



Meshanticut Brook

Watershed Description

This **TMDL** applies to the Meshanticut Brook assessment unit (RI0006017R-02), a 12.3-mile long stream located in central Rhode Island in the Cities of Cranston and Warwick and the Town of West Warwick (Figure 1). The Meshanticut Brook watershed is presented in Figure 2 with land use types indicated.

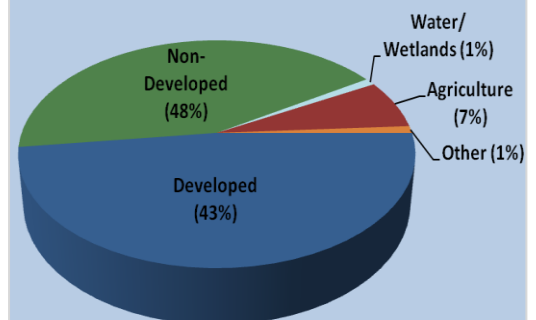
The east branch of Meshanticut Brook begins in a commercial area southwest of the intersecting of Interstate 295 and Route 14 in Cranston. It flows east, under Interstate 295, passes the Wal-Mart Plaza, and enters a high density residential area. The brook then flows under Elton Circle in a wooded area north of Route 12. After crossing Routes 12 and 52, the brook enters a protected wetland on Ambrose Street. It then flows south to Meshanticut Park and enters Ralph's Pond. As the brook leaves the pond, it flows parallel to Interstate 295 to the east of the PRM Concrete Corporation. It joins with Furnace Hill Brook, and continues south through the Meshanticut Brook Area.

The west branch begins south of Laten Knight Road, flows across Hope Road and into the Cranston Country Club golf course. The brook continues under Route 51, through a wooded area, and flows under Natick Avenue and Interstate 295. The east branch joins the west branch just east of Interstate 295 in Cranston. The main stem of Meshanticut Brook continues south and empties into the Pawtuxet River in Warwick, just north of Exit 2 on Interstate 295.

The Meshanticut Brook watershed covers 13.6 square miles. Non-developed uses occupy 48% of the watershed, while developed uses (including commercial, transportation, and residential uses) occupy 43%. Agricultural land use occupies 7% of the watershed, and water and wetlands and other land uses each occupies 1% of the land use. Surface water and wetlands and other land uses each occupies 1% of the watershed.

Assessment Unit Facts *(RI0006017R-02)*

- **Town:** Cranston, West Warwick, Warwick
- **Impaired Segment Length:** 12.3 miles
- **Classification:** Class B
- **Direct Watershed:** 13.6 mi² (8,718 acres)
- **Impervious Cover:** 20.8%
- **Watershed Planning Area:** Pawtuxet (#12)



