



## 2025 Island Lake Water Quality Review

### Introduction

The goals of this testing protocol were to monitor various water quality parameters of the lake, compare results to historical data, and identify any potential risks to the health of Island Lake. Water samples were taken at two different locations and tested for 14 parameters. Tests were conducted in May and August. This report describes conditions at the times the samples were taken. The quality of the water was tested only to the parameters listed below.

Test results were compared to historical data from the report “2024 Island Lake Water Quality Review” by LakePro, Inc.

In this report, we included historical data from Water Quality Investigators. Their information provided annual averages for many parameters from 2002 to 2009. Including this data allowed us to see more accurate trends in the water quality data. To make the analysis more accessible, we added annual averages for our data and trendlines on the graphs. The trend lines provide a quick indication of how each water quality parameter changed over the testing history.

### Results

Parameter	2025 Season		Status
	Average	Target Range	
Temperature	66.9 °F	Less than 75 °F	● Healthy
Dissolved Oxygen	7.8 mg/L	4.0 – 12.0 mg/L	● Healthy
Total Phosphorus	103 ppb	0 – 100 ppb	● Above
Phosphate	58 ppb	0 – 100 ppb	● Healthy
Nitrate-Nitrogen	81 ppb	0 – 200 ppb	● Healthy
Chlorophyll-a	4.1 ppb	0 – 7.3 ppb	● Healthy
Transparency	6.2 feet	More than 6.5 feet	● Below
pH	8.0 S.U.	7.0 – 9.0 S.U.	● Healthy
Total Dissolved Solids	381 ppm	0 – 1,000 ppm	● Healthy
Conductivity	694 ppm	0 – 1,500 ppm	● Healthy
Alkalinity	142 ppm	100 – 250 ppm	● Healthy
Sulfate	11.1 ppm	3 – 30 ppm	● Healthy
Fluoride	0.09 ppm	0.01 – 0.30 ppm	● Healthy
Chloride	117 ppm	0 – 230 ppm	● Healthy



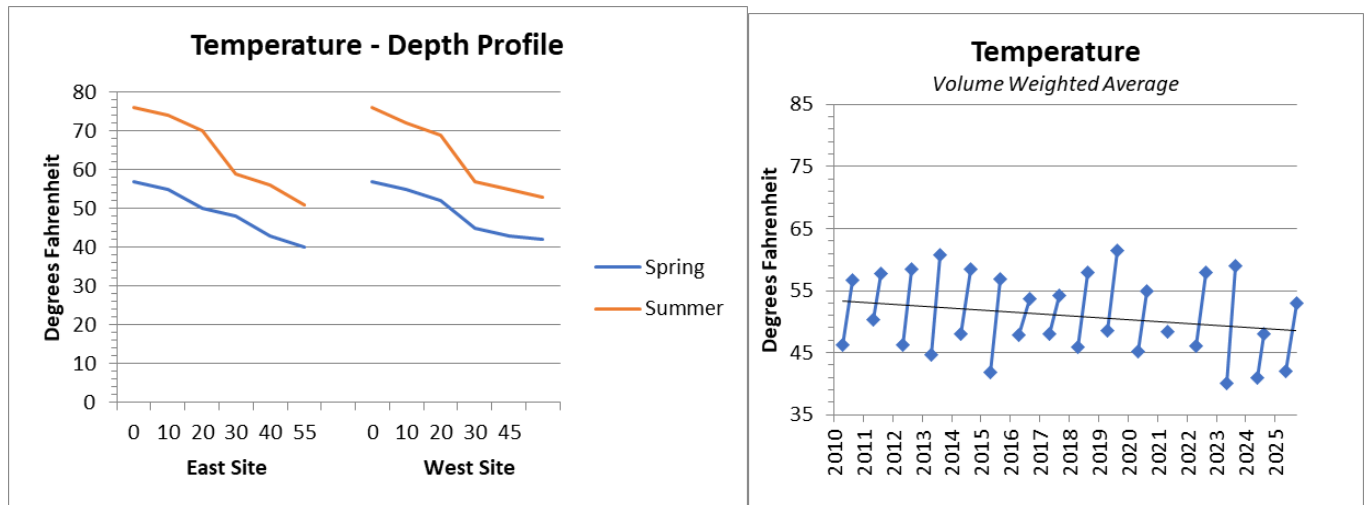
### Year-End Discussion

2025 was characterized by slightly elevated nutrient concentrations and reduced clarity early in the season, followed by stabilization and continued strong oxygen and chemistry conditions.

#### Temperature and Dissolved Oxygen

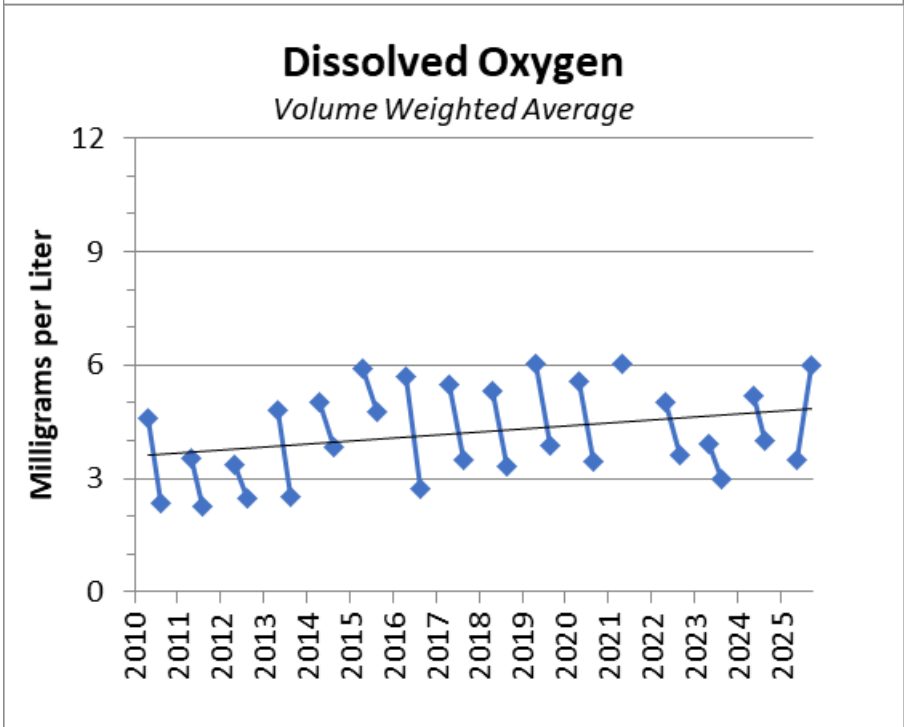
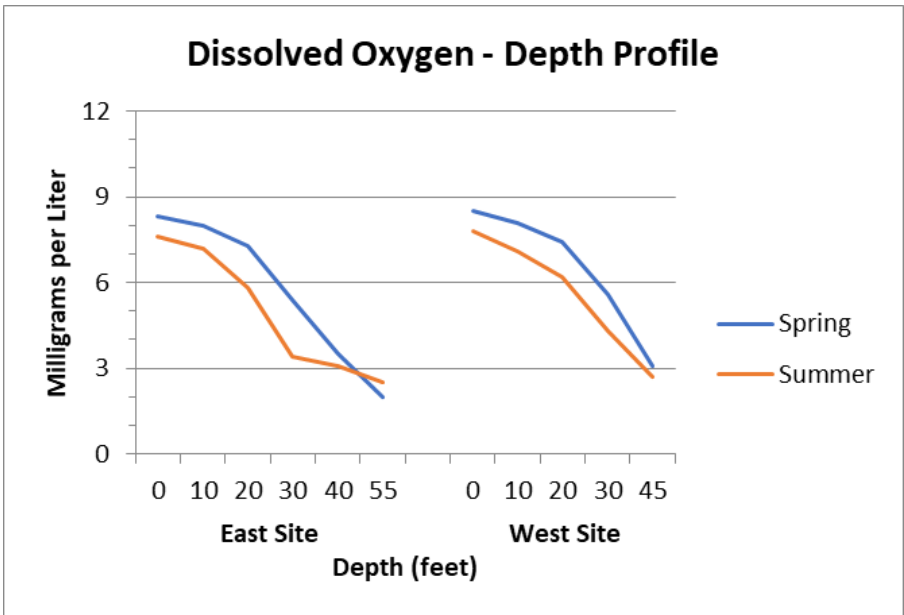
The average **Temperature** of the surface water was within the target range. In the month of September, we noted temperatures just above the mark. Colder water can hold more oxygen, so cooler water is preferred to promote healthy lake ecology. Despite the warmer temperatures through August & September, the **Dissolved Oxygen** concentrations stayed within the target range for the entire summer. We also measured temperature at different depths to create a temperature profile. This data shows how the temperature changed with depth and whether or not a thermocline was present in the lake. The first graph below shows the data we collected this year. In the spring, the water temperatures decreased evenly from the surface to the lake bottom at both testing sites. During the summer testing events, there was a thermocline in the water at a depth of twenty-five feet, where the temperatures decreased sharply.

