

# MEMBERS SUMMARY – 2020 LAKE SAMPLING EVENT #4 PERFORMED BY PRINCETON HYDRO, SEPTEMBER 14, 2020



**BACKGROUND:** The Water Quality Committee (WQC) recommended to the LLPOA Board retaining a professional lake advisor to guide the management of Lake Latonka to support the desired broad range of uses, including swimming, boating, water skiing, fishing, and aesthetics. After an extensive review of potential advisor firms and evaluation of proposals, the Board accepted the WQC’s recommendation and retained Princeton Hydro (PH) to serve as our community’s professional lake advisor. Their services will include 15 specific tasks focused on fully understanding the lake’s water quality throughout the primary recreation season, culminating with a lake management plan. Over the course of the summer, PH will be conducting five sampling events that also will include observations by the Project Manager/Senior Limnologist (fresh water pond/lake scientist).

The aerial image to the left shows the locations where PH is sampling during each of the five sampling events (2 Inlet stations, 3 Lake stations + 1 Beach station, and 1 Outlet station).

## SUMMARY OF SAMPLING EVENT #4 – SEPTEMBER 14, 2020:

### In-Situ (In-place) Sampling

Clarity – Clarity remained similar to August. Clarity was greatest at L-3 at 3’, and was 2.3’ and 2.0’ at L-1. The desired threshold value is 3.3’.

Thermal Stratification - Thermal stratification prevents water mixing and negatively impacts dissolved oxygen at depth. The Lake exhibited little thermal stratification in September. At the deepest station, L-3, the surface water temperature was 72.6°F, while the temperature at 24.6’ deep was 66°F. There was no stratification at L-1 and L-2.

Dissolved Oxygen (DO) – Aquatic organisms require oxygen dissolved in the water for survival. PH suggests a minimum 4 mg/l to sustain the warm-water fish in our lake. At L-3, DO was over 7 mg/l in the upper 20 feet. However, below 23’ the DO was less than PH’s suggested 4 mg/l and less than 1 mg/l (anoxic, promoting internal phosphorus loading) within the bottom 3’. DO concentrations at L-2 were below the 1 mg/l anoxic threshold in the bottom 1.4’. DO concentrations at L-1, the shallow station, were above the recommended minimum thresholds.

pH – The lake went from slightly acidic in June, consistent with low early-season rates of algal productivity to basic (increasing photosynthesis generally leads to basic water conditions with pH > 7.0). September’s pH’s ranged from 7.61 to 8.79 and was higher near the surface.

### Laboratory Water Quality Results

Chlorophyll a – Chlorophyll is the pigment plants use to convert sunlight to energy. Chlorophyll a is the primary photosynthetic pigment in algae and is an indicator of algal biomass. PH typically recommends that this value remain below 20 µg/l. Measured results ranged from a minimum of 37µg/l to a maximum of 70 µg/l. Overall, measures were the highest measured in 2020 and indicative of a eutrophic to hypereutrophic system (i.e. high algal productivity).

Total phosphorus (TP) – TP includes inorganic, organic, dissolved and particulate forms of phosphorus. In freshwater ecosystems like our lake, TP (as opposed to Nitrogen) typically controls the amount of vegetative and phytoplankton growth. PH recommends TP concentrations in natural lakes to remain below 0.03 mg/l to preclude nuisance algal growth, especially blue-green algae. In man-made lakes, such as ours, an initial threshold value of 0.05 mg/l is somewhat acceptable given larger tributary areas and agricultural runoff. TP concentrations were consistent with August. The highest value was in the deep waters of L-3 at 0.11 mg/l and lowest in the surface and mid-depth of the same station at 0.06 mg/l. Mean TP concentration of the lake samples was 0.08 mg/l. Inlet stations met the PH's recommended values.

Soluble Reactive Phosphorus (SRP) – SRP is the dissolved, inorganic portion of phosphorus which is most readily assimilated by algae for growth. PH recommends that SRP concentrations remain below 0.005 mg/l. In September, all SRP values were below the detection limit of 0.002 mg/l.

