

WATERSHEDS: UPPER CAPE Great, Green and Bournes Ponds



The Problem

The Massachusetts Estuaries Project (MEP) technical report (available at www.oceanscience.net/estuaries) indicates the Great, Green and Bournes Pond systems exceed their critical thresholds for nitrogen, resulting in impaired water quality. A total maximum daily load (TMDL) for nitrogen has been established by MassDEP and US EPA for each water body.

Great Pond

- **MEP TECHNICAL REPORT STATUS:** Final
- **TMDL STATUS:** Final TMDL
- **TOTAL WASTEWATER FLOW:** 219 MGY (million gal year)
 - Treated WW Flow: 0 MGY
 - Septic Flow: 219 MGY
- **UNATTENUATED TOTAL NITROGEN LOAD (MEP):** 21,796 kg/Y (kilograms per year)
- **ATTENUATED TOTAL NITROGEN LOAD (MEP):** 16,034 kg/Y
- **SOURCES OF CONTROLLABLE NITROGEN (MEP):**
 - 82% Septic Systems
 - 7% Lawn Fertilizer
 - 9% Stormwater From Impervious Surfaces
 - 2% Wastewater Treatment Facilities*
(*MEP assumed contribution from the MMR Ashumet Plume)

CONTRIBUTING TOWNS

- **FALMOUTH**
- **SANDWICH (JBCC)**
- **BOURNE (JBCC)**
- **DISCUSSION:** The land area in Sandwich and Bourne is not in the control of the towns as it is part of Joint Base Cape Cod (JBCC), which is served by a wastewater treatment facility and discharged outside of the watershed.

THE MEP RESTORATION SCENARIO

- **WATERSHED TOTAL NITROGEN REDUCTION TARGET:** 63%
- **WATERSHED SEPTIC REDUCTION TARGET:** 82%
(The scenario represents the aggregated sub-embayment percent removal targets from the MEP technical report)

GREAT POND ESTUARY

- **EMBAYMENT AREA:** 282 acres
- **EMBAYMENT VOLUME:** 54 million cubic feet
- **2012 INTEGRATED LIST STATUS:** Category 4a for fecal coliform, estuarine bioassessments and nitrogen
 - Category 4a: TMDL is completed
 - www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

The Great, Green and Bournes Ponds have shorelines located entirely in the Town of Falmouth. They are linear coastal ponds that are approximately ¼ mile wide and extend approximately 2 miles to their headwaters with groundwater fed streams. Two of the three coastal ponds, Great Pond and Bournes Ponds, have sub-embayments (Perch Pond and Israel's Cove). Contributing areas to Great Pond are located in Falmouth. The estuaries support a variety of recreational uses including boating, swimming, shell fishing and fin fishing.

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GREAT POND WATERSHED

- ACRES: 7,962
- PARCELS: 4,901
- % DEVELOPED RESIDENTIAL PARCELS: 84%
- PARCEL DENSITY: 1.6 acres per parcel (approx.)
- WASTEWATER TREATMENT FACILITIES: 0

Green Pond

- MEP TECHNICAL REPORT STATUS: Final
- TMDL STATUS: Final TMDL
- TOTAL WASTEWATER FLOW: 71 MGY (million gal year)
 - Treated WW Flow: 2 MGY
 - Septic Flow: 69 MGY
- UNATTENUATED TOTAL NITROGEN LOAD (MEP): 6,947 kg/Y (kilograms per year)
- ATTENUATED TOTAL NITROGEN LOAD (MEP): 5,623 kg/Y
- SOURCES OF CONTROLLABLE NITROGEN (MEP):
 - 79% Septic Systems
 - 9% Lawn Fertilizer
 - 7% Stormwater From Impervious Surfaces
 - 5% Wastewater Treatment Facilities* (*MEP assumed contribution from the MMR Ashumet Plume)

CONTRIBUTING TOWNS

- FALMOUTH: 100%

THE MEP RESTORATION SCENARIO

- WATERSHED TOTAL NITROGEN REDUCTION TARGET: 55%

- WATERSHED SEPTIC REDUCTION TARGET: 65% (The scenario represents the aggregated sub-embayment percent removal targets from the MEP technical report)

GREEN POND ESTUARY

- EMBAYMENT AREA: 135 acres
- EMBAYMENT VOLUME: 22 million cubic feet
- 2012 INTEGRATED LIST STATUS: Category 4a for fecal coliform, estuarine bioassessments and nitrogen
 - Category 4a: TMDL is completed
 - www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

GREEN POND WATERSHED

- ACRES: 1,450
- PARCELS: 1,448
- % DEVELOPED RESIDENTIAL PARCELS: 89%
- PARCEL DENSITY: 1 acre per parcel (approx.)
- WASTEWATER TREATMENT FACILITIES: 1
 - Village Laundromat