We used the water temperature and volume at each depth to calculate a volume-weighted average. The results of those calculations are presented in the second graph below. The trend line shows that over our testing history, the average temperatures of the lake have slightly declined.





The depth profile methodology was repeated to measure dissolved oxygen. This allowed us to see how the oxygen concentrations changed throughout the water column. We also used the dissolved oxygen and volume at each depth to calculate a volume-weighted average. The trend line shows that over our testing history, the lake's dissolved oxygen increased.

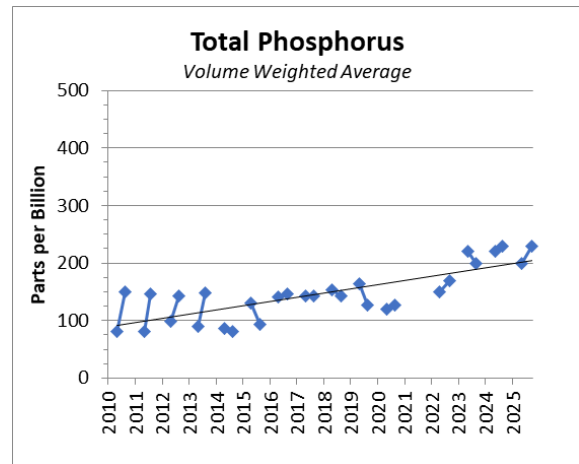
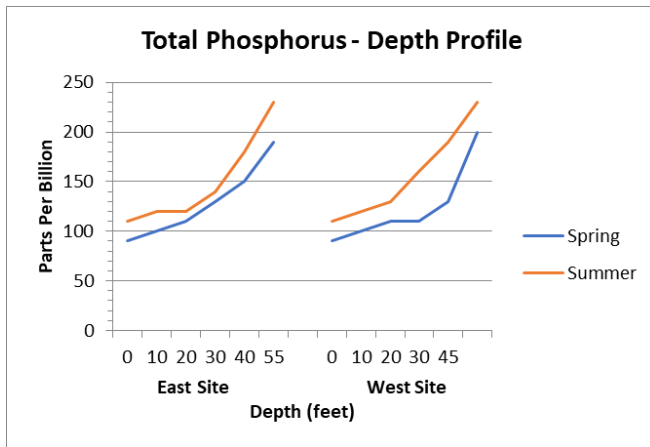




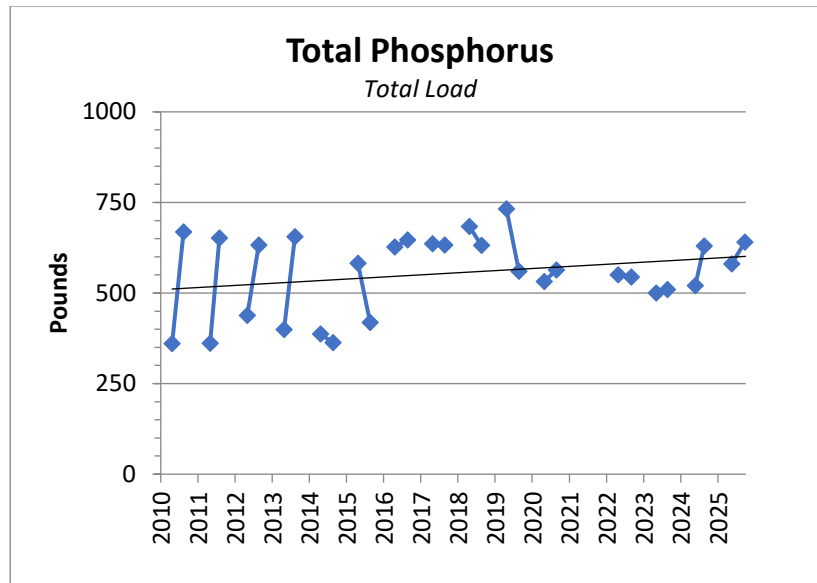
Nutrients, Plant Production, and Transparency

Nutrients in the water are the fuel for plant growth. Measuring the nutrient concentrations reveals the potential for additional plant growth. Phosphorus is a major nutrient necessary for aquatic plant growth, so it is important that this nutrient remains low in the lake. The **Total Phosphorus** was elevated throughout the season, peaking in Summer testing. **Phosphate**, which is the form of phosphorus usable by plants, was within the target range for all samples.

The depth profile methodology was repeated, and measurements were taken for total phosphorus. This revealed how its concentration changed with increasing depth. We also used the concentration and volume at each depth to calculate a volume-weighted average. The trend line shows that the total phosphorus within the entire lake increased over our testing history, which is common in lakes receiving ongoing watershed inputs. Phosphorus tends to accumulate in lake systems over time unless actively removed or exported. This is why managing external loads is vital for lake health.



Additionally, we used the concentration of phosphorus and the lake volume to calculate the total phosphorus load. This quantified the amount of phosphorus in the lake. The following graph shows the results of this calculation over the years of our testing. In theory, phosphorus availability at this level could support substantial plant biomass.



**Nitrate** is another major nutrient for aquatic plant growth. The nitrate concentrations remained within the target range this summer. Although concentrations were in the target range, it is important that residents take measures to ensure their properties are not contributing excess fertilizers to the lake.

We also measured **Chlorophyll** concentrations because it is a reliable indicator of plant production. The target for chlorophyll is below 7.3 parts per billion. The chlorophyll concentrations were below the target level to start the summer, and held steady with no drastic spikes later in the year.

A major effect of plant growth on the lake is the reduction of water clarity. Before algae forms the green mats of “scum” on the surface, it is suspended in the water column. Algae floating in the water can decrease water clarity even before you see a tint of green. This year, the **Transparency** averaged a depth of 6.2 feet. The measurements were low in May. Why does the lake clarity fluctuate in spring? This is most likely attributed to spring lake turnover and the movement of cyanobacterial dominant species throughout the water column. Clear water was observed from June through the rest of the year. Clearer water is generally a positive attribute, but it does allow more sunlight to reach the lake bottom to fuel plant growth.



