Ecosystem Consulting Service
A Division of GZA

GEOTECHNICAL
ENVIRONMENTAL
ECOLOGICAL
WATER
CONSTRUCTION MANAGEMENT

135 Sheldon Road
Box 1, Unit I
Manchester, CT 06042
T: 860.742.0744
ecosystemconsulting.com
gza.com

November 07, 2025
Project No. 05.0046838.04

Mr. Scott Soderberg
Gardner Lake Authority
240 Hartford Road
Salem, CT 06420

Re: Gardner Lake 2024 Monitoring Report
Gardner Lake, Salem, CT

Dear Mr. Soderberg

GZA GeoEnvironmental, Inc. (GZA) is pleased to provide this update to the Gardner Lake Authority (GLA) summarizing our observations and findings related to water quality on Gardner Lake in 2024. This report and its findings and recommendations are subject to the Limitations attached as **Appendix A**.

BACKGROUND

Gardner Lake is an approximately 550-acre waterbody located in the Towns of Salem, Bozrah, and Montville, Connecticut. It has been monitored by GZA (formerly Ecosystem Consulting Service) since 1996, under the direction of the GLA. The long-term monitoring program was originally established to assess trophic state conditions, track oxygen dynamics in the lake's deep basin, and evaluate nutrient trends in support of proactive watershed and in-lake management. Over nearly three decades, the program has provided a continuous record of physical, chemical, and biological data that constitute one of the most complete long-term limnological datasets in the State of Connecticut.

The lake's bathymetry and hydrology play a defining role in its limnological behavior, which GZA has identified as a key natural feature. Gardner Lake has a maximum depth of approximately 42–45 feet (~13.7 meters (m)) and a mean depth near 13.7 feet (~4.2 m). Although its total volume is about 7,500 acre-feet, less than 2% of this volume occurs below 24 feet (7.3 m), and only 33% occurs below 12 feet (3.7 m). However, roughly 55% of the lake bottom lies deeper than 12 feet (3.7 m), forming a broad mid-depth plateau between 12 ft (3.7 m) and 24 feet (7.3 m). This morphology makes the system particularly sensitive to internal nutrient loading when bottom waters become anoxic (oxygen-depleted, defined as dissolved oxygen < 1.0 milligrams per liter (mg/L)). The small deep basin north of Minnie Island—commonly referred to as the "deep hole"—is the focal point for monitoring because it provides a representative sample of the entire water column and it represents the most vulnerable area to oxygen depletion (anoxia) and nutrient loading from sediments (**Figure 1**).

Since the initial 1996 baseline study, Gardner Lake has generally maintained mesotrophic characteristics: moderate nutrient levels, good transparency, and episodic late-summer oxygen depletion confined primarily to the deep basin. Routine measurements of Secchi depth, thermal stratification, dissolved oxygen, and nutrient concentrations have allowed GZA to assess year-to-year variability and to distinguish between internal processes and watershed influences.

Management goals established in the late 1990s remain consistent today:

- Maintain total phosphorus (TP) below 20 micrograms per liter (µg/L; preferably <15 µg/L);
- Maintain dissolved oxygen (DO) above 1 mg/L at 6 m depth at all times;
- Maintain water clarity with Secchi transparency >3 m during summer months; and,
- Prevent development of "nuisance" aquatic invasive plant communities.

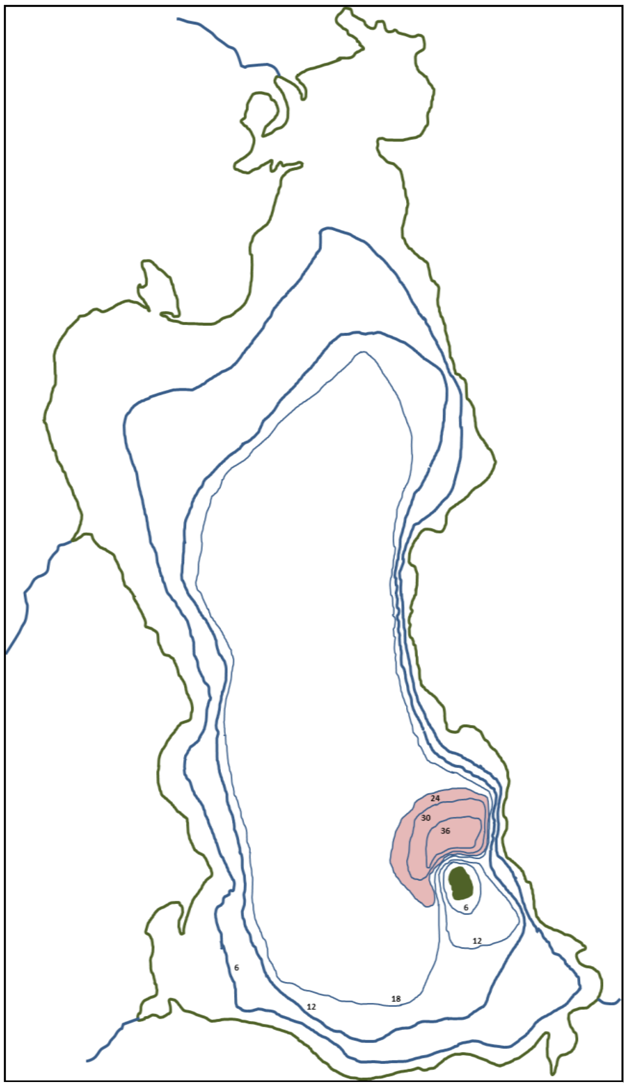

FIGURE 1. **Gardner Lake, with 6-ft contour bathymetry. The deepest area is sampled (area marked in pink), North of Minnie Island (pink).**

These goals have guided decades of assessment and management, emphasizing the prevention of "anoxic ascent"—the upward migration of the anoxic, or oxygen deficient zone—beyond the boundaries of the deep hole, which would increase internal phosphorus loading rates by an order of magnitude and degrade water quality.

The 2024 monitoring year continues the long-term cooperative assessment between GZA and the GLA. Building upon the 2023 findings—which documented stable water quality, moderate stratification, and low cyanobacteria density—this year's program aimed to track any shifts in oxygen dynamics, transparency, and nutrient behavior under variable climate conditions.

Monitoring efforts at Gardner Lake have been especially important in recent years as regional trends show increasing frequency of thermal stratification intensity, extended duration of anoxia, and increasing hypolimnetic phosphorus accumulation in similar Connecticut lakes. These trends are often linked to climate-driven factors such as warmer summer surface temperatures, reduced wind mixing, and increased stormwater nutrient pulses related to watershed development.

In 2024, monitoring also took on an additional focus due to identification of the invasive aquatic plant *Hydrilla verticillata* (Hydrilla; **Figure 2**). During the annual macrophyte inspection on July 17, 2024, GZA staff identified rooted Hydrilla along multiple sections of the shoreline, including the dam outlet cove, eastern shoreline, and the beach and boat ramp areas. Genetic confirmation by the Connecticut Agricultural Experiment Station (CAES) determined that this strain matches the *Hydrilla verticillata* subsp. *lithuanica* Clade C previously documented in the Connecticut River and Lake Pocotopaug, and not the monoecious strain more common to northern lakes. This finding marks a significant ecological event for Gardner Lake and underscores the importance of continued vigilance in both invasive species management and nutrient control. With this recent change along with other environmental pressures, upholding the original management goals of Gardner Lake has become more important than ever.

FIGURE 2. Sample of *Hydrilla verticillata* subsp. *lithuanica* Clade C.

MONITORING

Gardner Lake's 2024 monitoring involved a cooperative field effort between GZA staff and GLA volunteers. Gardner Lake was sampled 7 times (1 by GZA and 6 by GLA) in 2024, with monitoring occurring from mid-April to mid-October. Field staff performed vertical water column tests in meter increments to assess the lake's physical and chemical composition.

FIGURE 3. Example of a datalogging buoy, though instrumentation and depths vary. In Gardner, the top of the buoy remained submerged, was anchored at 12 m depth, and had three miniDOTs at 10, 6, and 2 m deep.

For more detailed chemical analyses, water samples were collected at 1 m, 5 m, and 10 m below the surface of the lake using a van-Dorn water sampler. When GZA sampled, a 5-meter sampling straw was used to collect phytoplankton samples which were preserved with Lugol's solution and shipped to a taxonomist for enumeration. A set of 3 miniDOTs were deployed early in the season in May at the routine sampling location and subsequently collected/removed in October (**Figure 3**). These miniDOTs recorded hourly snapshots of temperature and dissolved oxygen concentrations. Instruments were spot-checked, and data were collected during GZA's July field visit to confirm instrument function and performance. A complete hourly dataset from the three depths was recovered for 2024.

RESULTS

Climactic variability in rainfall and air temperature influence lake ecosystems in a variety of ways. For instance, **increased rainfall** results in elevated watershed connectivity, which could mean external inputs of nutrients or organic material. The Gardner Lake area experienced slightly below-average rainfall during the 2024 season with the heaviest single rainfall event occurring in mid-May (**Figure 4**). The late season (from August onwards) was particularly dry with very little precipitation across Connecticut.

Air temperature can be assessed by cumulative density degree days (DDD; **Figure 5**) calculated by subtracting the temperature at which water is densest (4 °C or roughly 40 °F) from mean daily air temperature. The residual, which is cumulative through time, is the DDD. This is similar in concept to growing degree days (GDD), often used for agricultural purposes. From mid-June to mid-August, Gardner Lake's 2024 season had the highest DDD when compared to the previous 4 seasons, indicating that 2024 was a relatively warm summer season. This is consistent with the intense heat waves that were experienced through June and July in 2024.

