WATER THREAT LEVEL

HIGH

WATERSHEDS: LOWER CAPE

Pleasant Bay

The Problem

The Massachusetts Estuaries Project (MEP) technical report (available at: http://www.oceansciences.net/estuaries/) indicates that the nitrogen load from the Pleasant Bay watershed exceeds the threshold and Total Maximum Daily Load (TMDL) for the water body, resulting in impaired water quality.

- **MEP TECHNICAL REPORT STATUS:** Final
- **TMDL STATUS:** Final TMDL
- **TOTAL WASTEWATER FLOW:** 272 MGY
  - Treated WW Flow: 17 MGY
  - Septic Flow: 255 MG°Y
- **UNATTENUATED TOTAL NITROGEN LOAD (MEP):** 81,167 Kg/Y (kilograms per year)
- **ATTENUATED TOTAL NITROGEN LOAD (MEP):** 78,001 Kg/Y
- **SOURCES OF CONTROLLABLE NITROGEN (MEP):**
  - 75% Wastewater
  - 16% Fertilizer
  - 9% Stormwater From Impervious Surfaces

CONTRIBUTING TOWNS

- **BREWSTER**
- **CHATHAM**
- **HARWICH**
- **ORLEANS**

- **DISCUSSION:** A portion of the land area in this watershed is within the boundaries of the Cape Cod National Seashore and any nitrogen load that results is not within control of the towns.

THE MEP RESTORATION SCENARIO

- **WATERSHED TOTAL NITROGEN REDUCTION TARGET:** 36%
- **WATERSHED SEPTIC REDUCTION TARGET:** 54% (The scenario represents the aggregated sub-embayment percent removal targets from the MEP technical report)

PLEASANT BAY ESTUARY

- **EMBAYMENT AREA:** 6,162 acres
- **EMBAYMENT VOLUME:** 2,077 million cubic feet
- **2012 INTEGRATED LIST STATUS:** Category 4A
  - Category 4A: TMDL is completed
  - www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

PLEASANT BAY WATERSHED

- **ACRES:** 11,760
- **PARCELS:** 5,796
- **% DEVELOPED RESIDENTIAL PARCELS:** 79%
- **PARCEL DENSITY:** 2 acres per parcel (appx.)

Pleasant Bay is the largest marine embayment on Cape Cod with shoreline located in the Towns of Orleans, Harwich and Chatham. The system is designated under state surface water regulations as Outstanding Resource Waters that should not be allowed to degrade. Pleasant Bay is comprised of a large basin rimmed by numerous sub-embayments, including Ryder's Cove, Muddy Creek, Quanset Pond and Pochet Neck.

- **WASTEWATER TREATMENT FACILITIES:** 3
  - Pleasant Bay Nursing Home, Brewster
  - Wequassett Inn, Harwich
  - Chatham Bars Inn, Chatham

Freshwater Sources

PONDS

- **IDENTIFIED SURFACE WATERS:** 77
- **NUMBER OF NAMED FRESHWATER PONDS:** 42
- **PONDS WITH PRELIMINARY TROPHIC CHARACTERIZATION:** 24
  (Listed In Appendix 4C, Ponds With Water Quality Data)
- **2012 INTEGRATED LIST STATUS:** 7 listed for fecal coliform only
- **DISCUSSION:** Water quality assessments have been critical to the 2010 implementation of alum treatments for Stillwater Pond and Lovers Lake, located in the Chatham portion of the Pleasant Bay watershed. Other detailed assessments include a water quality assessment and management recommendations for freshwater ponds in Brewster, some of which are located in the Pleasant Bay watershed, and a water quality assessment of Hawksnest Pond in Harwich, which contributes to Muddy Creek. Detailed assessments have also been conducted for Bakers Pond and Crystal and Pilgrim Lakes located in Orleans and within the Pleasant Bay watershed.