Trophic State Indices

In order to better understand the relationship between nutrients, plant production, and clarity, limnologists use Trophic State Indices (TSI) to score each category and examine the relationship between them. In general, lower scores indicate a less productive lake. The TSI's for Island Lake this year were:

Category	Water Quality Parameter	Trophic State Index (season average)	Classification
Nutrients	Total Phosphorus	71	Eutrophic
Plant Production	Chlorophyll	44	Mesotrophic
Clarity	Transparency	53	Eutrophic

The TSI for total phosphorus classified the lake as eutrophic, or high productivity, based on the availability of nutrients to fuel plant growth. The TSI for chlorophyll was lower than the nutrient index. This shows that despite the availability of nutrients, the plants were not at the levels predicted by the nutrient concentrations. This was due, in part, to the plant management on the lake, such as harvesting and the removal of biomass. The presence of cyanobacteria can alter algal species composition or reduce total chlorophyll relative to phosphorus levels. Finally, the TSI for transparency was higher than the production index and classified the lake as eutrophic. The elevated transparency TSI relative to chlorophyll may be influenced by the morphology of dominant cyanobacteria, which often form filamentous strands or dispersed colonies that increase light scattering and reduce water clarity without proportionally increasing measured chlorophyll concentrations.

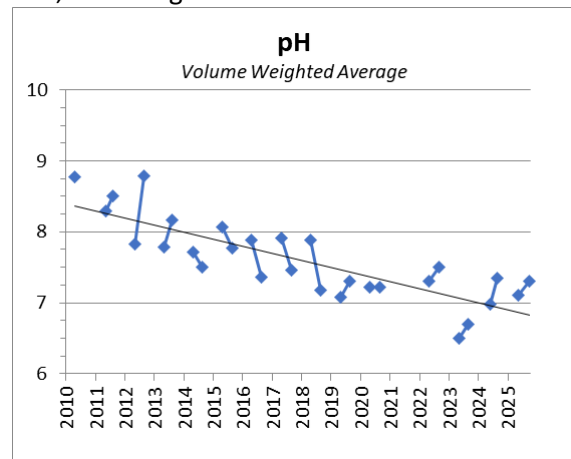
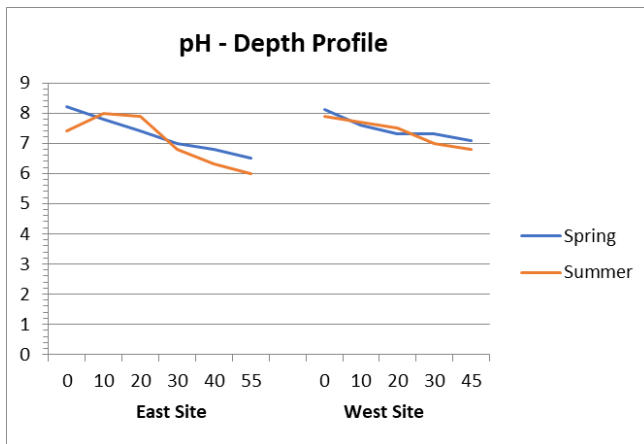


### Water Chemistry Parameters

It is important to monitor the basic water chemistry of the lake water. Shifts in these parameters can indicate major changes to the lake that may need to be further investigated.

The **pH** of the lake remained within the target range across all tests this year. This showed that the pH did not fluctuate to a point of concern despite changes in dissolved oxygen, alkalinity, and rainfall/runoff/groundwater flow.

The depth profile methodology was repeated and measurements were taken for pH. This revealed how this parameter changed throughout the water column. We also used the readings and the volume at each depth to calculate a volume-weighted average. The trend line shows that over our testing history, the pH of the entire lake decreased. The major point of data that seemed to decrease the trend was 2023. Since, pH has rebound back to a steady reading. From 2019-2025, pH has remained mildly consistent, excluding 2023.



The **Total Dissolved Solids (TDS)** were in the bottom half of the target range throughout summer, showing there were low amounts of dissolved molecules in the water. This parameter includes salts, pollutants, and other substances, so it is a positive that this parameter remained low.

**Conductivity** measures ionic molecules in the water and usually follows the TDS. This parameter measures the molecules in the water ability to conduct electricity. So, it is particularly sensitive to salts, which are excellent conductors. The conductivity was in the middle of the target range this year, indicating a normal amount of ionic molecules in the lake and no immediate concern of salts.

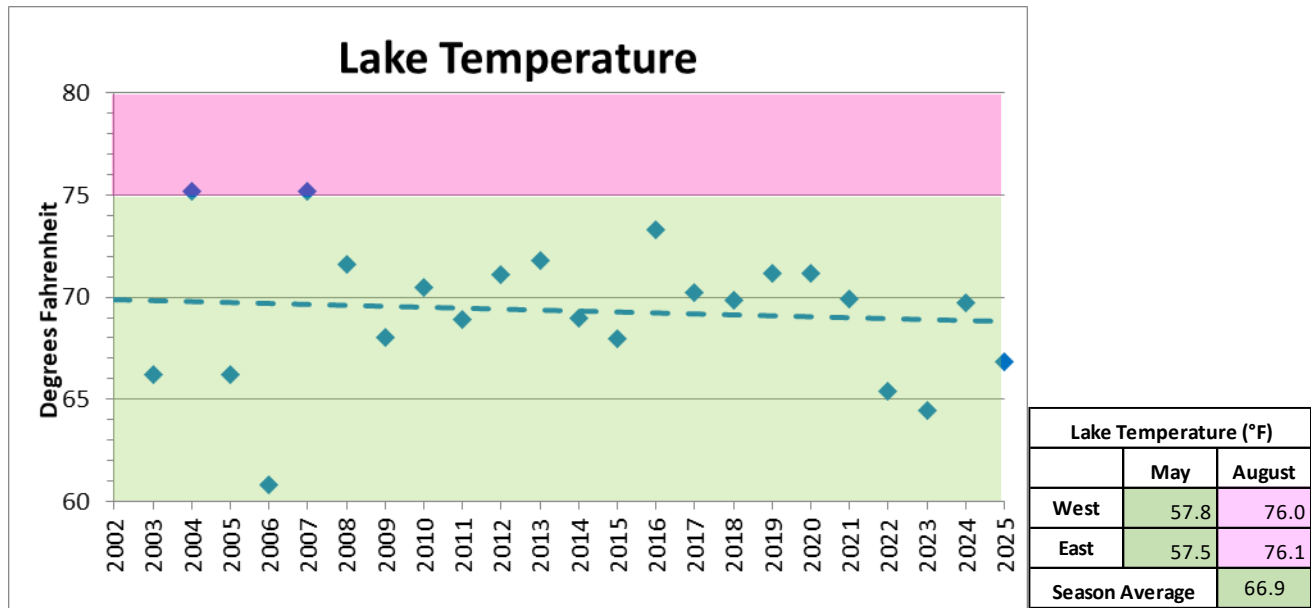
**Alkalinity** measures the concentration of one salt, Calcium Carbonate, which is beneficial to the aquatic ecosystem. The carbonate ions are able to accept protons from acids, making it a natural buffer. This means that as acidic substances enter the lake, the carbonate is able to buffer against severe changes in pH that would pose a threat to the ecosystem. The alkalinity was at a healthy concentration for all tests this year.