Watershed Land Uses

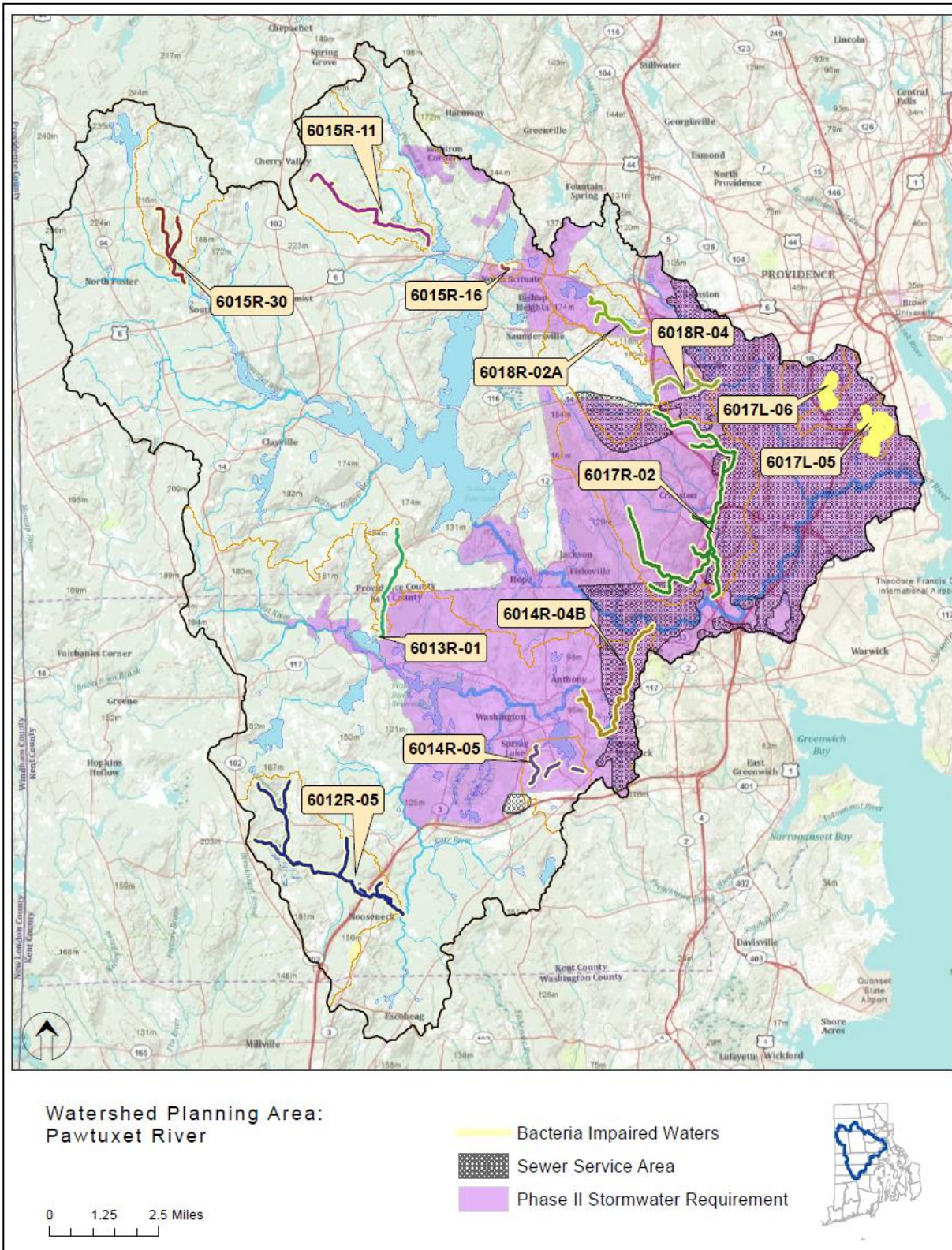


Figure 1: Map of Pawtuxet Watershed Planning Area with impaired segments addressed by the Statewide Bacteria TMDL, sewer service areas, and stormwater regulated zones.

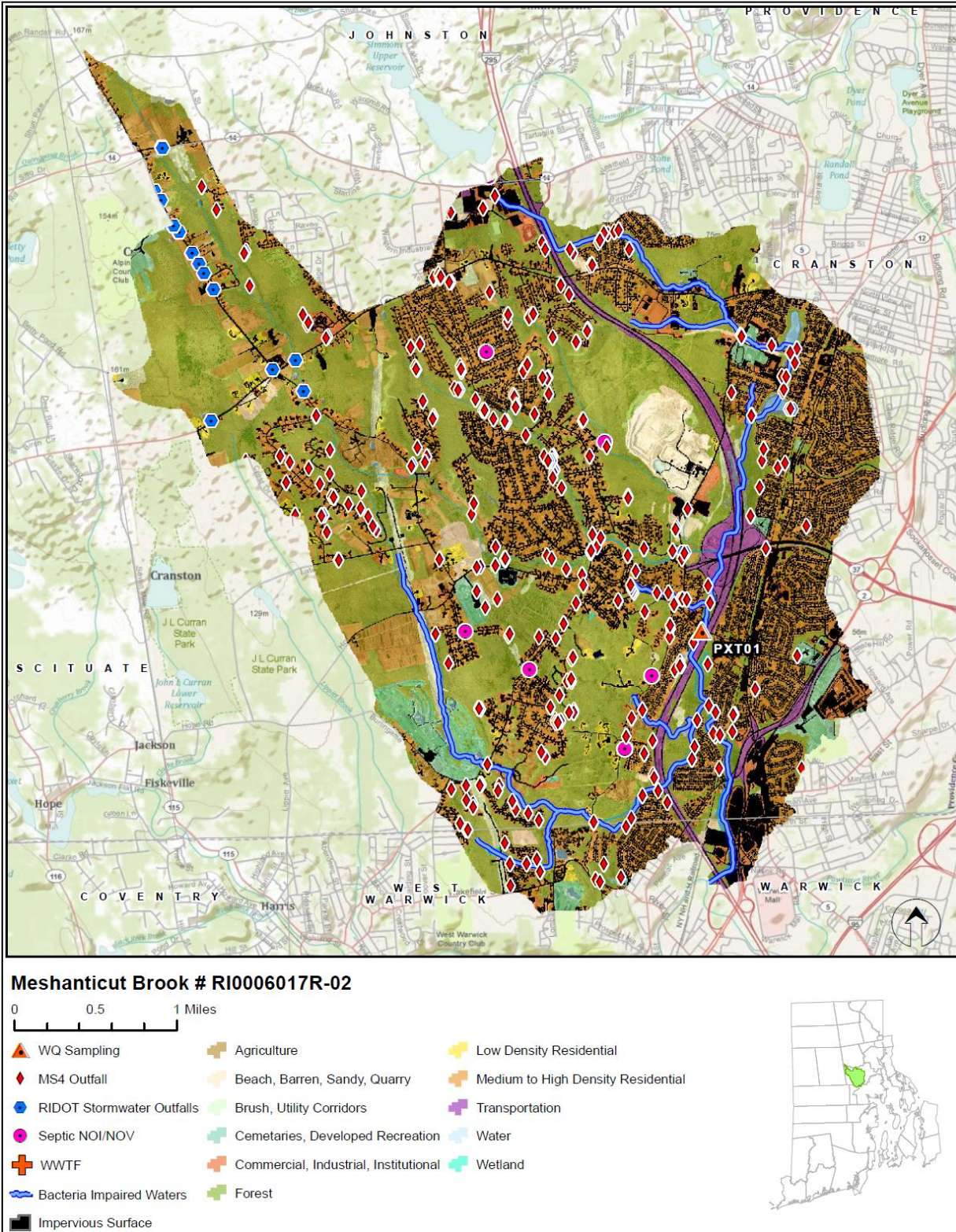


Figure 2: Map of the Meshanticut Brook watershed with impaired segment, sampling location, and land cover indicated.

Why is a TMDL Needed?

Meshanticut 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 2007-2008, water samples were collected from sampling station (PXT01) along the east branch of the brook and analyzed for the indicator bacteria, enterococci. The water quality criteria for enterococci, along with the bacteria sampling results from 2007-2008 and associated statistics are presented in Table 1. The geometric mean was calculated for Station PXT01 and exceeded the water quality criteria for enterococci. All samples were collected in dry-weather conditions.

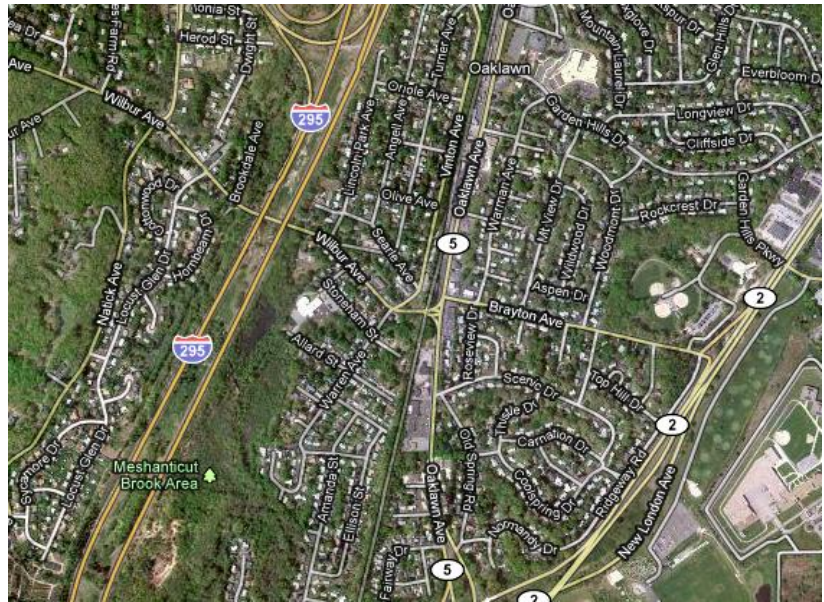


Figure 3: Partial aerial view of Meshanticut Brook watershed. (Source: Google Maps)

Due to the elevated bacteria measurements presented in Table 1, Meshanticut Brook does not meet Rhode Island’s 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.

Meshanticut Brook has previously been assessed by RIDEM as not meeting water quality standards for copper and lead, though no TMDLs have been completed for these impairments.

Potential Bacteria Sources

Previous investigations have concluded that there are several potential sources of harmful bacteria in the Meshanticut Brook watershed including stormwater runoff from developed areas, malfunctioning onsite wastewater treatment systems, illicit discharges, agricultural activities, and wildlife and domestic animal waste. Each type of potential bacteria sources is described briefly below.

Developed Area Stormwater Runoff

The Meshanticut Brook watershed has an impervious cover of 20.8%. 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. As discussed in Section 6.3 of the Core TMDL Document, as a general rule, impaired streams with watersheds having higher than 10% impervious cover are assumed to be affected by stormwater runoff.

In accordance with Phase II requirements, stormwater outfalls and their receiving water bodies in Cranston, Warwick, and West Warwick have been identified and mapped (RIDEM, 2010). Multiple stormwater outfalls have been identified within the Meshanticut Brook watershed (Figure 2). As stormwater is known to carry a suite of pollutants including bacteria, it is a likely source of bacterial contamination to Meshanticut Brook.

Onsite Wastewater Treatment Systems

Meshanticut Brook is partially sewered and also relies on onsite wastewater treatment systems (OWTS). Sewered portions of the watershed include the area east of Interstate 295, while residents to the west of the interstate rely on OWTS (Figure 1). Soils to the west of Interstate 295 are severely limited for OWTS disposal. Many systems have failed due to poor construction, improper maintenance, and inadequate infiltration (City of Cranston, 2002). 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). As shown in Figure 2, six OWTS Notices of Violation/Notices of Intent to Violate (NOV/NOIs) have been issued by the RIDEM Office of Compliance and Inspection in the Meshanticut Brook watershed.

Sewer Leaks

Sewer system leaks and other illicit discharges have also historically been reported in the Meshanticut Brook watershed (Fuss & O'Neill, 2004), particularly along Furnace Hill Brook, a tributary of

Meshanticut Brook. Such leaks could potentially be significant as the watershed has multiple sewer lines near Meshanticut Brook.

Agricultural Activities

Agricultural operations are an important economic activity and landscape feature in the state's rural areas. Agricultural land use makes up 7% of the Meshanticut Brook watershed, and is concentrated in the western portion of the watershed near the west branch of the brook. Agricultural runoff may contain multiple pollutants, including bacteria. Excessive algal growth in Furnace Hill Brook has previously been attributed to excess fertilizer application (Fuss & O'Neill, 2004), and may be contributing to increased bacteria counts in Meshanticut Brook.

Wildlife and Domestic Animal Waste

The western portion of the Meshanticut Brook watershed is predominately undeveloped. Many of these areas are home to multiple species of wildlife and waterfowl. Wetland 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.

Land use adjacent to the impaired segment of Meshanticut Brook, particularly in the eastern portion of the watershed is characterized by high-density residential development. Waste from domestic animals such as dogs, may also be contributing to bacteria concentrations in Meshanticut Brook if residents are not disposing of pet waste properly.

Existing Local Management and Recommended Next Steps

The cities of Cranston and Warwick and the Town of West Warwick have developed and implemented programs to protect water quality from bacterial contamination. Future mitigative activities are necessary to ensure the long-term protection of Meshanticut Brook. A brief description of existing local programs and recommended next steps from stormwater phase II reports, Onsite Wastewater Management Plans, and Wastewater Facilities Plans, Comprehensive Plans, and other documents are provided below. Stakeholders should review these documents directly for more detailed information.

Stormwater Management

The Town of West Warwick (RIPDES permit RIR040015), the Cities of Warwick (RIPDES permit RIR040031) and Cranston (RIPDES permit RIR040012), and RIDOT (RIPDES permit RIR040036) are

municipal separate storm sewer (MS4) operators in the Meshanticut Brook watershed and have prepared the required Phase II Stormwater Management Plans (SWMPP). The entire watershed area is regulated under the Phase II program.

West Warwick, Warwick, and Cranston's SWMPPs outline goals for the reduction of stormwater runoff to Meshanticut Brook 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).

The City of Warwick adopted an illicit discharge detection and elimination ordinance in 2008 and the Town of West Warwick and the City of Cranston adopted similar ordinances in 2009 (RIDEM, 2010a). These ordinances prohibit illicit discharges to the MS4 and provide an enforcement mechanism. The municipalities should continue to select priority areas to identify and eliminate illicit discharges in the Meshanticut Brook watershed. 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, 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.

While these first steps are important to reduce the effects of stormwater runoff to Meshanticut Brook, additional efforts are needed to restore the river's water quality. As mentioned previously, the Meshanticut Brook watershed has an impervious cover of 20.8%, a level where stormwater impacts are expected. At this threshold, RIDEM is requiring the MS4 operators to revise their post-construction stormwater ordinances as described in Section 6.3 of the Core TMDL Document. RIDEM also requires the MS4 operators to evaluate the sufficiency of their six minimum measures in achieving the TMDL provisions. Changes to the SWMPPs should be documented in a TMDL Implementation Plan (TMDL IP) and should comply with relevant provisions Part IV.D of the RIPDES Stormwater General Permit

(RIDEM, 2010b), which are summarized in Section 6.2 (Numbers 1 through 5) of the Core TMDL Document.

