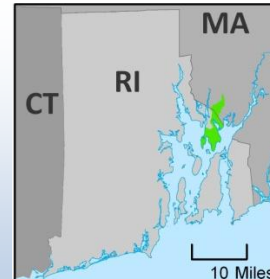




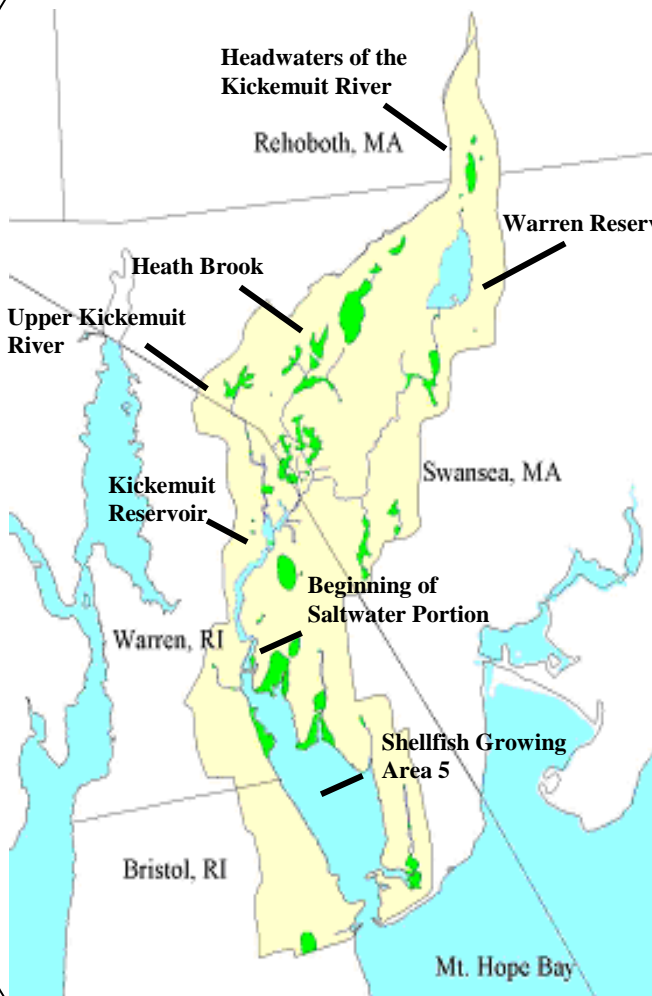
Water Quality Summary: Bristol-Kickemuit River (WPA 3)

Watershed Planning Area (WPA) Facts:

- **Direct Watershed Area:** 16.8 miles² (76% in RI, 24% in MA)
- **MA Towns:** Rehoboth and Swansea
- **RI Towns:** Warren and Bristol
- **Major Rivers:** Kickemuit
- **Other Major Waterbodies:** Mt. Hope Bay, Upper Narragansett Bay, and Bristol Harbor



The Kickemuit River



Freshwater portion

Location

- Headwaters in Rehoboth, MA
- Flows into the Warren Reservoir in Swansea, MA
- Flows into RI and empties into the Kickemuit Reservoir

Uses and/or Special Features

- The Kickemuit Reservoir provides drinking water to residents of Bristol, Warren, and Barrington, RI
- Water from Shad Factory Reservoir and Upper Warren Reservoirs (located in WPA 2) is piped into the Kickemuit Reservoir

Saltwater portion

Location

- Begins at the dam at the southern end of the Kickemuit Reservoir
- Empties into Mt. Hope Bay, which forms the northeast corner of the Narragansett Bay estuary

Uses and/or Special Features

- The Kickemuit River Estuary is designated for shellfishing (Growing Area 5)

Freshwater Portion of the Kickemuit River

Impairments: Fecal coliform, total phosphorus

Waterbody Class and Designated Uses:

MA-portion: Class B

Designated uses include habitat for fish, other aquatic life, and wildlife, and for primary and secondary contact recreation. Where designated they shall be suitable as a source of public water supply with appropriate treatment.