Pollutants

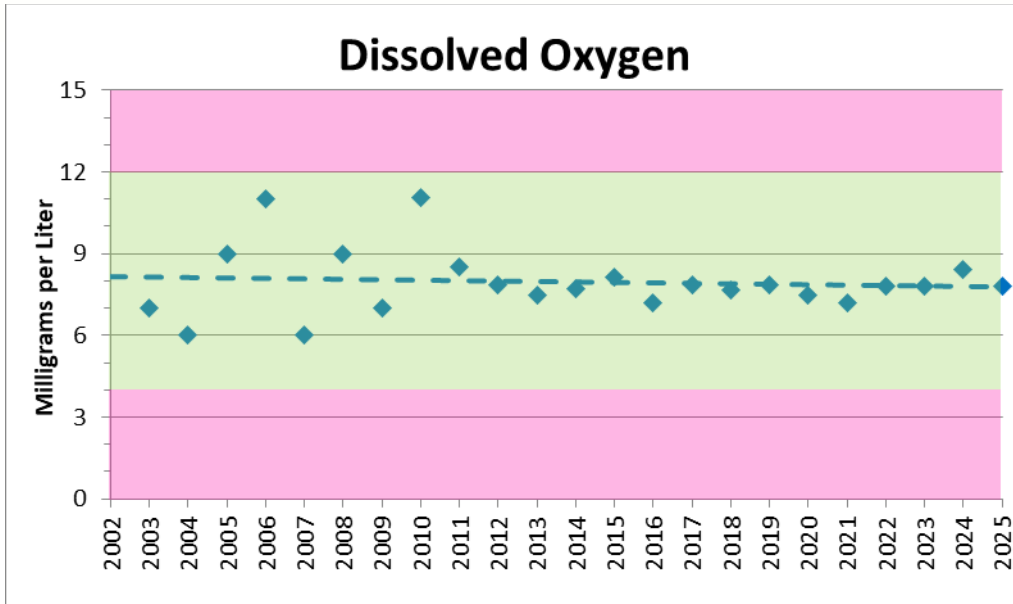
The lake was tested for **Sulfate**, **Fluoride**, and **Chloride** as indicators of pollution. These molecules should be present in the water naturally, but elevated levels can indicate pollution from within the watershed and may pose a risk to the ecosystem. All three parameters were within their target ranges for all tests

Historical Trends & Monthly Data



**Target Range: < 75°F**

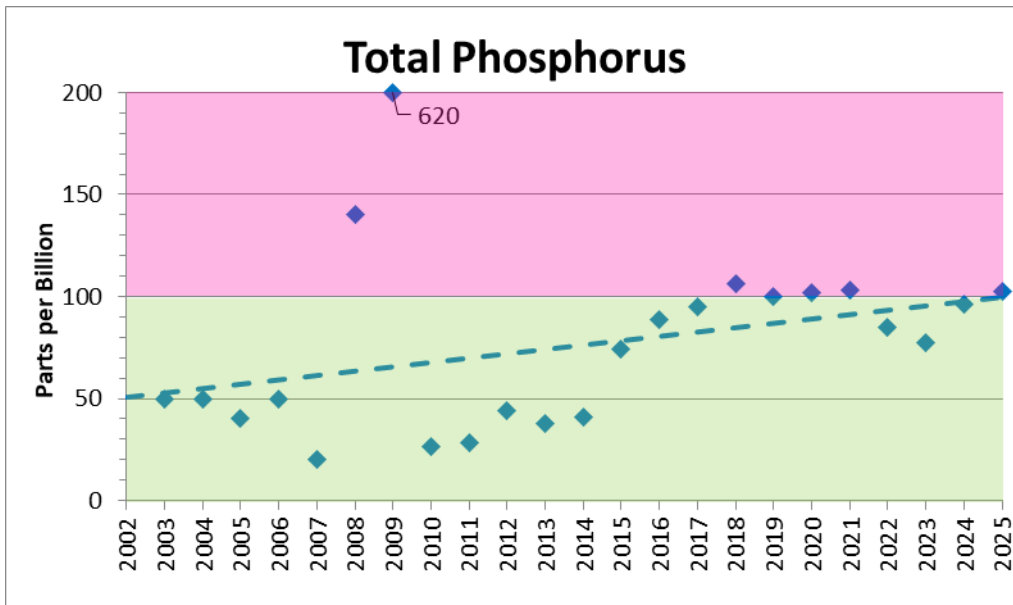
The long-term trend for water temperature has had a slightly downward trend. The 2025 season average was on the lower end as well, strengthening the trend down. Water temperature is dependent upon air temperatures and the dates selected for testing. For that reason, LakePro tried to select similar dates for testing each year. The primary concern with warmer water temperatures is decreasing oxygen solubility.



Dissolved Oxygen (mg/L)		
	May	August
West	8.1	7.5
East	8.3	7.3
Season Average	7.8	

**Target Range: 4.0 – 12.0 mg/L**

Dissolved oxygen concentrations varied but have remained relatively consistent. Although the concentrations varied throughout the testing history, adequate oxygen for a healthy aquatic ecosystem has always been available. From the temperature trends seen above, D.O. holds strong and remains steady.



Total Phosphorus (ppb)		
	May	August
West	90	110
East	100	110
Season Average	103	

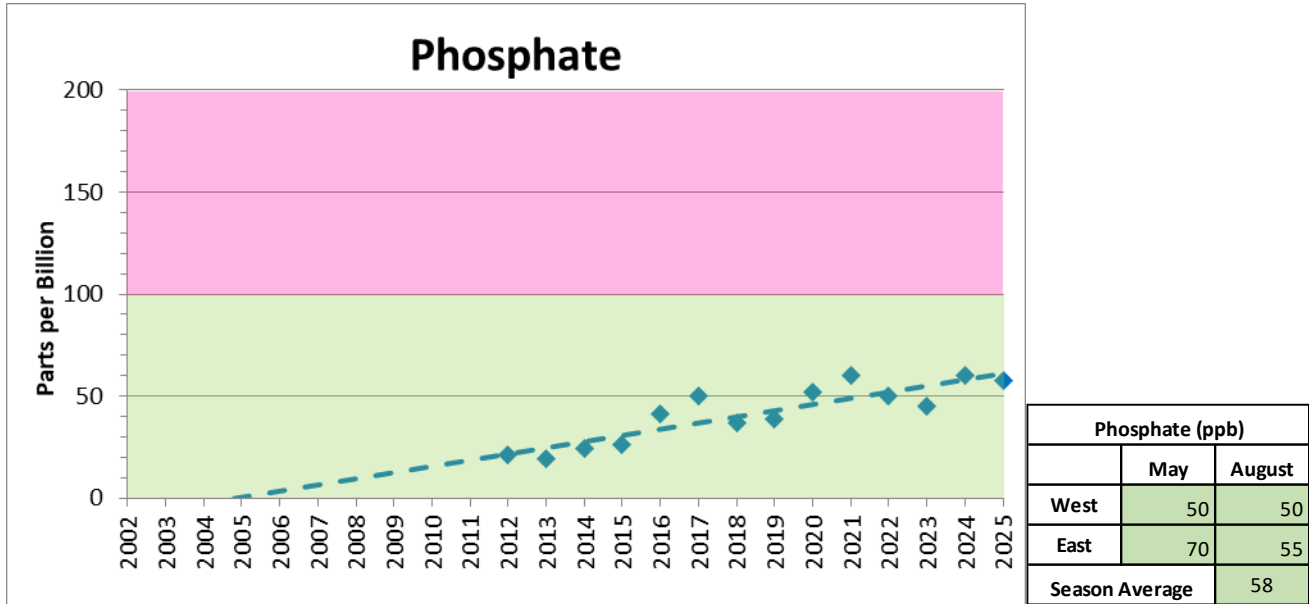
**Target Range: 0 – 100 ppb**

Lakes generally accumulate the substances and materials that flow into it, including nutrients. Since testing began in 2003, the water's phosphorus trend has tracked upward. The 2008 and 2009 concentrations were significantly higher than other years of testing, which pulled the trendline up. Since 2010 total phosphorus has steadily increased, averaging at or above the target range since 2018.

