812-497-2410
418 W. State Rd, 258
Seymour, IN 47274
www.aquaticcontrol.com

Pinnacle Lake Report

Pinnacle Lake was inspected on 7/18/25, for nuisance vegetation and water quality information. Below are findings from the inspection, water quality results, and recommendations to improve the lake.

Water Chemistry

When managing an aquatic ecosystem the quality of water should always be considered first. If a lake or pond is perfectly constructed with abundant food and habitat, but has poor water quality, the fishery will ultimately suffer and never reach it's full potential. Although oxygen is typically not a year-round issue there are certain situations that can cause oxygen to drop to detrimental levels. If parameters such as pH or alkalinity are too low or too high it can put tremendous stress on the organisms living in it or even create a toxic environment all together. Other important parameters to consider are nitrogen and phosphorus levels. Nitrogen and phosphorus are two major nutrients that drive the plant growth in an aquatic ecosystem. If the ratio of nitrogen to phosphorus is below 17:1 there is potential for blue-green algae to become abundant. These species of algae can create a stressful environment for fish due to disruption of the food web.

The results of selected physio-chemical parameters from Pinnacle Lake are presented in the attached report. Dissolved oxygen, pH, alkalinity, and hardness levels were all in acceptable ranges. The lake had sufficient oxygen (>5.0 ppm) down to 12 feet. The nitrogen to phosphorus ratio is 30:1 on the surface at the dam. This indicates there is low potential for abundant blue-green algae growth during warmer months of the year. Overall, water quality parameters indicate Pinnacle Lake appears to be capable of supporting a healthy fish population.

E. Coli exists in every waterbody naturally. It only becomes a health issue when concentrations are higher than the 235 CFU/100 mL threshold. Currently the concentration is 3 CFU/100mL. This is well below the threshold meaning *E.coli* is not an issue in the lake.

Vegetation

Vegetation observed during the inspection on Pinnacle Lake included coontail, American pondweed, and creeping water primrose. There was also minimal algae present at the end of the coves. Of all the vegetation present, coontail is the biggest concern for the lake. Finding the balance between having vegetation for fish habitat and also not restricting boat or swimming activities is often a challenge for lake managers. In most cases roughly 15-30% of the shoreline containing structure is recommended for fish habitat. This number can vary depending on the complexity of the cover. If there is not enough habitat available fish, they will spend too much time roaming around looking for food instead of saving energy and waiting near a piece of structure for food to swim by. This often results in fish with poor growth and weights. While adding habitat, such as brush piles or artificial structures can be very beneficial for lakes, aquatic vegetation is necessary to support fish populations. Vegetation is preferred by small fish because it has higher complexity, providing more areas for them to hide. Submersed vegetation also produces oxygen in the water which is necessary for all aquatic life and it competes with algae for the same nutrients. Lakes that do not have any vegetation often have large amounts of filamentous algae and blue-green algae blooms in the summer. However, too much submersed vegetation can also have a negative impact on the fish community. Fish fry and young of the year will find too many places to hide and avoid predation leading to over-recruitment and this can potentially develop into a stockpiled population of stunted fish. Maintaining the proper amount vegetation coverage should provide a balance that allows excellent growth potential for fish populations while limiting the numbers below a stockpiled situation.

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Treatment Recommendations

The main nuisance vegetation on Pinnacle Lake is coontail. Coontail is a native plant and the Missouri Department of Conservation often promotes its growth. However, it can be very aggressive and take over if conditions are right. Currently, the coontail is isolated to the upper ends of both coves. Particularly it is most abundant in the west cove. We see two potential options to move forward. The first option is to not treat the lake and keep the current vegetation. The coontail is providing good fish habitat in the area that is not available in most of the lake. Since most of the lake has very steep, rocky banks, there will be limited growth in those areas. The ends of the coves are the only areas that a significant amount of vegetation will be able to grow. To a certain extent these areas need to be protected for fish habitat.

The other option we see is to treat a 4 acre patch in the west arm of the lake. This is where the vegetation is the most dense and causing the most problems with boaters. If you decide to move forward with treatment, we recommend not treating the areas next to the shoreline in order to protect that area for fish habitat. We do not recommend treating a larger area than the highlighted 4 acres. If a larger area of the lake is treated, it may have detrimental consequences to the fish population and the lake. Attached to this document is a map and a treatment proposal. The proposal has a sliding scale based on the area that will be treated. For example, if the 4 acres are treated, it will cost $2,000. Additionally, attached there is a separate proposal to treat the weeds in the beach and on the dam.

