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2025 Forest 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 Forest Lake. Water samples were taken at two different locations and tested for 14 parameters. Tests were conducted throughout the spring and summer. Tests were conducted with a YSI ProDSS Multiparameter Water Quality Meter, HANNA Nutrient Specific Calorimeters or LaMotte SMART2 Colorimeter.

Test results were compared to historical data from the report "Forest Lake 2024 WQ Report" by LakePro, Inc.

In this report, we included historical data from Water Quality Investigators. Their report provided annual averages for many of the parameters from 2002 to 2009. Including this data allows us to see more accurate trends in the water quality data. In order to make the analysis easier, we displayed annual averages and trendlines on the graphs. The trend lines revealed which direction each water quality parameter moved over the past sixteen years.

Results

Parameter	2025 Season Average	Target Range	Status
Temperature	70.6 ˚F	Less Than 75 ˚F	Healthy
Dissolved Oxygen	8.1 mg/L	4.0 – 12.0 mg/L	Healthy
Total Phosphorus	85 ppb	0 – 100 ppb	Healthy
Phosphate	40 ppb	0 – 100 ppb	Healthy
Nitrate-Nitrogen	70 ppb	0 – 200 ppb	Healthy
Chlorophyll-a	3.5 ppb	0 – 7.3 ppb	Healthy
Transparency	13.4 feet	More than 6.5 feet	Healthy
pH	7.8 S.U.	7.0 – 9.0 S.U.	Healthy
Total Dissolved Solids	551 ppm	0 – 1,000 ppm	Healthy
Conductivity	910 ppm	0 – 1,500 ppm	Healthy
Alkalinity	130 ppm	100 – 250 ppm	Healthy
Sulfate	15.2 ppm	3 – 30 ppm	Healthy
Fluoride	0.08 ppm	0.01 – 0.30 ppm	Healthy
Chloride	286 ppm	0 – 230 ppm	Above

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Year-End Discussion

Forest Lake's water quality was very good throughout 2025. The season-average for most parameters were within the target ranges. Total phosphorus was near the top end of the target range, however we did notice a small decrease in chloride levels.

Temperature and Dissolved Oxygen

The average surface water temperature this year was higher on average compared to 2024's season average. Regional weather patterns during the summer of 2025 likely contributed to the temperature conditions observed in the lake. Periods of prolonged heat in southeast Michigan can raise surface water temperatures and strengthen stratification, which in turn affects dissolved oxygen distribution because warmer water holds less oxygen.

Nutrients, Plant Production, and Transparency

Nutrients in the water are the fuel for plant growth. Nutrient concentrations can be interpreted as the potential for nuisance plant growth. Phosphorus is a main nutrient necessary for aquatic plant growth, so it is important that this nutrient remains low in the lake. Total phosphorus began the summer near the upper limit of the target range but declined into a more comfortable position within the target range by September, following a pattern similar to what was observed in 2024. Phosphate, the active form of phosphorus, was within the target range for all tests this year.

Nitrate is another major nutrient for aquatic plant growth. The nitrate concentrations remained within the target range across all tests. It is important that residents fertilize and use their land responsibly to prevent additional nutrients from entering the lake.

We also measured chlorophyll concentrations because it is a direct indicator of plant production. The target for chlorophyll is below 7.3 parts per billion. In May and September, the concentrations were within the target range along with the annual average.

One of the most important effects 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. Despite the chlorophyll concentrations recorded in September, the water clarity averaged surged to almost 13.5 feet this year.

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 TSIs for Forest Lake this year were:

Category	Water Quality Parameter	Trophic State Index (season average)	Classification
Nutrients	Total Phosphorus	68	Eutrophic
Plant Production	Chlorophyll	43	Mesotrophic
Clarity	Transparency	40	Mesotrophic

The TSI based on Total Phosphorus classified the lake as eutrophic, meaning the lake has an elevated level of nutrients available to support plant growth. However, the TSI based on chlorophyll was lower, indicating that plant growth did not fully match the level of nutrients present. The TSI based on transparency was lower still, classifying the lake as mesotrophic. This suggests that water clarity was better than would typically be expected based on the chlorophyll levels.

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Water Chemistry Parameters

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

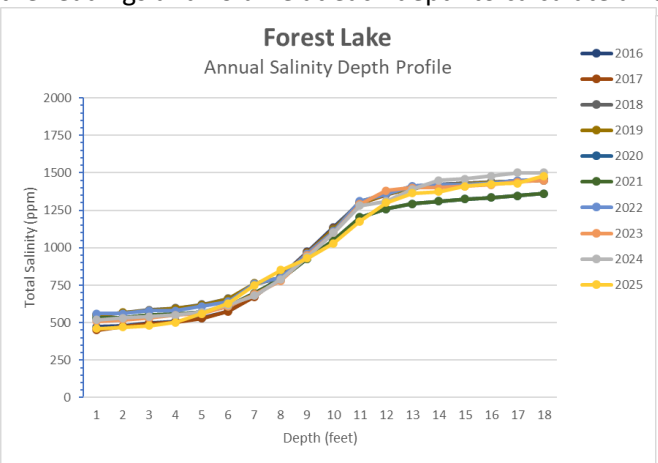
The pH of the lake remained within the target range throughout the summer. Total Dissolved Solids (TDS) indicated average concentrations of dissolved substances in the water, including nutrients, salts, and other materials, so it is positive that this parameter remained within the target range. Conductivity, which measures the concentration of ionic molecules in the water, generally follows the trend of TDS. This parameter reflects the water's ability to conduct electricity and is particularly sensitive to dissolved salts, which are strong conductors. Conductivity also remained within the middle of the target range this year. However, we did observe a slight increase in both TDS and conductivity in 2025.

