2025

ECOSYSTEM MONITORING REPORT

Chilmark Pond

Prepared on behalf of

CHILMARK POND FOUNDATION

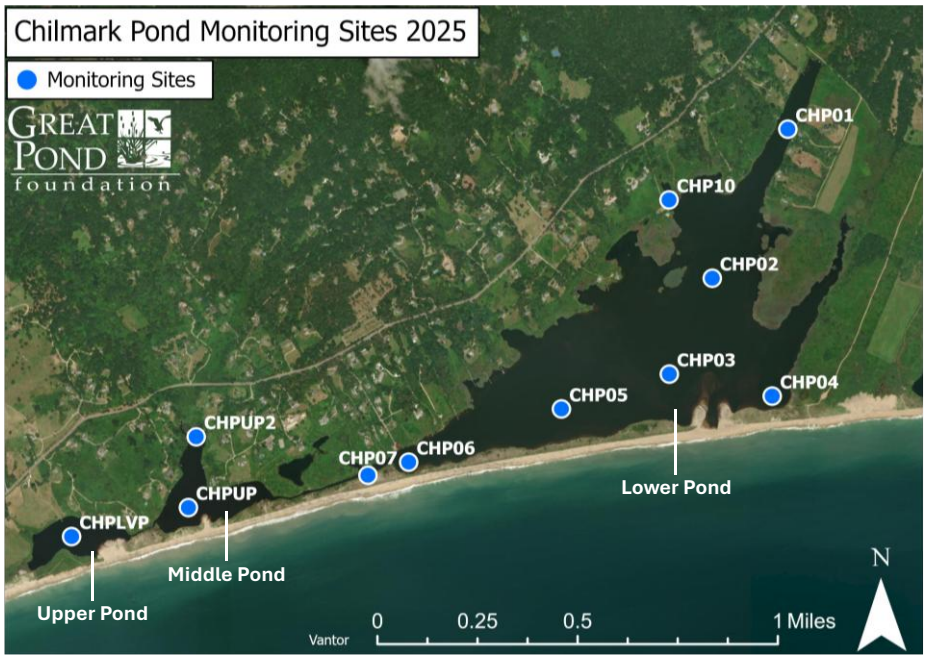
GREAT POND foundation®

CHILMARK POND
Executive Summary

2025

Study Area

Chilmark Pond (CHP) is a coastal estuary approximately 210 acres in size located on Martha's Vineyard's southern shoreline. CHP is a complex system comprised of 3 interconnected basins known as the "Upper", "Middle", and "Lower" Ponds. These 3 basins encompass a roughly 3,400-acre watershed. The barrier beach separating the Lower Pond from the ocean is manually breached 3-5 times per year as a nutrient and elevation management tool.

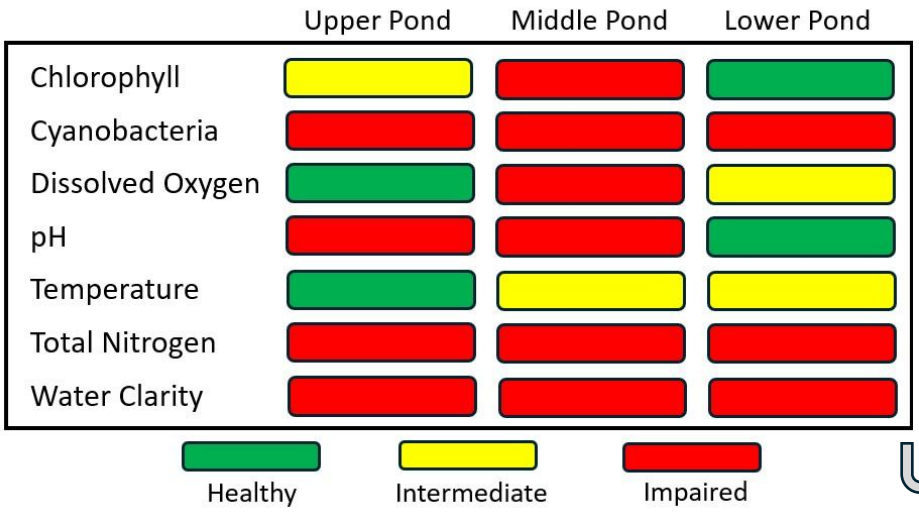


Sampling Regime 2025

In 2025, on behalf of Chilmark Pond Foundation (CPF), Great Pond Foundation (GPF) resumed an ecosystem monitoring program on CHP for the 5th consecutive year. A total of 22 weekly monitoring trips were conducted between May and October. During each trip, water quality data was obtained for 11 monitoring sites (see map to left). Nutrient samples were collected at 8 of the regular 11 monitoring sites once a month.

A total of 271 water samples were collected from CHP in 2025 and tested for cyanobacteria as part of MV CYANO$_{TM}$, a collaborative program between GPF and the Island Boards of Health.

Summary of Metrics, 2025



Cut Dates 2025

Date of Opening	Date of Closure	Cut Duration
Mar 2nd	Mar 6th	4 days
Apr 24th	May 5th	11 days

*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

In response to recurring cyanobacteria blooms and poor ecosystem health in Chilmark Pond, CPF deployed an ultrasonic buoy in Chilmark Middle Pond in July of 2025 to help prevent cyanobacteria overgrowth using ultrasound. This buoy is the first of its kind deployed in Massachusetts, placing CPF at the forefront of coastal restoration within the State. While the buoy was deployed too late in the season to prevent the formation of a cyanobacteria bloom, monitoring data strongly suggests that the buoy was responsible for the bloom's extremely rapid dissipation in late September following a cleaning of its ultrasonic transmitters. This suggests a high likelihood that the buoy will reduce or prevent cyanobacteria bloom formation in 2026 under a full season of operation and regular cleanings.

A Year of Restorative Action: Sonic Buoy Deployment and Dredging in 2025

In response to recurring incidences of toxic cyanobacteria blooms and poor water quality in Chilmark Pond (CHP), Chilmark Pond Foundation (CPF) employed 2 innovative remediation technologies in 2025 to improve the health of the ecosystem. CPF remains committed to making management decisions driven by science, acknowledging that a comprehensive understanding of the Pond's water quality issues must be determined before, during, and after solutions are implemented in order to evaluate efficacy and impact. As such, the restorative actions taken in 2025 were informed by several years of high-resolution water quality data going back to 2021, gathered by scientists from the Great Pond Foundation (GPF) on behalf of CPF.

In July of 2025, an ultrasonic buoy manufactured by LG Sonic was deployed in Chilmark Middle Pond to help prevent cyanobacteria overgrowth (often referred to as a "bloom") through the use of ultrasound (**Figure 1**). The Middle Pond was chosen to house the buoy since it's been the epicenter of bloom activity each year since 2022, with blooms often spilling downstream to Abel's Hill Crossing once established. This buoy is the first of its kind deployed in Massachusetts, placing CPF at the forefront of coastal restoration not only on Martha's Vineyard, but across the State as a whole. The buoy was deployed on July 23rd and was pulled out of the water in late October, prior to the winter season.