Bournes Pond

- MEP TECHNICAL REPORT STATUS: Final
- TMDL STATUS: Final TMDL
- TOTAL WASTEWATER FLOW: 58 MGY
 - Treated WW Flow: 0 MGY
 - Septic Flow: 58 MGY
- UNATTENUATED TOTAL NITROGEN LOAD (MEP): 5,772 kg/Y
- ATTENUATED TOTAL NITROGEN LOAD (MEP): 4,279 kg/Y
- SOURCES OF CONTROLLABLE NITROGEN (MEP):
 - 85% Septic Systems

GREAT, GREEN AND BOURNES PONDS

- 7% Lawn Fertilizer
- 8% Stormwater From Impervious Surfaces

CONTRIBUTING TOWNS

- FALMOUTH: 100%

THE MEP RESTORATION SCENARIO

- WATERSHED TOTAL NITROGEN REDUCTION TARGET: 76%
- WATERSHED SEPTIC REDUCTION TARGET: 91% (The scenario represents the aggregated sub-embayment percent removal targets from the MEP technical report)

BOURNES POND ESTUARY

- EMBAYMENT AREA: 159 acres
- EMBAYMENT VOLUME: 22,408,300 million cubic feet
- 2012 INTEGRATED LIST STATUS: Category 4a for fecal coliform, estuarine bioassessments and nitrogen
 - Category 4a: TMDL is completed
 - www.mass.gov/eea/docs/dep/water/resources/07v5/12list2.pdf

BOURNES POND WATERSHED

- ACRES: 1,335
- PARCELS: 1,191
- % DEVELOPED RESIDENTIAL PARCELS: 85%
- PARCEL DENSITY: 1.1 acres per parcel (approx.)
- WASTEWATER TREATMENT FACILITIES: 0

Freshwater Sources

PONDS

- **IDENTIFIED SURFACE WATERS:** 35
- **NUMBER OF NAMED FRESHWATER PONDS:** 18
- **PONDS WITH PRELIMINARY TROPHIC CHARACTERIZATION:** 0
(Listed In Appendix 4C, Ponds With Water Quality Data)
- **2012 INTEGRATED LIST STATUS:** None listed
- **DISCUSSION:** Only three of the ponds, all of which are in the Great Pond watershed have water quality data; however, these ponds are listed as not interpreted which indicates that not enough information has been gathered to assign a preliminary trophic status.

STREAMS

- **SIGNIFICANT FRESHWATER STREAM OUTLETS:** 3
 - Bournes Brook:
 - Average Flow: 3,766 cubic meters per day (m³/d)
 - Average Nitrate Concentrations: 0.543 milligrams per liter (mg/L)
 - Backus Brook:
 - Average Flow: 7,211 m³/d
 - Average Nitrate Concentrations: 0.062 mg/L
 - Coonamesset River:
 - Average Flow: 26,593 m³/d
 - Average Nitrate Concentrations: 0.565 mg/L
- **DISCUSSION:** Characterization of fresh water streams like these is a regular part of the MEP technical reports. 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 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:** 1
 - Falmouth Water Department
- **GRAVEL PACKED WELLS:** 4
 - 1 has nitrate concentrations between 0 and 0.5 mg/L
 - 1 has nitrate concentrations between 0.5 and 1 mg/L
 - 2 have no nitrate concentration data
- **SMALL VOLUME WELLS:** 6
- **DISCUSSION:** Residents in Great, Green and Bournes Ponds receive drinking water from the Falmouth Water

LOCAL PROGRESS

FALMOUTH

The Town of Falmouth contributes 100% of the attenuated nitrogen load to Great, Green and Bournes Ponds. The Town of Falmouth has an approved Comprehensive Wastewater Management Plan (CWMP) (2014). It contains a Targeted Watershed Management Project for the Little Pond watershed to install a sewer collection system and a tidal inlet widening to improve flushing of Bournes Pond. Further decisions are deferred to evaluate a series of pilot projects for nontraditional technologies.

To acquire baseline water quality data necessary for ecological management of Falmouth's coastal salt ponds and harbors, a citizen-based water quality monitoring program was initiated, Falmouth Pond Watch, to provide

on-going nutrient related embayment health information. The water quality monitoring program originally monitored the health of three ponds - Oyster Pond, Little Pond, and Green Pond. By 1990, the scope broadened to include Great/Perch Pond and Bournes Pond. Continuing efforts to monitor conditions will be part of the CWMP implementation.

SANDWICH

The entire contributing portion in Sandwich is on Joint Base Cape Cod (formerly the Massachusetts Military Reservation), land area over which the town does not have control.

The portion of Sandwich which contributes to the Great Pond watershed is wholly comprised within the JBCC.

Areas within the JBCC are served by the wastewater treatment facility located in the Ashument Pond subwatershed. Treated wastewater from the facility is discharged out of the watershed in close proximity to the Cape Cod Canal. As such, wastewater contributions are not considered as part of the nitrogen loading calculations for this watershed. The wastewater effluent plume from the previous MMR wastewater facility has been fully described and documented by the US Geological Survey (USGS) and the Air Force Center for Engineering and the Environment (AFCEE). A small portion of nitrogen from the historic effluent plume is discharging into the Bourne's Pond system in relation to the mass of nitrogen from residential development as documented by MEP and USGS reports.

