



White Horn Brook

Watershed Description

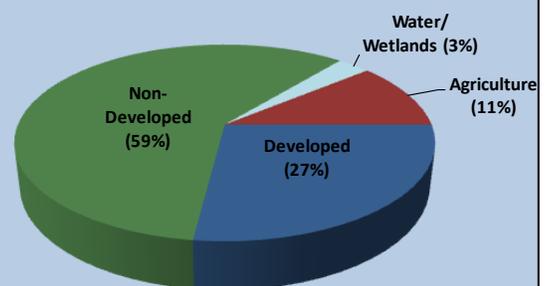
This **TMDL** applies to the White Horn Brook assessment unit (RI0008039R-27B), a 4.7-mile long stream located in South Kingstown, RI (Figure 1). The Town of South Kingstown is located in the southern portion of the state. White Horn Brook is located in the northern section of town. The White Horn Brook watershed is presented in Figure 2 with land use types indicated.

White Horn Brook begins in a developed area in the northern section of South Kingstown, just south of Flagg Road. The brook flows south through the University of Rhode Island campus and crosses Route 138. The brook continues southeast, parallel to Route 110, through a predominately agricultural area to the east of Larkin Pond. White Horn Brook then enters the western edge of the Great Swamp Management Area through the Genesee Swamp, and ends in a wetland area east of Worden Pond.

The White Horn Brook watershed covers 4 square miles. Non-developed areas occupy a large portion (59%) of the watershed, including the Great Swamp Management Area. As shown in Figure 3, developed uses (including residential and commercial uses and the University of Rhode Island campus) occupy approximately 27%. Agricultural land uses occupy 11%. Wetlands and other surface waters, including Larkin Pond occupy 3%. Impervious surfaces cover a total of 13.4%.

Assessment Unit Facts (RI0008039R-27B)

- **Town:** South Kingstown
- **Impaired Segment Length:** 4.7 miles
- **Classification:** Class B
- **Direct Watershed:** 4 mi² (2536 acres)
- **Impervious Cover:** 13.4%
- **Watershed Planning Area:** Wood - Pawcatuck (#23)