RI-portion: Class AA

Designated uses include a tributary within a public drinking water supply, primary and secondary contact recreational activities and fish and wildlife habitat.



Warren Reservoir in Swansea, MA

Existing TMDLs: Fecal Coliform and Total Phosphorus

TMDLs for the Kickemuit Reservoir (RI), Upper Kickemuit River (RI), and Kickemuit River (MA) (2006)

Pollutant Load Reductions Required to Meet Water Quality Standards: 66%-99%

Freshwater Kickemuit River Impairment

Most of the Class B section of the Kickemuit River in MA and the Class AA section of the river in RI are impaired for bacteria and total phosphorus, and are unsuitable for their designated uses of primary and secondary contact activities, fish and wildlife habitat, and as a tributary within a public drinking water supply (RI only). The Warren Reservoir in Swansea, MA is not considered impaired.

Primary Pollutant Sources Identified in the Existing TMDL

The largest sources of bacteria and phosphorus to this section of the Kickemuit River are thought to be failing onsite wastewater treatment systems (OWTS) in the Smoke Rise housing development in Swansea, MA and unmanaged runoff from agricultural operations along the Upper and Lower Kickemuit Reservoir and the Upper Kickemuit River.

Other Pollutant Sources Identified in the Existing TMDL

Other potential sources of bacteria and phosphorus to the freshwater portion of the Kickemuit River as identified in the TMDL include piped input from the Shad Factory Reservoir and stormwater runoff particularly in areas directly adjacent to the main branch of the river in RI and MA. Waterfowl and wildlife, particularly in the Upper and Lower Kickemuit Reservoirs may also be contributing bacteria and phosphorus to the river.

Saltwater Portion of the Kickemuit River

Impairment: Fecal coliform

Waterbody Class and Designated Uses:

Class SA

Designated uses include shellfishing, primary and secondary contact recreation, and fish and wildlife habitat.

Class SA {b}

Designated uses include all uses for Class SA with a partial use designation for a concentration of vessels.

Existing TMDL: RIDEM TMDL Study for Bacteria for Mt. Hope Bay/Kickemuit Estuary Bacteria TMDL (2010)



Mt. Hope Bay and the Kickemuit River Estuary

Pollutant Load Reductions Required to Meet Water Quality Standards: 41%-90%

Shellfish Closures: Growing Area (GA) 5-1 (Prohibited); GA5-2 and GA5-3 (Seasonal); GA5-4 (Conditional)

Saltwater Kickemuit River Impairment

The entire saltwater portion of the Kickemuit River is impaired for bacteria and is unsuitable for its designated uses of shellfishing, primary and secondary contact activities, and fish and wildlife habitat. All of the shellfish growing areas within the Kickemuit River are either conditionally closed or closed to shellfishing.

Pollutant Sources Identified in Existing TMDL

The primary sources of bacteria to the saltwater portion of the Kickemuit River include contributions from the freshwater portion of the river and stormwater runoff.

Other Pollutant Sources Identified in the TMDL

Other pollutant sources include suspected sewer leaks, overflows, and illicit connections, failing or malfunctioning OWTS, marine vessel discharges, and high-density nuisance waterfowl (particularly swans and geese) and other wildlife.