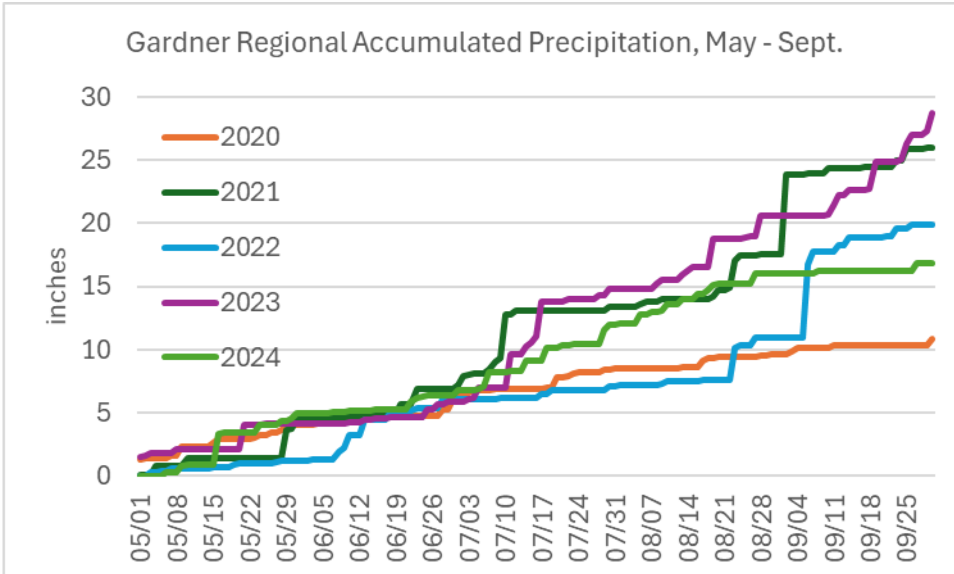

FIGURE 4. Gardner Lake accumulated precipitation.

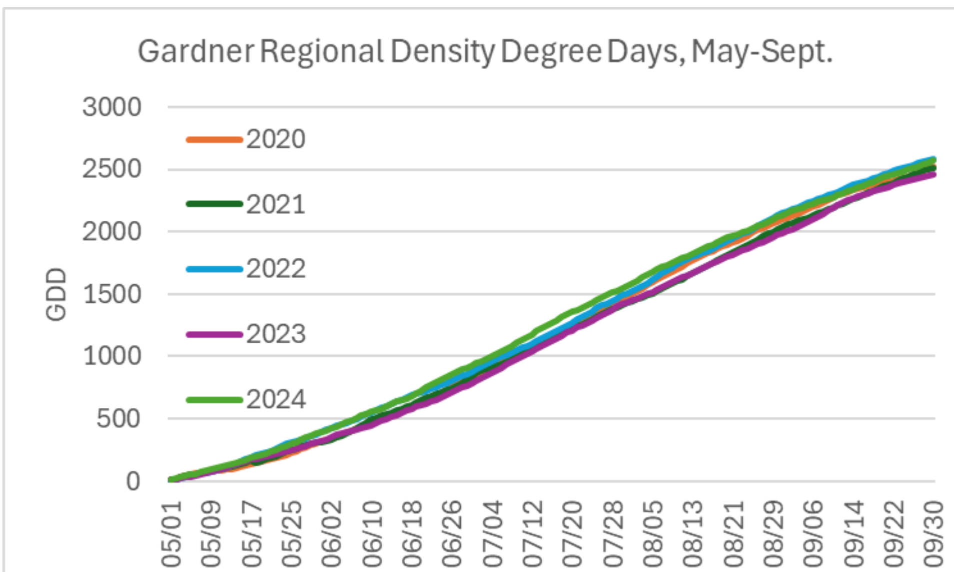

FIGURE 5. Gardner Lake heat accumulation (recorded as density degree days, DDD).

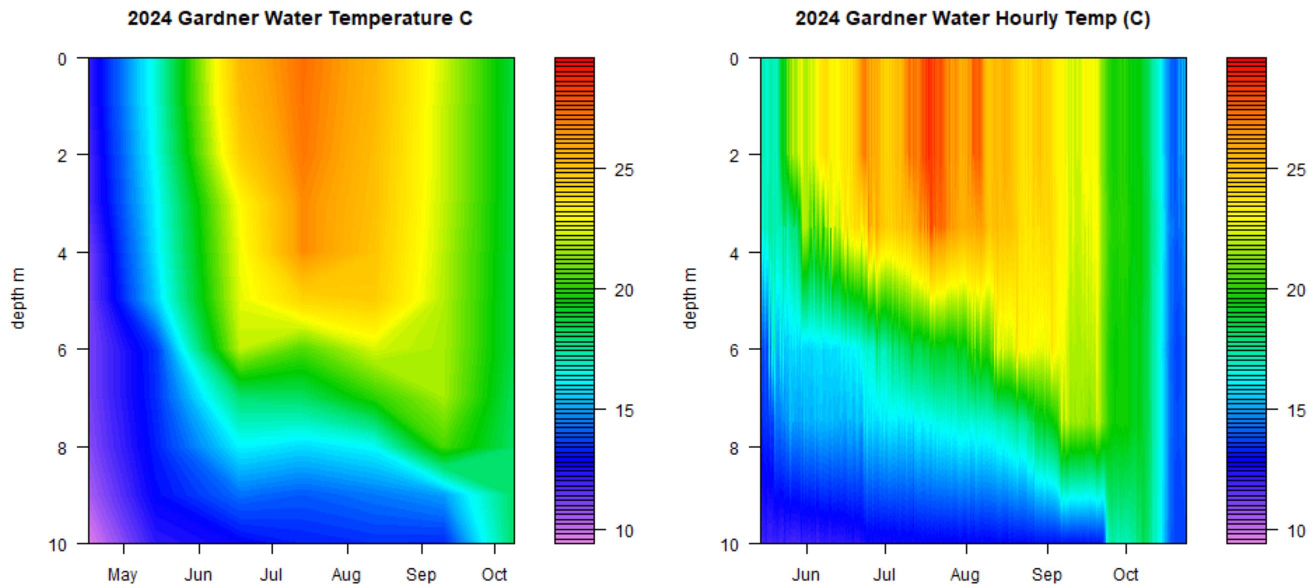

FIGURE 6. Gardner Lake monthly (left) and hourly (right) temperature profiles.

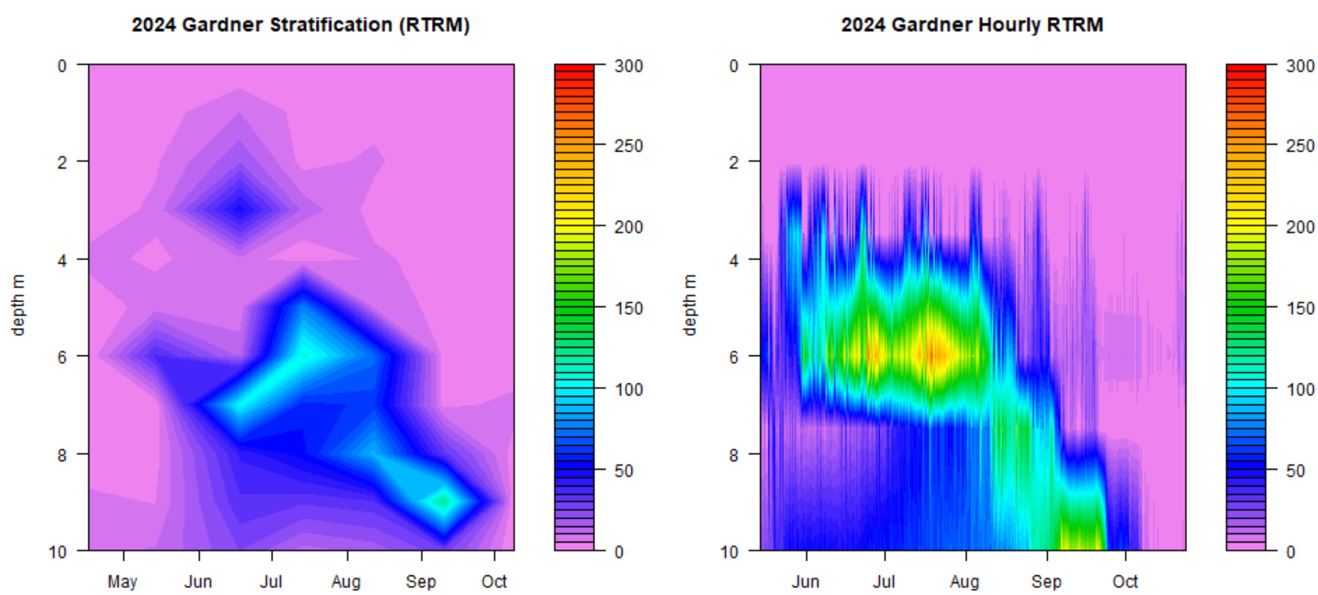

FIGURE 7. Gardner Lake monthly (left) and hourly (right) stratification profiles (measured as relative thermal resistance to mixing, RTRM).

Thermal stratification, where warm water is located at the surface, and colder, denser water is located deep, began in Gardner starting in mid May. On May 14th, the temperature at the surface of the water column was 17 °C and 12 °C over bottom (**Figure 6**). Stratification is measured by relative thermal resistance to mixing (RTRM), which is a unitless ratio. RTRM below 30-50 at any given depth, or below 100 when summed across the water column, is considered weak. Stratification in Gardner Lake remained weak until June 18th, when RTRM across the water column reached 308 RTRM (**Figure 7**) indicating stable thermal structure and the formation of a thermocline. Stratification increased in intensity through June and peaked in July with a total water column RTRM of 447. The thermocline remained at approximately 6 m to 7 m through June and July, deepening to approximately 8 m – 9 m in August and September. By October, it weakened substantially with minimum RTRM indicating fall turnover and mixed lake conditions.

Dissolved oxygen (DO) is critical for lakes as it allows organisms to conduct aerobic respiration and can maintain good water quality in recreational water sources. DO is diffused across the lake's surface from the atmosphere or produced by plants and phytoplankton within the lake. After lakes experience stratification, DO in the deepest hypolimnetic layer can become exhausted by biological processes (mainly, microbial respiration). This leads to anoxia (defined here as DO < 1.0 mg/L) and, often, chemically reduced conditions (low oxidation-reduction potential (**ORP**)). Such conditions increase the rate of release and transport of problematic nutrients and constituents such as total phosphorus (TP), iron (Fe), and manganese (Mn) from the lake sediments into the water column. TP and Fe are critical nutrients for cyanobacteria growth, while Mn can be a concern in source water reservoirs, but generally not in lakes such as Gardner. Hence, the water at the bottom of the lake during the summer may not only be cold and dense (which is not problematic in and of itself), but if anoxic and chemically reduced, it may also be very nutrient and metal rich (which can have negative implications).

