Lake Quinsigamond
2025 Water Quality Report

The City *of* Worcester
Department of Sustainability and Resilience
Lakes and Ponds Program

Summary

The following report is presented by the City of Worcester Department of Sustainability and Resilience (DSR) Lakes and Ponds Program (L&P). It details the program's water quality monitoring results, management activities and outreach efforts at Lake Quinsigamond in 2025. The "State of the Lake" will be rated "Excellent", "Good", "Fair", or "Poor" based on the results' implications for water quality and recreational value. This report will also outline projects and opportunities the City of Worcester's Lakes and Ponds Program (L&P) intends to implement at Indian Lake in 2026.

Lake Quinsigamond is impacted by many of the pressures of the urban environment. Lake Quinsigamond faces challenges including beach closures due to fecal bacteria, high nutrient levels, invasive aquatic plants, and depletion of dissolved oxygen (DO). The lake is managed by the Lake Quinsigamond Commission with support from the City of Worcester, the Town of Shrewsbury, and the Town of Grafton, and efforts continue to support a healthy ecosystem and a wide variety of recreational opportunities. ***In 2025, Lake Quinsigamond Lake received a score of "Good"***. Continue reading to learn more about this rating and L&P's work at Lake Quinsigamond.

Background

Lake Quinsigamond is a naturally formed, 4-mile-long, 475-acre lake nestled between eastern Worcester and western Shrewsbury, with Grafton to the south. It empties into Flint Pond to the south and later into the Quinsigamond River, ultimately joining the Blackstone River. Lake Quinsigamond and Flint Pond are connected by direct flow through culverts and are generally managed as a single system. The waterbody has a maximum depth of 90 feet, and a water residence time of about 6 months. The Commonwealth of Massachusetts considers Lake Quinsigamond a "Great Pond", meaning that it was larger than 10 acres in its original state and is therefore within the jurisdiction of Chapter 91, a law which protects public rights to access a waterway. There are seven major tributaries that feed the lake from Worcester and Shrewsbury. The lake is crossed by three major roadways, Interstate 290, Route 9, and Route 20.

Lake Quinsigamond is renowned as a major recreational asset for rowing, sailing, swimming, fishing, water skiing, and other motorized and non-motorized boating. The Massachusetts Department of Conservation and Recreation (DCR) manages two parks with bathing beaches on the Worcester side of the lake, and the Town of Shrewsbury manages one boat ramp on the eastern shore and one boat ramp on Flint Pond. Management of the lake is led by the Lake Quinsigamond Commission, a state-level commission consisting of representatives from Worcester, Shrewsbury, and Grafton. The lake is stocked with rainbow and brown trout by MassWildlife in the spring and fall, and northern pike and tiger muskellunge when available. Carp fishing is also gaining popularity at Lake Quinsigamond as a state record mirror carp was recently caught, weighing over 46 pounds. Other popular game fish include largemouth bass, smallmouth bass, chain pickerel, yellow perch, white perch, black crappie, and bullhead catfish.

Lake Quinsigamond is listed on the Massachusetts Impaired Waters 303d List as Category 4a for non-native aquatic plants, *Enterococcus* bacteria, excess algal growth, and low dissolved oxygen. It received a Total Maximum Daily Load (TMDL), or "nutrient budget," in 2002 for phosphorus. At that time, it was suggested that management plans be created to achieve 200 days' supply of oxygen in the hypolimnion (deep, colder layer) during the summer months. The TMDL also identified Flint Pond, the southern section of Lake Quinsigamond, as being impaired for turbidity because it had an average Secchi disk transparency of below 4 feet, which can indicate concerns for both ecological health and human recreational safety. Additionally, the lake hosts at least eight invasive aquatic plants, including Eurasian Milfoil (*Myriophyllum spicatum*), Variable Leaf Milfoil (*Myriophyllum heterophyllum*), Fanwort (*Cabomba caroliniana*), Brittle Naiad (*Najas minor*), Curly Leafed Pondweed (*Potamogeton crispus*), Water Chestnut (*Trapa natans*), Sacred Lotus (*Nelumbo nucifera*), and Common Reed (*Phragmites australis*). It also hosts the invasive mollusk *Corbicula fluminea.* The Lakes and Ponds Program began monitoring Lake Quinsigamond as part of its Water Quality Monitoring Program in 2017.

This report details the results of water quality monitoring programs in 2025, as well as the projects L&P intends to implement in 2026. To provide context for the 2025 data, the following paragraph highlights L&P's key findings from 2024.

In 2024, Lake Quinsigamond received a score of "Good/Fair." As in past years, the largest impediment to recreation was closure of the two DCR beaches due to fecal bacteria exceedances. The beach at Regatta Point was closed for a total of 50 days, and Lake Park Beach was closed for 24 days. Multiple invasive aquatic plant species continued to be present in the lake, though management efforts continued. A survey following a 2023 herbicide treatment in the northern portion of the lake indicated a successful reduction of target species, and the Lake Quinsigamond Watershed Association (LQWA) hosted three successful volunteer Water Chestnut hand pulling events. Water clarity was generally higher than in 2023 and was rated "Good" overall. Water temperature was rated "Good," though mid-summer stratification created stressful conditions for cold-water fish by reducing suitable habitat. Dissolved oxygen (DO) was rated "Fair" overall due to low oxygen conditions in a large portion of the water column during the summer and fall. Nutrient concentrations were generally low at the surface of the lake, though concentrations of total phosphorus (TP) and (NH_3) rose drastically at the bottom as lake stratification intensified in the summer and fall.

To view full reports from all previous seasons, please visit WorcesterMA.gov/bluespace or contact greenworcester@worcesterma.gov.

Management Summary

The Lake Quinsigamond Commission (LQC) began implementing an invasive aquatic plant management plan in 2018 to reduce the density of six invasive aquatic plants that were identified by a survey the previous year. Management activities include a 3-foot winter drawdown of the lake, a volunteer effort to remove Water Chestnut by hand, removal of fanwort and milfoil by divers, and chemical treatment with herbicides. Management is complicated by the presence of an endangered pondweed (*Potamogeton vaseyii)* that also resides in the lake.

In 2025, L&P continued coordinating with LQC to address invasive aquatic plants in Lake Quinsigamond. L&P contracted the removal of Fanwort by divers in the Round Pond section of the lake. In 2025, the Lake Quinsigamond Watershed Association (LQWA) hosted two volunteer Water Chestnut removal events, supported by L&P. L&P will continue to collaborate with both LQC and LQWA to inform and implement aquatic plant management in Lake Quinsigamond.

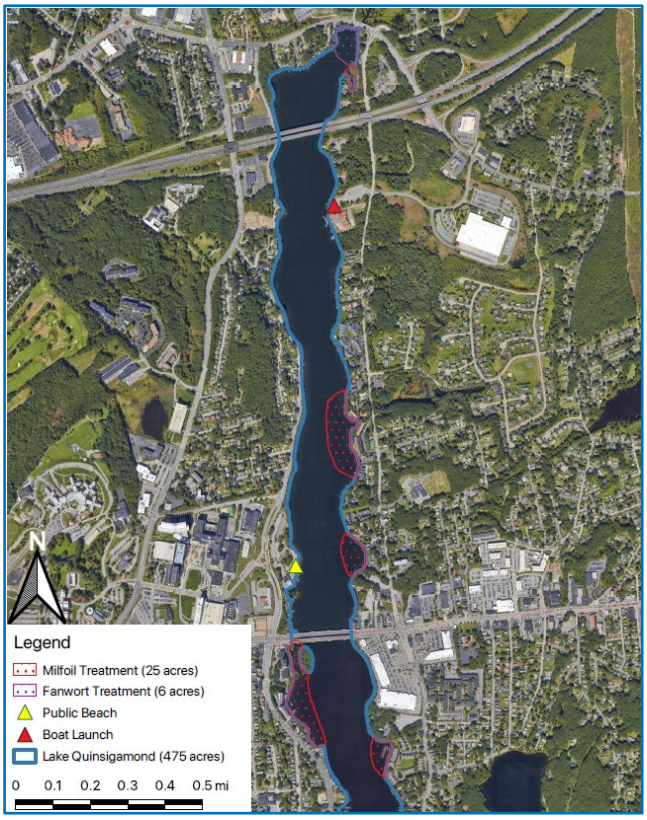


Figure 1 *– Treatment area for herbicide application on 23-Aug 2023.*

Sampling Analysis and Overview

Sampling from multiple locations within a waterbody and its watershed leads to better understanding of the water that enters the lake, how it is transformed within, and the water leaving the lake. To account for these changes over space and time, L&P samples at sites in tributaries, at the surface and bottom of mid-lake sites, and the outlet.

Tributaries, or inlets, are streams that flow into a lake or pond. They collect surface runoff from rain or snowmelt along with some groundwater and carry it through the stream channel to the waterbody. In some cases, tributaries make up a large portion of the water going into the lake, and the quality of the water in these tributaries provides insight into where certain impairments in the lake originate. Outlets are the major exits for water in the lake. Most L&P water quality parameters are measured at the major natural tributaries and outlets of the lakes.

Lake Quinsigamond was visited twice monthly from May through October and sampled at seven locations: The major aboveground tributaries, Coal Mine Brook and Poor Farm Brook in Worcester and Billings Brook in Shrewsbury; the northern culvert at Main Street; the two deepest parts of the lake (the northern site is about 85-feet deep, and the southern site is about 75-feet deep); and the outlet at the Irish Dam located in the southern part of the lake in Grafton (see Figure 2). At the in-lake locations, probe measurements and water samples were collected 1 foot below the surface of the water ("surface"), and 2 feet above the bottom of the lake ("bottom"). Parameters evaluated on every sampling day included Secchi transparency, temperature, dissolved oxygen (DO), pH, total phosphorus (TP), and total dissolved phosphorus (TDP). Total suspended solids (TSS), ammonia (NH_3), and nitrate (NO_3) were sampled once monthly. Lake profiles were created for temperature, pH, and dissolved oxygen throughout the water column. Altogether, there were 12 sampling events over 24 days as all sampling events were split between two consecutive days.

