

# Water quality at Harvey Lake, 2018

The water at Harvey Lake has been tested for several decades, even before the creation of the Harvey Lake Watershed Association in 2003.

A look at the historical data indicates that the lake experienced its most serious degradation about 30 years ago, when during the period from 1977 to 1990, the lake’s trophic classification was reduced from mesotrophic to eutrophic.

An explanation of the two terms:

**Mesotrophic:** (Harvey Lake’s classification prior to 1977) These lakes are commonly clear water lakes and ponds with beds of submerged aquatic plants and medium levels of nutrients.

**Eutrophic:** (Harvey Lake’s classification since 1990) A eutrophic body of water has high biological productivity. Due to excessive nutrients, especially nitrogen and phosphorus, these water bodies are able to support an abundance of aquatic plants. Usually, the water body will be dominated either by aquatic plants or algae.

Eutrophication is the process by which a lake accumulates an excessive richness of nutrients, frequently due to runoff from the land, which causes a dense growth of plant life and death of animal life from lack of oxygen.

A DES report dated Jan. 16, 1991, indicates: “The change in trophic status was due to a doubling of the algae level and a two-thirds reduction in water clarity.”

## A sampling of recent testing results:

Date	Chl.-A	Transparency	Phos/inlet	Phos/dam	Phos/deep (EPI)	Dis. Oxy.
7/10/1990	9.76 ug/L	1.8 m	44 ug/L	32 ug/L	20 ug/L	0.0
8/31/2005			41 ug/L	26 ug/L	28 ug/L	
9/24/2007			35 ug/L	25 ug/L	18 ug/L	
8/11/2009			29 ug/L	22 ug/L	24 ug/L	
8/11/2011			50 ug/L	68 ug/L	15 ug/L	
8/15/2013			27.5 ug/L	21.2 ug/L	16.3 ug/L	
8/16/2016	8.6 ug/L		61.8 ug/L	19.0 ug/L	11.6 ug/L	
7/23/2017	7.98 ug/L	1.55 m	87.9 ug/L	20.2 ug/L	19.3 ug/L	
6/10/2018		1.5 m	29.4 ug/L	23.3 ug/L	18.5 ug/L	
7/15/2018		1.68 m	51.4 ug/L	36.1 ug/L	17.0 ug/L	
8/16/2018			27.2 ug/L	23.8 ug/L	20.9 ug/L	

### Note:

State median for phosphorous is 12 ug/L for N.H. lakes.

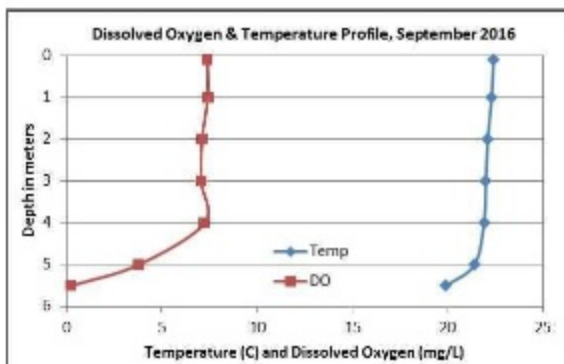
A 2006 report noted chlorophyll-A levels at Harvey Lake are higher than the state median of 4.58 mg/m<sup>3</sup>. Our Chl-A results were called “slightly bad” in a 2016 report.

I attended the annual VLAP conference Saturday, May 19, 2018, in Concord. Overall, the news on the state front was good for lakes. Sampling data from last summer indicated for the most part over the past three decades, a lot of the indicators we check - phosphorous, chlorophyll-a, and transparency – have remained relatively stable. For 30 years, with all the development that has occurred along lakefronts in that time period, that's pretty good news.

Not so good on the national front, with the 2012 National Lake Assessment showing that nationwide, 40 percent of the country's lakes had high phosphorous, which increased overall from 2007 to 2012, with the most dramatic increase in undeveloped lakes.

Fortunately, in New Hampshire, the opposite was found to be the case: indicators of lake productivity are stable for most of the 180 lakes sampled statewide, with most lakes showing stable or improving trends in phosphorous, chlorophyll-a and transparency.

The state credits several factors for this good news: a ban on phosphates used in household detergents since 2010, a maximum on the phosphate content in fertilizers since 2014, better oversight of septic system permitting, and the Shoreland Water Quality Protection Act, which mandates what can and can't be built on shoreland, including the size of impervious surface areas. The state has also indicated a decline in phosphorous concentration in precipitation during the past 30 years, probably the results of less acid rain due to EPA standards that regulate what factories can emit into the air.



