



West River

Watershed Description

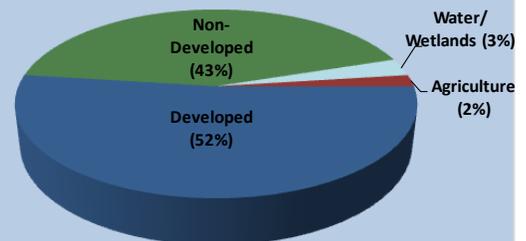
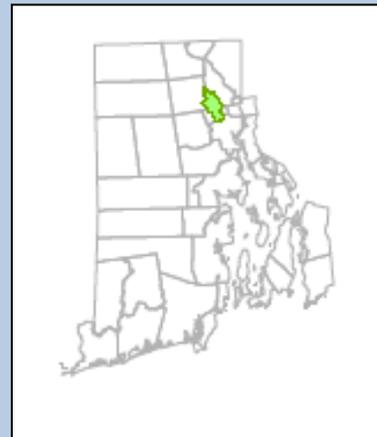
This **TMDL** applies to the West River assessment unit (RI0003008R-03B), a 9-mile long stream located in Lincoln, Smithfield, North Providence, and Providence, RI (Figure 1). The municipalities are located in the northeastern corner of the state. The West River watershed is presented in Figure 2 with land use types indicated.

The eastern branch of the West River begins near the intersection of Routes 123 and 246 on the Community College of Rhode Island campus in Lincoln, RI. The river flows southeast, crosses Twin River Road, and flows through the Twin River Casino and Lincoln Greyhound Park. This branch continues south through the Lousiquisset Golf Club, and flows into North Providence where it joins the western branch of the river near Route 15. The western branch of the West River begins near Lantern Road along the border of Lincoln and Smithfield. The river flows south, crosses Whipple and Twin River Roads, and enters the Wenscott Reservoir. The western branch of the river is not impaired upstream of the reservoir. As it leaves the reservoir, it joins with the eastern branch in North Providence. The land use in this portion of the watershed is more heavily developed (Figure 2). The river then continues into Providence where it empties into the Woonasquatucket River just west of downtown.

The West River watershed covers 7.8 square miles. The northwestern portion of the watershed is largely non-developed and has some low-density residential neighborhoods. Developed areas occupy 52% of the land area and consist of mostly medium to high-density residential neighborhoods, commercial, and transportation uses. Development is concentrated in the eastern and southern portions of the watershed. Agricultural uses occupy 2% of the land area and wetland and surface waters occupy 3%.

Assessment Unit Facts *(RI0003008R-03B)*

- **Town:** Lincoln, Smithfield, North Providence, and Providence
- **Impaired Segment Length:** 9 miles
- **Classification:** Class B
- **Direct Watershed:** 7.8 mi² (4983 acres)
- **Impervious Cover:** 22.9%
- **Watershed Planning Area:** Moshassuck (#9)