The Bristol Peninsula

Kickemuit River

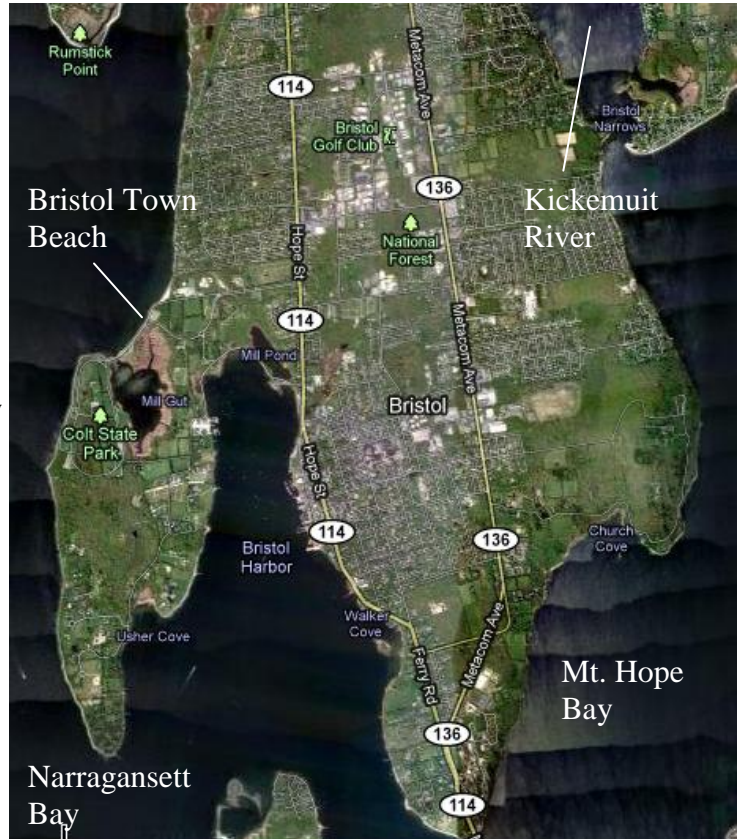
- The northeast corner of Bristol is included in the Kickemuit River watershed (above)
- The Kickemuit River discharges to Mt. Hope Bay through the Bristol Narrows
- Part of Shellfish Growing Area 5

Mt. Hope Bay

- The southern and eastern portions of Bristol are included in the Mt. Hope Bay watershed
- Forms the northeast corner of the Narragansett Bay estuary
- Part of Shellfish Growing Area 17

Western Bristol and Bristol Harbor

- Mouth of the Warren River is located near the northwest corner of Bristol
- Includes Bristol Town Beach and Colt State Park
- Part of Shellfish Growing Areas 1 and 3



Bristol Area of Mt. Hope Bay

Impairment: Fecal coliform

Waterbody Class and Designated Uses:

Class SA

Designated uses include shellfishing, primary and secondary contact recreation, and fish and wildlife habitat.

Existing TMDL: RIDEM TMDL Study for Bacteria for Mt. Hope Bay/Kickemuit Estuary Bacteria TMDL (2010)

Pollutant Load Reductions Required to Meet Water

Quality Standards: 56%

Shellfish Closures: Growing Area 17-1 (Conditional)



Bridge in Mt. Hope Bay from Bristol to Portsmouth. RI

Bristol Area of Mt. Hope Bay Impairment

The Class SA section of Mt. Hope Bay located near the Town of Bristol, RI is impaired for bacteria and is unsuitable for its designated uses of shellfishing, primary and secondary contact activities, and fish and wildlife habitat.

Pollutant Sources Identified in Existing TMDL

Sources of bacteria to this portion of Mt. Hope Bay include stormwater pollutants in runoff from six MS4 outfalls in Bristol, sewer leaks, failing onsite wastewater treatment systems, marine vessel discharges, and high-density nuisance waterfowl (particularly swans and geese) and other wildlife.

Bristol Harbor and Western Bristol

Waterbody Class:

Class SA

Designated uses include shellfishing, primary and secondary contact recreation, and fish and wildlife habitat.

Class SB1

Designated uses include primary and secondary contact recreation, and fish and wildlife habitat. Primary contact recreation activities may be impacted due to pathogens from approved wastewater discharges. All Class SB criteria must be met.