Central Massachusetts experienced fluctuating drought conditions during 2025. The year began under Level 2 - Significant drought, worsened to Level 3 - Critical in February - March, and improved through spring, returning to Normal by early May. Conditions remained Normal through most of the summer monitoring season before drought returned at Level 2 - Significant in September - October and eased to Level 1 - Mild in November - December. Dry conditions in the summer and fall of 2025 led to reduced flow in tributaries and dry conditions in Poor Farm Brook on seven occasions (See Figure 3). Three sampling days in 2025 were considered "wet weather" with 24-hour rainfall totals exceeding 0.25 inches. Those days include 6-May (0.41 in), 24-Sep (0.29 in), and 8-Oct (0.43 in). Results from wet weather days are denoted with the raincloud symbol in the figures.

The Massachusetts Department of Conservation and Recreation (DCR) tested the two state park beaches for

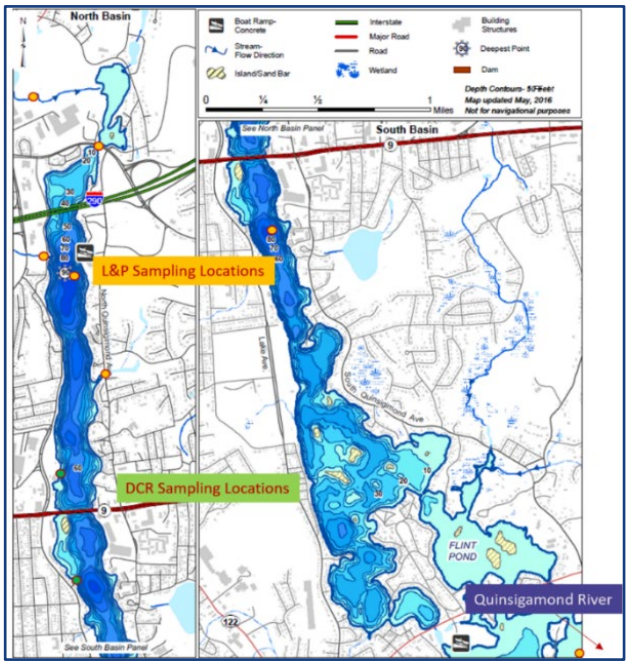


Figure 2 *– Lake Quinsigamond map and approximate sampling locations.*

Figure 3 *– Dry conditions in the summer and fall of 2025 led to dewatering in Poor Farm Brook.*

Enterococcus as an indicator of fecal bacteria on a weekly basis during the swimming season. Volunteers from the Worcester Cyanobacteria Monitoring Collaborative (WCMC) collected samples for phycocyanin and relative cyanobacteria density analysis to assess bloom risk. Volunteers visited Regatta Point Beach, Lake Park Beach, and Sunset Beach at Lake Quinsigamond and Point Rok at Flint Pond between early May and late October.

Raw data are displayed and explained below. No statistical analysis has been performed. In some cases, results were so low the laboratory equipment could not reliably measure them. This is known as a result below the laboratory reporting limit, and is expressed with the less-than symbol (<) before the reporting limit. For example, an undetected result with a reporting limit of 1.0 mg/L is shown as <1.0 mg/L. Ratings of "Excellent", "Good", "Fair", and "Poor" for reported values are based on the Massachusetts Department of Environmental Protection's SMART Monitoring Watershed Report Card Criteria.

Quality Assurance/Quality Control

The Lakes and Ponds Program uses Quality Assurance/Quality Control (QAQC) checks to ensure data are representative of local conditions and meet precision and accuracy standards. QAQC check results identify data that must be flagged and/or censored before being shared and QAQC checks can highlight issues that affect data quality. When data fail to meet acceptable criteria for these checks, they are either flagged as being slightly less robust or censored entirely. Flagged data points are marked with a red flag and censored data are not included in this report. For more information on L&P's data quality, please contact greenworcester@worcesterma.gov.

Monitoring Parameters and 2025 Results

Fecal Bacteria

Recreational contact with water contaminated by certain fecal bacteria may cause illness. *Escherichia coli* (*E. coli*) and *Enterococcus* are types of bacteria found in the digestive tract of warm-blooded animals including geese, pets, and humans. While most strains are harmless, some can cause illness. These bacteria enter the water in many ways, including direct contact with animal waste, runoff from the shoreline and impervious surfaces like paved roadways during rainstorms, leaking septic tanks, and illicit sewer connections that empty sewage to the stormwater system. The Commonwealth of Massachusetts has strict regulations for bathing

Lake Park Enterococcus CFU/100mL	
20-May	64.1
27-May	4.1
3-Jun	5.2
10-Jun	5.1
17-Jun	13.5
24-Jun	8.4
1-Jul	2
8-Jul	7.5
15-Jul	7.4
22-Jul	4.1
29-Jul	2
5-Aug	6.3
12-Aug	5.2
19-Aug	3.1
26-Aug	8.4

Regatta Point Enterococcus CFU/100mL	
20-May	43
27-May	14.8
3-Jun	6.3
10-Jun	6.2
17-Jun	50.4
24-Jun	52.1
1-Jul	11
8-Jul	8.7
15-Jul	7.5
22-Jul	17.6
29-Jul	19.7
5-Aug	4.1
12-Aug	4.1
19-Aug	8.6
26-Aug	14.5

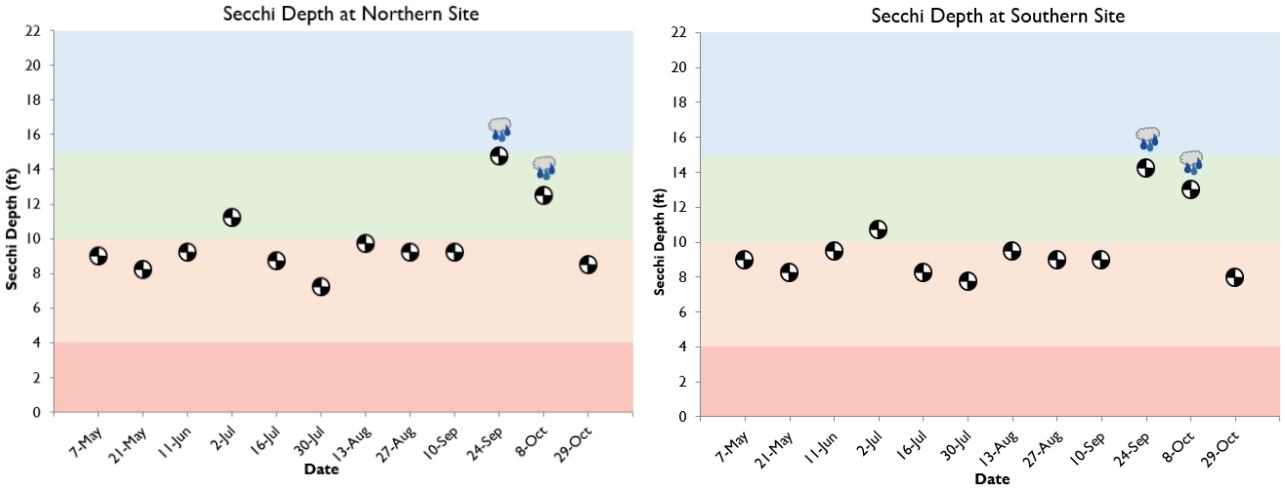
Tables 1 and 2 – *Lake Park (above left) was closed for 7 days in late May due to fecal bacteria exceedances, the only closure in 2025 at either Lake Park or Regatta Point Beach. Green text indicates days with no beach closure. Red text indicates days in which fecal bacteria exceedances prompted beach closure. Beaches were closed due to an exceeded single day maximum for Enterococcus (61 CFU/100mL) or an exceeded geometric mean (33). There was no closure due to geomean exceedance in 2025.*

beaches, and the Massachusetts Department of Conservation and Recreation (DCR) collects samples for fecal bacteria weekly at public beaches during the swimming season to ensure that the water is safe for direct contact, closing beaches if the results are above the recreational threshold. Samples are sent to an external lab for analysis. As in-lake *E. coli* results never indicated concern, L&P ceased collecting them in 2023, although beach testing by DCR continues.

Fecal Bacteria at Lake Quinsigamond. In 2025, DCR tested for *Enterococcus* bacteria at the Lake Park and Regatta Point beaches 15 times and was closed once at Lake Park for seven days (see Tables 1 and 2). The geomean limit was never exceeded. Unlike previous seasons, closures due to fecal bacteria did not significantly limit recreation at Lake Quinsigamond. Because fecal bacteria tend to be localized and short-lived, it is important to note that beach sampling results represent only the water conditions around the sampling site. Conditions in open water and at different points along the shoreline are likely to vary. Given the comparatively low number of beach closures at the Lake Park and Regatta Point beaches, L&P rates bacteria at Lake Quinsigamond as "Good".

Water Clarity

Water clarity is a measure of the transparency of water. Cyanobacteria and other microorganisms, eroded particles, and re-suspended bottom sediments are some factors that interfere with light penetration and reduce water transparency. Clear water allows sunlight to penetrate the depths of a waterbody, supporting growth of aquatic plants, which provide food, shelter, and oxygen to aquatic organisms. Clear water is also pleasant to the eye and may be safer for recreational contact. Turbid water, or water filled with particles, absorbs more heat from sunlight. This reduces the water's capacity to hold oxygen, creating favorable conditions for algal and cyanobacteria blooms, which further reduce clarity. Water clarity can be measured with a Secchi disk or by quantifying Total Suspended Solids (TSS). A Secchi disk is a weighted black and white disk on a calibrated line that is lowered into the water until it is no longer visible. Secchi readings are collected on each lake visit by L&P. TSS is a measure of the dry weight of suspended particles in a given amount of water. TSS samples are taken once monthly and submitted to a lab for analysis.