Watershed Land Uses

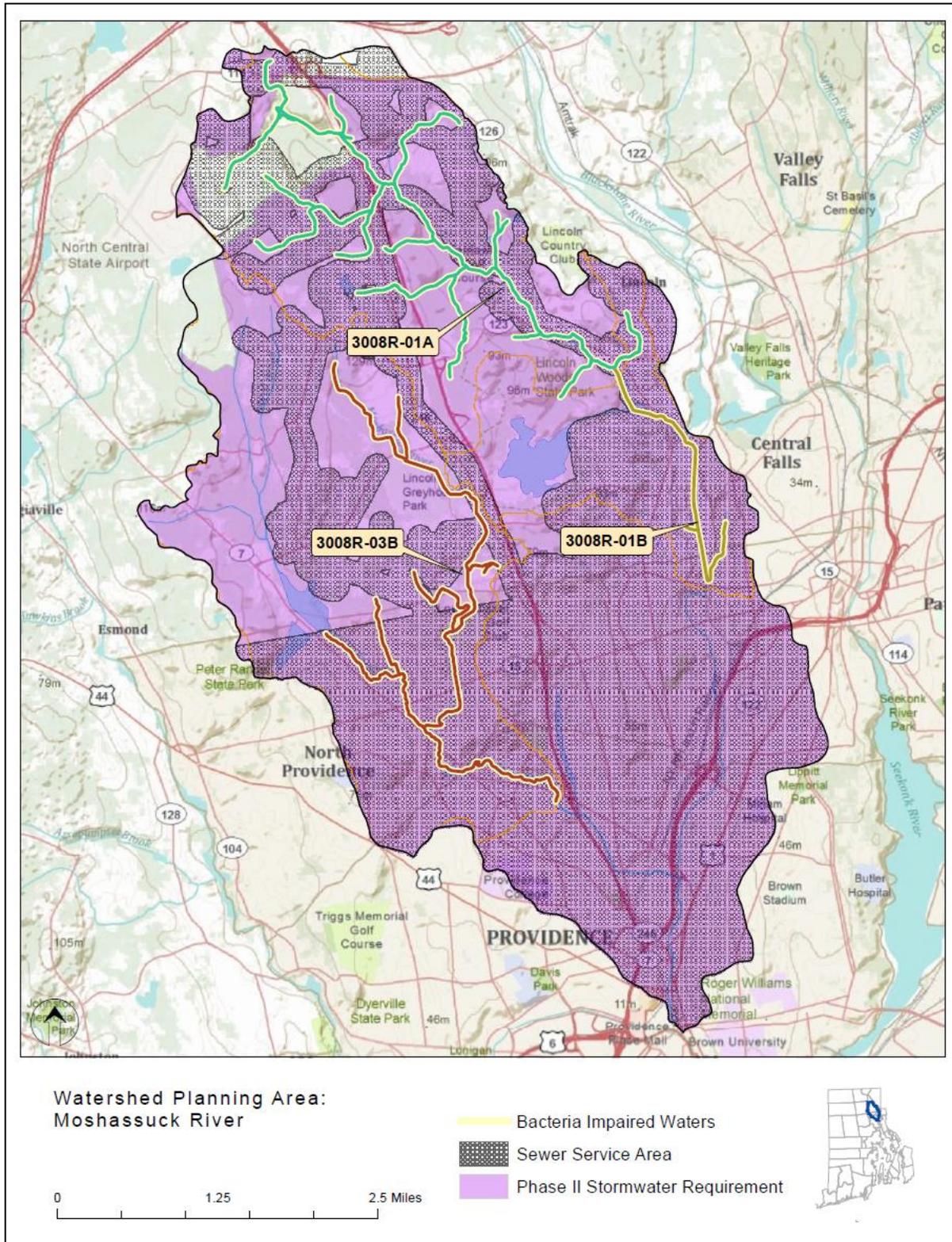


Figure 1: Map of the Moshassuck Watershed Planning Area with impaired segments addressed by the Statewide Bacteria TMDL, sewered areas, and stormwater regulated zones.

