Brawley Consulting Group, LLC

Land Conservation and Management Services

Memo

Date: September 26, 2024

To: Bantam Lake Protective Association

From: Brawley Consulting Group

Re: Results of Cyanobacteria Monitoring of September 23, 2024

Summary

Based on cyanobacteria cell concentrations in samples collected from the lake and other water quality characteristics measured at the lake on September 23, 2024, the risk to the public from cyanobacteria and harmful algal blooms was high. Cyanobacteria cell concentrations at two of the three sampling sites, and the lake average were consistent with the State's Visual Rank Category 2 conditions. Recommended public interventions for Category 3 include notifying CT DPH and CT DEEP, increased visual surveillance until conditions change, and consideration of beach closing postings at public access points (CT DPH & CT DEEP 2023).

Methods and Conditions

On Monday, September 23rd, the Brawley Consulting Group collected field data and waters samples from the lake and analyzed those over the next 2 days as part of the biweekly *Bantam Lake Cyanobacteria Monitoring Program*. Detailed methods have been described in past summaries. Field data were collected at the North Bay (NB), Center Lake (CL), Folly Point (FP) and South Bay (SB) sites. Water samples were collected at the NB, CL, and SB sites and analyzed at Brawley Consulting Group facilities. Water samples were not concentrated by centrifugation in the lab, i.e., the whole-water lake samples were used for algae counts.

Arrival at the Lake was at approximately 1:00pm. Visible cyanobacteria surface blooms were not observed along the shoreline or in the open water. The lake water did appear turbid as it has been observed over the last 8 weeks, i.e., water clarity has been low. Air temperatures were in the low 50s °F and winds were very light (Weather Underground 2024).

Algae and Cyanobacteria Community

A total of 27 algal genera were identified in the plankton net or whole water samples. The Chlorophyta (aka green algae) followed by the Cyanophyta (aka cyanobacteria or blue-green algae) had the greatest richness (numbers of different genera) at 12 and 8 identified genera, respectively. Five other algal taxa were represented by three of less genera each.

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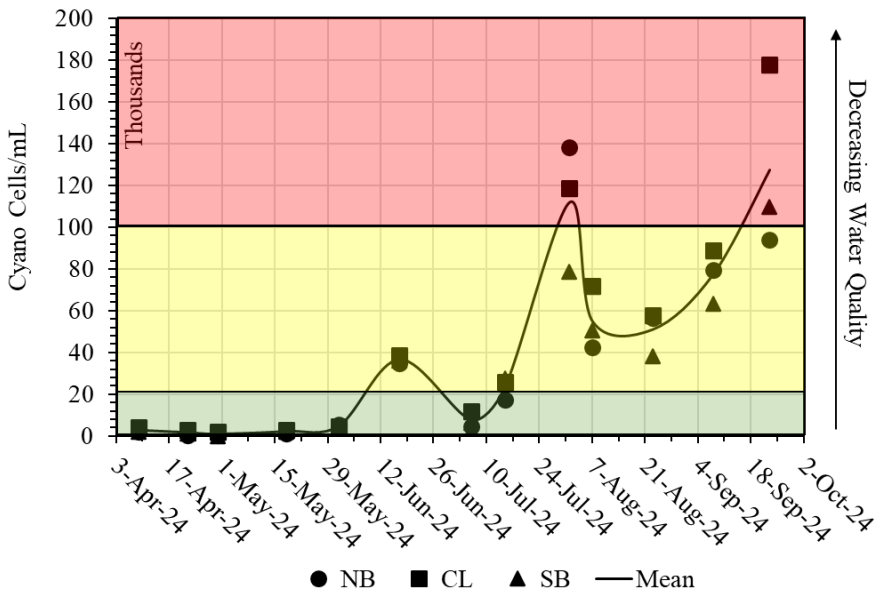

Figure 1. Cyanobacteria cell concentrations at the North Bay (NB), Center Lake (CL), and South Bay (SB) sites in the 2024 season at Bantam Lake. The plot is color coded to represent the CT DEEP's Visual Rank Categories for risk from harmful algal blooms: green = low risk; yellow = moderate risk; and red = high risk.

