2025

ECOSYSTEM MONITORING REPORT

Tisbury Great Pond

Great Pond foundation®

TISBURY GREAT POND

Executive Summary

2025

Study Area

Tisbury Great Pond (TGP) is a coastal estuary approximately 740 acres in size located on the Vineyard's southern shoreline in the Towns of Chilmark and West Tisbury, MA. The Pond encompasses a roughly 1,906-acre area watershed. The barrier beach separating TGP from the ocean is manually breached 3-4 times/year as a nutrient and elevation management tool.

Sampling Regime 2025

In 2025, Great Pond Foundation (GPF) continued its ecosystem monitoring program on TGP for the 5th consecutive year. A total of 11 biweekly monitoring trips were conducted between June and October. During each trip, water quality data was obtained for 9 monitoring sites (see map to right). Nutrient samples were collected at 5 of the regular 9 monitoring sites in June, August, and September.

A total of 142 water samples were collected from TGP in 2025 and tested for cyanobacteria as part of the MV CYANO$_{TM}$ program, a collaborative initiative between GPF and the Island Boards of Health.

Cut Dates 2025

Opening Date	Closure Date	Cut Duration
Dec 14th (2024)	Jan 25th	42 days
Mar 26th	Apr 16th	21 days
Jun 21st	Aug 4th	44 days
Nov 2nd	Nov 16th	14 days

Summary of Metrics, 2025

Chlorophyll	🟨
Cyanobacteria	🟥
Dissolved Oxygen	🟥
pH	🟩
Total Nitrogen	🟥
Water Clarity	🟥

🟩 Healthy 🟨 Intermediate 🟥 Impaired

*The "Summary of Metrics" tool assigns health rankings to individual water quality metrics. Refer to the *Appendix* for information on how rankings are assigned.

Pond Summary 2025

TGP exhibited poor water quality in 2025, continuing trends observed in past years. Excessive nitrogen levels promoted phytoplankton overgrowth across much of the Pond, reducing water clarity and depleting dissolved oxygen. Data going back to 2021 indicates that phytoplankton overgrowth has consistently been highest in the Pond's northwestern arm, potentially as a result of elevated nitrogen loading. TGP exhibited nitrogen impairment in 2025 despite a successful 44-day summer cut, indicating that cuts on their own are not adequate to deal with TGP's nitrogen loading issues. For the 3rd straight year, high concentrations of cyanobacteria were measured in benthic (i.e. bottom-dwelling) macroalgae within the Pond's coves. Excess nitrogen loading, phytoplankton build-up, and benthic cyanobacteria growth comprise TGP's key concerns.

Introduction: Continued Impairment in 2025

In 2025, Tisbury Great Pond (TGP) exhibited poor water quality and signs of ecosystem impairment, continuing many of the same trends consistently observed in the Pond since Great Pond Foundation (GPF) began regular monitoring in 2021. As has become typical of TGP, the summer of 2025 saw elevated phytoplankton growth across the Pond, giving the water a murky, green appearance (**Figure 1**). TGP's high turbidity (a measure of murkiness) has likely also been exacerbated by sediment resuspension off the pond bottom, particularly within the Pond's tributary coves where the pond floor is especially shallow, making it more susceptible to wind and wave action at the surface. Excessive phytoplankton growth has presumably played a role in facilitating some of this sediment resuspension by blocking sunlight from reaching the bottom, thereby suppressing the growth of submerged aquatic plants like eelgrass and widgeon grass that act to stabilize sediment with their roots.


Tiah's Cove, 7/23/25　　Deep Bottom Cove, 9/2/25

Figure 1. *Photos of murky water conditions in TGP during the 2025 field season.*

Each year since 2021, TGP's recurring phytoplankton "blooms" (used to describe overgrowth) have consistently been dominated by green algae and diatoms, while planktonic (i.e. diffuse within the water) cyanobacteria levels have routinely remained low. Given that cyanobacteria are capable of producing and releasing toxins harmful to humans and animals, it's fortunate that the waters of TGP continue to host primarily non-toxic classes of phytoplankton like green algae and diatoms instead. Regardless, the Pond's recurring phytoplankton blooms have had detrimental impacts, including reducing water clarity, depleting dissolved oxygen reserves, and diminishing the overall health of the ecosystem.

The Pond's elevated phytoplankton growth continues to be driven largely by excess nutrient levels, specifically that of nitrogen. The Massachusetts Estuaries Project's (MEP) 2013 report for TGP established 2 total nitrogen (TN) standards for assessing nitrogen impairment within the Pond; these are specific to the Pond's tributary coves and its main basin, respectively (Howes et al., 2013). Nitrogen impairment in 2025 is evident in measured TN levels exceeding both thresholds in August and September (**Table 1**), indicating excess nitrogen enrichment across the Pond during the later summer. Note that the

Table 1. *Total nitrogen (TN) levels measured in TGP in 2025. Values shaded in orange exceeded one of the State's TN limits (Howes et al., 2013).*

Region	**State TN Limit (mg/L)**	**Measured TN Levels in 2025 (mg/L)**		
		6/17/25	**8/12/25**	**9/16/25**
Coves	0.48	0.355	0.573*	0.570
Main Basin	0.46	0.339	0.483	0.535

*"Coves" pertains to the average TN value across stations TGP04, TGP05, and TGP06. Data from TGP05 is missing from the cove average on 8/12/25.

