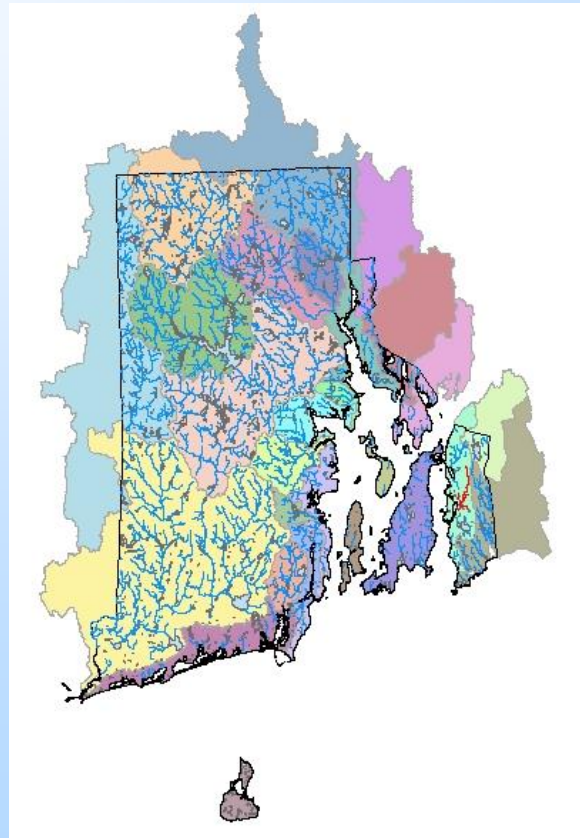




# Draft TMDLs for Borden Brook, Quaker Creek, and Tributary to Nonquit Pond

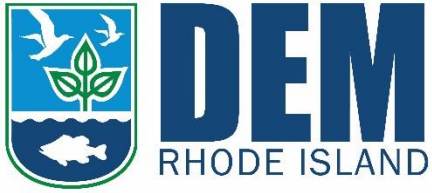


Office of Water Resources  
January 30, 2023 at 3 PM



# Overview of Presentation

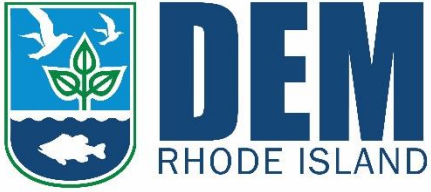
- Background Federal Clean Water Act Requirements
- Overview of Assessment Process
- Overview of Statewide Bacteria TMDL
- TMDL Development
  - Borden Brook
  - Quaker Creek
  - Tributary to Nonquit Pond



