WATERSHED REPORT: MID CAPE

Rushy Marsh

BARNSTABLE

WATER THREAT LEVEL

HIGH

Rushy Marsh is an embayment system with shoreline located entirely in the Town of Barnstable. The Rushy Marsh system is disconnected from Nantucket Sound during low tide with tidal waters entering the Marsh intermittently.

The Problem

The Massachusetts Estuaries Project (MEP) technical report (available at www.oceanscience.net/estuaries) indicates that the Rushy Marsh system exceeds its critical nitrogen threshold, resulting in impaired water quality. Although a MEP report is available, a Total Maximum Daily Load (TMDL) for nitrogen has not yet been established.

- **MEP TECHNICAL REPORT STATUS:** Final
- **TMDL STATUS:** TMDL not yet established
- **TOTAL WASTEWATER FLOW:** 1 MGY (million gal per year)
  - Treated Wastewater Flow: 0 MGY
  - Septic Flow: 1 MGY
- **UNATTENUATED TOTAL NITROGEN LOAD (MEP):** 163 Kg/Y (kilograms per year)
- **ATTENUATED TOTAL NITROGEN LOAD (MEP):** 163 Kg/Y
- **SOURCES OF CONTROLLABLE NITROGEN (MEP):**
  - 89% Septic Systems
  - 4% Lawn Fertilizer
  - 7% Stormwater From Impervious Surfaces

CONTRIBUTING TOWN

Percent contributions listed below are the aggregate sub-embayment contributions identified in Appendix 8C of the Cape Cod Section 208 Plan Update (contributions are based on attenuated load where available). See Appendix 8C for detailed town allocations by sub-embayment.

- **BARNSTABLE:** 100%

THE MEP RESTORATION SCENARIO

- **WATERSHED TOTAL NITROGEN REDUCTION TARGET:** 79%
- **WATERSHED SEPTIC REDUCTION TARGET:** 100% (The scenario represents the aggregated sub-embayment percent removal targets from the MEP technical report)

RUSHY MARSH ESTUARY

- **EMBAYMENT AREA:** 15 acres
- **EMBAYMENT VOLUME:** 3 million cubic feet
- **2014 INTEGRATED LIST STATUS:** Category 3
  - Category 3: No uses assessed
  - www.mass.gov/eea/docs/dep/water/resources/07v5/14list2.pdf

RUSHY MARSH WATERSHED

- **ACRES:** 57
- **PARCELS:** 18
- **% DEVELOPED RESIDENTIAL PARCELS:** 33%

- **PARCEL DENSITY:** 3 acres per parcel (approx.)
- **WASTEWATER TREATMENT FACILITIES:** 0

Freshwater Sources

PONDS

- **IDENTIFIED SURFACE WATERS:** 1
- **NUMBER OF NAMED FRESHWATER PONDS:** 0
- **PONDS WITH PRELIMINARY TROPHIC CHARACTERIZATION:** 0
- **2014 INTEGRATED LIST STATUS:** None listed

Barnstable has participated in the Pond and Lake Stewardship (PALS) program that has helped establish baseline water quality. Trophic characterizations are based on most recent Commission staff assessment. The pond in this watershed does not have water quality data that allows a preliminary trophic characterization.

STREAMS

- **SIGNIFICANT FRESHWATER STREAM OUTLETS:** 0

Nitrate concentrations higher than 0.05 mg/L background concentrations, evident in public supply wells located in pristine areas, provide evidence of the impact of non-point source pollution on the aquifer and receiving coastal water bodies.