Watershed Land Uses

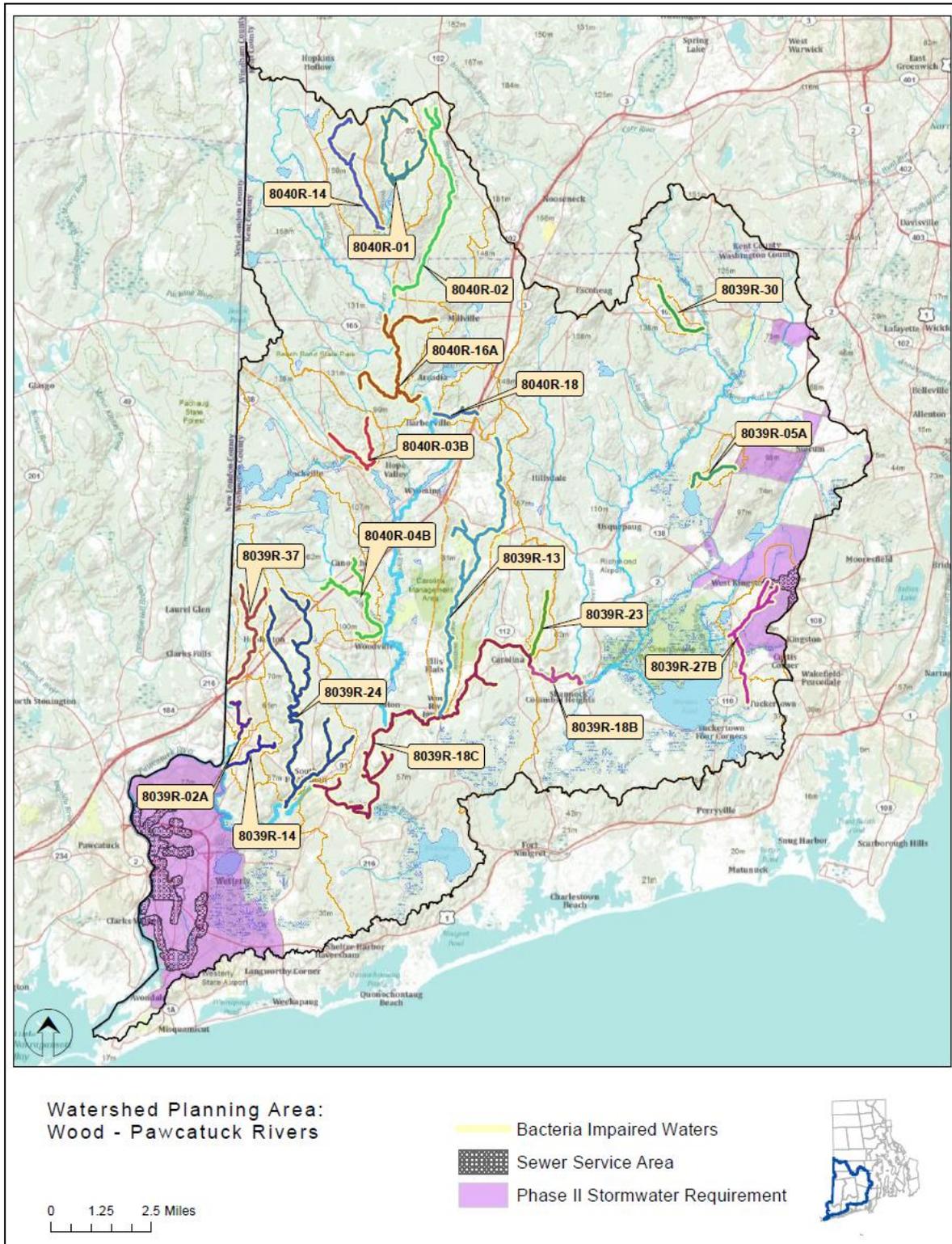


Figure 1: Map of the Wood-Pawcatuck Watershed Planning Area with impaired segments addressed by the Statewide Bacteria TMDL, sewered areas, and stormwater regulated zones.

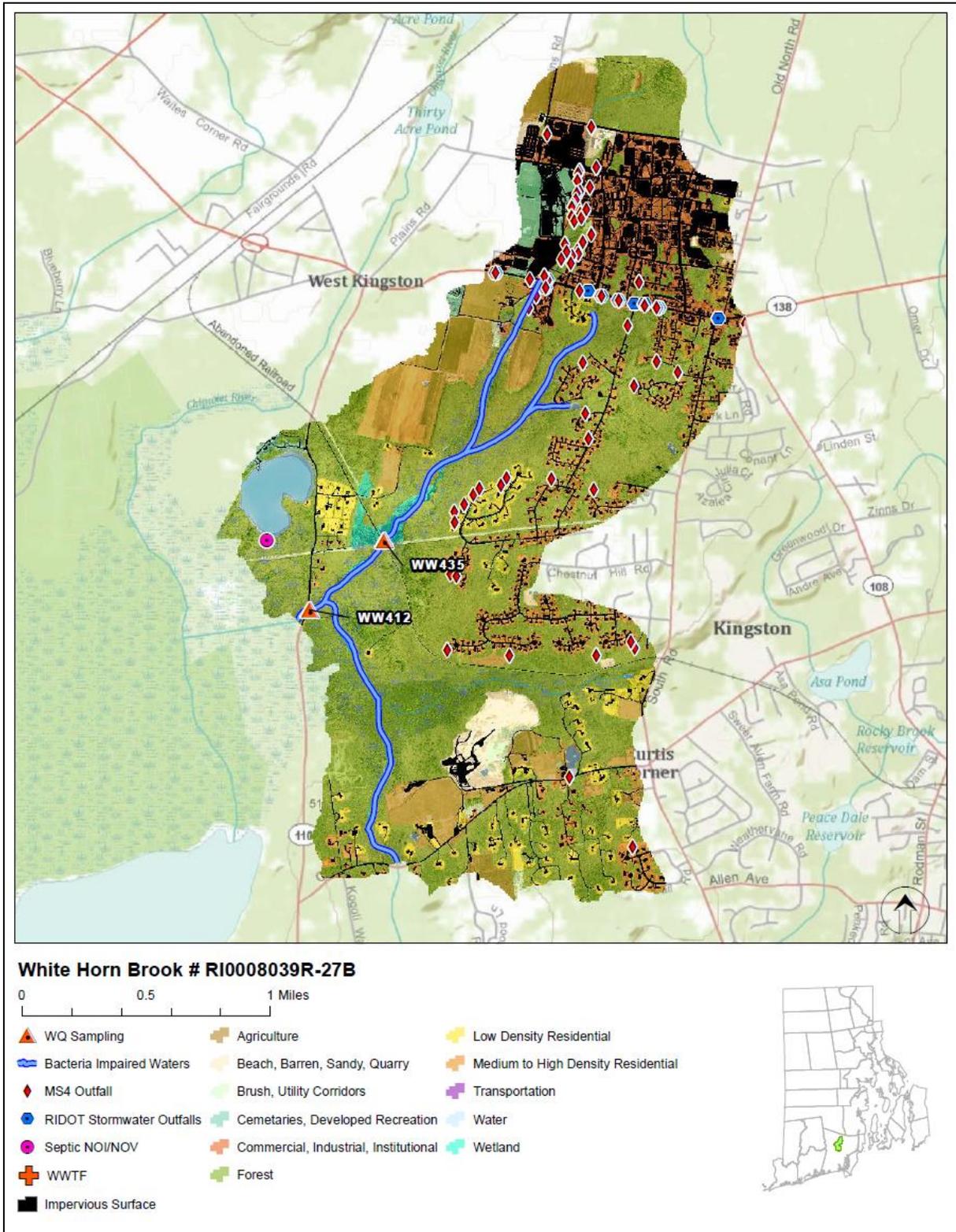


Figure 2: Map of the White Horn Brook watershed with impaired segment, sampling locations, and land cover indicated.