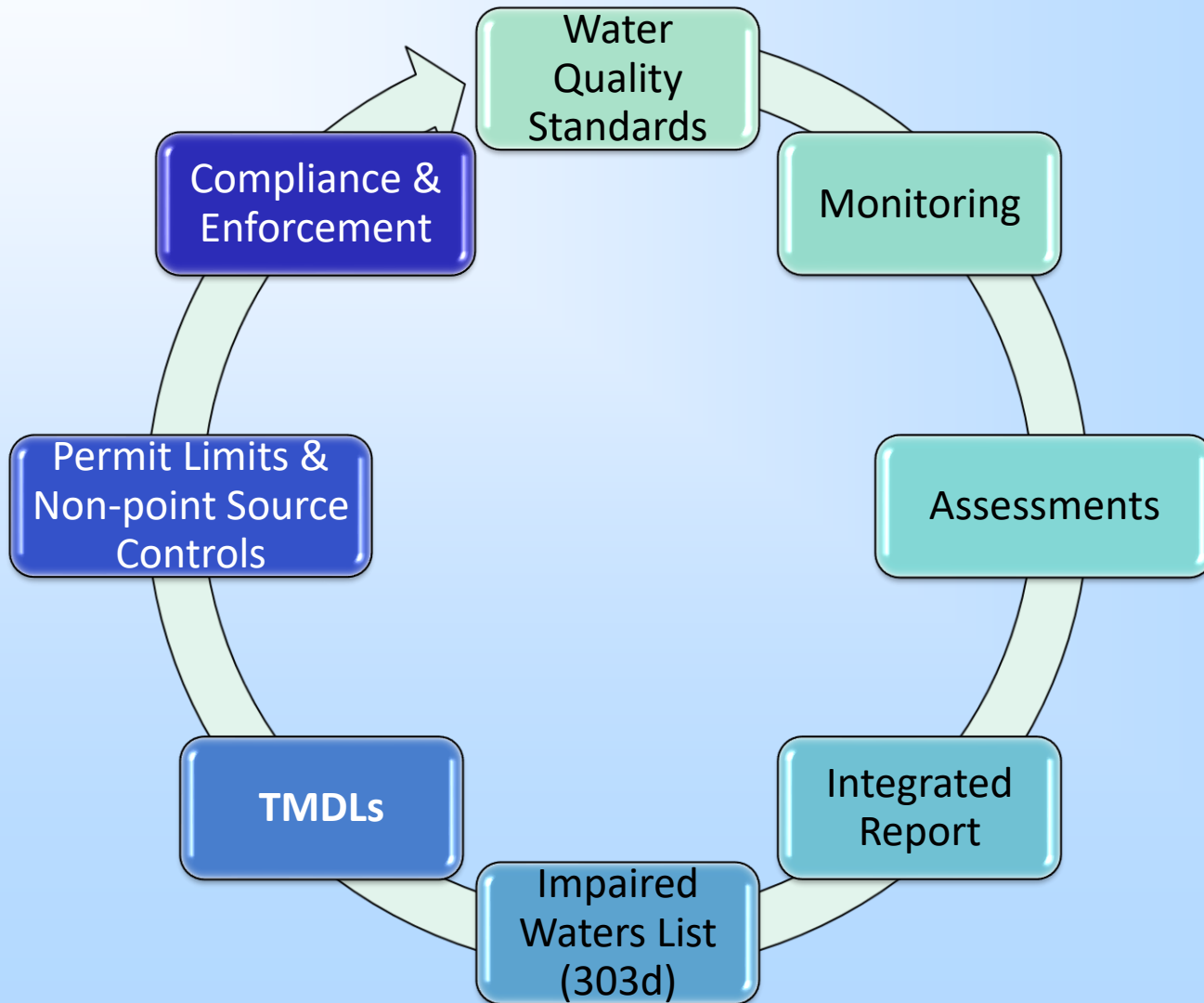
# Federal Clean Water Act

Restore and maintain the chemical, physical, and biological integrity of the nation's waters.

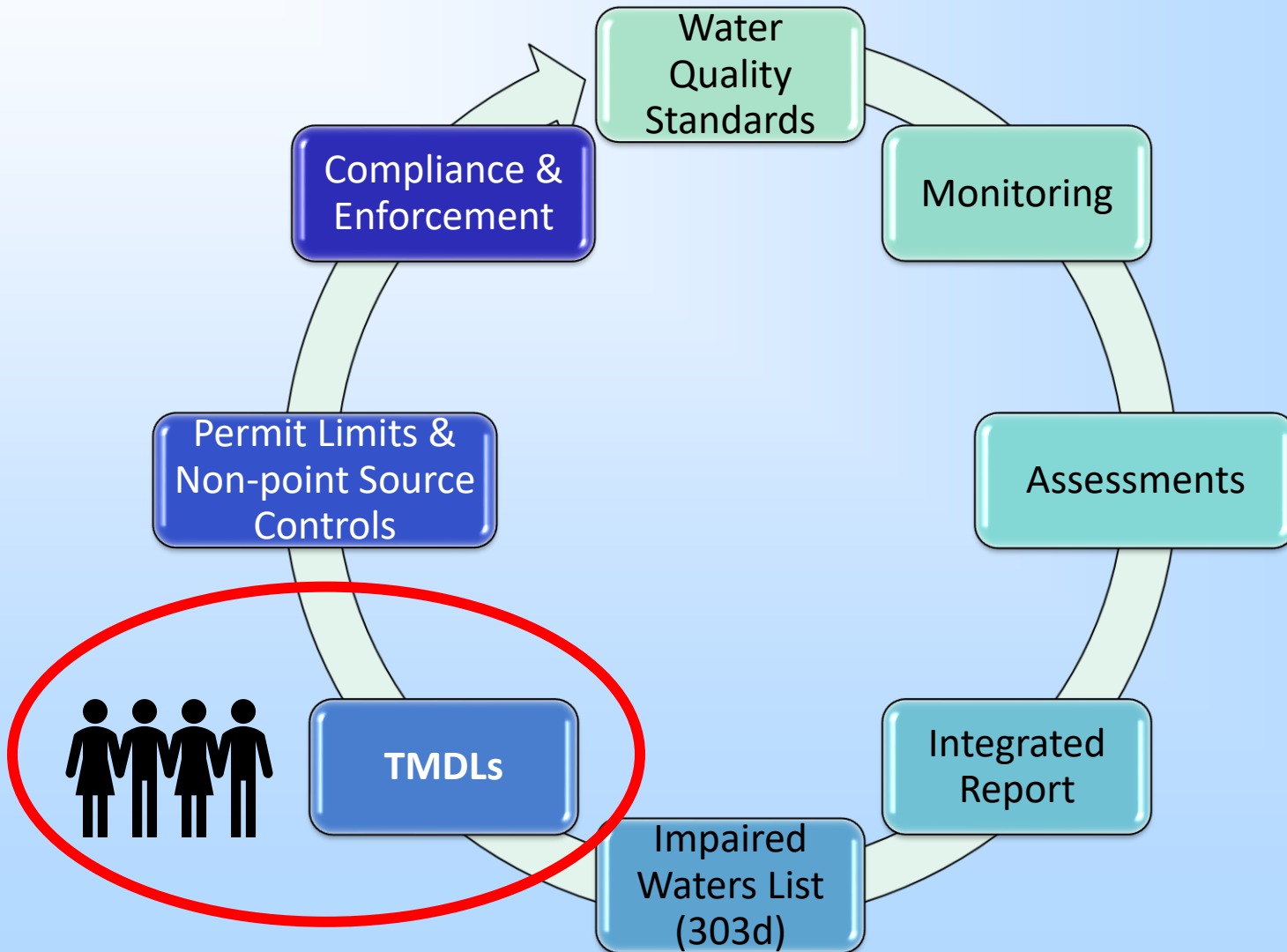




# WATER QUALITY MANAGEMENT FRAMEWORK



# WATER QUALITY MANAGEMENT FRAMEWORK





# TMDL – Water Quality Restoration Studies

## What is a Total Maximum Daily Load?

- Federally mandated Water Quality Restoration Study
- Determines amount of a pollutant that can be discharged into a water body and still maintain water quality standards
- TMDL equals the sum of pollutant allocations for:
  - Point sources (non-stormwater & stormwater)
  - Non-point sources (Agriculture)
  - Plus a margin of safety