There are ways to remove phosphorus, such as mechanical harvesting, flocculants, and heavy rain events that create strong mixing and outflow. However, it is much easier to prevent excess nutrients from entering the lake.

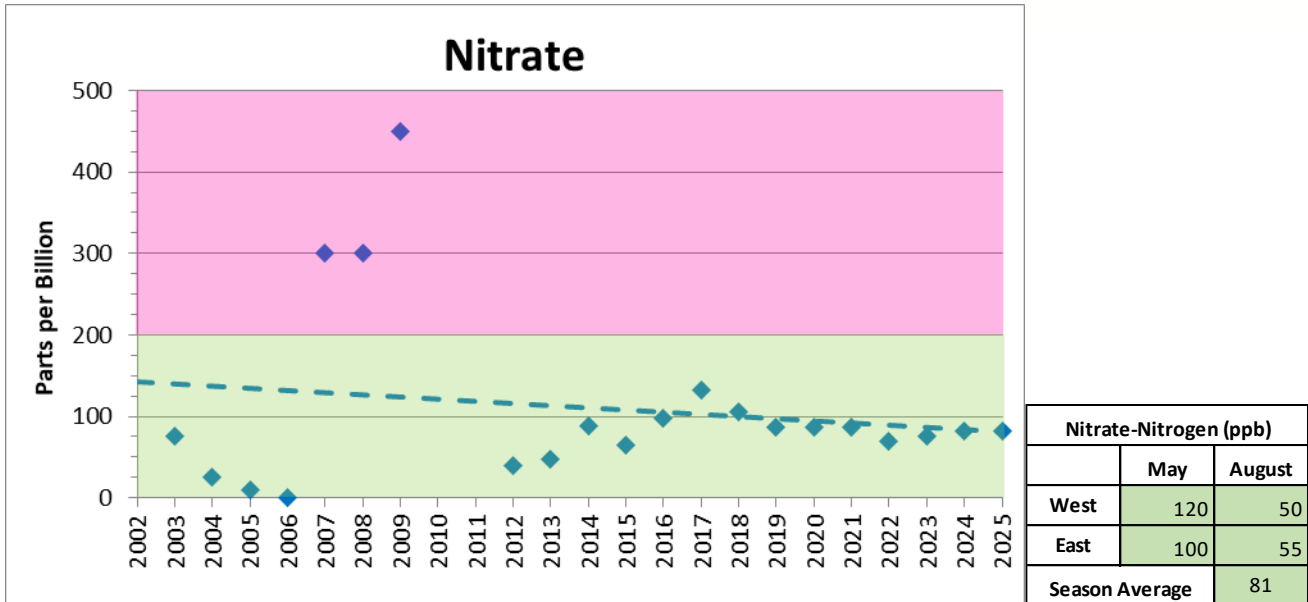


For this reason, it is vital that residents around the lake fertilize and use their land responsibly to prevent phosphorus from reaching the lake.



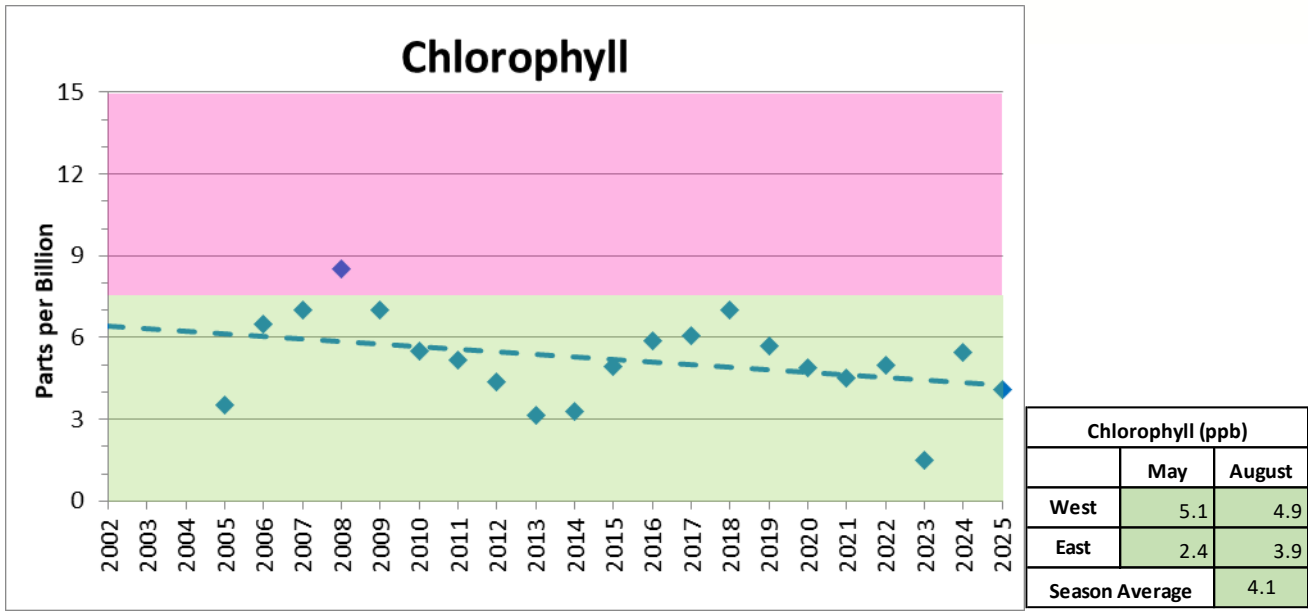
**Target Range: 0 – 100 ppb**

Phosphate is the form of phosphorus that is most usable by plants and algae. As the total phosphorus accumulates, phosphate usually follows. There is no historical data available for phosphates, so the trendline reflected the changes only during the years of LakePro’s testing. The trend was upward, but the phosphate concentrations remained within the target range. As noted last year, cyanobacteria and algae can use phosphate, ultimately manipulating how much is bioavailable.



**Target Range: 0 – 200 ppb**

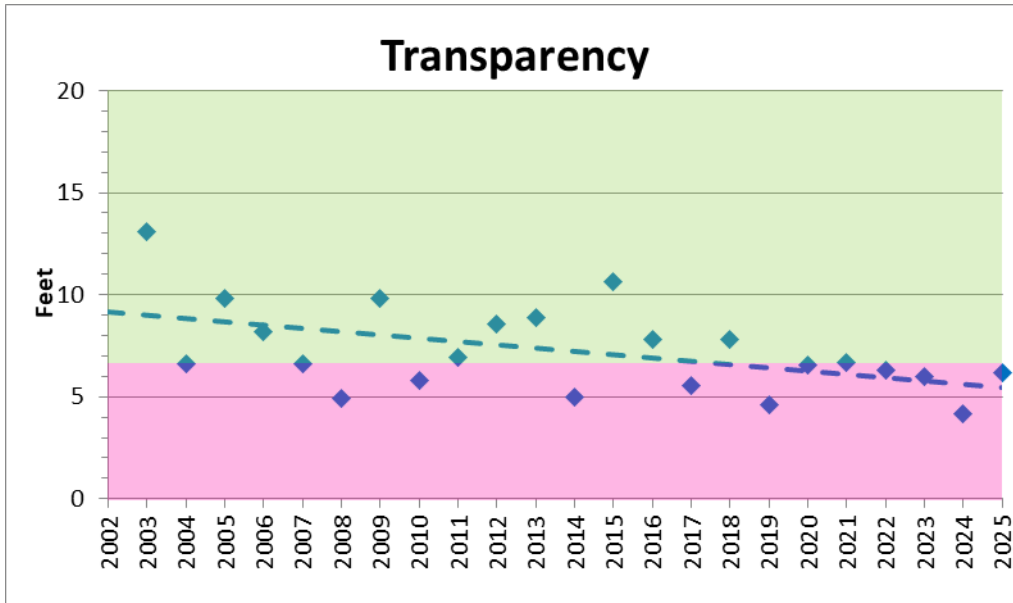
Nitrate is another major nutrient that accumulates in lakes. The historical trend for nitrate is downward, due to consistently lower values since 2012 and despite wild variability in previous years of testing. It is important that residents fertilize and use their land responsibly to prevent additional nitrates from reaching the lake.



