

Memorandum

To: Ms. Colleen Conover, Lake Hopatcong Commission

From: Michael Hartshorne, Princeton Hydro

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

RE: 24 July 2018 – Cyanotoxin Testing – Lake Hopatcong

Pages: 5

Princeton Hydro conducted the first of two cyanobacteria / cyanotoxin testing events at Lake Hopatcong on 24 July 2018. The data collected as part of this effort are provided below.

Methodology

Princeton Hydro sampled at ten stations on 24 July 2018. At each station, plankton grab samples were collected, preserved with Lugol's and the plankton community identified to genus by Princeton Hydro. In addition, at each site, samples were collected in glass vials and analyzed the same day for the cyanotoxins Microcystin and Cylindrospermopsin utilizing ELISA based test kits from Abraxis. In addition, *in-situ* monitoring at each station was conducted utilizing a Hach MS5 water quality meter which was calibrated prior to use. Please note, the meter malfunctioned in the field following data collection at B1 and B2. The locations of the sample stations are listed in the table below (Table 1). A map depicting these stations will be provided shortly.

Table 1: Sampling Locations

Sampling Locations - 24 July 2018		
Station	Lat	Long
B1	40.9703	-74.6092
B2	40.9604	-74.6308
B3	40.9428	-74.6584
B4	40.9410	-74.6598
B5	40.9292	-74.6392
B6	40.9171	-74.6626
B7	40.9165	-74.6620
B8	40.9375	-74.6421
B9	40.9622	-74.6130
B10	40.9635	-74.6176



Results

The results of the sampling effort are listed in the following tables (Tables 2 through 5).

Table 2: Cyanotoxin Data

Cyanotoxin Results - 24 July 2018		
Station	Microcystin	Cylindrospermopsin
B1	negative	negative
B2	negative	negative
B3	negative	negative
B4	negative	negative
B5	negative	< 0.5 ppb
B6	negative	negative
B7	negative	negative
B8	negative	negative
B9	negative	negative
B10	< 1 ppb	negative
Draft EPA Criteria for Recreation	4 ppb	8 ppb

Table 3: *In-situ* Data

Lake Hopatcong - 24 July 2018 - Cyanotoxin Monitoring - <i>In-situ</i> Data							
	Secchi	Temp	SpC	DO	DO%	pH	Notes
	(m)	(°C)	(mS/cm)	(mg/L)	(%)	(units)	
B1	1.0	24.71	0.435	7.71	92.9	7.65	Light brown tint to water
B2	1.3	24.78	0.476	7.63	92.0	7.60	Tapegrass and slender naiad observed
B3	1.0	Water quality meter malfunctioned.					Mat algae present, greenish water coloration
B4	0.8						Benthic algae present
B5	1.4						Clear
B6	N/A						Clear
B7	N/A						Clear but some tapegrass floaters
B8	2.0						Clear

Table 4: Plankton Data (1 of 2)

Phytoplankton and Zooplankton Community Composition Analysis (1 of 2)												
Sampling Location: Lake Hopatcong					Sampling Date: 7/24/18					Examination Date: 8/2/18		
Phytoplankton (cells/mL)												
	B1	B2	B3	B4	B5		B1	B2	B3	B4	B5	
Bacillariophyta						Chlorophyta						
Melosira	3,669	2,211	684	365		Golenkria	175		86			
Tobellaria	699					Actinastrum	699					
Fragillaria	874		10,606		2,663	Scenedesmus	1,398		342			
Synedra	524		342			Chlamydomonas	349	402	513		213	
Asterionella	699					Chlorella	1,048	2,412	257	122	213	
Pinnularia	349		171			Pediastrum	2,096		513	1,461		
						Eudorina		804				
						Oocysts		402				
						Gloeocystis	15,199					
						Haematococcus			171			
						Staurastrum					107	
						Eustigmatophyceans						
						Chlorobotrys			86			
Chrysophyta												
						Cryptomonads						
						Cryptomonas	524	804	6,158	852	107	
Sites:	1	2	3	4	5	Comments:						
Total Phytoplankton (cells/mL)	221,698	41,607	26,345	3,287	30,145							

Table 5: Plankton Data (2 of 2)

Phytoplankton and Zooplankton Community Composition Analysis (2 of 2)																				
Sampling Location: Lake Hopatcong					Sampling Date: 7/24/18					Examination Date: 8/2/18										
Phytoplankton (cells/mL)																				
Bacillariophyta		B6	B7	B8	B9	B10	Chlorophyta		B6	B7	B8	B9	B10	Cyanobacteria		B6	B7	B8	B9	B10
Melosira		1,392	740			5,113	Goelenkio		278				128	Aphanizomenon			4,073	35,220		16,107
Tubellaria		557	463			511	Sphaerocystis		2,227	802				Anabaena		27,838	4,597	4,943		34,259
Fragilaria			987				Scenedesmus		1,670	123				Gloeocapsa		4,454				2,173
Synedra		139		154		256	Chlamydomonas			31		227		Aphanocapsa		62,635				104,183
Asterionella		1,531				383	Chlorella		557	185	309	113	1,534	Synechococcus		974		309	113	
Pinularia		278					Pediastrum		1,392	1,913			1,278	Lyngbya				864		
Stephanodiscus			31				Eudorina		1,670	247			2,045	Raphidiopsis						128
Ceratoneis			31				Oocystis		1,114	123	1,236		511	Merismopedia						2,045
Navicula				154			Cucullaria			2,314										
Cyclotella						128	Coscinorium			123										
							Staurastrum			123										
							Coelastrum		13,780	216										
							Ankistrodesmus			62										
							Haematooccus					113	128							
							Microsterias					113								
							Staurodesmus						1,023							
							Eustigmatophyceans													
							Chlorobotrys													

Overall, the plankton communities were generally diverse with a mixture of diatoms, cryptomonads, greens and blue-greens. Cyanobacteria cell counts ranged from a minimum of 113 cells/mL at B9 to a maximum of 193,396 cells/mL at B1 which showed a large density of the very small celled *Aphanocapsa*. The nuisance producing *Aphanizomenon* and *Anabaena* were present at all stations with the exception of B9. These genera were particularly abundant at B1, B2, B6, B8 and B10.