# Statewide Bacteria TMDL

## What is included in a Statewide Bacteria TMDL?


- Explanation of state water quality standards
- Description of point and nonpoint pollution sources
- Details of bacteria TMDL development
- Guidance for implementation efforts
- Individual waterbody-specific TMDL summaries



# Statewide Bacteria TMDL

## Waterbody Summary (Appendix)

- Watershed Description
- Maps
- Monitoring Data Description
- Actual/Potential Sources of Bacteria in the Watershed
- Existing Management and Recommended Next Steps
- Data Summary Tables and Necessary Pollutant Reductions



### *Borden Brook*

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**Watershed Description**


This TMDL applies to the Borden Brook (RI0010031R-01) watershed that ultimately discharges into Nonquit Pond (RI0007035L-08). The pond is one of nine source reservoirs for the Newport Water System. The Newport Water System is comprised of a complex network that provides public water to all of Aquidneck Island with customers in Newport, Middletown, and a portion of Portsmouth, RI. It also provides water to the Portsmouth Water and Fire District and to Naval Station Newport.

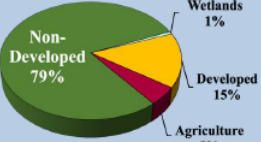
Borden Brook is a stream system that totals 11.5 miles, of which 6.99 miles are mapped and tracked for assessment purposes (Figure 1). It originates at Basket Swamp, located to the south of Bulgarmarsh Road (RT 177). The stream passes through Weetamoo Woods and flows past a couple of residential lots and a hay field prior to crossing East Road. An unnamed tributary discharges to Borden Brook immediately downstream of the brook crossing under East Road. Downstream of its confluence with the unnamed tributary, Borden Brook parallels East Road for 450 feet where Quaker Creek (RI0010031R-04) merges with the brook. Downstream of its confluence with Quaker Creek, the brook jogs to the south where it flows past a hayfield and through a small pasture. The stream then flows through a wetland corridor and to a commercial area on Main Road. An unnamed tributary, discussed in the section below, discharges into Borden Brook just upstream of Main Road.

This unnamed tributary to Borden Brook joins the northern segment of Borden Brook approximately 800 feet upstream of the brook's discharge into Nonquit Pond.

**Assessment Unit Facts**  
***(RI0010031R-01)***

- Towns: Tiverton and Little Compton
- Impaired Segment Length: 6.99 miles
- Classification: Class AA
- Direct Watershed: 4.89 mi<sup>2</sup> (3.131 acres)
- Impervious Cover: 5 %





**Watershed Land Uses**

Land Use	Percentage
Non-Developed	79%
Developed	15%
Agriculture	5%
Water / Wetlands	1%





# Statewide Bacteria TMDL

## Rhode Island's Statewide Bacteria TMDL

- EPA approved the Core TMDL document in 2011
  - 57 waterbody summaries
  - Waterbodies were from several watershed planning areas statewide
- EPA approved 6 additional waterbody summaries 2014
  - Hunt River and Wood-Pawcatuck Rivers watershed planning areas
- Current update proposed
  - Three tributaries to Nonquit Pond in Tiverton



# Statewide Bacteria TMDL

## Rhode Island's Statewide Bacteria TMDL

- Rhode Island uses Fecal Indicator Bacteria to assess recreational/swimming use
  - FIB are surrogates used to measure the potential presence of fecal material and associated fecal pathogens
  - FIB – enterococci, fecal coliform, *E. coli*
- Enterococci is the primary bacteria indicator for recreational use attainment and sets TMDL target
  - Freshwater criteria is geometric mean <54 colonies per 100mL



# Statewide Bacteria TMDL

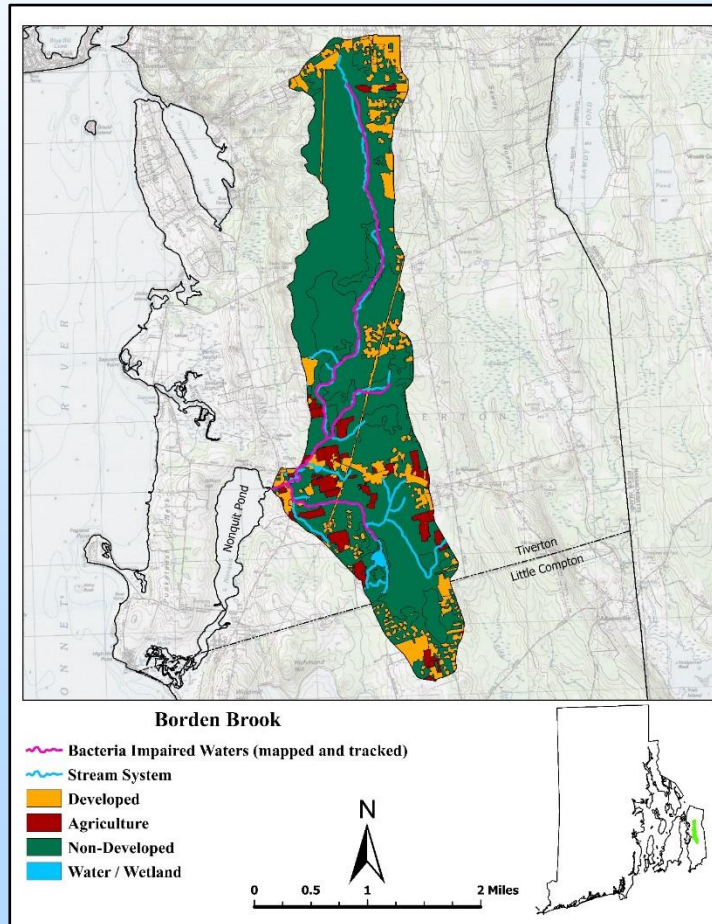
## Rhode Island's Statewide Bacteria TMDL