The September 23rd, cyanobacteria cell concentrations were notably up from the September 8th and August concentrations (Fig. 1). Cell concentrations on September 23rd at the North Bay and South Bay sites were below and above, respectively, the 100,000 cyanobacteria cells/mL threshold delineating moderate to high risk (Fig. 1). The Center Lake site concentration was 178,165 cells/mL but may be anomalous (see below). The lake averages, with and without the Center Lake data, were 127,469 and 102,121 cells/mL. As a group, cyanobacteria accounted for 93 to 99% of all cells counted at the three sites. The filamentous *Aphanizomenon spp.* was the dominant genus at the North Bay and South Bay sites and was codominant with the filamentous *Dolichospermum spp.* at the Center Lake site. Other cyanobacteria observed included *Aphanocapsa spp.*, *Chroococcus spp.*, *Pseudanabaena spp.*, *Gomphosphaeria spp.*, *Woronichinia spp.*, *Planktothrix spp.*, and *Microcystis spp*.

Water Quality

Several other indicators of algal and cyanobacteria productivity and water quality measured as part of the monitoring program were Secchi disk transparency and relative phycocyanin concentration. Secchi transparency is a measurement indicating how far light transmits through the water column. The more algae and other particulate matter suspended in the water column, the less Secchi disk transparency will be and vice versa. Secchi transparencies on September 23rd at the four sites were the lowest of the season to date and between approximately 1.2 and 1.4 meters (Table 1). The average for September 23rd was also the lowest of the season at 1.28 meters (Fig. 2).

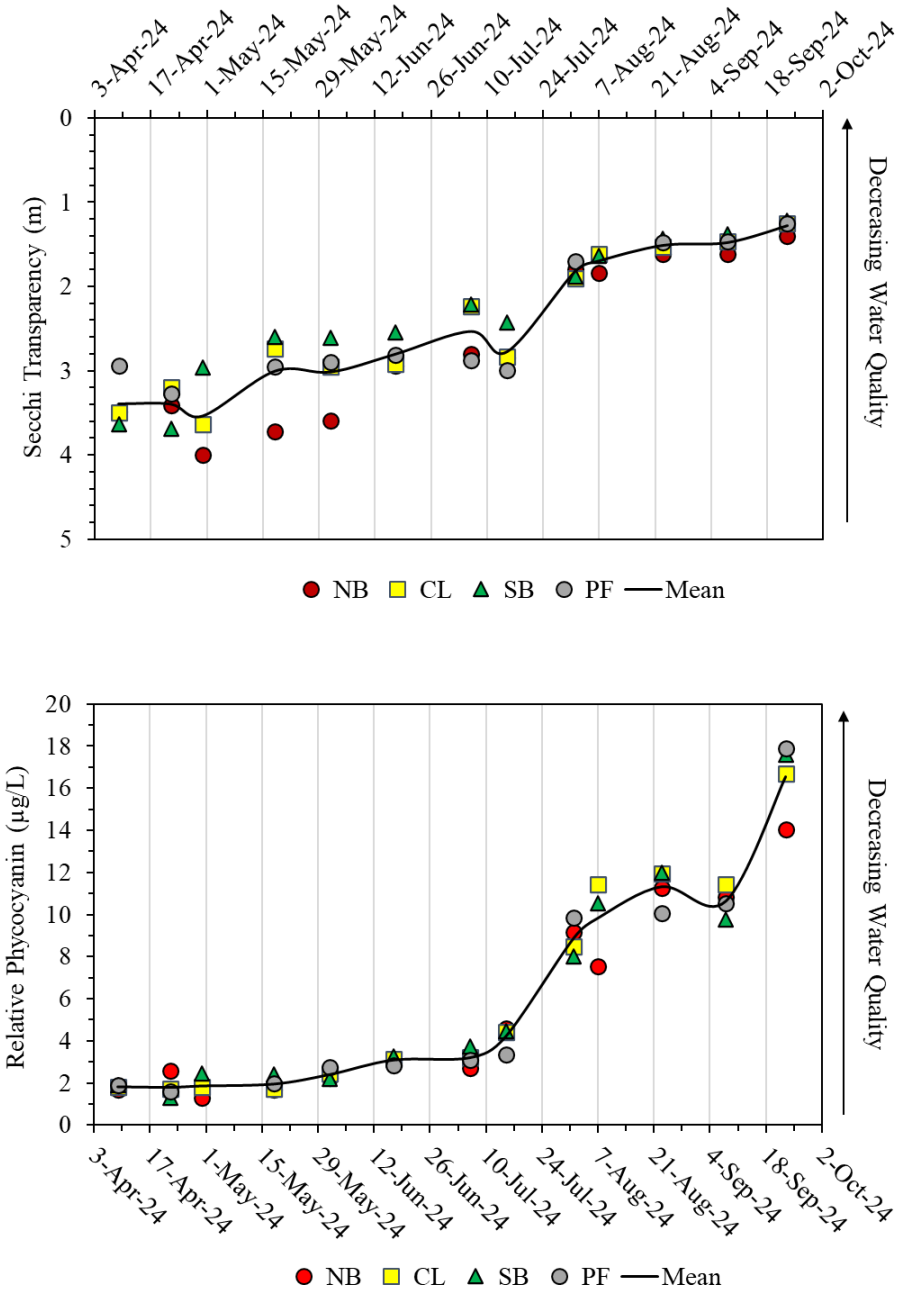

Figure 2. Secchi disk transparencies (top) and relative phycocyanin concentrations (bottom) at the North Bay (NB), Center Lake (CL), South Bay (SB), and Folly Point (PF) sites on Bantam Lake in 2024

Phycocyanin is a photosynthetic pigment almost unique to freshwater cyanobacteria. It was measured throughout the water column with the fluorimeter in the scientific instrumentation used in the monitoring program. Measurements were relative in that the meter was not calibrated with a primary standard. Although relative, they were useful in that they were

comparable to measurements collected at different depths and dates. The average for the top three meters of the water column were used here, as they have in the past.

Relative phycocyanin site levels and the lake average on September 23rd were the highest of the season and indicative of high cyanobacteria cell concentrations (Fig. 2). The September 23rd average was 16.6 µg/L while averages from early August through early September were between 9 and 11 µg/L. April – July averages were only between 1.7 and 4.4 µg/L.

For comparative purposes, we regressed relative phycocyanin concentrations against corresponding cyanobacteria cell concentrations measure at sites from 2020 to 2023 to create a simple two-dimensional model of Bantam Lake. The April 2024 / May 2024 data, June 2024 data, July 2024 data, August 2024 data, and September 2024 data were added as separate datasets. The September 23rd data from North Bay and South Bay were consistent with the model while the Center Lake data appeared anomalous (Fig. 3).

Another two-dimensional model was developed by regressing relative phycocyanin concentrations and Secchi disk transparencies from 2020 to 2023 (Fig. 4). Like with the previous model, 2024 datasets were added separately. August and September 2024 data closely fit the 2020 – 2023 model but were a clear departure from the April / May, June, and July 2024 datasets. The September 23rd data, particularly that from Center Lake, Folly Point, and South Bay, were situated at the far right of the model and were indicative of some of the poorest conditions observed since 2020.

Table 1. Site characteristics and cyanobacteria cell concentrations at Bantam Lake on September 23, 2024.

Sites	Cyanobacteria cells (cells/mL)	Total Depth (m)	Secchi Transparency (m)	Temperature Top/Bottom (°C)	Oxygen Top/Bottom (mg/L)
North Bay	94,238	5.90	1.40	20.1 / 19.8	7.3 / 6.3
Center Lake	178,168	8.30	1.25	20.4 / 20.1	9.5 / 8.4
South Bay	110,004	4.80	1.22	20.1 / 20.0	7.4 / 7.6
Folly Point		6.40	1.25	20.4 / 20.0	8.7 / 7.2

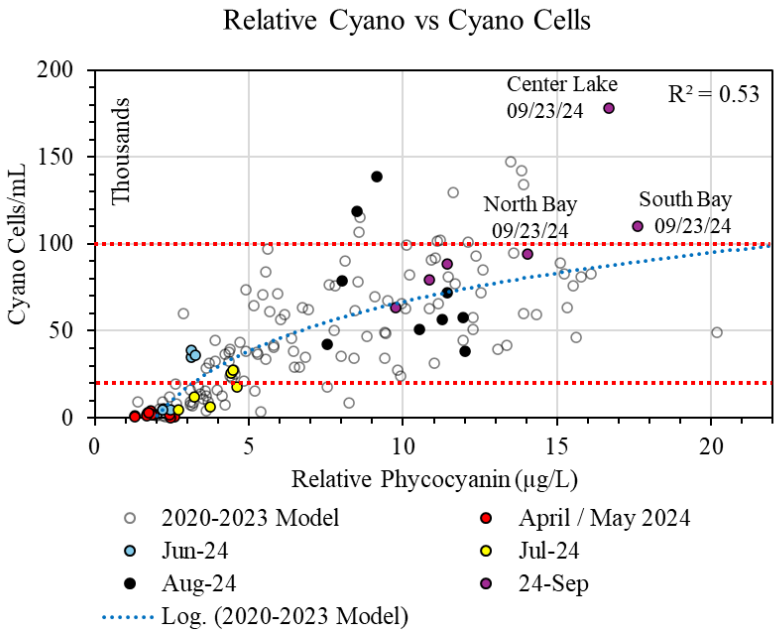

Figure 3. The model of Bantam Lake based on the regression of paired cyanobacteria cell concentrations and relative phycocyanin concentration measured at Bantam Lake from 2020 to 2023. The 2024 data have been added as separate datasets.

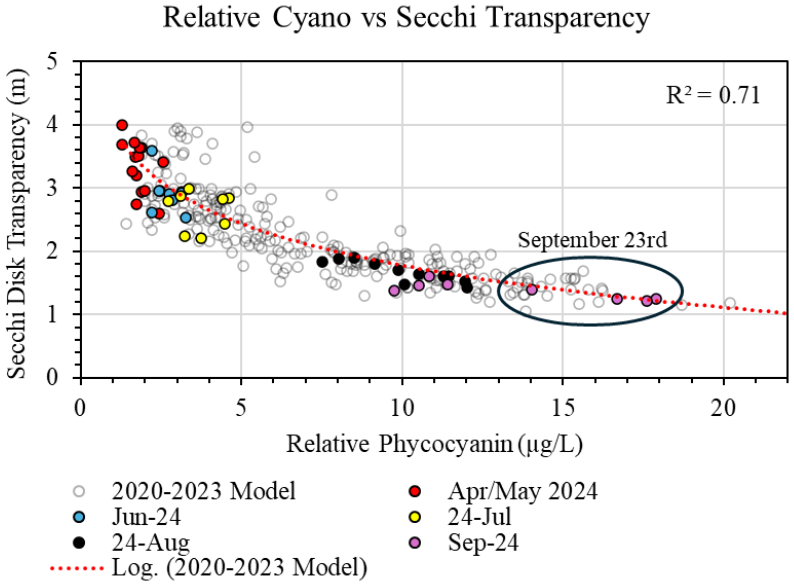

Figure 4. The model of Bantam Lake based on the regression of paired Secchi disk transparencies and relative phycocyanin concentrations measured at Bantam Lake from 2020 to 2023. The 2024 data have been added as separate datasets.

Site Condition

The water columns were thermally mixed at all sites. Oxygen levels throughout the water columns of all sites were high (Table 1).

Conclusions

The public risk from cyanobacteria at Bantam Lake on September 23, 2024 was high based on lake average cell concentrations and concentrations at several sites. Those site and average concentrations were consistent with Visual Rank Category 3 level (CT DPH & CT DEEP 2023). Secchi transparencies were lowest of the season and relative phycocyanin concentrations were the highest of the season confirming the high cell concentrations. Regression analyses indicated Center Lake site cell concentration may have been anomalous. However the lake average cell concentration, with or with out the Center Lake data, was greater than 100,000 cells/mL.

Recreational users are advised to avoid contact with the water, particularly where surface blooms are observed.

Larry Marsicano
Brawley Consulting Group

Literature Cited

Connecticut Department of Public Health and Connecticut Department of Energy and Environmental Protection. 2023. Guidance to Local Health Departments for Blue–Green Algae Blooms in Recreational Freshwaters. See https://portal.ct.gov/-/media/dph/ehdw/blue-green-algae-blooms/guidance-to-lhd-for-blue-green-algaeblooms.pdf