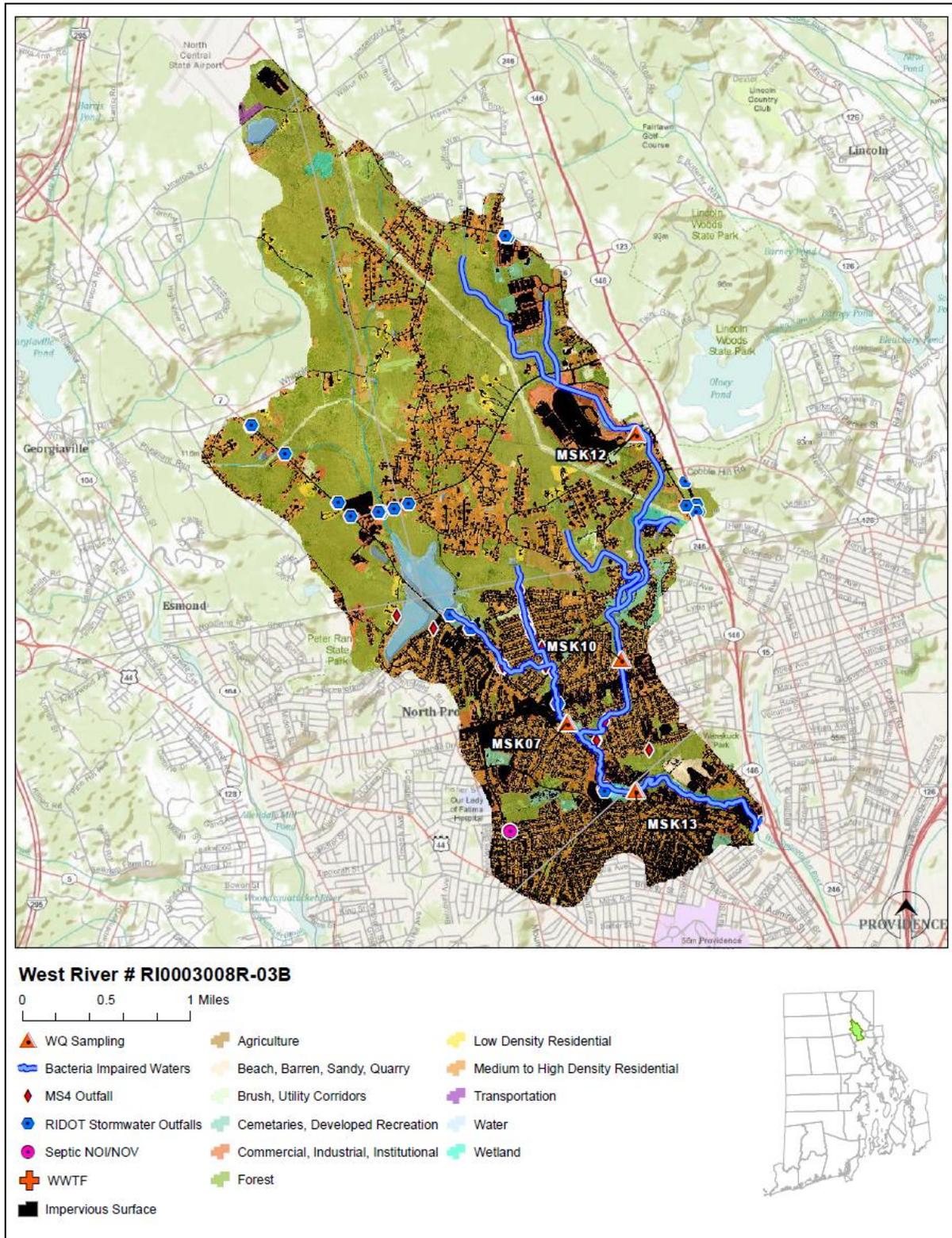


Figure 2: Map of the West River watershed with impaired segment, sampling locations, and land cover indicated.

Why is a TMDL Needed?

The West River is a Class B fresh water stream with designated uses of primary and secondary contact recreation and fish and wildlife habitat (RIDEM, 2009). From 2008-2009, water samples were collected from four sampling locations 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 all stations and exceeded the water quality criteria for enterococci at all stations except Station MSK12. This station is located just downstream of the Twin River Casino.

To aid in identifying possible bacteria sources, the geometric mean value was also calculated for wet and dry-weather sample days for both stations, where appropriate. Most samples were collected in dry-weather conditions and the dry-weather geometric mean values exceeded the water quality criteria for enterococci at all stations except MSK12.

Due to the elevated bacteria measurements presented in Table 1, the West River assessment unit does not meet Rhode Island's water quality standards. The segment was identified as impaired and 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 impairments and identifies measures needed to restore water quality. The goal is for all waterbodies to comply with state water quality standards.

The West River has also been assessed by RIDEM as impaired for biodiversity. No TMDL has been completed for this impairment.

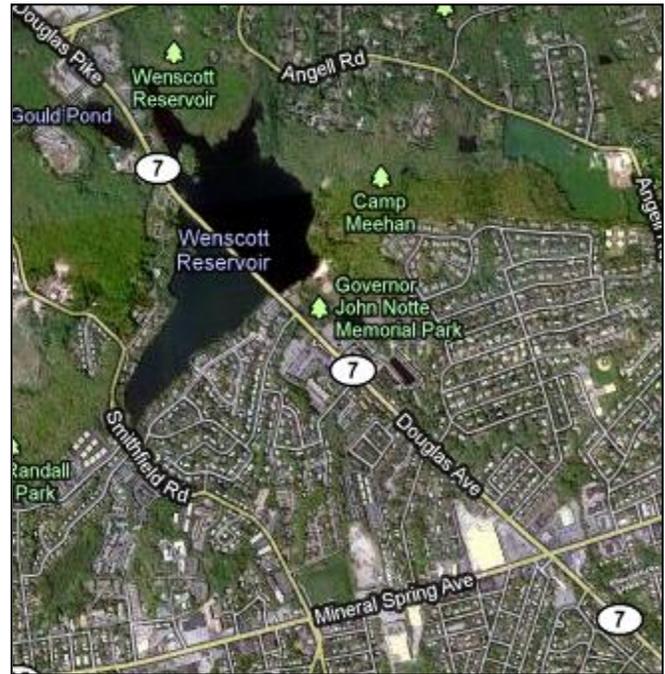


Figure 3: Partial aerial view of the West River Watershed (Source: Google Maps)