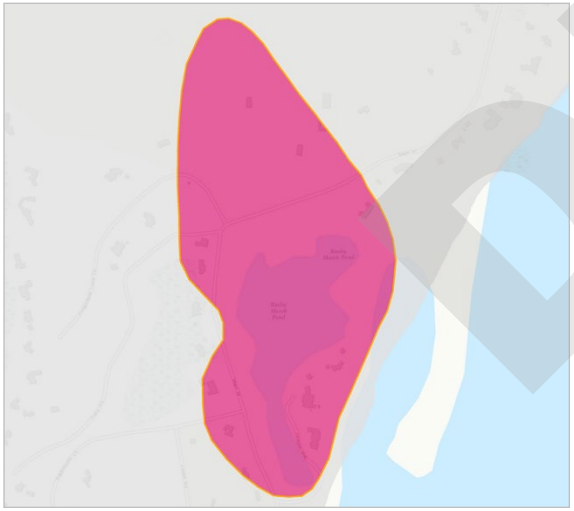
DRINKING WATER SOURCES

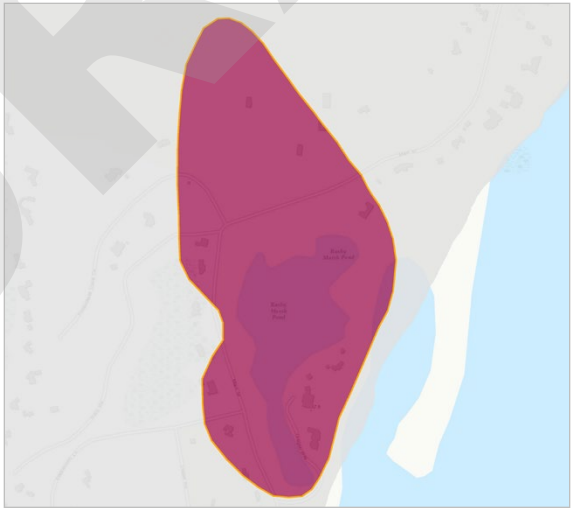
- **WATER DISTRICTS:** 1
  - Centerville-Osterville-Marstons Mills (COMM) Water District
- **GRAVEL PACKED WELLS:** 0
- **SMALL VOLUME WELLS:** 0

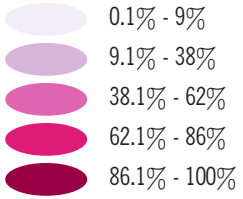
Degree of Impairment and Areas of Need

For the purposes of the Section 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. The aggregated watershed removal rates for Rushy Marsh are 79% and 100% for total watershed load and septic nitrogen load, respectively (see figures: Subwatersheds with Total Nitrogen Removal Targets and Subwatersheds with Septic Nitrogen Removal Targets).

The nitrogen load from the watershed exceeds the threshold for Rushy Marsh, 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.







Subwatersheds with Total Watershed Removal Targets

(Left) Benthic and atmospheric loads directly on embayments are not included.

Subwatersheds with Septic Nitrogen Removal Targets

(Right)

ECOLOGICAL CHARACTERISTICS AND WATER QUALITY

- **OVERALL ECOLOGIC CONDITION:** Severely Degraded
- **MAIN BASIN:** Severely Degraded
- **CHANNEL:** Severely Degraded
- **SENTINEL STATION:**
  - Total Nitrogen Concentration Threshold: 0.99 mg/L
  - Total Nitrogen Concentration Existing: 1.11 mg/L (As reported at the MEP sentinel water-quality monitoring station)

Collection & Non-Collection Scenarios

Regional Data

In 2010, the Commission sought to collect regionally consistent data for the purposes of watershed scenario development. Both parcel data and water use data was identified and collected for the entire region. While the scientific basis for planning is the thresholds identified in the MEP technical reports, each report uses data from different years, and in some cases the MEP data used is 10 or more years old. In addition, there are watersheds on Cape Cod without the benefit of an MEP report; therefore, similar data was not available for planning purposes.

The updated regional data set was used to estimate wastewater, stormwater and fertilizer loads, using the same methodologies as the MEP. This approach allows for a reevaluation of existing development, which may have changed in the last 10 years. Parcel data included in the regional database is from 2010-2012 and water use data is from 2008-2011, depending on the water district. This approach allows for regionally consistent watershed scenario development.

Watershed Scenarios

The watershed scenarios that follow outline possibilities for the watershed. A series of non-traditional technologies that might be applicable are included, as well as the amount of flow and approximate number of residential parcels that would need to be collected if a traditional collection system and treatment facility was implemented. Some assumptions were made in determining the approximate flows and parcels for collection, including a treatment factor of 5 parts per million (ppm), disposal occurring inside the watershed, and no natural attenuation, therefore prioritizing parcels with a direct impact on the water body. Site specific determinations of collection areas may result in the need to collect more or less parcels to meet the nutrient reduction target. The scenarios presented are meant to act as a starting point for discussions regarding effective and cost efficient solutions.