- Data Calculations
  - Geometric Mean
    - A type of average that multiplies and takes the roots of the numbers instead of adding and dividing
    - Useful to find the central tendency when measurements are not independent of each other or if numbers tend to make large fluctuations
  - Percent Reduction

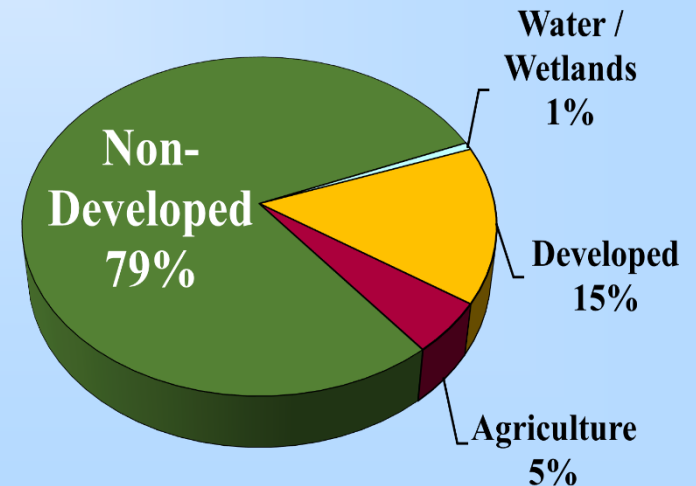
$$\text{Percent Reduction} = \frac{\text{Geometric Mean} - \text{Criteria}}{\text{Geometric Mean}} \times 100$$

# Statewide Bacteria TMDL

## Borden Brook

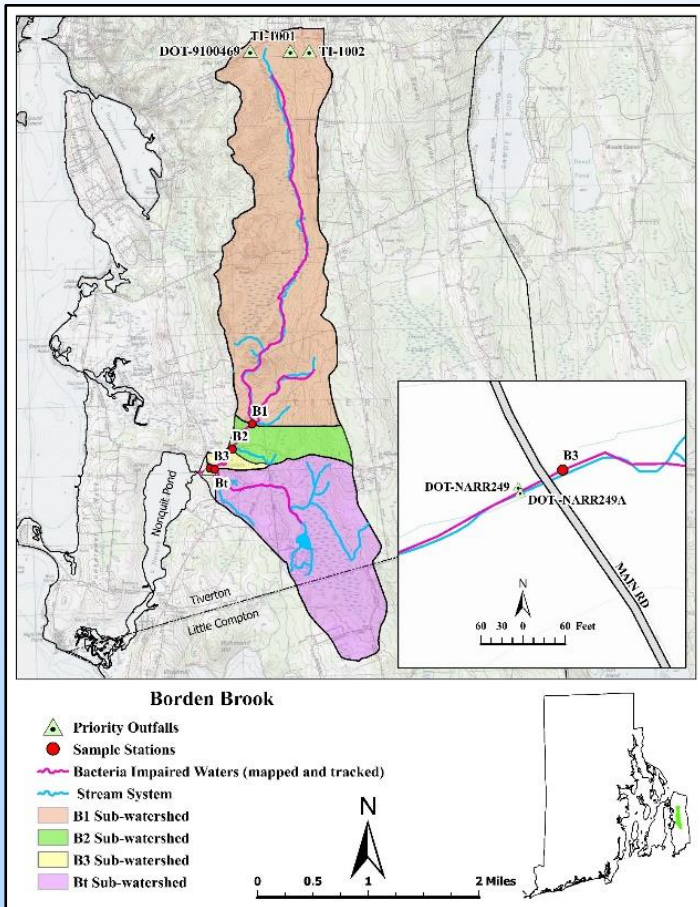


- **Towns:** Tiverton and Little Compton
- **Impaired Segment Length:** 6.99 miles
- **Classification:** Class AA
- **Direct Watershed:** 4.89 mi<sup>2</sup> (3,131 acres)
- **Impervious Cover:** 5 %