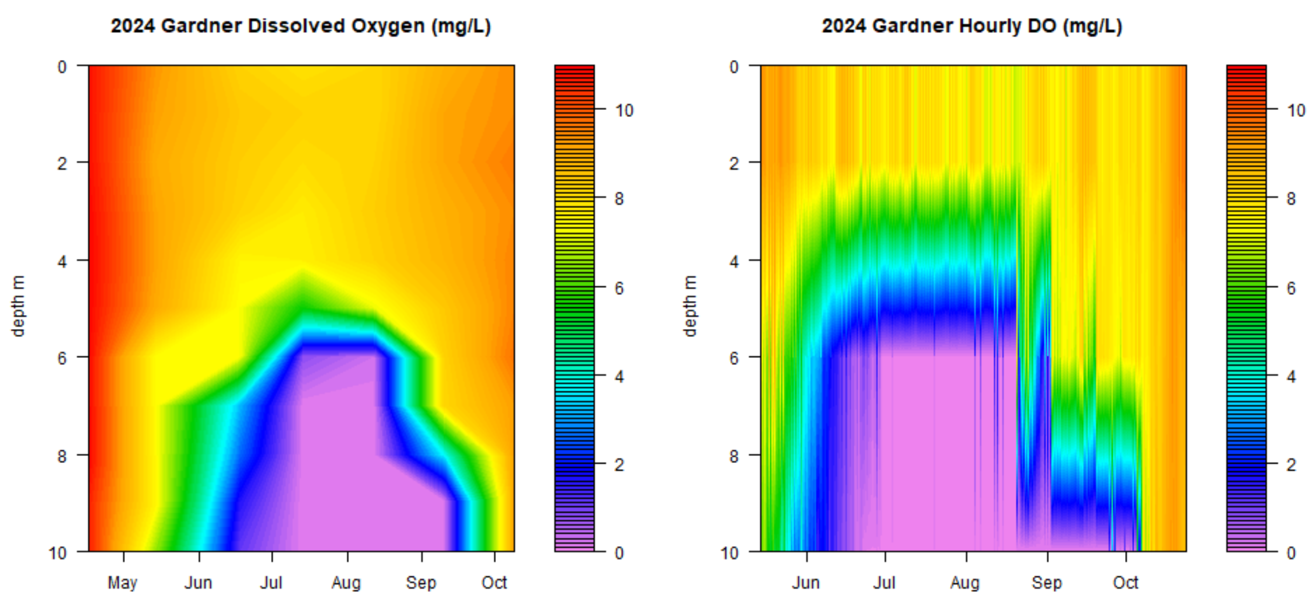

FIGURE 8. Gardner Lake monthly (left) and hourly (right) dissolved oxygen (DO) profiles.

Gardner Lake remained aerobic above the thermocline through the 2024 season, with DO concentrations remaining at or above 5 mg/L throughout that portion of the water column. Anoxia occurred from 6 m down to over-bottom depths early in the season, from June through September (**Figure 8**). Data also indicate an abrupt mix-down event occurred in mid-August (probably weather-driven) which temporarily relieved anoxia above 8 m depth. **DO saturation** is a related, but slightly different metric to DO concentration (**Figure 9**). It can indicate supersaturation (DO > 100% saturation) of the water column which may correspond to high rates of photosynthetic productivity. Mainly, this can be an indicator of phytoplankton growth and reproduction leading into or during bloom conditions. Mild supersaturation (≤ 110%) was observed at the surface throughout the season but did not clearly indicate elevated phytoplankton productivity.

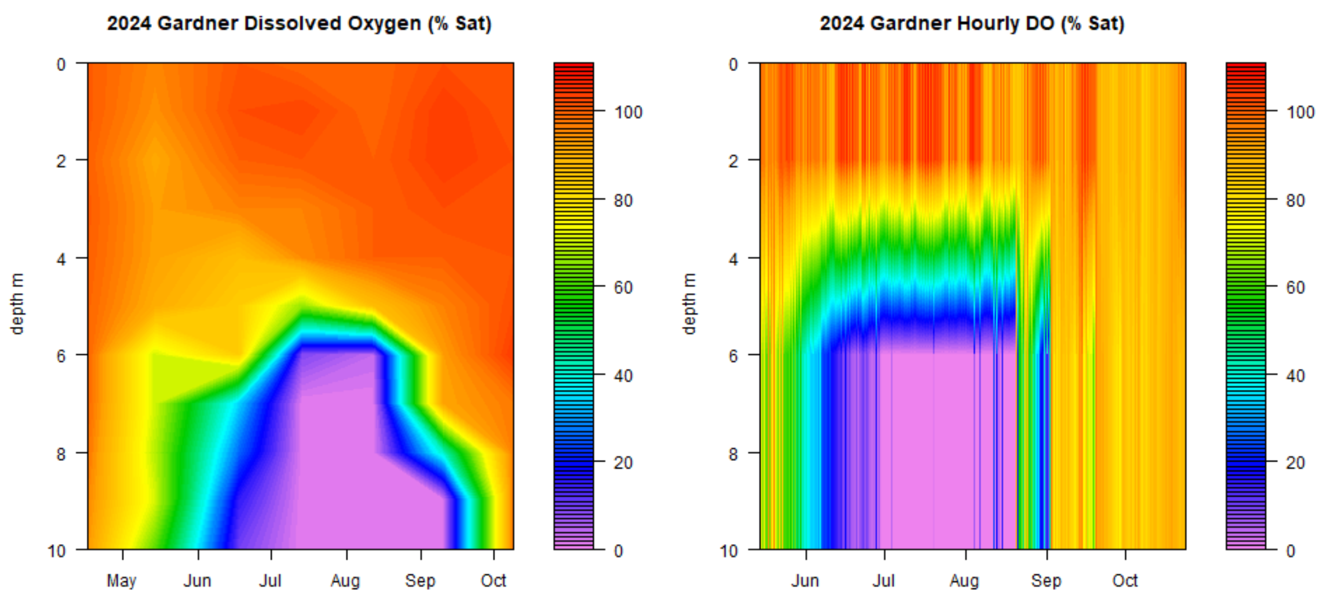

FIGURE 9. Gardner Lake monthly (left) and hourly (right) dissolved oxygen (% saturation) profiles.

In the absence of oxygen, Fe and Mn can become reduced and mobilized from sediments into the water column by anaerobic microbial respiration, which requires 'scavenging' for these constituents for use as electron acceptors in lieu of oxygen. When anoxia occurs for a duration of time, Fe and Mn can accumulate to high concentrations in over-bottom water. Chemistry analyses suggested that anaerobic respiration byproducts, such as Fe, accumulated over bottom through the season, starting in June and peaking at 7 mg/L in September (**Figure 10**). Mn followed the same trend, peaking in September at approximately 1.4 mg/L.

Total Phosphorus (TP) is a key nutrient for biological productivity in lakes in the northeast. Typically, we prefer to see TP at the top of a lake or reservoir (where there is sunlight exposure) no higher than 20 µg/L. TP in the 15 – 20 µg/L range can initiate and sustain some types of cyanobacteria at high cell densities if other conditions are favorable (such as temperature, sunlight, micronutrients, etc.). Thus, a threshold of 20 µg/L TP indicates favorable nutrient conditions for cyanobacteria, at which blooms can initiate and be sustained in fresh waterbodies. Gardner

Lake is a moderate TP system, with 2024 mean TP around 17 µg/L; top and middle depth TP only rarely exceeds 20 µg/L and averages around 13.5 µg/L (**Figure 11**). Over bottom TP is moderately enriched due to internal loading, averaging 23 µg/L and peaking at 39 µg/L in September.

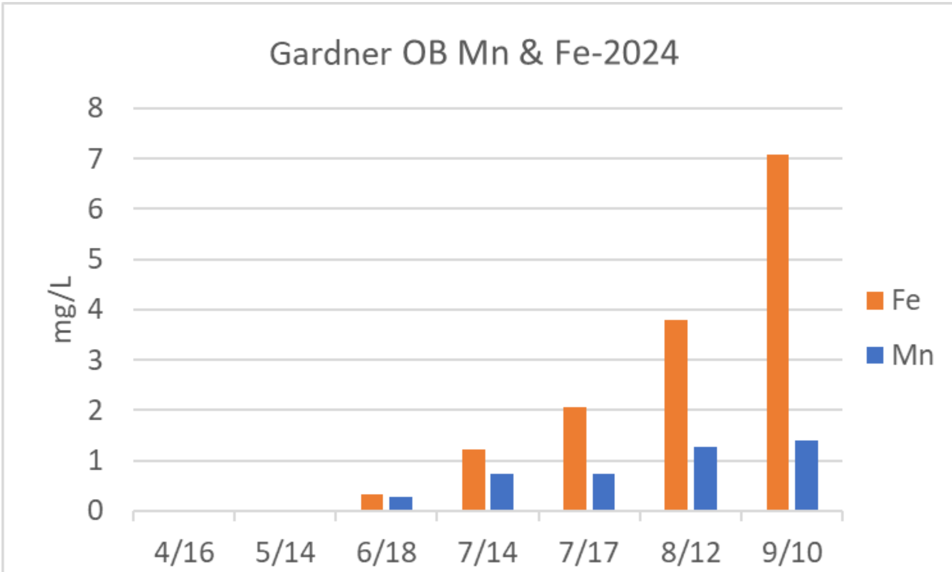

FIGURE 10. Gardner Lake over bottom manganese (Mn) and iron (Fe).

Ammonia is an important source of inorganic nitrogen to cyanobacteria and typically accumulates near the bottom of lakes and reservoirs resulting from organic decomposition during anoxia. This was observed at Gardner Lake, with the only 'moderately high' concentrations occurring over bottom, peaking in September over 0.5 mg/L (533 µg/L; **Figure 12**). Ammonia was low at all other depths.

