



Tomaquag Brook

Watershed Description

This **TMDL** applies to the Tomaquag Brook assessment unit (RI0008039R-24), a 13.6-mile long stream located in Hopkinton, RI (Figure 1). The Town of Hopkinton is located in the southwestern corner of the state and is bordered by Connecticut to the east and Westerly, RI, to the south. Tomaquag Brook is located in the southwestern section of town. The Tomaquag Brook watershed is presented in Figure 2 with land use types indicated.

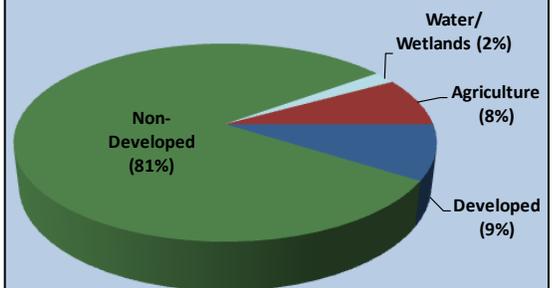
Two northern branches of Tomaquag Brook begin in a forested area just north of Route 3 and Interstate 95 (I-95). Both branches flow south and cross low-density residential communities along Route 3. The western branch of the brook continues south through an area of mixed forested and agricultural land use. The eastern branch flows south past a horse hay farm and into an unnamed pond near Woodville Road. This branch of the brook then continues south through land owned by Thompson Lumber Company. The two branches continue south and join just south of Collins Road.

Another eastern branch of Tomaquag Brook begins in a forested area just east of Bradford Woodville Road. This branch of the brook flows southwest through agricultural and forested areas before it joins with the northern branch near the intersection of Route 216 and Chase Hill Road. Tomaquag Brook then empties into the Pawcatuck River along the border with the Town of Westerly.

The Tomaquag Brook watershed covers 8.5 square miles. Non-developed areas occupy a large portion (81%) of the watershed. Developed uses (including residential, commercial, and transportation uses) cover approximately 9%. Agricultural land uses occupy 8% and wetlands and other surface waters cover 2%.

Assessment Unit Facts (RI0008039R-24)

- **Town:** Hopkinton
- **Impaired Segment Length:** 13.6 miles
- **Classification:** Class A
- **Direct Watershed:** 8.5 mi² (5458 acres)
- **Impervious Cover:** 3.6%
- **Watershed Planning Area:** Wood – Pawcatuck (#23)