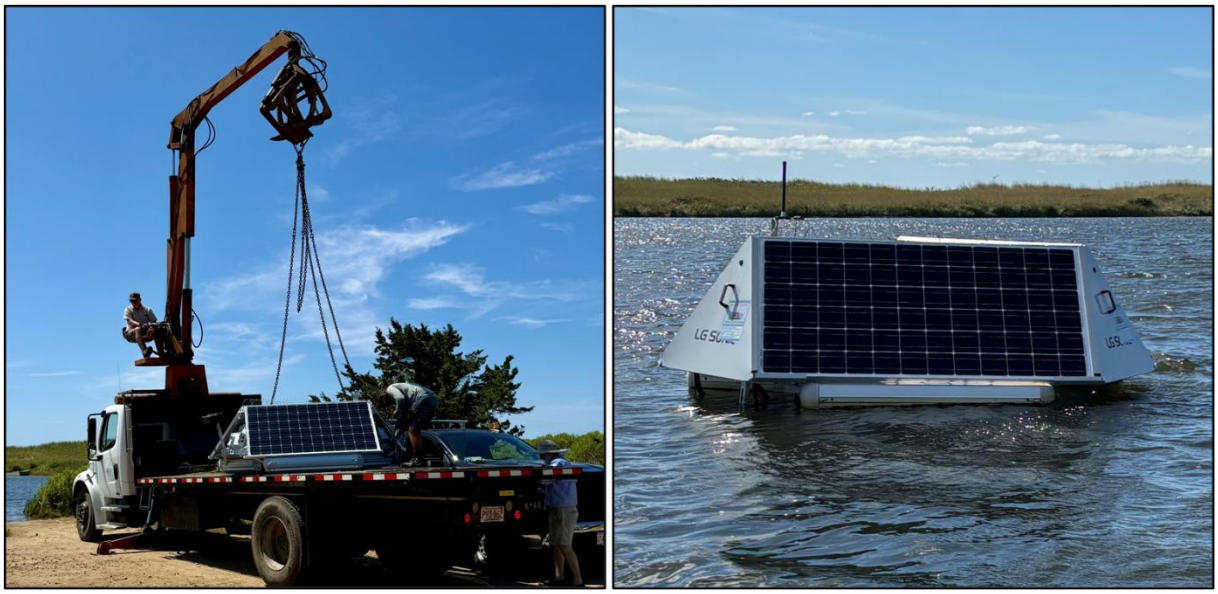


Figure 1. *The LG Sonic buoy being placed into Chilmark Pond on 7/23/25 (left), and the buoy at its stationary position in the Middle Pond following deployment (right).*

The LG Sonic buoy works by using ultrasound to disrupt the upward and downward movement of phytoplankton (such as algae and cyanobacteria) in the water (LG Sonic, 2026) (**Figure 2**). This vertical movement is fundamental to these species' life cycles, as they require sunlight at the surface for photosynthesis and key nutrients at the pond bottom. By emitting ultrasonic waves, the buoy is able to keep these phytoplankton in a fixed position in the middle of the water column, barring them from accessing these essential commodities. This prevents blooms and causes cyanobacteria cells to die and sink to the pond bottom to decompose, preventing overgrowth and allowing nutrients to be used by other flora that benefit the ecosystem, such as submerged aquatic plants.

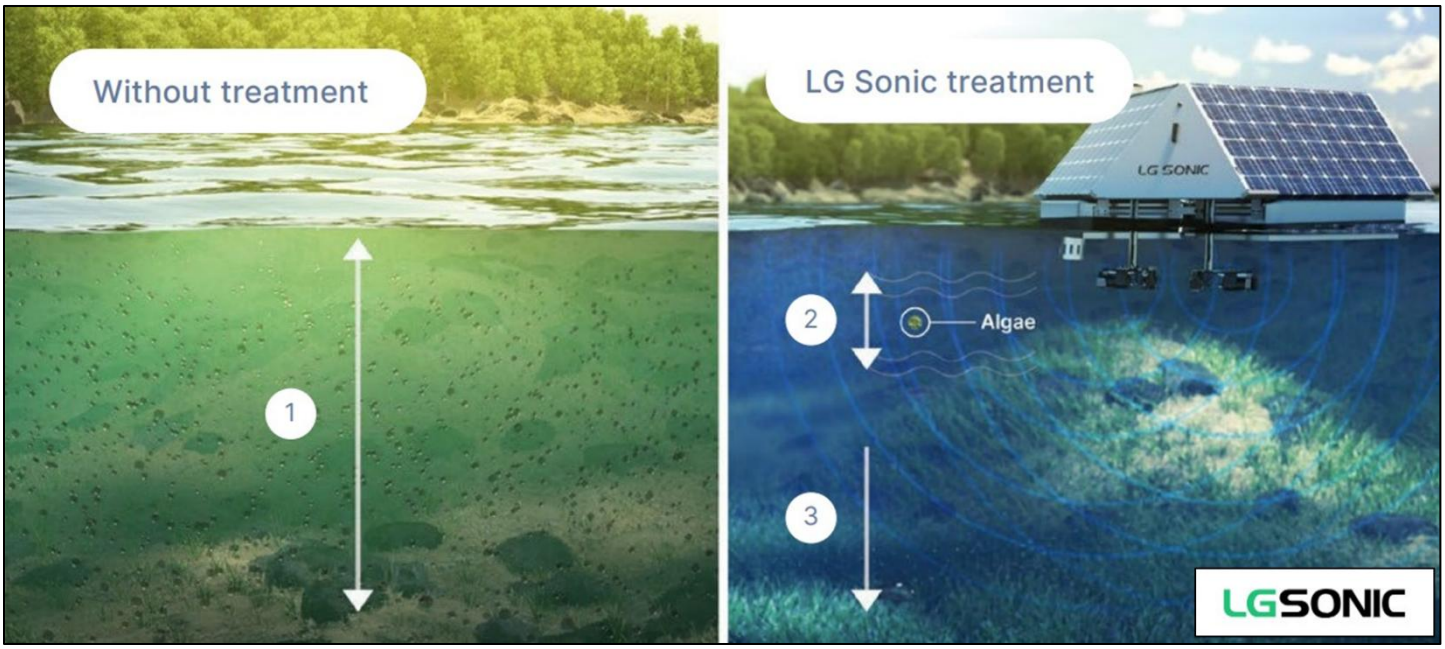


Figure 2. *Diagram taken from LG Sonic's website depicting how their MPC-Buoy targets phytoplankton through ultrasound. The image on the left shows what a pond may look like without treatment, with abundant phytoplankton moving between the surface and bottom to access sunlight and nutrients, respectively. The image on the right shows how ultrasound can fix phytoplankton in the center of the water column and cause cells to sink to the bottom. See LG Sonic, 2026 in "Works Cited" section for a link to the diagram's original source.*

In addition to deploying an ultrasonic buoy in the summer of 2025, CPF conducted a dredging project around the Lower Pond's cut site during the winter of 2025-2026 after completing a multi-year permitting process. For context, the barrier beach separating Chilmark Lower Pond from the ocean is intentionally breached or "cut" 3-5 times per year by Chilmark Pond Association to drain the Pond and allow for a period of tidal exchange with the sea. By removing the sand shoals around the cut site, the dredging project should keep cuts open longer and improve flushing during openings, which in turn will enable a greater exchange of nutrient-rich, algal-dense pondwater with comparatively cleaner saltwater.