Existing TMDLs: No existing TMDLs

Shellfish Closures:

Growing Area 1 (western portion of Bristol)

- GA1-1 and GA1-2: Conditional

Growing Area 3 (Bristol Harbor)

- GA3-1: Eastern portion of Bristol Harbor (prohibited)
- GA3-2: Northwestern corner of harbor (seasonal)

Beach Closures: Bristol Town Beach (multiple seasonal closings since 1998)



Bristol Harbor



Bristol Town Beach

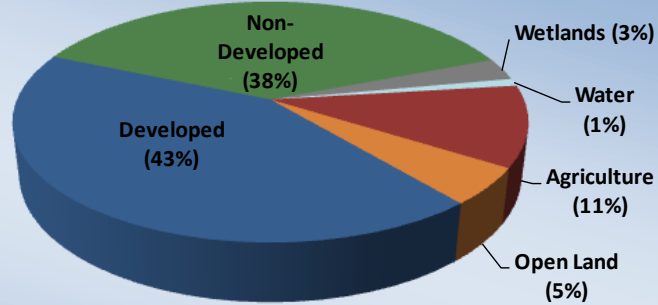
Bristol Harbor and Western Bristol Impairments

Bristol Harbor receives discharges from the Bristol Wastewater Treatment Facility. This portion of the harbor is designated as Class SB1 waters, and is closed to shellfishing (Growing Area GA3-1). The northwestern corner of the harbor is seasonally closed to shellfishing (Growing Area 3-2).

The western portion of the Bristol Peninsula includes the Bristol Town Beach and Colt State Park. These Class SA waters are conditionally closed to shellfishing (Growing Area 1). Bristol Town Beach has had multiple seasonal closings since 1998.

Land Use in WPA 3

- MA-portion of WPA 3:
 - 57% non-developed
 - 27% developed
 - 9% agriculture
- RI-portion of WPA 3:
 - 47% developed
 - 32% non-developed
 - 12% agriculture



Overall Land Use in WPA 3

Other Pollutants of Concern

Portions of the waterbodies in WPA 3 have been sampled for fecal coliform, total phosphorus, dissolved oxygen, temperature, total suspended sediments, and chlorophyll A. Based on land use data in WPA 3, other pollutants of concern include:

Enterococci

Like fecal coliform, enterococci are indicators of pollution from bacteria. Bacteria can enter waterbodies from sources such as leaking septic systems, stormwater and agricultural runoff, and domestic and wild animal waste. As RI is in the process of switching to using enterococci as an indicator of bacterial contamination in fresh and salt water to assess primary contact recreation/swimming criteria, it is recommended that both the fresh and salt water portions of the Kickemuit River as well as the waters surrounding the Bristol Peninsula also be sampled for enterococci.

Nitrogen

Excess nutrients, such as nitrogen and phosphorus, have been shown to cause algal blooms in fresh (phosphorus) and salt (nitrogen) water. Nutrients can enter waterbodies from sources such as leaking septic systems and stormwater and agricultural runoff. It is recommended that the salt water portions of the Kickemuit River and the waters surrounding the Bristol Peninsula be sampled for nitrogen, as land use in this part of the watershed includes both agriculture and residential developments.

Chloride

Chloride can enter surface waters from runoff from agricultural practices and stormwater. Large amounts of chloride have been shown to enter surface and ground waters during snowmelt, as the salts used in snow removal practices throughout New England accumulate in snow banks throughout the winter. Chloride has the potential to negatively affect aquatic biota and as well as threaten drinking water supplies. High levels of chloride in streams can occur year round when adjacent groundwater is contaminated. It is recommended that the freshwater portion of the Kickemuit River be sampled for chloride, as the watershed is 46% developed.

Data Summary

Data Available from Ongoing Data Monitoring Programs/Existing TMDLs

Freshwater Portion of the Kickemuit River

- MADEP Water Quality Assessment Report Program: *E. coli*, total nitrogen, ammonia, total phosphorus, temperature, specific conductivity, total dissolved sediments, and dissolved oxygen (DRAFT data only)
- RIDEM Fecal Coliform and Total Phosphorus TMDLs for the Kickemuit Reservoir (RI), Upper Kickemuit River (RI), and Kickemuit River (MA) (2006)

Saltwater Portion of the Kickemuit River

- RIDEM Shellfish Monitoring Program: Fecal coliform
- RIDEM TMDL Study for Mt. Hope Bay/Kickemuit Estuary Bacteria TMDL (2010)