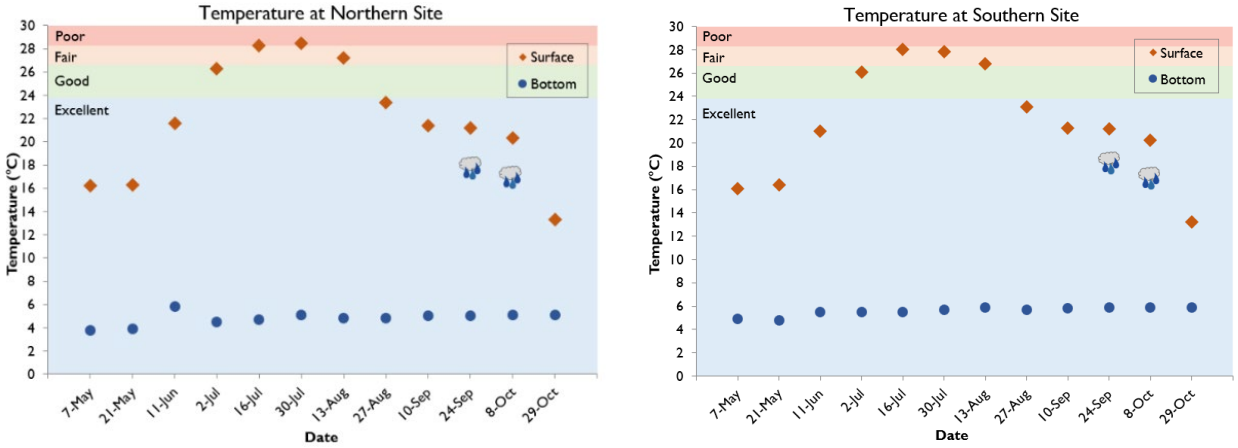
Figures 4 and 5 - *Secchi depth in the Northern and Southern in-lake sites ranged between 7.25 ft and 14.75 ft, with most results falling between 4 and 10 ft, or in the range considered "Fair".*

Water Clarity at Lake Quinsigamond. Secchi depth in the Northern and Southern in-lake sites ranged between 7.25 ft and 14.75 ft, with most results falling between 4 and 10 ft, or in the range considered "Fair" (see Figures 4 and 5). The season's lowest readings for both sites were observed on the first monitoring session, 9-May. Secchi depth readings taken between 17-Jul and 14-Aug were consistently in the range considered "Fair".

Surface TSS results at the Northern and Southern Sites were consistently low, ranging between 1.1 mg/L and 3.6 mg/L, and were within the range considered "Excellent". At the bottom of the Northern and Southern Sites, results were mostly considered "Excellent", though two results at LQ6d were in the range considered "Good".

At Coal Mine Brook, Poor Farm Brook, and the outlet, TSS results were consistently below 10 mg/L, or in the range considered "Excellent". TSS results at Billings Brook were generally higher with some results in the range considered "Good" and "Fair".

As most Secchi depth readings were on the high end of the range considered "Fair" and all TSS results were considered "Excellent", clarity at Lake Quinsigamond was considered "Fair".



Figures 6 and 7 - *Bottom temperature was consistently low and stable at both sites due to thermal stratification. Surface temperature steadily increased, reaching its peak in mid-July before beginning to decrease.*

Temperature and Stratification

Water temperature impacts both the biology and chemistry of aquatic ecosystems. Because many organisms prefer to live in a narrow temperature range, understanding temperature across the area and depth of a water body is essential. Temperature also impacts the speed of chemical reactions and the ability of water to hold oxygen. Warmer water can hold less dissolved oxygen than colder water. Temperature dynamics in lakes can also impact the level of mixing occurring in the waterbody, affecting the distribution of oxygen, nutrients, and organic matter throughout the water column. Because the density of water changes with temperature, variations in temperature can cause cold water to settle in a layer on the bottom while warm water stays on top, resulting in stratification. The area of the water column where the temperature changes rapidly between the warm surface water and the cold bottom water is called the thermocline. While stratification is a natural process, the thermocline can become a

barrier that prevents the replenishing of oxygen at the bottom layers of the lake and the rise of sediment and nutrients to the top. Lake Quinsigamond is home to cold water fish species, including trout stocked by MassWildlife in the spring and fall. These fish are sensitive to several factors related to stratification, such as elevated temperatures and low dissolved oxygen (DO). To understand whether stratification is occurring, lake profiles were created by measuring temperature and DO at 5-foot increments throughout the water column.

Temperature and Stratification at Lake Quinsigamond. Surface temperature at the Northern and Southern Sites ranged between 13.2°C and 28.5°C, following the previously observed seasonal distribution (see Figures 6 and 7). Maximum recorded temperature for the season was observed at the Southern site on 16-Jul, and the Northern site on 30-Jul. As Lake Quinsigamond experiences stratification during the summer months, temperatures on the bottom of each site were low and stable, ranging between 3.8°C and 5.9°C.

To determine the extent of warming throughout the water column, depth profiles were taken at each site (see Appendix). During the season's first readings in May, the temperature difference was relatively small between the surface and bottom of the lake, only 12.2°C. As the surface of the water warmed in June, the water below the surface also began to warm and float on the denser, colder water below, creating a thermocline and preventing the mixing of oxygen to the water at the bottom. On 16-Jul, the temperature difference between the surface and bottom layers was greatest, reaching 23.4°C, indicating pronounced thermal stratification. As temperature increased at the surface to levels that are considered stressful to cold water fish, stratification caused the colder water below to become increasingly devoid of oxygen. This pattern continued through mid-October. During late October, the surface temperature dropped, however, a distinct thermocline was present during the last sampling session, indicating that the distinct layers of the water column had not yet begun to thoroughly mix.

Temperatures at the lake's northern culverted inlet, Billings Brook, and the lake outlet ranged from 5.6°C to 28.3°C (see Figure 8). Coal Mine Brook and Poor Farm Brook are both designated as Coldwater Fish

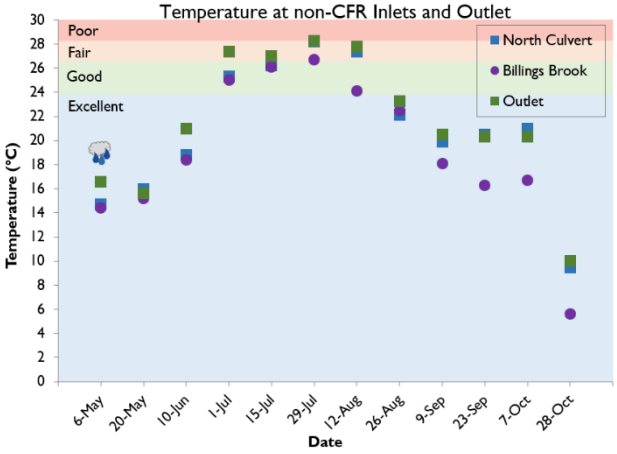


Figure 8 – *Temperature at the non-CFR inlets and the outlet were mostly in the range considered "Excellent" though readings were observed in the "Good", "Fair", and "Poor" categories in July and August. Temperature at the outlet was usually highest of the three sites.*

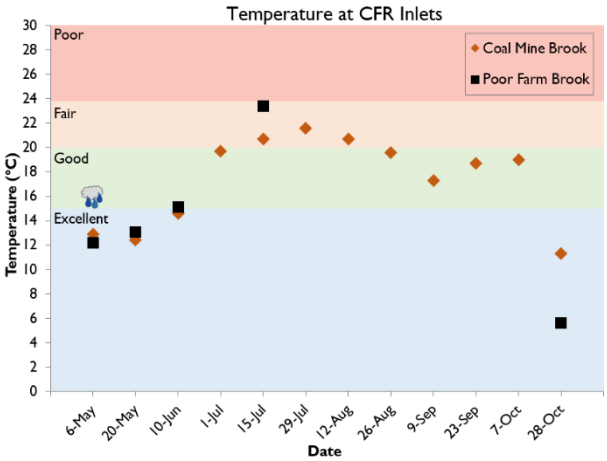


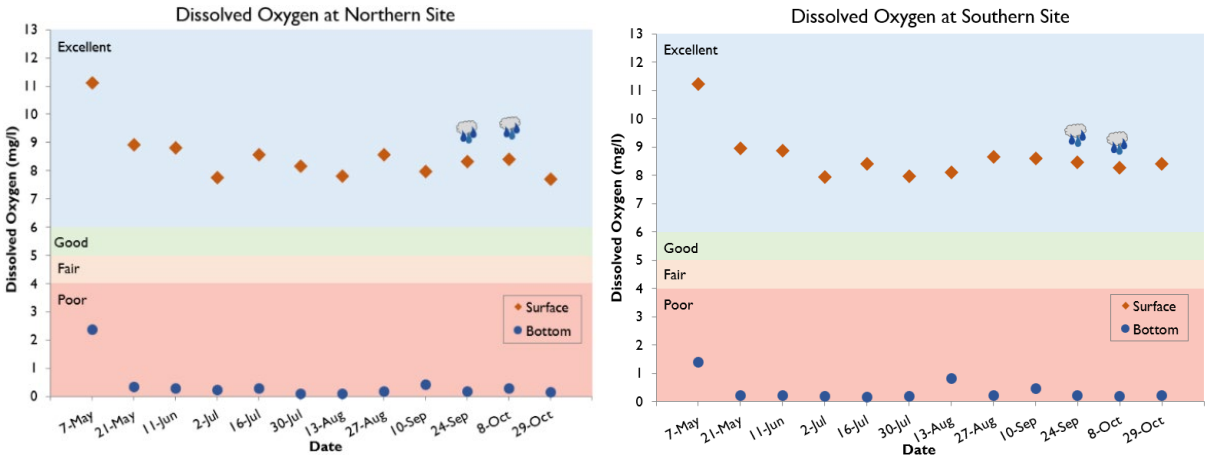
Figure 9 – *Water temperature ranged between 5.6 and 23.4 °C at the cold water fish resources (CFR) tributaries, Coal Mine Brook and Poor Farm Brook. Though temperature was generally lower at the CFR tributaries than non-CFR tributaries, stricter standards for CFRs led to a majority of ratings in the "Good" and "Fair" Categories.*

Resources (CFR) and were usually cooler than the other tributaries, ranging between 5.6°C and 23.4°C (see Figure 9). Poor Farm Brook was dry on 1-Jul and from 29-Jul through 7-Oct. According to the stricter standards for CFRs, water temperature at Coal Mine Brook and Poor Farm Brook ranged from the "Excellent" to "Fair" categories. While most surface temperatures recorded by L&P fell within the "Excellent" category, higher temperatures recorded at in-lake sites and CFR inlets fell within ranges challenging to cold water fish. L&P rates temperature at Lake Quinsigamond in 2025 as "Good" due to this interaction.