Aquatic Control Laboratory (800)-753-LAKE lab@aquaticcontrol.com

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ADVANCED WATER QUALITY ASSESSMENT REPORT

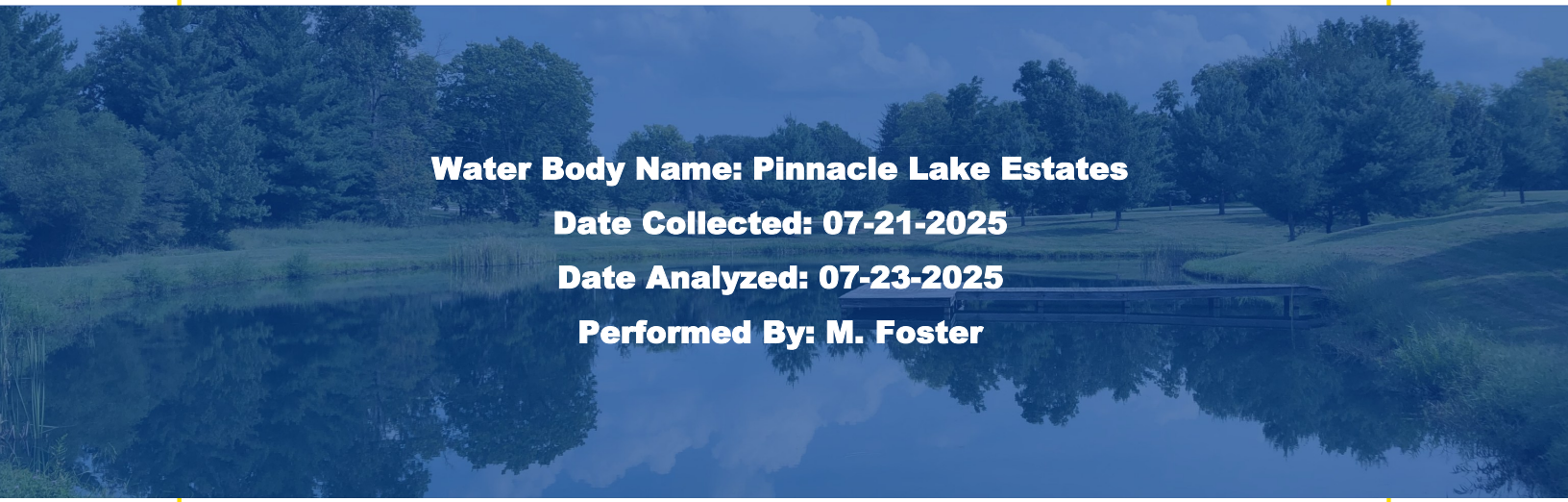
Prepared For:

Pinnacle Lake Estates
102 Skyline Drive
New Florence, MO 63363

Attn: Nikki Mohrmann
(314) 537-6241
mohrmann2007@gmail.com

July 25, 2025

Report # 4106



Water Body Name: Pinnacle Lake Estates

Date Collected: 07-21-2025

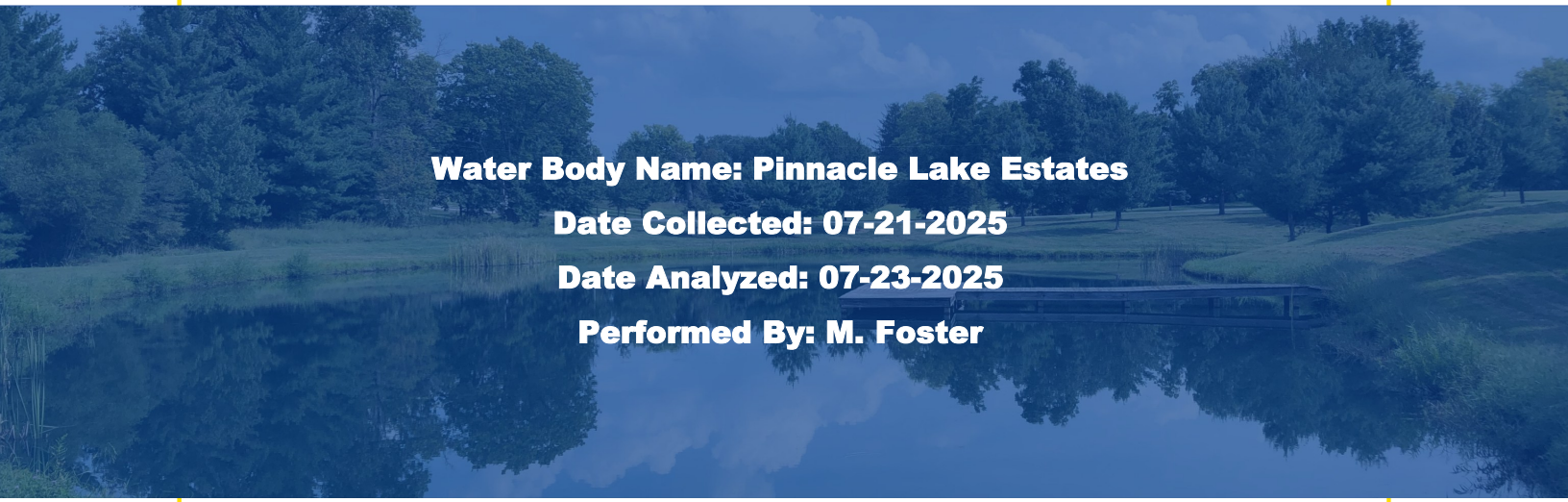
Date Analyzed: 07-23-2025

Performed By: M. Foster

Sample ID: Beach **Sample Depth (feet): Surface**

Sample Type: Grab **Preservative: Chilled/0.2% sulfuric**

Parameter	Value	Reference Page and Section Number for Interpretation of Value
pH (Standard Units [S.U.])	8.20	Page 3 Section 1.1
Alkalinity (mg/L as $CaCO_3$)	144	Page 3 Section 1.2
Hardness (mg/L as $CaCO_3$)	126	Page 3 Section 1.3
Conductivity (µS/cm)	254	Page 4 Section 1.4
Turbidity (NTUs)	0.00	Page 4 Section 1.5
Chlorophyll-a Concentration (ppb; µg/L)	3	Page 4 Section 1.6
Total Phosphorus Concentration (ppb; µg/L)	29	Page 5 Section 1.7
Total Nitrogen Concentration (ppm; mg/L)	0.659	Page 5 Section 1.8
Total Nitrogen: Total Phosphorus Ratio	23:1	Page 5 Section 1.9
Reactive Phosphorus Concentration (ppb; µg/L)	6	Page 6 Section 2.0



Water Body Name: Pinnacle Lake Estates

Date Collected: 07-21-2025

Date Analyzed: 07-23-2025

Performed By: M. Foster

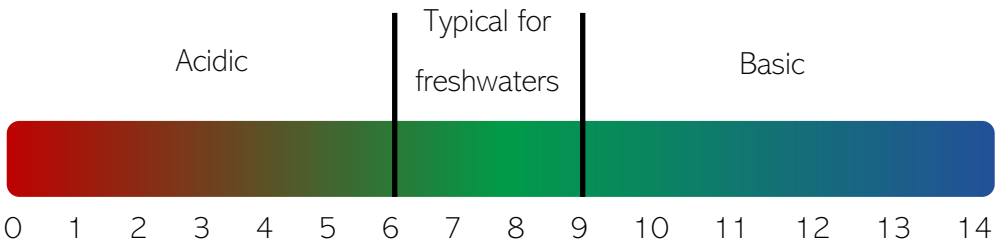
Sample ID: Dam **Sample Depth (feet): Surface**

Sample Type: Grab **Preservative: Chilled/0.2% sulfuric**

Parameter	Value	Reference Page and Section Number for Interpretation of Value
pH (Standard Units [S.U.])	7.73	Page 3 Section 1.1
Alkalinity (mg/L as $CaCO_3$)	138	Page 3 Section 1.2
Hardness (mg/L as $CaCO_3$)	116	Page 3 Section 1.3
Conductivity (µS/cm)	240	Page 4 Section 1.4
Turbidity (NTUs)	0.00	Page 4 Section 1.5
Chlorophyll-a Concentration (ppb; µg/L)	3	Page 4 Section 1.6
Total Phosphorus Concentration (ppb; µg/L)	26	Page 5 Section 1.7
Total Nitrogen Concentration (ppm; mg/L)	0.776	Page 5 Section 1.8
Total Nitrogen: Total Phosphorus Ratio	30:1	Page 5 Section 1.9
Reactive Phosphorus Concentration (ppb; µg/L)	11	Page 7 Section 2.0

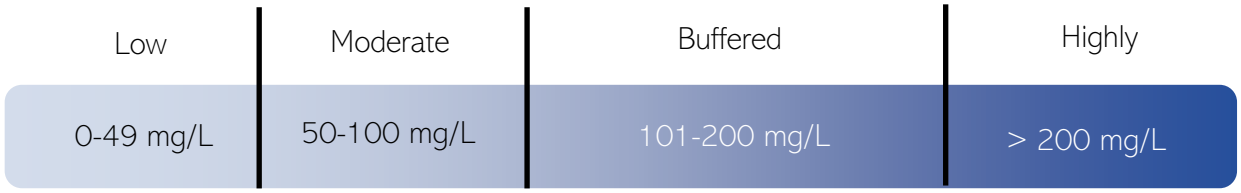
Section 1.1 pH

pH is the measure of how acidic or basic water is, reported in standard units (S.U.). A pH of 7 is neutral, and a range of 6-9 is typical for freshwaters. A pH range of 6.5-9 is required for health and protection of aquatic organisms (i.e. survival, growth, and reproduction), while a range of 6.8-8.2 is preferable.



