

Memorandum

To: Ms. Colleen Lyons, Lake Hopatcong Commission

From: Patrick Rose, Princeton Hydro

CC: Fred Lubnow, Ph.D., Princeton Hydro

RE: 20 August 2024 – Cyanotoxin Testing – Lake Hopatcong

Pages: Five

Princeton Hydro conducted the second of two 2024 cyanobacteria / cyanotoxin testing events at Lake Hopatcong on 20 August 2024. The data collected as part of this effort are provided below.

Methodology

Princeton Hydro sampled at nine stations on 20 August 2024. Plankton grab samples were collected at each station, and the cyanobacteria community was identified to genus and densities were quantified as cells / mL. In addition, at each site samples were collected in glass vials and analyzed the same day for the cyanotoxins microcystins and anatoxin-a. The cyanotoxin analyses were performed utilizing Abraxis Algal Toxin Test Strip Kits and read with an Abraxis Field Meter. It should be noted that this analytical methodology is not NJ-State certified; however, the resulting data can be used for informational and management purposes. *In-situ* monitoring was also conducted at each station utilizing an In-Situ AquaTROLL 500 water quality meter which was calibrated prior to use; Princeton Hydro is State certified in its use of field meters (#10006). *In-situ* phycocyanin and chlorophyll-*a* concentrations were also measured at each station with Turner fluoroprobes. The monitoring program was modified in 2023 to concentrate on the assessment of cyanobacteria and cyanotoxins in near-shore areas, directly from the shoreline of the lake. Sampling from the shoreline of the beaches allows for the collection of samples directly where people are recreating in the water.

The nine sampling stations are listed below:

- Hopatcong State Park Beach – northern end (B1)
- Hopatcong State Park Beach – southern end (B2)
- Hopatcong State Park – downstream of dam near fountain (B3)
- Landing Channel (B4)
- Memorial Beach in Mount Arlington (B5)
- Lake Forest Yacht Club Beach in Jefferson Township (B6)
- Byram Bay Community Club in the Borough of Hopatcong (B7)
- Witten Park in Byram Bay (B8)
- Northwest Shoreline of Crescent Cove (B4)

A figure with the sampling locations is provided at the end of the memo.



Results

The results of the sampling effort are listed in the following tables (Tables 1 through 5).

Table 1: Cyanotoxin Data

Station	Microcystin	Anatoxin-A
B1	Negative	Negative
B2	Negative	Negative
B3	Negative	Negative
B4	Negative	Negative
B5	Negative	Negative
B6	Negative	Negative
B7	Negative	Negative
B8	Negative	Negative
B9	Negative	Negative

Table 2: In-situ Data

<i>In-Situ Data 8/20/24</i>							
Station	Depth (meters)		Temperature	Specific Conductance	Dissolved Oxygen		pH
	Secchi	Total	°C	µS/cm	mg/L	% Sat.	S.U.
B1	0.3+	0.3	23.64	0.342	8.15	99.6	7.52
B2	0.3+	0.3	23.58	0.343	8.12	99.1	7.25
B3	0.3+	0.3	23.75	0.342	8.08	98.8	7.58
B4	0.3+	0.3	23.80	0.336	7.98	97.7	7.72
B5	0.3+	0.3	24.14	0.373	8.18	100.7	7.80
B6	0.3+	0.3	23.72	0.294	8.49	103.9	7.85
B7	0.3+	0.3	24.31	0.347	7.58	93.7	7.62
B8	0.3+	0.3	23.68	0.349	8.60	105.0	7.90
B9	0.3+	0.3	22.87	0.380	8.45	101.7	7.68

Table 3: Observations

Observations
Cloudy water with a brown hue; abundant particulates; no filamentous algae observed
Cloudy water with a yellow/brown hue; abundant particulates; no filamentous algae observed
Clear water; low density of suspended particulates; no filamentous algae observed
Cloudy water with a brown hue; abundant particulates; no filamentous algae observed
Clear water; low density of suspended particulates; no filamentous algae observed
Clear water; low density of suspended particulates; no filamentous algae observed
Clear water; moderate suspended particulates; no filamentous algae observed
Clear water; moderate suspended particulates; no filamentous algae observed
Slightly cloudy water with a brown hue; abundant particulates; light filamentous algae observed