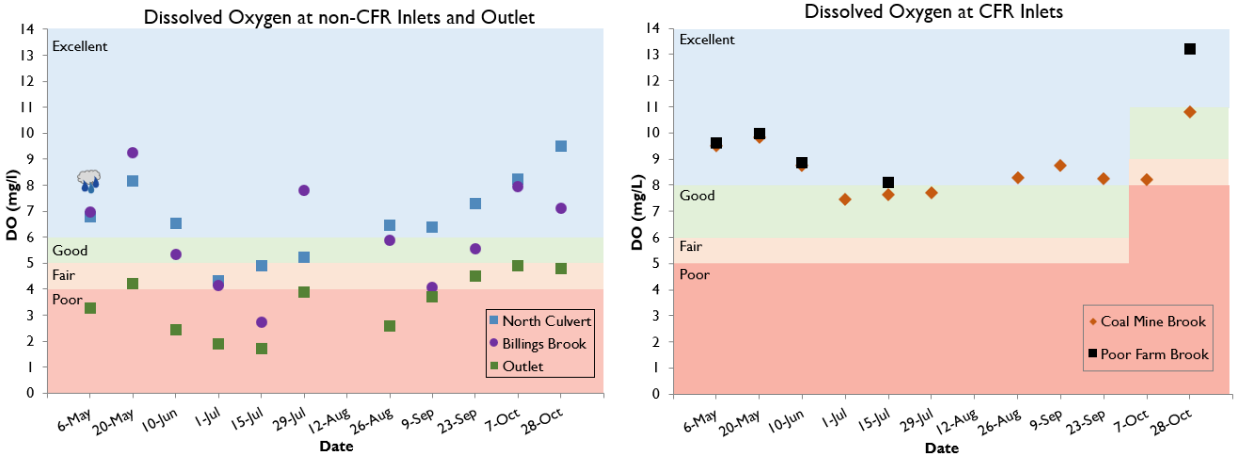
Dissolved Oxygen

Oxygen dissolved in water is essential to aquatic life. Dissolved Oxygen (DO) is a highly variable parameter that is controlled by many factors, including temperature, pressure, aeration, diffusion, rate of photosynthesis, rate of respiration and more. When water temperature rises, water can hold less dissolved oxygen, potentially stressing aquatic organisms. When DO falls below 4 mg/L in warm water systems, or 8 mg/L in CFRs, conditions can be unsuitable for some aquatic life. Thermal stratification, which is layering in the water column based on temperature, can also create a barrier to waterbody mixing, creating areas with depleted DO in some deeper portions of waterbodies. Increased algal growth followed by excessive decomposition of organic material can also lead to low oxygen conditions, and potentially causing fish kills. DO was measured using a galvanic DO sensor on a handheld probe at the water's surface, and two feet from the bottom at the in-lake locations. To form a more complete picture of how DO changes through the water column, depth profiles were created by measuring DO at 5-ft increments throughout the water column and plotting with temperature (see Appendix).

Dissolved Oxygen at Lake Quinsigamond. Surface DO at the in-lake sites ranged between 7.70 and 11.22 mg/L, consistently within the range considered "Excellent" (see Figures 10 and 11). On the bottom, DO ranged between 0.09 and 2.35 mg/L with all readings in the range considered "Poor".



Figures 10 and 11 - *Dissolved oxygen at the Northern and Southern sites stayed in the "Excellent" category at the surface all season and was generally in the "Poor" category at the bottom.*



Figures 12 and 13 – *The lake outlet (left) was in the "Poor" category for most of the season. Billings Brook and North Culvert ranged in category through the season. Poor Farm Brook and Coal Mine Brook (right) were in the "Excellent" and "Good" categories in all but one instance.*

At the beginning of the season, depth profile results indicated DO above 4 mg/L at depths 65 feet and shallower (see Appendix). DO at the bottom of the lake began to decrease, and the depth of this decrease became shallower as the season went on while the surface of the water continued to have sufficient oxygen for fish and wildlife. From 16-Jul through the end of monitoring, the oxycline was between 15 and 30 ft deep. The oxycline is a zone in the water column where oxygen concentration changes rapidly with depth, and below which DO can be too low to support aquatic life.

Temperatures above 20°C and DO below 4 mg/L can stress cold water fish such as trout. In these scenarios, fish will swim to an area with lower temperatures or higher DO. In the height of summer, surface water temperatures at Lake Quinsigamond eventually increased in the top layer of the water, to above 20°C. This leads to increased thermal and oxygen stratification. Oxygen depletion begins at the lake bottom and low oxygen conditions extend into higher portions of the water column as the summer goes on. This reduces the preferred habitat zone for cold water fish in a phenomenon known as “the squeeze,” increasing the risk of fish kills.

In 2025 there were two sampling days at each in-lake site in which there no portion of the water column satisfied both the 4 mg/L DO requirement and the 20°C CFR temperature requirement (10-Sep – 24-Sep at the Northern site and 27-Aug – 10-Sep at the Southern Site). During the last sampling session on 29-Oct, surface temperatures cooled in the upper portions of the water column and made available more preferrable habitat close to the water’s surface. However, between 16-Jul and 8-Oct, there was only a 5-10 ft section of the water column that was habitable for cold-water fish, which likely stressed populations as fish often need to access shallow water to feed.

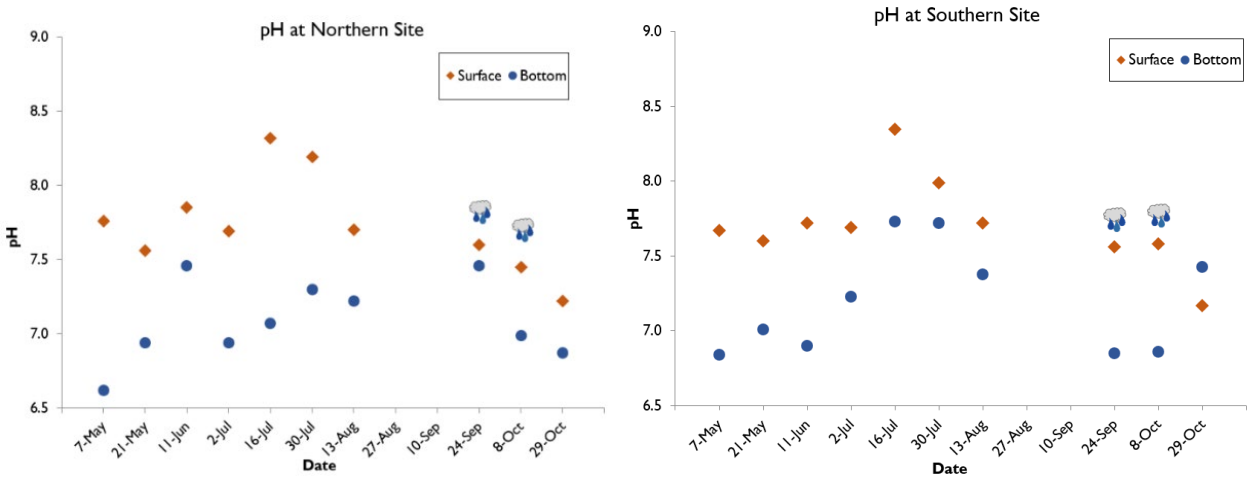
All but three DO readings at the lake’s northern culverted inlet were in the range considered “Excellent”, though two readings were in the range considered “Fair”. DO at Billings Brook ranged from “Excellent” to “Poor”. (see Figure 12). At the outlet, DO was considerably lower, in the ranges considered “Fair” and “Poor”. DO was in the ranges considered “Excellent” and “Good” at Coal Mine Brook, on all but one sampling day (see Figure 13). DO was consistently considered “Excellent” at Poor Farm Brook when sampled, but it was not flowing at the sampling site on 1-Jul and from 29-Jul through 7-Oct. For Coldwater Fish Resources such as Coal Mine Brook and Poor Farm Brook, DO standards are stricter and change

seasonally. Given the interaction of water temperature and DO reducing viable habitat for cold water fish, L&P rated DO at Lake Quinsigamond in 2025 as “Fair”.

pH

pH is the concentration of hydrogen ions (H+) in a solution. The more H+ ions that are present, the more acidic the solution. On a scale of 0-14 units, 7 is a neutral pH. As pH increases from 7, the solution is more basic, and as pH decreases from 7, it becomes more acidic. In aquatic ecosystems, pH affects most chemical and biological processes including species distribution, growth rate, reproductive success, and nutrient dynamics in lakes. A high pH can promote chemical reactions that release phosphorus from lake sediments. Healthy lakes in our area have a pH between 6.5 and 8.5. pH was measured using an ion-selective electrode (ISE) pH sensor on a handheld monitoring probe. Readings are taken at the water’s surface and two feet from the bottom.

pH at Lake Quinsigamond. Surface pH at the in-lake sites ranged between 7.17 and 8.35 (see Figures 14 and 15). Bottom pH was almost always lower than the surface and ranged between 6.62 and 6.84. Tributary pH ranged from 6.66 to 8.22 and was generally higher at Coal Mine Brook and Poor Farm Brook than Billings Brook, the North Culvert and the Outlet.