Bristol Area

- RIDEM Shellfish Monitoring Program: Fecal coliform

Relevant Water Quality Standards

Fecal Coliform

- RI Freshwater Class AA (Drinking Water Supply): Geometric Mean 20 MPN/100 mL
- RI Freshwater Class AA (Primary/Secondary Contact Recreation): Geometric Mean 200 MPN/100 mL
- MA Freshwater Class B: Geometric Mean 200 MPN/100 mL
- RI Saltwater Class SA and SA {b} (Shellfish Criteria): Geometric Mean 14 MPN/100 mL
- RI Saltwater Class SA, SA {b}, and SB1 (Primary/Secondary Contact Recreation): Geometric Mean 50 MPN/100 mL

Total Phosphorus

- RI Freshwater: Mean 25 µg/L
- RI Saltwater: No set standards; may be assigned site-specific; may not cause impairment of any designated uses
- MA: No set standards; may be assigned site-specific; may not cause impairment of any designated uses

Freshwater Portion of the Kickemuit River

Table 1: 2000 Fecal Coliform and Total Phosphorus Data for the Freshwater Portion of the Kickemuit River from the RIDEM Fecal Coliform and Total Phosphorus TMDLs for the Kickemuit Reservoir (RI), Upper Kickemuit River (RI), and Kickemuit River (MA) (2006)

Station	State	Location	Geometric Mean Fecal Coliform (MPN/100 mL)	Mean Total Phosphorus (µg/L)
K11	MA	Warren Upper Reservoir (Anawan)	5	24
K10	MA	Shad Factory Reservoir	90	66
K7	MA	Outlet of Warren Reservoir (Swansea)	7	28
K6	MA	Route 6 (upstream of Smoke Rise)	976	34
K13	MA	Smoke Rise Housing Development	5000	-
K5	MA	Poverty Corner Rd (downstream of Smoke Rise)	2785	100
K8	MA	Unnamed Trib at MA-RI border	234	132
K9	MA	Upper Heath Brook	232	42
K3A	MA	Lower Heath Brook	20494	46
K3	RI	Upper Kickemuit River	4899	100
K4	RI	Outlet of Upper Kickemuit Reservoir	134	61
K2	RI	North end of Lower Kickemuit Reservoir	59	77
K1	RI	Outlet to Tidal Waters	84	39

- Shaded cells indicate an exceedance of water quality standards.
- Exceedances for fecal coliform in MA are based on a MA Class B standards (200 MPN/100 mL) while exceedances for fecal coliform in RI are based on the RI Class AA standard for drinking water (20 MPN/100 mL).
- Exceedances for total phosphorus are based on RI's standards of 25 µg/L.

Saltwater Portion of the Kickemuit River

Table 2: 2006 Five-Day, Wet-Weather and 2009 Dry-Weather Fecal Coliform Data for the Saltwater Portion of the Kickemuit River from the RIDEM TMDL Study for Bacteria for Mt. Hope Bay/Kickemuit Estuary Bacteria TMDL (2010) and 2010 Dry-Weather Fecal Coliform Data from the RIDEM Shellfish Monitoring Program

Station	2006 Wet-Weather Geometric Mean Fecal Coliform (MPN/100 mL)	2009 Dry-Weather Geometric Mean Fecal Coliform (MPN/100 mL)	2010 Dry-Weather Geometric Mean Fecal Coliform (MPN/100 mL)
GA5-1	3	4	4
GA5-2	4	5	5
GA5-3	10	4	4
GA5-4	8	4	3
GA5-5	6	3	3
GA5-6	14	3	5
GA5-7	22	4	5
GA5-8	19	3	7
GA5-9	7	4	4
GA5-10	10	-	3

Shaded cells indicate an exceedance of water quality standard (based on the RI Class SA and SA{b} shellfishing standards of 14 MPN/100 mL).