# Statewide Bacteria TMDL

## Borden Brook



Wet and Dry Weather Enterococci Geometric Mean Values for all Stations

Station Name	Station Location	Years Sampled	Number of Samples		Geometric Mean (MPN/100mL)		
			Wet	Dry	All	Wet	Dry
B1	Borden Brook in Weetamoo Woods	2017	4	1	35	49	<10*
B2	South side of East Road	2017	4	1	57	87	<10*
TLC03	South side of East Road	2014	1	4	46	365*	27
		2021	1	4	160	201*	151
Bt	Rear of commercial area on Main Rd.	2017	4	0	200 <sup>^</sup> (78%)**	200	0
B3	Main Road	2017	4	1	113	208	<10*
WW554	East Road Crossing	2014	0	4	45	0	45
WW616	Main Road	2016	1	2	76	464*	31

\* - These are single grab samples, not a geomean

<sup>^</sup> - Geometric Mean Used to determine percent Reduction

\*\* - Includes 5% Margin of Safety. Criteria is a geomean of 54 MPN/100ml



# Statewide Bacteria TMDL

## Borden Brook

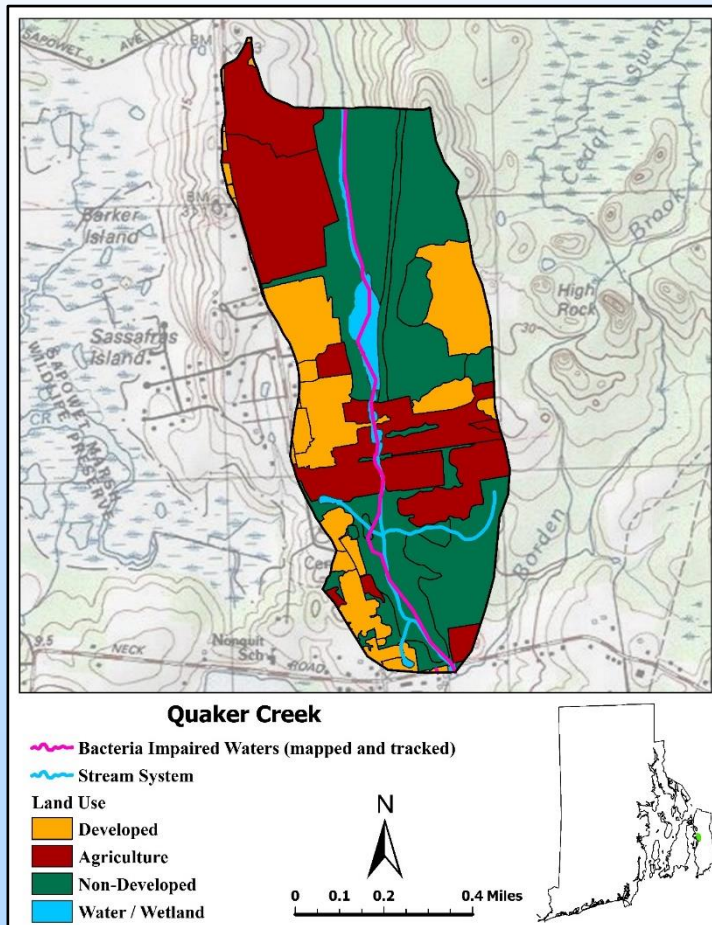
- Sources
  - Stormwater Runoff
    - MS4Phase II
      - 5 Priority Outfalls
      - Town of Tiverton - Mary Lane and Knotty Pine Road
      - RIDOT - Bulgarmarsh Rd (RT 177) and Main Rd (RT 77)
  - Agricultural Activities
    - Runoff from agricultural activities flowing into stream system during storm events.
    - Cattle have access to flooded area adjacent to stream system
    - Lack of buffer in residential areas
  - Onsite Wastewater Treatment Systems
    - Most of Tiverton unsewered
    - No recent OWTS NOV/NOIV issued
    - Eliminate cesspools and maintain properly sited and sized septic systems
  - Waterfowl, Wildlife, and Domestic Animal Waste