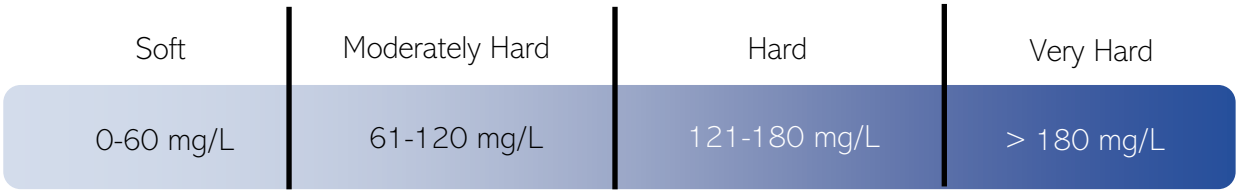
Section 1.2 Alkalinity

Alkalinity is a measure of the buffering capacity of water, reported in "mg/L as calcium carbonate" or parts per million (ppm). Buffering capacity of water describes the capacity of water to resist changes in pH. In other words, waters with lower alkalinity are more susceptible to pH shifts that can occur due to plant and algae growth. An alkalinity of 50-150 mg/L is desirable for fish health and growth.



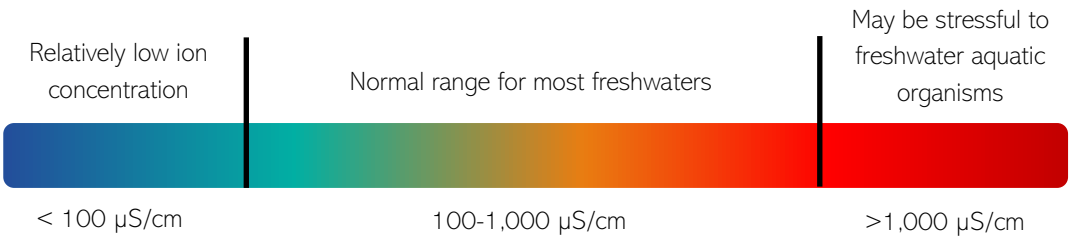
Section 1.3 Hardness

Hardness is a measure of dissolved calcium and magnesium in water, reported in "mg/L as calcium carbonate" or parts per million (ppm). Elevated calcium helps to improve survival of juvenile fish and is necessary for scale and bone formation as well as other metabolic functions. Hardness can also impact herbicide/algaecide efficacy. For fish health, a range of 50-150 mg/L hardness is desired.



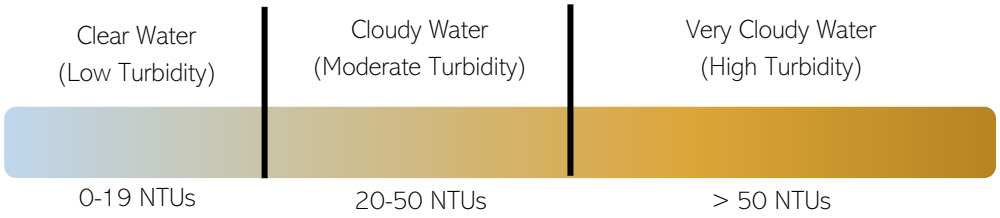
Section 1.4 Conductivity

Conductivity is a measure of water's ability to pass an electrical charge. This is directly related to the concentration of ions in the water. Conductivity is measured in µS/cm. In freshwater bodies, a conductivity greater than 1,000 µS/cm may not be tolerable for fish and aquatic invertebrates.



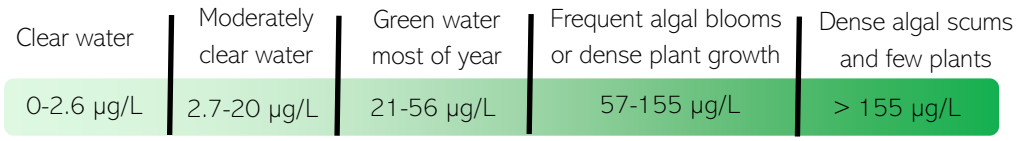
Section 1.5 Turbidity

Turbidity is the cloudiness or haziness of a liquid caused by suspended particles. Sunlight can penetrate deeper into clear water than turbid water. Clear waters will generally grow more submersed vegetation species and experience fewer algae blooms. More turbid waters transmit less light, will grow fewer submersed weeds, but may have problems with planktonic algae blooms and thermal stratification. Turbidity is quantified as NTUs (Nephelometric Turbidity Units) which are used to describe the clarity of water.