Figures 14 and 15 - *Bottom pH at the Northern and Southern sites ranged from 6.62 – 7.73. Surface pH ranged from 7.17-8.35.*

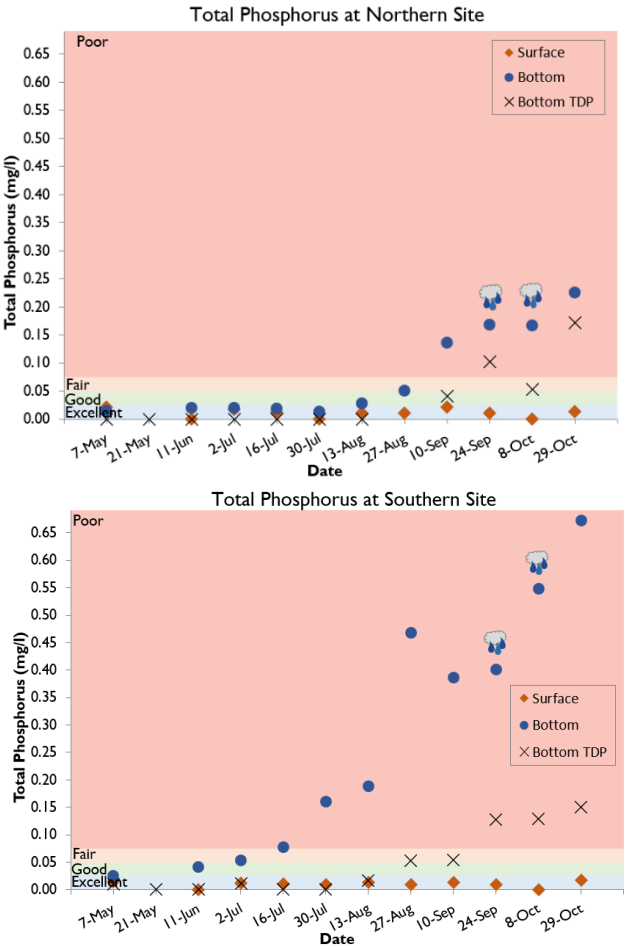
Nutrients

Nutrients, primarily nitrogen (N) and phosphorus (P), are food sources for aquatic plants and algae. Although plants and algae are the basis of aquatic food chains and necessary for a healthy lake ecosystem, an overabundance of nutrients can lead to issues such as harmful algal blooms and excessive plant growth. Common nutrient inputs to urban lakes and ponds include fertilizers, pet and goose waste, illicit sewer connections to the stormwater system, and runoff that flows over land into the stormwater system. Additionally, under the right conditions, phosphorus can be released from the sediments at the bottom of the lake, becoming more available for uptake by organisms. To examine the nutrients present in program lakes, L&P collects samples for several compounds and submits them to an external lab for

analysis. To measure N, samples are collected for nitrate (NO_3) and ammonia (NH_3) at all sites monthly. To measure P, samples are collected for total phosphorus (TP) twice a month at all sites, and total dissolved phosphorus (TDP) twice a month at all bottom sites. TDP is analyzed to understand how much P is dissolved in the water and available for use by aquatic organisms.

Nutrients at Lake Quinsigamond. Surface TP at the two in-lake sites was consistently below 0.025 mg/L, or in the range considered "Excellent" (see Figures 16 and 17). At the bottom of the in-lake sites, TP results ranged widely, between below the laboratory reporting limit and 0.673 mg/L. Bottom TP concentrations generally increased over the course of the season. As seen in past seasons, bottom TP was considerably higher at the Southern Site with a maximum recorded value of 0.673 mg/L, compared to the Northern Site with a maximum result of 0.226 mg/L. TDP results from bottom samples ranged between below the laboratory reporting limit and 0.172 mg/L. The Southern Site often exhibited higher TDP concentrations than the Northern Site.

Surface and bottom NO_3 results at both in-lake sites consistently fell below 0.6 mg/L and were in the range considered "Excellent".



Figures 16 and 17 - *Surface total phosphorus at the Northern and Southern sites was consistently considered "Excellent". Bottom total phosphorus increased as the season progressed, with results in the "Excellent", "Good", "Fair", and "Poor" categories. TDP results were consistently lower than bottom TP and followed a similar distribution.*

Surface NH_3 was below 0.15 mg/L, or in the range considered "Excellent" for all but two readings. Results from bottom sites were consistently greater than 0.50 mg/L, or in the range considered "Poor", and generally increased as the season progressed. Bottom NH_3 was always higher at the Southern Site than the Northern Site.

TP results at Poor Farm Brook, the North Culvert, and the Outlet were mostly in the ranges considered "Excellent" and "Good" (see Figure 18). TP results at Coal Mine Brook were considerably higher than expected ranging from 0.025 to 0.162 mg/L with most results considered "Fair" and "Poor" and generally increased over the season. TP results at Billings Brook ranged from 0.014 to 0.114 mg/L and was in the ranges considered "Excellent" to "Poor".

NO_3 in the tributaries was consistently below 0.9 mg/L and in the ranges considered "Excellent" and "Good". Results from Poor Farm Brook and Coal Mine Brook were generally higher than Billings Brook and the spillway. NH_3 results in the tributaries were mostly below 0.30 mg/L and in the ranges considered "Excellent" and "Good", with one result at Coal Mine Brook in the "Poor" Category.

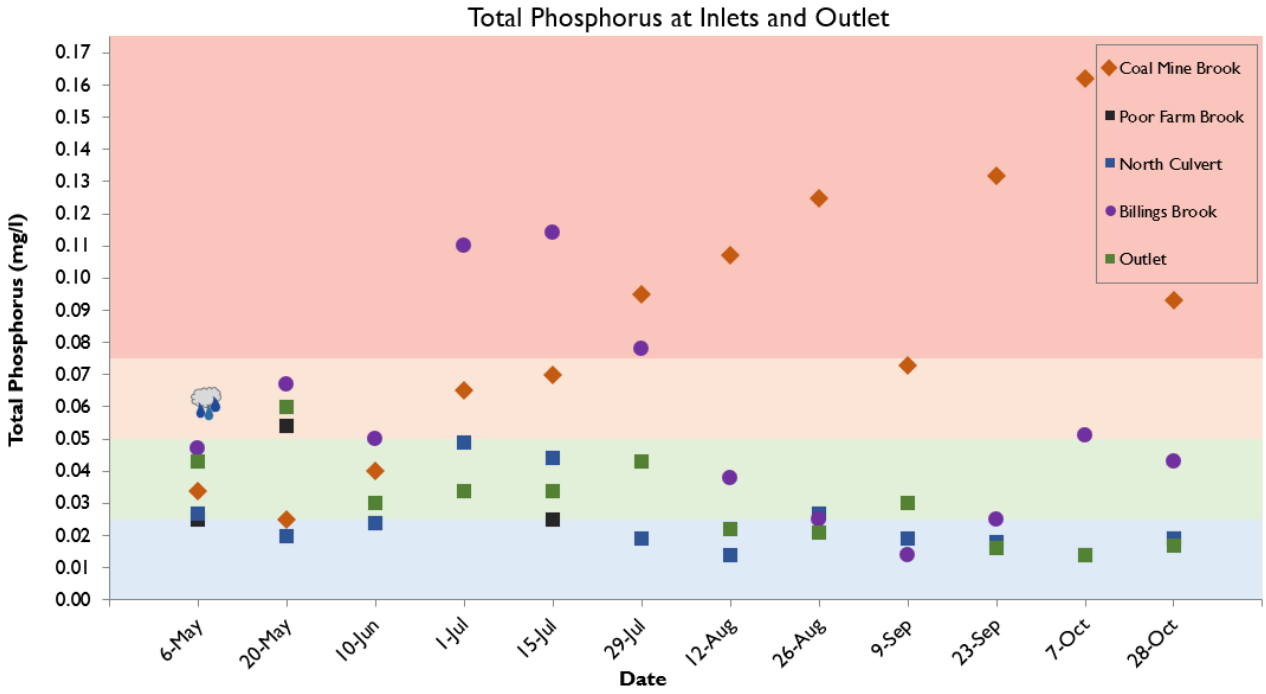


Figure 18 – *TP results in the tributaries were mostly in the ranges considered "Excellent", "Good", and "Fair". Results at Coal Mine Brook were considerably higher than expected ranging from 0.025 to 0.162 mg/L and generally increased over the season.*

Cyanobacteria

Cyanobacteria are naturally occurring microorganisms in waterbodies. Using sunlight and nutrients such as N and P, cyanobacteria use photosynthesis to gain energy similarly to plants. While normal at low densities in healthy ecosystems, under the right conditions, some species of cyanobacteria can reproduce quickly and cause potentially harmful blooms. In addition to being unsightly and smelly, cyanobacteria blooms can produce toxins that are harmful to humans and pets. Blooms also have the potential to create low oxygen conditions that can cause fish kills.

To understand the abundance of cyanobacteria and support decisions regarding lake management and safe access, L&P utilizes the data collected by the Worcester Cyanobacteria Monitoring Collaborative (WCMC) to measure cyanobacteria indicators and estimate toxin exposure risk. The WCMC is a group of community science volunteers that collect water quality samples twice monthly between May and October at 24 waterbodies in and around Worcester, including Lake Quinsigamond. Parameters examined include phycocyanin and the relative abundance of cyanobacteria taxa. Like chlorophyll, the pigment phycocyanin is used by cyanobacteria to harness the sun's energy. Because phycocyanin is unique to cyanobacteria, it can be used as an indicator of cyanobacteria's relative abundance in a waterbody. Cyanobacteria taxa and their comparative abundance help determine which toxins may be present. The

WCMC is also able to determine relative density of cyanobacteria genera in samples using a high-powered microscope. Using both phycocyanin and comparative cyanobacteria density, WCMC results are assigned an overall bloom risk at each participating waterbody. For more information on the WCMC and their results, visit WorcesterMA.gov/WCMC.

Cyanobacteria at Lake Quinsigamond. In 2025, WCMC samples were taken at Regatta Point Beach, Lake Park beach, and Sunset Beach at Lake Quinsigamond and Point Rok at Flint Pond between early May and late October. Phycocyanin was detected at Lake Park at eight of the twelve sampling sessions it was analyzed, but never exceeded 50 µg/L, the concentration that may indicate bloom conditions (see Figure 19). Cyanobacteria relative density, or the relative abundance of cyanobacteria compared to other organisms, ranged between "None" and "High". Cyanobacteria relative density was rated as "High" twice at Lake Park (18-Aug and 6-Sep) and twice at Flint Pond (21-Jul and 2-Aug). Though cyanobacteria were numerous relative to other taxa, phycocyanin levels were low, indicating that the overall cyanobacteria populations did not pose a risk on these dates. Several genera of cyanobacteria were observed, including *Dolichospermum*, *Aphanizomenon*, *Microcystis, Woronichinia,* and *Snowella*. Overall bloom and toxin exposure risk ranged between "Almost None" and "Elevated" at Lake Quinsigamond and Flint Pond, with all but three rated as "Low" (See Table 3).