Table 4: Phycocyanin and Chlorophyll *a* Concentrations

Station	Phycocyanin	Chlorophyll <i>a</i>
	ppb	ppb
B1	32	17
B2	34	15
B3	30	19
B4	31	15
B5	31	5
B6	19	15
B7	30	5
B8	35	7
B9	31	17

Table 5: Plankton Data

Cyanobacteria Community Composition Analysis									
Sampling Location: Lake Hopatcong	Sampling Date: 8/20/24					Examination Date: 8/23/24			
Cyanophyta (Blue-Green Algae)	B1	B2	B3	B4	B5	B6	B7	B8	B9
<i>Aphanizomenon</i>	20,810	28,347	26,954	14,308	22,516	741	30,830	33,261	24,043
<i>Aphanocapsa</i>			3,209						
<i>Chroococcus</i>						222			
<i>Microcystis</i>			3,851			44,470			
<i>Raphidiopsis</i>	69,367	58,962	83,430	52,830	80,525	11,859	67,826	108,853	75,563
Total Cyanobacteria Cells/mL	90,178	87,310	117,443	67,138	103,041	57,292	98,656	142,114	99,606
NJDEP HAB Alert Level	ADVISORY	ADVISORY	ADVISORY	WATCH	ADVISORY	WATCH	ADVISORY	ADVISORY	ADVISORY

Discussion

A total of five cyanobacteria genera were identified in the near-shore samples. Cyanobacteria densities were elevated throughout the lake, with seven stations exceeding 80,000 cells/mL which would all fall under the “Advisory” HAB Alert Level (Table 5). Note, since these data were not developed by NJDEP, they can not be used for regulatory purposes. However, the data can be used for both educational and management purposes.

Cyanobacteria cell counts were elevated at all stations, ranging from a minimum of 57,292 cells/mL at B6 to a maximum of 142,114 cells/mL at B8. All stations had cyanobacteria cell counts that exceeded the “Watch” HAB Alert Level of 20,000 cells/mL. *Raphidiopsis* was the dominant genera at all stations with the exception of B6; *Microcystis* was the dominant genera at B6. *Raphidiopsis* is a sub-tropical species of cyanobacteria that has been appearing in Lake Hopatcong in increasing densities in recent years. *Aphanizomenon* densities were down significantly relative to the July cyanotoxin monitoring event. Although total cyanobacteria concentrations increased at seven stations relative to July, phycocyanin concentrations were only slightly higher; the mean phycocyanin concentration at all stations was 28 in July and 30 in August. This is likely due to the fact that

Raphidiopsis filaments are much smaller than *Aphanizomenon* filaments and the increase in cyanobacteria densities was mostly a result of increased *Raphidiopsis* densities.

Phycocyanin concentrations were moderately elevated at all stations, ranging from 19 ppb at B6 to 35 ppb at B8. Based on the cyanobacteria and phycocyanin data, cyanobacteria densities were moderately elevated around most of the lake, with a few localized areas with higher densities.

Microcystins and anatoxin-a concentrations were non-detectable at all stations (Table 1). Please note that while microcystins and anatoxin-a are typically the two most common groups of cyanotoxins found in freshwater systems, they are only two groups. Other cyanotoxins that NJDEP has recommended thresholds for include cylindrospermopsin and saxitoxin. However, these other cyanotoxins tend to be rare in New Jersey lakes and reservoirs.

Please feel free to contact myself or Dr. Fred Lubnow with any questions or concerns.

Sincerely,

Patrick Rose



Project Manager
Princeton Hydro, LLC

File: P:\0003\Projects\0003082\GIS\APRX\Lake Hopatcong - 2024 Cyanotoxin Monitoring Location Map.aprx, Layout: Cyanotoxin Monitoring Location Map, Exported: 7/24/2024, Drawn by: thopper, Copyright Princeton Hydro, LLC.



Legend

- Stream
- Cyanotoxin Monitoring Location

NOTES:
 1. Cyanotoxin monitoring locations are approximate. Monitoring was conducted from July through August 2024 by Princeton Hydro.
 2. 2020 orthoimagery, streams, and roads obtained from the New Jersey Geographic Information Network.

0 1,500 3,000 Feet

Spatial Reference: NAD 1983 2011 StatePlane New Jersey FIPS 2900 FT US

CYANOTOXIN MONITORING LOCATION MAP

LAKE HOPATCONG
 MORRIS AND SUSSEX COUNTIES
 NEW JERSEY

PH PRINCETON HYDRO
 SCIENCE DESIGN ENGINEERING

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