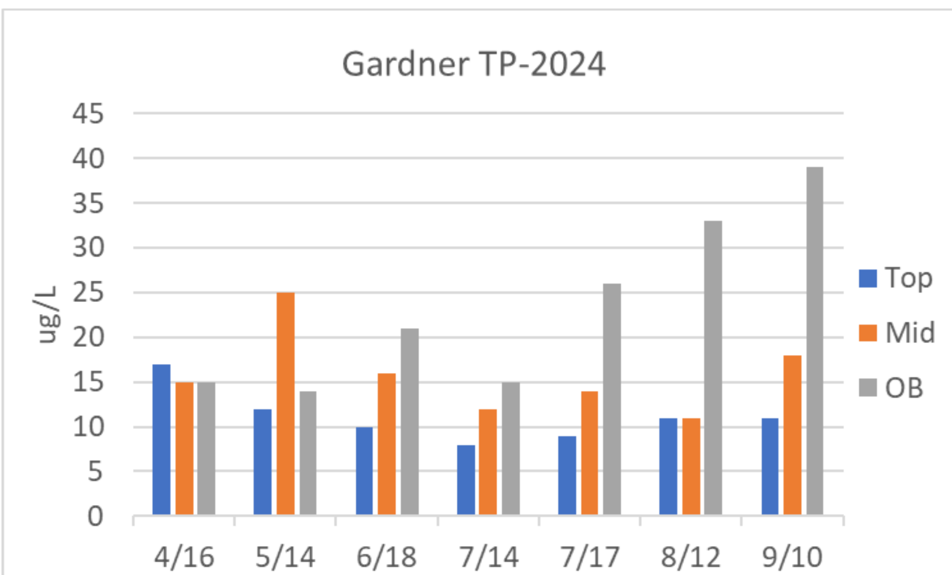

FIGURE 11. Gardner Lake total phosphorus (TP).

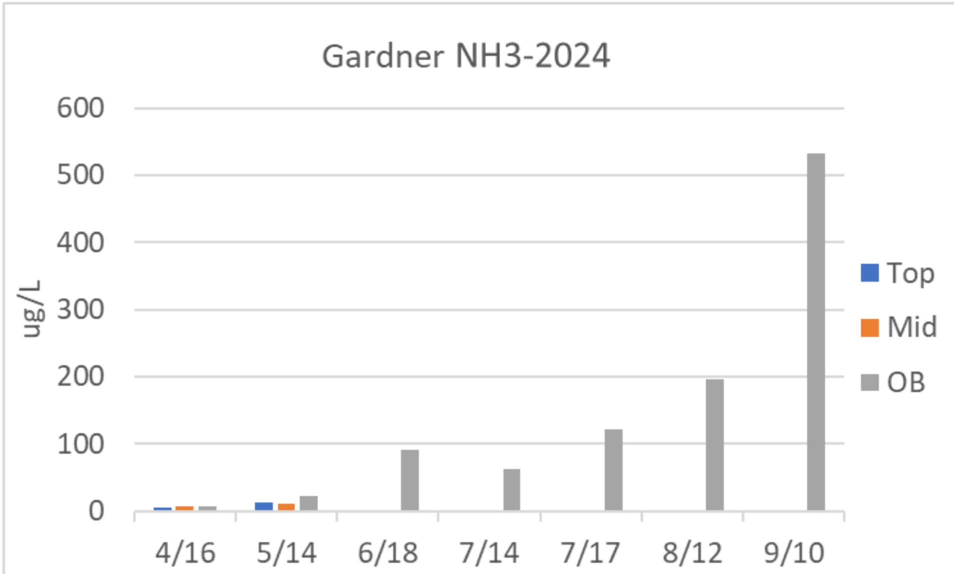

FIGURE 12. Gardner Lake ammonia (NH_3).

Nitrate is an important nutrient for eukaryotic phytoplankton such as diatoms and chrysophytes, which can readily compete with cyanobacteria when conditions are favorable. Typically, early season waterbodies are enriched with nitrate following ice off, snow melt, and spring rains. Spring diatom blooms often track nitrate availability, and "bust" when nitrate is exhausted in the upper water column. Following nitrate exhaustion, lakes and reservoirs may experience a 'clear-water phase,' where diatoms senesce and settle to the bottom of the lake. When nitrate becomes unavailable in surface waters, N-fixing cyanobacteria can gain a competitive advantage over eukaryotic algae. Gardner's nitrate availability tracked this typical seasonal trend both in the upper and lower portions of the water column (**Figure 13**). Peak concentrations in the upper water column occurred in April at approximately 90 µg/L. In Gardner, nitrate tends to become exhausted, first at the top of the lake by June, and then at the bottom of the lake by July.

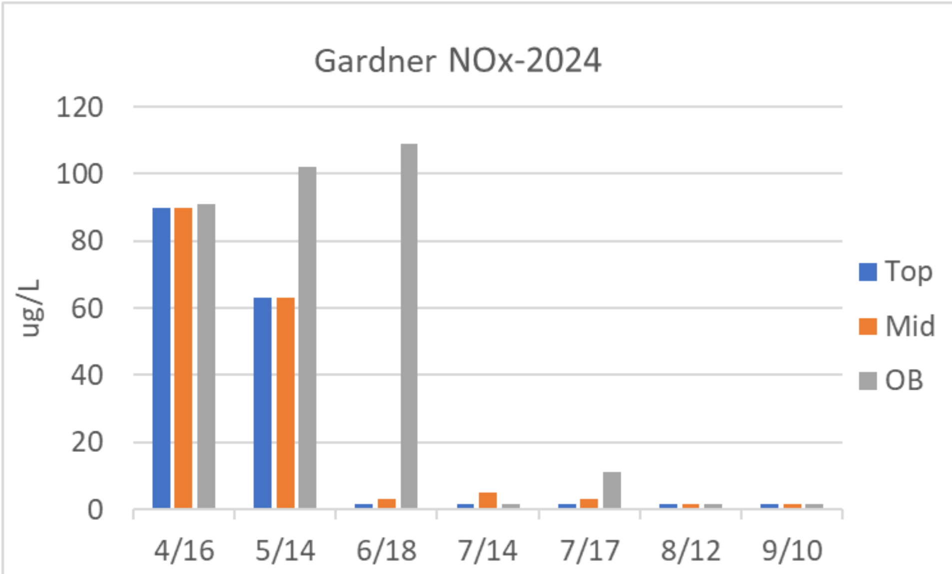

FIGURE 13. Gardner Lake nitrate (NO_3).

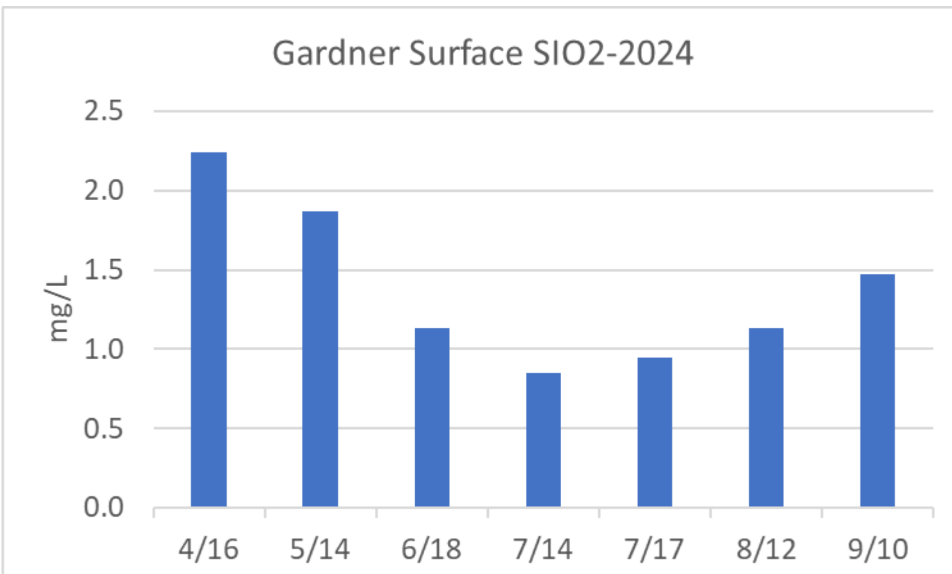

FIGURE 14. Gardner Lake silica oxide (SiO_2).

Silica is an important nutrient for certain eukaryotic phytoplankton taxa, such as diatoms and chrysophytes. Diatom frustules, which are their unique cellular wall structures, are composed of silica and can be quite intricate (with geometric, and even snowflake-like shapes). Similar to nitrate, silica can follow seasonal dynamics of spring enrichment and depletion as senesced diatoms settle out of the water column by early summer. Also, like nitrate, silica is a nutrient that can determine how well diatoms and chrysophytes compete with cyanobacteria, so it is important to measure to understand phytoplankton community and is part of GZA's standard nutrient chemistry suite. Silica in Gardner Lake is moderately low, as indicated by 2024 surface water samples (**Figure 14**), though it does follow typical seasonal trends of spring and fall enrichment.

Water clarity is aesthetically and ecologically important and determines the depth that sunlight can penetrate through the water column. Clarity is affected by physical, chemical, and biological factors such as suspended particulates, turbidity, and phytoplankton. Decreased water clarity can be an indicator of compromised water quality and greater water clarity usually indicates favorable water quality conditions. Water clarity is assessed by Secchi disk, which is a black and white disk that is lowered through the water column until it is no longer visible. The depth at which it disappears from view is recorded as the **Secchi disk depth**. Greater Secchi disk depths indicate clearer conditions. In 2024, Gardner Lake exhibited water clarity that varied between 2.6 and 5.5 m, largely exceeding its water clarity goals (**Figure 15**). Peak summer exhibited less water clarity than spring and fall, which may be associated with higher abundance of large-celled phytoplankton in the upper water column. Other variation throughout the season could be explained by variable quality inflow and suspended fines because of storm events. Also shown on **Figure 15** is the estimated **euphotic zone**, that is, depth of the water column that receives enough light to support photosynthetic productivity. In Gardner, the deepest euphotic zone extent, near 10 m from the lake's surface, occurred in May; most of the time it averaged around 6 m.