Why is a TMDL Needed?

White Horn Brook is a Class B freshwater 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 two sampling locations (WW412 and WW435) and analyzed for the indicator bacteria, enterococci. The water quality criteria for enterococci, along with bacteria sampling results from 2007-2008 and associated statistics are presented in Table 1. The geometric mean was calculated for both stations and exceeded water quality criteria for enterococci.

To aid in identifying possible bacteria sources, the geometric mean was also calculated for each station for wet-weather and dry-weather sample days, where appropriate. Wet and dry geometric mean values exceeded the water quality criteria for enterococci at both stations. Wet-weather values were higher than dry-weather values at both stations, with the highest value at station WW412. Possible bacteria 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.

Due to the elevated bacteria measurements presented in Table 1, White Horn 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.



Figure 3: Partial aerial view of the White Horn Brook watershed (Source: Google Maps)

Potential Bacteria Sources

There are several potential sources of bacteria in the White Horn Brook watershed including stormwater runoff from developed areas, illicit discharges from leaking sewer pipes, malfunctioning onsite wastewater treatment systems, agricultural activities, and waterfowl, wildlife, and domestic animal waste.

Onsite Wastewater Treatment Systems

Most residents in the White Horn Brook watershed rely on onsite wastewater treatment systems (OWTS) such as cesspools and septic systems. A small section of the watershed, located in and around the University of Rhode Island campus, relies on municipal sewer systems. 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). 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 in the White Horn Brook 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.

Illicit Discharges

Other illicit discharges, or any discharge to a municipal separate storm sewer system (MS4) that is not composed entirely of stormwater, may also be contributing bacteria to White Horn Brook. As shown in Figure 2, multiple MS4 outfalls have been identified along the brook.

Developed Area Stormwater Runoff

Though most of the White Horn Brook watershed is undeveloped, the headwaters of the brook originate in a heavily developed area in the center of the University of Rhode Island campus. The White Horn Brook watershed has an impervious cover of 13.4%. 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, the Rhode Island Department of Transportation (RIDOT), University of Rhode Island, and the Town of South Kingstown have identified and mapped all stormwater outfalls in the White Horn Brook watershed. Multiple stormwater outfalls are found in the watershed, particularly along major highways and in the eastern portion of the watershed. As stormwater is known to carry a suite of pollutants, including bacteria, stormwater is a likely source of bacterial contamination to White Horn Brook.

Agricultural Activities

Agricultural operations are an important economic activity and landscape feature in the state's rural areas. Agricultural land use occupies 11% of the land area in the White Horn Brook watershed. Much of this land is adjacent to White Horn Brook, particularly near the intersection of Route 138 and Route 110, just northwest of Larkin Pond. Agricultural runoff may contain multiple pollutants, including bacteria, and may be contributing bacteria to White Horn Brook.

Waterfowl, Wildlife, and Domestic Animal Waste

The White Horn Brook watershed is predominately undeveloped, particularly in the southern portion of the watershed in the Great Swamp Management Area. These large wetland and surface water areas are also home to various wildlife and waterfowl. 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 northern section of the brook. Waste from domestic animals such as dogs, may also be contributing to bacteria concentrations in White Horn Brook.

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 White Horn Brook 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

Many residents of the White Horn Brook watershed rely on OWTS (septic systems or cesspools). The Town of South Kingstown has an approved Onsite Wastewater Management Plans that provides a framework for managing the OWTS. As all of the drinking water for the Town of South Kingstown comes from groundwater, the town is particularly interested in protecting the quality of their groundwater through measures such as limiting contamination from OWTS. As such, the Town of South Kingstown has 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). South Kingstown should continue to track the maintenance history of all OWTS, and enforce the inspection and pump-out ordinance.

The Town of South Kingstown is eligible for Rhode Island's Community Septic System Loan Program (CSSLP). South Kingstown has obtained 1.2 million dollars in CSSLP money since 2002. The CSSLP program provides low-interest loans to residents to help with maintenance and replacement of OWTS. South Kingstown should also continue to provide funds to residents through CSSLP.

