

WATER THREAT LEVEL
HIGH

WATERSHEDS: MID CAPE
Bass River



The Problem

The Massachusetts Estuaries Project (MEP) technical report indicates that Bass River system exceeds its critical threshold for nitrogen, resulting in impaired water quality. While the MEP technical report has been completed, a Total Maximum Daily Load (TMDL) for nitrogen has not yet been established.

- **MEP TECHNICAL REPORT STATUS:** Final
- **TMDL STATUS:** In Progress
- **TOTAL WASTEWATER FLOW:** 733 MGY (Million Gal/Year)
 - Treated WW Flow: 20 MGY
 - Septic Flow: 713 MGY
- **UNATTENUATED TOTAL NITROGEN LOAD (MEP):** 65,541 Kg/Y (kilograms per year)
- **ATTENUATED TOTAL NITROGEN LOAD (MEP):** 63,219 Kg/Y
- **SOURCES OF CONTROLLABLE NITROGEN (MEP):**
 - 82% Septic Systems
 - 8% Lawn Fertilizer
 - 8% Stormwater from Impervious Surfaces
 - 2% Wastewater Treatment Facilities

CONTRIBUTING TOWNS

- **DENNIS**
- **YARMOUTH**

THE MEP RESTORATION SCENARIO

- **WATERSHED TOTAL NITROGEN REDUCTION TARGET:** 47%
- **WATERSHED SEPTIC REDUCTION TARGET:** 60%
(The scenario represents the aggregated sub-embayment percent removal targets from the MEP technical report)

BASS RIVER ESTUARY

- **EMBAYMENT AREA:** 987 acres
- **EMBAYMENT VOLUME:** 250 million cubic feet
- **2012 INTEGRATED LIST STATUS:** Category 5
 - Category 5: Waters requiring a TMDL
 - www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

BASS RIVER WATERSHED

- **ACRES:** 10,835
- **PARCELS:** 12,070
- **% DEVELOPED RESIDENTIAL PARCELS:** 85%
- **PARCEL DENSITY:** 0.9 acres per parcel (approx.)
- **WASTEWATER TREATMENT FACILITIES:** 3
 - Dennis-Yarmouth Regional High School, Yarmouth
 - Thirwood Place, Yarmouth
 - Patriot Square, Dennis

The Bass River estuary and embayment system is located in the towns of Dennis and Yarmouth. The River is one of the largest on Cape Cod and delineates the boundary area between the two largest groundwater lenses (Sagamore and Monomoy). Bass River is comprised of a large number of sub-basins including Davis Beach, Grand Cove, Kelleys Bay, Dinahs Pond, Follins Pond and Mill Pond. The estuary supports a variety of recreational uses including boating, swimming, shell fishing and fin fishing.

Freshwater Sources

PONDS

- **IDENTIFIED SURFACE WATERS:** 50
- **NUMBER OF NAMED FRESHWATER PONDS:** 21
- **PONDS WITH PRELIMINARY TROPHIC CHARACTERIZATION:** 8
(Listed In Appendix 4C, Ponds With Water Quality Data)
- **2012 INTEGRATED LIST STATUS:** 3 Listed
- **DISCUSSION:** The Long Pond subwatershed is unique for its high density flows split between the Parkers River and Bass River watersheds. Nitrogen flowing towards Parkers River is reduced by natural attenuation by 89%. The bulk of nitrogen from the watershed which flows through the pond into Bass River is only attenuated by 50%.

STREAMS

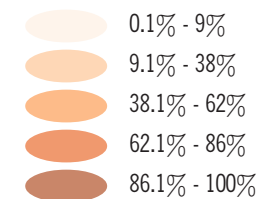
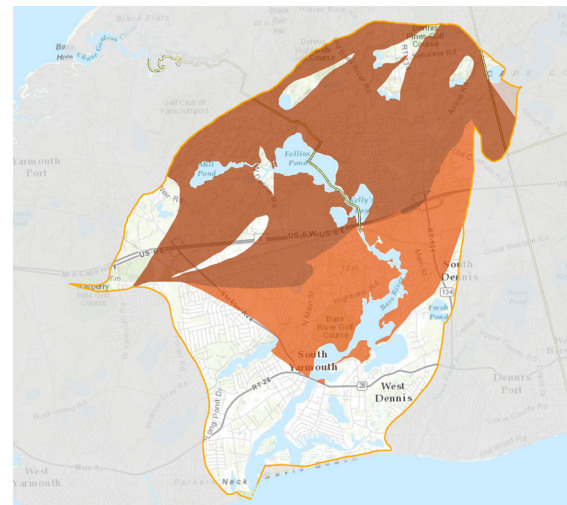
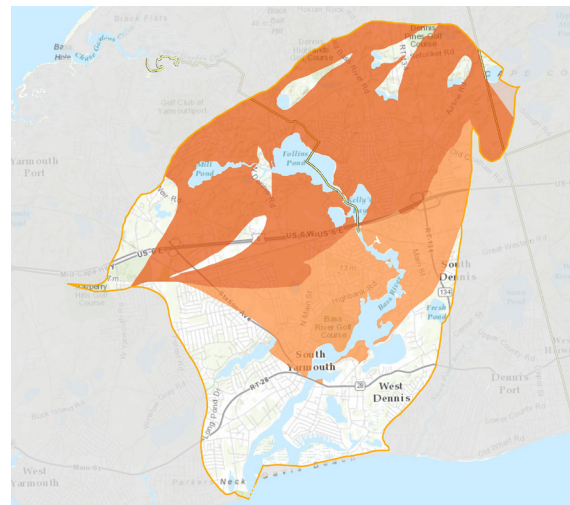
- **SIGNIFICANT FRESHWATER STREAM OUTLETS:** 3
 - Hamblin Brook:
 - Average Flow: 2,993 cubic meters per day (m3/d)
 - Average Nitrate Concentrations: 1.18 milligrams per liter (mg/L)
 - Weir Creek:
 - Average Flow: 16,098 m3/d
 - Average Nitrate Concentrations: 1.04 mg/L
 - Fresh Pond Creek:
 - Average Flow: 1,107 m3/d
 - Average Nitrate Concentrations: 0.955 mg/L
- **DISCUSSION:** These concentrations are significantly higher than areas of the aquifer with less than 0.05 mg/L background concentrations that are evident in public supply wells located in pristine areas. This provides further evidence of the impact of non-point source nitrogen pollution from residential areas on the aquifer and receiving coastal waters.