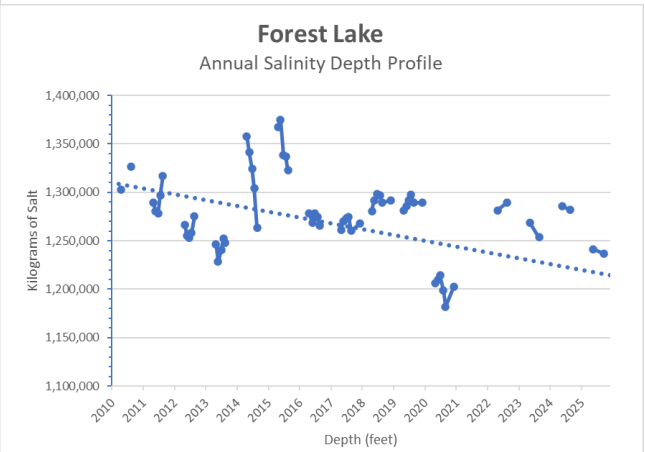
Alkalinity measures the concentration of one salt, Calcium Carbonate, which is beneficial to the aquatic ecosystem. The carbonate ions are able to accept protons from acids, making it a natural buffer. This means that as acidic substances enter the lake, the carbonate is able to buffer against severe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

Pollutants

Finally, the lake is 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. Throughout the year, the sulfate and fluoride concentrations were within their target ranges. Chloride was above the target range for the whole summer, but improved over the course of the year.

Chloride is a major constituent of total salinity. The depth profile protocol was followed and measurements were taken for salinity. This allowed us to see how this parameter changed throughout the water column. We also used the readings and volume at each depth to calculate a volume weighted load.





The first graph shows the average annual salinity at 3-foot depth intervals. This graph shows the salinity increases with depth and ranges from about 500 parts per million at the surface to about 1,500 parts per million in the deepest portion of the lake. This year, throughout the water column, we picked up slightly lower concentrations in our readings.

Based on the amount of water at each depth interval and the concentration of salts, we calculated a total salt load for the lake. The second graph shows those calculated loads during each testing event. The salinity fluctuated throughout the summer, but this year showed a slight increase in the salinity load, however, not impacting the downward trend over the testing history.

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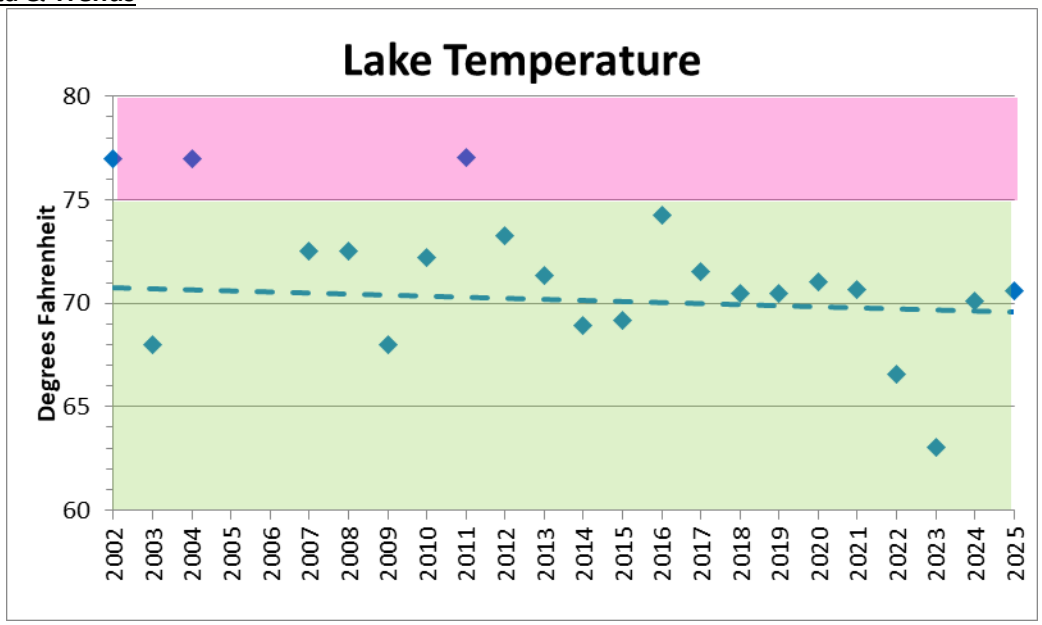
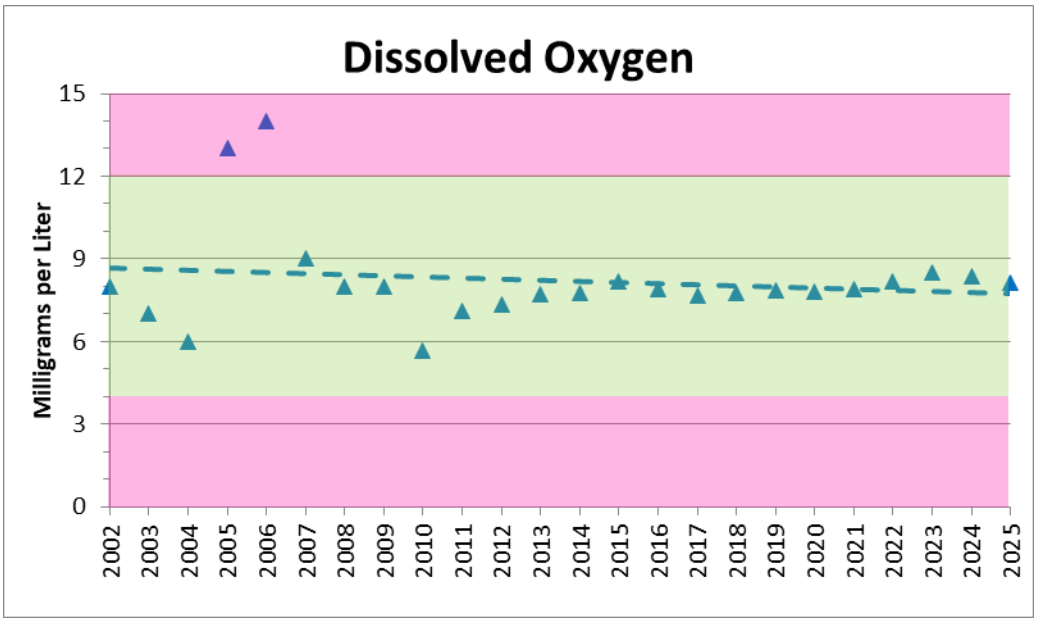
Historical Data & Trends



