

# Town Cove/Nauset Marsh

## Orleans, MA

### 2001-2023 Water Quality Summary

#### ESTUARY SETTING

Town Cove is the largest terminal basin (425 acres) within the larger Nauset Marsh estuary, which is shared between Orleans and Eastham and is connected through a dynamic inlet to the Atlantic Ocean. The Town Cove inlet is near the end of Freemans Lane with a southwest orientation toward Main Street in town center. The 2012 Nauset Marsh Massachusetts Estuaries Project (MEP) ecosystem assessment noted that Town Cove was significantly impaired with high loss of eelgrass, regular low dissolved oxygen (DO), and degraded sediment habitats. MEP staff concluded that total nitrogen (TN) concentrations in Town Cove (*i.e.*, sentinel station WMO-27) should be limited to 0.45 mg/L in order to restore ecological health throughout the system.



#### WATER COLUMN SAMPLING HISTORY

Nauset Marsh water column sampling began in 2001 at 16 stations for the MEP assessment, but was generally reduced to three key stations in 2005-2015, including WMO-27 in Town Cove. Sampling at most of the original MEP sites was started again beginning in 2016. Sampling results from 2001-2004 were used in the MEP assessment, which was a refined ecosystem assessment

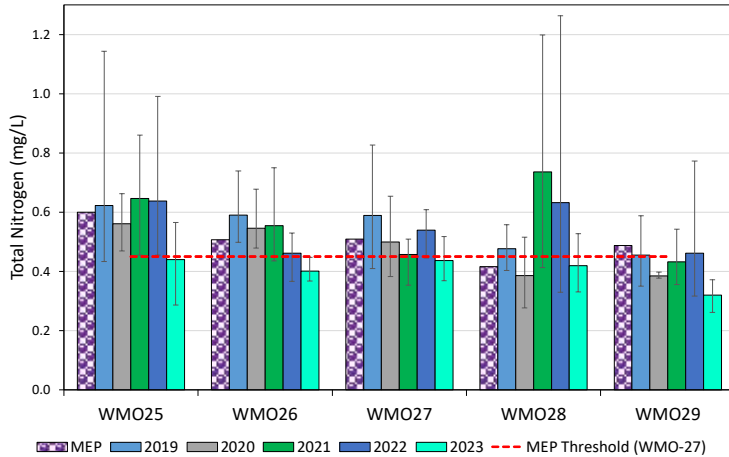
including review of sediment habitat and species, macroalgal accumulation and continuous dissolved oxygen (DO) and tidal measurements. Recent summer sampling occurs 4-5 times each year. Sampling includes DO and temperature readings and lab assays for chlorophyll-a (CHL), ortho-phosphorus, and particulate and dissolved species of nitrogen.

#### 2023 WATER QUALITY STATUS

Town Cove continues to be impaired. Recent monitoring results (2019-2023) show that Town Cove TN levels tend to be greater than the recommended MEP level. The average 2016-2020 TN level at the Town Cove sentinel station (0.60 mg/L) was also significantly higher than the MEP TN level (0.51 mg/L), but 2005-2011 TN levels had decreased to a lower level before rising again. The cause of these variations was thought to be due to changes in the system inlet (2019 tidal levels showed a reduction in the Town Cove tide range), but other key data to help explain these changes in water column readings have not been collected (*e.g.*, sediment TN release, tidal levels, watershed TN inputs). Review of other recent water column factors (*e.g.*, pigments) also had higher recent averages than during the MEP. Since all water column sampling has been completed using the same MEP protocols, data throughout the historical record can be compared. In addition, since all MEP protocols were approved by the state Department of Environmental Protection (MassDEP), all data may be used in regulatory decisions. MassDEP has not established a system-specific nitrogen limit (or TMDL) for Town Cove or Nauset Marsh.