**Target Range: 0 – 7.3 ppb**

The linear trend for Chlorophyll was slightly downward. However, the average concentrations show a strong cyclical pattern. Except for 2008, the chlorophyll remained within the target range. Continuing the plant management activities will continue to suppress the algae and plants to acceptable levels. Continuing to mechanically harvest aquatic plants and to conduct herbicide treatments for dense invasive species will help keep the plant community to acceptable levels.

Another key to limiting plant production is to slow the influx of nutrients from both around the lake and throughout the watershed. Responsible land use practices, especially fertilizing, will limit the nutrients entering the lake, starving the plants and algae of the food they need for growth.

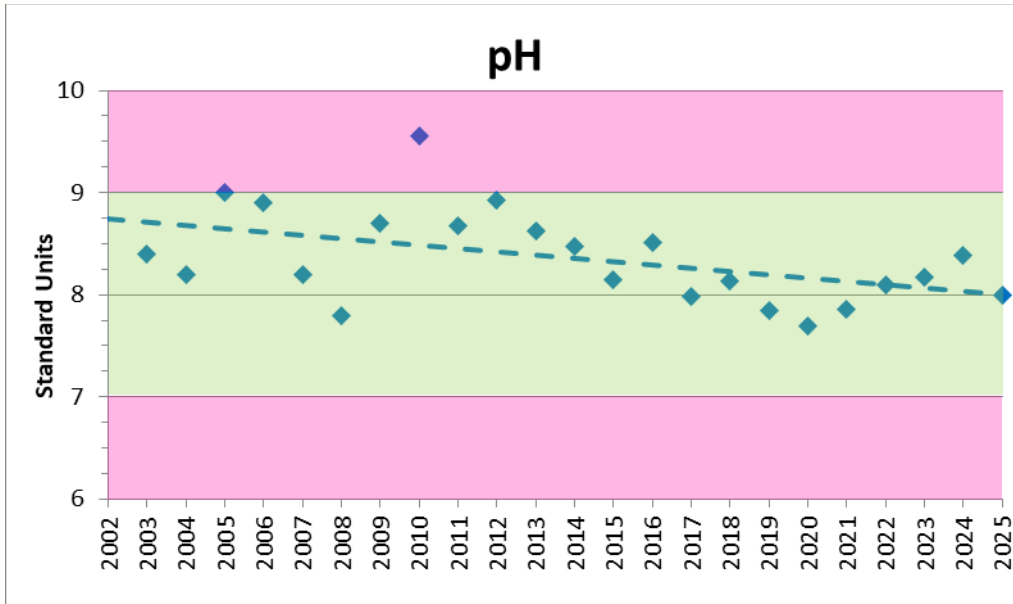


Transparency		
	May	August
West	3.3	9.1
East	3.4	9.0
Season Average	6.2	

**Target Range: > 6.5 feet**

Water transparency is influenced by multiple factors, though certain parameters play a greater role than others. In 2014, testing determined that the brown coloration observed in early summer was primarily caused by elevated concentrations of the cyanobacterium Planktothrix. More recent sampling in 2024 showed similar biological influences, with Aphanizomenon identified as the dominant genus, along with the continued presence of Limnothrix and Planktothrix.

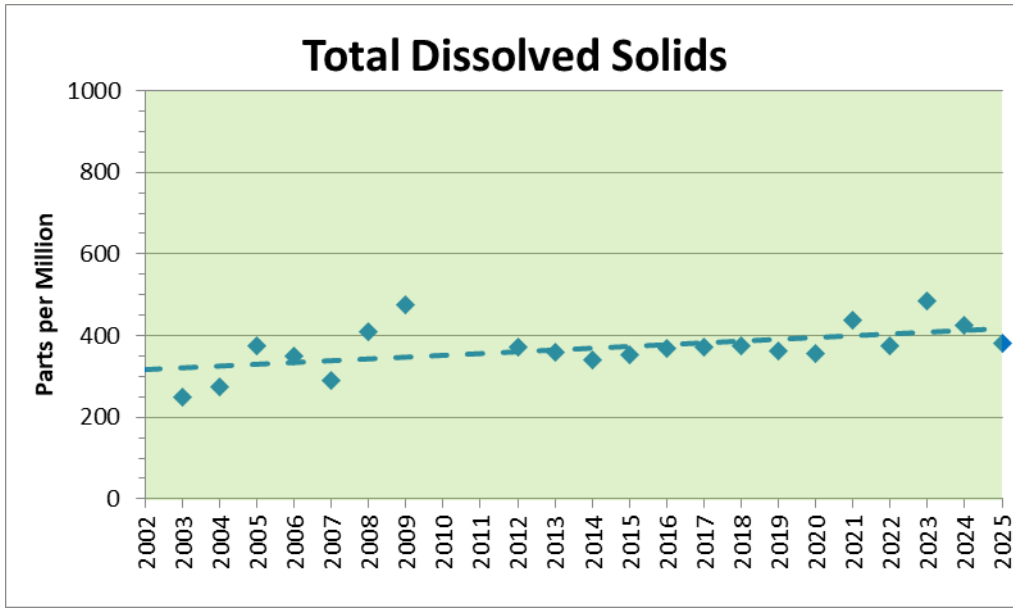
Although still slightly below the 6.5-foot target, transparency improved compared to 2024. This improvement is encouraging, as transparency strongly influences both the aesthetic appeal and recreational safety of the lake. Reduced clarity can limit a swimmer’s ability to accurately judge depth or identify submerged hazards, so maintaining and improving transparency remains an important management objective.



pH		
	May	August
West	7.9	8.10
East	8.0	8.00
Season Average	8.0	

**Target Range: 7.0 – 9.0 S.U.**

The pH at the lake surface trended downward over the testing history. It is important to look for the trend to flatten with additional years of data. Some fluctuation is expected, but major shifts or changes beyond the target range may indicate a larger problem. Despite the downward trend, the pH remained comfortably within the target range. We have observed pH increasing from 2021 to 2024. pH fluctuates naturally due to photosynthesis and respiration. During the day, plants and algae remove carbon dioxide, causing pH to rise; at night, respiration releases carbon dioxide back into the water, causing pH to decrease slightly.