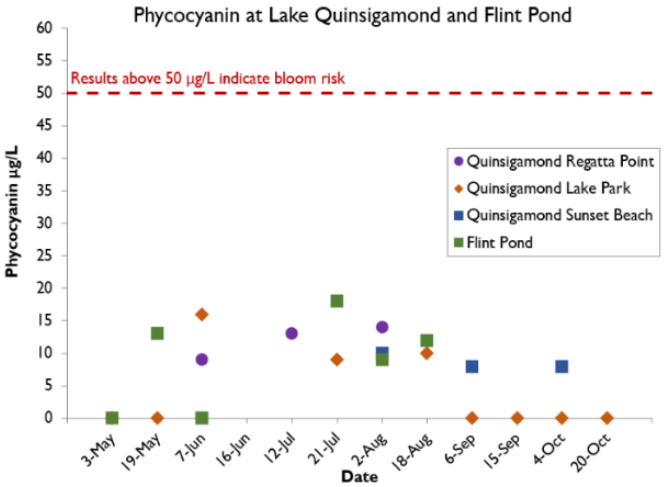


Figure 19 *- Phycocyanin measured in samples collected by the WCMC at Lake Quinsigamond and Flint Pond was consistently below 50 µg/L, the level associated with cyanobacteria bloom risk.*

Cyanobacteria activity has generally been limited during the recreational season, with low concern for public health. As Lake Quinsigamond is a large and complicated system and the Lakes and Ponds Program's staffing is limited, tracking reports of scums can be a challenge. It should be noted that WCMC results never indicated high bloom risk at Lake Quinsigamond beach areas during the swimming season and no closures took place. L&P assigned a score of "Good" to Lake Quinsigamond for cyanobacteria in 2025.

Overall Bloom Risk at Lake Quinsigamond and Flint Pond

	3-May	19-May	7-Jun	12-Jul	21-Jul	2-Aug	18-Aug	6-Sep	15-Sep	4-Oct	20-Oct
Quinsigamond - Regatta Point	Low	Not Taken	Low	Low	Not Taken	Low	Not Taken	Low	Not Taken	Low	Not Taken
Lake Quinsigamond - Lake Park	Low	Low	Low	Not Taken	Low	Not Taken	Elevated	Low	Low	Low	Low
Quinsigamond - Sunset Beach	Low	Not Taken	Low	Not Taken	Not Taken	Low	Not Taken	Almost None	Not Taken	Low	Not Taken
Flint Pond	Low	Not Taken	Low	Not Taken	Elevated	Low	Low	Not Taken	Not Taken	Not Taken	Not Taken

Table 3 *- Overall cyanobacteria bloom risk ratings derived from data collected by the WCMC ranged between "Almost None" and "Elevated" at Lake Quinsigamond and Flint Pond, with all but three rated as "Low". The above table is a selection of WCMC's 2025 data. To view all results, visit Worcesterma.gov/WCMC.*

Invasive Aquatic Plants and Animals

An invasive plant or animal is an organism that is not native to the region and outcompetes local flora and fauna. The absence of natural constraints, like predators or environmental limitations, allows invasive

plants and animals to reproduce at a rapid rate. When invasive aquatic plants and animals become too numerous or dominant, they can overtake available space, disrupting local ecosystems and making recreation more difficult. Invasive organisms can arrive at new locations by hitching a ride on boats, pets, or boots. Some are released with good intentions as a beautiful addition to a landscape or sport fishing opportunity. Professional surveys and visual inspections from Lakes and Ponds Program staff are used to support management decisions regarding invasive species.

Invasive Aquatic Plants and Animals at Lake Quinsigamond.

Lake Quinsigamond is managed for several invasive aquatic plants and one endangered aquatic plant. A professional plant survey in August 2025 mapped the extents of Fanwort (*Cabomba caroliniana*), Eurasian Milfoil (*Myriophyllum spicatum*), Variable Leaf Milfoil (*Myriophyllum heterophyllum*), Brittle Naiad (*Najas minor*), Water Chestnut (*Trapa natans*), and Common Reed (*Phragmites australis*), and overall plant cover area (see Figure 20). Curly-Leaf Pondweed (*Potamogeton crispus*) has also been noted in the past, but its extent has been difficult to capture in summertime surveys as its peak growth occurs in early spring. A 2024 survey by a state-certified botanist confirmed the endangered plant Vasey's Pondweed (*Potamogeton vaseyii*) is present in the Round Pond section of Lake Quinsigamond and may be present in Old Faith Cove or other areas of the lake. The population in Round Pond was densely intermixed with Fanwort. In August 2025, L&P contracted Fanwort removal in this area through Diver-Assisted Suction Harvesting (DASH), in which divers pull the plants by hand from the lake bottom and use a suction tube to speed collection. While this technique can leave native plants untouched, it is very slow and only a small fraction of Fanwort in Round Pond could be addressed with available funds. Eurasian Milfoil also grows at high density in the southern portion of the lake and Flint Pond. Dense growth of Water Chestnut is present in the northernmost section of the lake north of Lincoln Street.

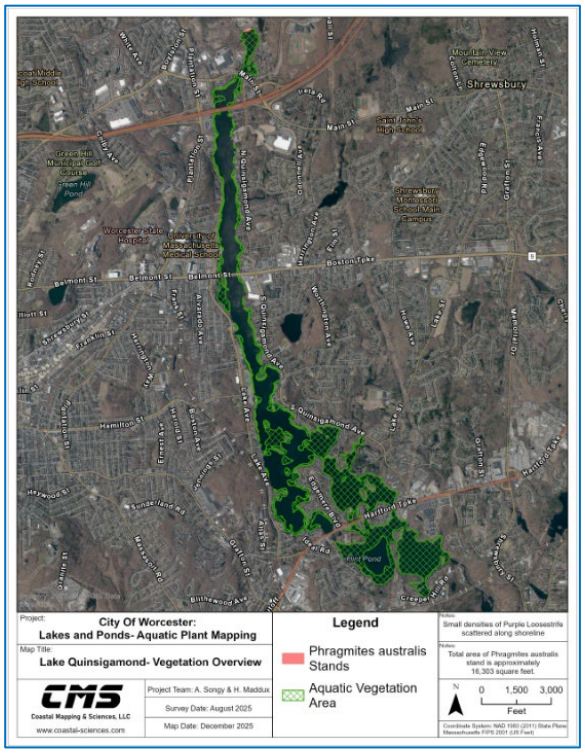


Figure 20 – *Aquatic plant cover in Lake Quinsigamond as of August 2025. Both native and invasive species are mapped above.*

Figure 21 - *The invasive mollusk (*Corbicula fluminea*).*

In 2023, L&P collaborated with LQC to facilitate chemical treatment of 31 acres of Eurasian Milfoil, Variable Milfoil, and Fanwort in the northern section of the lake. The 2025 survey indicated that Variable Milfoil and Fanwort had not returned to these areas, and Eurasian Milfoil had been reduced to two small patches near Ramshorn Island. In 2025, the Lake Quinsigamond Watershed Association (LQWA) hosted two volunteer Water Chestnut removal events, supported by L&P. L&P will continue to collaborate with both LQC and LQWA to inform and implement aquatic plant management in Lake Quinsigamond.

Much like invasive plants, invasive animals can severely alter the aesthetics and functioning of a lake. In 2018, an invasive mollusk, *Corbicula fluminea*, was identified in several areas of the lake. *C. fluminea* has a small light brown or green shell and is native to Southeast Asia (see Figure 21). It can be an aggressive invasive species that has been known to proliferate to the exclusion of other shellfish, altering the terrain by coating the lake bottom with sharp jagged shells. They are efficient filter feeders that can reduce the food available to juvenile fish. *C. fluminea* can spread from one waterbody to another when they are attached to boats or equipment, but also via the bilge water of boats in their larval stage. More information is needed to determine the threat level of the infestation.

Industrial Contaminants

Worcester is a post-industrial urban center and legacy pollutants and emerging contaminants of concern from industrial processes are potential threats to recreational waters. These contaminants may cause negative health and environmental effects. Every few years, L&P tests for a range of these compounds on both a wet and dry weather event in our lakes. Because most industrial contaminants are legacy pollutants, contamination levels are not expected to change much year to year. In 2022, L&P tested for 74 volatile organic compounds (VOCs), 72 semi volatile organic compounds (SVOCs), 9 polychlorinated biphenyls (PCBs), petroleum hydrocarbons (TPH), 23 perfluoroalkyl substances (PFAS), 21 pesticides, 10 herbicides, and 22 heavy metals. No results of concern were observed. See the 2022 Lake Quinsigamond Water Quality Report or contact greenworcester@worcesterma.gov for more information. The follow up monitoring planned for summer 2025 was rescheduled to spring 2026 due to program capacity and greater wet weather sampling opportunities.

State of the Lake

In 2025, Lake Quinsigamond received a score of "Good". Unlike recent seasons, in 2025, fecal bacteria did not significantly impact recreation at Lake Quinsigamond. The beach at Lake Park was closed for a total of 7 days, and Regatta Point Beach was never closed, resulting in a rating of "Good" for fecal bacteria. Multiple invasive aquatic plant species continue to be present in the lake, though management efforts are ongoing. Water clarity was similar to that recorded in 2024 and was rated "Good" overall. Water temperature was rated "Good," though mid-summer stratification created stressful conditions for cold-water fish by reducing suitable habitat. Dissolved oxygen (DO) was rated "Fair" overall due to low oxygen conditions in a large portion of the water column during the summer and fall. Nutrient concentrations were generally low at the surface of the lake, though concentrations of TP and NH_3 rose drastically at the bottom as lake stratification intensified in the summer and fall.

Despite challenges such as invasive aquatic plants and stratification-related ecological stress, Lake Quinsigamond continues to support recreational use and maintain ecological health. The City of Worcester's Lakes and Ponds Program (L&P) will continue monitoring and management efforts to protect the lake's water quality and recreational value into the future.

Ongoing Projects and Plan for 2025

Water Quality Monitoring

In 2026, the Lakes and Ponds Program will continue to monitor Lake Quinsigamond to track changes in water quality and support the invasive aquatic plant management plan. Pending budget availability, L&P plans to conduct sampling for industrial contaminants again in 2026. Since 2022, the Lakes and Ponds Program has seasonally deployed solar powered continuous monitoring buoys in Lake Quinsigamond and Flint Pond. These buoys use probes to track the cyanobacteria indicators phycocyanin and chlorophyll, as well as turbidity and temperature (see Figure 22). In 2026, L&P will redeploy buoys to track environmental conditions and potential cyanobacteria activity. L&P will continue to facilitate cyanobacteria monitoring through WCMC at multiple sites throughout Lake Quinsigamond and Flint Pond. As volunteer capacity allows, the Worcester Cyanobacteria Monitoring Collaborative (WCMC) will continue monitoring cyanobacteria at multiple locations in Lake Quinsigamond and Flint Pond in 2026.

Figure 22 *– Continuous monitoring buoys were deployed at Lake Quinsigamond near the Lake Ave Sewer Pump Station, and in Flint Pond to track cyanobacteria conditions.*

Lake Management

Watershed Based Plans. The Lakes and Ponds Program has contracted a consultant to develop watershed-based plans to reduce nonpoint source pollution in the City's three main recreational sub-watersheds (see Figure 23). These plans will be based on the U.S. EPA's 9-Element watershed-based planning framework and make future projects aimed at reduction of nonpoint source pollution eligible for state and federal grant funding. A plan is being created for Lake Quinsigamond Watershed. This project will identify

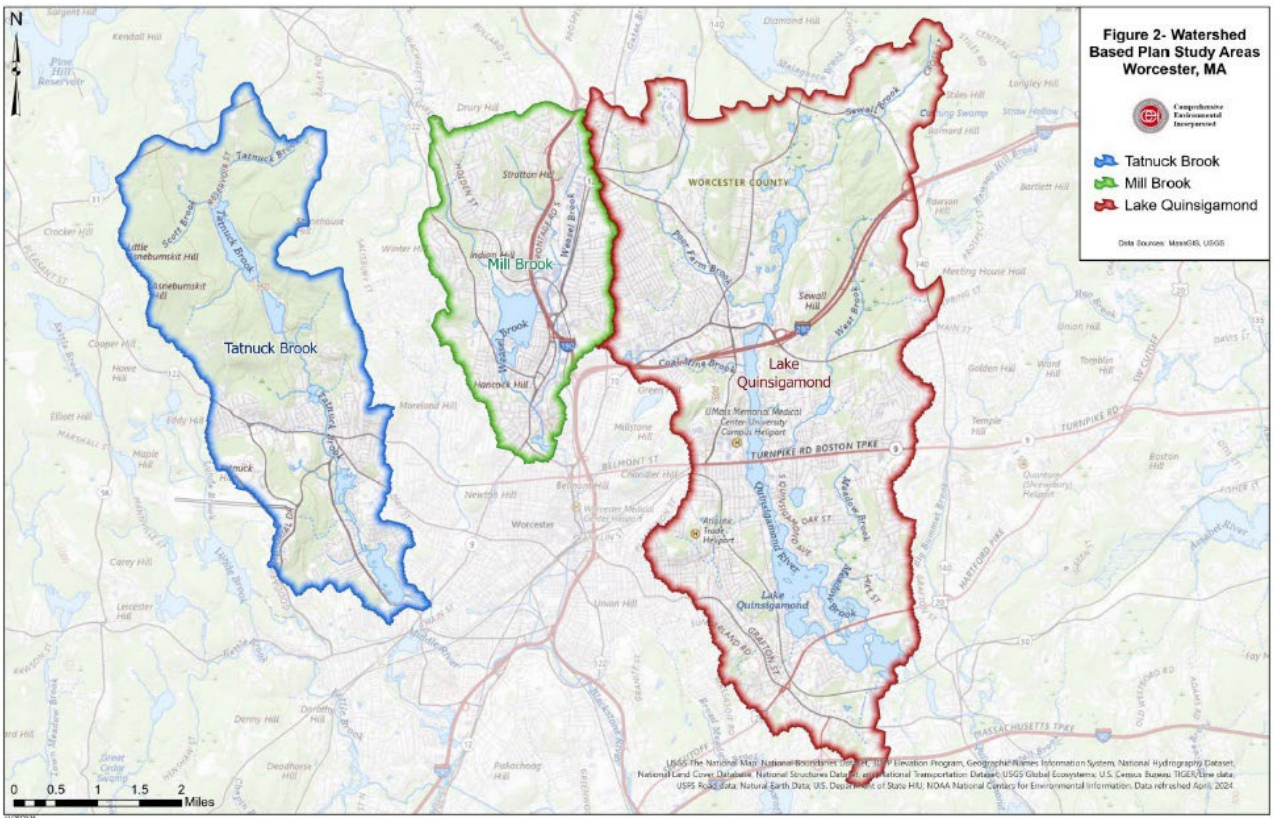


Figure 23 – *The Lakes and Ponds Program has contracted a consultant to develop watershed-based plans to reduce nonpoint source pollution in the City's three main recreational sub-watersheds. This project will identify pollutant loads and load reduction targets and provide stakeholders with a roadmap to restoration and protection. Image credit: Comprehensive Environmental Inc (CEI).*

pollutant loads and load reduction targets and provide stakeholders with a roadmap to restoration and protection.

Since the project's kickoff in late 2024, the project team has used data collected by L&P and other sources to model stormwater and nutrient dynamics. These models estimate pollutant volumes entering waterbodies, evaluate how the lake ecosystem responds, and establish goals for reducing pollutants and improving water quality.

At public workshops in April 2025, community members provided insight into possible pollutant sources throughout the watershed. This local expertise guided field assessments to identify locations suitable for stormwater control measures, such as bioretention basins, shoreline restoration, erosion prevention, or infrastructure upgrades. High-

Figure 24 *– A contractor installs a particle separator in Suntaug Road.*

level conceptual designs were prepared for potential project sites to explore feasibility and cost-effectiveness. More detailed plans will be developed for selected sites to guide implementation. In 2026, the project will review institutional and community practices and recommend initiatives to further reduce nutrient pollution and protect local water resources. The draft plan will be discussed at an upcoming public meeting. Community feedback will be integrated into the plan to create the final version.

Stormwater Infrastructure Improvements. In 2025, L&P leveraged funding from the American Rescue Plan Act (ARPA) to install two particle separators in stormwater drainage lines discharging into Lake Quinsigamond (see Figure 24). Particle separators are units installed in the stormwater system which typically use either chambered systems or swirl concentrators to trap and remove sediment from stormwater. The retained sediment is removed from the separator through periodic maintenance, reducing sediment and nutrient input into waterbodies. The improvements were completed in late 2025.

Volunteer Invasive Species Removal. In 2025, the Lake Quinsigamond Watershed Association (LQWA) and L&P co-hosted two hand pulling events to remove Water Chestnut from the area North of the RT 70 (see Figure 25). L&P facilitated the loan of canoes and kayaks from the City of Worcester Parks Division and Worcester State University Department of Earth, Environment and Physics. Volunteers worked from canoes, kayaks, and small boats to clear patches of Water Chestnut and slow its spread in June and July. Although Water Chestnut generally requires years of targeted management to fully eradicate, these efforts are invaluable to limiting spread on a season-to-season basis, especially as the infestation at Lake Quinsigamond is in its early stages. In 2026, L&P will continue to support or organize volunteer removal events.

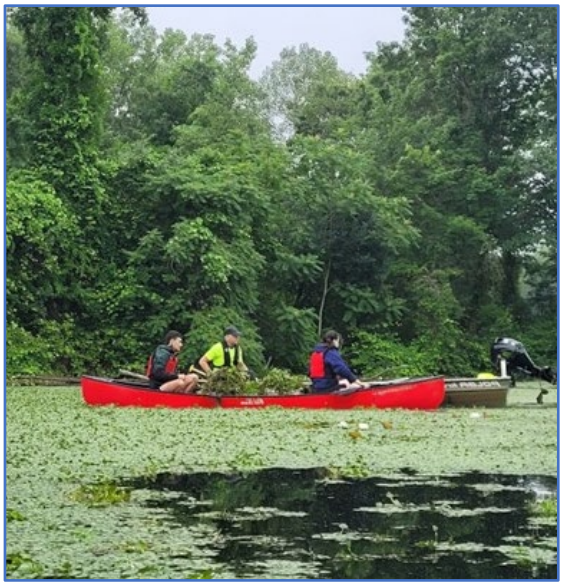


Figure 25 *– Volunteers pulling invasive Water Chestnut in Lake Quinsigamond at an event organized by LQWA and a L&P.*

Education and Outreach

Text Message Alert System. In 2023, the Lakes and Ponds Program launched a text message alert system allowing residents to sign up to receive up to date information on lake access to guide upcoming visits. Text messages will alert residents to when a beach is closed for fecal bacteria exceedances, or if a boat ramp is closed because a lake is receiving an invasive aquatic plant treatment. To sign up for the text message alert system, please visit WorcesterMA.gov/bluespace.

Educational Programming. Since its inception, the Lakes and Ponds Program has partnered with groups such as local schools, Mass Audubon, the EcoTarium, Worcester JCC, and local watershed associations to provide educational programming in which students learn about water quality issues that affect recreation on our waterways and get hands-on experience in environmental monitoring methods.

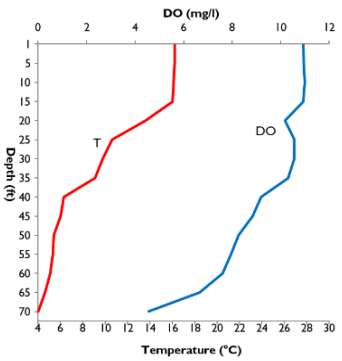
The Lakes and Ponds Program is looking to expand opportunities for educational field trips. If you are affiliated with a school and would like to discuss holding a program together, please email us at greenworcester@worcesterma.gov.

To learn more about Lakes and Ponds Program offerings, please see WorcesterMA.gov/bluespace.

Appendix

Depth Profiles Northern Site

May 7



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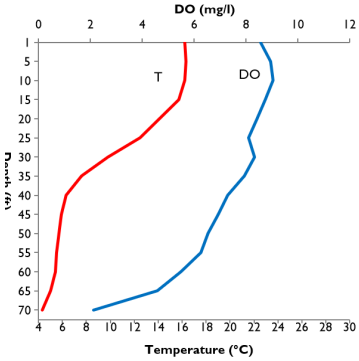

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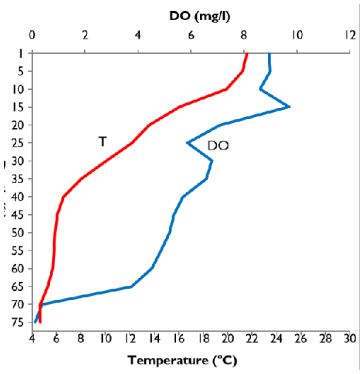

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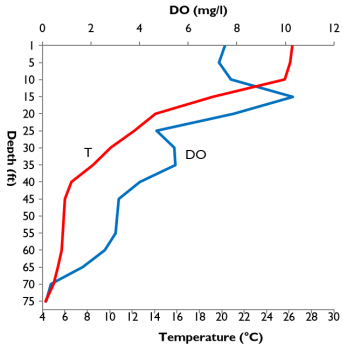

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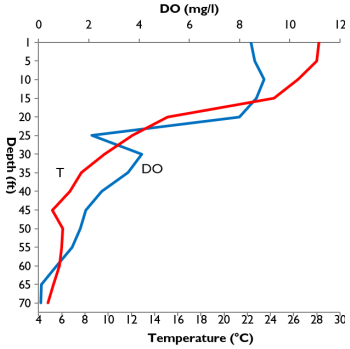

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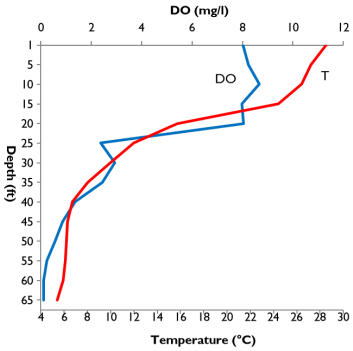

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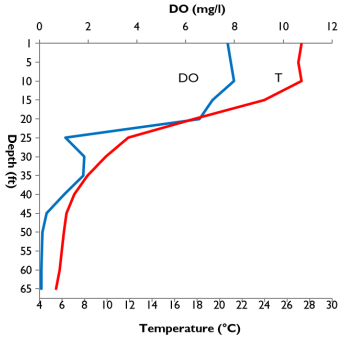

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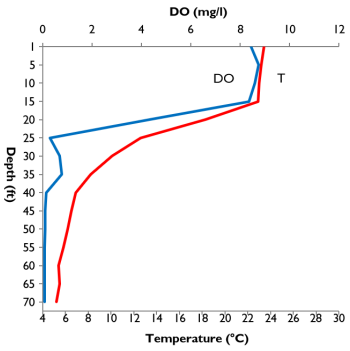

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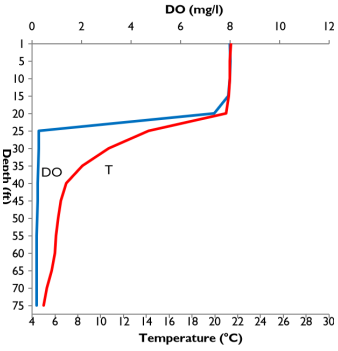

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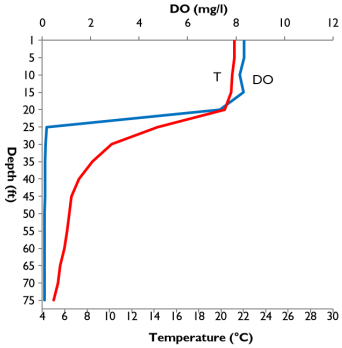

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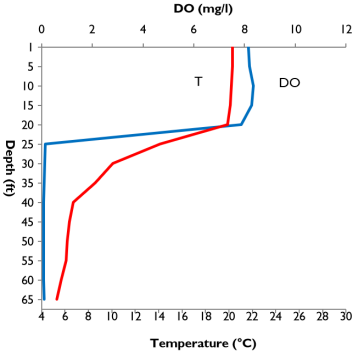

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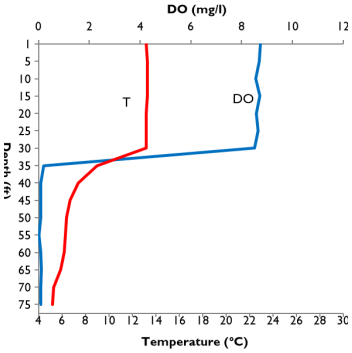
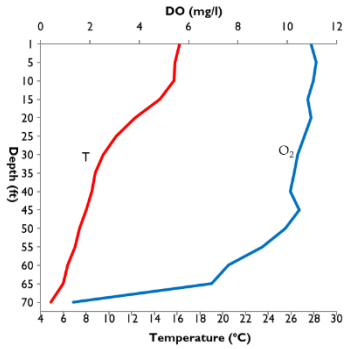


Depth Profiles Southern Site

May 7



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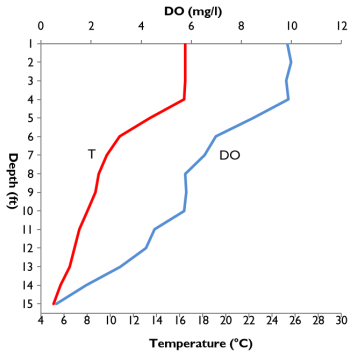

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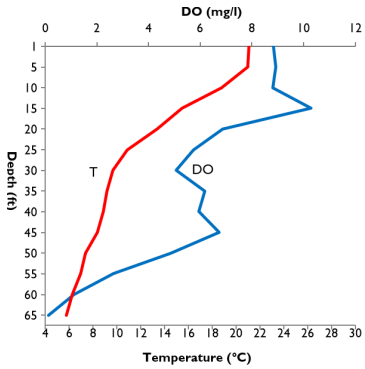

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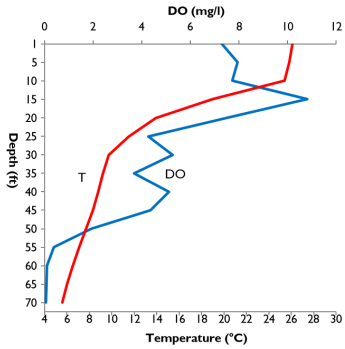

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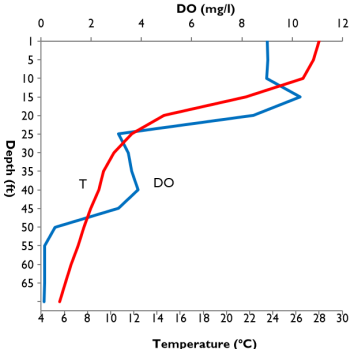

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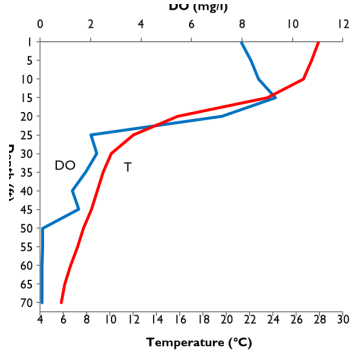

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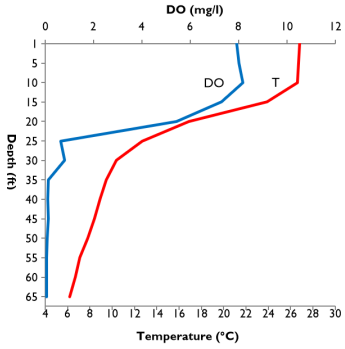

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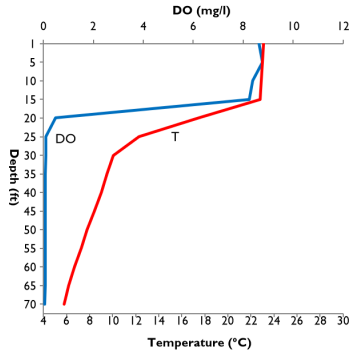

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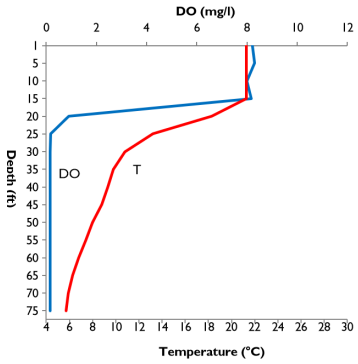

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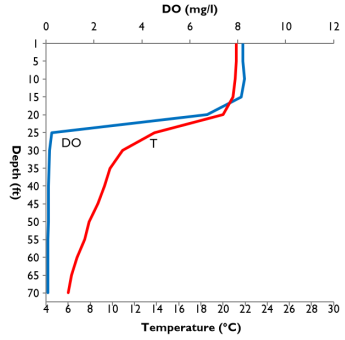

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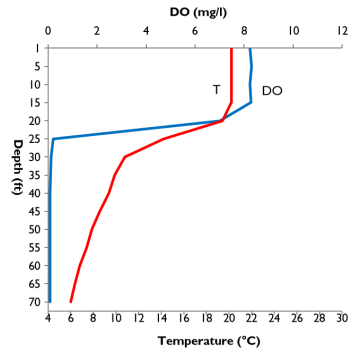

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