DRINKING WATER SOURCES

- **WATER DISTRICTS:** 2
 - Dennis Water District
 - Yarmouth Water Division
- **GRAVEL PACKED WELLS:** 31
 - 8 have nitrate concentrations between 0 and 0.5 mg/L
 - 7 have nitrate concentrations between 0.5 and 1 mg/L
 - 7 have nitrate concentrations between 1 and 2.5 mg/L
 - 3 have nitrate concentrations between 2.5 and 5 mg/L
 - 6 have no nitrate concentration data
- **SMALL VOLUME WELLS:** 0

Degree of Impairment and Areas of Need

For the purposes of the §208 Plan Update areas of need are primarily defined by the amount of nitrogen reduction required as defined by the TMDL and/or MEP technical report. These were referred to above as 60% of the septic load or 47% of the total load. The MEP technical report also provides a



Subwatersheds with Total Nitrogen Removal Targets

Figure 4-1 BR

Subwatersheds with Septic Nitrogen Removal Targets

Figure 4-2 BR

specific targeted amount of nitrogen reduction required by subwatershed, see Figure 4-1BR Subwatersheds with Total Nitrogen Removal Targets and Figure 4-2BR Subwatersheds with Septic Nitrogen Removal Targets. While the estuary is heavily tidally influenced in the lower reaches (south of Route 6), portions of the upper reaches have decreased salinity and greatly reduced tidal flushing. A nitrogen loading analysis performed by the MEP shows marked differences between the upper and lower reaches of Bass River. Achieving threshold nitrogen values for the upper reaches requires a total nitrogen removal of up to 80% as opposed to a required reduction of 0% in the lower reaches.

The nitrogen load from the watershed exceeds the threshold for Bass River, resulting in impaired water quality. The ecological health of a water body is determined from water quality, extent of eelgrass, assortment of benthic fauna, and dissolved oxygen and ranges from 1-severe degradation, 2-significantly impaired, 3-moderately impaired, 4-healthy habitat conditions.

ECOLOGICAL CHARACTERISTICS AND WATER QUALITY

- **OVERALL ECOLOGIC CONDITION:** Healthy to Significantly Impaired
- **UPPER REACH:**
 - Mill Pond: Significantly Impaired
 - Follins Pond: Significantly Impaired
 - Dinah Pond: Moderately to Significantly Impaired
 - Kelleys Bay: Significantly Impaired
- **MID REACH:**
 - Mid River: Significantly Impaired
 - Grand Cove: Significantly Impaired
- **LOWER REACH:**
 - Lower River: Significantly Impaired
 - Weir Creek Basin: Healthy to Moderately Impaired
- **SENTINEL STATIONS:**
 - Total Nitrogen Concentration Threshold: 0.42 mg/L
 - Total Nitrogen Concentration Existing: 0.52 mg/L
(As reported at the MEP sentinel water-quality monitoring stations)

LOCAL PROGRESS

DENNIS

Dennis contributes 44% of the attenuated nitrogen load to the Bass River watershed. To date, the Town of Dennis has submitted a Needs Assessment (2005) listing areas of concern (AOCs) for drinking water and wastewater related infrastructure. Dennis identified the AOCs through an analysis of factors including onsite septic system failures and site constraints, shellfish closure areas and,

as the Massachusetts Estuaries Project (MEP) technical report for Bass River was not yet published, possible MEP nitrogen loading findings. A number of these AOCs for the Town of Dennis are located in the Bass River watershed.

YARMOUTH

Yarmouth comprises 56% of the attenuated nitrogen load to the Bass River watershed. The Yarmouth comprehensive wastewater management plan (CWMP), which addresses nitrogen loading issues within the town, was voted down

at Town Meeting in 2011. The CWMP proposed phased sewerage throughout much of the southern portions of town. At the time, the MEP technical report for Bass River had not been published, so the plan emphasized nitrogen reduction needs in the Parkers River and Lewis Bay watersheds. The Needs Assessment, completed in 2005, identified other wastewater needs to address Title 5 compliance and economic development.

Local efforts in these towns are described in Chapter 6.