

STATE OF DUXBURY BAY - 2025



Prepared by Duxbury Bay Management Commission
For the Selectboard and Duxbury Community
November 17, 2025

THE STATE OF DUXBURY BAY – 2025 OVERVIEW



- **Duxbury Bay is a vital ecological, economic, recreational and cultural resource**
- **In the past fifteen years, there has been a significant increase in both recreational and commercial activity on Duxbury Bay.**
 - 40% increase in participants in DBMS programming (over 2,500 individual participants in 2024 vs 600 in 2000).
 - Deep water moorings waitlist has grown to 700 in 2025, and 350 on flats mooring wait list - in 2009 there was no flats mooring waitlist
 - 12 million oysters were harvested and sold in 2024 from Duxbury Bay – a 300%. Increase since 2009.
 - Pleasure boating, and recreational fishing continues to be extremely popular activities/uses of Duxbury Bay
- **Challenges and costs have increased to manage the Duxbury Beach Reservation, with goal to balance conflicting priorities between preservation, conservation, and recreation**

THE STATE OF DUXBURY BAY – 2025 OVERVIEW, CONTINUED



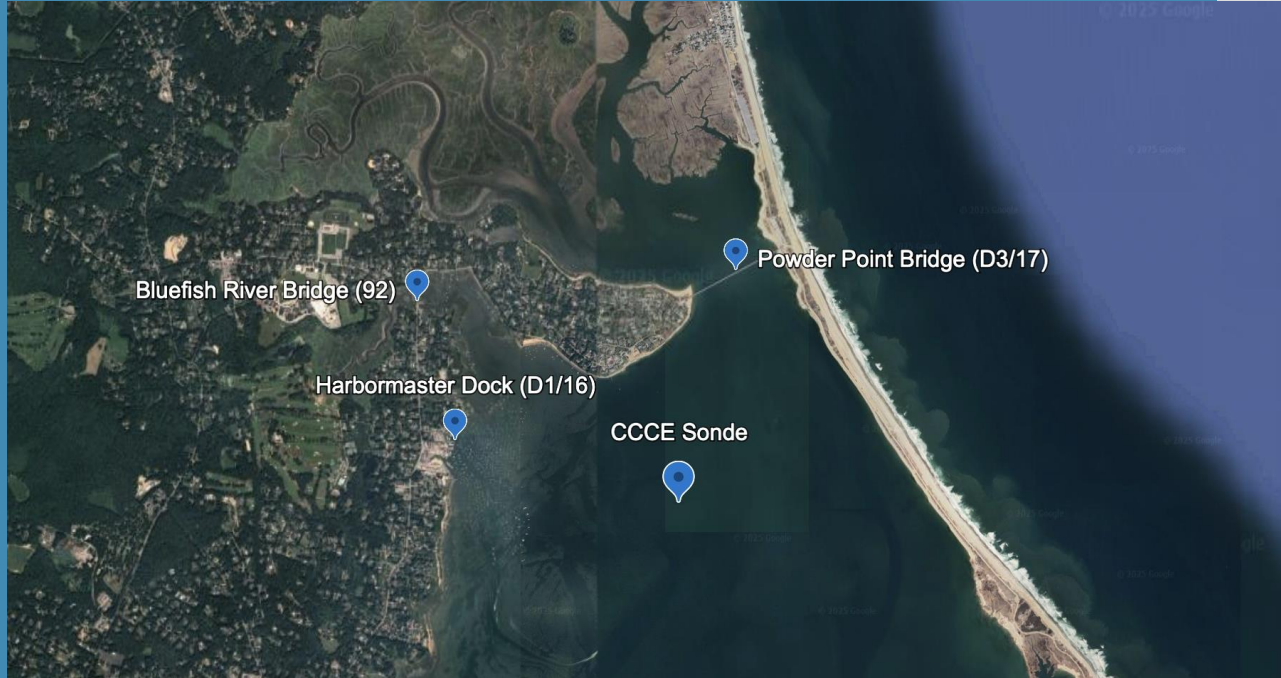
- **Duxbury's Oyster industry is making a significant contribution to the local economy**
 - Aquaculture in Duxbury also provides environmental benefits by removing nutrients from the water, and sequestering CO₂
 - Challenges to Oyster industry include rising costs, increased competition (flat prices), and environmental changes
- **Pathogen testing of bathing beaches as well as Oyster growing areas, indicates Duxbury Bay water quality remains largely safe and compliant to MA DEP and MA DMF standards**
 - However, periodic exceedance events highlight need for continued monitoring, responsive management and public engagement
- **As Oyster industry has grown, there has been a decline of commercial shell fishing of other species, razor clams, quahogs**
 - This is likely an access/licensing issue, not a resource issue
- **Invasive species, particularly green crabs – have seen significant growth and increasingly harmful impact in the last 15 years**