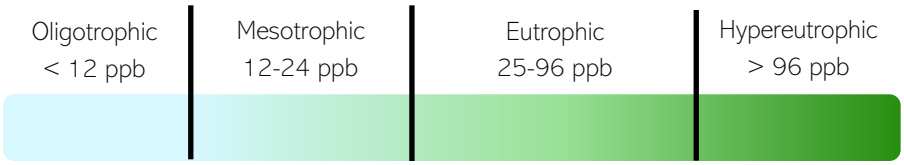
Section 1.6 Chlorophyll-*a*

Chlorophyll-*a* is a pigment produced by plants and algae that is used to conduct photosynthesis. Measurements in water provide an estimate of the amount of planktonic (i.e. free-floating) algae and cyanobacteria present and can serve as a metric of productivity in water at that point in time. For example, chlorophyll-a concentrations of 0-2.6 µg/L are generally correlated with oligotrophic status and clear water. Concentrations between 2.7 and 20 µg/L can correlate with mesotrophic status, which is characterized by moderately clear water for most of the year yet some periods of green color in the water in the summer. Concentrations between 21 and 56 µg/L can correlate with eutrophic status, which is characterized by green colored water for most of the year and potential issues with excessive plant and algae growth. Concentrations between 57 and 155 µg/L can correlate with hypereutrophic status, characterized by frequent dense algal blooms and macrophyte growth. Concentrations more than 155 µg/L are likely to correlate with frequent dense algal scums and few aquatic plants.



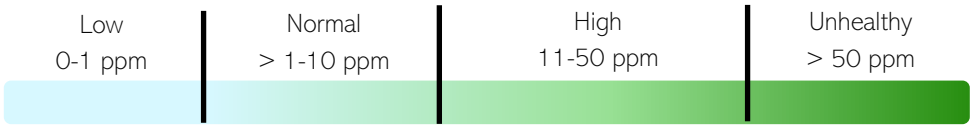
Section 1.7 Total Phosphorus

Phosphorus is an essential nutrient often correlating to algae growth. Total phosphorus (TP) is the measure of all phosphorus in a sample, reported in µg/L (or parts per billion; ppb). Includes phosphorus that is readily available for algae and plant growth and phosphorus that has potential to become available. The total phosphorus concentration in an aquatic system is often correlated with the trophic state of water. *For example, <12 ppb is considered oligotrophic and is often characterized by clear water with little plant or algae growth; 12-24 ppb is considered mesotrophic and is characterized by moderately clear water with some algae; 25-96 ppb is considered eutrophic and is characterized by productive waters with algae and plants; >96 ppb is considered hypereutrophic (highly productive) and is characterized by frequent algal blooms.*



Section 1.8 Total Nitrogen

Nitrogen: Essential nutrient that can enhance growth of algae and plants. Measured as total nitrogen (TN) in mg/L (or parts per million; ppm). Total nitrogen is the combined amount of all forms of inorganic nitrogen (ammonia, nitrite, nitrate) and organic nitrogen (forms found in animal and plant matter). *For reference, < 1 ppm is considered relatively low, 1-10 ppm is considered normal but may support eutrophic to hypereutrophic lake status, >10 ppm is considered high for human consumption and may cause accelerated plant growth; > 50 ppm is unhealthy for lakes.* Nitrogen is usually not a limiting nutrient in aquatic systems, but is often compared to total phosphorus levels to establish a nutrient ratio (see section 1.9).



Section 1.9 Total Nitrogen to Total Phosphorus Ratio

The total nitrogen to total phosphorus ratio (N:P) of water can provide evidence of the potential for growth and types of cyanobacteria or algae that could dominate phytoplankton communities. In general, as N:P increases above 17:1, there will likely be a higher proportion of green algae than of cyanobacteria (i.e. blue-green algae). However, it is important to consider the actual concentrations of the nutrients as well and where they lie within the ranges found in aquatic systems. N:P ratios can be informative as to how nutrient levels could be altered to promote growth of a different type of algal community, as discussed in the table below.

N:P Ratio	Algal Community	Solutions
< 10:1	Blue-green algae may dominate if conditions persist	Phosphorus mitigation and/or aeration
< 17:1	Some green algae during cool seasons	Phosphorus mitigation or aeration
17:1	Balance of green and blue-green algae, favoring green algae	No action likely needed
> 17:1	Some blue-green algae present in warmer seasons, but mostly green algae present	Aeration to oxidize nitrogen more rapidly, bacteria may help. Some P fertilization only if oligotrophic or mesotrophic for fishery
> 29:1	Almost exclusively green algae	Aeration to increase N oxidation rate, bacteria may help reduce N, may need liming and P fertilizing if oligotrophic or mesotrophic for fishery improvement

Section 2.0 Reactive Phosphorus

Reactive phosphorus consists of mostly orthophosphate, which is an inorganic form of phosphorus that is readily utilized by plants and algae. As such, this form of phosphorus is most often the target for phosphorus management products. The goal of these treatments is to decrease the ratio of reactive phosphorus to total phosphorus in eutrophic and hypereutrophic systems, so that the minimal concentrations are available to promote growth of harmful algae or nuisance aquatic weeds. In general, healthy aquatic systems contain about 10% orthophosphate relative to the total phosphorus concentration. We recommend in situ phosphorus management treatments that target orthophosphate only when approximately 20% or more of total phosphorus is in the reactive form in eutrophic and hypereutrophic systems. Aluminum-based products can target all forms of phosphorus and can be used more broadly regardless of the fraction of orthophosphate.