Given that the effects of this recent dredge work on the health of CHP won't be apparent until the 2026 monitoring season, this report will primarily examine the impact of the ultrasonic buoy in its first season of use. Data indicate that while the buoy was deployed too late in the season to have prevented the formation of a cyanobacteria bloom in 2025, it was likely responsible for the bloom's rapid dissipation in late September after it had gotten through its initial acclimation period and was removed of biofouling by GPF staff. This suggests a high likelihood that the buoy will reduce or prevent cyanobacteria bloom development in 2026 under a full season of operation and regular cleanings.

Another Late Summer Cyanobacteria Bloom in 2025

Despite the installation of the LG Sonic buoy in July, the western region of CHP still experienced a concentrated cyanobacteria bloom during the late summer and early fall of 2025 (**Figure 3**), representing the 4th straight year in which this has occurred. The bloom in 2025 was once again comprised of

cyanobacteria belonging to the genus *Dolichospermum* (consistent with all other bloom years), a genus capable of producing toxins harmful to humans, pets, wildlife, and livestock.

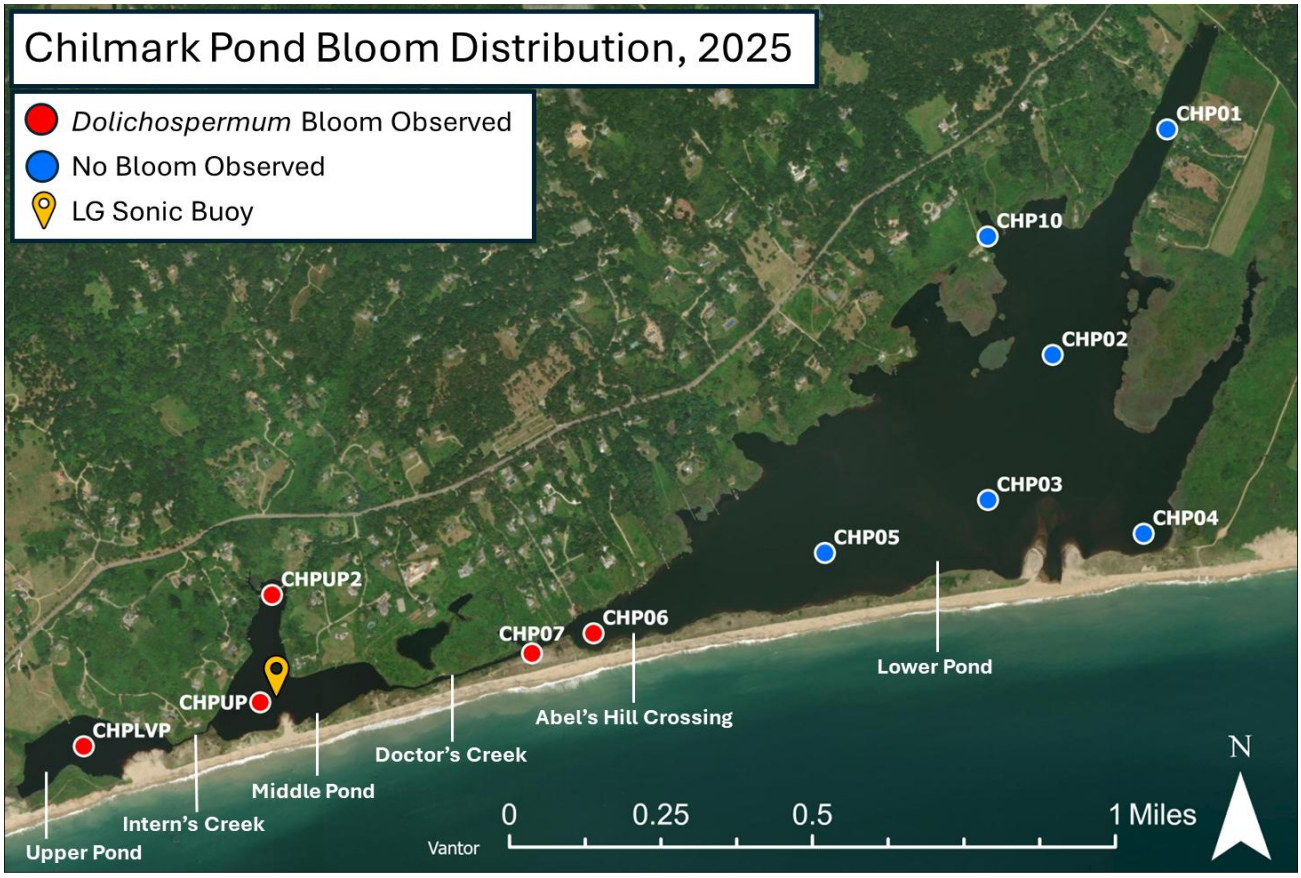


Figure 3. *Map of CHP indicating where the Dolichospermum cyanobacteria bloom was and wasn't observed in 2025. Monitoring stations listed with "Dolichospermum Bloom Observed" exhibited cyanobacteria concentrations above the MV CYANO$_{TM}$ program's bloom threshold when Dolichospermum was the dominant genus (as revealed by microscopy). The location of the LG Sonic buoy in the Middle Pond is also shown.*

The *Dolichospermum* bloom present in 2025 was first observed in the Upper Pond on July 30th prior to disappearing from this location within a week. However, a bloom soon reappeared in the Middle Pond in mid-August, quickly expanding across the entire basin and down through Doctor's Creek to Abel's Hill Crossing. The bloom remained present across this region until its eventual dissipation in late September. Photos of the bloom can be found in **Figure 4**, where the water looks murky and has a bright-green hue throughout the water column.

Figure 4. *Photos of 2025's Dolichospermum cyanobacteria bloom.*

Despite the deployment of the LG Sonic buoy, the cyanobacteria bloom that developed in 2025 did not appear to be any less intense or of a shorter duration than the blooms seen in prior years. This is evident in comparing cyanobacteria concentrations at CPF's primary monitoring station in the Middle Pond (CHPUP), the typical epicenter of the system's recurring *Dolichospermum* blooms, for each bloom year documented by the Foundation (2022-2025) (**Figure 5**).