THE STATE OF DUXBURY BAY – 2025 EEL GRASS DECLINE



- **Eel Grass has continued to decline in the past 15 years**
 - Eelgrass aerial photos from 1951, 1995, 2001, 2006, and 2012 surveyed by MA DEP show a 45% loss of eelgrass over the studied period
 - By 2014, eelgrass was no longer present in several areas previously mapped
- **Factors that likely contributed to eel grass loss**
 - Increased nutrient levels, particularly nitrogen, lead to phytoplankton blooms that reduce light penetration, essential for eelgrass photosynthesis
 - Activities such as boating, dredging, and aquaculture can physically damage eelgrass beds
 - Rising water temperatures and changes in salinity can stress eelgrass, making it more susceptible to disease and other stressors
- **Past eel grass restoration efforts in Duxbury have been unsuccessful – but new methods have emerged which are proving to be effective – and will be tried in Duxbury starting in 2026**

THE STATE OF DUXBURY BAY – 2025 WATER QUALITY



- More than 15 years of water quality testing data was analyzed from the Powder Point Bridge, Blue Fish River Bridge, Harbor Masters Dock, an Oyster lease near two rock channel – as well as offshore in Cape Cod Bay
- Duxbury Bay water was tested for:
 - **Temperature, Dissolved Oxygen, Chlorophyll, Total nitrogen compounds (TN), Turbidity**
 - Temperature - Water temperature in the Gulf of Maine and Cape Cod Bay have risen over the past fifteen years. However, from measurement data in Duxbury Bay, there is not statistical correlation to rising temperatures in Cape Cod Bay. However, heat stress events, defined as hourly water temperatures above 25°C, (77 F) have become more frequent and persistent
 - Dissolved Oxygen - Oxygen stress in Duxbury Bay is episodic but appears to be increasing in frequency and severity, particularly in nutrient-impacted and poorly flushed areas of upper Duxbury Bay. These conditions threaten the long-term stability of the estuarine ecosystem.
 - Chlorophyll - The chlorophyll-a data presented in this report suggest that the mid- to upper reaches of the estuary— particularly at the Harbormaster Dock and Power Point Bridge measurement locations —are experiencing heightened stress.
 - Turbidity - In Duxbury Bay, overall water clarity is generally good with no negative trends observed during this nearly twenty year study period.