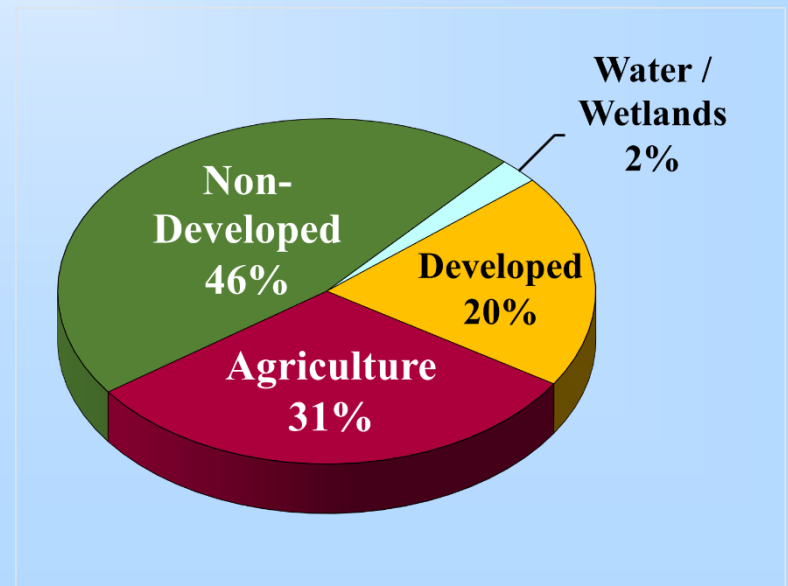


# Statewide Bacteria TMDL

## Quaker (aka Quaket) Creek



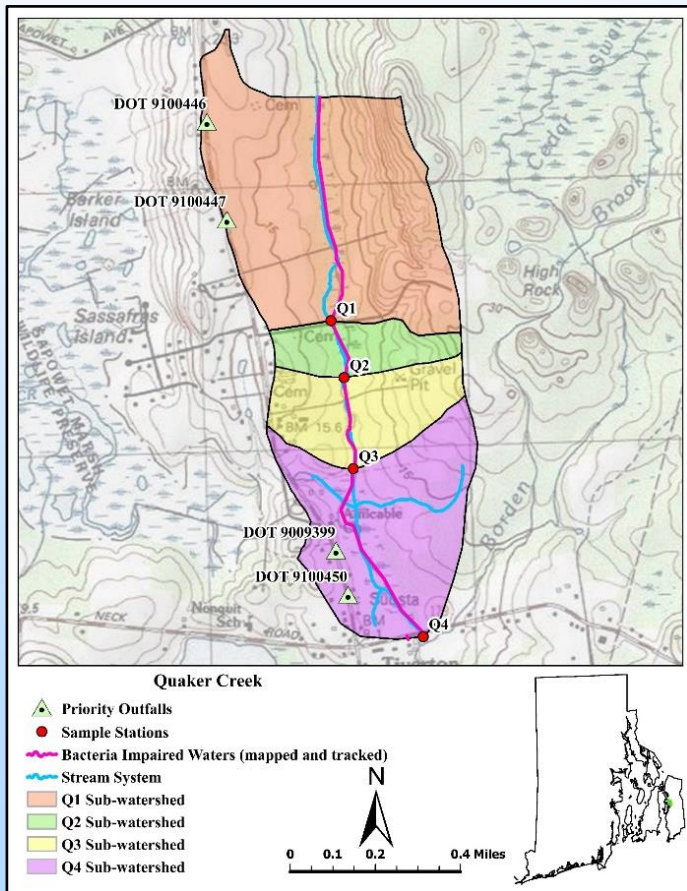
- **Town:** Tiverton
- **Impaired Segment Length:** 2.31 miles
- **Classification:** Class AA
- **Direct Watershed:** 0.57 mi<sup>2</sup> (364 acres)
- **Impervious Cover:** 3%





# Statewide Bacteria TMDL

## Quaker (aka Quaket) Creek



Wet and Dry Weather Enterococci Geometric Mean Values for all Stations

Station Name	Station Location	Years Sampled	Number of Samples		Geometric Mean (MPN/100ml)		
			Wet	Dry	All	Wet	Dry
Q1	Landfill access road crossing	2017	4	1	116	214	10*
Q2	Northern boundary of livestock area	2017	4	1	240	531	<10*
Q3	Southern boundary of livestock area	2017	4	-	300	703	-
Q4	East Road crossing before Borden Brook	2017	4	1	80	135	<10*
TLC04	East Road crossing before Borden Bk	2014	1	2	769 <sup>^</sup> (98%)**	2,420*	433
		2021	1	4	158	162*	157

\* - These are single grab samples, not a geomean

<sup>^</sup> - Geometric Mean Used to determine percent Reduction

\*\* - Includes 5% Margin of Safety. Criteria is a geomean of 54 MPN/100ml.