State's TN threshold for the coves (i.e. the "Sentinel Station") is specific to the average value across TGP's 3 primary coves (Town Cove, Tiah's Cove, and Deep Bottom Cove).

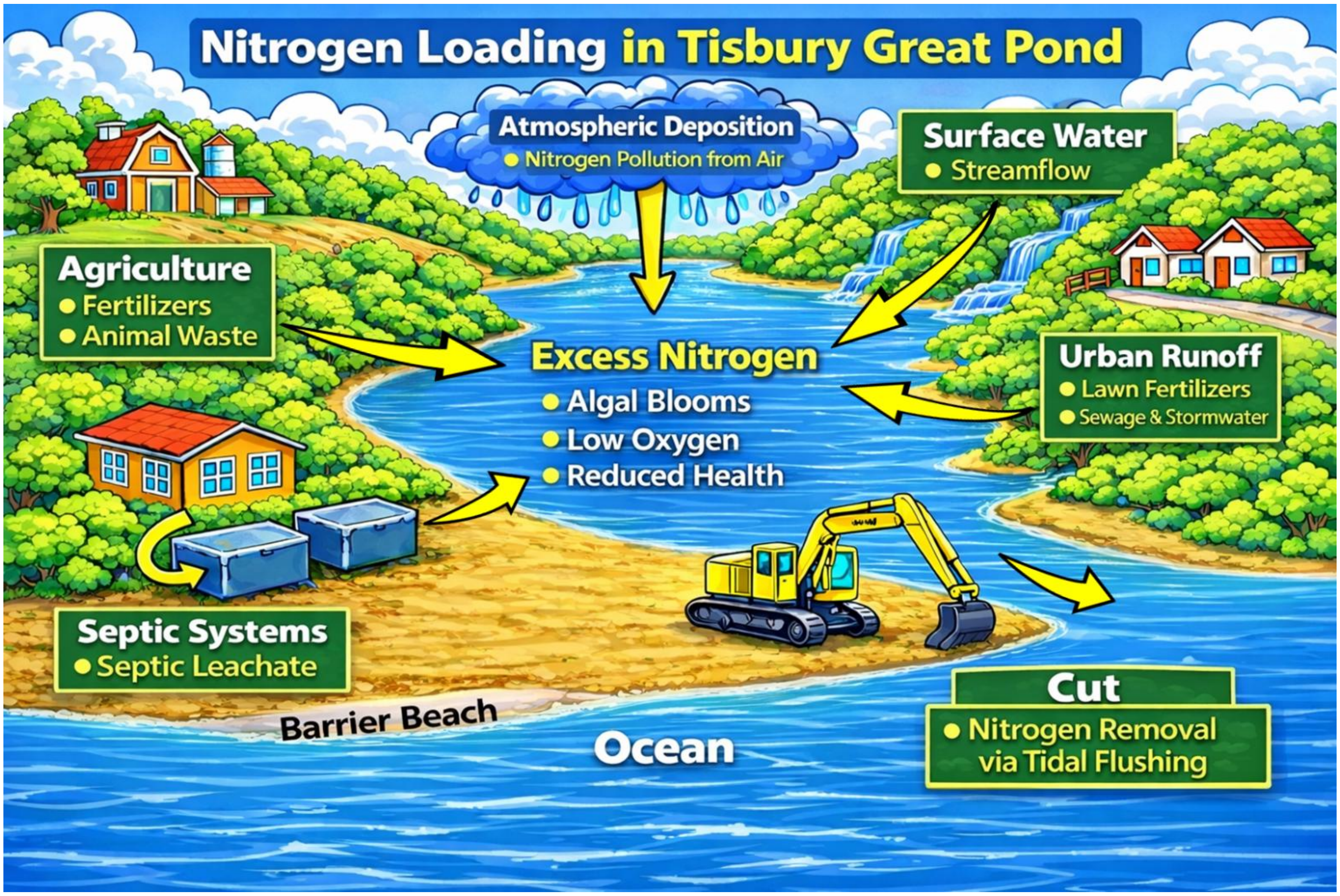

Figure 2. *Graphic showing the different sources that contribute to excess nitrogen loading in TGP. The ability of periodic cuts to remove nitrogen is also shown. This graphic was generated using OpenAI's ChatGPT.*

Excess nitrogen loading into TGP has been largely driven by human development and land use change within the Pond's watershed (i.e. the area of land that drains to the Pond). A graphic depicting the different sources that contribute to excess nitrogen loading is provided in **Figure 2**. TGP's primary watershed nitrogen sources include wastewater discharge (mainly from septic systems) and fertilizer runoff (both residential and agricultural) (Howes et al., 2013). The nitrogen originating from these watershed sources may be transported to the Pond through either groundwater or surface water flow.