THE STATE OF DUXBURY BAY – 2025 WATER QUALITY - NITROGEN

MASSACHUSETTS ESTUARIES PROJECT

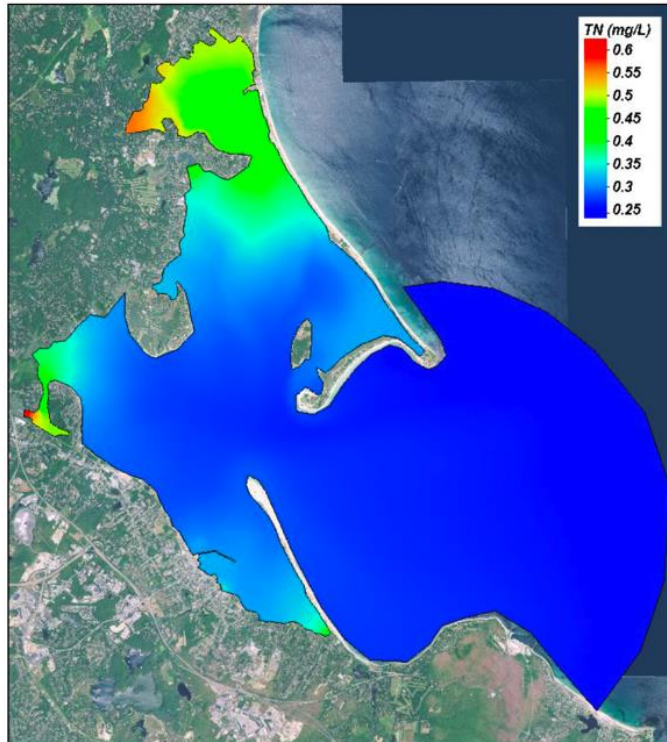


Figure VI-7. Contour plot of average total nitrogen concentrations from results of the present conditions loading scenario, for Plymouth Bay system.

- Upper reaches of Duxbury Bay, (see light green areas in figure below from 2017 MA DEP) are increasingly stressed by nutrient enrichment impacts.
- Nitrogen concentrations are highest in the Bluefish River and have increased at Powder Point Bridge and Harbormaster Dock since 2006, often exceeding recommended ecological thresholds for good water quality.
- Excess nitrogen fuels phytoplankton blooms, leading to oxygen depletion and habitat degradation.
- Primary sources of nitrogen runoff – Septic systems (70% +/-), fertilizer (15%)

THE STATE OF DUXBURY BAY – 2025 WATER QUALITY – NITROGEN



Nitrogen pollution fuels the growth of algae, like this algae bloom in West Falmouth Harbor.

- What is Nitrogen, and why are increased levels of nitrogen compounds harmful to Duxbury Bay?
- Nitrogen is a common, essential element that makes up nearly 80% of the air we breath
- Nitrogen is a major component of all living matter, including in chlorophyll, the compound plants use to perform photosynthesis
- Nitrogen compounds act as fertilizers in marine environments and stimulate plant and algae growth
- Algae and phytoplankton, which form the base of the marine food web, respond with rapid, excessive growth, much like a garden fertilizer promotes plant growth
- This overstimulation of plant growth, or eutrophication, triggers the harmful chain of events like oxygen depletion and habitat degradation in coastal bays and marshes