# Statewide Bacteria TMDL

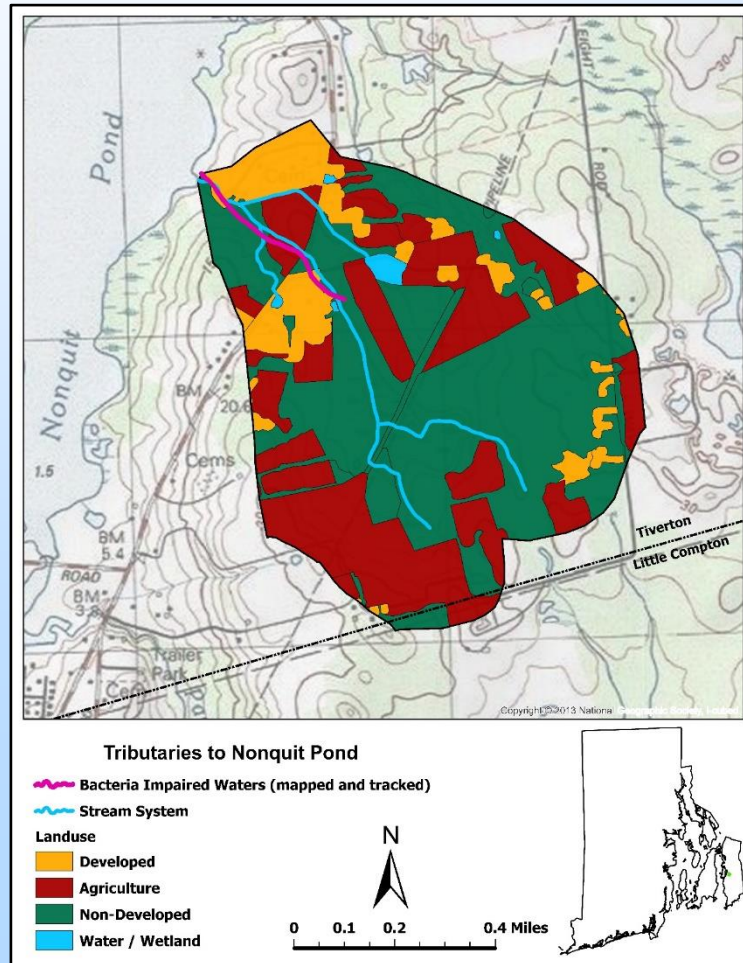
## Quaker (aka Quaket) Creek

- Sources
  - Stormwater Runoff
    - MS4Phase II
      - 4 Priority Outfalls
      - RIDOT - Route 77
  - Tiverton Landfill
    - Undergoing closure and will be issued RIPDES permit
  - Agricultural Activities
    - Runoff from agricultural activities flowing into stream system during storm events.
    - Cattle and horses have access to flooded area adjacent to stream system
    - Lack of buffer in residential areas
  - Onsite Wastewater Treatment Systems
    - Most of Tiverton unsewered at this time
    - No OWTS NOV/NOIV issued
    - Eliminate cesspools and maintain properly sited and sized septic systems
  - Waterfowl, Wildlife, and Domestic Animal Waste

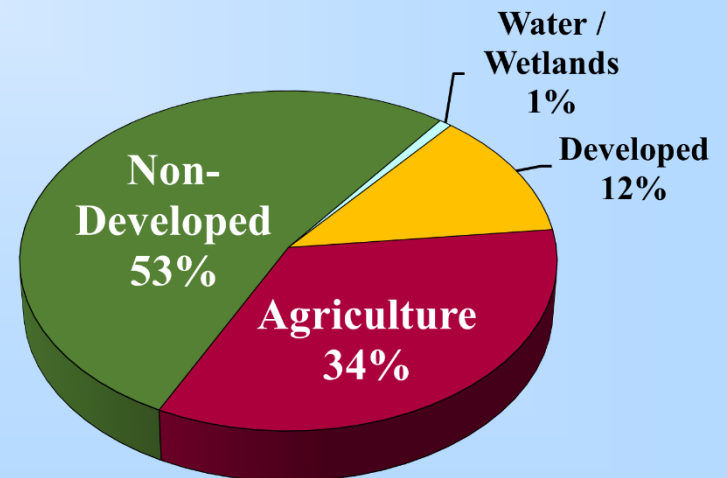


# Statewide Bacteria TMDL

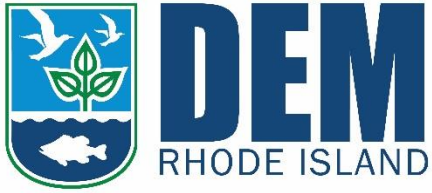
## Tributary to Nonquit Pond



- **Town:** Tiverton and Little Compton
- **Impaired Segment Length:** 0.38 miles
- **Classification:** Class AA
- **Direct Watershed:** 0.59 mi<sup>2</sup> (375 acres)
- **Impervious Cover:** 3%



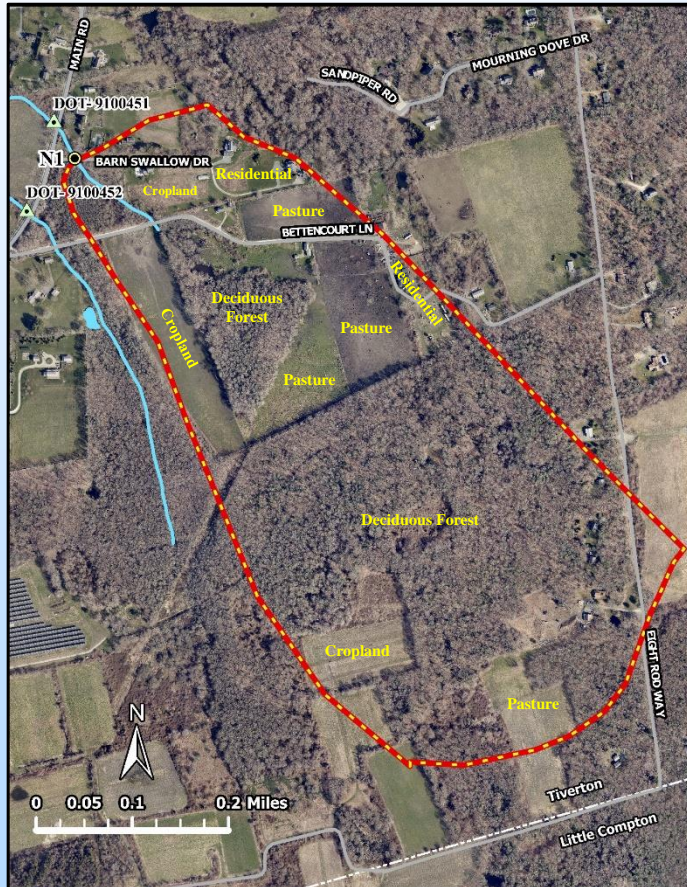




# Statewide Bacteria TMDL

## Tributary to Nonquit Pond

Wet and Dry Weather Enterococci Geometric Mean Values for all Stations



Station Name	Station Location	Years Sampled	Number of Samples		Geometric Mean (MPN/100ml)		
			Wet	Dry*	All	Wet	Dry*
N1	Trib at Barnswallow Drive	2017	3	1	122	192	31
N2	Trib at Peaceful Way Cul-de-Sac	2017	4	1	190 <sup>^</sup> (77%) <sup>**</sup>	396	10

