



Northeast Aquatic Research, LLC

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Mansfield Center, CT 06250
July 16, 2021



TO: Residents of East Hampton, CT
ATTN: Town of East Hampton Conservation Lake Commission
FROM: Hillary Kenyon Garovoy, Certified Lake Manager
RE: **2021 Lake Pocotopaug Conditions Update**

The following summary letter provides an overview of in-situ water quality conditions, lake management activity, and laboratory nutrient results reported so far in 2021. A narrative of cyanobacteria bloom events and treatments is provided for historical records.

As mentioned in the April and May summary letters to Lake Commissioners, the EverBlue Lakes circulation aeration system was turned on 4/20/2021, prior to natural thermal stratification and subsequent oxygen loss in late spring. April and May water clarity (Secchi disk transparency) was generally poor, ranging from 1.7 to 1.9 meters; such clarity is within the range of regular spring clarity data collected from 2015-2020.

Nutrient concentration results take approximately six weeks to be reported by the laboratory, so April and May nitrogen and phosphorus results are formally reported in the table below. Please note that nutrient results are not used to make BioBlast treatment recommendations and are instead used to evaluate the success of aeration, any treatments, and watershed improvements. Results are important for long-term records and are used to track change over time, driven by both in-lake management and watershed projects. The monitoring parameters fulfill CT Department of Energy and Environmental Protection (DEEP) permit requirements for EverBlue Lakes to be able to perform BioBlast microbial-additive treatments in Lake Pocotopaug.

It is important for residents and Town officials to recognize that nutrient concentrations from April and May are highly variable at Lake Pocotopaug. These months tend to be more heavily impacted by watershed nutrient loading and variation in precipitation from year to year. Lake Pocotopaug nutrient concentration trends over the last two decades have categorized the waterbody as *eutrophic*, or dominated by algae and high nutrients. Nutrient concentrations measured so far in 2021 still classify Pocotopaug as *eutrophic* based on CT Water Quality Standards. April and May 2021 TP and TN surface (1-meter) results were above average, but values were within the range of spring measurements from 2015-2020. Spring-time bottom nutrient concentrations across the years are even more variable than surface values, in part related to the duration and extent of winter ice-cover and subsequent oxygen loss. Summer nutrient trends tend to reflect more in-lake phenomena than spring values, as internal nutrient loading from bottom sediments occurs predominantly in the summer into fall.

Long term and seasonal nutrient trends yield much more useful information than attempting to compare nutrient concentrations from a single day, or from one week to another. The exception to such an approach to nutrient data comparison is when aerators are turned on or off – because the amount of energy and mixing that occurs when the circulation aeration system is switched on will dramatically change nutrient concentrations in bottom waters within just hours. This was documented in 2020 and explained to Town Council in the year-end presentation. If resident groups wish to learn more about Lake Pocotopaug's long term and current nutrient concentrations, the Town is planning to offer a series of public Zoom presentations and question and answer sessions in 2021-2022. This is part of an increased effort to engage East Hampton residents and to decrease misinformation. All results are also regularly discussed in the Lake Advisory Committee Meetings.

	All Units = ug/L	Markham			Oakwood			Island		South/Outlet
		Top	Middle	Bottom	Top	Middle	Bottom	Top	Bottom	Top
4/19/2021	Ammonia Nitrogen (NH3)	9	NS	128	27	NS	368	14	21	NS
	Nitrate + Nitrite Nitrogen (NOx)	7	NS	6	6	NS	3	NS	NS	NS
	Total Nitrogen (TN)	426	334	425	442	423	670	384	461	423
	Total Phosphorus (TP)	33	22	31	44	24	84	26	27	29
	Chlorophyll-a	4	NS	NS	6.2	NS	NS	7.9	NS	8
5/17/2021	Ammonia Nitrogen (NH3)	12	NS	21	10	NS	124	12	17	7
	Nitrate + Nitrite Nitrogen (NOx)	ND	NS	ND	ND	NS	ND	NS	NS	NS
	Total Nitrogen (TN)	392	425	377	398	471	572	412	491	339
	Total Phosphorus (TP)	27	43	27	29	40	55	35	36	23
	Chlorophyll-a	5.2	NS	NS	5.1	NS	NS	3.4	NS	3.1
ND = None Detected / Below Method Detection Limit										
NS = Not Sampled (not part of the scope of work and/or certain parameters not applicable)										
Red values indicate that the results are averages of two (field duplicate) samples - field duplicate samples were < 10% different for TN and TP										
Center for Environmental Sciences & Engineering (CESE) Laboratory Reported QA/QC Information Reported for Data Batch										
Parameter (Units = ug/L)	NH3-N	NOx-N	TN	TP	Chlorophyll-a					
EPA Method #	350.1	353.2	353.2	365.4	445.0					
Practical Quantitation Limit (PQL)	10	10	50	10	0.3					
Method Detection Limit (MDL)	3	3	8	1	0.1					

June-July 2021:

Town and Chatham Health Department (CHD) officials were notified of an early-season cyanobacteria bloom that formed around 6/15 and produced surface accumulations. Cyanobacteria scums were documented near the marina. The observed scums were apparently short-lived and dissipated within a day or two. Northeast Aquatic Research visited the lake on 6/17 and noted cyanobacteria surface accumulations in open-water, appearing as streaks and clumps across much of the surface of the lake. There was limited shoreline wind-blown accumulation of cyanobacteria at the Sears Park boat ramp, but no observable scums in the public swim area. Water quality conditions were immediately reported to the East Hampton Park and Recreation Department and CHD. CHD visited the lake on 6/18. CHD inspected the Sears Park Beach and several other shoreline areas, and they posted a recreational swimming advisory due to cyanobacteria presence and potential to produce shoreline scums (Category 2, CT DEEP/DPH). CHD sent a sample for toxin analysis, but no cyanotoxins were detected at that time.

Town officials decided to go forwards with EverBlue Lake’s proposal to apply BioBlast, a microbial-additive treatment that was first permitted in CT in 2020. BioBlast treatment was performed over multiple days the week of 6/21/2021. NEAR performed follow-up water quality monitoring on the last day of the BioBlast treatment on 6/24. NEAR collected phytoplankton algae samples from four locations before and after BioBlast treatment, as well as chlorophyll, nutrients, and temperature and dissolved oxygen profiles. Algae samples confirmed the presence of cyanobacteria, but cell counts are no longer being used to make public health determinations for beach postings. CHD now relies mainly on the presence of visual cyanobacteria surface accumulations and simple microscope confirmation of the presence of cyanobacteria in high amounts. NEAR provided duplicate algae samples to CHD for redundant confirmations.

Prior to the next regularly scheduled monitoring visit in mid-July, Lake Pocotopaug experienced another notable cyanobacteria bloom, including surface accumulations in the Sears Park beach area on 7/15. CHD posted a Category 3 cyanobacteria closure on 7/15. NEAR followed up with subsequent monitoring on 7/16. The day after the beach closure, the Sears swim area remained cloudy, but no surface cyanobacteria scums remained. Surface

accumulations of cyanobacteria are subject to movement by wind and conditions can change rapidly. Cyanobacteria surface accumulations were visible mainly on the eastern side of the lake on 7/16. Residents and their pets should avoid swimming in surface scums, as these areas tend to be where toxins accumulate in high amounts. We encourage anyone with recent or future cyanobacteria bloom photos to email them to pocotopaugvolunteermonitoring@gmail.com. Please make sure that your phone camera has access to your geolocation – as it will mark the latitude and longitude where the photo was taken.

June and July 2021 in-situ monitoring results are included below. (Secchi = water clarity; values below 2.0m are poor)