Microcystis were negative at all stations with the exception of B10 which showed a concentration of $< 1 \mu\text{g/L}$. This value is well below the draft recreational threshold of $4 \mu\text{g/L}$ set by the US EPA. Cylindrospermopsin was negative at all stations with the exception of a value of $< 0.5 \mu\text{g/L}$ at B5 which is well below the draft criteria of $8 \mu\text{g/L}$.

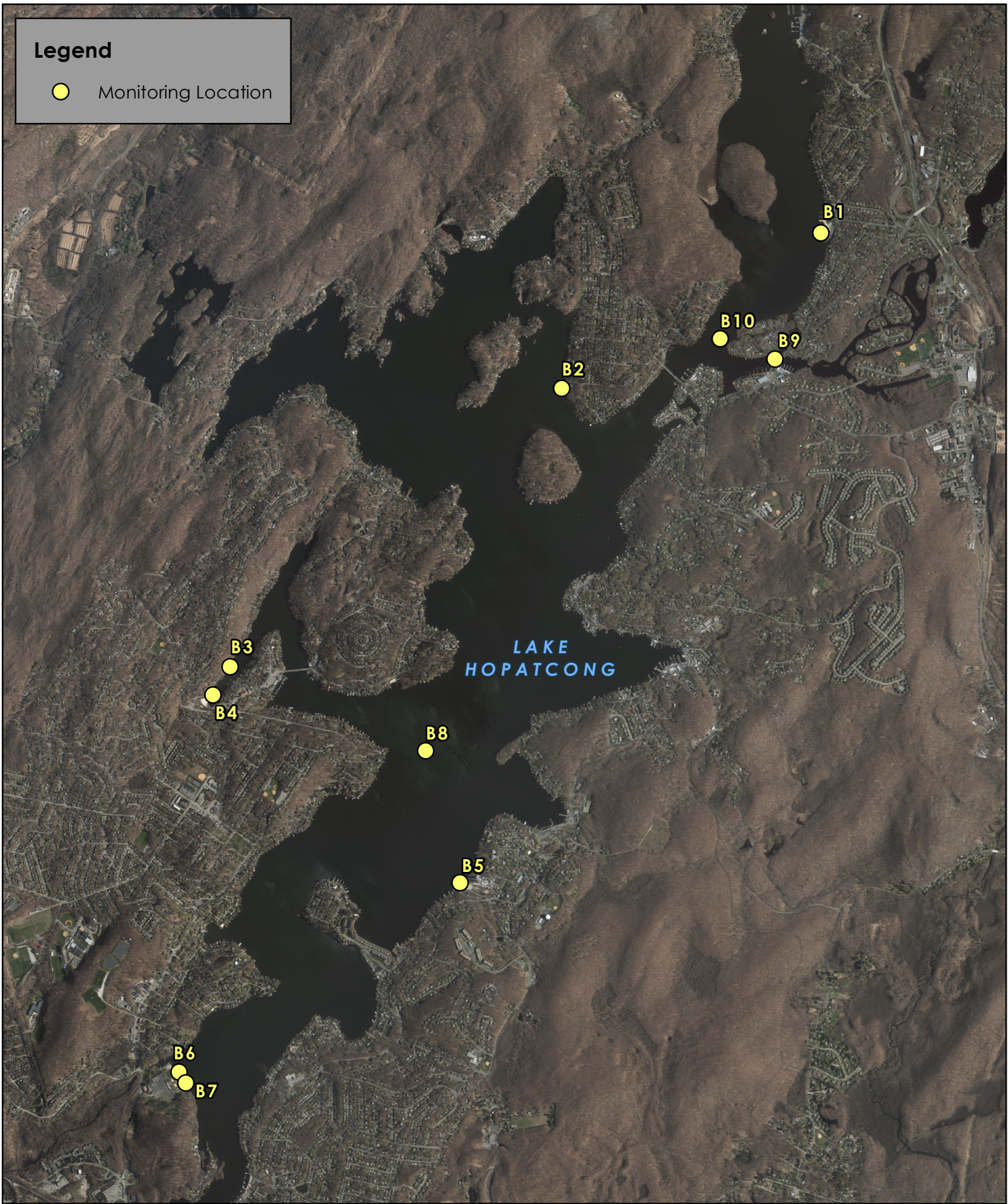
Thank you for your review of this brief summary. Please feel free to contact me or Dr. Fred Lubnow with any questions or concerns.

Sincerely,

A handwritten signature in black ink that reads "Michael Hartshorne". The signature is written in a cursive, flowing style with a long horizontal stroke at the end.

Michael Hartshorne
Senior Limnologist
Princeton Hydro, LLC

File: P:\0003\projects\0003051\GIS\MXD\LakeHopatcong_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 (NJOLT), Office of Geographic Information Systems (OGIS).



CYANOTOXIN MONITORING LOCATION MAP

LAKE HOPATCONG
MORRIS AND SUSSEX COUNTIES
NEW JERSEY



PRINCETON HYDRO
SCIENCE DESIGN ENGINEERING
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