



---

## Westcolang Lake

### *2025 Temperature Dissolved Profile Water Quality Report*

Lackawaxen County, PA

September 26, 2025  
Westcolang Lake  
Conservancy  
Hawley, PA 18428

---

**YEAR END WATER QUALITY REPORT  
2025 WATER QUALITY ASSESSMENT  
WESTCOLANG LAKE**

---

During the late growing season of 2025 at Westcolang Lake, SŌLitude Lake Management was contracted to perform the weekly documentation of temperature and dissolved oxygen profiles within the basin. These once-per-week visits were conducted from August 15<sup>th</sup> through September 3<sup>rd</sup>. The following report includes highlights of the profile data. Recommendations for future lake management strategies are included based on observations from the 2025 visits.



### **Background information and Methods**

Temperature/Dissolved Oxygen (DO) profiles provide crucial insights into the physical and chemical dynamics of the water column. This profile is typically obtained by collecting data at multiple depths throughout the lake. Both readings are collected using a calibrated probe, specifically a YSI Pro20 Meter with a 50-meter-long cable.

The methodology involves lowering the probe or sampling device at predefined intervals (for this project, every two-feet) from the lake surface to the bottom, ensuring representative sampling across different depths and locations. Temperature variations reveal stratification patterns within the water column, identifying distinct layers such as the epilimnion (warm surface layer), metalimnion (thermocline), and hypolimnion (cold bottom layer) during stratified periods. Dissolved Oxygen levels are critical indicators of lake health, with variations influenced by photosynthesis, respiration, and the decomposition processes. Low DO levels can indicate oxygen

depletion due to organic matter decomposition or nutrient enrichment, impacting aquatic organisms and overall ecosystem function.

The significance of Temperature/Dissolved Oxygen profiles lies in their ability to assess lake stratification, thermal habitat availability, and oxygen availability. All three are critical factors for aquatic life, particularly fish and the macroinvertebrates they feed on. These profiles also inform management strategies for nutrient loading and aquatic vegetation control. For example, understanding thermal stratification dynamics can guide the timing of herbicide applications to target invasive species effectively while minimizing impacts on native flora and fauna.

DO profiles also play crucial roles in shaping the distribution, growth, and health of aquatic vegetation. As previously indicated, temperature directly influences metabolic rates, photosynthesis, and respiration of aquatic plants. Warmer temperatures can enhance photosynthesis, leading to increased growth rates of some aquatic vegetation species, but can also increase respiration rates and nutrient uptake, potentially leading to oxygen depletion. Cooler temperatures, on the other hand, may limit plant growth but help maintain higher DO levels due to increased oxygen solubility. The stratification of water bodies, where warmer, oxygen-rich surface layers are separated from cooler, oxygen-poor deeper layers, can create distinct habitats and influence which plant species thrive in different zones. Understanding temperature profiles also help predict seasonal growth patterns and the spatial distribution of aquatic plants.

Additionally, a multiprobe meter equipped with a sensor for Chlorophyll *a* concentrations and a Secchi disk were also used during each weekly visit. The multiprobe sensor, known as an In-Situ AquaTroll 500, was deployed at the surface of the basin for 30 seconds. Those readings were then averaged for the final Chlorophyll *a* concentration result used in the Trophic State Index below. Water clarity was measured utilizing a black and white patterned Secchi disk on a rope marked at every one-foot increment. The disk is lowered off the side of the boat until the white markings are no longer visible. The clarity reading is then taken at the surface of the water where it meets the marked rope. However far down the disk traveled before it could no longer be seen, is the measurement of water clarity.

### **Trophic State Index:**

Trophic State Index, developed by R.E. Carlson and J. Simpson (1996, A Coordinator's Guide to Volunteer Lake Monitoring Methods), combines three water quality parameters, chlorophyll *a*, Secchi depth, and total phosphorus (not measured in this project). These readings are used to assist with the identification of the average type of biological productivity in a lake system (Carlson and Simpson, 1996). Biological productivity in a lake can fall under four categories: oligotrophic, mesotrophic, eutrophic, and hypereutrophic. The desired productivity systems being oligotrophic and mesotrophic. The use of TSI is an attempt to make evaluating biological productivity easier to understand. These values fall within specific ranges to determine the trophic status of any

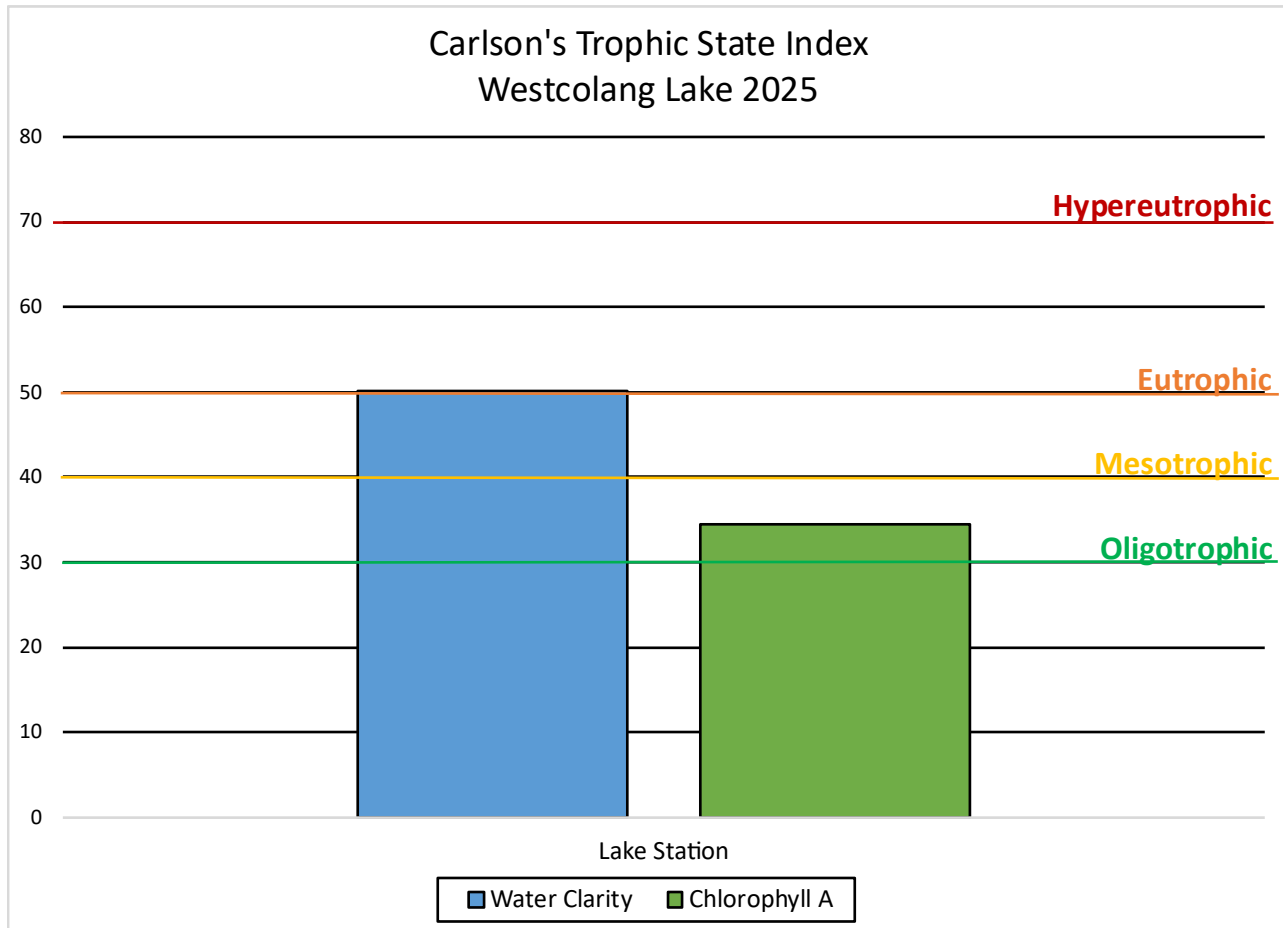
freshwater basin: oligotrophic (30-40 TSI), mesotrophic (40-50 TSI), eutrophic (50-70 TSI), and hypereutrophic (70+ TSI).

This year at Westcolang Lake, TSI values for water clarity fell in the eutrophic zone, which is considered poor. Chlorophyll *a* levels at the Lake Station would be considered moderately oligotrophic, which is good overall. The collection of total phosphorus samples in the future will help aquatic biologists get a better understanding of the entire Trophic State Index at Westcolang Lake.

Table 1: Westcolang Lake TSI Results

Site Name	Water Clarity	Chlorophyll <i>a</i>
Lake Station	50.15	34.51

Figure 1: Westcolang Lake Trophic Index



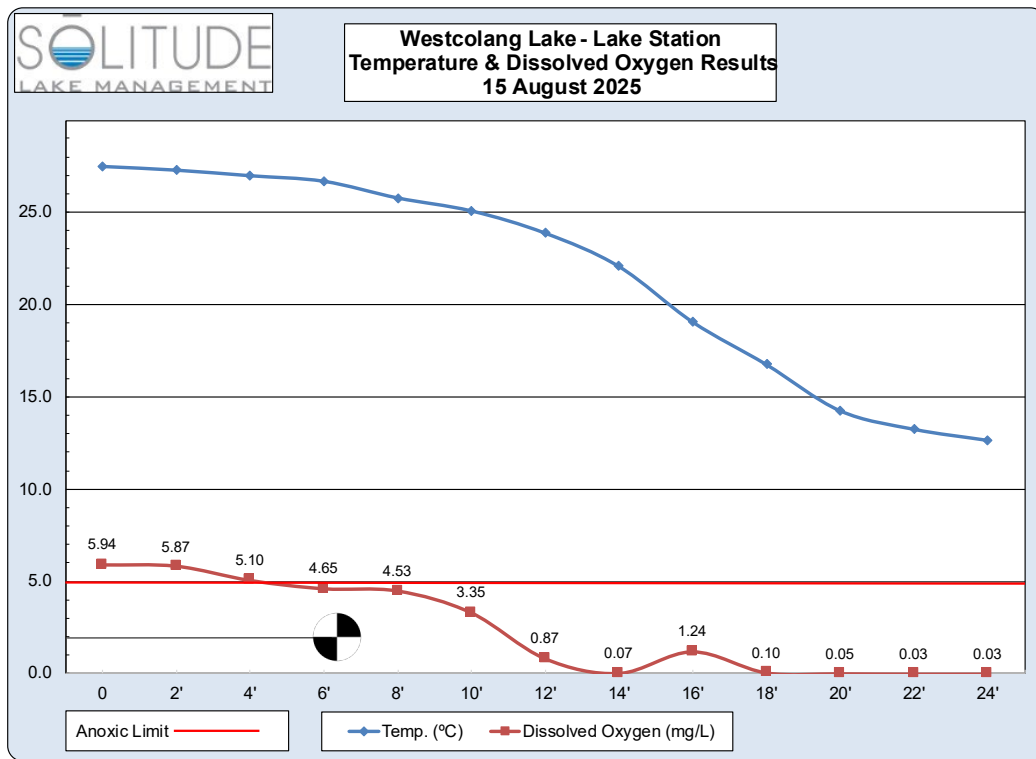
## Dissolved Oxygen Profile Description

**Table 2. Westcolang Lake Dissolved Oxygen Profiles**

Depth	8/15/2025		8/22/2025		8/28/2025		9/3/2025	
	Temp	DO	Temp	DO	Temp	DO	Temp	DO
Surface	27.5	5.94	23.3	5.97	22.1	6.65	22.1	6.78
2 Feet	27.3	5.87	23.1	5.86	22.0	6.55	22.0	6.71
4 Feet	27.0	5.10	22.9	5.79	22.0	6.58	21.4	6.75
6 Feet	26.7	4.65	22.8	5.88	22.0	6.45	21.1	6.49
8 Feet	25.8	4.53	22.7	5.71	22.0	6.28	20.9	6.23
10 Feet	25.1	3.35	22.6	5.36	21.9	6.48	20.7	4.96
12 Feet	23.9	0.87	22.4	5.72	21.8	6.49	20.5	4.28
14 Feet	22.1	0.07	21.6	2.30	21.7	6.35	20.4	3.54
16 Feet	19.1	1.24	19.3	0.46	21.1	5.56	19.9	1.66
18 Feet	16.8	0.10	16.4	0.41	18.2	1.15	18.9	0.09
20 Feet	14.3	0.05	14.2	0.37	15.9	0.70	15.9	0.07
22 Feet	13.3	0.03	13.3	0.34	15.8	0.50	15.1	0.05
24 Feet	12.7	0.03	12.6	0.30	15.8	0.50	15.0	0.03

During the four visits to the basin, there was a moderate fluctuation in surface water temperature between the first and second visits. After the second visit, the surface water temperature remained the same. The lowest reading was recorded on August 28<sup>th</sup> at 22.1°C. The highest water temperature reading was noted on August 15<sup>th</sup> at 27.5°C. This was a 5.4°C difference from the lowest temperature. The internal water temperature of freshwater lakes typically follows this trend as water temperature is generally proportional to air temperature throughout the season.

Dissolved oxygen levels were lower than the average basin as readings ranged from 6.78mg/L to 0.03 mg/L, while the ideal range for freshwater ecosystems in the summer is 7.00 mg/L to 9.00 mg/L. In a healthy aquatic habitat, dissolved oxygen typically increases with increasing water depth and the decline of water temperature. Therefore, colder water temperatures can hold a greater dissolved oxygen content. Anaerobic conditions (low dissolved oxygen) allow nutrients to dissolve into the water column more readily and can cause excessive photosynthetic growth throughout the season, such as harmful algal blooms. A well aerated basin can increase beneficial bacteria which increases the decomposition rate of organic material. This allows the decrease of muck build up at the bottom of a basin during the growing season as well as improve oxygen levels for fish and other aquatic species.



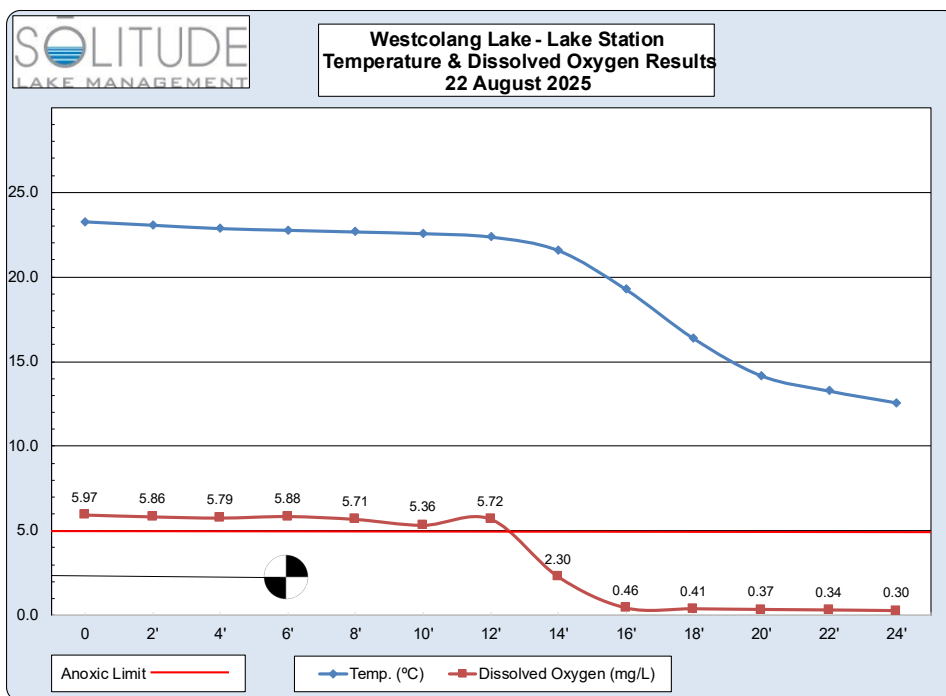
The first provided DO profile reveals important aspects of the aquatic environment's vertical structure. The temperature remains relatively constant with a slight decrease starting at the two-foot depth down to the six-foot depth, indicating a well-mixed upper layer. However, at 18 feet, the temperature decreases significantly by 2.3°C. Below this, there is a gradual decrease in temperature to 12.7°C at 24 feet. This temperature decline suggests a thermocline, a layer where the temperature gradient is steeper, usually due to reduced mixing and the differential heating of the water column.

The DO profile shows low dissolved oxygen levels throughout the water column, with a significant decrease in DO concentration as the depth increases. The readings peak at 5.94 mg/L at the surface before significantly decreasing to 0.07 mg/L at 14 feet. The lowest DO observed was between 22 and 24 feet at 0.03 mg/L. The lower DO concentrations at greater depths are indicative of a severe lack of mixing throughout the water column. This profile suggests a very high biological oxygen demand (BOD) or decomposition in the deeper layers, as DO levels remain very low. The dissolved oxygen readings from August 15<sup>th</sup> revealed a stratified lake.

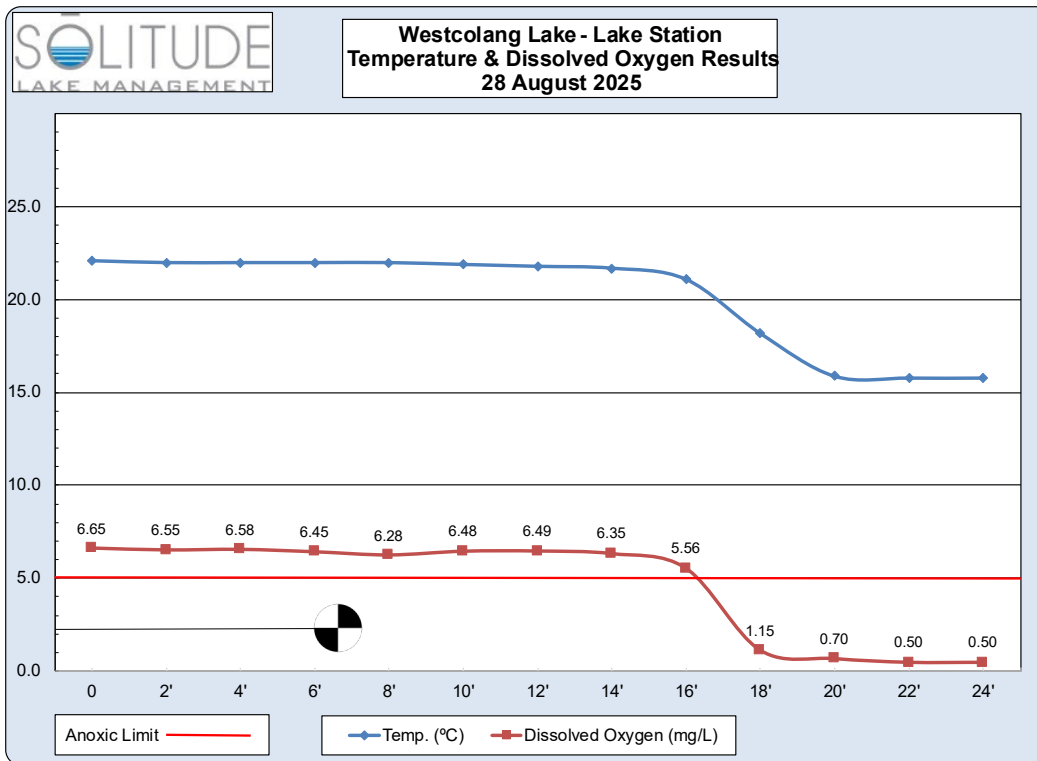
Freshwater fish species have varying temperature and oxygen requirements. The more oxygenated upper layers (0-8 feet) with a stable temperature of around 27.5°C can support warm-water fish species, such as bass and sunfish. These conditions are ideal for feeding, breeding, and overall health. However, despite being more oxygenated near the surface, the DO levels below 4

feet are below the minimum of 5.0 mg/L for cold-water and warm-water fish. And the deeper, cooler waters with even lower DO levels (down to 0.03 mg/L) are unfavorable for cold-water fish species, such as trout and bluegills, which require higher oxygen concentrations.

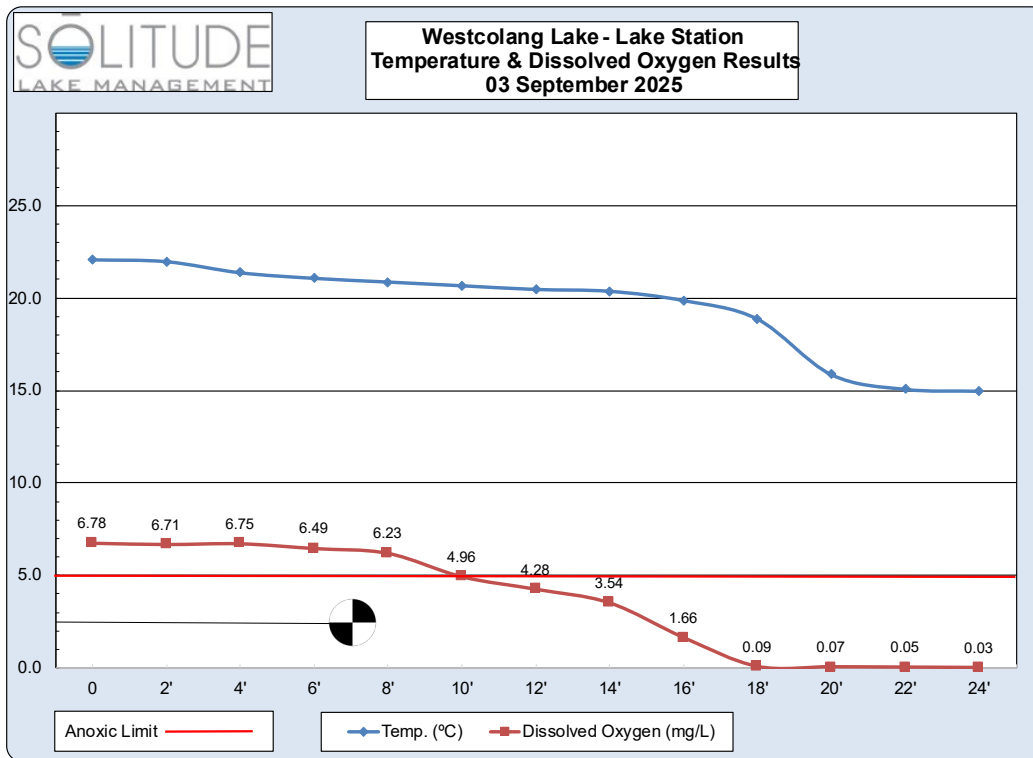
Invertebrates and microorganisms also may be impacted from these conditions. Low DO levels cannot support aerobic microbial processes, which are essential for nutrient cycling and organic matter decomposition. Benthic invertebrates, such as insect larvae and crustaceans, thrive in oxygen-rich environments and contribute to the food web by serving as prey for fish and other animals. The presence of low DO levels at depth also suggests anoxic conditions, increasing the risk of harmful anaerobic processes that can produce toxic substances like hydrogen sulfide.



On August 22<sup>nd</sup> at Lake Station, the water temperatures steadily decreased from the surface to the 16-foot mark. At 18 feet, the temperature dropped significantly to 16.4°C, which indicates the thermocline. The highest reading observed during this sampling event was at the surface at 23.3°C. The surface temperature had decreased by about 4.2°C from the first sampling event. The lowest water temperature was recorded at around 24 feet at 12.6°C, which is only 0.1°C lower than the previous sampling event. Dissolved oxygen readings during this sampling event fluctuated between 5.97 mg/L at the surface down to 5.72 mg/L at 12 feet before becoming completely anoxic. Compared to the first sampling event where anoxic conditions started at six feet, this profile revealed a slight improvement since August 15<sup>th</sup>, with anoxic conditions starting at 14 feet. However, surface readings were just above the minimum dissolved oxygen requirements to be anoxic.



On August 28<sup>th</sup> at Lake Station, surface water temperatures gradually decreased down the water column until dropping by 3.9°C at the thermocline at 18 feet. The highest reading observed during this sampling event was at the surface at 22.1°C. When compared to the August 22<sup>nd</sup> sampling event, the surface water temperature only decreased by 1.2°C. The lowest water temperature was recorded at 22 feet at 15.8°C, which is 3.2°C higher than the previous sampling event. Dissolved oxygen readings during this sampling event fluctuated between 6.65 mg/L at the surface to 5.56 mg/L at 16 feet before becoming completely anoxic. Compared to the previous sampling events, this profile revealed dissolved oxygen improvements down the water column, with anoxic conditions starting at 16-18 feet. This sampling event observed the first DO readings above 6.0 mg/L.



On September 3<sup>rd</sup>, the surface water temperatures were around the same as the previous sampling event. Starting at 22.1°C, surface temperatures slightly decreased until dropping by 6.2°C at the thermocline at 20 feet. The thermocline had shifted since the previous sampling event due to the start of cold weather seasonal changes. The lowest water temperature was recorded at around 24 feet at 15.0°C, which is only 0.8°C lower than the previous sampling event. Dissolved oxygen readings during this sampling event fluctuated between 6.78 mg/L at the surface and 6.23 mg/L at 8 feet before becoming anoxic at 10 feet. Compared to the previous sampling event where anoxic conditions started at 16-18 feet, this profile revealed a steadier decline in dissolved oxygen down the water column.

## **DISCUSSION**

Westcolang Lake is a thriving recreational lake with a supportive surrounding community. Through programs such as water quality monitoring, aquatic plant control treatments, as well as algae control treatments, a suitable habitat can be maintained for local wildlife and fish populations. It is always a challenge to manage an ecosystem under a restrictive budget and a myriad of changing conditions (such as regional weather, storm events, etc.). However, a yearly management program can assist with achieving the goals of a healthy basin.

From time to time, the balance will shift within a basin; but these shifts tend to be temporal when actively managed with a comprehensive lake management program. Prime examples of these shifts would be the colonization of native submersed plants, emergent plant growth (native cattails or

pickereelweed), as well as increased unicellular and filamentous algae populations. Other changes within the basin can also include the nutrient load suspended in the water column such as total phosphorus, nitrate, or ammonia. Year-to-year adjustments to the lake management program can maintain the aesthetics and biological integrity of the lake ecosystem within proposed budgets.

We highly recommend the continuation of the current temperature and dissolved oxygen profile program with the adjustment of twice per months visits starting in March and ending in November. As this will allow SŌLitude Lake Management to better understand the basin’s vertical structure during seasonal changes. For the 2026 management season, the addition of a water quality program is recommended to better understand the overall nutrient load and water chemistry of the basin. Water quality sampling events for the parameters below are recommended to take place once per month at four sampling stations within the basin (Lake Station, Inlet Pipe, North Beach, South Station. See Appendix A for Sampling Location Map.) as well as parameters taken in-situ. Additionally, E. coli and fecal coliform testing is recommended once per month at North Beach to identify and monitor the bacterial issues. In 2026, we also recommend once per month algal and zooplankton sampling to fully understand the base food chain changes within Westcolang Lake. All of these parameters will allow us to monitor the overall health of the basin throughout the growing season.

	Lake Station	South Station	Inlet Pipe	North Beach
	Ammonia	Ammonia	Total Metals, Iron	Ammonia
	Total Kjeldahl Nitrogen (TKN)	TKN	Ammonia	TKN
	Total Phosphorus	Total Phosphorus	TKN	Total Phosphorus
	Total Suspended Solids (TSS)	TSS	Total Phosphorus	
	Biological oxygen demand	Biological oxygen demand		

Currently with our limited knowledge of Westcolang Lake, a submersed aquatic vegetation survey is recommended. The data collected from a mid-summer survey will allow us to better understand the current population of macrophytes within the basin. This data would then be presented in a Year End Report with all species listed, their densities observed at the time of the survey, and their GPS-recorded locations. This data would then be converted into professional ARC GIS maps generated by our in-house GIS Coordinator to then be used for future management efforts by SŌLitude Lake Management on Westcolang Lake.

Although chemical treatment was not the objective throughout the season, SŌLitude Lake Management recommends a change of management plan should be considered. The use of Diquat based herbicides to treat large, dense portions of a basin at once creates the risk of oxygen depletion. Diquat is fast-acting and kills the parts of the plant it directly touches, causing rapid

decomposition and poses a risk to non-target species. Decomposition consumes oxygen throughout the water column as the plant breaks down, which can result in decreased dissolved oxygen throughout the water column. Copper-based herbicide is a good option for non-rapid control of aquatic plants and algae. This type of herbicide also generates slower decomposition time, which allows more oxygen to be available in the water column.

Finally, we recommend conducting a SedDox Max treatment in 2026 to increase the amount of oxygen in the basin, introduce inorganic carbon to rebalance the nutrient ratio, and bind any excess phosphorus. Since low dissolved oxygen is one of the major issues at Westcolang Lake, it is one of the biggest factors that can negatively affect the flora and fauna that inhabit the basin. During all four sampling events in 2025, dissolved oxygen levels at Westcolang Lake were either lower than the minimum levels required for biota or just above the minimum. SedDox Max stimulates microbial activity and releases oxygen into the water while improving overall water quality. For mechanical methods of oxygen introduction, SŌLitude Lake Management offers a variety of different aeration units (electrical or solar) that can be installed and will continue to work throughout the winter.

SŌLitude Lake Management would like to thank Westcolang Lake Conservancy for allowing us to provide quality lake management consulting and water quality monitoring, and we look forward to providing our services for the 2026 lake management season.

Sincerely,

*Kat Grubic*

**Kat Grubic**

Aquatic Biologist

The logo for SŌLITUDE LAKE MANAGEMENT features the word "SŌLITUDE" in a large, grey, sans-serif font. The letter "O" is replaced by a stylized blue and white wave icon. Below "SŌLITUDE" is the phrase "LAKE MANAGEMENT" in a smaller, grey, sans-serif font.

D: 908-619-9332 P: 888-480-5253

[www.solitudelakemanagement.com](http://www.solitudelakemanagement.com)

## **2026 Outline of Recommended Lake Management Services: Westcolang Lake**

### **March**

Water Quality Monitoring/Site Survey (2)  
Algae Identification and analysis  
Zooplankton Identification and analysis

### **April**

Water Quality Monitoring/Site Survey (2)  
Algae Identification and analysis  
Zooplankton Identification and analysis

### **May**

Water Quality Monitoring/Site Survey (2)  
Algae Identification and analysis  
Zooplankton Identification and analysis

### **June**

Water Quality Monitoring/Site Survey (2)  
Algae Identification and analysis  
Zooplankton Identification and analysis

### **July**

Water Quality Monitoring/Site Survey (2)  
Algae Identification and analysis  
Zooplankton Identification and analysis

### **August**

Water Quality Monitoring/Site Survey (2)  
Submersed Aquatic Vegetation Survey  
Post-Sedox Treatment Sampling  
Algae Identification and analysis  
Zooplankton Identification and analysis

### **September**

Water Quality Monitoring/Site Survey (2)  
Algae Identification and analysis  
Zooplankton Identification and analysis

### **October**

Water Quality Monitoring/Site Survey (2)  
Algae Identification and analysis  
Zooplankton Identification and analysis

### **November**

Water Quality Monitoring/Site Survey (2)

Algae Identification and analysis  
Zooplankton Identification and analysis

## **APPENDIX**

**APPENDIX A: RECOMENDED WATER QUALITY SAMPLING MAP**

**APPENDIX B: WATER QUALITY PARAMETER DESCRIPTIONS**

**Appendix A: Westcolang Lake 2026 Recommended Water Quality Sampling Sites**



## Appendix B: Water Quality Parameters

### Temperature

Temperature is measured in degrees Celsius and is very important to aquatic biota. Several factors affect temperature in a lake system, including air temperature, season, wind, water flow through the system, and shade trees. Turbidity can also increase water temperature as suspended particles absorb sun rays more efficiently. Water depth also affects temperature. In general, deeper water remains cooler during the summer months.

Temperature preferences vary among aquatic biota. Since water temperature typically varies between 5 °C and 30 °C during the season, most aquatic biota can flourish under this wide range of temperatures. Of more concern is thermal shock, which occurs when temperature rapidly changes in a short amount of time. Some aquatic biota can become stressed when temperature changes as little as 1-2 °C in a 24 hour period.

### Dissolved Oxygen

Dissolved Oxygen is the measurement of the amount of oxygen freely available to aquatic biota in water. Several factors play a role in affecting the amount of dissolved oxygen in the water. These factors include temperature (warmer water holds less dissolved oxygen), low atmospheric pressure (such as higher altitude) decreases the solubility of oxygen, mineral content of the water can reduce the water's dissolved oxygen capacity, and water mixing (via wind, flow over rocks, or thermal upwelling) increases dissolved oxygen in the water. In addition, an over-abundance of organic matter, such as dead algae or plants causes rapid aerobic bacteria growth. During this growth, bacteria consume oxygen during respiration, which can cause the water's dissolved oxygen to decrease.

Dissolved oxygen has a wide range, from 0 mg/L to 20 mg/L. To support diverse aquatic biota, 5 mg/L is minimally required, but 9-10 mg/L is an indicator of better overall water quality. Dissolved oxygen reading of below 4 mg/L is stressful to most aquatic organisms, especially fish.

### Water Clarity

Transparency (or visibility) is measured with a Secchi disc and can provide an experienced biologist with a quick determination of a lake's water quality. In short, higher visibility indicates a cleaner (and healthier) aquatic system. Cloudy conditions could indicate nutrient rich sediments entering the lake or excessive algal blooms due to nutrient availability, leading to a degradation of water quality.



Clear conditions allow greater light penetration and the establishment of a deeper photic zone. The photic zone is the depth of active photosynthesis carried out by plants and algae. A byproduct of photosynthesis is dissolved oxygen, required for use by higher aquatic organisms, such as zooplankton and fish.

## **Chlorophyll *a***

Chlorophyll is the green pigment in plants used to create energy from light. By measuring the chlorophyll content of a lake, one can indirectly measure the amount of photosynthesizing algae present. Chlorophyll *a* is the measure of the portion of pigment that is still actively respiring and photosynthesizing at the time of sample collection. Factors that affect algae (such as sunlight, wind, temperature, and nutrients) likewise affect chlorophyll *a* concentrations. Chlorophyll *a* is a trophic status indicator. In general, chlorophyll *a* levels exceeding 8 µg/L indicate eutrophic conditions, while levels between 2 and 8 µg/L indicate mesotrophic conditions. Levels below 2 µg/L indicate oligotrophic conditions.