Watershed Land Uses

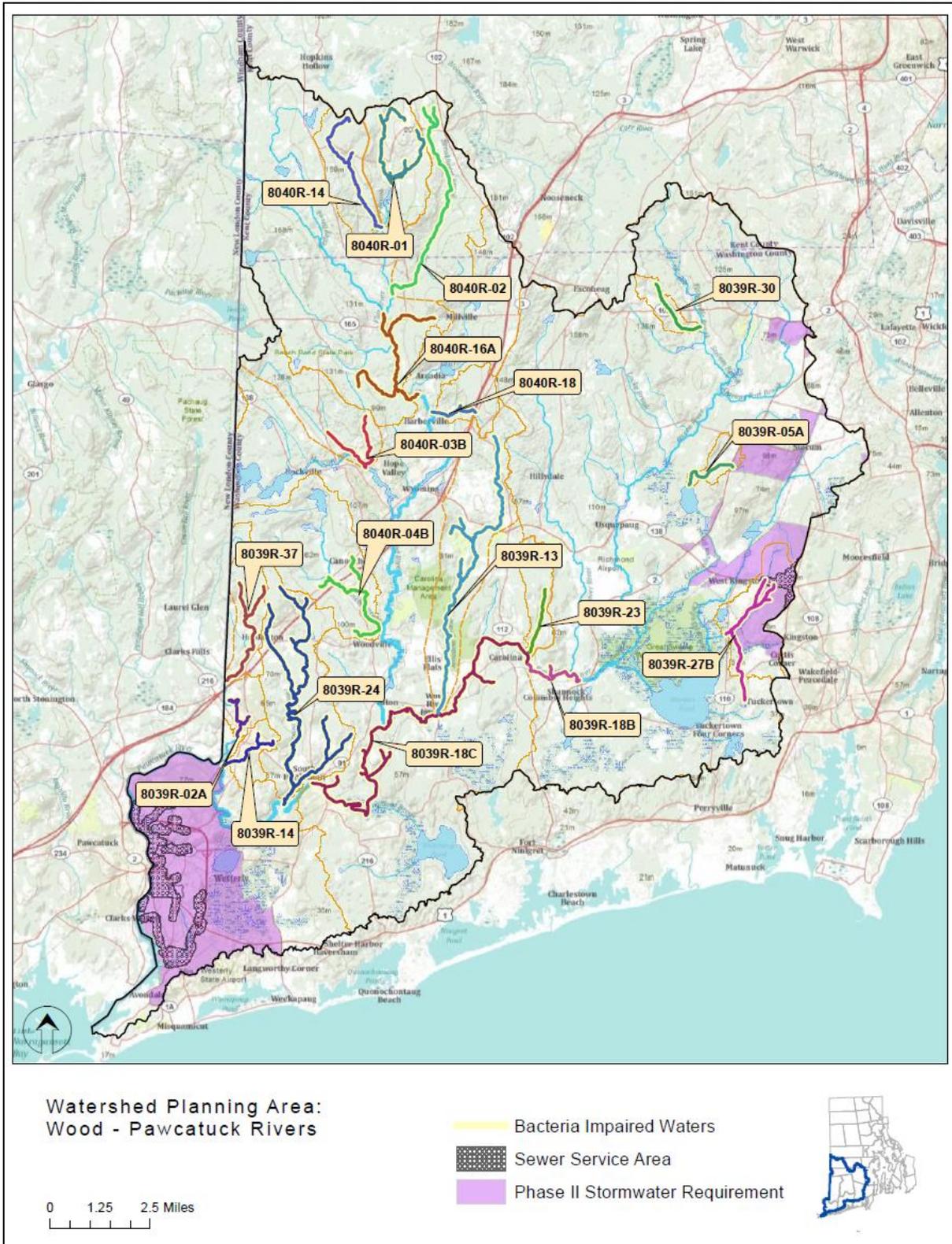


Figure 1: Map of the Wood-Pawcatuck Watershed Planning Area with impaired segments addressed by the Statewide Bacteria TMDL, sewer service areas, and stormwater regulated zones.