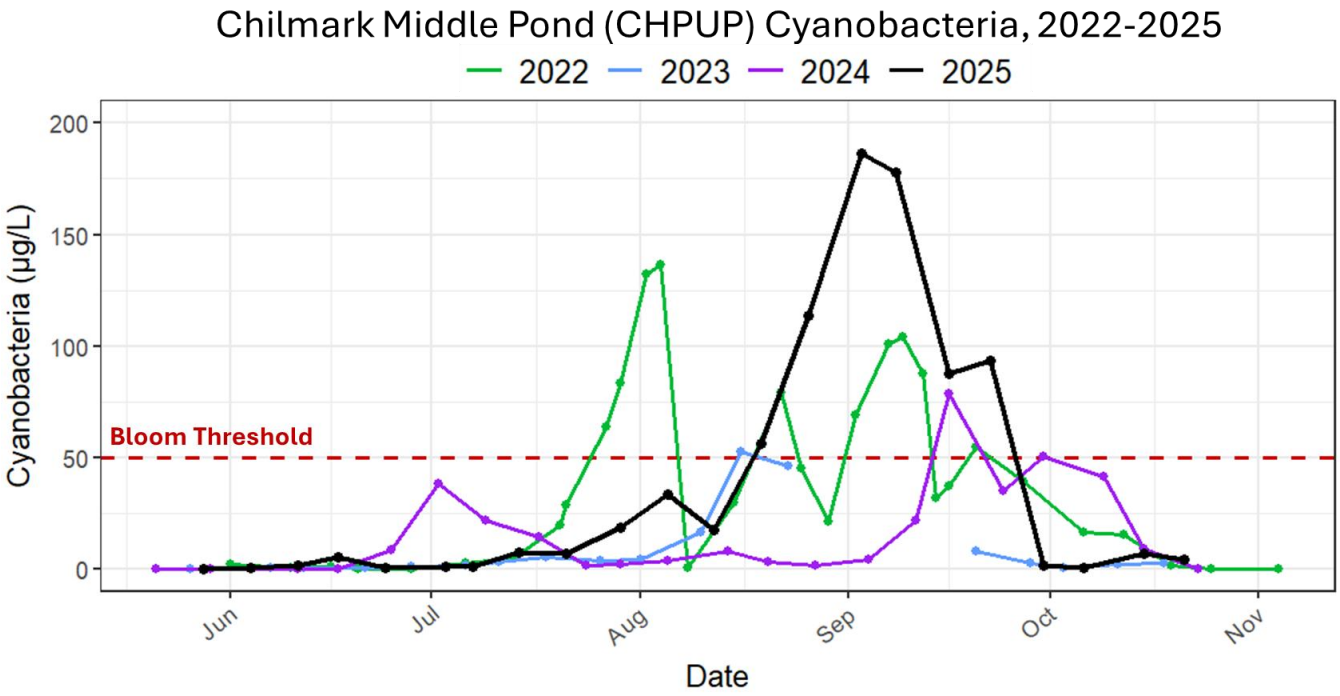


Figure 5. *Cyanobacteria concentrations (in µg/L) for Chilmark Middle Pond's CHPUP monitoring station for the years 2022-2025. The dashed red line represents the MV CYANO$_{TM}$ program's bloom threshold (a bloom is considered present when concentrations exceed this limit). Data is missing from 2023's primary bloom period. Shoreline samples taken roughly 220 feet from station CHPUP on 9/3, 9/8, 9/22, and 9/30 are included in the 2025 dataset. Note that 2022's late July/early August bloom was comprised of the Sphaerospermopsis genus of cyanobacteria; all other blooms were comprised of the genus Dolichospermum.*

It should be noted that bloom conditions prevented GPF staff from accessing the CHPUP monitoring station during 2023's peak bloom period, making it unclear how the bloom in 2025 compared to that of 2023. Additionally, some of the 2025 cyanobacteria concentrations plotted in **Figure 5** were taken from the Middle Pond's southern shoreline (roughly 220 feet away from the CHPUP monitoring station) when bloom conditions prevented safe access to the station by kayak.

Given the relative proximity of this shoreline to the station, GPF opted to include 2025's shoreline samples in **Figure 5** to provide a higher resolution timeline of cyanobacteria activity in 2025 (refer to **Figure A1** in the appendix for a version of the figure omitting shoreline samples). However, both 2025 datasets (with and without the shoreline samples, respectively) were used to compare bloom stats across years in **Table 1** to eliminate sampling bias. Regardless of whether or not shoreline samples are included, 2025's *Dolichospermum* bloom exhibited both a similar duration and peak concentration to the blooms of 2022 and 2024 (**Table 1**).

Table 1. *Chilmark Middle Pond (station CHPUP) Dolichospermum bloom stats, 2022-2025.*

Year	Bloom Duration (days)	Peak Concentration (µg/L)
2022	29	104.17
2023	NA	NA
2024	14	78.58
2025 (No shoreline samples)	28	113.67
2025 (With shoreline samples)	34	186.17

*Refer to the Appendix for info on bloom durations were calculated.

So, what might explain CHP experiencing another concentrated cyanobacteria bloom in 2025? The year's bloom likely owes to 2 main factors: 1) the LG Sonic buoy being deployed too late in the season, and 2) favorable environmental conditions for *Dolichospermum* growth during the late summer. Due to a shipping delay, CPF's ultrasonic buoy did not arrive on Martha's Vineyard until July, ultimately going into the water on July 23rd when it was originally scheduled to be deployed in May. By the time the device was installed, cyanobacteria levels in the Middle Pond were beginning to rise, while the Upper Pond saw the initial onset of the year's *Dolichospermum* bloom just a week later. This suggests that *Dolichospermum* had already gained a foothold in the western region of CHP by the time the buoy was deployed.

It's also worth noting that when an LG Sonic buoy first goes into a body of water, it generally takes the company's technicians a few weeks to properly adjust the device's ultrasound settings to control the phytoplankton community specific to that lake or pond. As such, the Middle Pond's *Dolichospermum* bloom was presumably already present by the time CPF's buoy was fully acclimated.

In addition to the buoy going into the water too late, the environmental conditions present in the Middle Pond during the late summer of 2025 were highly conducive to *Dolichospermum* growth. In CPF's 2024 ecosystem monitoring report, it was established that late summer *Dolichospermum* blooms are likely to develop in the Middle Pond when water temperatures are beginning to cool and total nitrogen levels exceed the State's 0.5 mg/L limit (CPF, 2025). This owes to *Dolichospermum*'s ability to outcompete other species of cyanobacteria at lower water temperatures (Zhang et al., 2020; Deng et al., 2024), especially when excessive amounts of nitrogen (a limiting nutrient) are present (Liu et al., 2024). In September of 2025, total nitrogen levels in the Middle Pond were measured at 3 times the State limit while water temperatures were simultaneously cooling, providing *Dolichospermum* with optimal growing conditions (see **Figure A2** in the Appendix).

Impact of Buoy on Bloom's Dissipation

While the LG Sonic buoy might not have prevented the formation of a cyanobacteria bloom in 2025, monitoring data suggests that it was likely responsible for the bloom's sudden dissipation in late September. As previously mentioned, LG Sonic technicians adjusted the buoy's settings several times during the summer but did not see any resulting decline in cyanobacterial abundance. By early September, the technicians began to suspect that biofouling on the buoy's ultrasonic transmitters may have been interfering with the efficacy of the ultrasound treatment. On September 23rd, members of

GPF's staff paddled out to the buoy and pulled up the device's sonic transmitters, revealing a moderate amount of biofouling (**Figure 6**). A thorough cleaning of the transmitters was performed the same day.

Figure 6. *Biofouling on the LG Sonic buoy's ultrasonic transmitters on 9/23/25. Photo credit: Sheny Leon*

Remarkably, within just 5 days of the transmitters being cleaned, the *Dolichospermum* bloom in the Middle Pond had completely disappeared. This is well illustrated by the continuous phycocyanin measurements logged by the sonic buoy in 2025 (**Figure 7**). Phycocyanin is a pigment unique to cyanobacteria that's commonly used to measure the abundance of these potentially toxin-producing species. At the time of GPF's buoy cleaning on 9/23, phycocyanin measurements were especially high (>100 µg/L) but had dropped to nearly nothing by 9/28. The dissipation of the bloom in the Middle Pond was accompanied by a simultaneous dissipation of the bloom downstream at Doctor's Creek and Abel's Hill Crossing. In the bloom's aftermath, harmless green algae became the most abundant phytoplankton in western CHP.

The sudden decline of CHP's *Dolichospermum* bloom following the cleaning of the transmitters strongly suggests that the buoy's ultrasound treatment (now free of fouling interference and fully acclimated) was responsible for the bloom's dissipation. This is further supported by the fact that at the time of the bloom's recession, there were no major shifts in water temperature or rainfall that might have otherwise initiated a cyanobacterial decline.

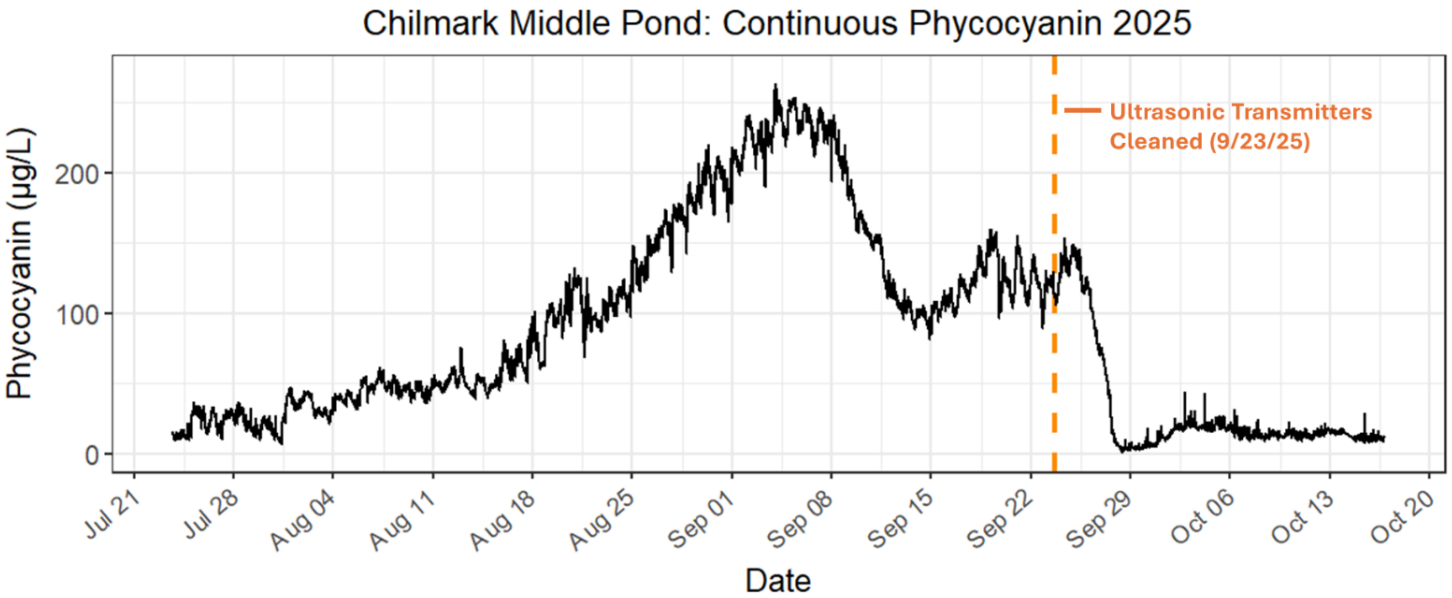


Figure 7. *Continuous phycocyanin measurements (in µg/L) in Chilmark Middle Pond in 2025. Data was obtained from the LG Sonic buoy, located roughly 200 feet away from CPF's CHPUP monitoring station.*

Further evidence for the LG Sonic buoy's role in triggering the decline of CHP's 2025 *Dolichospermum* bloom is apparent in the bloom dissipating much faster than those of past years. In **Figure 8**, cyanobacteria concentrations recorded in the Middle Pond (at station CHPUP) are shown for each monitoring year that experienced a *Dolichospermum* bloom (2022-2025), excluding 2023 due to a lack of data during this year's primary bloom period. Each year's peak *Dolichospermum* bloom period is shaded in blue, while bloom dissipation periods are shown in gold (refer to figure caption for methods).

While the blooms of 2022 and 2024 both dissipated at relatively gradual rates, taking 29 and 15 days, respectively, 2025's *Dolichospermum* bloom had fully dissipated in just 8 days. It should be noted that the approximate dissipation periods shown in **Figure 8** are likely overestimated given the limitations of CPF's weekly monitoring schedule (true dissipation may occur anytime in between these weekly trips). Therefore, these values are useful for comparative purposes but should not be considered definitive. This can be seen by the dissipation period estimated for 2025 (8 days) differing slightly from the year's actual dissipation period (5 days) that was determined using the LG Sonic buoy's phycocyanin measurements.

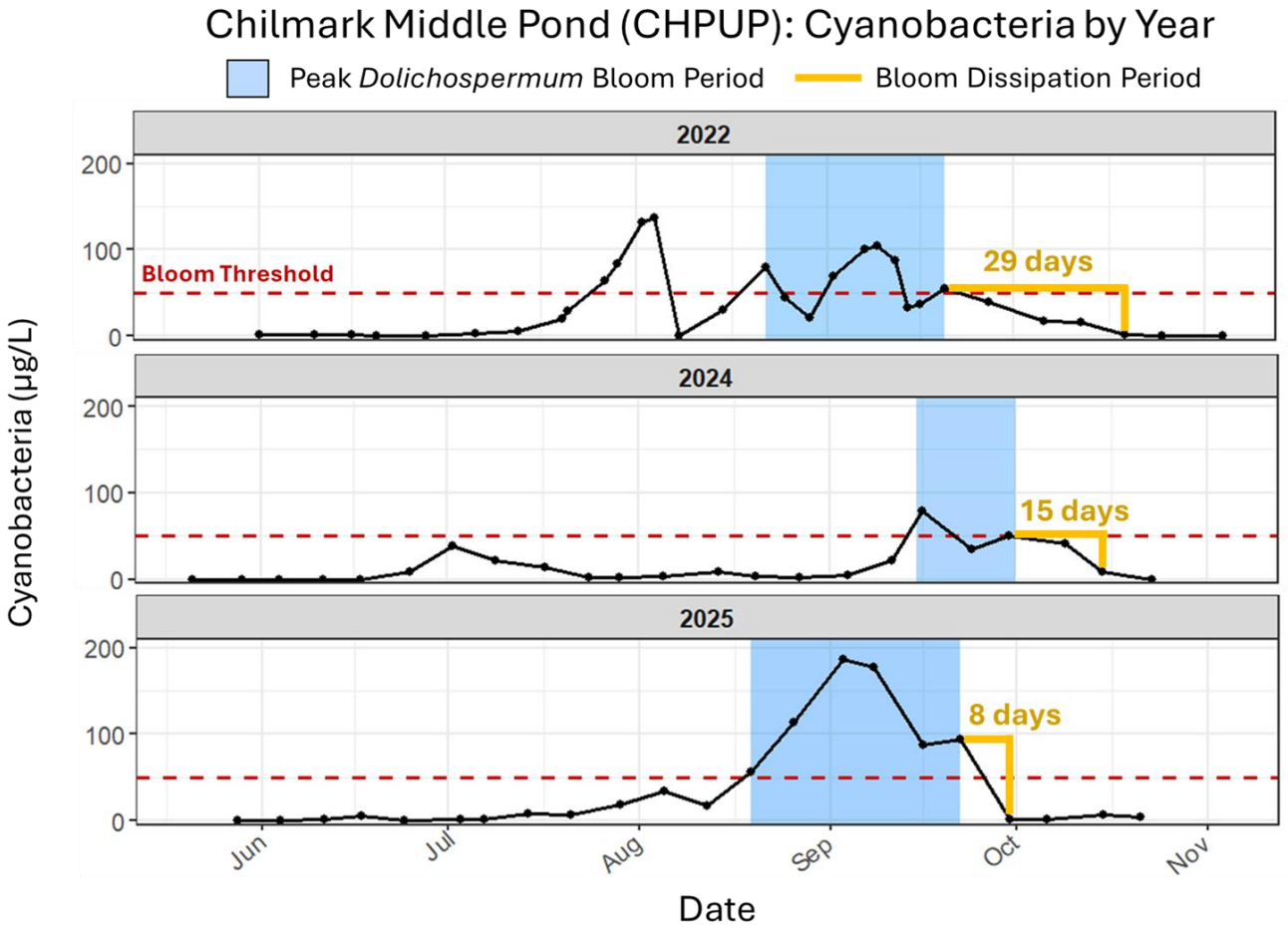


Figure 8. *Cyanobacteria concentrations (in µg/L) for Chilmark Middle Pond's CHPUP monitoring stations for the years 2022, 2024, and 2025. Each year's peak Dolichospermum bloom period is shaded in blue (defined as when cyanobacteria levels exceeded the MV CYANO$_{TM}$ program's bloom advisory threshold). Each year's approximate bloom dissipation period is shown in gold (defined as the time it takes for concentrations to fall from above the bloom threshold to <10 µg/L). Shoreline samples taken roughly 220 feet from station CHPUP on 9/3, 9/8, 9/22, and 9/30 are included in the 2025 dataset (see Appendix).*

Table 2. *Chilmark Middle Pond (station CHPUP) Dolichospermum bloom dissipation stats, 2022-2025.*

Year	Dissipation Period (days)	Dissipation Rate (µg/L per day)
2022	29	1.83
2023	NA	NA
2024	15	2.75
2025	8	11.44

*Refer to the Appendix for info on how these metrics were calculated.

In addition to declining faster, 2025's *Dolichospermum* bloom also dissipated at a much steeper rate relative to the blooms seen in 2022 and 2024 (**Table 2**), indicating that an overall greater amount of cyanobacteria cells died during the year's shorter dissipation period. In 2022 and 2024, cyanobacteria concentrations at the Middle Pond's CHPUP monitoring station declined at rates of 1.83 and 2.75 µg/L per day, respectively, presumably representing typical rates of bloom deterioration under normal conditions (i.e. no sonic buoy). Conversely, 2025's *Dolichospermum* bloom dissipated at a rate of 11.44 µg/L per day, more than 4 times higher than both other years. The much greater rate of cyanobacterial decline in 2025 relative to the baseline rates observed in 2022 and 2024 strongly suggests that the deterioration of the year's bloom in late September was driven by the LG Sonic buoy. However, this cannot be said for certain, as it's not uncommon for *Dolichospermum* blooms in CHP to naturally dissipate at this time of the year.

