Memorandum

To: Ms. Colleen Conover, Lake Hopatcong Commission

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

Date: 18 August 2020

cc: Lake Hopatcong Commission

Katie Walston, Princeton Hydro

RE: 12 August 2020 – Cyanotoxin Monitoring – Lake Hopatcong

Pages: Five

Princeton Hydro conducted the second of two cyanobacteria / cyanotoxin monitoring events at Lake Hopatcong on 12 August 2020. The data collected as part of this effort are provided below.

Methodology

Princeton Hydro sampled at nine (9) stations on 12 August 2019. At each station, plankton grab samples were collected, preserved with Lugol's. The phytoplankton were identified down to genus by Princeton Hydro and densities were quantified as cells / mLs. In addition, at each standard cyanotoxin site (8 stations), sub-surface samples were collected in glass vials and analyzed the same day for the cyanotoxins microcystins, cylindrospermopsin and anatoxin-a utilizing Eurofins Abraxis Algal Toxin Test Strip Kits and read with an Eurofins 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 addition, *in-situ* monitoring at each station was conducted utilizing a Hach MS5 water quality meter which was calibrated prior to use; Princeton Hydro is State certified in its use of field meters (#10006).

Sampling Stations and Results

The results of the sampling effort are listed in the following tables (Tables 1 through 3). The sampling stations include: Beyond the Beach in Northern Jefferson (B1), beyond CAPP Beach (B2), along the central western shoreline of Crescent Cove (B3), beyond Borough of Hopatcong Beach (B4), beyond Barnes Brothers Beach (B5), just north of the Hopatcong State Park (B6), just south of the Hopatcong State Park (B7), and mid-Lake (B8). In addition, samples were collected at the Outlet (Station #5 in the long-term monitoring) as well as in the center of River Styx / Crescent Cove (Station #3 in long-term monitoring). The locations of the sample stations are shown in the Figure attached to the end of this memo. It should be emphasized that no sampling occurred

within a beach area. Near-shore samples were collected either beyond the designated swimming / wading area or adjacent to the identified beach site.

Table 1: Cyanotoxin Data

Lake Hopatcong Cyanotoxin Results 8/12/20 (as ppb)			
Station	**Microcystin**	**Cylindrospermopsin**	**Anatoxin**
B1	Negative	Negative	Negative
B2	Negative	Negative	Negative
B3	Negative	Negative	>2.5 ppb
B4	Negative	Negative	>2.5 ppb
B5	Negative	Negative	Negative
B6	Negative	Negative	Negative
B7	Negative	Negative	Negative
B8	Negative	Negative	Negative
NJDEP Recreational Health Advisory	**3 ppb**	**8 ppb**	**27 ppb**

Table 2: *In-situ* Data

Station	Secchi	Temperature	Specific Conductance	Dissolved Oxygen		pH
	(m)	°C	mS/cm	mg/L	% Sat.	S.U.
B1	0.8	27.95	0.324	8.63	110	7.97
B2	0.8	28.28	0.367	8.40	107.6	7.88
B3	0.6	28.42	0.614	10.81	139	8.75
B4	0.4	28.14	0.658	11.53	147	8.82
B5	1.5	27.37	0.426	8.95	112.9	8.42
B6	-	29.34	0.434	8.64	113.0	8.27
B7	-	29.72	0.432	8.14	107	8.17
B8	1.4	27.57	0.426	8.76	110.6	8.18
ST3	0.5	28.04	0.562	9.22	117.8	8.46
ST5 (outlet)	0.9	28.45	0.429	8.33	107.1	8.24

Table 3: Cyanobacteria cell counts for July Cyanotoxin sampling event

Nearshore Sampling Station	Cyanobacteria cells / mLs
Beyond Beach in Northern Jefferson (B-1)	37,377
Beyond CAPP Beach (B-2)	60,397
Western shoreline of Crescent Cove (B-3)	530,992
Beyond Borough of Hopatcong Beach (B-4)	323,022
Beyond Barnes Brothers Beach (B-5)	58,311
North of Hopatcong State Park Beach – Outlet (B-6)	65,380
South of Hopatcong State Park Beach – (B-7)	73,585
Mid-Lake (B-8)	50,832
River Styx / Crescent Cove WQ Station (ST3)	261,156

As shown in Table 1 all test strip, field readings for microcystins and cylindrospermopsin were negative during the 12 August 2020 sampling event. In the case of anatoxin-a, most samples were negative but two had measurable concentrations; the western shoreline of Crescent Cove and beyond (outside) of the Borough of Hopatcong's Beach. These concentrations were identified as greater than 2.5 ppb. It should be noted that these measurable anatoxin-a concentrations at B-3 and B-4 were associated with the highest concentrations of dissolved oxygen and pH values (Table 2), which tends to be associated with high rates of algal and/or aquatic plant photosynthesis. Additionally, B-3 and B-4 also had the highest cyanobacteria cell counts (see Table 3). As shown in Table 1, NJDEP's Recreational Health Advisory for anatoxin-a is 27 ppb and at this point in time it is not known if the concentrations were greater than the 27 ppb draft threshold.

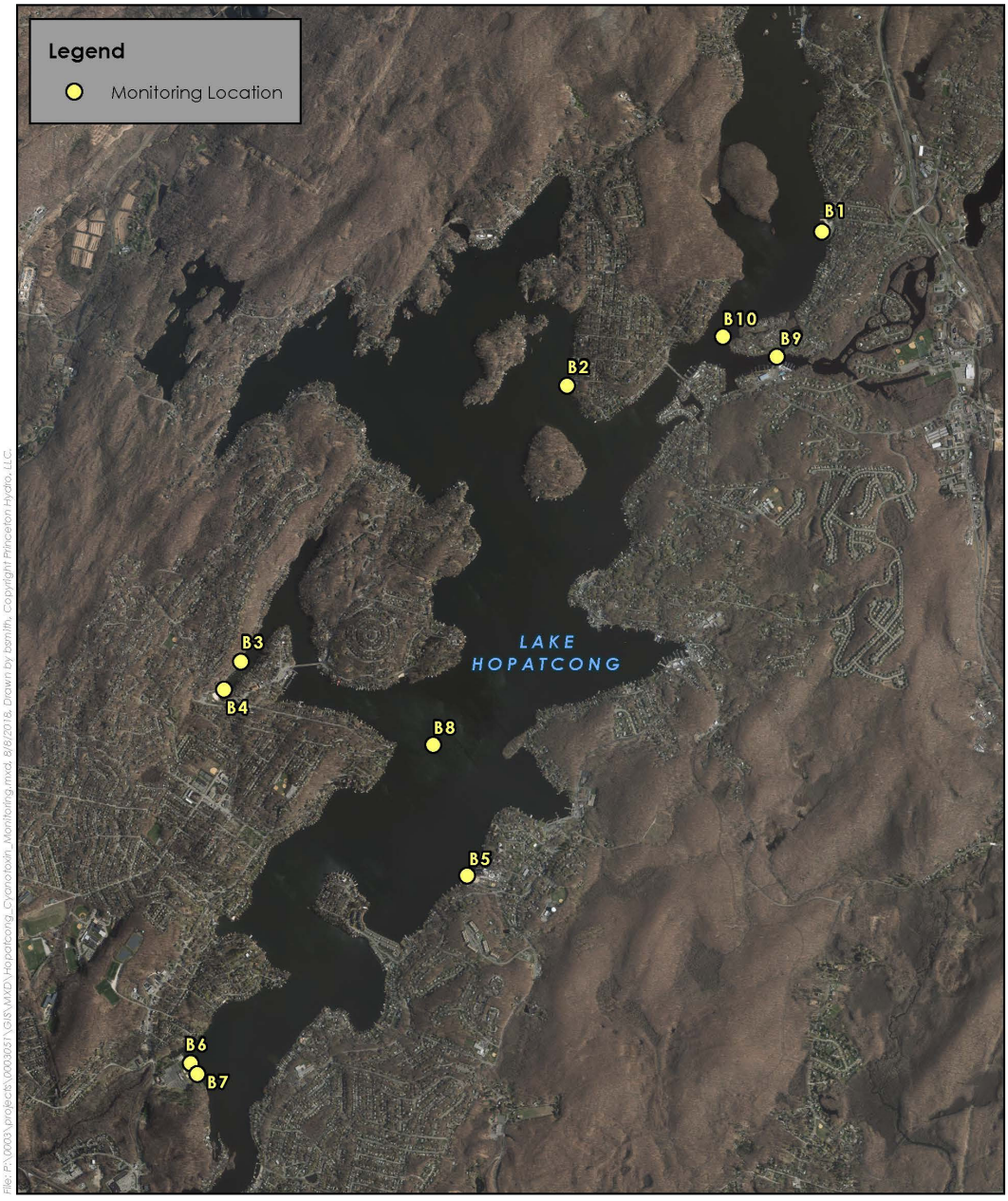
While the plankton communities were relatively diverse and included a high number of green algae and diatoms, the cyanobacteria were the most abundant relative to cell counts. A total of nine genera of cyanobacteria were identified during the 12 August 2020 sampling event with the dominant genera including *Aphanizomenon* and *Dolichospermum*. Both genera have gas vacuoles, so they can move through the water column, and both can produce heterocysts to fix their own nitrogen from the atmosphere.

As shown in Table 3, the lowest cyanobacteria cell counts were found beyond the Beach in Northern Jefferson (B-1), while the highest cyanobacteria cell counts were found along the western shoreline of Crescent Cove (B-3). Historically, this part of the lake experiences some of the highest cyanobacteria cell counts due to a minimal amount of flushing and exchange of water with the main body of the lake, as well as the prevailing winds concentrating the cells along this section of shoreline.

Recommendations: While microcystins and cylindrospermopsin measurements were negative among all of the sampling stations, anatoxin-a concentrations were detected at two of the eight sampling sites. Both of these sampling sites were located in the River Styx / Crescent Cove section of the lake. However, it is not known if the concentrations exceed the State draft threshold of 27 ppb. In addition to the detected anatoxin-a, these two sampling stations (B-3 and B-4) had the highest concentrations of dissolved oxygen, pH values and cyanobacteria cell counts, all indicative of high rates of photosynthesis experienced during a bloom.

Princeton Hydro recommends that the current Advisory Alert remain in effect for the River Styx / Crescent Cove section of the lake and that the Borough beach remain closed until additional cyanobacteria cell count samples are collected and analyzed. Note that while somewhat rare, the field test strips have the potential to produce false positives. Thus, it is also recommended that samples be collected at the beach and analyzed for anatoxin-a, using the Eurofins Abraxis ELISA methodology. It is also recommended that samples be re-tested for microcystins and cylindrospermopsin, again using the Eurofins Abraxis ELISA methodology.

Site Location Map



File: P:\0003\projects\0003051\GIS\MXD\Hopatcong_Cyanotoxin_Monitoring.mxd, 8/8/2018, Drawn by: bsmith, Copyright Princeton Hydro, LLC

NOTES:
1. Monitoring locations are approximate.
2. 2015 orthoimagery obtained from NJ Office of Information Technology (NJOIT), Office of Geographic Information Systems (OGIS).

0 2,000 4,000 Feet

Map Projection: NAD 1983 StatePlane New Jersey FIPS 2900 Feet

CYANOTOXIN MONITORING LOCATION MAP

LAKE HOPATCONG
MORRIS AND SUSSEX COUNTIES
NEW JERSEY

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