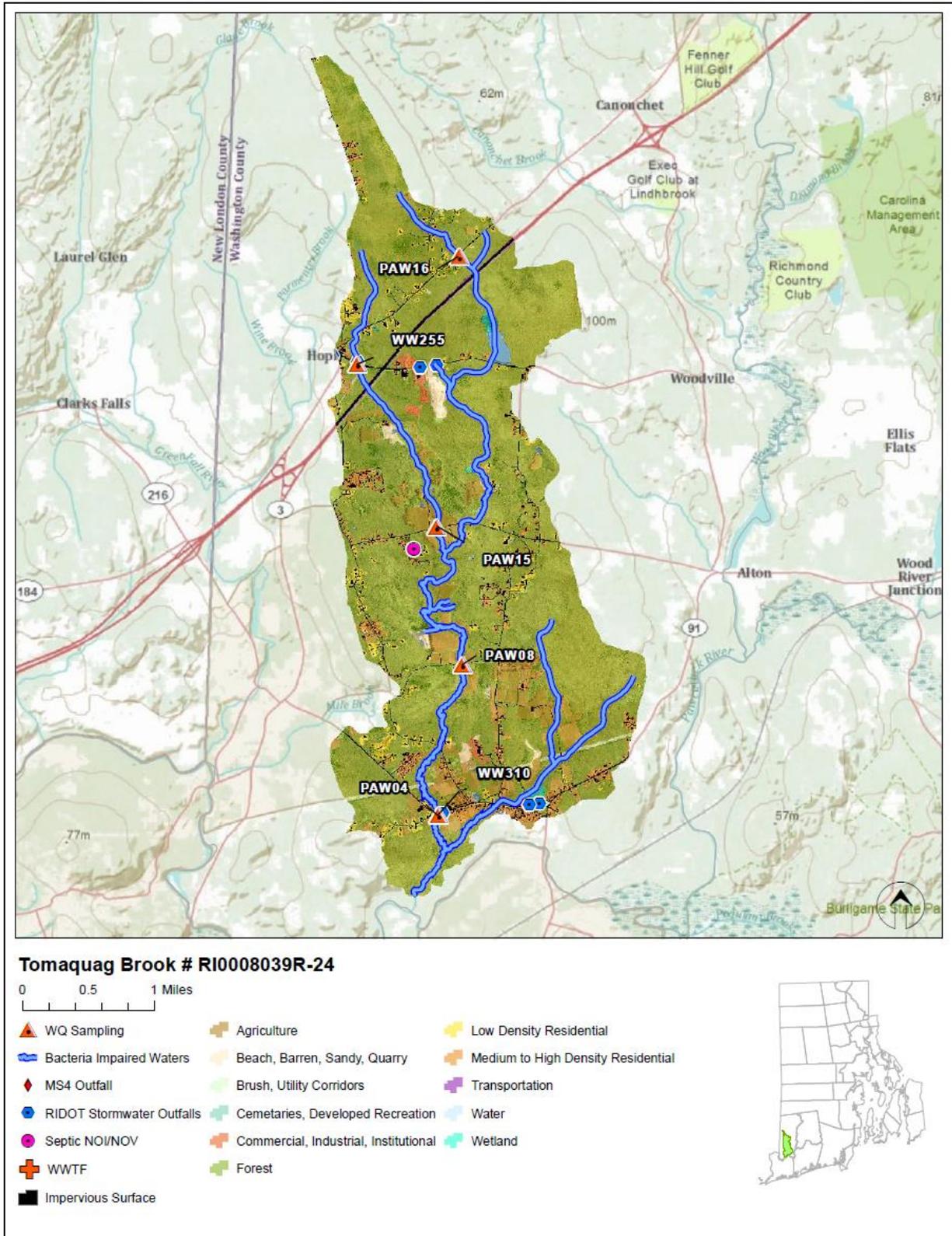


Figure 2: Map of the Tomaquag Brook watershed with impaired segment, sampling locations, and land cover indicated.

Why is a TMDL Needed?

Tomaquag Brook 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 2005-2008, water samples were collected from five sampling locations and analyzed for the indicator bacteria, enterococci. The water quality criteria for enterococci, along with bacteria sampling results from 2005-2008 and associated statistics are presented in Table 1. The geometric mean statistical metric was calculated for all stations and exceeded the water quality criteria at three of the five stations. The two stations that comply with water quality standards are located near the headwaters of the northern branch of the brook.

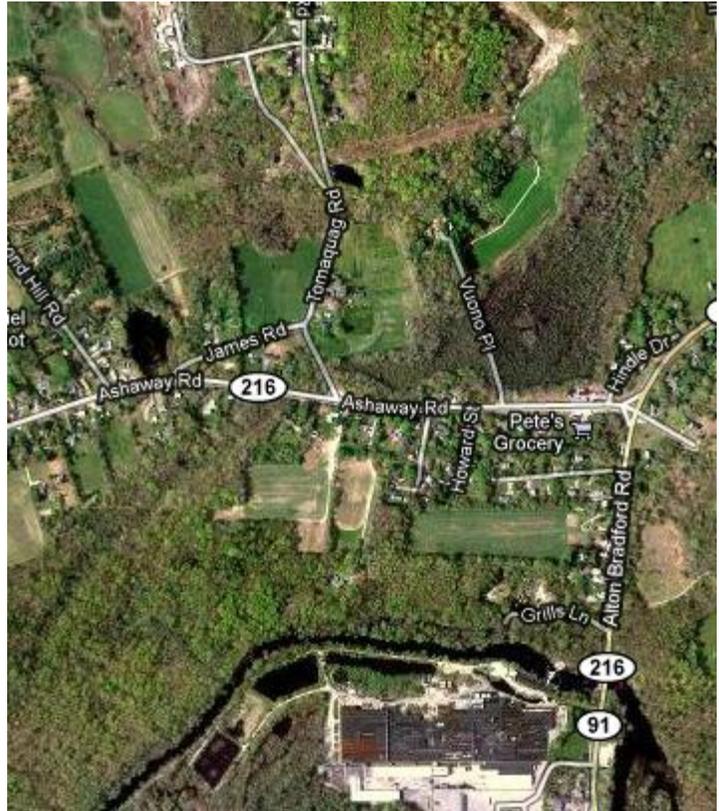


Figure 3: Partial aerial view of the Tomaquag Brook watershed. (Source: Google Maps)