**ECOSYSTEM STATUS:  
Impaired System**

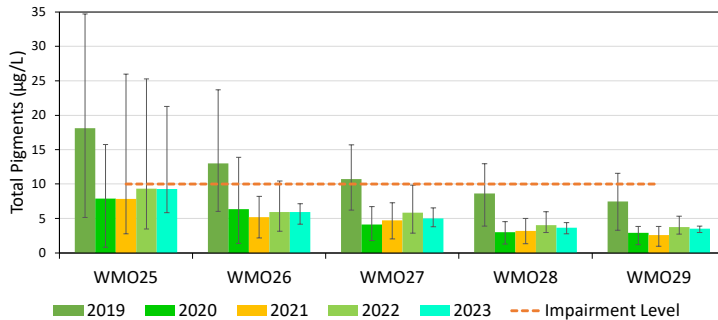
Town Cove Monitoring Stations: Total Nitrogen (2019-2023)



## TOTAL NITROGEN

Nitrogen is a limiting nutrient in salt marsh and estuary ecosystems and is necessary for plant, phytoplankton, and algae growth, but excessive N can be harmful. Based on the 2012 MEP ecosystem assessment of Nauset Marsh, a total nitrogen concentration of 0.45 mg/L at station WMO-27 was recommended as a maximum level in order to maintain a healthy Town Cove ecosystem. A 2022 review of available water column data showed WMO-27 TN levels fluctuate over multi-year periods: decreased to near the MEP threshold in 2005-2011, then increased to greater than 0.6 mg/L in 2016-2020.

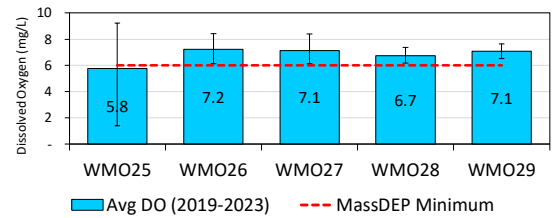
Town Cove Monitoring Stations: Total Pigments (2019-2023)



## TOTAL PIGMENTS

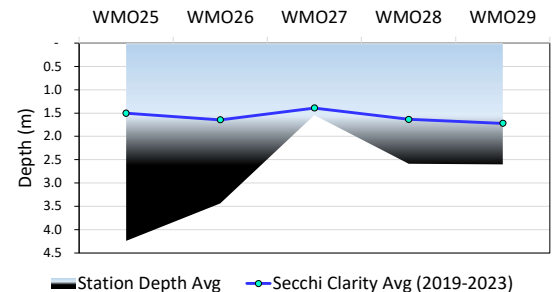
The primary pigments used for photosynthesis by microscopic plants floating in water are summed for the total pigment concentration, which can be used as a measure of the amount of phytoplankton. Excessive levels generally correspond to higher nutrient levels, but these relationships can get complex when eelgrass has disappeared and extensive seaweeds, like the sea lettuce in Town Cove, are part of the ecosystem. Recent pigment levels in Town Cove have been generally moderately impaired and slightly higher than the MEP average (2001-2006).

Town Cove Monitoring Stations: Dissolved Oxygen (2019-2023)



## Dissolved Oxygen

DO concentrations in Town Cove typically vary by depth with generally acceptable levels near the surface and frequent low levels near the sediments (occasional lack of oxygen has also been recorded in the main basin). MassDEP has a regulatory minimum DO level of 6 mg/L for SA waters like Town Cove, but provides flexibility for natural variability. Recent individual mid-depth DO levels at WMO-27 have generally ranged from 7.0 to 7.5 mg/L, while the inner Cove levels at WMO-25 have been lower (5.1 to 6.5 mg/L).



## Water Clarity

Water clarity measured with a Secchi disk is an easy way to measure how deep light can penetrate into an estuary water column. Clarity is an indirect measure of phytoplankton density and where plants can grow well on the bottom of an estuary. Because the depth in an estuary will vary with the tide, measuring the total depth is also an important monitoring task when measuring clarity. Recent clarity in Town Cove has averaged 1.56 m, which is close to the average depth at WMO-27, but is only about a third of the average depth in the deep basin (WMO-25).

Nauset Harbor Massachusetts Estuaries Project report is available on the MassDEP website:

<https://www.mass.gov/doc/nauset-harbor-embayment-system-orleans-eastham-ma-2012/download>