Discussion

The long term trend for water temperature is slightly downward. The averages for 2022 & 2023 were sporadic, which helped to flatten it, and now decrease the trend. This year's more in line with 2024 and the rest of the testing history. Water temperature depends upon air temperatures and the dates selected for testing. For that reason, LakePro tries to select similar dates for testing each year. Cooler water is able to hold more oxygen, so lower temperatures are better for the ecosystem.



Discussion

As expected with increasing temperatures, dissolved oxygen showed a slight downward trend. As water temperature rises, the solubility of oxygen decreases, which can naturally lead to lower oxygen concentrations. While this represents a modest negative trend objectively, dissolved oxygen levels remained sufficient.

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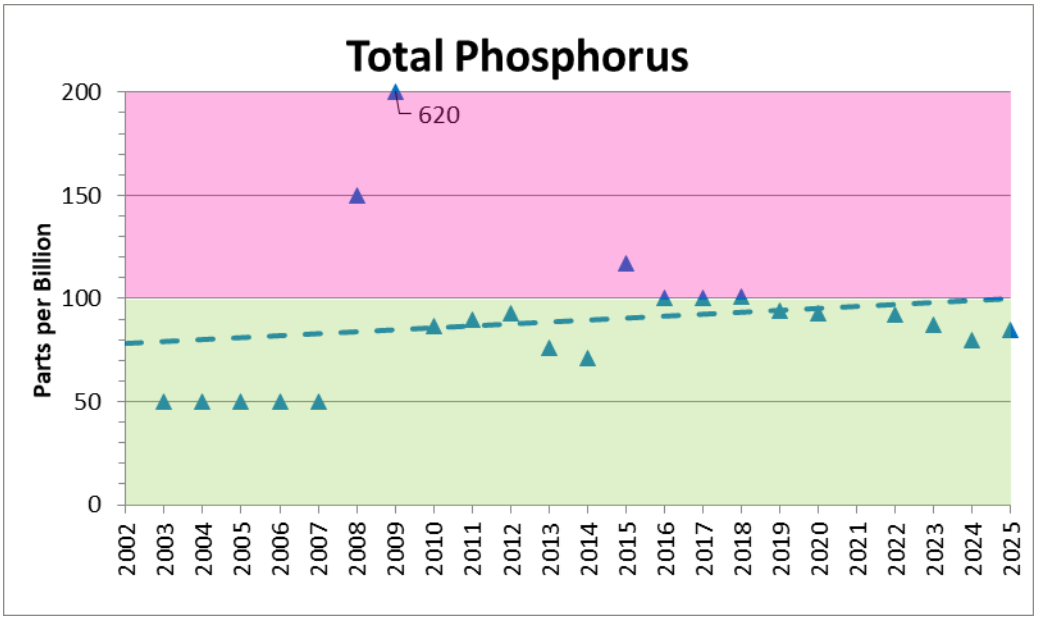
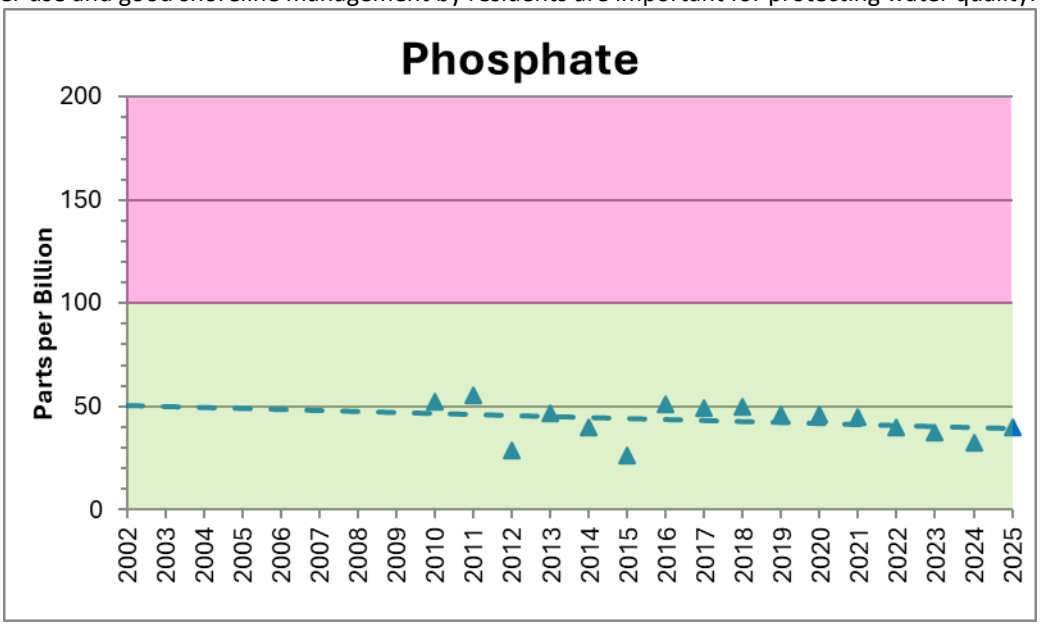


