

MEMBERS SUMMARY – 2020 LAKE SAMPLING EVENT #3 PERFORMED BY PRINCETON HYDRO, AUGUST 10, 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 #3 – AUGUST 10, 2020:

In-Situ (In-place) Sampling

Clarity – Clarity dropped some from July 6; with visibility decreasing 0.5 feet to 3.1' at the deepest lake station (L-3), 3.3' at L-2, and 2.5' at L-1 based on Secchi disc transparency. The desired threshold value is 3.3'.

Thermal Stratification - The Lake exhibited somewhat less thermal stratification than it had in July (temperature variability with depth). At the deepest station, L-3, the surface water temperature was 81.8°F, while the temperature at 23' deep was 59.8°F. Temperature zones were defined as the top 3' of warm water (the epilimnion), the thermocline from 7 to 16' separating warmer surface water from the coolest deep water, and the hypolimnion below 16' containing the coolest water. Thermal stratification prevents water mixing and negatively impacts dissolved oxygen at depth.

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 high within the upper 7'. However, at 16' the DO was less than the suggested 4 mg/l. DO was less than 1 mg/l (anoxic) within the bottom 5'. In June, anoxic conditions were found only at the sediment interface and grew in both July and August.

pH – The lake has gone 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). August's pH's ranged from 7.31 to 8.84 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 15 µg/l to a maximum of 28.0 µg/l, with surface samples from L-1 and L-2 exceeding the recommended upper threshold at 22 µg/l and 28 µg/l respectively, signaling increased algae.

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. Although TP concentrations were elevated at the surface, mid-depth and at depth at L-3, the deep sample TP dropped from 0.46 mg/l in July to 0.12 mg/l in August. All other samples from all sampling locations also exceeded the 0.05 mg/l threshold with values ranging from 0.06 to 0.09 mg/l.

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. Two samples exceeded this recommendation with 0.010 mg/l at I-1 (Cool Spring Creek) and the deep sample at L-3, but the L-3 deep sample was way down from 0.152 mg/l in July (from 30 times the recommended threshold to only 2 times the threshold).

Nitrogen Compounds (Ammonia [NH₃] and Nitrates [NO₃]) – Nitrogen is a nutrient that can lead to eutrophication of water bodies, but typically estuarine or marine ecosystems, versus freshwater lakes like ours. Ammonia can be converted to nitrate (NO₃) by bacteria, and then used by plants. Nitrate and ammonia are the most common forms of nitrogen in aquatic systems and are sampled at L-3 only. Ammonia measures were low with a maximum concentration of 0.02 mg/L. Nitrate concentrations were also low to moderate with a maximum concentration of 0.06 mg/L.

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 values in the lake and inlets ranged from 2 mg/l to 12 mg/l (for the deep sample at L-3). The outlet beyond the spillway had a TSS of 27 mg/l.

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 generally moderate to borderline high densities of algae ranging from 48,136 cells/ml at the beach to 127,419 cells/ml at L-3 surface. The cyanobacteria were the dominant group at all sampling three stations, representing 75% of the community at L-3 surface, 96% of the community at L-3 mid and 95% at B-1. There has been a shift since July from the genus *Woronichinia* and *Aphanizomenon* to the genus *Pseudanabaena*, *Coelosphaerium*, and *Dolichospermum*. The Beach grab sample also was analyzed for cyanotoxins.

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 remain negative (0 ppb) for both toxins.

Zooplankton results - Samples showed an aquatic herbivore community comprised primarily of copepods and rotifers and a limited abundance of the cladoceran *Daphnia* at L-3 mid only. However, in June large-bodied *Daphnia* predominated the zooplankton. Zooplankton community dynamics often shift when cyanobacteria proliferate, as evidenced by this shift in zooplankton. Zooplankton consumes phytoplankton and is important as a primary consumer supporting fish populations.

Overall Comparison of June, July and August Sampling Events

Many water quality parameters continued to decline over this hot summer. Likely most noticeable to lake residents was the decrease in water clarity, falling slightly in August, but down considerably from June. Dissolved oxygen has continued to decline at depth. August sampling at the deep lake location (L-3) showed elevated total phosphorus at 2.4 times PH's threshold, compared to 9 times in July. The August soluble reactive phosphorus was 2 times the value that PH suggests, vs. 30 times in July. Although water quality has generally diminished since June, the sampling at the beach continued to show no cyanotoxins (0 ppb) were present (two classes analyzed - total microcystins and cylindrospermopsins).

As of August 24, five lake treatments have been completed by SOLitude using SeClear Algaecide and Water Quality Enhancer. The next lake sampling event by Princeton Hydro is scheduled for September 14, 2020.