6/17/2021				6/24/2021				7/16/2021			
Cyanobacteria Bloom Noted 6/15-6/16, Advisory, no toxins detected				BioBlast Treatment Last Day				(Sears Beach Closed yesterday 7/15/21 for visible surface wispy scums)			
Markham Secchi = 1.95m				Markham Secchi = 1.30m				Markham Secchi = 1.20m			
Depth (m)	Temp (°C)	Oxygen (mg/L)	Oxygen Saturation %	Depth (m)	Temp (°C)	Oxygen (mg/L)	Oxygen Saturation %	Depth (m)	Temp (°C)	Oxygen (mg/L)	Oxygen Saturation %
0	23.3	8.4	100	0	24.5	8.0	96	0	26.6	9.5	120
1	23.2	8.4	100	1	24.3	8.0	96	1	26.2	9.3	117
2	23.2	8.4	99	2	24.0	8.1	96	2	26.1	9.1	113
3	23.2	8.4	100	3	23.9	7.8	96	3	25.9	9.0	112
4	23.2	8.4	99	4	23.7	7.7	92	4	25.8	9.1	113
5	23.2	8.4	99	5	23.7	7.7	92	5	25.0	8.7	106
6	23.1	8.4	100	6	23.7	7.7	92	6	24.6	7.9	96
7	23.1	8.2	97	7	23.7	7.7	91	7	24.4	7.1	86
8	23.0	8.2	97	8	23.4	7.4	88	8	24.1	6.4	77
8.2	22.8	6.9	82	8.2	23.4	5.9	70	8.5	23.9	3.3	38
Oakwood Secchi = 1.60m				Oakwood Secchi = 1.37m				Oakwood Secchi = 1.10m			
Depth (m)	Temp (°C)	Oxygen (mg/L)	Oxygen Saturation %	Depth (m)	Temp (°C)	Oxygen (mg/L)	Oxygen Saturation %	Depth (m)	Temp (°C)	Oxygen (mg/L)	Oxygen Saturation %
0	22.5	8.6	100	0	23.8	8.1	96	0	26.2	9.6	121
1	22.5	8.5	99	1	23.7	8.1	95	1	26.1	9.5	118
2	22.5	8.4	98	2	23.6	7.9	94	2	25.4	8.8	100
3	22.5	8.3	97	3	23.5	7.8	92	3	25.3	8.7	107
4	22.5	8.2	97	4	23.4	7.7	90	4	24.9	8.5	104
5	22.5	8.2	96	5	23.4	7.6	89	5	24.4	7.9	96
6	22.4	8.3	96	6	23.3	7.6	90	6	24.1	7.1	86
7	22.4	8.3	96	7	23.3	7.5	88	7	24.0	6.8	81
8	22.4	8.1	95	8	23.1	7.5	88	8	23.8	6.8	81
9	22.3	8.1	95	9	22.9	7.4	87	9	23.7	6.0	73
10	22.2	8.0	93	10	22.9	6.5	76	10	23.6	4.4	54
10.5	21.5	1.8	20	10.5	22.8	5.9	70	10.5	23.4	1.2	15
Island St. Secchi = 1.55m				Island St. Secchi = 1.45m				Island St. Secchi = 1.20m			
Depth (m)	Temp (°C)	Oxygen (mg/L)	Oxygen Saturation %	Depth (m)	Temp (°C)	Oxygen (mg/L)	Oxygen Saturation %	Depth (m)	Temp (°C)	Oxygen (mg/L)	Oxygen Saturation %
0	22.4	8.8	102	0	24.5	8.3	100	0	25.9	9.7	122
1	22.5	8.7	102	1	23.9	8.4	100	1	25.6	9.5	118
2	22.5	8.7	102	2	23.6	8.2	96	2	25.4	9.7	119
3	22.5	8.7	101	3	23.5	8.1	96	3	25.1	9.1	113
4	22.5	8.6	101	4	23.3	7.9	92	4	24.4	7.8	94
5	22.3	8.4	98	5	23.3	7.6	90	5	24.0	7.1	85
6	22.3	8.3	97	6	23.2	7.4	86	6	23.8	5.7	63
6.2	22.2	8.1	94					6.5	23.5	1.6	21
South/Outlet Station Secchi = 1.60m				South/Outlet Station Secchi = 1.35m				South/Outlet Station Secchi = 1.20m			
Depth (m)	Temp (°C)	Oxygen (mg/L)	Oxygen Saturation %	Depth (m)	Temp (°C)	Oxygen (mg/L)	Oxygen Saturation %	Depth (m)	Temp (°C)	Oxygen (mg/L)	Oxygen Saturation %
0	23.2	8.8	104	0	24.7	8.8	106	0	26.3	10.3	129
1	22.9	8.7	103	1	24.5	8.9	106	1	25.0	10.2	125
2	22.3	8.7	108	2	23.6	8.9	106	2	24.5	9.7	118
3	22.7	8.7	101	3	23.5	8.5	100	3	24.1	8.1	97
3.6	22.4	4.5	56	3.6	22.8	3.6	41	4	23.5	2.2	25
								4.1	23.3	0.7	6

It is important to note that the June water clarity was much worse than average, because the presence of artificial circulation aeration prevents the natural “clear-water phase” that occurs around June. June 2020 water clarity was very good for Lake Pocotopaug, at 3.5-meters; this clear-water phase is not possible while the aerators are running because there is no longer a transitional period between spring and summer types of phytoplankton. July 2021 Secchi water clarity was slightly worse than average, but within the normal range from 2015-2020.

The temperature and dissolved oxygen profile results indicate that the aeration circulation system is still actively circulating the lake and preventing anoxic conditions (<1.0mg/L DO) at the bottom of the Oakwood and Markham stations. However, the presence of dissolved oxygen at the lake bottom has not been able to reduce surface cyanobacteria blooms. At the recommendation of EverBlue Lakes, a follow-up BioBlast treatment is planned for the week of 7/19. As in the summer of 2020, it appears that the results of BioBlast treatments are relatively short-lived. Long-term effects are not possible to determine at this time. The Town has committed to approximately four total planned 2021 BioBlast treatments on top of the aeration circulation system operation. NEAR water quality data collection will continue on a monthly basis, or as requested by the Town of East Hampton. We request that EverBlue Lakes report BioBlast treatment dosages in daily dry-weight of product applied, for appropriate long-term records.

Efforts to update additional sites in the watershed, part of the long-term stormwater nutrient reduction strategy for Lake Pocotopaug, are underway. The Town is currently in the contracting phase with CT DEEP for the state-grant funding allocated to projects at Christopher Brook, O’Neil’s Brook, Edgewater Circle, and Fawn Brook at Bay Road. The Town is also pursuing additional watershed improvement construction projects at various sites, beyond the scope of the 2021 CWA-Sec.319-grant. Watershed updates are regularly discussed at the Conservation Lake Commission meetings.

Sincerely,

Hillary Kenyon Garovoy
Limnologist, Certified Lake Manager, & Soil Scientist

Pocotopaug Monitoring Sites Map:

