

Memorandum

To: Ms. Colleen Lyons, Lake Hopatcong Commission

From: Patrick Rose, Princeton Hydro

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

RE: 22 July 2024 – Cyanotoxin Testing – Lake Hopatcong

Pages: Five

Princeton Hydro conducted the first of two 2024 cyanobacteria / cyanotoxin testing events at Lake Hopatcong on 22 July 2024. The data collected as part of this effort are provided below.

Methodology

Princeton Hydro sampled at nine stations on 22 July 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	Microcystins	Anatoxin-A
B1	Negative	Negative
B2	<1 ppb	Negative
B3	Negative	Negative
B4	Negative	Negative
B5	Negative	Negative
B6	<1 ppb	Negative
B7	<1 ppb	Negative
B8	Negative	Negative
B9	Negative	<0.4 ppb

Table 2: In-situ Data

<i>In-Situ Data 7/22/24</i>							
Station	Depth (meters)		Temperature °C	Specific Conductance mS/cm	Dissolved Oxygen		pH S.U.
	Secchi	Total			mg/L	% Sat.	
B1	0.3+	0.3	27.79	0.365	8.39	109.7	8.21
B2	0.3+	0.3	27.57	0.367	8.17	106.5	8.01
B3	0.3+	0.3	28.89	0.365	7.51	96.6	7.03
B4	0.3+	0.3	27.83	0.451	10.08	131.9	8.62
B5	0.3+	0.3	28.40	0.372	8.30	108.8	8.22
B6	0.3+	0.3	27.67	0.307	8.50	110.9	8.22
B7	0.3+	0.3	27.61	0.367	7.99	104.4	8.07
B8	0.3+	0.3	27.65	0.365	7.51	98.1	7.99
B9	0.3+	0.3	26.54	0.398	12.01	152.7	9.01

Table 3: Observations

Station	Observations
B1	Clear water with a brown hue; low amount of suspended particulates; light filamentous algae present near rocks
B2	Clear water with a brown hue; low amount of suspended particulates; light filamentous algae present near rocks
B3	Clear water with a brown hue; very low suspended particulates; no filamentous algae or cyanobacteria accumulations
B4	Cloudy water with a brown hue; abundant suspended particulates; no filamentous algae or cyanobacteria accumulations
B5	Clear water with a green hue; moderate suspended particulates; no filamentous algae or cyanobacteria accumulations
B6	Cloudy yellow/brown water; abundant suspended particulates; no filamentous algae or cyanobacteria accumulations
B7	Cloudy water with a green/brown hue; abundant suspended particulates; light amount of filamentous algae present
B8	Clear water with a green/yellow hue; moderate suspended particulates; no filamentous algae or cyanobacteria accumulations
B9	Cloudy water with green hue; abundant suspended particulates; light filamentous algae present

Table 4: Phycocyanin and Chlorophyll *a* Concentrations

Station	Phycocyanin	Chlorophyll <i>a</i>
	ppb	ppb
B6	18	24
B1	32	21
B2	30	11
B3	31	25
B4	23	18
B5	28	8
B7	27	8
B8	28	9
B9	35	25

Table 5: Plankton Data

Cyanobacteria Community Composition Analysis									
Sampling Location: Lake Hopatcong	Sampling Date: 7/22/24					Examination Date: 7/24/24			
Cyanophyta (Blue-Green Algae)	B1	B2	B3	B4	B5	B6	B7	B8	B9
<i>Aphanizomenon</i>	49,328	41,848	70,021	48,095	45,119	21,739	49,636	60,701	31,135
<i>Aphanocapsa</i>						1,231			
<i>Dolichospermum</i>		968	419		2,256	902	302		
<i>Microcystis</i>			3,145			3,692			
<i>Planktothrix</i>			2,096	1,480			1,511		
<i>Pseudanabaena</i>								445	
<i>Raphidiopsis</i>	28,364	15,239	19,706	26,144	22,149	22,149	15,970	19,344	91,662
Akinete								44	
Total Cyanobacteria Cells/mL	77,691	58,055	95,388	75,718	69,524	49,713	67,419	80,535	122,797
NJDEP HAB Alert Level	WATCH	WATCH	ADVISORY	WATCH	WATCH	WATCH	WATCH	ADVISORY	ADVISORY

Discussion

A total of seven cyanobacteria genera were identified in the near-shore samples. Cyanobacteria densities were variable throughout the lake, with three stations exceeding 80,000 cells/mL which would all fall under the “Advisory” HAB Alert Level; Stations B3, B8, and B9 all exceeded this threshold (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 49,713 cells/mL at B6 to a maximum of 122,797 cells/mL at B9. Dissolved oxygen concentrations and pH values were both elevated at B9, indicating elevated rates of photosynthesis, likely from cyanobacteria. All stations had cyanobacteria cell counts that exceeded the “Watch” HAB Alert Level of 20,000 cells/mL. The two dominant genera throughout the lake were *Aphanizomenon* and *Raphidiopsis*. *Raphidiopsis* is a sub-tropical species of cyanobacteria that has been appearing in Lake Hopatcong in increasing numbers in recent years.

Phycocyanin concentrations were moderately elevated at all stations, ranging from 18 ppb at B6 to 35 ppb at B9. 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.

However, cyanotoxin concentrations were low at all stations. Microcystins and anatoxin-a concentrations were non-detectable at all stations except for B2, C6, B7, and B9 (Table 1). Microcystins concentrations were below the detection limit of 1 ppb at B2, B6, and B7. The anatoxin-a concentration was below the detection limit of 0.4 ppb at B9. Both of these toxins are below the New Jersey Health Advisory Guidance levels. For reference, these thresholds are 2.0 ppb and 15.0 ppb for microcystins and anatoxin-a, respectively. 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.



CYANOTOXIN MONITORING LOCATION MAP

LAKE HOPATCONG
 MORRIS AND SUSSEX COUNTIES
 NEW JERSEY

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 SCIENCE DESIGN ENGINEERING
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