Stormwater Management

The Town of South Kingstown (RIPDES permit RIR040037), the University of Rhode Island (RIPDES permit RIR040019), and RIDOT (RIPDES permit RIR040036) are municipal separate storm sewer (MS4) operators in the White Horn Brook watershed and have prepared the required Phase II

Stormwater Management Plans (SWMPP). Only the eastern portion of the watershed is regulated by the Phase II program.

South Kingstown's SWMPP outlines goals for the reduction of stormwater runoff to White Horn 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).

In 2010, South Kingstown also adopted an illicit discharge detection and elimination ordinance (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.

URI's SWMPP outlines its stormwater program goals through the implementation of BMPs. URI has mapped its stormwater outfalls and instituted an inspection and cleaning program for its catch basins. URI also has policies in place to prohibit and enforce illicit discharges to the MS4 and has policies to ensure construction erosion and sediment control and post-construction stormwater control activities are appropriate and in place (RIDEM, 2010a).

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. Stormwater Management 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 mentioned previously, the White Horn Brook watershed has an impervious cover of 13.4%, a level where stormwater impacts are expected. At this threshold, RIDEM is requiring 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 continue to comply with and adapt the minimum measures to reflect the bacteria impairments in the regulated areas. Information regarding plans to revise the post construction ordinance should be documented in a TMDL Implementation Plan (TMDL IP). Unless

otherwise noted in this waterbody summary, any other TMDL IP requirements described in Section 6.2 of the Core TMDL Document are not applicable to the MS4 operators for watershed areas having impervious cover between 10 and 15 %. Information regarding how the MS4 operators' minimum measures are addressing the pollutant of concern (i.e. bacteria) should be documented in the MS4 operators' annual report, consistent with Part IV.G.2.d of the RIPDES General Permit (RIDEM, 2010b). Further detail is also included in Sections 6.3 of the core document.

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 Routes 110 and 138, to ensure that there are 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.

Waterfowl, Wildlife, and Domestic Animal Waste

South Kingstown's 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. South Kingstown should work with volunteers to map locations where animal waste is a significant and chronic problem. This work should be incorporated into the town's 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 White Horn 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 White Horn Brook and can harm human health and the environment.

Land Use Protection

Woodland and wetland areas within the White Horn Brook watershed, particularly in the southern portion of the watershed in the Great Swamp Management Area, 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 White Horn Brook 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 White Horn Brook.

Table 1: White Horn Brook Bacteria Data

Waterbody ID: RI0008039R-27B

Watershed Planning Area: 23 – Wood-Pawcatuck

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: 52% (Includes 5% Margin of Safety)

Data: 2007-2008 from RIDEM

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

Station Name	Station Location	Date	Result	Wet/Dry	Geometric Mean
WW435	White Horn Brook @ Bike Trail	10/25/2008	42	Dry	102[†] (52%)*
WW435	White Horn Brook @ Bike Trail	9/20/2008	155	Dry	
WW435	White Horn Brook @ Bike Trail	8/25/2008	38	Dry	
WW435	White Horn Brook @ Bike Trail	6/7/2008	190	Wet	
WW435	White Horn Brook @ Bike Trail	5/10/2008	411	Wet	
WW435	White Horn Brook @ Bike Trail	9/15/2007	157	Wet	
WW435	White Horn Brook @ Bike Trail	8/18/2007	39	Dry	
WW412	White Horn Brook @ Ministerial Rd.	10/25/2008	15	Dry	81
WW412	White Horn Brook @ Ministerial Rd.	9/20/2008	1414	Dry	
WW412	White Horn Brook @ Ministerial Rd.	8/25/2008	81	Dry	
WW412	White Horn Brook @ Ministerial Rd.	6/7/2008	43	Wet	
WW412	White Horn Brook @ Ministerial Rd.	5/10/2008	36	Wet	
WW412	White Horn Brook @ Ministerial Rd.	9/15/2007	1298	Wet	
WW412	White Horn Brook @ Ministerial Rd.	8/18/2007	245	Dry	
WW412	White Horn Brook @ Ministerial Rd.	7/16/2007	20	Dry	
WW412	White Horn Brook @ Ministerial Rd.	5/12/2007	9	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 Enterococci Values for all Stations

Station Name	Station Location	Years Sampled	Number of Samples		Geometric Mean		
			Wet	Dry	All	Wet	Dry
WW435	White Horn Brook @ Bike Trail	2007-2008	3	4	102	230	56
WW412	White Horn Brook @ Ministerial Rd.	2007-2008	3	6	81	126	64
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. (2006). Town of South Kingstown, Regional Facilities Plan for Wastewater Management (August 2006).
- 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 (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 South Kingstown (2011). Onsite Wastewater Management Program. Online: <http://www.southkingstownri.com/town-government/municipal-departments/public-services/onsite-wastewater-management>