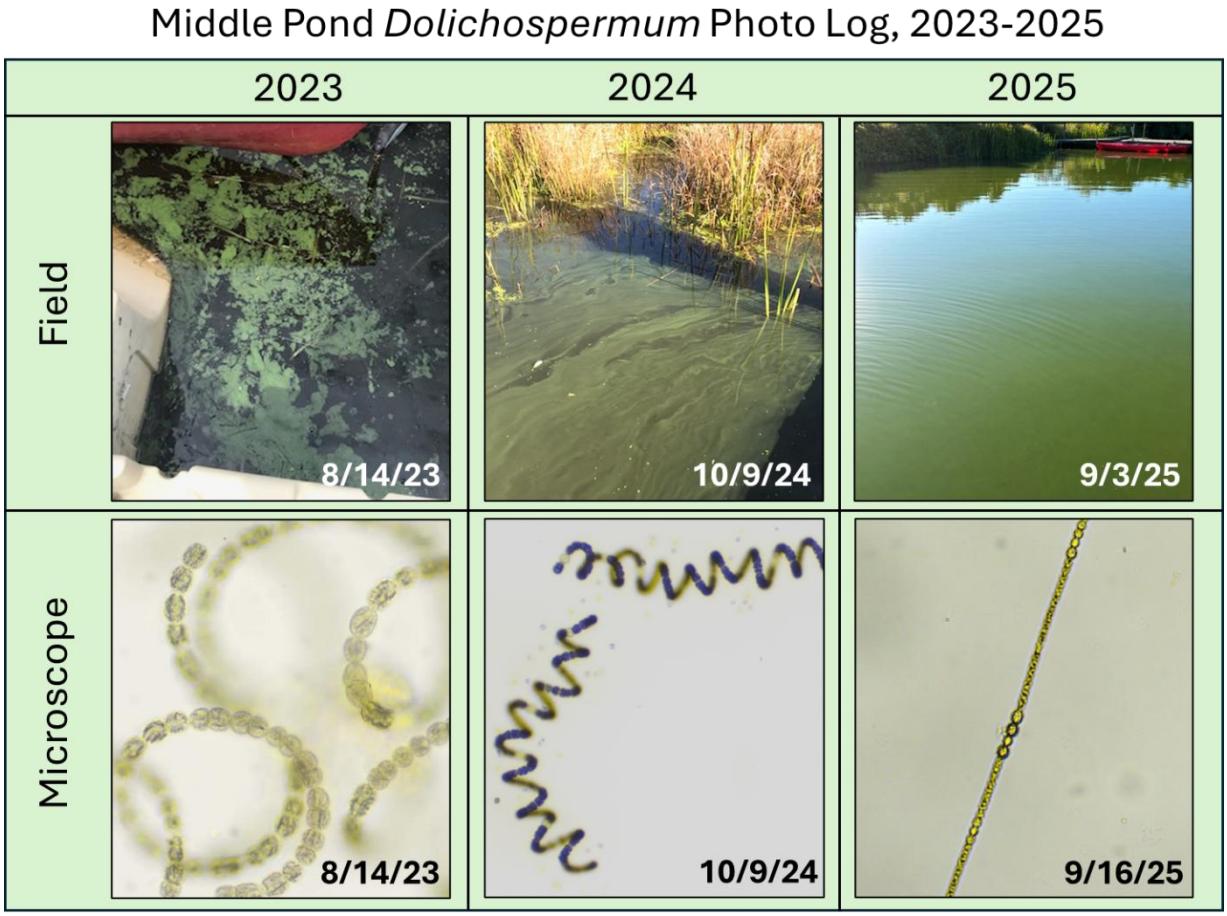


Figure 9. *Dolichospermum bloom photos from Chilmark Middle Pond for the years 2023-2025. Both field and microscope photos are included.*

Dolichospermum has been established as the predominant cyanobacteria genus comprising each of CHP's late summer blooms going back to 2022, as confirmed through consultation with an external laboratory. However, the *Dolichospermum* bloom observed in 2025 had a slightly different appearance relative to the blooms observed in prior years when viewed both in the field and under the microscope (**Figure 9**). While these blooms have traditionally appeared as green clumps and streaks present at the water's surface (often resembling paint), the bloom of 2025 gave the Pond a bright-green hue that was evenly distributed throughout the water column and absent of any obvious clumps or streaks. Additionally, when 2025 water samples were looked at under a microscope, *Dolichospermum* filaments were generally straight in stature, a divergence from their typical coiled form observed in all other bloom years.

It's possible that the bloom of 2025 was comprised of a different species of *Dolichospermum* than prior years. Alternatively, it's also possible that 2025's *Dolichospermum* bloom was comprised of the same species just exhibiting phenotypic plasticity (a different physical form) in response to differing environmental conditions. This might suggest that the LG Sonic buoy's ultrasound treatment prompted the cyanobacterium's different form in 2025, although this cannot be said for certain. Future investigation into this matter may be useful given that toxicity can vary widely across different species and strains of the same cyanobacteria genus.

Conclusion

In 2025, Chilmark Pond Foundation deployed an ultrasonic buoy in Chilmark Middle Pond with the goal of preventing cyanobacteria overgrowth in the western region of Chilmark Pond. While the buoy wasn't deployed early enough in the season to prevent the formation of a cyanobacteria bloom, monitoring data strongly suggests that the buoy was responsible for the bloom's rapid dissipation in late September following the cleaning of the device's ultrasonic transmitters. This suggests a high likelihood that the buoy will reduce or prevent cyanobacteria bloom development in 2026 when deployed at the start of the season and cleaned regularly of biofouling.

Additionally, after going through a multi-year permitting process, the Foundation conducted a dredging project during the winter of 2025-2026 that successfully removed the sand shoals north of the Lower Pond's cut site. By removing these shoals, future pond openings should remain open longer and enable more effective flushes of the Pond, helping to remove excess nutrients, prevent phytoplankton overgrowth, and improve the overall health of the ecosystem.

Scientific monitoring is vital in measuring the success of remediation efforts. As such, regular water quality monitoring will continue on Chilmark Pond in 2026 to assess the impacts of the LG Sonic buoy in its second season, as well as the impacts of the winter's dredging work in the Lower Pond. By undertaking these remediation efforts in 2025, Chilmark Pond Foundation has made a firm commitment to revitalizing the health of this invaluable ecosystem and has established itself as a leader in coastal restoration not only on Martha's Vineyard, but across Massachusetts as a whole.

Works Cited

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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.

Analysis Methods Used in Report

- **Figure 5**: The 2025 cyanobacteria dataset for the CHPUP monitoring station plotted in this figure includes samples collected on 9/3, 9/8, 9/22, and 9/30 from the Middle Pond's southern shoreline approximately 220 feet away from CHPUP. These samples were included to provide a higher resolution timeline of cyanobacteria activity in 2025. Refer to **Figure A1** below for a version of the figure omitting these shoreline samples. Even when shorelines samples are omitted, 2025's bloom is still of a similar duration and intensity to all other blooms going back to 2022.