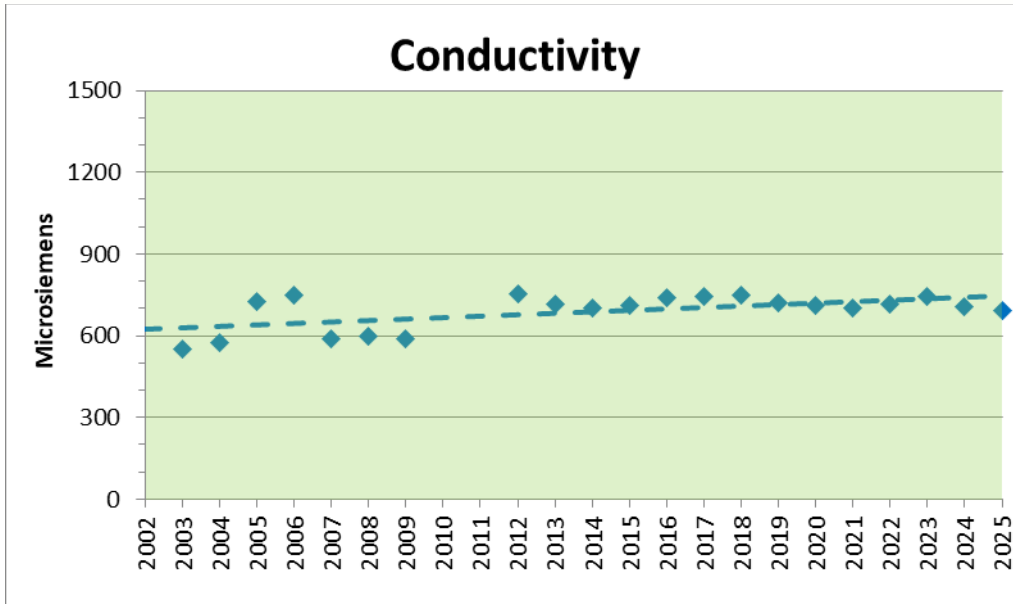


Total Dissolved Solids (ppm)		
	May	August
West	391	368
East	399	365
Season Average	381	

**Target Range: 0 – 1,000 ppm**

Total dissolved solids (TDS) increased gradually over the testing history, indicating a slow accumulation of dissolved substances within the lake. Continued mechanical harvesting helps remove these materials, including nutrients, as they are incorporated into plant biomass and physically exported from the system. Reduced plant density can also improve water movement, limiting sediment deposition and promoting the flushing of excess dissolved substances.

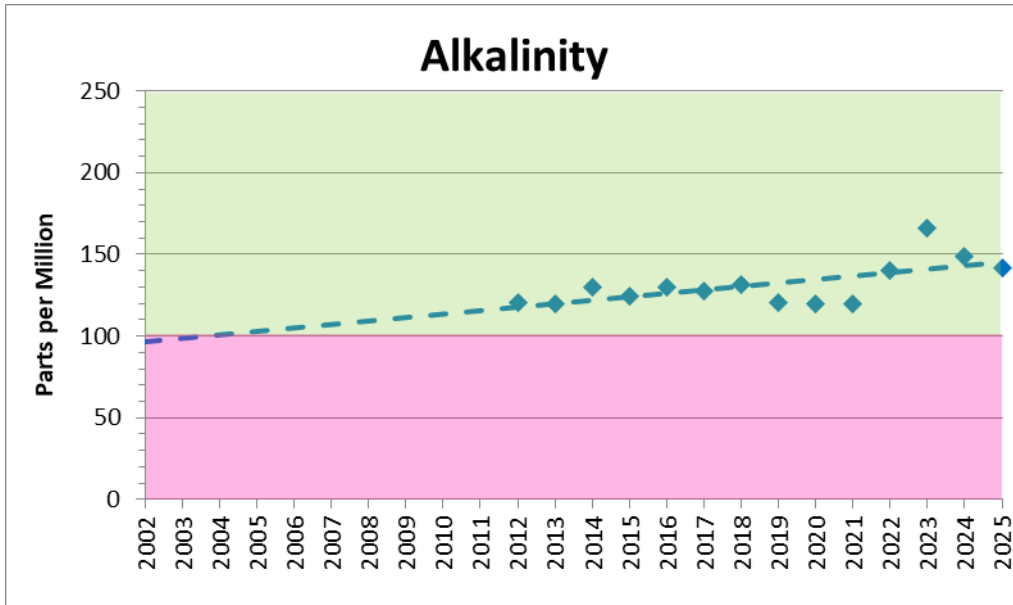
It is also important to note that in 2025, a damaged weir at the eastern outlet temporarily increased discharge from the lake. This observation could be used as a hypothesis that elevated outflow may have contributed to the minor decrease in TDS, Cond. And Alk., observed this year.



Conductivity (µS)		
	May	August
West	746	641
East	744	643
Season Average	694	

**Target Range: 0 – 1,500 µS**

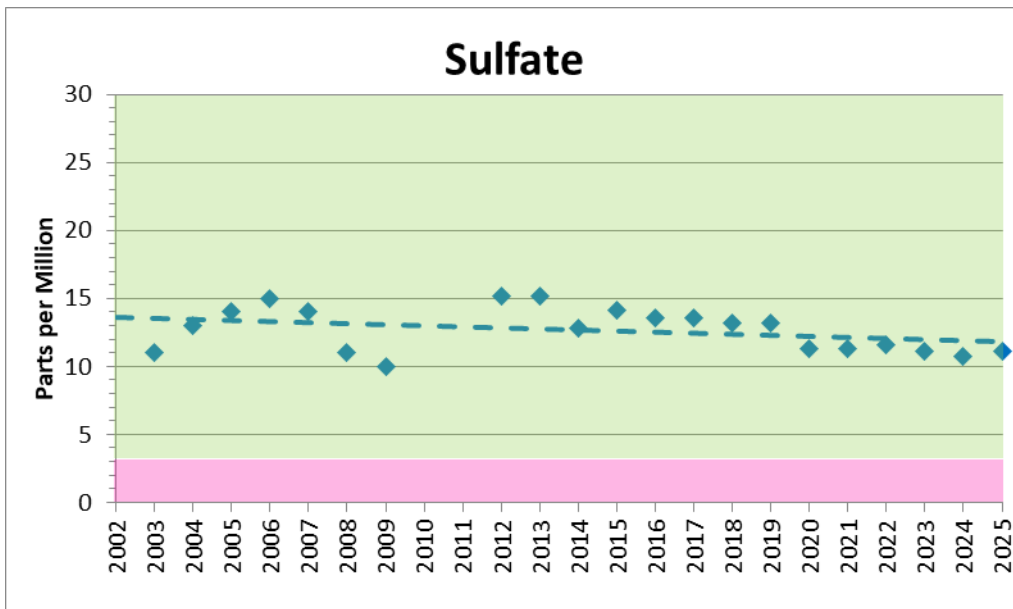
Similar to Total Dissolved Solids, conductivity has increased over the course of testing. Conductivity is directly related to TDS and reflects the concentration of dissolved ionic compounds in the water, most commonly salts. We will continue monitoring this parameter closely and look for signs that this upward trend begins to stabilize in future years.



Alkalinity (ppm)		
	May	August
West	149	135
East	146	137
Season Average	142	

**Target Range: 0 – 250 ppm**

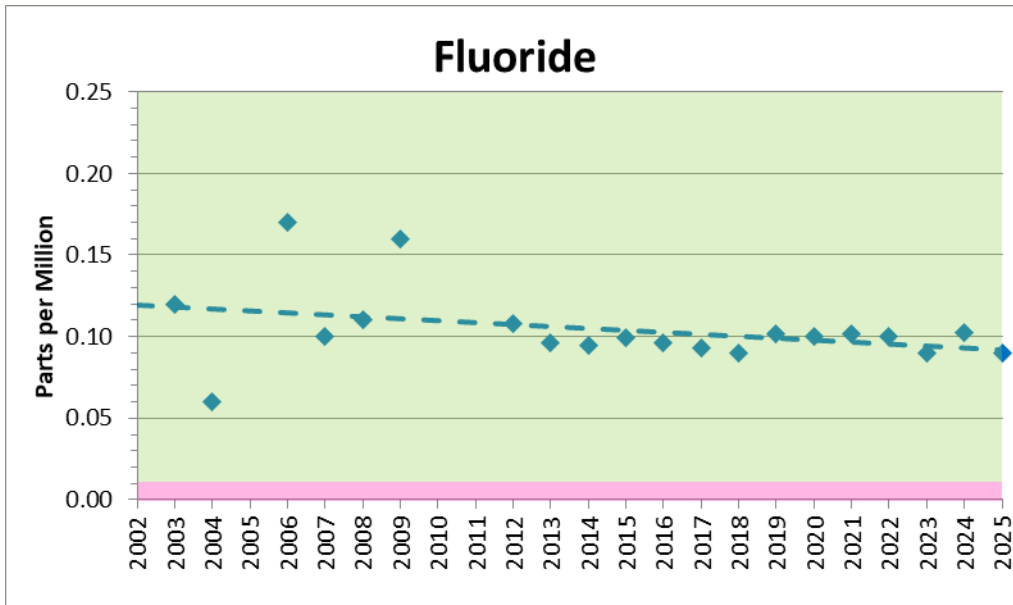
Alkalinity was first tested in 2012, so the historical data is limited. Since testing began, the alkalinity fluctuated mildly but does show a slowly increasing trend. Additional carbonates are beneficial to the lake because they are natural buffers.