THE STATE OF DUXBURY BAY – 2025 WATER QUALITY – NITROGEN

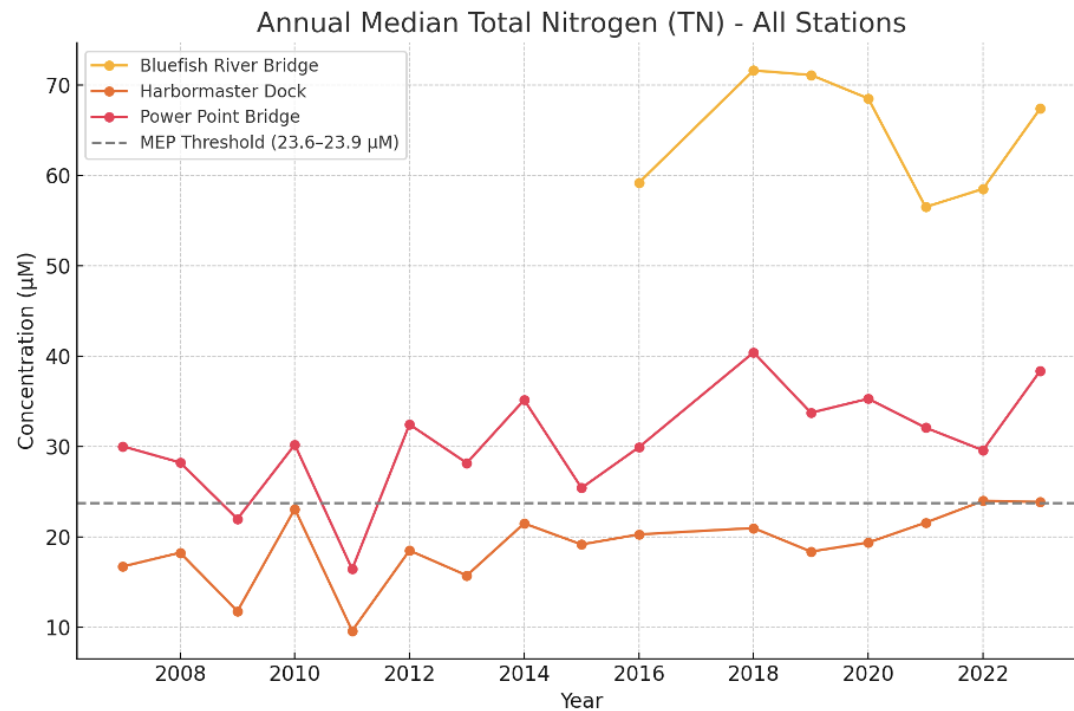


Figure 1: Annual Median Total Nitrogen (TN) at All Monitoring Stations (2007–2023).

- The Mass Department of Environmental Protection (MA DEP) considers excess nitrogen from human activity a “pollutant” when its concentrations exceed the natural background levels in marine ecosystems
- The MA DEP established in the MA Estuaries Project Draft 2017 Report, a total nitrogen (TN) threshold of 0.33 mg/L (.23 μM) for Duxbury Bay
- As indicated by chart on left, measured results at Blue Fish river bridge and Powder Point Bridge are above draft MA DEP TN threshold
- TN for water tested at Powder Point Bridge, and Harbor Master dock, are also showing increasing/negative trends