TGP is a unique ecosystem in that the barrier beach separating the Pond from the ocean is intentionally breached 3-4 times per year to allow for a period of tidal exchange with the sea. As such, TGP's periodic breaches (or "cuts") can serve as a nutrient release valve, helping to flush excess nitrogen out of the Pond while they remain open (**Figure 2**). Cuts are only possible when the Pond is high enough above sea level, to allow a sufficient head of water to run downhill towards the sea. This means that only a limited number of cuts can be attempted each year (typically 3-4), as it generally takes several months of rainfall for TGP to return to opening elevation once a given cut closes. As such, the capacity of these periodic cuts to remove nitrogen from TGP depends on how long they remain open; this will be further discussed later on (see "Pond Openings & Nitrogen" section).

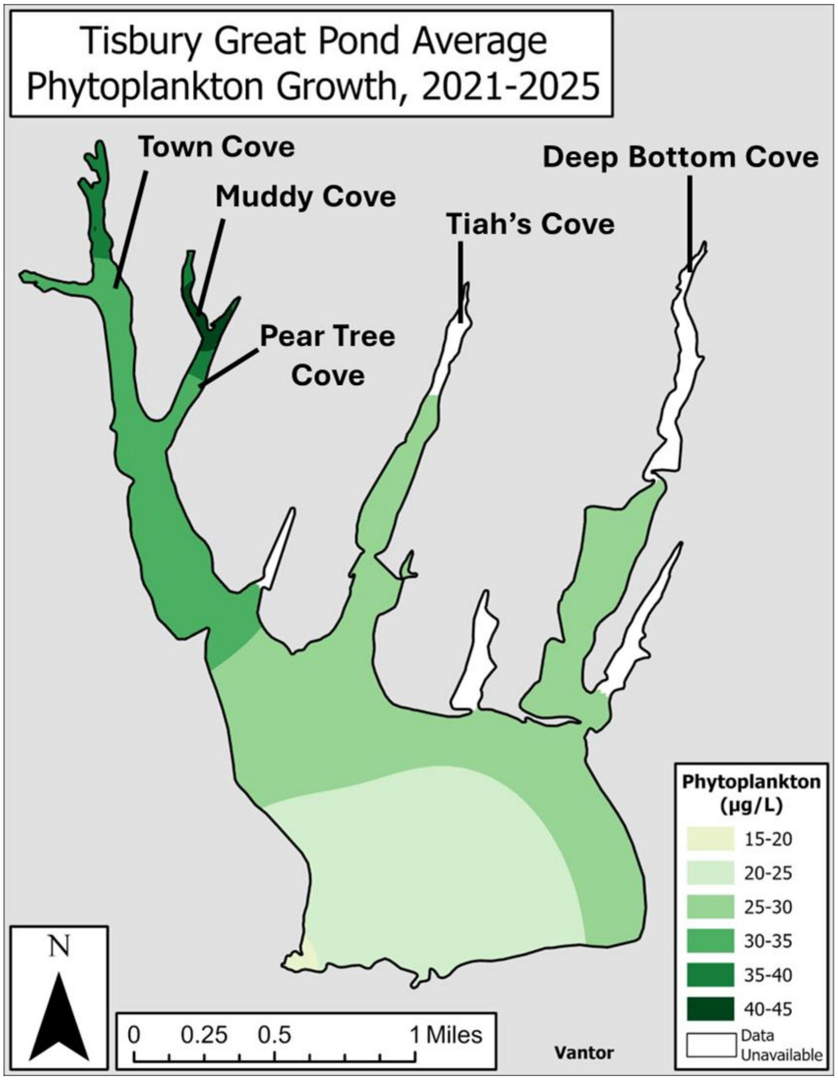

Figure 3. *Spatial interpolation of average phytoplankton abundance (in µg/L) in TGP from 2021-2025. Regions of the Pond lacking regular monitoring data have been omitted. Inverse Distance Weighting (IDW) was the interpolation method used to create this figure in ArcGIS.*

Monitoring data going back to 2021 reveals that phytoplankton overgrowth is not evenly distributed throughout TGP. **Figure 3** provides a spatial interpolation of average phytoplankton abundance across different parts of the Pond from 2021-2025. This analysis indicates that phytoplankton growth over the past 5 years has consistently been highest within the northwestern arm of the Pond, particularly in Muddy Cove and at the northern tip of Town Cove.

It should be noted that data has been omitted for the regions of the Pond that are not regularly monitored, including the northern tips of Tiah's Cove and Deep Bottom Cove. As such, it's unclear how the tips of these coves compare to those of the northwestern arm (Town, Pear Tree, and Muddy Coves). Regardless, the main body of Town Cove still exhibited higher phytoplankton growth relative to the main bodies of Tiah's Cove and Deep Bottom Cove, as well as the Pond's main basin, indicating that this region is especially impaired.

