

# Nauset Marsh North/Salt Pond

## Orleans, MA

### 2001-2023 Water Quality Summary

#### ESTUARY SETTING

Nauset Marsh is a complex, 1,500 acre, estuary shared by Orleans and Eastham and includes a number of terminal basins, including Salt Pond (and Town Cove and Mill Pond, each addressed separately). The system inlet to the Atlantic Ocean is dynamic, regularly moving along a barrier beach managed by Cape Cod National Seashore. The 2012 Nauset Marsh Massachusetts Estuaries Project (MEP) ecosystem assessment noted that the main portion of the marsh had healthy conditions, but the terminal basins were all significantly impaired including 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 Salt Pond (WMO-38). 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.

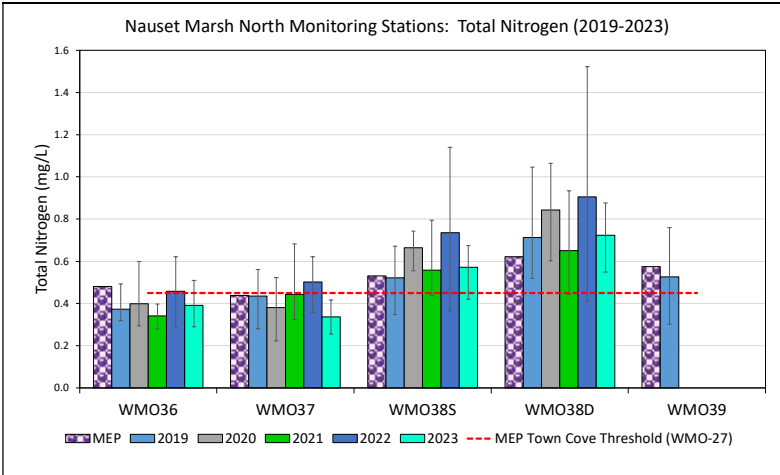
#### 2023 WATER QUALITY STATUS

Most of Nauset Marsh North has acceptable water quality conditions, except for Salt Pond, which was impaired during the MEP and continues to be impaired in recent samplings. Recent 2019-2023 data showed impaired conditions in Salt Pond. 2016-2020 average TN levels at all North Marsh monitoring stations, including shallow readings at Salt Pond, were either similar or less than 2001-2004 MEP averages., but deep Salt Pond readings were impaired. Key ecosystem measures (DO, pigments, etc.) at all North Marsh stations had high variability from year to year. This variability is thought to be due to relatively rapid changes in the system inlet, but other key data to help explain water column changes has not been collected (*e.g.*, sediment TN release, watershed TN inputs). Since all water 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 Nauset Marsh or Salt Pond.

**ECOSYSTEM STATUS:  
Impaired Salt Pond, Other  
Portions Acceptable**

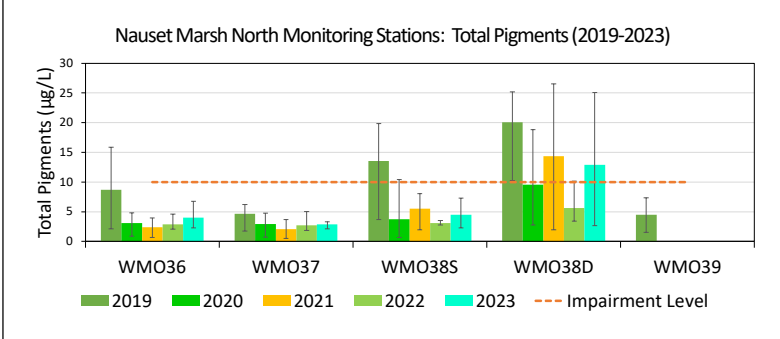
Nauset Harbor Massachusetts Estuaries Project report is available on the MassDEP website:

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



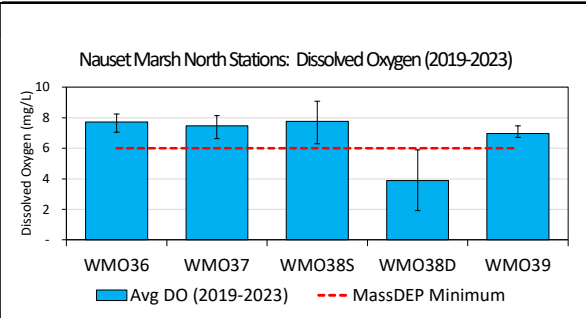
**TOTAL NITROGEN**

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 the Town Cove station (WMO-27) was recommended as a maximum level in order to attain a healthy ecosystem. 2019-2023 water column data showed most northern Marsh stations had acceptable TN levels, but Salt Pond levels regularly exceed the maximum level and deep levels were higher than shallow levels, which suggests sediment additions to the water column.



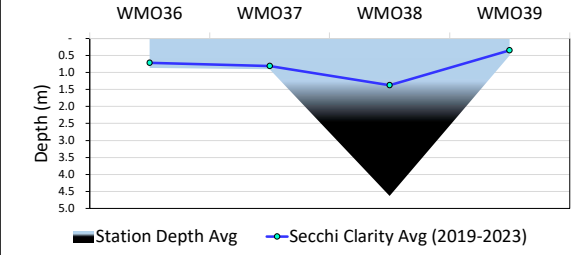
**TOTAL PIGMENTS**

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 Nauset Marsh, are part of the ecosystem. Recent pigment levels in northern Nauset Marsh have generally been acceptable except for impairments in Salt Pond, which often had summer averages greater than MEP average (2001-2006).



**Dissolved Oxygen**

DO concentrations in northern Nauset Marsh are generally acceptable except for the deep levels in Salt Pond, which are frequently less than the MassDEP regulatory minimum DO level of 6 mg/L and occasionally have no meaningful oxygen. Recent (2019-2023) individual station mid-depth DO levels at northern Nauset Marsh stations have generally ranged from 7.0 to 7.8 mg/L, while shallow Salt Pond levels have occasionally averaged >8 mg/L, suggesting regular phytoplankton blooms.



**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 Salt Pond has averaged 1.4 m, which is greater than the average depth at the other northern Marsh stations, but is <30% of the average total depth at Salt Pond (WMO-38).