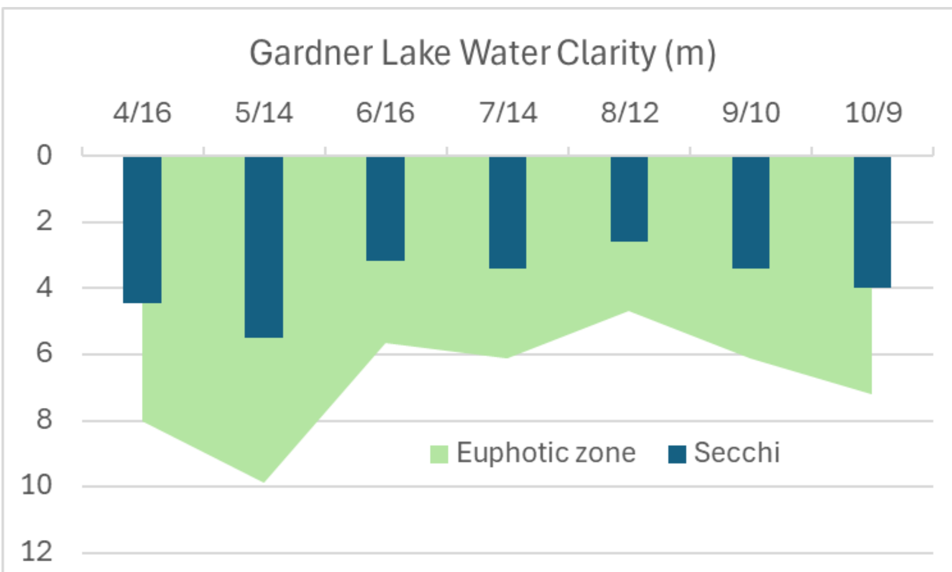

FIGURE 15. Gardner Lake water clarity (blue) and euphotic zone (green).

Gardner Lake phytoplankton is collected once a season by GZA. We collect a standard 0-5 m integrated water sample that is representative of the upper water column (**Figure 16**), and we've started collecting deep, depth discrete samples (from 7 m – 10 m) based on observations in recent years of high cyanobacteria density occurring at those depths (**Figure 17**). Cyanobacteria were dominant in both the upper water column and deep phytoplankton assemblages, though occurred at much higher densities at depth (approximately 75,000 cells/mL) as is typical for Gardner Lake. Cyanobacteria at the surface mostly consisted of very small-sized, buoyant *Aphanocapsa*, which is not a known toxin producer (**Figure 18**). Conversely, cyanobacteria at depth were mostly

Planktothrix, which is a cold, low-light tolerant group that can produce toxins (**Figure 19**). Luckily, at 6.5 m deep, these cyanobacteria were out of contact with normal recreational lake users.

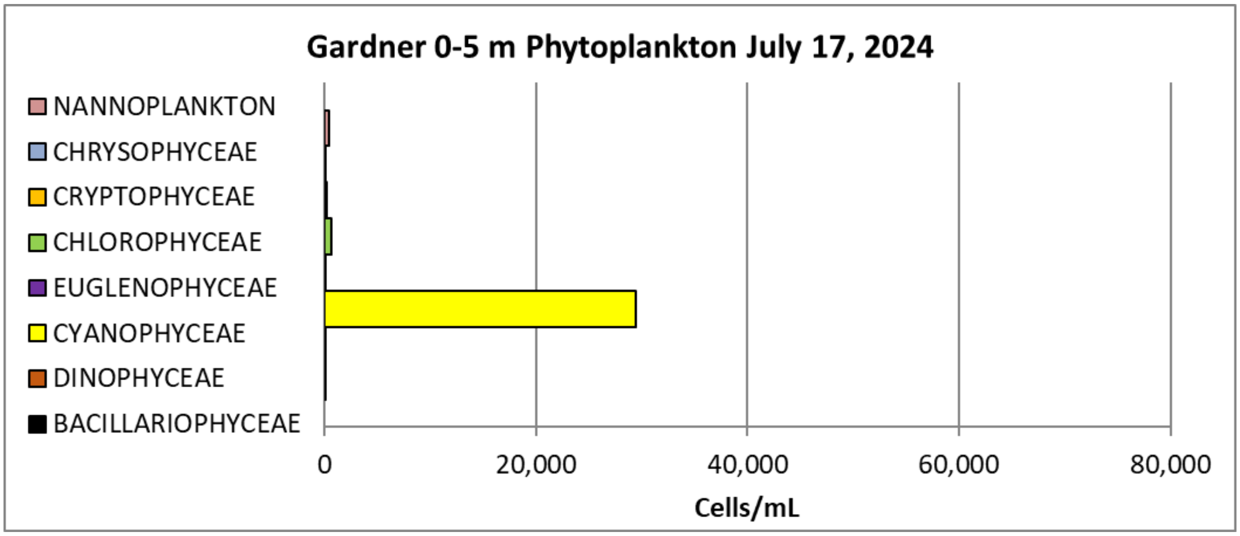

FIGURE 16. Gardner Lake surface (0 – 5 m) phytoplankton enumeration.

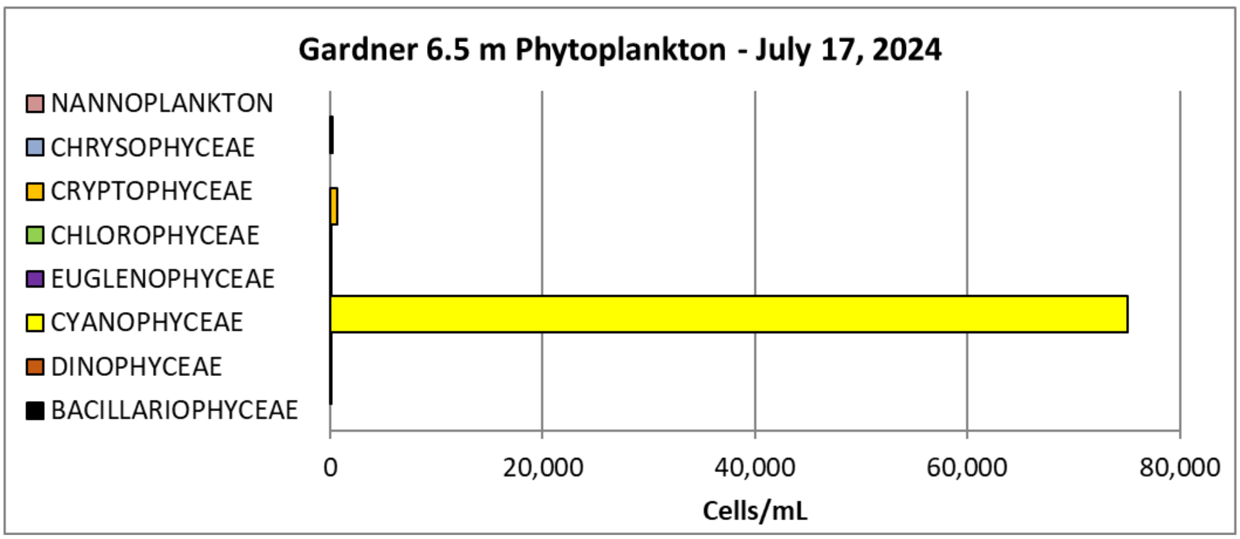

FIGURE 17. Gardner Lake deep (6.5 m) phytoplankton enumeration.

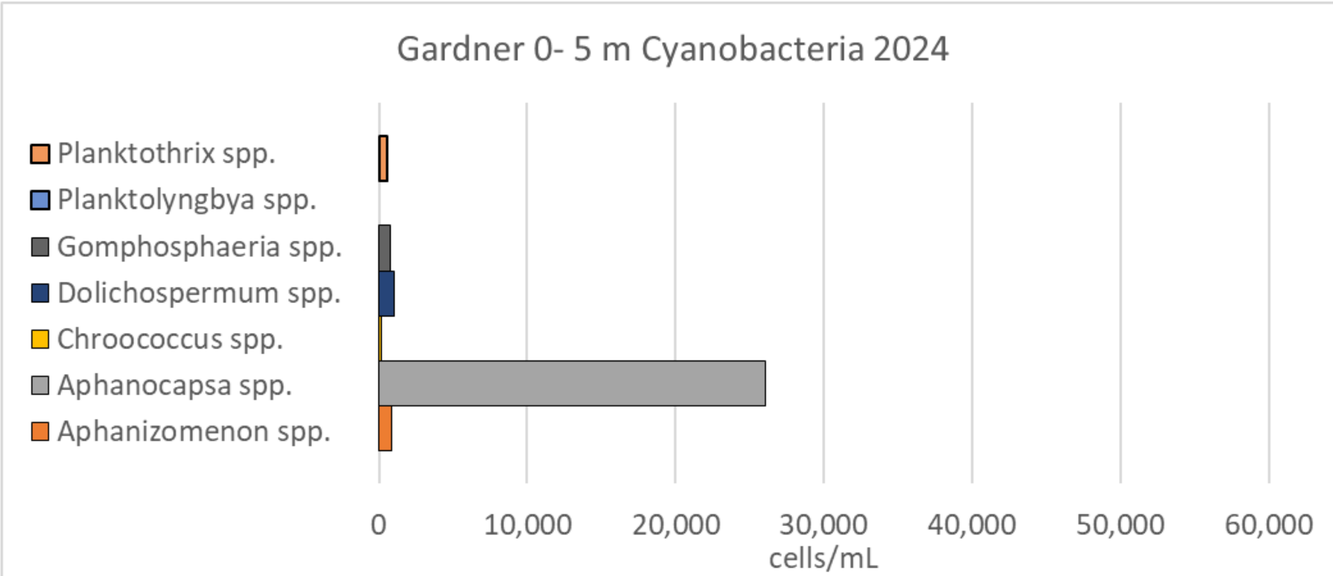

FIGURE 18. Gardner Lake surface (0 – 5 m) cyanobacteria enumeration and identification.

