Brawley Consulting Group, LLC

Land Conservation and Management Services

Bantam Lake Cyanobacteria Monitoring

Sample Date: October 21, 2024

Summary

Based on cell concentrations and other water quality characteristics measured on October 21, 2024, the risk to the public from cyanobacteria and harmful algal blooms was high. Site and lake averaged cyanobacteria cell concentrations were consistent with the State's Visual Rank Category 3 conditions, i.e., cyanobacteria were present in high concentrations (CT DEEP 2023). The public should exercise caution, be aware of changing conditions, e.g., localized bloom formation, and avoid contact with blooms if they are observed.

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Memo

Date: October 23, 2024

To: Bantam Lake Protective Association

From: Brawley Consulting Group

Re: Results of Cyanobacteria Monitoring of October 21, 2024

Summary

Based on cyanobacteria cell concentrations in samples collected from the lake and other water quality characteristics measured at the lake on October 21, 2024, the risk to the public from cyanobacteria and harmful algal blooms was high. Cyanobacteria cell concentrations at three sampling sites, and the lake average were consistent with the State's Visual Rank Category 3 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, October 21st, the Brawley Consulting Group collected field data and waters samples from Bantam Lake and analyzed those over the next day 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. There was no need to concentrate samples by centrifugation in the lab, i.e., the whole-water lake samples were used for algae counts.

Arrival at the Lake was at approximately 12:30pm. A heavy cyanobacteria surface bloom was observed along the southern shoreline of Deer Island. At open water sites, very turbid and/or light surface blooms were observed. The water clarity was low. Air temperatures were in the upper 70s °F and there were no to light winds (Weather Underground 2024).

Algae and Cyanobacteria Community

A total of 21 algal genera were identified in the plankton net or whole water samples. The Cyanophyta (aka cyanobacteria or blue-green algae) had the greatest richness (numbers of different genera) with 7 identified genera. Five Bacillariophyta (aka diatoms) and four Chlorophyta (aka green algae) genera were identified. Four taxonomic groups were represented by one or two algae genera.

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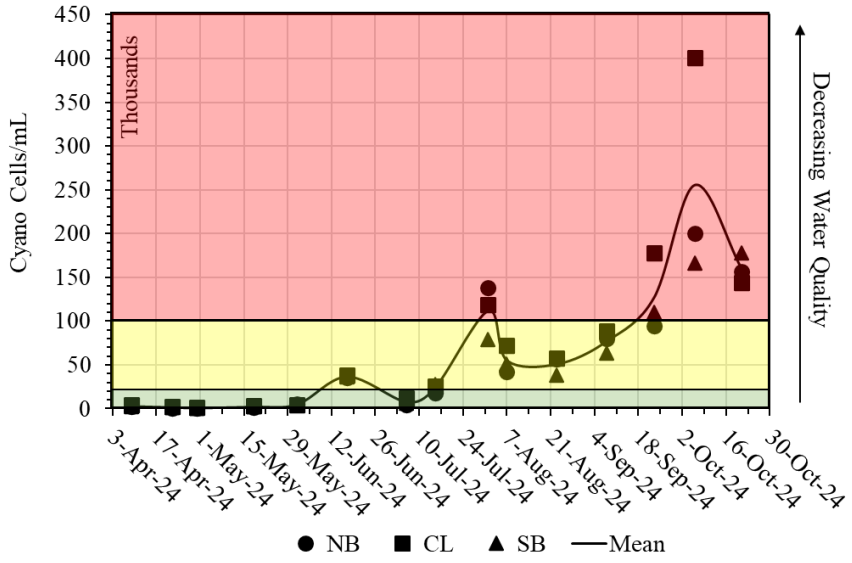

Figure 1. Cyanobacteria cell concentrations at the North Bay (NB), Center Lake (CL), and South Bay (SB) sites in the 2024 season at Bantam Lake. The plot is color coded to represent the CT DEEP's Visual Rank Categories for risk from harmful algal blooms: green = low risk; yellow = moderate risk; and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

The October 21st cyanobacteria cell concentrations were similar to the October 6th concentrations but without the CL outlier of approximately 401,000 cells/mL from the earlier date (Fig. 1). Because of that outlier, the October 21st lake average was lower than the October 6th average, but still high at 159,333 cells/mL, and within the range considered to be high risk from harmful algae blooms, as were all the site cell concentrations. As a group, cyanobacteria accounted for 96 to 98% of all cells counted at the three sites. The filamentous *Aphanizomenon spp.* was the dominant genus. Other cyanobacteria genera observed included *Dolichospermum 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 October 21st at the four sites, and the lake average of 1.01 meters, were the lowest of the season (Fig. 2).

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.

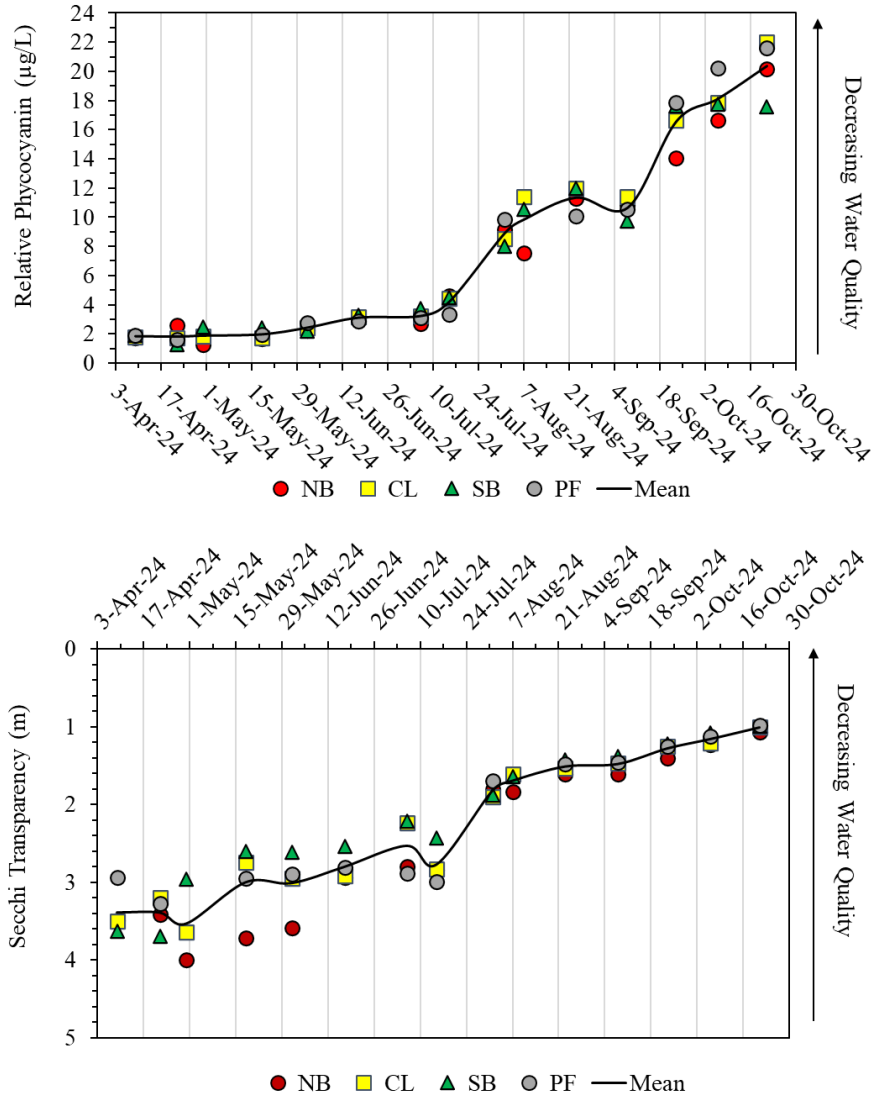

Figure 2. Secchi disk transparencies (top) and relative phycocyanin concentrations (bottom) at the North Bay (NB), Center Lake (CL), South Bay (SB), and Folly Point (PF) sites on Bantam Lake in 2024

Relative phycocyanin site levels and the lake average continued to increase on October 21st as they have since August 1st. The one exception was at the SB site that remained at approximately the same level as measured on October 6th (Fig. 2). The October 21st average was 20.4µg/L while averages from early August through early October increased from 8.9 and 18.1 µg/L. April – July averages were 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, September 2024, and October 2024 data were added as separate datasets. Except for the October 6th datapoint from Center Lake site, October data appear to be consistent with this model but at the far right of the model indicating some of the poorest conditions of the season and since 2020 (Fig. 3).

Another two-dimensional model was developed by regressing relative phycocyanin concentrations (or cyanobacteria biomass) and Secchi disk transparencies from 2020 to 2023 (Fig. 4). Like with the previous model, 2024 datasets were added separately. Points used for this model and the 2024 data points more closely fit the regression line than did points on the phycocyanin / cyanobacteria cell concentration model (Figs. 3, 4).

August, September, and October 2024 relative phycocyanin / Secchi disk transparency datasets were clear departures from the April / May, June, and July 2024 datasets. The October data were aligned at the far right of the model and were indicative of some of the poorest conditions observed since 2020.

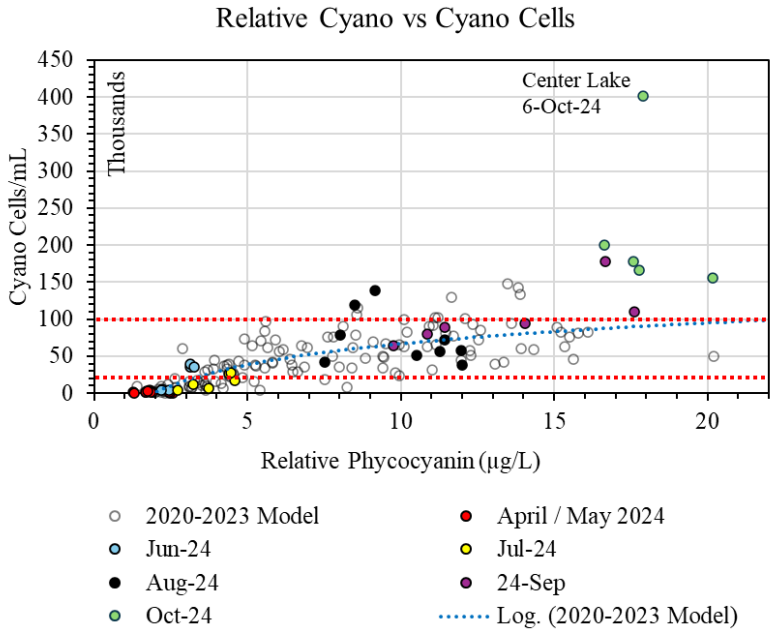

Figure 3. The model of Bantam Lake based on the regression of paired cyanobacteria cell concentrations and relative phycocyanin concentration measured at Bantam Lake from 2020 to 2023. The 2024 data have been added as separate datasets.

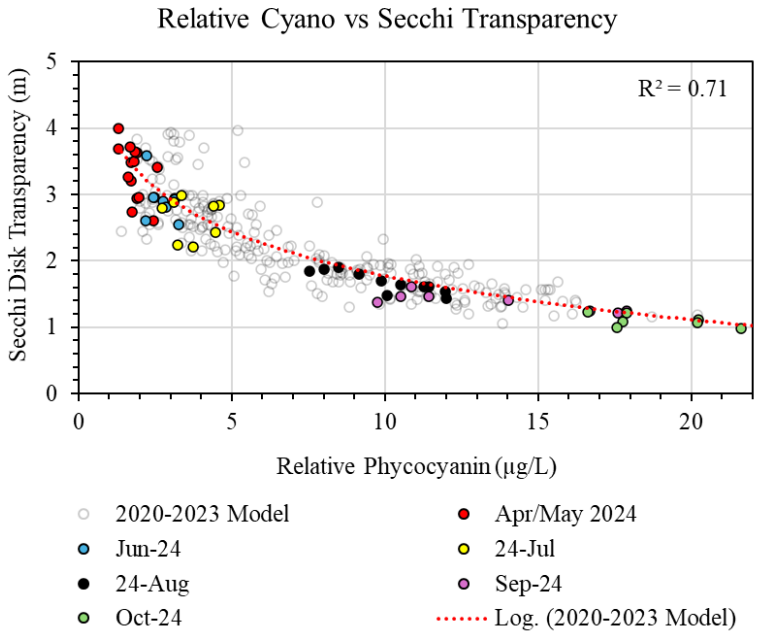

Figure 4. The model of Bantam Lake developed from the regression of paired Secchi disk transparencies and relative phycocyanin concentrations measured at Bantam Lake from 2020 to 2023. The 2024 data have been added as separate datasets.

Site Condition

The water columns were thermally mixed at all sites. Oxygen levels throughout the water columns of all sites were high except for the bottom of Center Lake (Table 1). There, oxygen concentrations were <1 mg/L indicting biological oxygen demand that exceeded replenishment from mixing.

Table 1. Site characteristics and cyanobacteria cell concentrations at Bantam Lake on October 21, 2024.

Sites	Cyanobacteria cells (cells/mL)	Total Depth (m)	Secchi Transparency (m)	Temperature Top/Bottom (°C)	Oxygen Top/Bottom (mg/L)
North Bay	156,228	5.98	1.07	13.6 / 13.0	11.6 / 5.8
Center Lake	144,284	7.75	1.00	14.4 / 13.2	11.9 / 0.7
South Bay	177,488	4.51	0.99	14.1 / 13.2	11.1 / 6.0
Folly Point	---	6.50	0.98	13.7 / 13.0	11.1 / 8.2

Conclusions

The public risk from cyanobacteria at Bantam Lake on October 21, 2024 was high based on high cyanobacteria cell concentrations. Cyanobacteria concentrations at the three sites and the lake average were within the Visual Rank Category 3 levels. Secchi transparency and relative phycocyanin data on October 21st indicated that conditions were the most turbid and with highest cyanobacteria biovolume of the season. Regression analyses indicated that October 21st cyanobacteria cell concentrations were consistent with a two-dimensional model of Bantam Lake based on 2020 to 2023 cyanobacteria cell concentration / relative phycocyanin data.

Recreational users are advised to avoid areas of the lake when 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?rev=137722b8b71f46f2831cf84f4a446693&hash=8B8A1249D0ED2A17FBFE69AD5FEB0BC5