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. Most stations were only sampled in dry-weather conditions, and thus, any exceedance of water quality standards suggests dry weather sources. However, both wet and dry geometric mean values exceeded the water quality criteria for enterococci at the downstream station (WW310). This station had the highest overall geometric mean of all sampling stations on Tomaquag Brook, and the wet-weather geometric mean was much higher than the dry-weather geometric mean at this station.

Due to the elevated bacteria measurements presented in Table 1, Tomaquag Brook does not meet Rhode Island's bacteria water quality standards, is 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 Tomaquag Brook watershed including malfunctioning onsite wastewater disposal systems, agricultural activities and stormwater runoff from developed areas. Other sources include waterfowl, wildlife, and domestic animal waste.

Onsite Wastewater Treatment Systems

All residents in the Tomaquag Brook 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, one OWTS Notice of Violation/Notice of Intent to Violate (NOV/NOI) has been issued by the RIDEM Office of Compliance and Inspection in the Tomaquag Brook watershed.

Agricultural Activities

Agricultural operations are an important economic activity and landscape feature in the state's rural areas. The Tomaquag Brook watershed has multiple agricultural operations, particularly in the southern portion of the watershed, including many near the banks of the brook. Agricultural runoff may contain multiple pollutants, including bacteria. 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.

Developed Area Stormwater Runoff

Only a small portion of the Tomaquag Brook watershed is developed and most of the development is concentrated along major roads in the watershed. The Tomaquag Brook watershed has an impervious cover of 3.6%. 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 of the potential for adverse stormwater impacts. While runoff from impervious areas in these portions of the watershed may be contributing bacteria to Tomaquag Brook, 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.

The Rhode Island Department of Transportation (RIDOT) has identified and mapped stormwater outfalls within the Town of Hopkinton, including those for I-95 and Route 3. As shown in Figure 2, multiple outfalls are found in the Tomaquag Brook watershed.

Wildlife and Waterfowl Waste

Approximately 80% of the Tomaquag Brook watershed is undeveloped. 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.

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 Tomaquag Brook watershed. These activities could 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 Town of Hopkinton and the Tomaquag Brook watershed rely on OWTS (septic systems or cesspools). The Town of Hopkinton has a draft Onsite Wastewater Management Plan that provides a framework for managing the OWTS. As part of the onsite wastewater planning process, Hopkinton should adopt ordinances to establish enforceable mechanisms to ensure that existing OWTS are properly operated and maintained. RIDEM recommends that communities create an inventory of onsite systems through mandatory inspections. Inspections help 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 develop an initial inventory of OWTS and can track voluntary inspection and pumping programs (RIDEM, 2010b).

The Town of Hopkinton is not eligible for the Community Septic System Loan Program (CSSLP). The CSSLP program provides low-interest loans to residents to help with maintenance and replacement of OWTS. It is recommended that the town develop a program to assist citizens with the replacement of older and failing systems.

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 to develop conservation plans for their farming activities within the watershed. NRCS and the RIDEM Division of Agriculture should 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.

Stormwater Management

RIDOT is a municipal separate storm sewer (MS4) operator (RIPDES permit RIR040036) in the Tomaquag Brook watershed and has prepared the required Phase II Stormwater Management Plan (SWMP) for state-owned divided highways in the watershed. The Town of Hopkinton is not currently regulated under the Phase II program.

The Town of Hopkinton does not currently have an ordinance to address illicit discharges. This type of ordinance prohibits illicit discharges to the storm drain system and provides an enforcement mechanism. It is recommended that any stormwater outfalls discharging in the vicinity of the sampling locations be monitored to check for illicit discharges. Illicit discharges can be identified through continued dry weather outfall sampling and microbial source tracking.