Discussion

Total phosphorus showed a slight increase compared to 2024. Minor fluctuations such as this are common in lake systems and can result from changes in weather, runoff, and internal nutrient cycling. Some phosphorus can be removed from the lake through mechanical harvesting, which physically removes nutrients contained in plant biomass, or during periods of high outflow following major rainfall events. However, these processes only remove a portion of the phosphorus present. The most effective way to manage phosphorus levels is to limit how much enters the lake in the first place, which is why responsible fertilizer use and good shoreline management by residents are important for protecting water quality.



Discussion

Phosphate is the form of phosphorus that is most usable by plants and algae. As the total phosphorus accumulates, phosphate typically follows. Phosphate concentrations were slightly higher than in 2024, reflecting normal year-to-year variability in nutrient levels within the lake.

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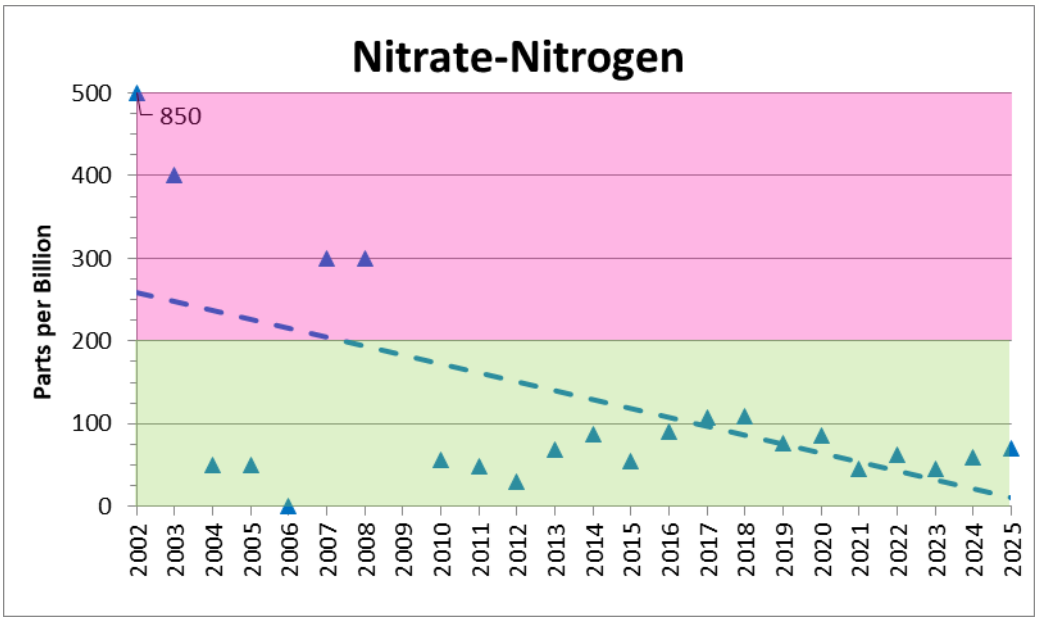
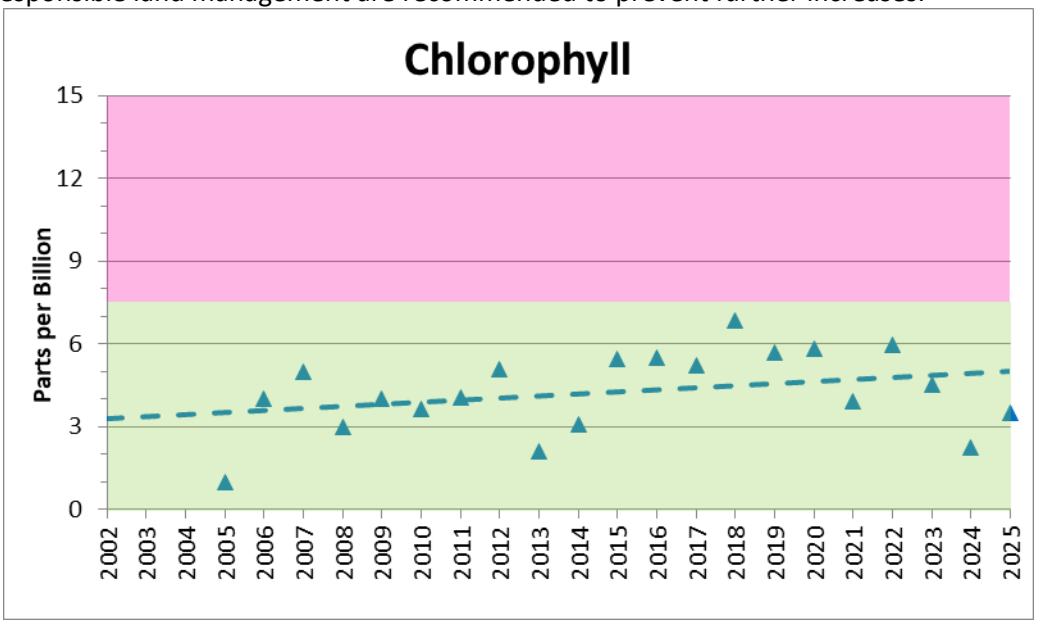


Discussion

The nitrate season averages fluctuated widely over the early testing history. The historical trend is downward. Nitrate levels increased slightly from last year, likely due to watershed runoff or fertilizer use. Continued monitoring and responsible land management are recommended to prevent further increases.