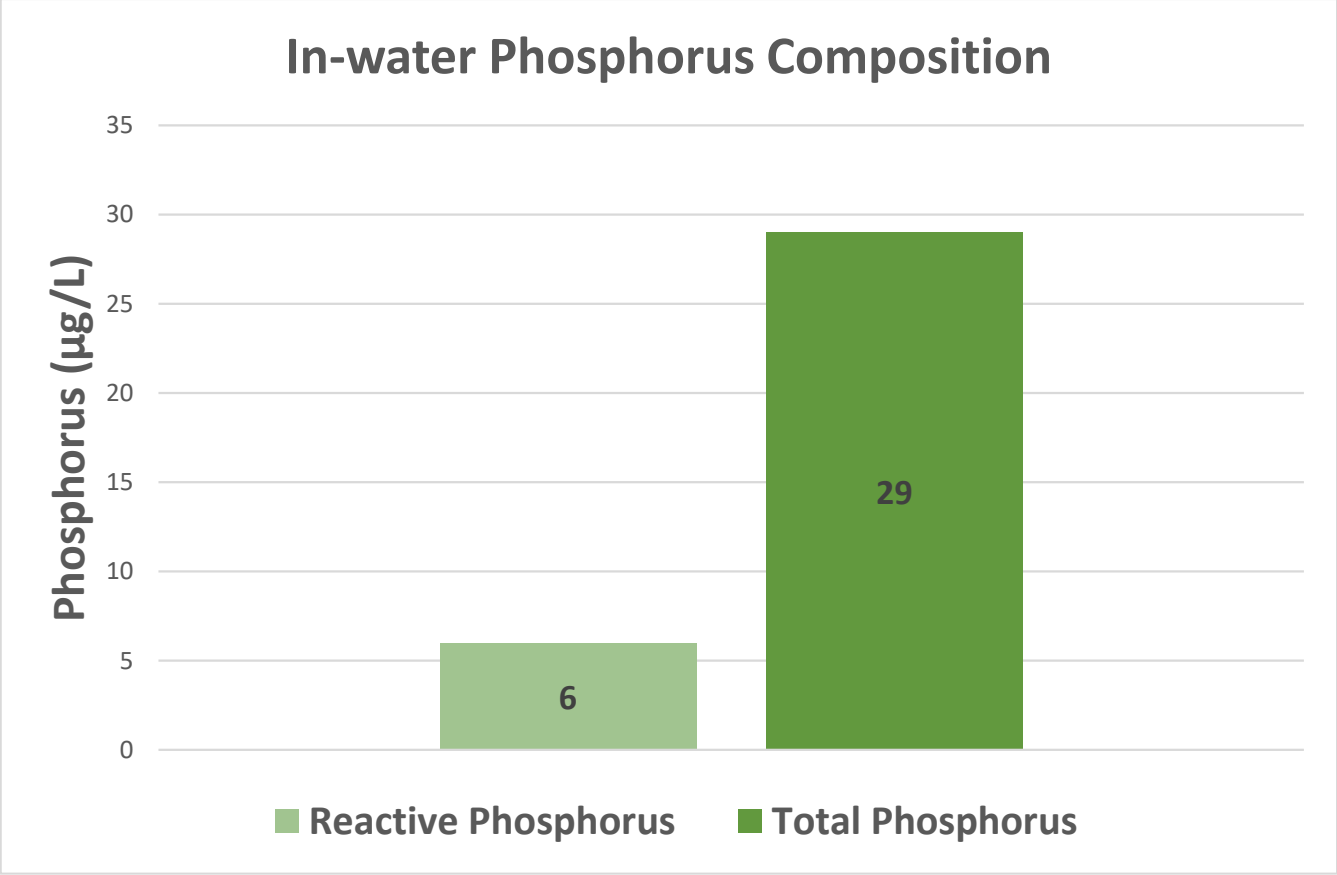


Figure 1. Concentrations of reactive and total phosphorus measured in the submitted sample Beach.

Section 2.0 Reactive Phosphorus

Reactive phosphorus consists of mostly orthophosphate, which is an inorganic form of phosphorus that is readily utilized by plants and algae. As such, this form of phosphorus is most often the target for phosphorus management products. The goal of these treatments is to decrease the ratio of reactive phosphorus to total phosphorus in eutrophic and hypereutrophic systems, so that the minimal concentrations are available to promote growth of harmful algae or nuisance aquatic weeds. In general, healthy aquatic systems contain about 10% orthophosphate relative to the total phosphorus concentration. We recommend in situ phosphorus management treatments that target orthophosphate only when approximately 20% or more of total phosphorus is in the reactive form in eutrophic and hypereutrophic systems. Aluminum-based products can target all forms of phosphorus and can be used more broadly regardless of the fraction of orthophosphate.

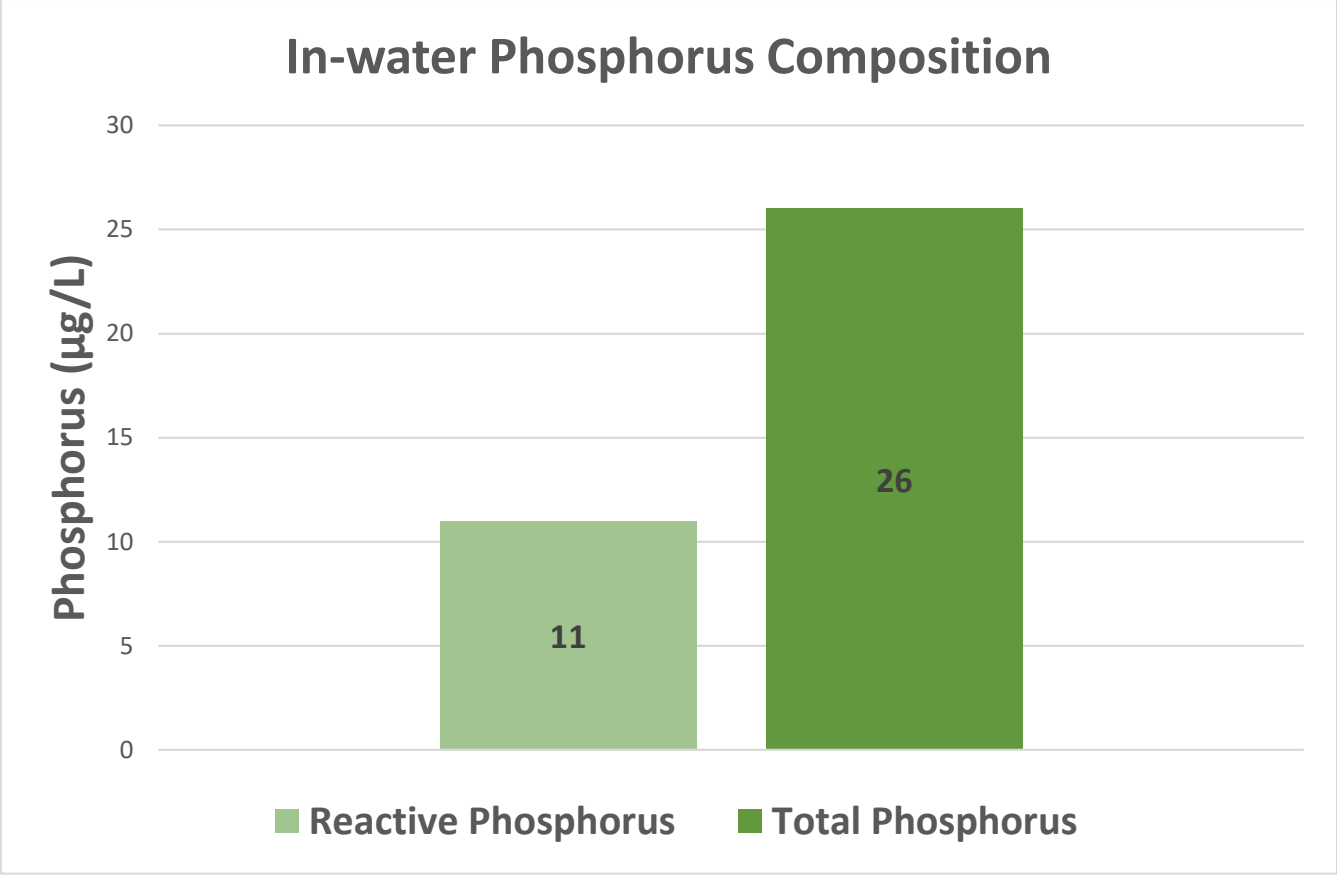


Figure 2. Concentrations of reactive and total phosphorus measured in the submitted sample Dam.