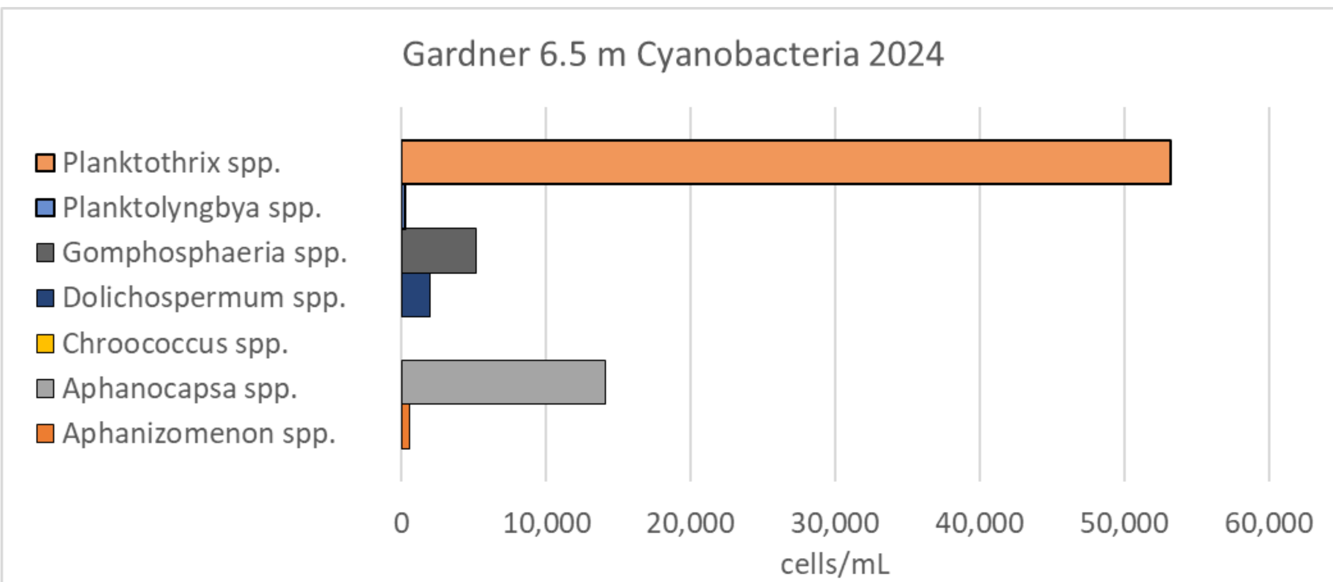

FIGURE 19. Gardner Lake deep (6.5 m) cyanobacteria enumeration and identification.

GZA staff (Dr. Benjamin Burpee and Sarah Gerhardt) performed a meandering littoral plant survey on July 17th to characterize the Gardner Lake plant community, density, and changes over the past few years. To conduct the survey, GZA utilized a grapple hook technique that consisted of tosses thrown from a slowly trolling boat. Aquatic plants collected from each toss were identified visually using Crow and Hellquist (2000), Padgett (2021), and Padgett (2022). Each species was logged according to a relative abundance scale of 1 – 5, with 1 being the lowest value and 5 being the highest (if a species was absent, the species was automatically assigned a value of 0). Field data were logged as an attribute table in the survey grids. Each sample point was populated with a series of data, which included latitude, longitude, and all the species detected during the survey. Species data were logged in that attribute table with the relative abundance.

Most plant density and species richness occurred in the north end of the lake in the cove areas adjacent to wetlands (though there was also a good amount of plant density and richness on the southern shore; **Figure 20**). A known Gardner Lake invasive, Fanwort (**Figure 21**) was isolated to the northern areas, with limited occurrence on the southern shore. Conversely, another invasive, Variable Leaf Milfoil (**Figure 22**), was reduced compared to previous years and only observed in the south end of the lake. Phragmites (**Figure 23**) was observed only in locations where it was previously known to be established. Hydrilla was a new invasive observed in 2024, with a single colony observed in the north of the lake, floating fragments on the eastern shore, and larger, more established colonies in the southern portion of the lake and surrounding the boat landing area (**Figure 24**). Other, common native species were observed at comparable densities and locations to previous years (Largeleaf Pondweed, **Figure 25**; Robbins' Pondweed, **Figure 26**; and Tape Grass, **Figure 27**), though Largeleaf Pondweed in Gardner and elsewhere is known for annual establishment in new areas of the lake. A native milfoil, Low Watermilfoil (**Figure 28**), was also observed at some abundance in the western and northern areas of the lake.

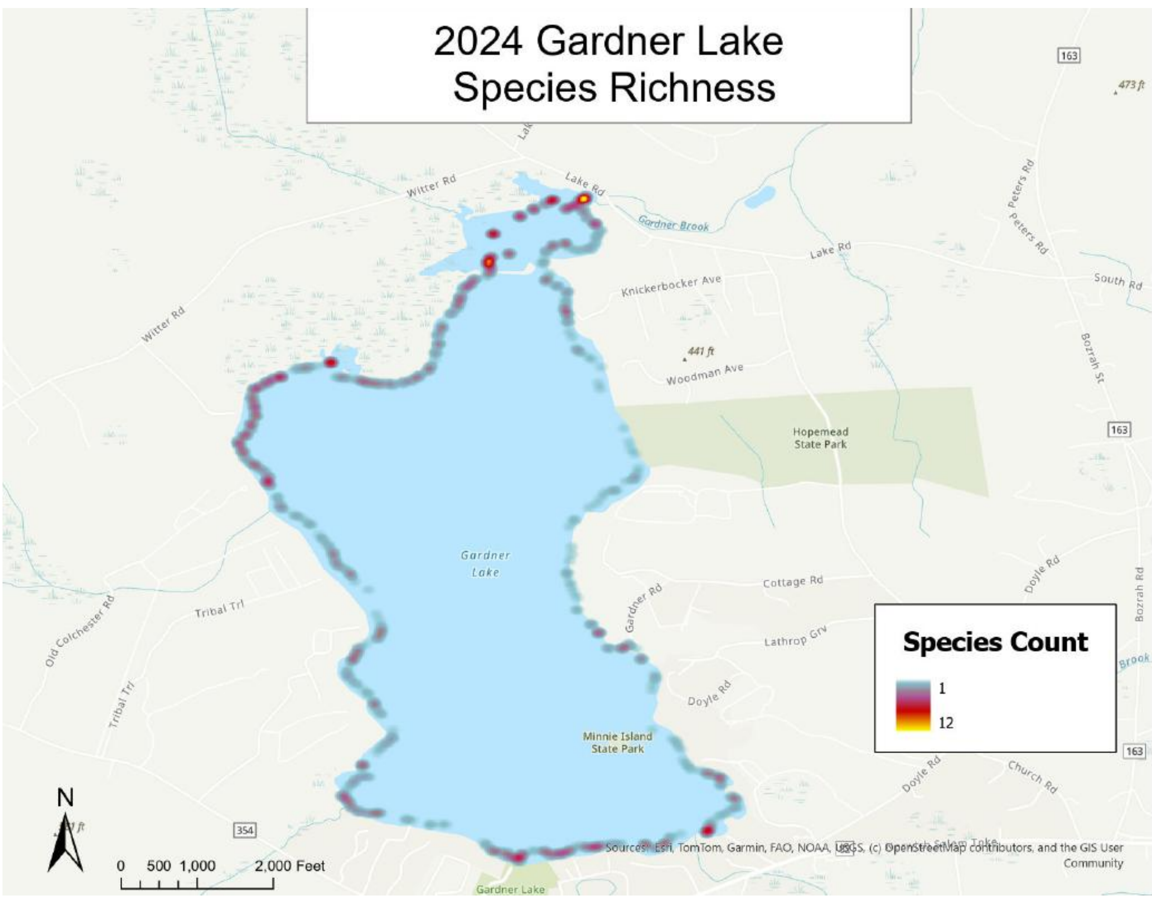

FIGURE 20. Gardner Lake meandering littoral plant survey, indicating species richness.

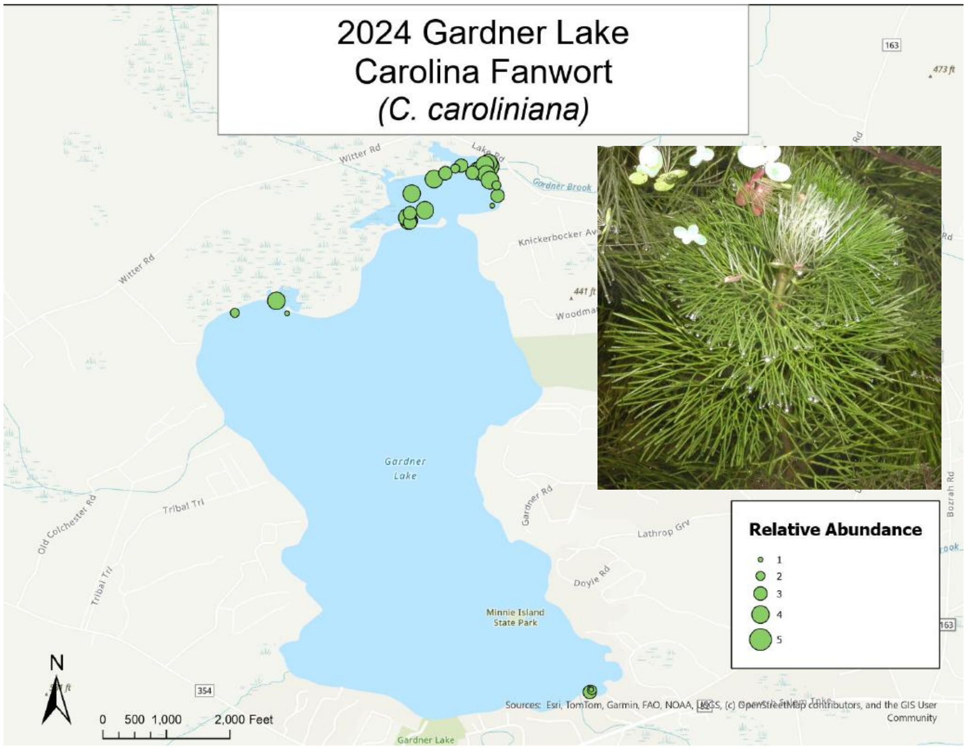

FIGURE 21. Gardner Lake *Cabomba caroliniana* (Fanwort).

FIGURE 22. Gardner Lake *Myriophyllum heterophyllum* (Variable Leaf Watermilfoil).

