watershed is predominately undeveloped, particularly in the northern portion of the watershed. Large wetland and surface water areas within the watershed are also home to various animals. 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.

Though only a small portion of the watershed is characterized by residential development, much of this development is located near the southern section of the brook. Waste from domestic animals such as dogs, may also be contributing to bacteria concentrations in Fresh Meadow Brook and tributaries.

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 Fresh Meadow Brook and tributaries 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 Fresh Meadow Brook and tributaries watershed rely on OWTS (septic systems or cesspools). The Towns of North Kingstown and South Kingstown both have approved Onsite Wastewater Management Plans that provide a framework for managing the OWTS. As all of the drinking water for the Towns of North and South Kingstown comes from groundwater, the towns are particularly interested in protecting the quality of their groundwater through measures such as limiting contamination from OWTS. As such, North Kingstown has an active Wastewater Management Committee (formed in 1996), that has worked to develop (1999) and adopt (2005) an ordinance requiring all OWTS in North Kingstown be inspected and pumped if necessary, once every three years (Geremia, 2009; Town of North Kingstown, 2000). The Committee has also established methods for tracking the location, age, and maintenance history of all OWTS in North Kingstown and developed four wastewater management districts to provide more comprehensive protection of surface and groundwater (Geremia, 2009).

The Town of South Kingstown has also adopted an ordinance (2001) requiring all OWTS to be inspected and pumped routinely. Cesspools discovered via the inspection program are to be upgraded within 5 years of the date of the First Maintenance Inspection or within 12 months of the sale of a property, whichever comes first. South Kingstown zoning also contains more stringent setbacks from natural features than the current state requirements. South Kingstown's Public Services Department is responsible for overseeing and enforcing this program. Once malfunctioning or failing OWTS have been identified, programs are in place to assist with the financial costs of replacement or repair to residents (Town of South Kingstown, 2011).

North Kingstown and South Kingstown should continue to track the maintenance history of all OWTS, and enforce the inspection and pump-out ordinance.

Both the Towns of North and South Kingstown are eligible for Rhode Island's Community Septic System Loan Program (CSSLP). North Kingstown has obtained 1.6 million dollars and South Kingstown has obtained 1.2 million dollars in CSSLP money since 2002. This program assists citizens with the replacement of older and failing systems through low-interest loans. The towns should also continue to provide funds to residents through CSSLP.

Stormwater Management

The Town of South Kingstown (RIPDES permit RIR040037) and RIDOT (RIPDES permit RIR040036) are municipal separate storm sewer (MS4) operators in the watershed and have prepared Phase II Stormwater Management Plans (SWMPP). Though the Town of North Kingstown (RIPDES permit RIR040028) is regulated by the Phase II program, the study area watershed is outside of the Phase II regulated area.

South Kingstown's SWMPP outlines goals for the reduction of stormwater runoff to the RIPDES-regulated densely populated and urbanized areas of the Fresh Meadow Brook and tributaries watershed through the implementation of Best Management Practices (BMPs). Many of these BMPs are now in place, including mapping all stormwater outfalls, instituting annual inspections and cleaning of the town's catch basins, implementing an annual street sweeping program, adopting construction erosion and sediment control and post-construction stormwater control ordinances, and conducting public education activities (RIDEM, 2010a).

North Kingstown and South Kingstown have also adopted illicit discharge detection and elimination ordinances (North Kingstown in 2006; South Kingstown in 2010) (RIDEM, 2010a). These ordinances prohibit illicit discharges to the MS4 and provide enforcement mechanisms. It is recommended that any stormwater outfalls discharging in the near vicinity of the sampling location be monitored to check for illicit discharges. Illicit discharges can be identified through continued dry weather outfall sampling and microbial source tracking.