Potential Bacteria Sources

Previous investigations have concluded that there are several potential sources of bacteria in the West River watershed including stormwater runoff from developed areas, illicit discharges, malfunctioning onsite wastewater treatment systems, agricultural activities, and wildlife and domestic animal waste (C&E, 2004). Each type of potential bacteria sources is described briefly below.

Developed Area Stormwater Runoff

Impervious surfaces in the West River watershed cover approximately 22.9 % and are located primarily in commercial and residential areas in the eastern and southern portions of the watershed. 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.

As part of Phase II requirements, Lincoln, Smithfield, North Providence, and Providence have mapped outfalls to surface water bodies, including the West River. The Rhode Island Department of Transportation (RIDOT) has also mapped stormwater outfalls within the West River watershed. Multiple outfalls have been identified within the watershed, particularly in North Providence and Providence and along major roads (Figure 2). As stormwater is known to carry a suite of pollutants, including bacteria, stormwater runoff is a likely source of bacteria to the West River.

Onsite Wastewater Treatment Systems

The West River watershed is mostly sewered, but also relies partially on onsite wastewater treatment systems (OWTS), such as septic systems and cesspools. As shown in Figure 2, one OWTS Notice of Violation/Notice of Intent to Violate has been issued by the RIDEM Office of Compliance and Inspection within the West River watershed. Failing OWTS can be significant sources of bacteria by allowing improperly treated waste to reach surface waters (RI HEALTH, 2003).

Sewer Leaks

As shown in Figure 1, sewered areas in the Town of Lincoln and Smithfield follow major roadways in the northern portion of the watershed. The southern portion of the watershed, including North Providence and Providence are completely serviced by a municipal sanitary sewer system and includes sewer lines directly adjacent to this impaired segment. Municipal wastewater is treated within the Narragansett Bay Commission system and discharged to the Providence River (Berger, 2004). The

extensive sewage collection system within the watershed increases the risk of sewer system leaks and subsequent contamination.

Waterfowl, Wildlife, and Domestic Animal Waste

Non-developed land accounts for 43% of the watershed area. The West River flows through the Lincoln Greyhound Park and multiple ponds throughout the watershed which are home to various species of wildlife and waterfowl. Continued development and encroachment into wildlife areas can cause densities to increase and animal waste to be more prevalent closer to the river. 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.

Domestic animals are also potential sources of bacteria to the West River. Medium to high-density residential developments are common throughout the watershed. If residents are not properly disposing of pet waste, the bacteria associated with that waste could enter and contaminate the stream.

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 West 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 would also be beneficial.

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

Stormwater Management

The Town of Lincoln (RIPDES permit RIR040021), the Town of Smithfield (RIPDES permit RIR040034), the Town of North Providence (RIPDES permit RIR040007), the City of Providence (RIPDES permit RIR040005), and RIDOT (RIPDES permit RIR040036) are municipal separate storm sewer (MS4) operators in the West River watershed and have prepared the required Phase II Stormwater Management Plans (SWMPP). The entire watershed is included in the regulated area.

Lincoln, Smithfield, North Providence, and Providence SWMPPs outline goals for the reduction of stormwater runoff to the West River 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 municipalities' catch basins, implementing annual street sweeping programs, adopting construction erosion and sediment control and post-construction stormwater control ordinances, and conducting public education activities (RIDEM, 2010a).

The Town of Lincoln and the City of Providence have adopted illicit discharge detection and elimination ordinances (RIDEM, 2010a; Berger, 2004). This type of ordinance prohibits illicit discharges to the MS4 and provides an enforcement mechanism. The municipalities should continue to prioritize areas to identify and eliminate illicit discharges in the West River watershed. Illicit discharges can be identified through continued dry-weather outfall sampling and microbial source tracking. It is recommended that both Smithfield and North Providence develop similar IDDE ordinances to help protect the West River watershed.