Local town efforts are described in more detail in Chapter 6.

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Department. Three of the gravel community supply wells are in Great Pond, and one is in Green Pond.

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 82%, 65% and 91% of the septic load and 63%, 55% and 76% of the total nitrogen load for Great, Green and Bourne Ponds, respectively. The MEP technical report also provides a specific targeted amount of nitrogen reduction required by sub-watershed, as shown in Figure 4-1 GGB Subwatersheds with Total Nitrogen Removal Targets and Figure 4-2 GGB Subwatersheds with Septic Nitrogen Removal Targets.

The nitrogen load from the watershed exceeds the thresholds or TMDLs for Great, Green, and Bourne Ponds, 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.

MEP ECOLOGICAL CHARACTERISTICS AND WATER QUALITY

■ GREAT POND

- Overall Ecologic Condition: Moderately Impaired to Severely Degraded
- Upper Great Pond: Significantly Impaired
- Perch Pond: Significantly Impaired/Severely Degraded
- Lower Great Pond: Moderately Impaired

Sentinel Stations:

- Total Nitrogen Concentration Threshold: 0.40 mg/L
- Total Nitrogen Concentration Existing: 0.59 mg/L (As reported at the MEP sentinel water-quality monitoring stations)

■ GREEN POND

- Overall Ecologic Condition: Significantly Impaired to Severely Degraded
- Upper Green Pond: Significantly Impaired to Severely Degraded
- Mid Green Pond: Significantly Impaired
- Lower Green Pond: Significantly Impaired

Sentinel Stations:

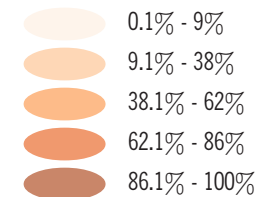
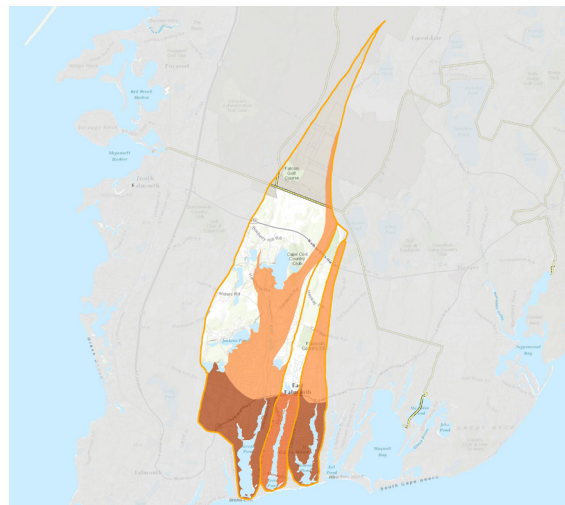
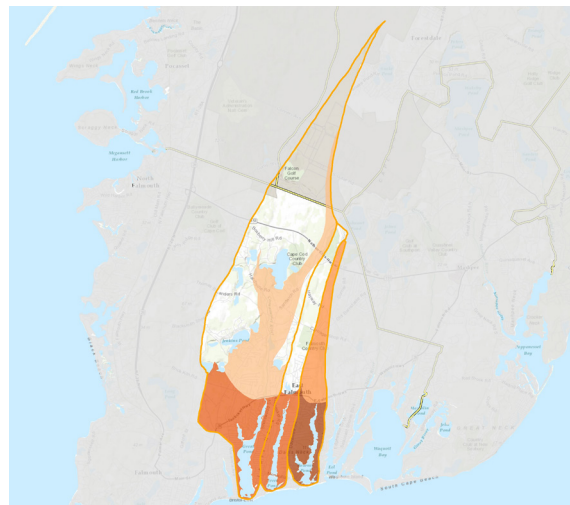
- Total Nitrogen Concentration Threshold: 0.42 mg/L
- Total Nitrogen Concentration Existing: 0.53 mg/L (As reported at the MEP sentinel water-quality monitoring stations)

■ BOURNE POND

- Overall Ecologic Condition: Healthy to Significantly Impaired
- Upper Bourne Pond: Significantly Impaired
- Israel's Cove: Moderately Impaired
- Lower Bourne Pond: Healthy Habitat Conditions

Sentinel Stations:

- Total Nitrogen Concentration Threshold: 0.45 mg/L
- Total Nitrogen Concentration Existing: 0.64 mg/L (As reported at the MEP sentinel water-quality monitoring stations)



Subwatersheds with Total Nitrogen Removal Targets

Figure 4-1 GGB

Subwatersheds with Septic Nitrogen Removal Targets

Figure 4-2 GGB