Table 3: Wet and Dry-Weather Fecal Coliform Data for Priority Outfalls draining to the Saltwater Portion of the Kickemuit River from the RIDEM TMDL Study for Bacteria for Mt. Hope Bay/Kickemuit Estuary Bacteria TMDL (2010)

Outfall Name	Town	Maximum Fecal Coliform Concentration During Dry Weather	Maximum Fecal Coliform Concentration During Wet Weather
Broken RR Bridge at Barker Ave.	Warren, RI	43,000	15,000
Parker Ave. Box Culvert	Warren, RI	15,000	23,000
Child St., West of Bridge	Warren, RI	>24,000	Not Sampled
Parker Ave.	Warren, RI	4,300	23,000
Libby Lane	Warren, RI	23,000	21,000
Narrows Road Stream	Bristol, RI	430	2,300

Shaded cells indicate an exceedance of water quality standard (based on the RI Class SA and SA{b} shellfishing standards of 14 MPN/100 mL).

Table 4: RIDEM Shellfish Monitoring Program data (2005-2010). Stations are organized from upstream to downstream reaches.

Waterbody	Station	Years	Fecal Coliform (MPN/100 mL)	
			Range	Geometric Mean
Kickemuit River	GA 5-6	2005-2010	2 - 43	3
Kickemuit River	GA 5-5	2005-2010	2 - 11	4
Kickemuit River	GA 5-10	2005-2010	2 - 15	3
Kickemuit River	GA 5-4	2005-2010	2 - 43	3
Kickemuit River	GA 5-3	2005-2010	2 - 43	4
Kickemuit River	GA 5-2	2005-2010	2 - 43	5
Kickemuit River	GA 5-1	2005-2010	2 - 15	4

Bristol Peninsula Data

Table 5: Available data for the waterbodies surrounding the Bristol Peninsula. This data was collected by the RIDEM Shellfish Monitoring Program

RIDEM Mt. Hope Bay TMDL (2007 - 2009)				
Waterbody	Station	Years	Fecal Coliform (MPN/100 mL)	
			Geometric Mean	90th Percentile
Mt. Hope Bay	GA 17-16	2007 - 2009	3.8	14
Mt. Hope Bay	GA 17-14	2007 - 2009	3.5	12
Mt. Hope Bay	GA 17-13	2007 - 2009	4.4	34
Mt. Hope Bay	GA 17-12	2007 - 2009	2.8	10
RIDEM Shellfish Monitoring Data (2005 - 2010)				
Waterbody	Station	Years	Fecal Coliform (MPN/100 mL)	
			Range	Geometric Mean
Western Bristol	GA 1-1	2005 - 2010	2-93	5
Western Bristol	GA1-4	2005 - 2010	2-240	5
Western Bristol	GA 1-5C	2005 - 2010	2-93	5
Western Bristol	GA 1-3C	2005 - 2010	2-43	3
Bristol Harbor	GA 3-10	2005 - 2010	2-93	3
Bristol Harbor	GA3-9	2005 - 2010	2-93	3
Bristol Harbor	GA 3-8	2005 - 2010	2-930	8
Bristol Harbor	GA 3-6A	2005 - 2010	2-240	6
Bristol Harbor	GA 3-7A	2005 - 2010	2-240	5
Bristol Harbor	GA3-7	2005 - 2010	2-43	4
Bristol Harbor	GA 3-6	2005 - 2010	2-240	4
Bristol Harbor	GA 3-5	2005 - 2010	2-240	4
Bristol Harbor	GA 3-4	2005 - 2010	2-93	3
Bristol Harbor	GA 3-3	2005 - 2010	2-21	3
Bristol Harbor	GA 3-1	2005 - 2010	2-43	3
Mt. Hope Bay	GA 17-16	2005 - 2010	2-1100	5
Mt. Hope Bay	GA 17-14	2005 - 2010	2-430	4
Mt. Hope Bay	GA 17-13	2005 - 2010	2-750	5
Mt. Hope Bay	GA 17-12	2005 - 2010	2-460	4