### Harvey Lake DO results, 2016

Now, specifically at Harvey Lake, the results are mixed. According to our individual lake report for 2017: Lake chlorophyll levels have improved in recent years and have remained below the threshold for eutrophic lakes since 2013. However, water clarity has significantly decreased since monitoring began and may in part be caused by an increase in dissolved organic matter that imparts a "tea" or brown color to the water. Apparent color analyses conducted in 2017 indicated highly tea colored water which can impact clarity. This is very different from 2016, a drought year, where water color was much clearer. This indicates that in wetter years, flushing of wetland systems rich in dissolved organic matter may negatively impact clarity as well as transport excess nutrients to the lake. Boat launch E.coli levels were elevated and not suitable for swimming. Continue to conduct sampling and discourage feeding of waterfowl and post signs cautioning the public if it is used as a swimming area. Lake conductivity levels have increased steadily since 2013 and attention should be focused on trying to reduce the impacts of winter de-icing materials applied to roads, parking lots, driveways and walkways. Encourage local road agents and winter maintenance companies to obtain a Voluntary NH Salt Applicator license through the UNH Technology Transfer Center's Green SnowPro certification program.

Ted Diers of The Dept. of Environmental Services gave a very good talk on the use of road salt on NH roadways. This salt affects our lake's conductivity readings. (Our lake's conductivity and chloride levels were slightly elevated in 2017 and above the state median at the inlet, but overall less than the state standard for chronic chloride issues.)

Salt matters because it kills trees, pollutes wells, is toxic for fish and can cause infrastructure damage (crumbling concrete walls, etc.)

## **E. coli testing**

We have tested intermittently for e coli (fecal bacteria) for several years. State standards for Class B waters (which includes Harvey Lake) specify no more than 406 e. coli counts/100nL in any one sample, and for designated beach areas (we are NOT part of the beach inspection program) the more stringent standard of 88 counts/100 mL applies. Over these amounts triggers a warning that is posted at the beach area (only in state-inspected beaches, not us).

We test only at the beach/boat ramp for e coli. Some results in the record over the years:

8/31/2005: 140 cts/100 mL; at the inlet: 270 cts/100 mL

8/8/2016 at the beach: 360 cts/100mL

6/11/2018 at the beach: 19.9 MPN/100mL

7/30/2018 at the beach: 770.1 MPN/100mL

8/14/2018 at the beach: 24.1 MPN/100mL

Other than the July 2018 reading, we have been in compliance for Class B waters when we test. The July reading could be an aberration due to the fact that it was a busy, hot day when we tested. No ducks were noted in the area, but several people, including children, were swimming, and boaters were putting in watercraft.

Several years ago, I did make a request of selectmen to include us in the beach inspection program, but they declined, stating we are not a public beach.

## **Cyanobacteria**

The new bogeyman in New Hampshire waters is cyanobacteria, previously known as blue-green algae, and recently linked with everything from ALS to Alzheimer's Disease. Because these single-cell organisms, which predate human existence, release toxins that could affect our skin (dermatotoxin), liver (hepatotoxin) or nervous system (neurotoxin), they are under study and not very well understood.

This past summer, probably due to heavy rains and high temperatures, was a busy one for warnings on N.H. lakes, not only fecal bacteria advisories, but also cyanobacteria advisories. The New Hampshire Department of Environmental Services says it is seeing an increase of dangerous levels of cyanobacteria in some lakes and ponds. The department has issued 10 advisories since June 29, 2018, on N.H. lakes.

Harvey Lake did not warrant an advisory this summer. We did have a bloom on the shore behind the gymnasium at Coe Brown Academy on Sunday, July 1, 2018. We called the state DES office and an inspector came out. Amanda McQuaid, the beach program coordinator for DES, sent us this report: "There were some cyanobacteria, but at low concentrations. It's been very common for these to bloom. I saw Microcystis, Woronichinia and Anabaena types at 7,000 cells/ml. We issue advisories once it

reaches 70,000 cells/ml. I don't think they observed the green mat from the photos you had sent me. I do think it could be a combination of green filamentous algae and cyanobacteria."

Harvey Lake did have an advisory issued for a cyanobacteria bloom, last on June 8, 2009. It was reported on the western shore.

In the file is a report dated Aug. 5, 1994, the aquatic biologist noted high amounts of blue-green algae called *Oscillatoria* and *Coelosphaerium* on the shorefront near the cemetery. However, no warning was issued.