RUSHY MARSH NITROGEN SOURCES	TOTAL NITROGEN LOAD (kg-N/yr)
Wastewater	63
Fertilizer	3
Stormwater	12
Other	4
TOTAL	82
Total Watershed Load (including atmospheric)	82
Total Watershed Threshold	34
TOTAL LOAD TO BE REMOVED	48

Collection & Non-Collection Scenarios

Non-Collection

400 Square Feet - Floating Constructed Wetlands

Collection

DEVELOPED RESIDENTIAL PARCELS IN WATERSHED

1

6 Residential Parcels in the watershed

RESIDENTIAL EQUIVALENTS NECESSARY TO MEET NITROGEN REDUCTION TARGET VIA COLLECTION

1

11 Residential Equivalents Necessary to Meet Nitrogen Reduction Target

= 50 Residential Parcels

11	1,635
Residential Equivalents Necessary to Meet Nitrogen Reduction Target	Flow Collected (gpd)

SCENARIO ASSUMPTIONS: Assumes treatment to 5 parts per million (ppm) nitrogen. Assumes disposal occurs inside the watershed. In this watershed, reduction targets may not be met with disposal inside the watershed. Assumes no natural attenuation; therefore, prioritizing parcels with a direct impact on the water body.

Town of Barnstable Local Progress

The Cape Cod Commission and the Town of Barnstable met and discussed the use of WatershedMVP to evaluate targeted watershed approaches for each of the watersheds in which they have jurisdiction. In 2015, the town reformulated its Citizen's Advisory Committee (CAC) for wastewater planning to better address local needs. In addition to local participation, the newly formed committee (the Water Resources Advisory Committee or WRAC) includes state and regional representatives. Town staff provided modifications to Commission-developed watershed scenarios and presented those scenarios to their WRAC for review and discussion. Those scenarios are included in this report.

The Town of Barnstable operates the Hyannis Water Pollution Control Facility (WPCF), located off Bearses Way in Hyannis, which is the primary wastewater treatment facility serving approximately 2,900 properties in Hyannis and Barnstable village. The treatment facility has been upgraded and permitted to treat additional flows up to a total of 4.2 million gallons per day (MGD), upon meeting requirements of an adaptive management plan approved by the Commission in 2007. Property along Route 132 was acquired by the town in 2002 to potentially accommodate future disposal needs. The site is approved under a 2006 Massachusetts Environmental Policy Act (MEPA) certificate to discharge up to 0.5 MGD. The site is not presently in use. However, a force main and sewer has been extended to the site from the WPCF.

The WPCF treats an average daily flow of 1.46 MGD and a maximum monthly average flow of 1.94 MGD. Treatment performance has averaged 5 milligrams per liter (mg/L) total nitrogen in the treated effluent and the facility has a discharge limit of 5 mg/L under the 2007 Development of Regional Impact (DRI) decision and a limit of 10 mg/L under a Groundwater Discharge Permit (GWDP). The facility is also equipped with sludge thickening, storage and dewatering facilities sized for the current process conditions.

The Town of Barnstable also operates two smaller facilities – the Marstons Mills Wastewater Treatment Facility (WWTF) and the Red Lily Pond Cluster System. The Marstons Mills WWTF is limited to a discharge flow of 42,900 gallons per day (GPD) and is intended to service the Barnstable United Elementary School and the Village at Marstons Mills affordable housing development. The Red Lily Pond Cluster System currently serves 17 homes. According to the comprehensive wastewater management plan (CWMP) approved in 2007, no performance sampling of the system occurs and the system is assumed to produce comparable effluent to any conventional single family septic system.

In addition to municipally-owned facilities, there are two privately-owned treatment facilities treating wastewater from the Cotuit Landing shopping plaza and the Cape Regency nursing and rehabilitation facility. These facilities provide high levels of wastewater treatment. The treatment facility at Cotuit Landing was designed with additional treatment capacity beyond the expected needs of the shopping plaza for potential treatment of flows from neighboring properties.

Barnstable is working on a town-wide nutrient management plan that will provide the basis of its CWMP. The plan will address nitrogen and other needs in watersheds draining to Three Bays, Centerville River, and Lewis Bay. A nitrogen total maximum daily load (TMDL) for Barnstable Harbor has not been approved by US EPA. The MEPA certificate scope for the Final Environmental Impact Report (FEIR) includes engagement in a targeted watershed approach, consistent with the 208 Plan Update.

In the fall of 2014, Barnstable adopted local nitrogen-oriented fertilizer management regulations consistent with the Cape-wide Fertilizer Managem ent District of Critical Planning Concern (DCPC).

In 2015, the Town submitted a Statement of Interest to the US EPA for a hydrogeologic site characterization as an initial step toward piloting a permeable reactive barrier in the town. One of three sites proposed by the Town was selected for characterization. The work was completed in 2016. The draft report is presently being reviewed by the Town.

In June 2016, Barnstable received $28,850 from the Commission to fund upgrades to three stormwater treatment BMPs. Funding was part of $142,149 in local grants made available to communities by the Commission in support of 208 Plan implementation.