RIDOT's SWMP and its 2011 Compliance Update outline its goals for compliance with the General Permit. 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. SWMPs 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 Tomaquag Brook based on the watershed's imperviousness, RIDOT will have no changes to their Phase II permit requirements and no TMDL Implementation Plan (TMDL IP) will be required at this time.

Wildlife and Waterfowl Waste

Hopkinton should develop education and outreach programs to highlight the importance of picking up after dogs and other pets and not feeding waterfowl. Animal waste should be disposed of away from any waterway or stormwater system. The towns should work with volunteers to map locations where animal waste is a significant and a chronic problem. The town 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 the impacts of wildlife and waterfowl to the Tomaquag Brook. The Brook'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 Tomaquag 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, contributes to water quality impairments in the Pawcatuck River and can harm human health and the environment.

Land Use Protection

Woodland and wetland areas within the Tomaquag Brook 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 the majority of the land use in the Tomaquag Brook watershed, it is important to preserve these undeveloped areas, and institute controls on development in the watershed. The Hopkinton Land Trust was established in 2004 and has since protected 875 acres of land through property acquisition and conservation easements (Town of Hopkinton, 2011). The town should work with the Land Trust to protect more of the undeveloped land in Hopkinton, with a focus on lands around the Tomaquag Brook.

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

Table 1: Tomaquag Brook Bacteria Data

Waterbody ID: RI0008039R-24

Watershed Planning Area: 23 – Wood-Pawcatuck

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: 83% (Includes 5% Margin of Safety)

Data: 2005-2008 from RIDEM

Single Sample Enterococci (colonies/100 mL) Results for Tomaquag Brook (2005-2008) with Geometric Mean Statistics

| Station Name | Station Location | Date | Result | Wet/Dry | Geometric Mean |
|--------------|--|------------|--------|---------|----------------|
| PAW16 | Eastern branch of Tomaquag at Rte 3, Hopkinton | 10/27/2006 | 1 | Dry | 10 |
| PAW16 | Eastern branch of Tomaquag at Rte 3, Hopkinton | 8/9/2006 | 79 | Dry | |
| PAW16 | Eastern branch of Tomaquag at Rte 3, Hopkinton | 5/31/2006 | 10 | Dry | |
| PAW16 | Eastern branch of Tomaquag at Rte 3, Hopkinton | 9/21/2005 | 14 | Dry | |
| WW255 | Tomaquag Brook at Woodville Rd. | 10/25/2008 | 16 | Dry | 16 |
| WW255 | Tomaquag Brook at Woodville Rd. | 9/20/2008 | 29 | Dry | |
| WW255 | Tomaquag Brook at Woodville Rd. | 8/16/2008 | 12 | Dry | |
| WW255 | Tomaquag Brook at Woodville Rd. | 7/12/2008 | 78 | Dry | |
| WW255 | Tomaquag Brook at Woodville Rd. | 6/7/2008 | 8 | Wet | |
| WW255 | Tomaquag Brook at Woodville Rd. | 9/15/2007 | 2827 | Wet | |
| WW255 | Tomaquag Brook at Woodville Rd. | 8/18/2007 | 236 | Dry | |
| WW255 | Tomaquag Brook at Woodville Rd. | 6/16/2007 | 6 | Dry | |
| WW255 | Tomaquag Brook at Woodville Rd. | 5/12/2007 | 0 | Dry | |
| PAW15 | Tomaquag Brook at Collins Road, Hopkinton | 10/27/2006 | 1 | Dry | |
| PAW15 | Tomaquag Brook at Collins Road, Hopkinton | 8/9/2006 | 2400 | Dry | |
| PAW15 | Tomaquag Brook at Collins Road, Hopkinton | 5/31/2006 | 370 | Dry | |
| PAW15 | Tomaquag Brook at Collins Road, Hopkinton | 9/21/2005 | 86 | Dry | |
| PAW08 | Tomaquag Valley Road, USGS Gage 1118050 | 7/30/2008 | 261 | Dry | 92 |
| PAW08 | Tomaquag Valley Road, USGS Gage 1118050 | 7/9/2008 | 317 | Dry | |
| PAW08 | Tomaquag Valley Road, USGS Gage 1118050 | 10/27/2006 | 1 | Dry | |
| PAW08 | Tomaquag Valley Road, USGS Gage 1118050 | 8/9/2006 | 200 | Dry | |
| PAW08 | Tomaquag Valley Road, USGS Gage 1118050 | 5/31/2006 | 61 | Dry | |
| PAW08 | Tomaquag Valley Road, USGS Gage 1118050 | 9/21/2005 | 610 | Dry | |