Nitrogen Compounds (Ammonia [NH<sub>3</sub>] and Nitrates [NO<sub>3</sub>]) – Nitrogen is a nutrient that can lead to eutrophication of water bodies, typically estuarine or marine ecosystems, versus freshwater lakes. Ammonia can be converted to nitrate (NO<sub>3</sub>) by bacteria, and then used by plants. Nitrate and ammonia are the common forms of nitrogen in aquatic systems and are sampled at L-3 only. Ammonia was generally low with a maximum concentration of 0.06 mg/l. Nitrate exhibited a maximum concentration of 0.05 mg/l. Suggested maximums are 0.10 mg/l for ammonia and 0.05 mg/l for nitrates.

Total suspended solids (TSS) – TSS represents the inorganic and organic particulates in the water column. TSS values in lakes should remain below 10 mg/l to preclude turbid conditions. TSS measures were moderately elevated at L-1 with values of 12 mg/l and 11 mg/l in the surface and deep waters, respectively. Values were below the recommended maximum at L-2, and were highest in the L-3 deep waters at 13 mg/l. The outlet sample was 10 mg/l TSS.

### **Plankton Data (Phytoplankton is aquatic plants, Zooplankton is small aquatic animals)**

Princeton Hydro collected three phytoplankton grab samples (two near the dam, one at the beach); these samples were subsequently identified and enumerated (cells/ml). Zooplankton also was collected near the dam for taxonomic analysis and enumeration (organisms/ml). Additionally, samples for cyanotoxins (toxins from cyanobacteria, a.k.a. blue-green algae), specifically, total microcystin, and cylindrospermopsin, were collected at the Beach.

Phytoplankton results - Phytoplankton grab samples showed high densities of algae ranging from 158,092 cells/ml at L-3 surface to 229,448 cells/ml at L-3 mid-depth. Cyanobacteria were the dominant group at all three sampling stations, ranging from 105,808 cells/ml at B-1 to 190,364 cells/ml at L-3 mid-depth. The dominant cyanobacteria at L-3 surface and mid-depth was *Aphanocapsa*, a small-celled, low bio-volume cyanobacteria. *Aphanocapsa* typically is not associated with acute water quality impairment. *Aphanizomenon*, a nuisance cyanobacteria, was dominant at B-1 at 53,897 cells/ml.

Cyanotoxins – Cyanobacteria (blue-green algae) can release natural toxins into water bodies. PH sampled at the Beach for common toxins from algae blooms; they analyzed for total microcystins and cylindrospermopsin (both are hepatotoxins that can impact the liver and kidneys). The good news is results remained negative (0 ppb) for both toxins.

Zooplankton results - Zooplankton samples showed an aquatic herbivore community comprised primarily of copepods and rotifers and a limited abundance of species of the order cladocera (water fleas such as Daphnia). In June, large-bodied Daphnia predominated the zooplankton. Zooplankton community dynamics often shift when cyanobacteria proliferate. Zooplankton consume phytoplankton (primary producers) and are a primary consumer supporting fish populations.

### **Overall Comparison of June, July, August and September Sampling Events**

Many water quality parameters declined over the hot summer months. Likely most noticeable to lake residents was the decrease in water clarity, decreasing early in the growing season, then leveling out in the last couple months. Through the summer, dissolved oxygen declined at depth. With less thermal stratification in September, the anoxic zone has diminished. Soluble reactive phosphorus improved; it was 30 times the suggested value in July, but was non-detectable in September. Although water quality generally diminished through the hot summer, the sampling at the beach continued to show no cyanotoxins (0 ppb) were present (two classes analyzed - total microcystins and cylindrospermopsins).

At the time of the September sampling event, six lake treatments were completed by SOLitude using SeClear Algaecide and Water Quality Enhancer. The next lake sampling event by Princeton Hydro is scheduled for October 13, 2020.