Discussion

Chlorophyll trended upward over the testing history and shown to be slightly lower each year since 2022. The annual chlorophyll averages remained within the target range. Continuing to mechanically harvest will remove plant biomass and the nutrients within it. Responsible land management by residents around the lake will help stifle the source of excess nutrients, preventing further worsening of the plant growth.

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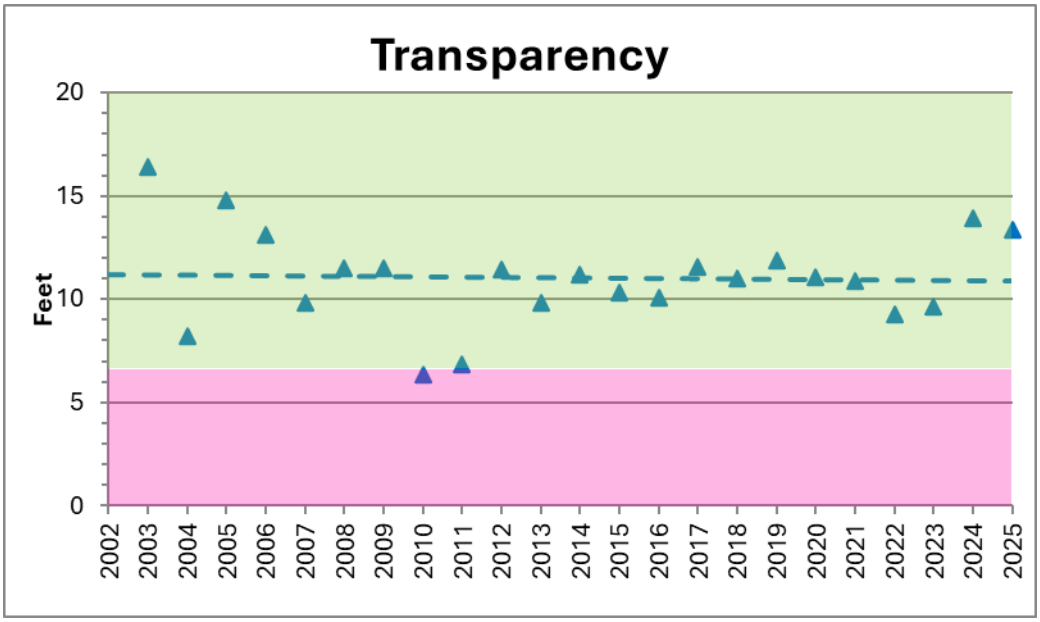
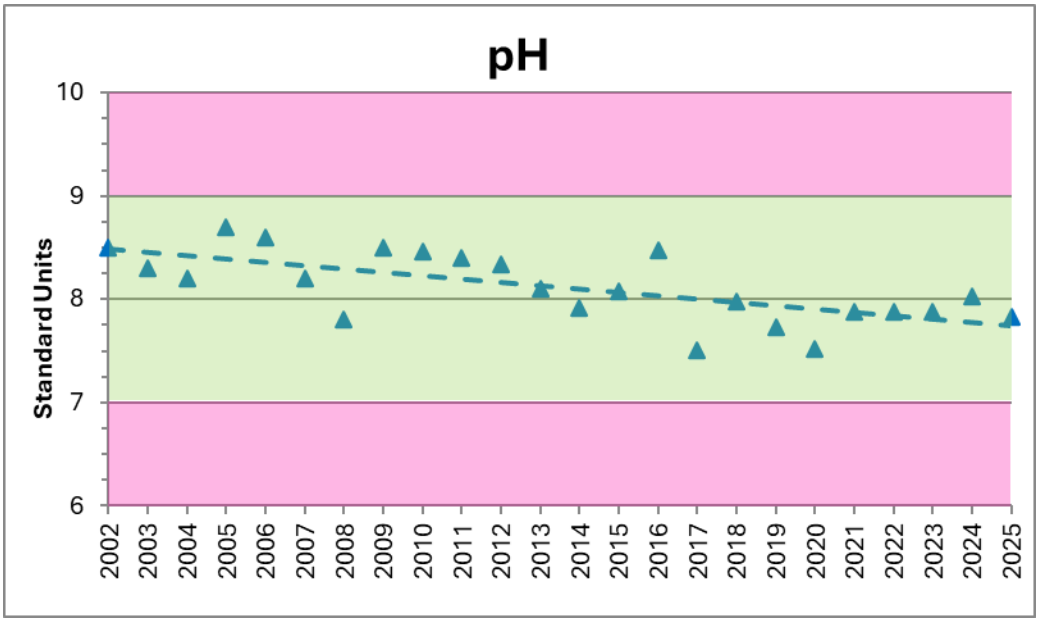


Discussion

Chlorophyll is used as an indicator of plant growth, including algae that clouds the water. Therefore, the increasing chlorophyll concentrations lead to lower transparency over the testing history. Water clarity may also be influenced by suspended sediments or dissolved organic matter. Although the clarity trended downward, it was still above the target depth this summer and continues to be great.