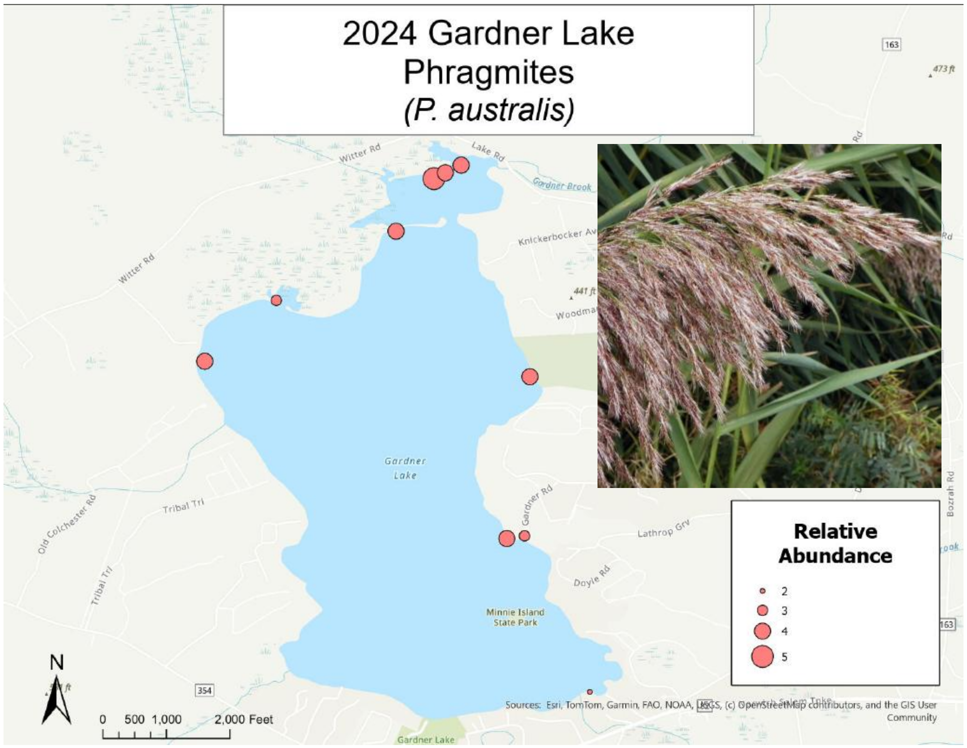

FIGURE 23. Gardner Lake *Phragmites australis* (Phragmites).

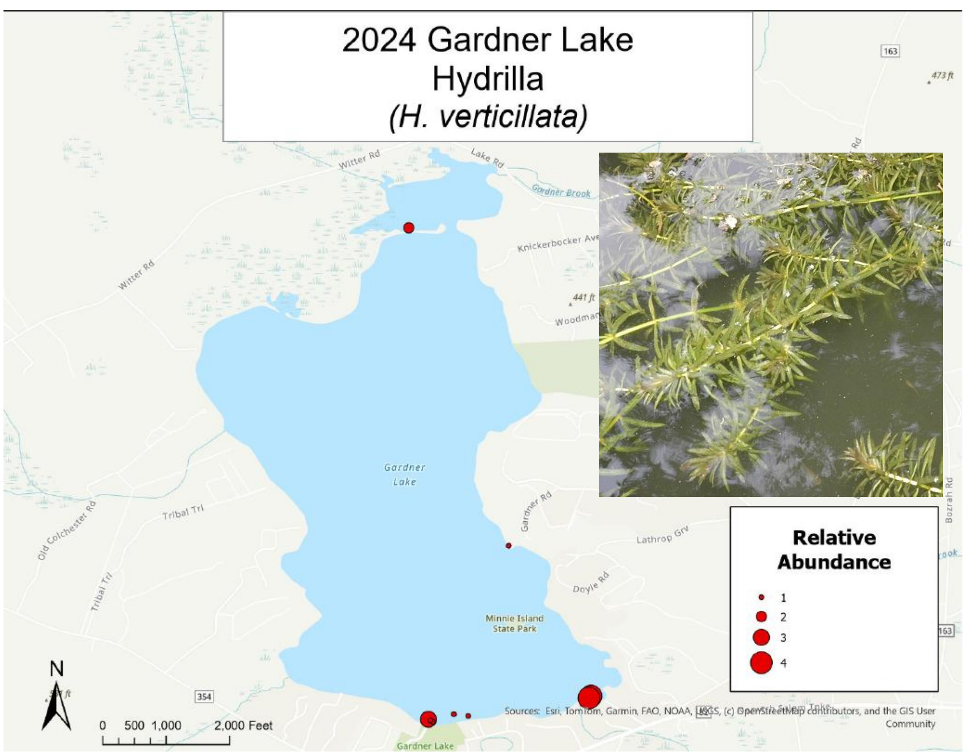

FIGURE 24. Gardner Lake *Hydrilla verticillata ssp. lithuanica* (Hydrilla).

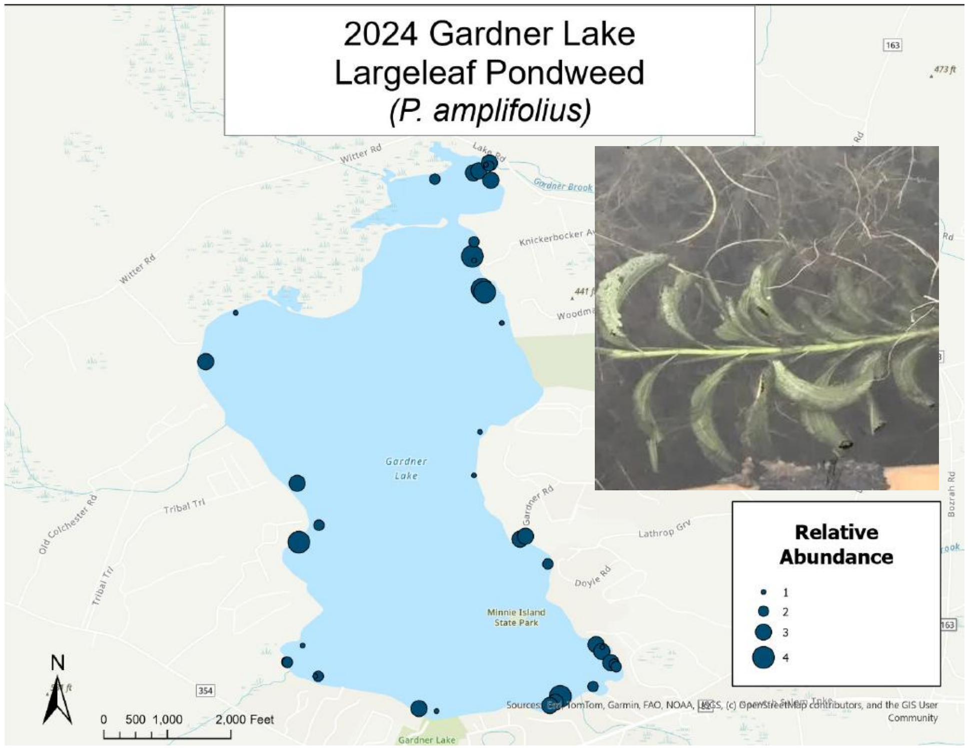

FIGURE 25. Gardner Lake *Potamogeton amplifolius* (Largeleaf Pondweed).

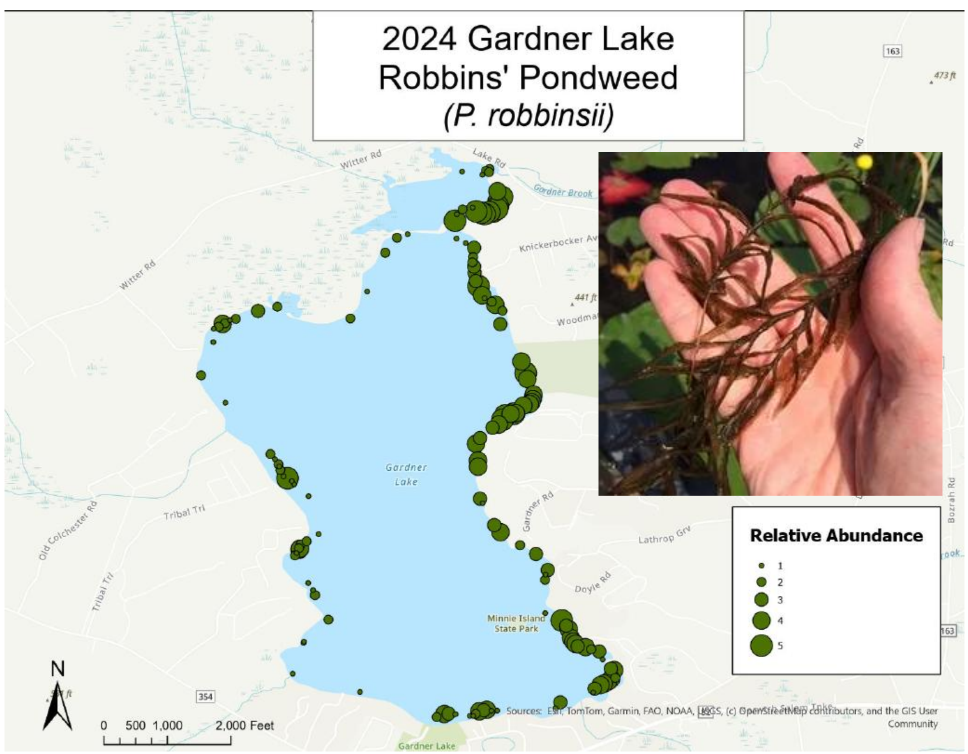

FIGURE 26. Gardner Lake *Potamogeton robbinsii* (Robbins' Pondweed).

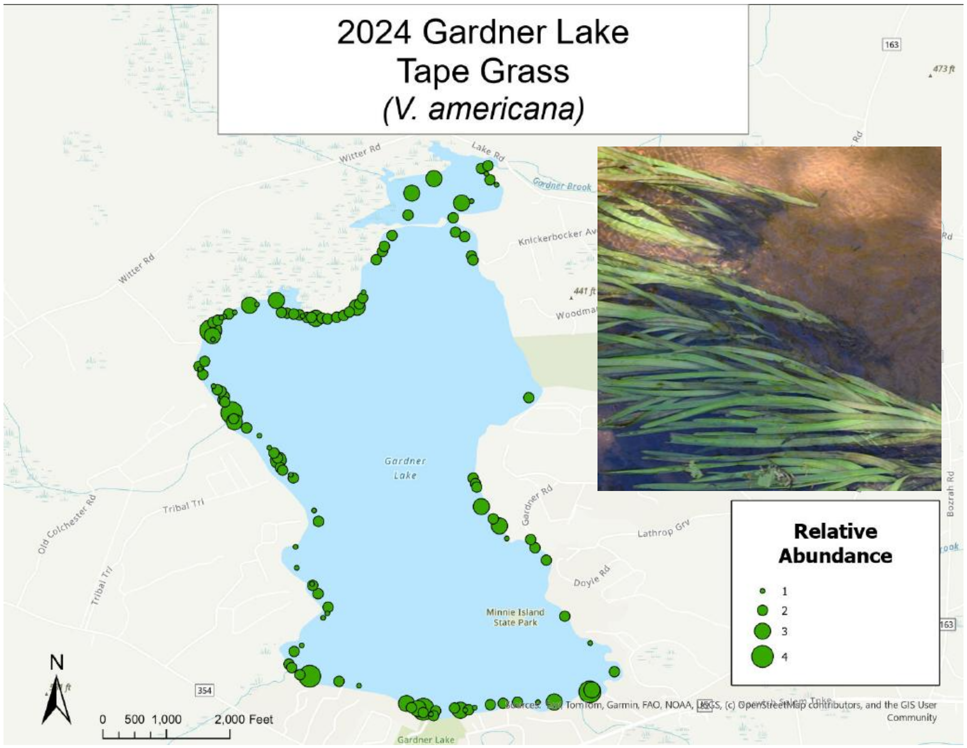

FIGURE 27. Gardner Lake *Vallisneria americana* (Tape Grass).