STREAMS

- **SIGNIFICANT FRESHWATER STREAM OUTLETS:** 2

  Tar Kiln Stream:
  - Average Flow: 2,763 cubic meters per day (m3/d)
  - Average Nitrate Concentrations: 0.35 milligrams per liter (mg/L)

LOCAL PROGRESS

ORLEANS

The Town of Orleans contributes 28% of the attenuated wastewater nitrogen load to the Pleasant Bay watershed. The town's Comprehensive Wastewater Management Plan (CWMP) was approved in 2011. The CWMP characterizes nitrogen reduction needs pursuant to the Massachusetts Estuaries Project (MEP) and Total Maximum Daily Load (TMDL) reports for Pleasant Bay. The Needs Assessment completed in 2009 identifies other wastewater needs to address Title 5 compliance and economic development.

BREWSTER

The Town of Brewster contributes approximately 14% of the attenuated wastewater nitrogen load to the Pleasant Bay watershed. The town is presently developing an Integrated Water Resources Management Plan (IWRMP). The IWRMP Phase II report was issued in 2012 with assessments and recommendations addressing nitrogen loading to Pleasant Bay, existing and future drinking water, and stormwater and freshwater pond needs.

HARWICH

The Town of Harwich contributes approximately 18% of the attenuated wastewater nitrogen load to the Pleasant Bay watershed. The town submitted its draft CWMP for review in 2012. The CWMP proposes wastewater collection in the Pleasant Bay watershed and considers opportunities to partner with Chatham to treat wastewater generated and collected in East Harwich at the Chatham wastewater treatment facility. Disposal of treated effluent would occur at the Chatham facility until Harwich constructs its own treatment and disposal facilities proposed in the Herring River watershed. The Harwich CWMP includes both structural and non-structural interventions, such as the use of stormwater best management practices (BMPs), enhanced natural attenuation, and permeable reactive barriers (PRBs) to reduce wastewater collection.

CHATHAM

The Town of Chatham contributes approximately 37% of the attenuated wastewater nitrogen load to the Pleasant Bay watershed. The town began implementing its CWMP in 2010. The CWMP proposes plans to sewer the entire town, with the implementation of later sewering phases being contingent upon results of on-going monitoring under the adaptive management plan. The Town of Chatham, in cooperation with the Town of Harwich, will begin construction of a new culvert that will provide increased tidal flushing and improved water quality in Muddy Creek.

Local efforts in these towns are described in Chapter 6.

Kescayo Stream:
- Average Flow: 981 m3/d
- Average Nitrate Concentrations: 0.19 mg/L

Pah Wah Stream:
- Average Flow: 388 m3/d
- Average Nitrate Concentrations: 0.19 mg/L

- **DISCUSSION:** These concentrations are 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.