RIDOT also has completed a SWMPP for state-owned roads in the watershed. 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, beyond the General Permit's requirements regarding stormwater from urbanized and densely populated areas, as well as from divided highways outside of the urbanized and densely populated areas. 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. Stormwater Pollution Prevention Plans (SWPPPs) 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 Fresh Meadow Brook and its tributaries based on the watershed's imperviousness, RIDOT, South Kingstown, and North Kingstown will have no changes to their Phase II permit requirements and no TMDL Implementation Plan (TMDL IP) will be required at this time.

Waterfowl, Wildlife, and Domestic Animal Waste

Education and outreach programs should highlight the importance of picking up after dogs and other pets and not feeding waterfowl. Animal wastes should be disposed of away from any waterway or stormwater system. North Kingstown and South Kingstown should work with volunteers to map locations where animal waste is a significant and a chronic problem. This work should be incorporated into the municipalities' Phase II plans and should result in an evaluation of 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.

Towns 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 Fresh Meadow Brook and its tributaries 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 the study area and can harm human health and the environment.

Agricultural Activities

If not already in place, agricultural producers should work with the RIDEM Division of Agriculture, and the U.S. Department of Agriculture Natural Resources Conservation Service (NRCS) to develop conservation plans for their farming activities within the watershed. NRCS and the RIDEM Division of Agriculture should continue to work with agricultural operation in the watershed, particularly near the intersection of Route 138 and Broad Rock Road, to ensure that all agricultural operations within the watershed have sufficient stream buffers, have fencing to restrict access of livestock and horses to streams and wetlands, and have animal waste handling, disposal, and other appropriate BMPs in place.

Land Use Protection

Woodland and wetland areas within the watershed, particularly in the northern portion of the 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 over half of the land use in the Fresh Meadow Brook and tributaries watershed, it is important to preserve these undeveloped areas, and institute controls on development in the watershed.

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

Table 1: Fresh Meadow Brook and Tributaries Bacteria Data

***Waterbody ID*:** RI0010045R-01

Watershed Planning Area: 17 – Saugatucket

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

Impairment: Enterococci (colonies/100mL)

Water Quality Criteria for Enterococci: Geometric Mean: 54 colonies/100 mL

Percent Reduction to meet TMDL: **64% (Includes 5% Margin of Safety)**

Data: 2008-2009 from RIDEM

Single Sample Enterococci (colonies/100 mL) Results for Fresh Meadow Brook (2008-2009) with Geometric Mean Statistics

Station Name	Station Location	Date	Result	Wet/Dry	Geometric Mean
SAU03	Fresh Meadow Brook at Broad Rock Road	8/27/2009	2420	Dry	**132 (64%)***
SAU03	Fresh Meadow Brook at Broad Rock Road	8/3/2009	579	Dry	
SAU03	Fresh Meadow Brook at Broad Rock Road	7/16/2009	44	Dry	
SAU03	Fresh Meadow Brook at Broad Rock Road	6/3/2009	19	Dry	
SAU03	Fresh Meadow Brook at Broad Rock Road	9/22/2008	36	Dry	

Shaded cells indicate an exceedance of water quality criteria
*Includes 5% Margin of Safety

Wet and Dry Enterococci Geometric Mean Values for Station SAU03

Station Name	Station Location	Years Sampled	Number of Samples		Geometric Mean		
			Wet	Dry	All	Wet	Dry
SAU03	Fresh Meadow Brook at Broad Rock Road	2008-2009	0	5	132	NA	132

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

References

James J. Geremia & Associates Inc. (2009). Town of North Kingstown, Rhode Island Comprehensive Wastewater Facilities Plan for the Post Road Corridor (December 2007).

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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.

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Town of South Kingstown (2011). Onsite Wastewater Management Program. Online: http://www.southkingstownri.com/town-government/municipal-departments/public-services/onsite-wastewater-management

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VHB (2004). Municipal Stormwater Management Program Plan: North Kingstown, Rhode Island. Vanasse Hangen Brustlin, Inc. (March 2004).