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 the West River, additional efforts are needed to restore the river's water quality. As mentioned previously, the West River watershed has an impervious cover of 22.9%, 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. The municipalities and RIDOT should also evaluate whether the six minimum measures alone are sufficient to meet the bacteria reduction targets. Per Part IV.D of the General Permit, the MS4 operators should ensure that their minimum measures are consistent with the recommendation of Section 6.2 of the Core TMDL Document. 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.

The municipalities should continue to implement the goals of their Phase II SWMPP including dry-weather sampling, extensive street and catch basin cleaning, and public education activities. RIDOT should also continue to implement the goals of its Phase II SWMPP.

Onsite Wastewater Management

Though a large portion of the West River watershed is sewered, a portion of the watershed in Lincoln and Smithfield relies on OWTS (Figure 1). Currently, the Town of Smithfield has a draft Onsite Wastewater Management Plan. The Town of Lincoln does not have an Onsite Wastewater Management Plan. Neither town has an OWTS ordinance. As part of the onsite wastewater planning process, Lincoln and Smithfield 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 Lincoln is currently not eligible for Rhode Island's Community Septic System Loan Program (CSSLP). It is recommended that the town develop a program to assist citizens with the replacement of older and failing systems.

Sewer Leaks

Wastewater from the Lincoln, Smithfield, North Providence, and Providence is treated by the Narragansett Bay Commission (NBC) (C&E, 2006). The system should be monitored for overextension and capacity limitations with a growing population. Aging wastewater infrastructure tasked with increasing loads is at a higher risk of rupture. If not already in place, the municipalities should develop a plan to identify leaks in the sewer system.

Waterfowl, Wildlife, and Domestic Animal Waste

The municipalities' education and outreach programs should highlight the importance of picking up after dogs and other pets. The towns should also incorporate educational materials focused on not feeding waterfowl, particularly around the small impoundments within the watershed, as part of their Phase II plan. Animal wastes should be disposed of away from any waterway or stormwater drainage system. The municipalities should work with volunteers from the town to map locations where animal waste is a significant and 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 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 also take several measures to minimize waterfowl-related impacts. They can allow tall, coarse vegetation to grow in areas along the shores of the many small impoundments along the streams course, which 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 West River and can harm human health and the environment.

Land Use Protection

Woodland and wetland areas within the West River 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 a large portion of the land use in the West River watershed, it is important to preserve these undeveloped areas, and to institute controls on development in West River watershed.

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

Table 1: West River Bacteria Data

Waterbody ID: RI0003008R-03B

Watershed Planning Area: 9 – Hunt River

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: 91% (Includes 5% Margin of Safety)

Data: 2008-2009 from RIDEM

Single Sample Enterococci (colonies/100 mL) Results for the West River (2008-2009) with Geometric Mean Statistics

Station Name	Station Location	Date	Result	Wet/Dry	Geometric Mean
MSK12	Unnamed Trib below Twin Rivers (Paul St) (West River & Tribs 3B)	8/17/2009	72	Dry	38
MSK12	Unnamed Trib below Twin Rivers (Paul St) (West River & Tribs 3B)	8/5/2009	78	Wet	
MSK12	Unnamed Trib below Twin Rivers (Paul St) (West River & Tribs 3B)	7/14/2009	26	Dry	
MSK12	Unnamed Trib below Twin Rivers (Paul St) (West River & Tribs 3B)	5/12/2009	11	Dry	
MSK12	Unnamed Trib below Twin Rivers (Paul St) (West River & Tribs 3B)	9/18/2008	49	Dry	

Single Sample Enterococci (colonies/100 mL) Results for the West River (2008-2009) with Geometric Mean Statistics (continued)