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E. COLI ENUMERATION REPORT

Prepared For:

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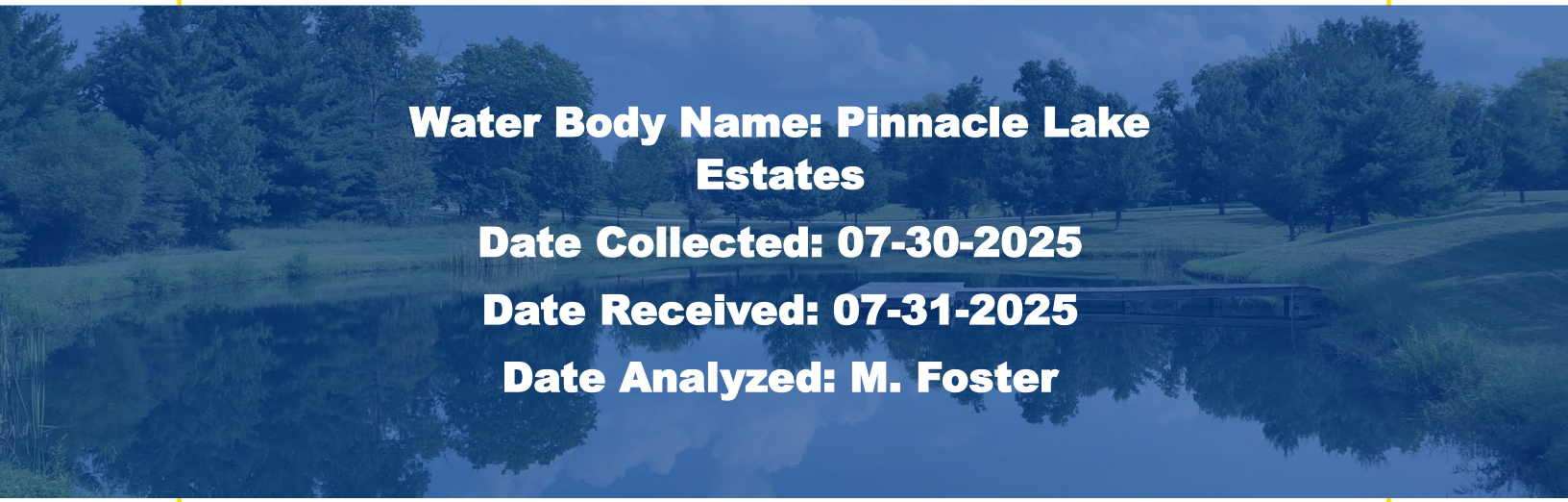
August 1, 2025

Report # 4141

Aquatic Control Laboratory (800)-753-LAKE lab@aquaticcontrol.com



Water Body Name: Pinnacle Lake Estates

Date Collected: 07-30-2025

Date Received: 07-31-2025

Date Analyzed: M. Foster

Sample ID: Pinnacle Lake Estates
Time collected: A.M. 07-30-2025
Time received: 11:30 A.M. 07-31-2025
Time analysis started: 1 P.M. 07-31-2025

Sample Depth (feet): Surface
Sample type: Grab
Preservative: Chilled (< 10 C)

Method: Colilert (IDEXX); US EPA approved method

Results

Parameter	Most Probable Number (CFU/100 mL)	Recreational advisory*	Reference Page and Section Number for Interpretation of Value
Total Coliforms	435.2	NONE	Page 2 Section 1.1
E. coli	3.1	NONE	Page 2 Section 1.2

*The USEPA has minimum surface water quality standards for levels of *E. Coli* when water is being used for full body contact recreation. A single sample with *E. Coli* levels exceeding 235 CFU/100 mL is considered a potential health risk for recreational activities like swimming. If a sample exceeds this value, we recommend more frequent testing (e.g., weekly) to determine the geometric mean of the data over 30 days. See page 2, section 1.2 of this report for more information.

Note: The data presented here pertain to water samples collected at the specified site on the collection date stated in this report. These data are not to be used for reporting to regulatory agencies unless samples have been collected and received in accordance with regulatory compliance protocols. Please contact us for more information.

Section 1.1 Total Coliforms

Total Coliforms are a large group of various species of bacteria that share the ability to grow rapidly in waters. This classification includes both fecal and non-fecal coliform bacterial sources. Total coliform testing is used to identify potential sources of contamination. While the presence of total coliform bacteria does not necessarily indicate an immediate health risk, it can suggest that the water may be vulnerable to contamination by more harmful pathogens.

Section 1.2 *E. coli*

E. coli *(Escherichia coli)* is one of the most common species of fecal coliform bacteria. Fecal coliforms are bacteria that are found naturally in the intestines of warm-blooded organisms such as humans, waterfowl, and livestock. *E. coli* is used as an indicator organism for fecal contamination because it is easily cultured. If sewage is present in water, pathogenic or disease-causing organisms may also be present. *E. coli* is enumerated in colony forming units (CFU) utilizing the statistical method "most probable number" which estimates the concentration of microorganisms in a sample. Recreation and swimming are not recommended when single samples are above 235 CFU/100 mL. In routine sampling, it is recommended to track a geometric mean of at least 5 samples over 30-day periods. The USEPA recommends using a geometric mean of 126 CFU/100 mL as a guideline for recreational advisories.