Sulfate (ppm)		
	May	August
West	11.0	10.8
East	11.7	10.8
Season Average	11.1	

**Target Range: 3 – 30 ppm**

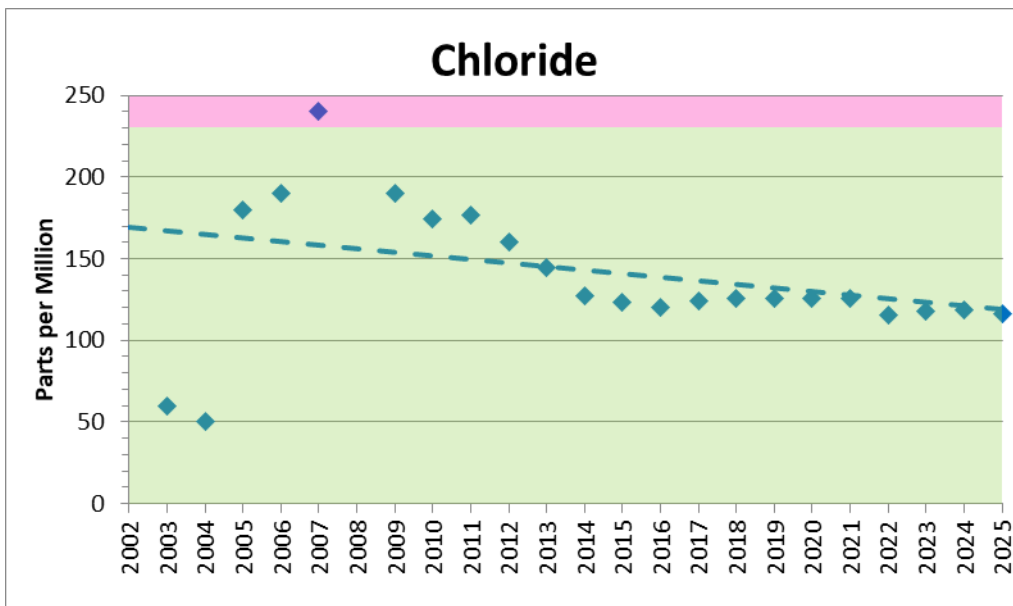
Sulfate has not changed significantly since 2002. It is important that this parameter stay within the target range and any significant increases should be investigated.



Fluoride (ppm)		
	May	August
West	0.10	0.09
East	0.08	0.09
Season Average	0.09	

**Target Range: 0.01 – 0.30 ppm**

Fluoride decreased in the lake since testing began. It is important that this parameter stay within the target range and any significant increases will be investigated.



Chloride (ppm)		
	May	August
West	114	118
East	120	114
Season Average	117	

**Target Range: 0 – 230 ppm**

The trend line for Chloride was slightly downward, but recent years have been relatively flat. With concerns about road salt entering lakes, it is important that this parameter remain within the target range and any increases will be investigated.



### **Analysis Information**

Temperature:	The water temperature directly affects the amount of oxygen that can dissolve into the water. The temperature of surface waters is not indicative of the entire water column.
Dissolved Oxygen:	D.O. is a measure of the amount of oxygen dissolved in the water. This oxygen is available to fish and other animals for respiration. Vegetation generally increases DO, particularly during the day and early evening. Animals and other respiring organisms consume the oxygen, mostly during the day. Oxygen is also added to the lake through wave action, rain, fountains and aerators.
Total Phosphorus:	Phosphorus is an essential nutrient for plant growth. However, concentrations exceeding 100 ppb can impair the water and results in nuisance vegetation growth.
Phosphates:	Phosphate is the form of phosphorous that is most readily available to plants and algae.
Nitrate:	Nitrogen is also essential for plant growth. Nitrate is the predominant form of nitrogen in water. Excessive nitrate concentrations may also result in pollution and increased vegetation.
Chlorophyll-a:	Chlorophyll-a is a direct measurement of the amount of green pigment produced by plants and phytoplankton. This indicates the amount of plant growth and is used to calculate a Trophic State Index.
Transparency:	The ability of light to penetrate the water column is determined by the amount of dissolved and suspended particles in the water. Although aesthetically desirable, transparent water allows increased light to reach the lake bed and may result in vegetation growth.
pH:	pH is a measure of acidity or alkalinity. pH is a general measure of lake health and can roughly indicate the range of other measurements such as alkalinity and hardness.
TDS:	Total Dissolved Solids is the amount of all organic and inorganic substances in the water in a molecular or ionized state. Higher values generally indicate richer and more productive water. Lower values usually indicate cleaner and less productive water.
Conductivity:	Conductivity is a measure of the ability of water to conduct electricity. Dissolved ions in the water increase conductivity, thus TDS and Conductivity are closely related.
Alkalinity:	Alkalinity refers to the ability of the water to neutralize acids, mainly through the hydrogenation of carbonate ions. Therefore, the alkalinity is expressed as "ppm as CaCO <sub>3</sub> ". However, other basic molecules in the water can also contribute to alkalinity.
Sulfate:	Sulfate occurs naturally as minerals, such as calcium sulfate and magnesium sulfate. In fresh water, sulfate is usually the second or third most abundant anion. Other sources of sulfate include water material from pulp mills, steel mills, food processing operations, and municipal wastes. Under low oxygen conditions, sulfate can be reduced to hydrogen sulfide gas, which smells like rotten eggs.
Fluoride:	Fluoride may occur naturally or be added to public drinking water supplies.
Chloride:	Chloride is one of the major anions found in water and sewage. The presence of chlorides may be due to water passing through salt formations in the earth or pollution from industrial processes, domestic wastes, or road salt. The salt content of water affects the distribution of plant and animal life in an aquatic system, based on the amount of salt they can tolerate.

**Trophic States**

- Oligotrophic:** Water is very clear. Nutrient levels are generally low. Plant and algae productivity are also low. Sufficient dissolved oxygen in the bottom, cooler waters allows cold-water fish to survive, such as salmon and trout.
- Mesotrophic:** Water is moderately clear. Nutrient levels are slightly elevated. Plant and algae productivity are present, but generally not a nuisance. Oxygen and temperature in the lower portion of the lake allow walleye and perch to survive.
- Eutrophic:** Water is not clear due to high nutrients levels, increased turbidity, and excessive algal growth. There is no oxygen in the bottom, cooler waters, restricting the lake to warm water species, such as bass and bluegill.
- Hypereutrophic:** Nutrient levels are extremely high, promoting very high algae productivity. Blue-green algae blooms are likely. High turbidity and algae growth make the water opaque. Little plant growth is restricted to invasive plants. The only fish that can survive this environment are rough fish, such as carp, catfish, and mudminnows.

**Sample Sites:**