Disparities in phytoplankton stress across different parts of the TGP system are likely explained in part by differences in nitrogen loading. TGP's 2013 MEP report established total watershed nitrogen loads for each of the Pond's main coves (**Table 2**). Of the 4 coves listed in the report, Town Cove and Pear Tree Cove (which by extension includes Muddy Cove) comprised the 2 greatest watershed nitrogen loads, respectively. These high nitrogen loads, combined with limited flushing during openings in this part of the Pond (as established in GPF's 2024 TGP

Table 2. *Estimated watershed nitrogen loads for each of TGP's coves as of 2013. Data was obtained from the Massachusetts Estuaries Project (Howes et., 2013).*

Cove	Primary Source	Total Watershed Nitrogen Load as of 2013 (kg/day)
Deep Bottom Cove	Groundwater	2.80
Pear Tree/Muddy Coves	Groundwater	3.83
Tiah's Cove	Groundwater	2.24
Town Cove	Surface Water (Mill Brook & Tiasquam River)	14.20

*N loads include natural background, fertilizer, runoff, and septic system loadings.

monitoring report), contribute to the northwestern arm's greater phytoplankton abundance relative to the rest of TGP. It should be noted that the watershed nitrogen loads estimated by the 2013 MEP report are more than 10 years old; as such, current loading dynamics are unknown. In any case, TN data collected by GPF from 2021-2025 reveal similar trends, with Town Cove typically exhibiting the Pond's highest TN levels, despite some inter-year variability (see **Figure A1** in Appendix).

Town Cove's particularly high watershed nitrogen load has been largely attributed to surface water inflow from the Pond's 2 sole tributary streams, the Mill Brook and Tiasquam River (Howes et al., 2013). Together, these 2 streams encompass a combined sub-watershed area comprising ~40% of the Pond's total watershed area, ultimately delivering a large quantity of nitrogen to Town Cove without allowing for the same level of attenuation that occurs during groundwater transport.

Pond Openings & Nitrogen

It has long been established that pond cuts can serve to remove excess nitrogen from TGP through tidal flushing (Howes et al., 2013). However, despite experiencing a successful 44-day summer cut in 2025 (open from 6/21-8/4), TGP still saw TN levels exceed State limits during the late summer, both within the Pond's tributary coves and its main basin (**Figure 4**). Nutrient samples were collected in June (pre-cut) and August (post-cut), but not in July while the cut was still open. As such, it's unclear how internal nitrogen levels responded during the opening itself. In the cut's aftermath, nitrogen levels recorded in mid-August were noticeably higher than those recorded prior to the cut in mid-June. Nevertheless, the summer's 44-day opening likely still acted to flush some amount of nitrogen out of the Pond, keeping late summer nitrogen levels lower than they would have been in the absence of a summer cut.

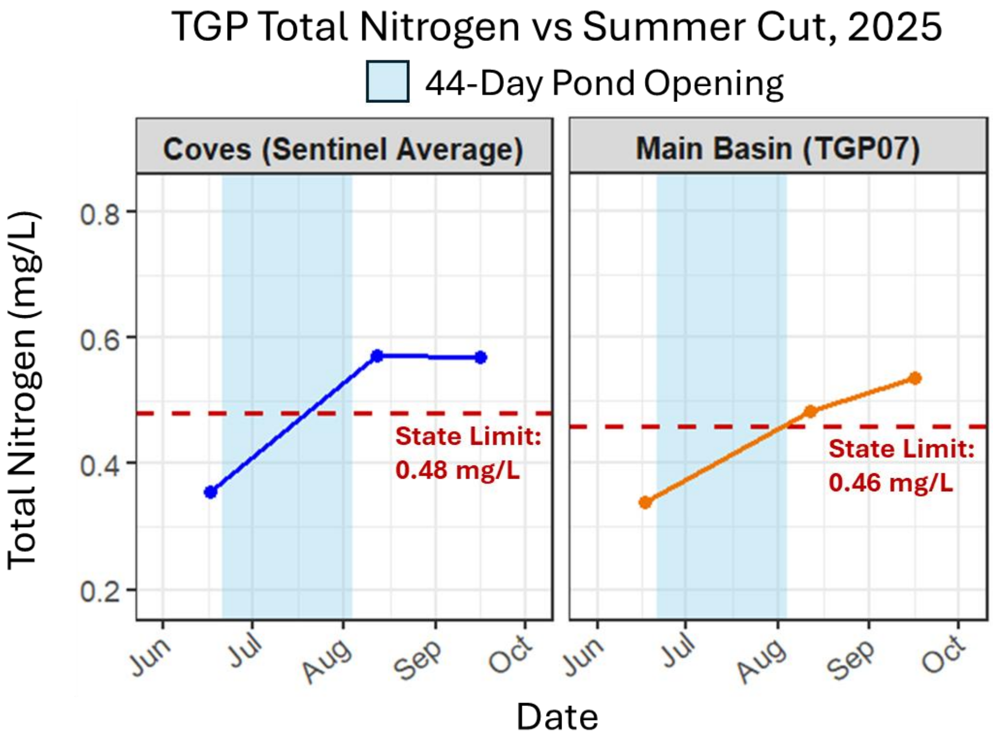

Figure 4. *Total nitrogen (in mg/L) for TGP's coves (i.e. the "Sentinel Station") and its main basin during the 2025 monitoring season. Dashed red lines represent the State's TN limits, as defined by the Pond's 2013 MEP report (Howes et al., 2013). The Sentinel Station comprises the mean value of stations TGP04, TGP05, and TGP06.*

The role of pond openings, including 2025's summer cut, in mitigating nitrogen impairment in TGP is apparent in comparing seasonal cut and nitrogen trends across multiple years (**Figure 5**). In **Figure 5**, the number of seasonal cut days (how many days the cut was open between May and October) and total nitrogen levels (for both the coves and the main basin) are presented for each year from 2021-2025. Moving from left to right, these years are ordered by descending number of seasonal cut days (not chronologically).

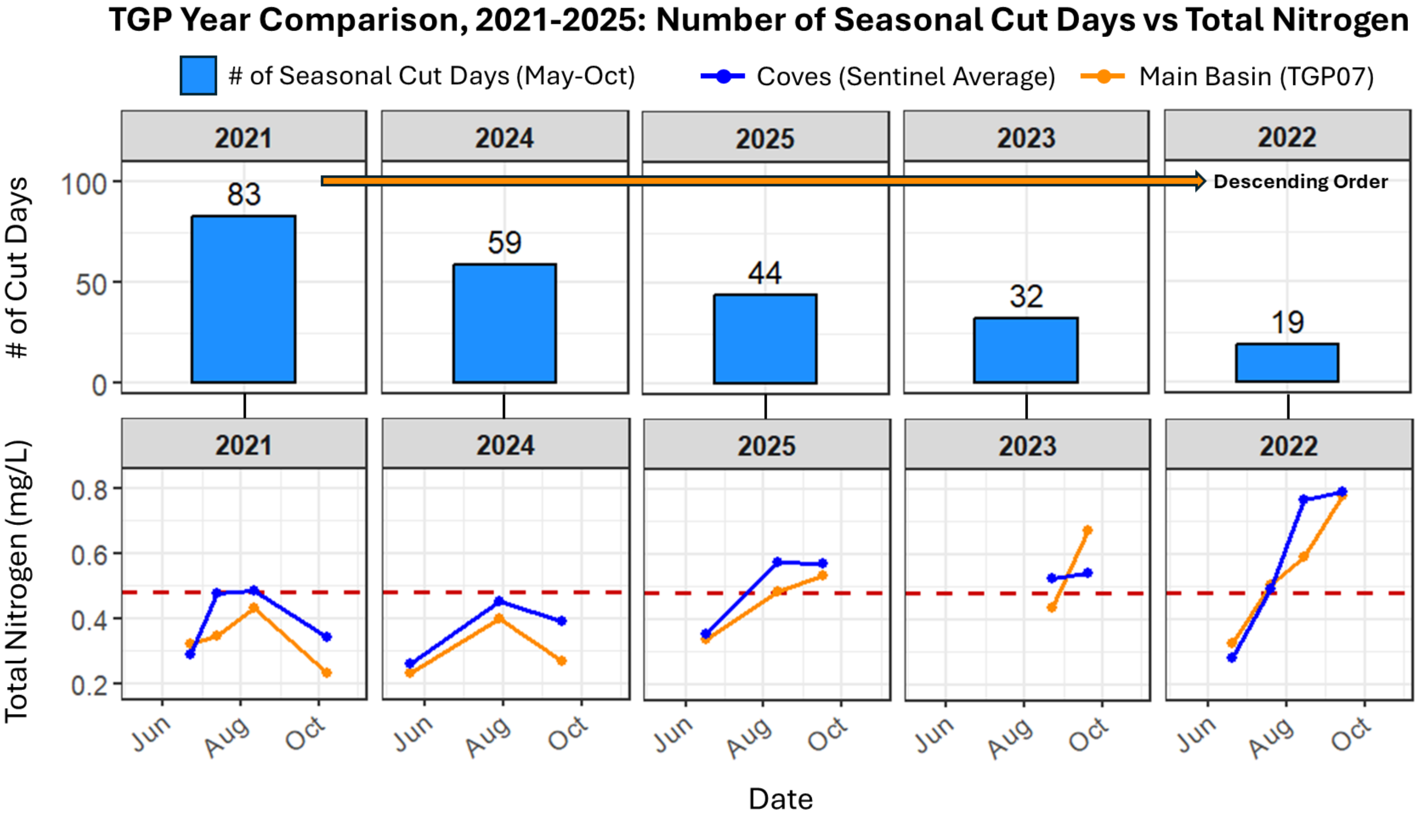

__Figure 5.__ Seasonal cut days (top column) vs total nitrogen (in mg/L, bottom column) in TGP for the years 2021-2025. Years are ordered by descending number of cut days. Seasonal cut days refers to how many days the TGP cut was open in a given year from May to October. Total nitrogen is shown for the TGP sentinel station (average of stations TGP04, TGP05, and TGP06) and the main basin (station TGP07). The dashed red line on the nitrogen graphs represents the State's 0.48 mg/L TN threshold for the sentinel station.

Figure 5's multi-year analysis reveals a distinct inverse relationship between seasonal cut days and total nitrogen levels in TGP, with nitrogen rising as cut days decline across years. These trends clearly show the ability of cuts to remove nitrogen from the Pond, with nitrogen mitigation being enhanced when cuts remain open longer and allow for more tidal flushing. In looking at the 2025 season, which experienced an intermediate number of cut days (44), total nitrogen levels in the Pond rose above State limits during the late summer but did not rise as high as those seen in other years with fewer cut days.

In any case, the trends observed in 2025 indicate that even with a long summer opening and multiple weeks of tidal flushing, nitrogen impairment can still persist in TGP. This may owe to the sheer amount of nitrogen entering the Pond. Estimated watershed nitrogen loads obtained from the Massachusetts Estuaries Project (MEP) for 7 of the Vineyard's coastal ponds are presented in **Table 3**. TGP can be seen to have the second highest watershed nitrogen load on the Island, second only to Lagoon Pond. With such a large load, it's no wonder that pond cuts can't always keep up with nitrogen inputs. This suggests that pond cuts cannot be relied upon as the sole solution in combating nitrogen impairment in TGP and stresses the importance of reducing nitrogen sources within the watershed.

Table 3. *Watershed nitrogen loads obtained from the Massachusetts Estuaries Project for 7 of Martha's Vineyard's coastal ponds (see Works Cited).*

Pond	**Year**	**Total Watershed Nitrogen Load (kg/day)**
Lagoon Pond	2010	46.79
Tisbury Great Pond	2013	45.98
Sengekontacket Pond	2011	37.56
Edgartown Great Pond	2008	30.28
Lake Tashmoo	2015	25.10
Chilmark Pond	2015	17.09
Menemsha/Squibnocket Ponds	2017	16.04

Benthic Cyanobacteria in 2025

For the 3rd straight year, clusters of benthic (i.e. bottom-dwelling) macroalgal material were observed in TGP's tributary coves. These macroalgal clusters were comprised primarily of cyanobacteria and appeared as dark green clumps floating freely at the water's surface, lining the shore, or coating the pond bottom (**Figure 6**). Given that these clusters grow on the bottom, they're typically most abundant during or immediately after pond cuts when TGP is at its lowest elevation, thereby exposing them and often enabling suspension to the surface. This is particularly common in TGP's coves, where the bottom becomes especially shallow and exposed during openings. Longtime residents and pond-goers recall having seen these clusters for years; however, they were not identified as cyanobacteria until 2023.

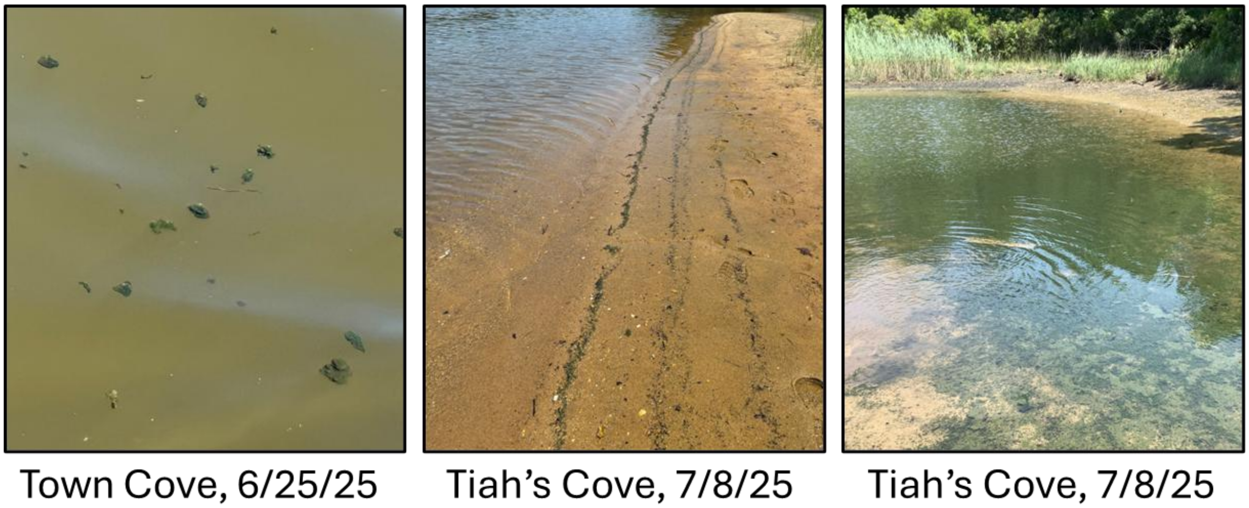
Town Cove, 6/25/25 Tiah's Cove, 7/8/25 Tiah's Cove, 7/8/25

Figure 6. *Photos of benthic macroalgal clusters in TGP taken in 2025.*

It's important to note that the cyanobacteria present within these benthic clusters is confined solely to the material itself, as cyanobacteria concentrations measured within the water column immediately adjacent to the clusters have been consistently low each year of testing. However, benthic cyanobacteria are still capable of releasing toxins into the surrounding water column (Bouma-Gregson et al., 2018; Poirier-Larabie et al., 2020) and should be viewed as a potential health concern as a result.

The geographic distribution of TGP's macroalgal clusters in 2025 is shown in **Figure 7**. While these clusters have traditionally been isolated to the northern tips of the Pond's coves going back to 2023, GPF staff observed them further south in several coves during the 2025 season (specifically Town, Pear Tree, and Tiah's Coves). It's unclear if 2025's benthic cyanobacteria bloom covered a greater area compared to those of prior years, or if these blooms have always been this widespread and GPF staff were just keeping a keener eye out in 2025. Either way, these clusters were still most abundant at the heads of the coves in 2025.

Figure 7. *The geographic distribution of where benthic macroalgal clusters were and were not observed in TGP is shown for 2025.*

The dominant cyanobacteria genus present within TGP's benthic macroalgal clusters has been identified morphologically (i.e. visually) as *Aphanothece* each year since 2023. *Aphanothece* is a unicellular, colonial genus whose cells are often distinguished by their ovular or rod shape (Montclair State University, 2026).

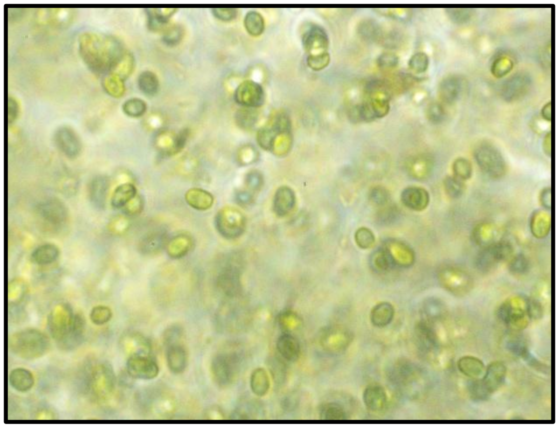

Figure 8. *Microscope photo of a benthic macroalgal cluster collected from Town Cove on 6/25/25.*

A microscope photo taken of a benthic macroalgal cluster collected from Town Cove in June of 2025 is shown in **Figure 8**, where cyanobacterial cells can be seen to have the ovular shape typical of *Aphanothece*.

Historically, cyanobacterial taxonomy relied on morphology (visual appearance/form) for classification purposes; however, the emerging use of genomic sequencing technology in the 21st century has enabled more accurate classifications that often conflict with traditional morphological classifications (Komárek, 2015; Österholm et al., 2020), leading to the reclassification of hundreds of species in the last 15 years (Strunecký et al., 2022). With regards to *Aphanothece* specifically, a 2017 study found that benthic cyanobacteria samples identified morphologically as *Aphanothece* actually belonged to the genus *Cyanobium* after being genetically sequenced (Albrecht et al., 2017). Given that genetic sequencing has not been performed for TGP's benthic macroalgal clusters, there is still some taxonomic uncertainty regarding the true identity of the clusters' dominant cyanobacteria species.

Genetic work could be useful due to the varying toxin-producing potential of different genera and species of cyanobacteria. While *Aphanothece* is not currently recognized as a toxin-producing genus (Delgado et al., 2026), microcystin (a cyanotoxin affecting the liver) has been detected in benthic macroalgal samples collected from TGP in 2023 and 2025. This suggests that TGP's benthic macroalgal clusters may comprise a different genus separate from *Aphanothece*, such as the similar-looking genus *Aphanocapsa*, which is known to produce microcystin (USEPA, 2025). Ultimately, the study of cyanobacteria and cyanotoxins in brackish (i.e. a mix of fresh and saltwater) water is an evolving field with plenty of unknowns. Confirming the identity of TGP's benthic cyanobacteria through genetic analysis and increasing the frequency and distribution of toxin sampling could be good first steps in gaining a better understanding of the associated health risk.

Conclusion

In 2025, TGP exhibited overall poor water quality, continuing many of the same trends consistently observed in the Pond since monitoring began in 2021. Internal nitrogen levels were excessively high, particularly during the late summer, promoting an overgrowth of phytoplankton across much of the Pond. The northwestern arm of the Pond has routinely displayed the greatest amount of phytoplankton growth in TGP since 2021.

Monitoring data going back to 2021 has shown that TGP's periodic openings can effectively remove nitrogen from the system, with nitrogen mitigation being maximized when frequent, long-lived cuts take place. However, despite the Pond seeing a successful 44-day summer opening in 2025, total nitrogen still exceeded State limits during the late summer. This may be due to just how large the Pond's current watershed nitrogen load is, enabling excess nitrogen to persist even after several weeks of tidal flushing. This suggests that pond cuts cannot be relied upon as the sole solution in combating nitrogen impairment in TGP. Rather, future management decisions must also be made with the goal of addressing nutrient sources within the watershed and minimizing entry into the Pond.

Benthic macroalgal clusters containing a high concentration of cyanobacteria were once again detected in TGP's coves in 2025. Relative to prior years, the range of these clusters was expanded further south compared to their normal confinement to the tips of the coves. It's unclear if 2025's benthic bloom was more widespread than normal or if GPF staff just observed more clusters during their monitoring. Uncertainty continues to exist regarding the true identity of the cyanobacteria present within these benthic clusters and their toxin-producing potential. We recommend genetic analysis to confirm the taxonomic identity of this benthic cyanobacteria. The West Tisbury Board of Health and Great Pond Foundation will continue monitoring and increase cyanotoxin analysis of the benthic clusters in 2026 to understand better their toxin potential and implications for public health.

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Appendix

Refer to GPF's **Summary of Metrics Methodology** page for information on how the Summary of Metrics rankings included in this report's executive summary were assigned.

- Water temperature has been omitted from TGP's 2025 Summary of Metrics figure since the season's continuous water temperature data was lost.

Supplementary Figures

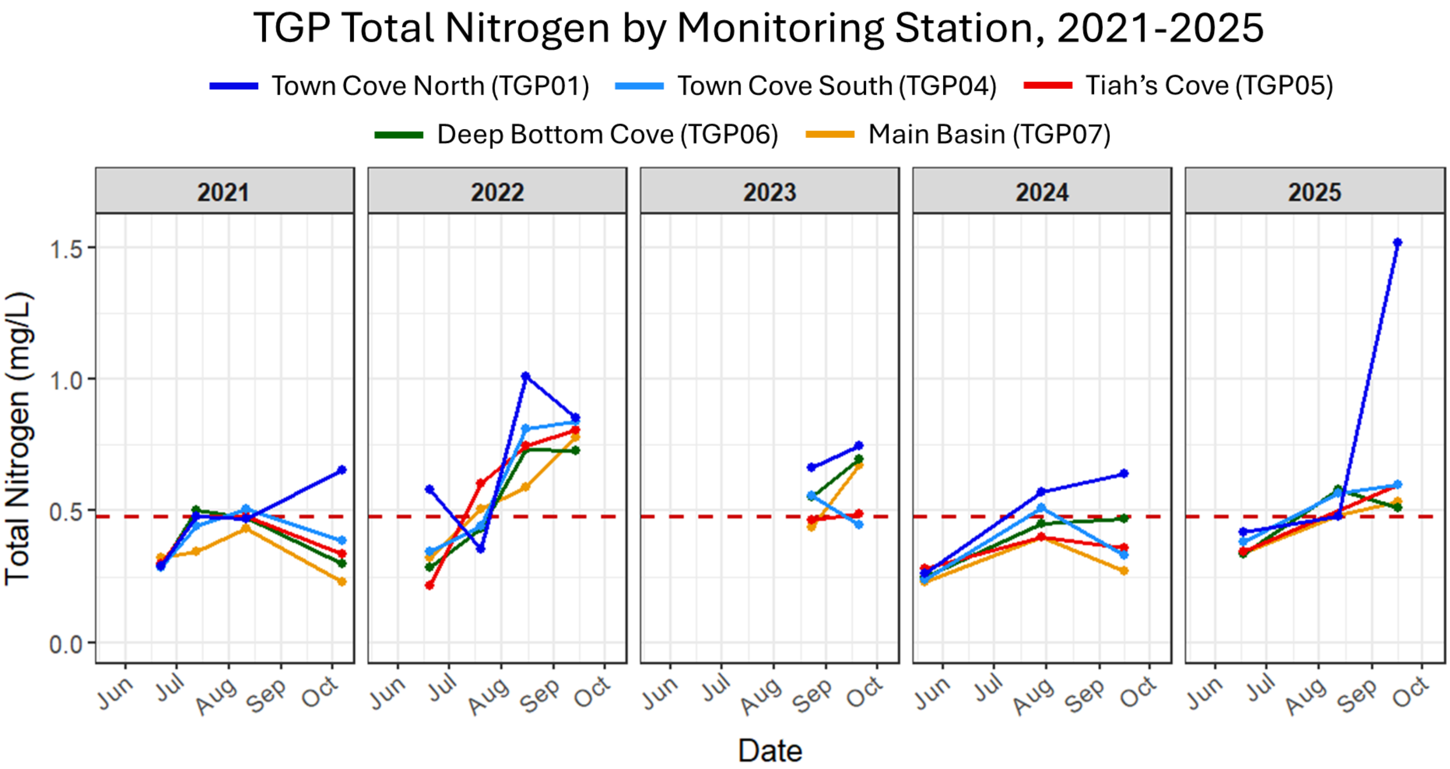

Figure A1. *Total nitrogen (in mg/L) at TGP's 5 nutrient monitoring stations for the years 2021-2025. Dashed red lines represent the State's 0.48 mg/L TN management threshold for the "Sentinel Station" (average of stations TGP04, TGP05, and TGP06). Total nitrogen is often highest in Town Cove during the late summer, although there is some inter-year variability.*