Station Name	Station Location	Date	Result	Wet/Dry	Geometric Mean
MSK10	Unnamed Trib below Louisquissett Golf Course on Benjamin Ave, off Mineral Spring Ave (West River & Tribs - 3B)	8/17/2009	291	Dry	103
MSK10	Unnamed Trib below Louisquissett Golf Course on Benjamin Ave, off Mineral Spring Ave (West River & Tribs - 3B)	8/5/2009	66	Wet	
MSK10	Unnamed Trib below Louisquissett Golf Course on Benjamin Ave, off Mineral Spring Ave (West River & Tribs - 3B)	7/14/2009	104	Dry	
MSK10	Unnamed Trib below Louisquissett Golf Course on Benjamin Ave, off Mineral Spring Ave (West River & Tribs - 3B)	5/12/2009	59	Dry	
MSK10	Unnamed Trib below Louisquissett Golf Course on Benjamin Ave, off Mineral Spring Ave (West River & Tribs - 3B)	9/18/2008	96	Dry	
MSK07	West River at end of Alexander Street off of Mineral Spring Ave, near Rte 7	8/17/2009	770	Dry	399 [†] (91%)*
MSK07	West River at end of Alexander Street off of Mineral Spring Ave, near Rte 7	8/5/2009	517	Wet	
MSK07	West River at end of Alexander Street off of Mineral Spring Ave, near Rte 7	7/14/2009	461	Dry	
MSK07	West River at end of Alexander Street off of Mineral Spring Ave, near Rte 7	5/12/2009	185	Dry	
MSK07	West River at end of Alexander Street off of Mineral Spring Ave, near Rte 7	9/18/2008	299	Dry	
MSK13	West River at Douglas Ave at outlet of Geneva Pond (8 sq. mi.)	8/17/2009	411	Dry	223
MSK13	West River at Douglas Ave at Geneva Pond Outlet (8 sq. mi.)	8/4/2009	291	Dry	
MSK13	West River at Douglas Ave at Geneva Pond Outlet (8 sq. mi.)	7/17/2009	248	Dry	
MSK13	West River at Douglas Ave at Geneva Pond Outlet (8 sq. mi.)	5/12/2009	260	Dry	
MSK13	West River at Douglas Ave at Geneva Pond Outlet (8 sq. mi.)	9/22/2008	71	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
MSK12	Unnamed Trib below Twin Rivers (Paul St) (West River & Tribs 3B)	2008-2009	1	4	38	NA	31
MSK10	Unnamed Trib below Louisquissett Golf Course on Benjamin Ave, off Mineral Spring Ave (West River & Tribs - 3B)	2008-2009	1	4	103	NA	115
MSK07	West River at end of Alexander Street off of Mineral Spring, near Rte 7	2008-2009	1	4	399	NA	374
MSK13	West River at Douglas Ave at Geneva Pond Outlet (8 sq. mi.)	2008-2009	0	5	223	NA	223

Shaded cells indicate an exceedance of water quality criteria

Weather condition determined from the Weather Underground rain gage in Lincoln, RI

References

- Berger (2004). Phase II Stormwater Management Plan. Wastewater Management Plan: Town of Lincoln, Rhode Island. Submitted by The Louis Berger Group, Inc, Providence, RI. February 2004.
- C&E (2006). Final Wastewater Facilities Plan. Town of Lincoln, Rhode Island. Submitted by C&E Engineering Partners, Inc, Woonsocket, RI. November 2006.
- Friends of the Moshassuck (2008). Online <http://www.themoshassuck.org/>
- NBEP (2011). West River Watershed. Status and Trends. Narragansett Bay Estuary Program.
- RIDEM (2008). State of Rhode Island and Providence Plantations 2008 303(d) List – List of Impaired Water Bodies. Rhode Island Department of Environmental Management.
- RIDEM (2009). State of Rhode Island and Providence Plantations Water Quality Regulations. Amended December, 2009. Rhode Island Department of Environmental Management.
- RIDEM (2010). MS4 Compliance Status Report for RI Statewide Bacteria TMDL. Rhode Island Department of Environmental Management.
- RIHEALTH (2003). Cumberland, Lincoln, and Pawtucket Source Water Assessment. University of Rhode Island Cooperative Extension in cooperation with Rhode Island Department of Health Source Water Assessment Program, Office of Drinking Water Quality.
- Town of Lincoln (2003). Town of Lincoln Comprehensive Plan. Prepared by the Lincoln Planning Board and the Lincoln Comprehensive Plan Update Advisory Committee. Updated 2003.
- USEPA (2002). Onsite Wastewater Treatment Systems Manual – Office of Water, Office of Research and Development – EPA/625/R-00/008. Online: www.epa.gov/owm/septic/pubs/septic_2002_osdm_all.pdf.