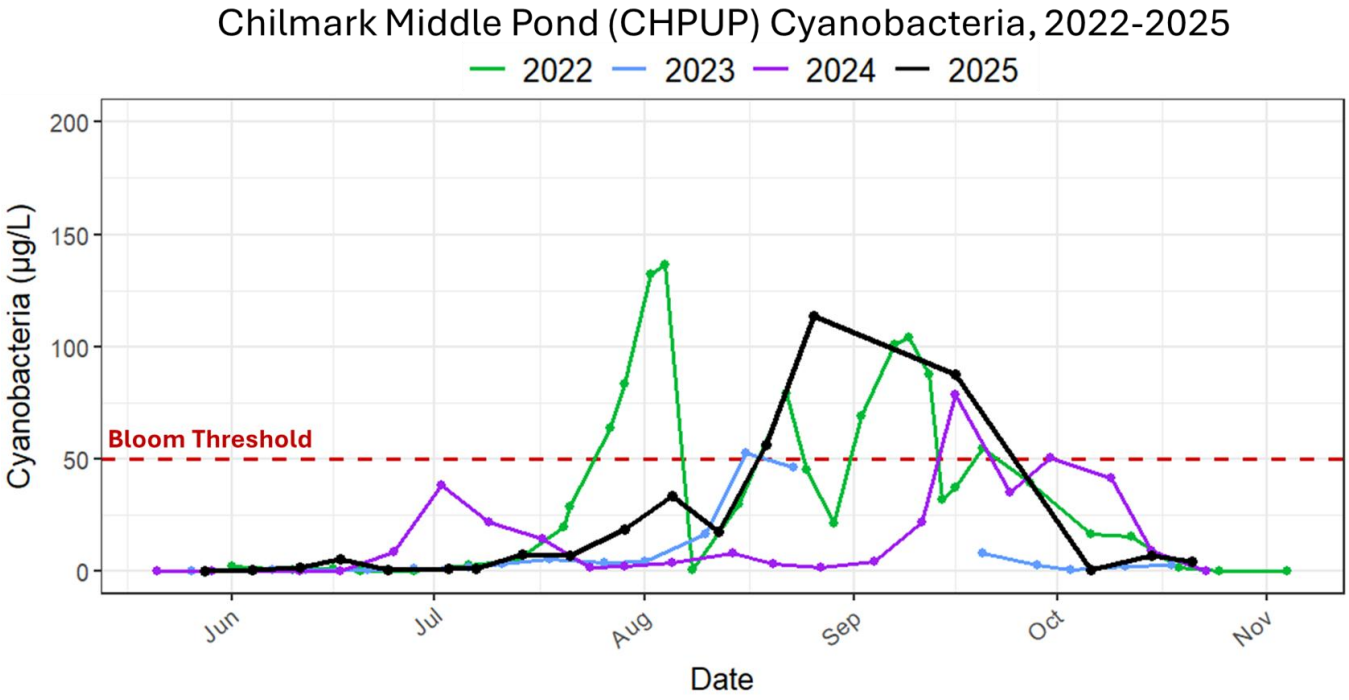

Figure A1. *Cyanobacteria concentrations (in µg/L) for Chilmark Middle Pond's CHPUP monitoring station for the years 2022-2025. The dashed red line represents the MV CYANO$_{TM}$ program's bloom threshold (a bloom is considered present when concentrations exceed this limit). Data is missing from 2023's primary bloom period.*

- **Table 1:** Bloom duration was defined as the amount of time (in days) between the first and last day that cyanobacteria concentrations exceeded the MV CYANO$_{TM}$ program's bloom advisory threshold during a given year. Only *Dolichospermum* blooms were included in this analysis. As such, 2022's bloom in late July/early August was omitted since it comprised a separate cyanobacteria genus (*Sphaerospermopsis*).

- **Figure 8:** The 2025 cyanobacteria dataset for the CHPUP monitoring station plotted in this figure includes samples collected on 9/3, 9/8, 9/22, and 9/30 from the Middle Pond's southern shoreline approximately 220 feet away from CHPUP. These samples were included to make

2025's estimated bloom dissipation period more comparable to those of other years. Weekly cyanobacteria data for the CHPUP monitoring station exists for both other comparison years (2022 and 2024) with no gaps. Had shoreline samples been omitted from the 2025 dataset, a 2-week gap during the year's dissipation period would have substantially overestimated the year's dissipation period and made it unfit for comparison to those of other years.

- **Table 2:** Dissipation periods were defined as the time it takes for cyanobacteria concentrations in a given year to fall from above the MV CYANO$_{TM}$ program's bloom advisory threshold to less than 10 µg/L. Dissipation rates were calculated by taking the total decline in cyanobacteria concentrations (in µg/L) over a given year's dissipation period and dividing it by the duration of the dissipation period (in days). This can be thought of as a simple slope calculation (rise/run).

Supplementary Figures

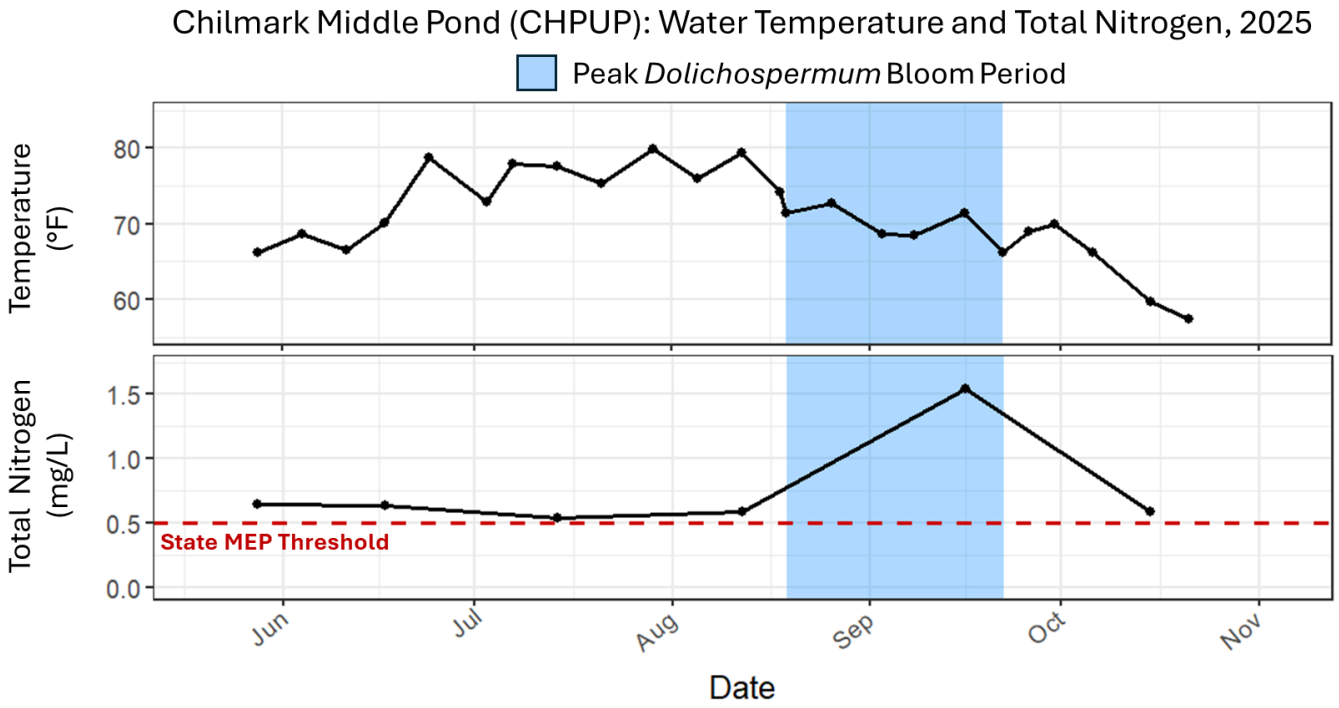

Figure A2. *Surface water temperature (in °F) and total nitrogen (in mg/L) for Chilmark Middle Pond's CHPUP monitoring station in 2025. Surface water measurements were taken at the adjacent shoreline on 9/3, 9/8, 9/22, and 9/30. The dashed red line on the nitrogen graph represents the State's 0.5 mg/L threshold, as established by CHP's 2015 Massachusetts Estuaries Project (MEP) report (Howes et al., 2015).*