Discussion

pH has decreased slightly over the monitoring period, bringing annual values closer to 8, the midpoint of the target range. This change has had minimal impact on the lake, but values outside the target range should be investigated promptly. In recent years, the trend has stabilized around 8 S.U.

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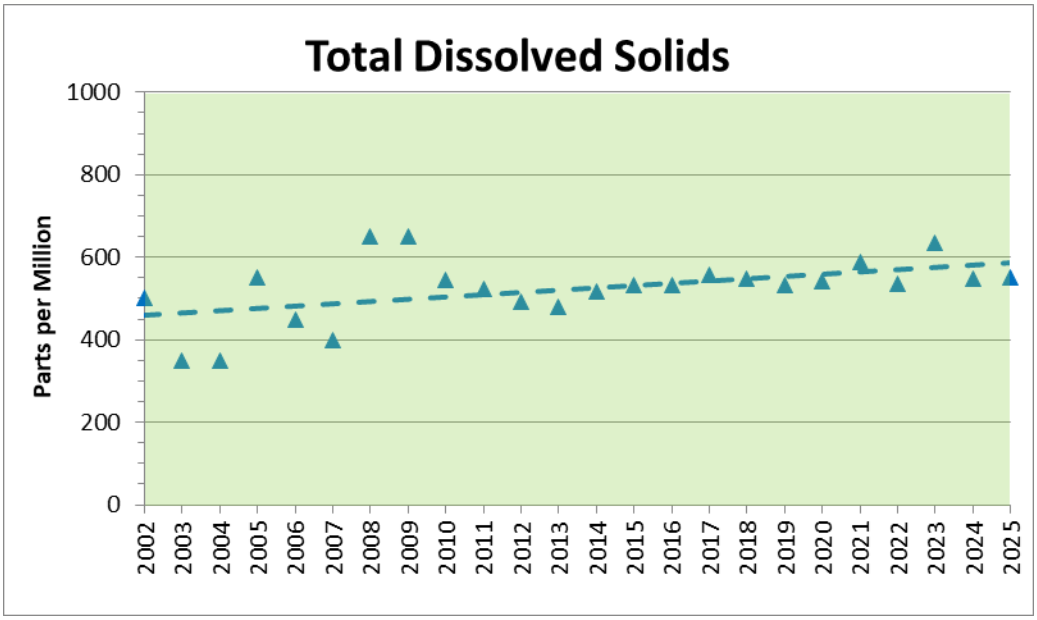
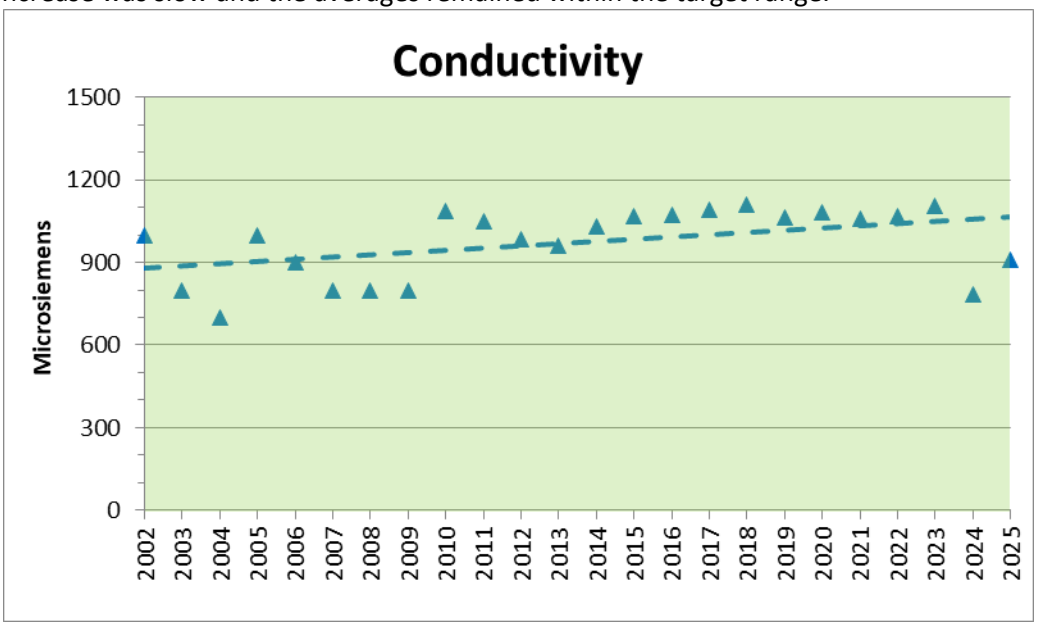


Discussion

The total dissolved solids increased over the testing history, showing that the lake is accumulating more substances. The increase was slow and the averages remained within the target range.



Discussion

Like the TDS, conductivity increased over the testing history. Conductivity is an extension of TDS and measures the amount of ionic molecules in the water (which conduct electricity, usually salts). In 2025, Conductivity showed an increase toward the trend line.