THE STATE OF DUXBURY BAY – 2025
WHAT OTHER TOWNS ARE DOING

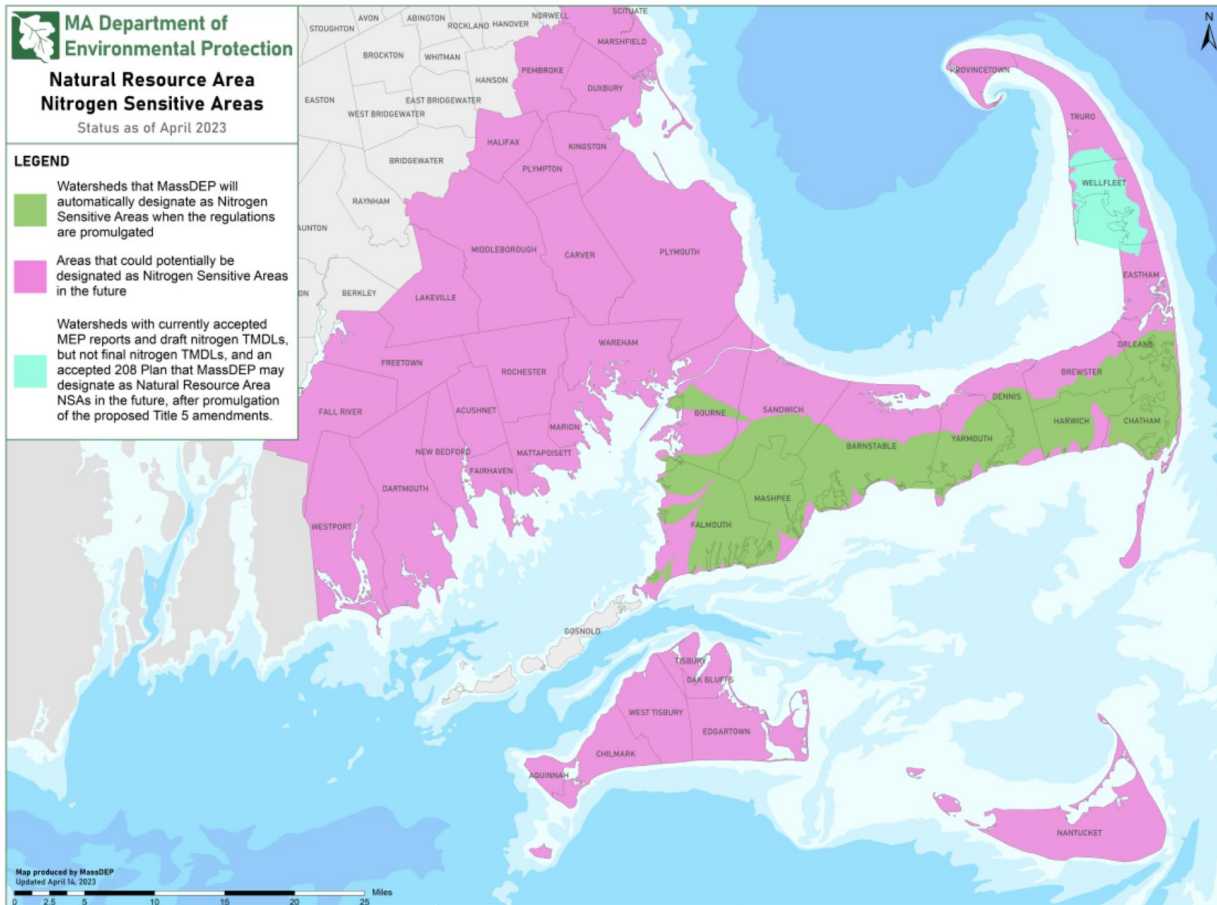
WEST FALMOUTH
NITROGEN-REDUCING
SEPTIC SYSTEM
DEMONSTRATION
PROJECT

MAY 2017 STATUS REPORT



- **Seasonal and Full Fertilizer Bans**
 - Many nearby towns bordering Buzzard's Bay have enacted seasonal fertilizer bans
- **Nantucket banned all fertilizer use, except agriculture in 2022**
- **In 2013 Wareham passed new septic system restrictions to reduce nitrogen pollution, especially near waterways**
 - These regulations prohibited new septic systems within 150 feet of waterways and required the use of nitrogen-reducing systems for any new construction, upgrades, or failed systems between 150 and 500 feet from waterways
- **Several towns on Cape Cod or on Buzzards Bay, have also introduced nitrogen removal requirements for septic systems, including:**
 - Bourne, Brewster, Falmouth,
 - Harwich, Chatham, Dennis, Tisbury, Marion, and Provincetown

THE STATE OF DUXBURY BAY – 2025 WHAT MA DEP IS DOING



- On July 7, 2023 MA DEP Designated “Nitrogen Sensitive Areas” – NSA’s
- Total Towns Affected:
 - All 15 towns in Barnstable County have been impacted by the regulations
- Designation Process:
 - The NSA designation is triggered when a watershed has an **EPA-approved nitrogen TMDL/TN**
- New construction in NRAs
 - Six months after July 7th, 2023, **ALL** new construction located within an NRA will be required to install nitrogen-reducing septic system technologies
- Requirement to Upgrade Septic Systems:
 - No septic systems will be allowed to be permanently “grandfathered” in

DUXBURY BAY – 2025 RECOMMENDED ACTION

1. Conduct a Nitrogen Runoff – Source Assessment

Identify sources and volume of nitrogen run off, particularly focusing on the blue fish, and back river water sheds – T.B.D

2. Develop and Execute Pilot Projects – Remediation

Eel Grass – NSRWA/MA BAY/DBMS/ICO

Marsh Grass – DBR, others

Shellfish “reefs” – T.B.D.

3. Maintain, Expand Water Quality Measurement/Testing

Ensure that testing which has taken place in Duxbury Bay for nearly 20 years, continues, and expand if possible real time, continuous measurement leveraging new technology – DBMS, MA BAYS, CCCE, CCS

For more information/background:

<https://www.town.duxbury.ma.us/conservation>

<https://www.duxburywaterquality.org>