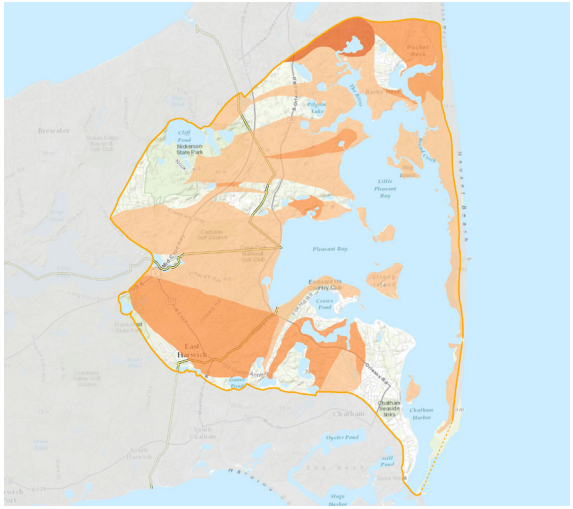
DRINKING WATER SOURCES

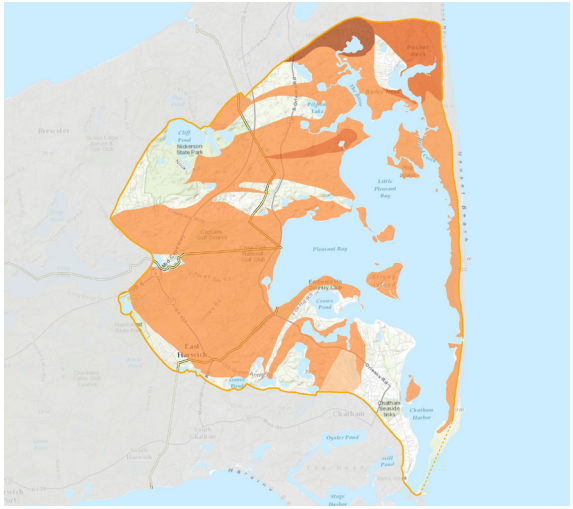
- **WATER DISTRICTS:** 3
  - Brewster Water Department
  - Harwich Water Department
  - Orleans Water Department
- **GRAVEL PACKED WELLS:** 15
  (11 with available nitrate data)
  - 8 have nitrate concentrations less than 1 mg/L
  - 3 have concentrations between 1 and 2.5 mg/L
- **SMALL VOLUME TRANSIENT WELLS:** 2
- **DISCUSSION:** Each of the town water departments and land trusts have acquired significant portions of land within wellhead protection areas for water quality protection which, together with adopted land use controls recommended from the 1978 §208 water quality plan, has resulted in excellent drinking water quality.

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 are shown above as 36% of the total nitrogen load and 52% of the septic nitrogen load and, more specifically as the targeted amount of nitrogen reduction required by subwatershed in Figure 4-1 PB Subwatersheds with Total Nitrogen Removal Targets and Figure 4-2 PB Subwatersheds with Septic Nitrogen Removal Targets.

The nitrogen load from the watershed exceeds the nitrogen TMDL for Pleasant Bay, 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. Headwater sub-embayments of Pleasant Bay are particularly impaired. Although well-flushed portions of the embayment system, such as Chatham Harbor, exhibit healthy habitat conditions, inland sub-embayments that receive less tidal flushing are experiencing moderate to severe habitat degradation.





0.1% - 9%
9.1% - 38%
38.1% - 62%
62.1% - 86%
86.1% - 100%

Subwatersheds with
Total Nitrogen Removal Targets

Figure 4-1 PB

Subwatersheds with
Septic Nitrogen Removal Targets

Figure 4-2 PB

MEP ECOLOGICAL CHARACTERISTICS AND WATER QUALITY

- **OVERALL ECOLOGIC CONDITION:** Healthy to Severely Degraded
- **MEETINGHOUSE POND AND OUTLET:** Significantly Impaired
- **LONNIES POND:** Moderately to Significantly Impaired
- **AREYS POND AND OUTLET:** Significantly Impaired to Severely Degraded
- **THE RIVER:** Moderately Impaired
- **PAW WAH POND:** Significantly Impaired
- **QUANSET POND:** Significantly Impaired
- **ROUND COVE:** Moderately to Significantly Impaired
- **UPPER MUDDY CREEK:** Severely Degraded
- **LOWER MUDDY CREEK:** Significantly Impaired
- **BASSING HARBOR – RYDERS COVE:** Moderately Impaired
- **BASSING HARBOR – CROWS POND:** Moderately Impaired
- **BASSING HARBOR – LOWER BASIN:** Healthy to Moderately Impaired
- **BASSING HARBOR – FROST FISH CREEK:** Significantly Impaired
- **POCHET:** Healthy
- **LITTLE PLEASANT BAY:** Moderately Impaired
- **PLEASANT BAY:** Moderately Impaired
- **CHATHAM HARBOR:** Healthy
- **SENTINEL STATIONS:**
  - Total Nitrogen Concentration Threshold: 0.16 mg/L
  - Total Nitrogen Concentration Existing: 0.18 mg/L (As reported at the MEP sentinel water-quality monitoring stations)