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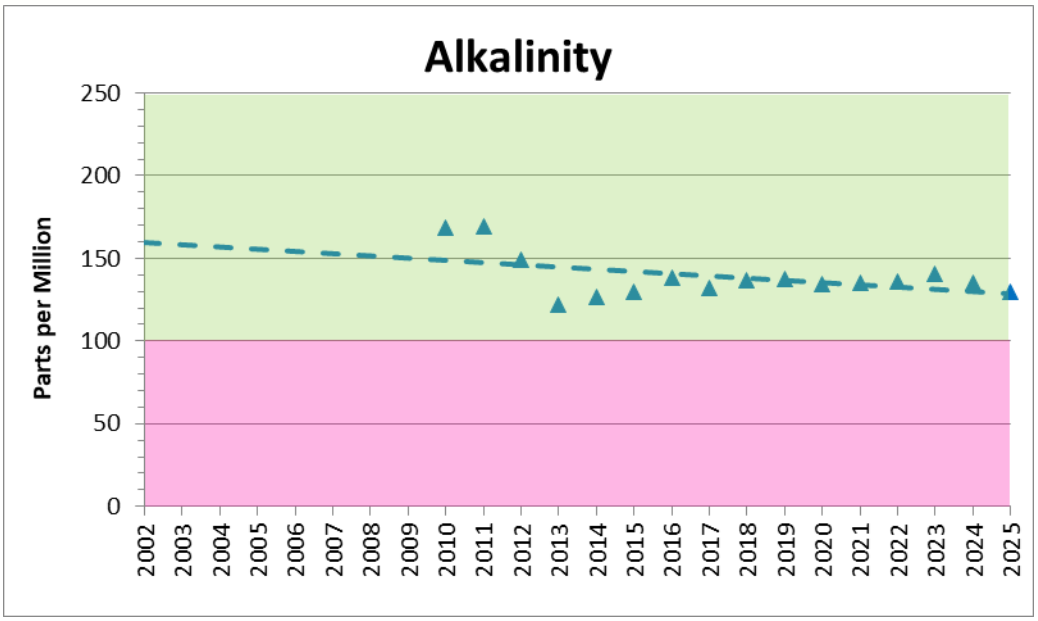
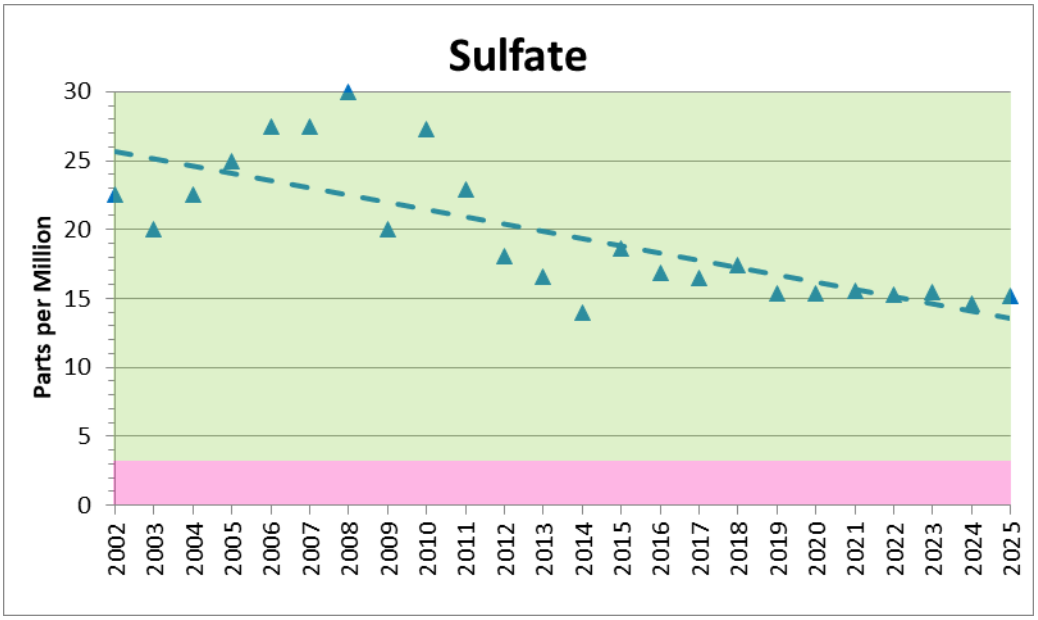


Discussion

Alkalinity was first included in the testing in 2010, so the historical data is abbreviated. Alkalinity decreased since 2011, but remained within the target range and showed slight recovery since 2013. Since, Alkalinity has leveled off.



Discussion

Sulfate fluctuated over the course of testing but the overall trend was downward. It is important that this parameter stay within the target range. Any sharp increases could indicate pollution that would need to be quickly investigated.