Onsite Wastewater Management

Some residents of the Meshanticut Brook watershed, primarily in Cranston, rely on OWTS. Most, if not all areas of the watershed located in Warwick and West Warwick have sewers. The City of Cranston has a draft Onsite Wastewater Management Plan that provides a framework for managing the OWTS (City of Cranston, 2004). All towns in the watershed have Wastewater Facilities Plans to regulate sewer portions of each town. As part of an onsite wastewater management planning process, the municipalities where OWTS are used should adopt an ordinance 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 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).

Though Cranston and Warwick are not currently eligible for Rhode Island's Community Septic System Loan Program (CSSLP), it is recommended that the towns develop programs to assist citizens with the replacement of older and failing systems. The CSSLP program provides low-interest loans to residents to help with maintenance and replacement of OWTS.

Sewer Leaks

Cranston, West Warwick, and Warwick should also implement a program to evaluate its sanitary sewer system and identify and reduce leaks and overflows.

Agricultural Activities

If not already in place, the U.S. Department of Agriculture Natural Resources Conservation Service and the RIDEM Division of Agriculture should work with local agricultural operations, particularly in the western portion of the watershed to develop conservation plans for farming activities. These plans should ensure that there are sufficient river buffers, that fencing exists to restrict access of livestock and horses to streams and wetlands, and that animal waste handling, disposal, and other appropriate BMPs in place. A plan should be developed to evaluate the contributions of these farms and other sites to the bacterial contamination in Meshanticut Brook.

Wildlife and Domestic Animal Waste

Education and outreach programs in Cranston, West Warwick, and Warwick 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. The municipalities should work with volunteers to map locations where animal waste is a significant and chronic problem. 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 Meshanicut 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 the Tiogue Tributaries and can harm human health and the environment.

Land Use Protection

Woodland and wetland areas within the Meshanticut Brook watershed absorb and filter pollutants from stormwater and agricultural runoff, and help protect both water quality in the stream and stream channel stability. As these areas represent approximately 48% of the land use in the Meshanticut Brook watershed, it is important to preserve these undeveloped areas, and institute controls on development in the watershed (RI HEALTH, 2003).

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

Table 1: Meshanticut Brook Bacteria Data

Waterbody ID: RI0006017R-02

Watershed Planning Area: 12 – Pawtuxet

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: 73% (Includes 5% Margin of Safety)

Data: 2007-2008 from RIDEM

Single Sample Enterococci (colonies/100 mL) Results for Meshanticut Brook (2007-2008) with Geometric Mean Statistics

Station Name	Station Location	Date	Result	Wet/Dry	Geometric Mean
PXT01	Meshanticut Brook at Wilbur Ave just near 295 overpass	8/19/2008	201	Dry	168 (73%)*
PXT01	Meshanticut Brook at Wilbur Ave just near 295 overpass	7/15/2008	291	Dry	
PXT01	Meshanticut Brook at Wilbur Ave just near 295 overpass	6/27/2008	228	Dry	
PXT01	Meshanticut Brook at Wilbur Ave just near 295 overpass	6/3/2008	154	Dry	
PXT01	Meshanticut Brook at Wilbur Ave just near 295 overpass	10/31/2007	66	Dry	

Shaded cells indicate an exceedance of water quality criteria

*Includes 5% Margin of Safety

Wet and Dry Weather Geometric Mean Enterococci Values for Station PXT01

Station Name	Station Location	Years Sampled	Number of Samples		Geometric Mean		
			Wet	Dry	All	Wet	Dry
PXT01	Meshanticut Brook at Wilbur Ave just near 295 overpass	2007-2008	0	5	168	NA	168

Shaded cells indicate an exceedance of water quality criteria

Weather condition determined from rain gage at T.F. Green Airport in Warwick, RI

References

- Fuss & O'Neill (2004a). Phase II Stormwater Management Plan: Town of Cranston, Rhode Island. Submitted by Fuss & O'Neill, Inc, Providence, RI.
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- City of Cranston (2002). City of Cranston On-Site Wastewater Management Plan. Cranston, Rhode Island, April 2002.
- Town of West Warwick (2005). Strategy for Reducing Risks from Natural Hazards in West Warwick, Rhode Island. Town of West Warwick Local Hazard Mitigation Committee, in collaboration with URI Coastal Resources Center and Integrated Management Solutions, Jamestown, RI. Approved November 2005.
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