Single Sample Enterococci (colonies/100 mL) Results for Tomaquag Brook (2005-2008) with Geometric Mean Statistics (continued)

| Station Name | Station Location | Date | Result | Wet/Dry | Geometric Mean |
|---|---|------------|--------|---------|----------------------------|
| WW310 | Tomaquag Brook at Chase Hill | 10/25/2008 | 19 | Dry | 245 [†] (83%)* |
| WW310 | Tomaquag Brook at Chase Hill | 9/20/2008 | 211 | Dry | |
| WW310 | Tomaquag Brook at Chase Hill | 8/16/2008 | 756 | Dry | |
| PAW04 | Tomaquag Brook at Rt. 216 and Chase Hill Road | 7/30/2008 | 365 | Dry | |
| WW310 | Tomaquag Brook at Chase Hill | 7/12/2008 | 365 | Dry | |
| PAW04 | Tomaquag Brook at Rt. 216 and Chase Hill Road | 7/9/2008 | 361 | Dry | |
| WW310 | Tomaquag Brook at Chase Hill | 6/7/2008 | 133 | Wet | |
| WW310 | Tomaquag Brook at Chase Hill | 5/10/2008 | 687 | Wet | |
| WW310 | Tomaquag Brook at Chase Hill | 10/20/2007 | 1414 | Wet | 145 |
| WW310 | Tomaquag Brook at Chase Hill | 9/15/2007 | 4839 | Wet | |
| WW310 | Tomaquag Brook at Chase Hill | 8/18/2007 | 579 | Dry | |
| WW310 | Tomaquag Brook at Chase Hill | 7/21/2007 | 68 | Dry | |
| WW310 | Tomaquag Brook at Chase Hill | 6/16/2007 | 42 | Dry | |
| WW310 | Tomaquag Brook at Chase Hill | 5/12/2007 | 8 | Dry | |
| PAW04 | Tomaquag Brook at Rt. 216 and Chase Hill Road | 10/27/2006 | 1 | Dry | |
| PAW04 | Tomaquag Brook at Rt. 216 and Chase Hill Road | 8/9/2006 | 490 | Dry | |
| PAW04 | Tomaquag Brook at Rt. 216 and Chase Hill Road | 5/31/2006 | 110 | Dry | |
| PAW04 | Tomaquag Brook at Rt. 216 and Chase Hill Road | 9/21/2005 | 870 | 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 Enterococci Geometric Mean Values for each Station

| Station Name | Station Location | Years Sampled | Number of Samples | | Geometric Mean | | |
|--|---|---------------|-------------------|-----|----------------|-----|-----|
| | | | Wet | Dry | All | Wet | Dry |
| PAW16 | Eastern branch Tomaquag at Rt 3, Hopkinton | 2005-2006 | 0 | 4 | 10 | NA | 10 |
| PAW255 | Tomaquag Brook at Woodville Rd. | 2007-2008 | 3 | 7 | 16 | 28 | 13 |
| PAW15 | Tomaquag Brook at Collins Road, Hopkinton | 2005-2006 | 0 | 4 | 96 | NA | 96 |
| PAW08 | Tomaquag Valley Rd, USGS Gage 1118050 | 2005-2008 | 0 | 6 | 92 | NA | 92 |
| WW310 PAW04 | Tomaquag Brook at Rt. 216 and Chase Hill Rd | 2005-2008 | 4 | 14 | 183 | 888 | 116 |
| Shaded cells indicate an exceedance of water quality criteria | | | | | | | |
| Weather condition determined from rain gage at URI in Kingston, RI | | | | | | | |

References

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- 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.
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