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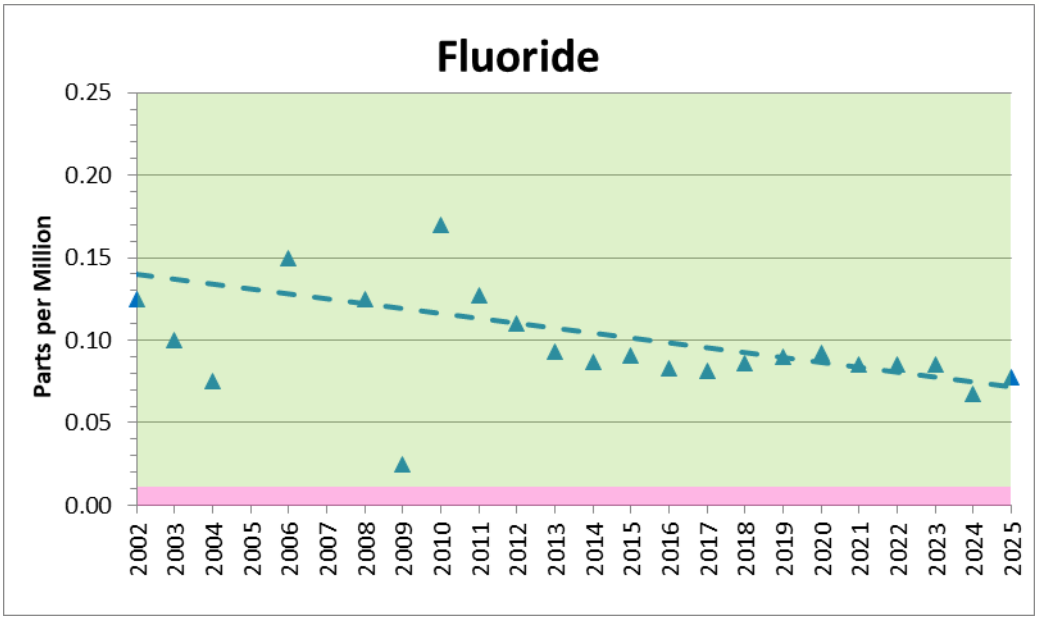
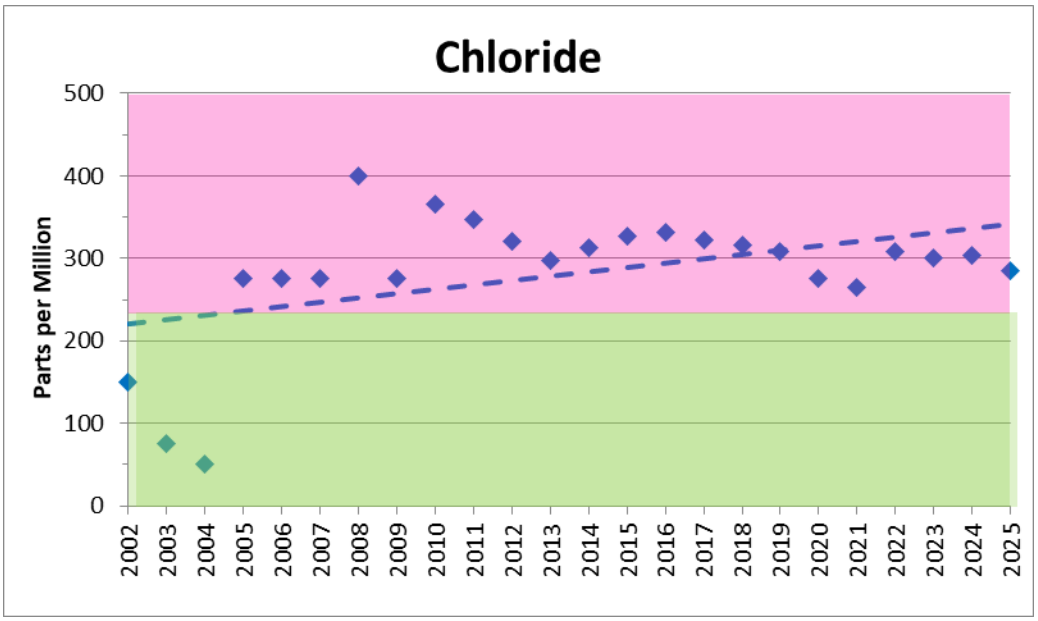


Discussion

Fluoride has fluctuated over the testing history but showed an overall decline. It is important that this parameter stay within the target range and any sharp increases are quickly investigated.



Discussion

The trend line for chloride shows an initial sharp increase in 2005, exceeding the target limit. Since 2008, concentrations have gradually declined, with 2025 showing a slight decrease compared to 2024. Despite this improvement, chloride levels remain above the threshold. Management of runoff routes is critical to prevent additional road salt from entering the lake, as elevated chlorides can negatively impact aquatic life.

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Summary & Discussion

Forest Lake exhibited **very good overall water quality** in 2025. Nearly all monitored parameters remained within their target ranges, supporting a healthy aquatic ecosystem.
Key highlights:

- Temperature, dissolved oxygen, pH, alkalinity, total phosphorus, phosphate, nitrate, chlorophyll-a, transparency, TDS, conductivity, sulfate, and fluoride were all within healthy target ranges.
- **Transparency** averaged an excellent 13.4 feet — well above the minimum target and indicative of good water clarity.
- Nutrient levels (total phosphorus near the upper end of the target, phosphate and nitrate comfortably within range) supported moderate plant/algae production, with chlorophyll-a averaging 3.5 ppb (well below the 7.3 ppb threshold).

The primary concern remains **chloride**, which stayed above the target range (286 ppm vs. 0–230 ppm target) throughout the season, although levels showed a slight improvement compared to 2024. Elevated chloride is largely attributed to road salt runoff, and continued efforts to manage runoff routes and reduce salt application near the watershed are recommended to protect long-term aquatic life.

Conclusion

Forest Lake continues to be a healthy, well-managed waterbody with excellent clarity and balanced conditions for recreational use and aquatic life. Maintaining current best practices — limited fertilizer use, proper shoreline management, continued mechanical plant harvesting, and reduced road salt impact — will help sustain and further protect water quality in the coming years.

Thank you for choosing TIGRIS/LakePro,

Michael Smith
Operations Manager
Environmental Science

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Analysis Information

Temperature:	The water temperature directly affects the amount of oxygen that is able to 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 TDS indicates greater dissolved material in the water. Some components may support productivity, while others such as salts simply reflect watershed inputs.
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. This is why the alkalinity is expressed as "ppm as $CaCO_3$". 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. Sulfate is commonly one of the major anions in freshwater systems. Other sources of sulfate include water material from pulp mills, steel mills, food processing operations, and municipal wastes. Under low oxygen conditions, sulfate can by 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 slat they can tolerate.

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Trophic States

Oligotrophic: Water is very clear. Nutrient levels are generally low. Plant and algae productivity is 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 is 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: