Moosup River

Watershed Description

This **TMDL** applies to the Moosup River assessment unit (RI0005011R-03), a 30.3-mile long stream located in Foster and Coventry, RI (Figure 1). The Towns of Foster and Coventry are located in the western portion of the state. A small portion of the watershed extends into Connecticut. The Moosup River watershed is presented in Figure 2 with land use types indicated.

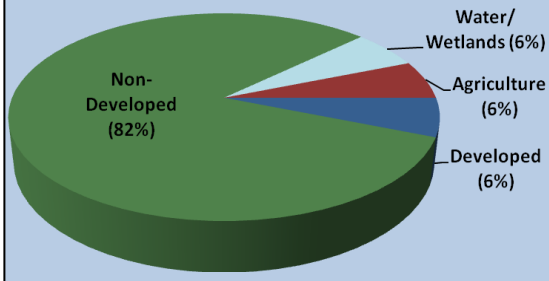
The Moosup River begins in Foster, southeast of the intersection of Route 6 and Cucumber Hill Road at the outlet of Clark Pond. The river flows south through forest and wetland areas joining six small tributaries before entering a residential area and the Foster Country Club Golf Course. The Moosup River crosses Harrington Road and flows through the golf course. West Meadow Brook empties into the Moosup River just below the golf course.

The Moosup River continues south into Coventry and crosses Route 14. The river then flows east through the Nicholas Farm Wildlife Management Area and crosses into Connecticut. The Moosup River then flows through Sterling and Plainfield, CT and empties into the Quinebaug River.

The Moosup River watershed covers 34.3 square miles and is mostly non-developed (82%). Non-developed areas include the Nicholas Farm Wildlife Management Area in the southern portion of the watershed. Agricultural areas are scattered throughout the watershed and occupy 6% of the land area. Surface water and wetlands and developed land uses each cover 6% of the watershed.

Assessment Unit Facts (RI0005011R-03)

- **Town:** Foster and Coventry
- **Impaired Segment Length:** 30.3 miles
- **Classification:** Class A
- **Direct Watershed:** 34.3 mi² (21,940 acres)
- **Impervious Cover:** 2.5%
- **Watershed Planning Area:** Quinebaug (#15)



Watershed Land Uses

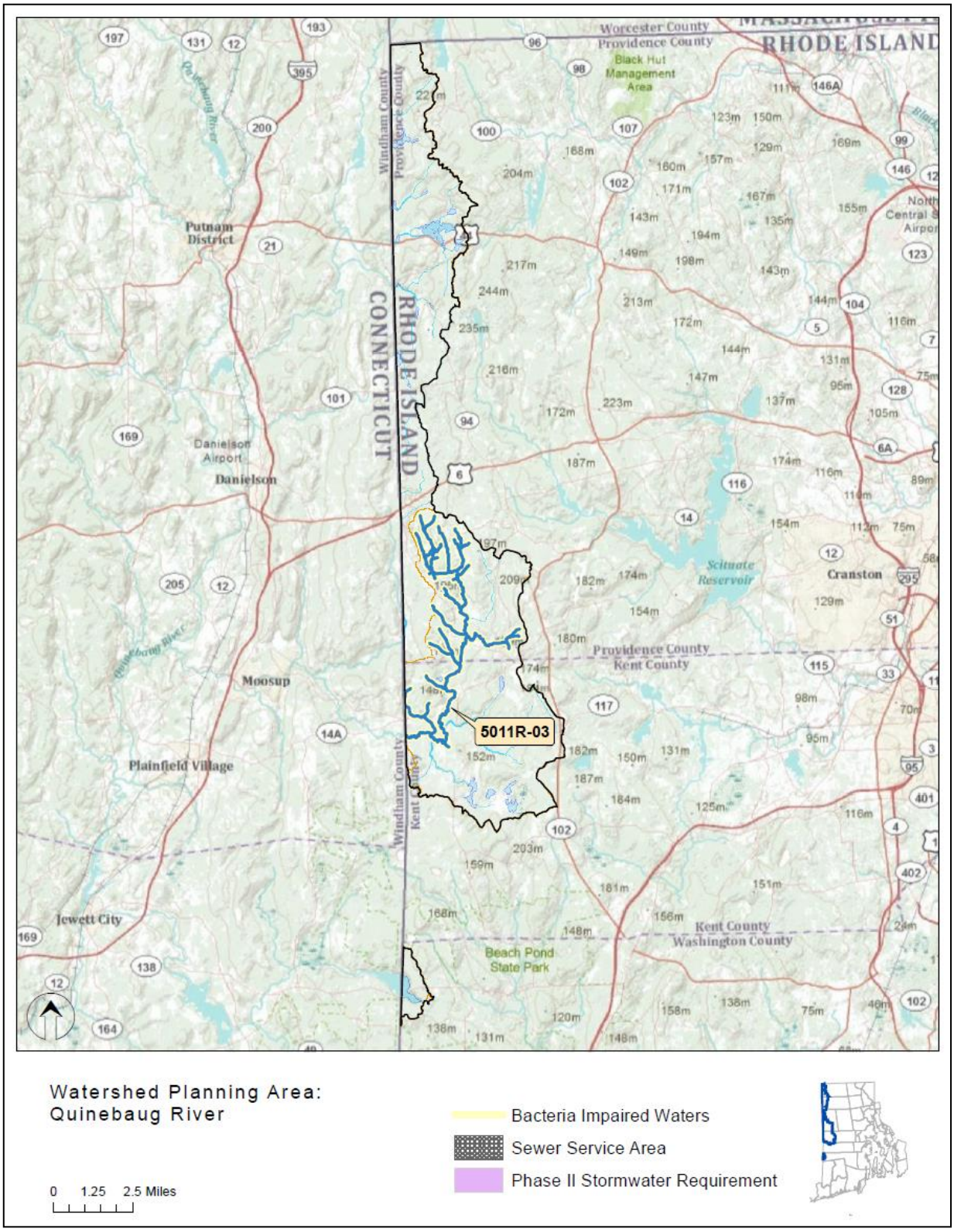


Figure 1: ***Map of the Quinebaug Watershed Planning Area with impaired segment addressed by the Statewide Bacteria TMDL, sewered areas, and stormwater regulated zones.***

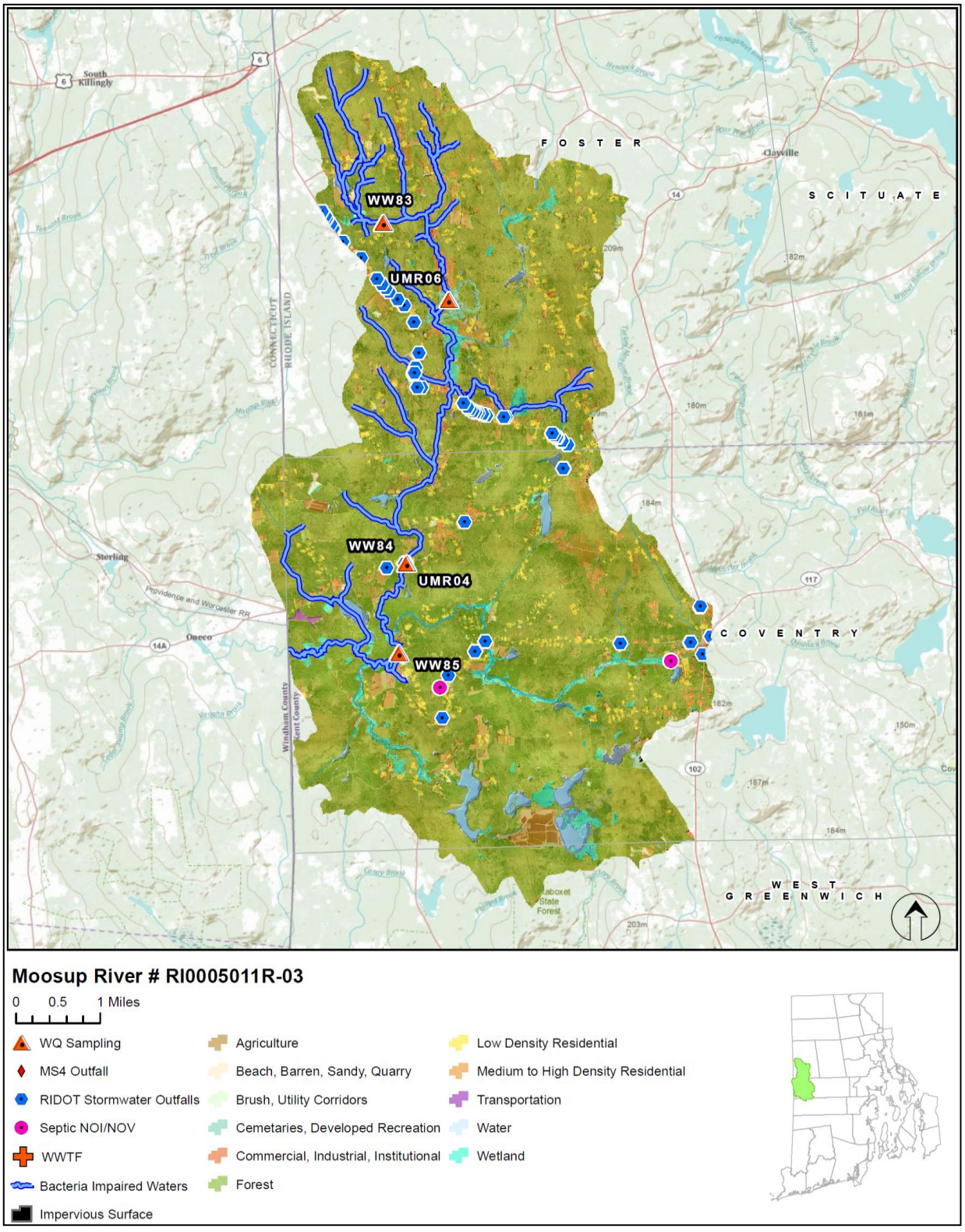


Figure 2: ***Map of the Moosup River watershed with impaired segment, sampling locations, and land cover indicated.***

Why is a TMDL Needed?

The Moosup River is a Class A 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 five sampling locations (Figure 2) and analyzed for the indicator bacteria, enterococci. The water quality criteria for enterococci, along with bacteria sampling results from 2006-2008 and associated statistics are presented in Table 1. The geometric mean was calculated for three of the five stations and exceeded the water quality criteria for enterococci for Station WW83 and WW84 for at least one of the three sample years.

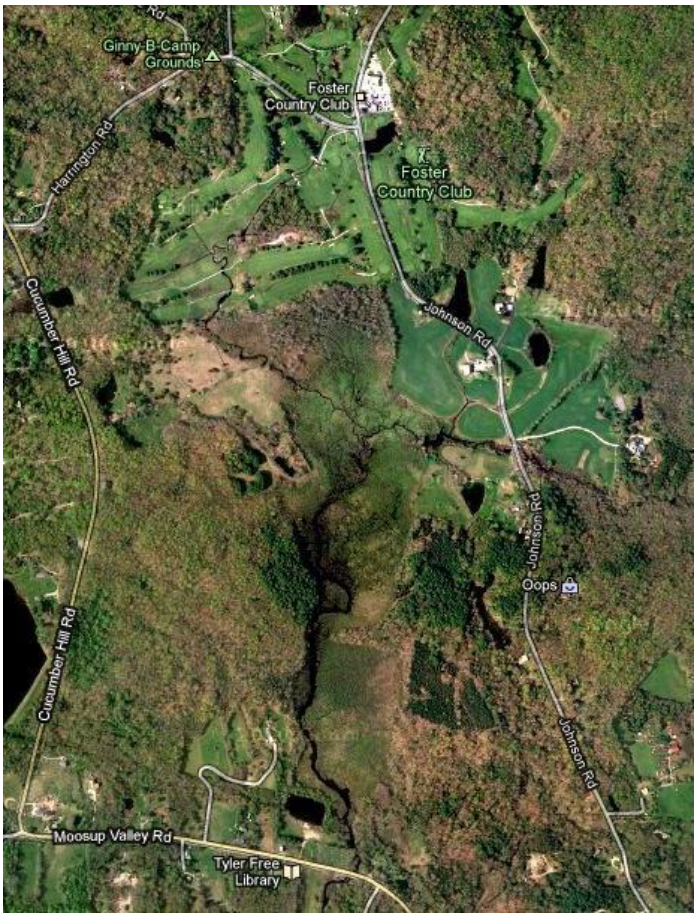


Figure 3: ***Partial aerial view of the Moosup River watershed (Source: Google Maps)***

To aid in identifying possible bacteria sources, the geometric mean was calculated for wet and dry-weather sample days for Stations WW83, WW84, and WW85, where appropriate. The wet-weather geometric mean values exceeded water quality criteria for enterococci at Stations WW83 and WW84. Dry-weather geometric mean values exceeded the criteria at Station WW83 only.

Due to the elevated bacteria measurements presented in Table 1, the Moosup River 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 Moosup River watershed including malfunctioning onsite wastewater treatment systems, agricultural runoff, waterfowl, wildlife, and domestic animal waste, and stormwater runoff. Each type of potential bacteria source is described briefly below.

Onsite Wastewater Treatment Systems

All residents in the Moosup River 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). As shown in Figure 2, two OWTS Notices of Violation/Notices of Intent to Violate (NOV/NOIs) have been issued by the RIDEM Office of Compliance and Inspection in the Moosup River watershed. These NOV/NOIs are located along Bucks Horn Brook, a southern tributary to the Moosup River.

Agricultural Activities

Agricultural operations are an important economic activity and landscape feature in the state's rural areas. Agricultural land use occupies 6% of the land area in the Moosup River watershed. Some of these agricultural activities, including hay fields, pasture, and low-intensity cropland, are located adjacent to the river, particularly off of Plainfield Pike (Route 14) and Johnson Roads, and in the Briggs Pond area (Figure 2). The Town of Foster has identified agricultural animal waste runoff as a potential bacteria source to surface waters in the town (Town of Foster, 2003). Agricultural practices such as allowing livestock to graze near streams, crossing livestock through waterbodies, spreading manure as fertilizer, and improper disposal of manure can contribute to bacterial contamination.

Waterfowl, Wildlife, and Domestic Animal Waste

Non-developed land accounts for 82% of the watershed area. Protected land within the watershed includes the Nicholas Farm Wildlife 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.

Low-density residential development is found throughout the watershed along the roadways. The Moosup River and its tributaries flow through these residential areas in multiple locations throughout the

watershed. Waste from domestic animals, such as dogs, in these residential neighborhoods may be contributing bacteria to the Moosup River. If residents are not properly disposing of pet waste, the bacteria from that waste could enter and contaminate the stream either directly or through stormwater.

Developed Area Stormwater Runoff

Though the majority of the Moosup River watershed is undeveloped, impervious surfaces cover approximately 2.5%, particularly along roadways. Impervious cover is defined as land surface areas, such as roofs and roads, that force water to run off of 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 the Moosup River, 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 Stormwater requirements, the Town of Coventry has identified and mapped outfalls to surface water bodies in its regulated area. The Rhode Island Department of Transportation (RIDOT) has also mapped stormwater outfalls, including those within the Moosup River watershed. As shown in Figure 2, numerous outfalls were found in the watershed, particularly along Cucumber Hill and Moosup Valley Roads.

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 Moosup River watershed. These activities could include sampling at several different locations and under different weather conditions (e.g., wet and dry). Field reconnaissance surveys focusing 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 Moosup River watershed rely on OWTS (septic systems or cesspools) (Figure 1). The towns of Foster and Coventry have Onsite Wastewater Management Plans that provide a framework for managing the OWTS. However, neither town has adopted an OWTS ordinance requiring all OWTS to be inspected and pumped routinely. As part of an onsite wastewater management planning process, the towns 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 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 Coventry is eligible for Rhode Island's Community Septic System Loan Program (CSSLP) and has obtained $300,000 from the program since 2008. CSSLP provides low-interest loans to residents to help with maintenance and replacement of OWTS. The Town of Foster is not currently eligible for CSSLP. It is recommended that Foster develop a program to assist citizens with the replacement of older and failing systems.

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 agricultural operations throughout the watershed to develop a conservation plan for farming activities, particularly at the animal farms in the watershed. These plans should ensure that there are sufficient stream 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.

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. Both Foster and Coventry should work with volunteers to map locations where animal waste is a significant and chronic problem. The towns 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.

Towns and residents can take several measures to minimize waterfowl-related impacts. The Moosup River's shores are largely vegetated. However, if the shore has been cleared, residents can allow tall, coarse vegetation to grow in areas along the shores of the Moosup River 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 Moosup River and can harm human health and the environment.

Stormwater Management

RIDOT (RIPDES permit RIR040036) is a municipal separate storm sewer (MS4) operator in the Moosup River watershed and has prepared a Phase II Stormwater Management Plan (SWMPP) for state-owned roads throughout the State. Though the Town of Coventry (RIPDES permit RIR040006) is regulated by the Phase II program, the Moosup River watershed is outside of the Phase II regulated area. The Town of Foster is not regulated under the Phase II program.

In 2009, the Town of Coventry adopted an illicit discharge detection and elimination (IDDE) ordinance (RIDEM, 2010a). The Town of Foster has not adopted an IDDE ordinance. This type of ordinance prohibits illicit discharges to the MS4 and provides an enforcement mechanism. It is recommended that any stormwater outfalls discharging in the 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'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 Moosup River based on the watershed's imperviousness, RIDOT and Coventry will have no changes to their 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 Moosup River watershed such as the Nicholas Farm Wildlife Management Area absorb and filter pollutants from stormwater runoff, and help protect both water quality in the stream and stream channel stability. 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 the Moosup River.

Table 1: Moosup River Bacteria Data

***Waterbody ID*:** RI0005011R-03

Watershed Planning Area: 15 – Quinebaug

Characteristics: Freshwater, Class A, 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: **88% (Includes 5% Margin of Safety)**

Data: 2006-2008 from RIDEM

Single Sample Enterococci (colonies/100 mL) Results for Moosup River (2006-2008) including Geometric Mean Statistics

Station Name	Station Location	Date	Result	Wet/Dry	Geometric Mean
WW83	Moosup River Upstream	10/25/2008	4	Wet	48
WW83	Moosup River Upstream	9/20/2008	112	Dry	
WW83	Moosup River Upstream	8/16/2008	344	Wet	
WW83	Moosup River Upstream	7/12/2008	328	Dry	
WW83	Moosup River Upstream	6/7/2008	38	Wet	
WW83	Moosup River Upstream	5/10/2008	6	Wet	
WW83	Moosup River Upstream	10/20/2007	553	Wet	**100[†] (88%)***
WW83	Moosup River Upstream	9/15/2007	2190	Wet	
WW83	Moosup River Upstream	8/18/2007	770	Wet	
WW83	Moosup River Upstream	7/21/2007	44	Dry	
WW83	Moosup River Upstream	6/16/2007	12	Dry	
WW83	Moosup River Upstream	5/12/2007	2	Dry	
WW83	Moosup River Upstream	10/28/2006	40	Wet	93
WW83	Moosup River Upstream	9/30/2006	163	Dry	
WW83	Moosup River Upstream	8/26/2006	261	Wet	
WW83	Moosup River Upstream	7/29/2006	816	Dry	
WW83	Moosup River Upstream	6/17/2006	19	Wet	
WW83	Moosup River Upstream	5/20/2006	25	Wet	
UMR06	Moosup River - Harrington Ave at Foster Country Club (off of Johnson Road)	9/23/2008	313	Dry	NA

Single Sample Enterococci (colonies/100 mL) Results for the Moosup River (2006-2008) including Geometric Mean Statistics (continued)

Station Name	Station Location	Date	Result	Wet/Dry	Geometric Mean
WW84	Moosup River-A	10/24/2008	9	Dry	52
UMR04	Moosup River at Plainfield Pike	9/23/2008	16	Dry	
WW84	Moosup River-A	9/19/2008	84	Dry	
WW84	Moosup River-A	8/15/2008	579	Wet	
WW84	Moosup River-A	6/6/2008	359	Wet	
WW84	Moosup River-A	5/9/2008	8	Wet	
WW84	Moosup River-A	10/16/2007	6	Dry	46
WW84	Moosup River-A	9/14/2007	34	Dry	
WW84	Moosup River-A	8/17/2007	101	Wet	
WW84	Moosup River-A	7/20/2007	2420	Wet	
WW84	Moosup River-A	6/13/2007	45	Dry	
WW84	Moosup River-A	5/10/2007	4	Dry	
WW84	Moosup River-A	10/27/2006	4	Dry	10
WW84	Moosup River-A	9/28/2006	14	Dry	
WW84	Moosup River-A	8/25/2006	54	Wet	
WW84	Moosup River-A	7/28/2006	201	Dry	
WW84	Moosup River-A	6/16/2006	16	Dry	
WW84	Moosup River-A	5/18/2006	0	Dry	
WW85	Moosup River-B	10/27/2006	2	Dry	10
WW85	Moosup River-B	9/28/2006	18	Dry	
WW85	Moosup River-B	8/25/2006	114	Wet	
WW85	Moosup River-B	7/28/2006	165	Dry	
WW85	Moosup River-B	6/16/2006	18	Dry	
WW85	Moosup River-B	5/18/2006	0	Dry	

Shaded cells indicate an exceedance of water quality criteria

* Includes a 5% Margin of Safety

† Geometric mean used to calculate percent reduction

Wet and Dry Weather Geometric Mean Enterococci Values for all Stations

Station Name	Station Location	Years Sampled	Number of Samples		Geometric Mean		
			Wet	Dry	All	Wet	Dry
WW83	Moosup River Upstream	2006-2008	11	7	76	84	66
UMR06	Moosup River - Harrington Ave at Foster Country Club (off Johnson Rd)	2008	0	1	NA	NA	NA
WW84 UMR04	Moosup River at Plainfield Pike	2006-2008	6	12	29	165	12
WW85	Moosup River-B	2006	1	5	10	NA	6

Shaded cells indicate an exceedance of water quality criteria
Weather condition determined from Weather Underground rain gage in Willimantic, CT

References

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