\* - These are single grab samples, not a geomean

<sup>^</sup> - Geometric Mean Used to determine percent Reduction

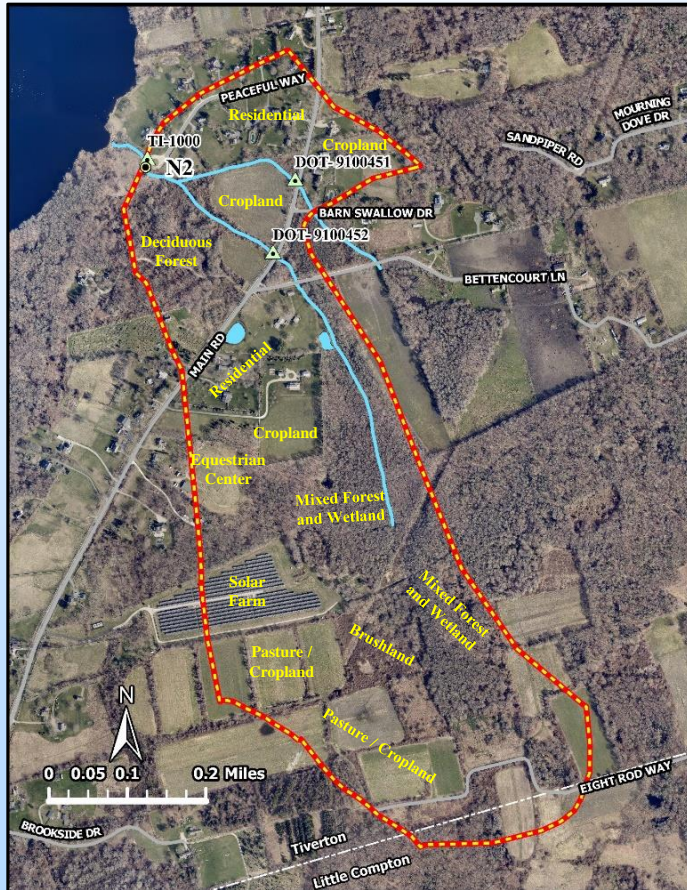
\*\* - Includes 5% Margin of Safety; Criteria is a geomean of 54 MPN/100ml.



# Statewide Bacteria TMDL

## Tributary to Nonquit Pond

Wet and Dry Weather Enterococci Geometric Mean Values for all Stations



Station Name	Station Location	Years Sampled	Number of Samples		Geometric Mean (MPN/100ml)		
			Wet	Dry*	All	Wet	Dry*
N1	Trib at Barnswallow Drive	2017	3	1	122	192	31
N2	Trib at Peaceful Way Cul-de-Sac	2017	4	1	<b>190<sup>^</sup> (77%)<sup>**</sup></b>	396	10

\* - These are single grab samples, not a geomean

<sup>^</sup> - Geometric Mean Used to determine percent Reduction

<sup>\*\*</sup> - Includes 5% Margin of Safety. Criteria is a geomean of 54 MPN/100ml.



# Statewide Bacteria TMDL

## Tributary to Nonquit Pond

- Sources
  - Stormwater Runoff
    - MS4 Phase II
      - 3 Priority Outfalls
      - Town of Tiverton – Peaceful Way Cul-de-Sac
      - RIDOT – Main Road (RT 77)
  - Agricultural Activities
    - Runoff from agricultural activities flowing into stream system during storm events.
    - Cattle have access to flooded area adjacent to stream system
    - Lack of buffer in residential areas
  - Onsite Wastewater Treatment Systems
    - Most of Tiverton unsewered at this time
    - No OWTS NOV/NOIV issued
    - Eliminate cesspools and maintain properly sited and sized septic systems
  - Waterfowl, Wildlife, and Domestic Animal Waste



# Statewide Bacteria TMDL

## Final Percent Reductions for Borden Brook, Quaker Creek, and Tributary to Nonquit Pond

Waterbody Name	Waterbody ID	Class	Impairment	Geometric Mean TMDL Endpoint*†	Percent Reduction to meet TMDL Endpoint^
<b>WPA: Sakonnet - East</b>					
<b>Borden Brook</b>	RI0010031R-01	AA	Enterococci	54	<b>78%</b>
<b>Quaker Creek</b>	RI0010031R-04	AA	Enterococci	54	<b>98%</b>
<b>Tributary to Nonquit Pond</b>	RI0010031R-20	AA	Enterococci	54	<b>77%</b>

\*Enterococci (MPN/100 mL)

† TMDL endpoint is set to the water quality standard

^ Includes a 5% Margin of Safety





# DEM ACCEPTING on Draft TMDLs

## Send Comments to:

Skip Viator

DEM/Office of Water Resources

235 Promenade Street, Providence, RI 02908

[skip.viator@dem.ri.gov](mailto:skip.viator@dem.ri.gov)

View or download the Draft TMDLs:

<https://dem.ri.gov/environmental-protection-bureau/water-resources/research-monitoring/restoration-studies-tmdl-documents>

**Comments accepted through Wednesday March 1, 2023**