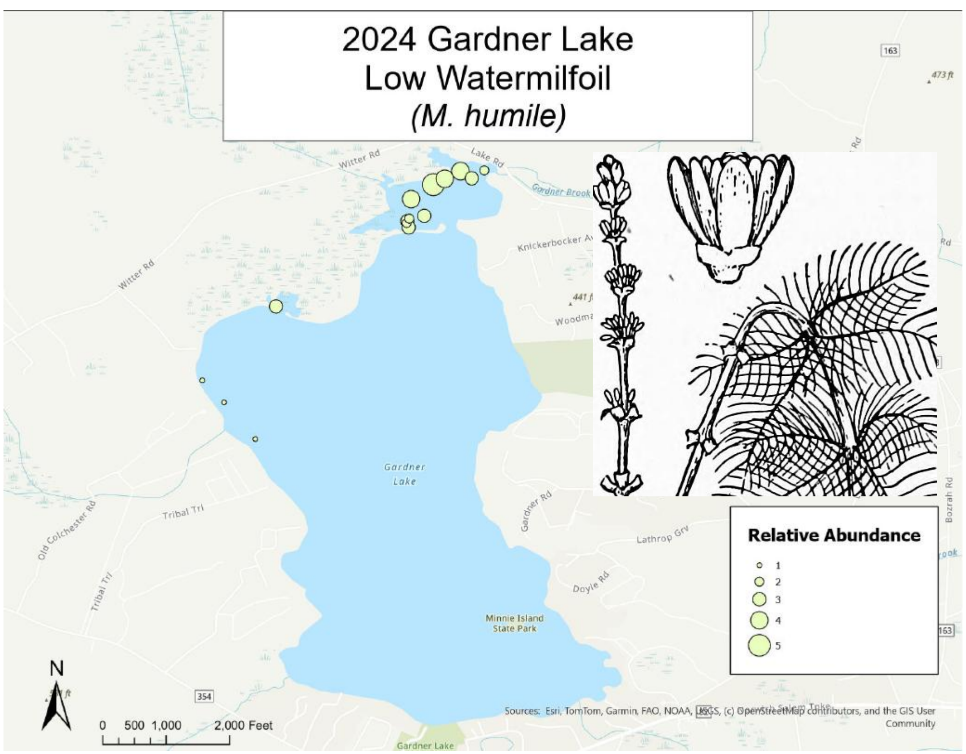

FIGURE 28. Gardner Lake *Myriophyllum humile* (Low Watermilfoil).

DISCUSSION AND RECOMMENDATIONS

In summary, 2024 was a good water quality year, though Hydrilla colonization is a large management concern and unfortunate occurrence for Gardner Lake and its community. Besides invasive Hydrilla establishment, Lake conditions mostly met other long-term goals outlined for Gardner Lake. DO was greater than 1 mg/L above 6 m at all times; thus, anoxic conditions were just contained within the deep hole feature of Gardner Lake. Secchi disk depths were greater than 3 m throughout the summer, which served to maintain an oxygenated water column and contain the anoxic boundary ascent. Nuisance plant conditions were not observed within recreational areas of the lake, and other invasive species were contained to known areas within the basin and shoreline (Hydrilla was contained to cove areas and did not occur at nuisance densities at the boat launch). Lastly, total phosphorus was maintained, for the most part, below 20 µg/L. The only exception to this threshold occurred late in the summer in deep areas of the water column and was not of immediate concern. For future seasons, GZA recommends continued monitoring in collaboration with the GLA, and an annual macrophyte survey to monitor established invasives and Hydrilla colonization. In addition, GZA recommends the deployment of high-frequency remote data logging instruments to monitor anoxia throughout the Gardner Lake water column.

GZA appreciates the opportunity to provide these services to the GLA and we look forward to continuing to serve you in the future. If you have any questions regarding the information presented, please feel free to contact Benjamin Burpee directly at 207-887-0358.

Very truly yours,

GZA, GeoEnvironmental, Inc.

Benjamin Burpee, PhD, CLM
Project Limnologist

Robert Kortmann, PhD
Senior Limnologist

Dave Rusczyk, PE, CT-LEP
Associate Principal

Attachments: Attachment A – Limnology Report Limitation

USE OF REPORT

1. GZA GeoEnvironmental, Inc. (GZA) prepared this report on behalf of, and for the exclusive use of our Client for the stated purpose(s) and location(s) identified in the Proposal for Services and/or Report. Use of this report, in whole or in part, at other locations, or for other purposes, may lead to inappropriate conclusions; and we do not accept any responsibility for the consequences of such use(s). Further, reliance by any party not expressly identified in the agreement, for any use, without our prior written permission, shall be at that party's sole risk, and without any liability to GZA.

STANDARD OF CARE

2. GZA's findings and conclusions are based on the work conducted as part of the Scope of Services set forth in the Proposal for Services and/or Report and reflect our professional judgment. These findings and conclusions must be considered not as scientific or engineering certainties, but rather as our professional opinions concerning the limited data gathered during the course of our work. Conditions other than described in this report may be found at the subject location(s).

3. GZA's services were performed using the degree of skill and care ordinarily exercised by qualified professionals performing the same type of services, at the same time, under similar conditions, at the same or a similar property. No warranty, expressed or implied, is made. Additionally, GZA makes no warranty that any response action or recommended action will achieve all of its objectives or that the findings of this study will be upheld by a local, state or federal agency.

4. In conducting our work, GZA relied upon certain information made available by public agencies, Client and/or others. GZA did not attempt to independently verify the accuracy or completeness of that information. Inconsistencies in this information which we have noted, if any, are discussed in the Report.

COMPLIANCE WITH CODES AND REGULATIONS

5. We used reasonable care in identifying and interpreting applicable codes and regulations necessary to execute our scope of work. These codes and regulations are subject to various, and possibly contradictory, interpretations. Interpretations and compliance with codes and regulations by other parties is beyond our control.

6. The standard of care for projects like this is that the proposed apparatus/equipment is 'exempt by right' from permits and no permits were requested or obtained as part of this project. If a permit is ultimately required and if Client retains GZA to assist Client or any other party with applying for any license, permit, certificate or other authorization, Consultant does not guarantee that it will be able to obtain such license, permit, certificate or other authorization, only that it will assist Client in the application for such license, permit, certificate or other authorization in accordance with the standard of care.

SCREENING AND ANALYTICAL TESTING

7. GZA may have collected samples at the locations identified in the Report. These samples were analyzed for the specific parameters identified in the report. Additional constituents, for which analyses were not conducted, may be present in soil, groundwater, surface water, sediment and/or air. Future Site activities and uses may result in a requirement for additional testing.

8. Our interpretation of field screening and laboratory data is presented in the Report. Unless otherwise noted, we relied upon the laboratory's QA/QC program to validate these data.

9. Variations in the types and concentrations of constituents observed at a given location or time may occur due to release mechanisms, changes in flow paths, and/or the influence of various physical, chemical, biological or radiological processes. Subsequently observed concentrations may be other than indicated in the Report.

INTERPRETATION OF DATA

10. Our opinions are based on available information as described in the Report, and on our professional judgment. Additional observations made over time, and/or space, may not support the opinions provided in the Report.

ADDITIONAL SERVICES

11. GZA recommends that we be retained to provide services during any future investigations, design, and/or implementation activities at the Site. This will allow us the opportunity to: i) observe conditions and compliance with our design concepts and opinions; ii) allow for changes in the event that conditions are other than anticipated; iii) provide modifications to our design; and iv) assess the consequences of changes in technologies and/or regulations.

NUMERICAL MODELS

12. Actual conditions are likely more complex than indicated in this Report. If a mathematical model is refenced in this report, it is by its very nature, a simplification of actual conditions. Except as noted in the report, we did not validate the code used in the model. In constructing the model, point specific data was generalized and extrapolated across the study area. In addition, in areas where field data was not available, we used professional judgment, based on experience and regional information, to construct the model. Model assumptions are provided in this report. Actual flow patterns, etc. may be other than simulated. As additional field data becomes available our numerical model can be modified to better reflect conditions of possible interest.

COST ESTIMATES

13. Unless otherwise stated, our cost estimates are only for comparative and general planning purposes. These estimates may involve approximate quantity evaluations. Note that these quantity estimates are not intended to be sufficiently accurate to develop construction bids, or to predict the actual cost of work addressed in this Report. Further, since we may have no control over either when the work will take place or the labor and material costs required to plan and execute the anticipated work, our cost estimates were made by relying on our experience, the experience of others, and other sources of readily available information. Actual costs may vary over time and could be significantly more, or less, than stated in the Report.

APPARATUS/EQUIPMENT INSTALLATIONS

14. GZA will not be responsible for damage to installed equipment or apparatus as a result of Acts of God such as extreme weather events or events not within our reasonsible control.

15. GZA will not be responsible for damage to installed equipment or apparatus as a result of actions by others. Certain types of installed apparatus/equipment are designed to be fully submerged, while other apparatus/equipment may have portions of the units partially exposed above the water surface during normal operations.

16. GZA will not be responsible for damage to installed apparatus/equipment due to improper start up or operation by others. Any usage that is not consistent with GZA’s recommendations would be considered improper operation and has the potential to damage the installed apparatus/equipment.

17. GZA will not be responsible for damage to installed apparatus/equipment if the installed apparatus/equipment is changed or altered by anyone other than GZA or our subcontractor(s).

18. GZA will not be responsible for damage to installed apparatus/equipment if the apparatus/equipment is moved or relocated by anyone other than GZA or our subcontractor(s).