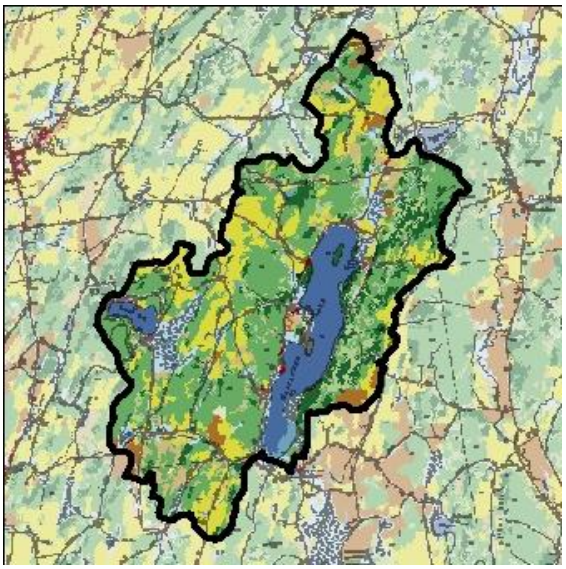
Cossayuna Lake

Cossayuna Lake Improvement Association	Town of Argyle	Washington County



Lake Characteristics		
	Surface area (ac/ha)	659 / 267
	Max depth (ft/m)	25 / 8
	Mean depth (ft/m)	12 / 4
	Retention time (years)	0.8
	Lake Classification	A
	Dam Classification	A

Watershed Characteristics		
	Watershed area (ac /ha)	7652/3060
	Watershed / Lake ratio	11
	Lake & wetlands %	17%
	Agricultural %	21%
	Forest, shrub, grasses %	57%
	Residential	6%
	Urban	0%

CSLAP Participation		
	Years	1992-1996, 1998-1999, 2001-2010, 2012-2018
	Volunteers	Richard Snyder, P. Gene Henry, Lynn Clauer, and Lynn Wilbur

Trophic state	HABs Susceptibility	Invasive Vulnerability	PWL Assessment
Mesoeutrophic	Frequent blooms, Moderate Susceptibility	Invasives present, High Vulnerability	Impaired

Water quality values for Cossayuna Lake for the 2018 sampling season. “Seasonal change” shows current year variability. Light red color indicates eutrophic conditions in top table and bloom conditions in bottom table. Summer averages for each of the CSLAP years and long term trend analyses show trends in key water quality indicators over a consistent index period (mid-June thru mid-September).

Open Water Indicators	2018 Sampling Results								Seasonal change	Long Term Avg	Long Term Trend?	18 Diff from Avg
	5/29	6/11	6/26	7/10	7/30	8/13	8/27	9/10				
Clarity (m)	7.5	7.0	5.0	4.0	3.0	3.5	2.2	2.0		2.2	↑↑	↑
Surface TP (mg/l)	0.016	0.012	0.016	0.016	0.017	0.018	0.025	0.032		0.028	↓	no
Surface TDP (mg/l)	0.009	0.004	0.013	0.007	0.010	0.008	0.007	0.010		1.734	↓	
Deep TP (mg/l)	0.012	0.013	0.018	0.022	0.052	0.060	0.025	0.033		0.036	↓↓	
Deep/Surface TP	1	1	1	1	3	3	1	1		1		
TN (mg/l)	0.561	0.422	0.530	0.500	0.636	0.612	0.756	1.110		0.528	no	no
TDN (mg/l)	0.424	0.363	0.524	0.499	0.259	0.339	0.633	1.180				
N:P Ratio	36	35	33	31	37	35	30	34		21		
Deep/Surface NH4	2	4	2		6	5	11	1		5		
Chl.a (ug/l)	1.1	1.2	1.3	5.1	3.6	12.4	6.2	7.7		18.3	no	no
pH	7.9	7.4	8.0	7.8	7.4	7.7	8.1	7.7		8.0	↓↓	no
Cond (umho/cm)	166	202		224		213	214	209		186	no	no
Upper Temp (degC)	20	24	21	27	25	27	24			23	↑	no
Deep Temp (degC)	18	19	20	22	24	24	23			22	no	no
FP BG Chl.a (ug/l)	0	0	0	2	1	22	41	18		5	no	no
HABs reported?	no	no	no	no	no	no	shore	shore				

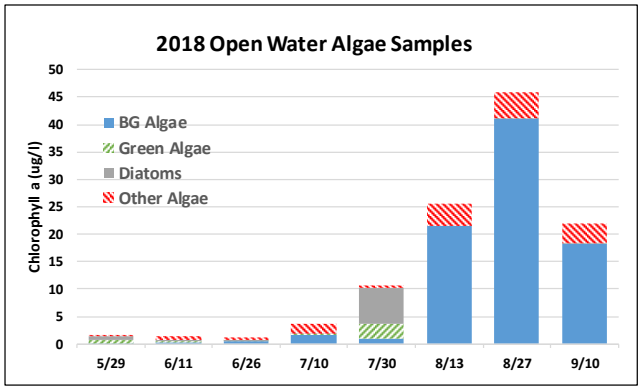
Shoreline bloom and HABs notifications

Date of first listing	Date of last listing	# weeks on the DEC notification list	# Weeks with updates
8/31/2018	10/5/2018	6	3

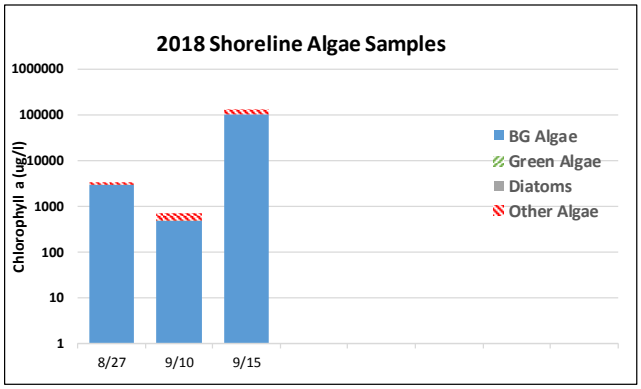
Shoreline HAB Sample Dates 2018

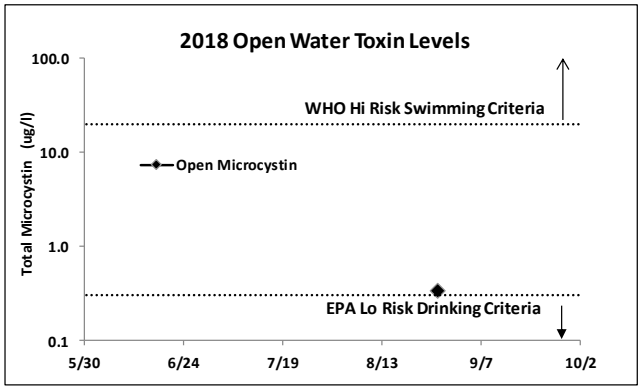
HAB Indicators	HAB criteria	8/27/2018	9/10/2018	9/15/2018
BGA	25 - 30 ug/L	3045.3	498.1	105572.2
microcystin	20 ug/L	2.6	0.8	270.0
anatoxin - a	4 ug/L			

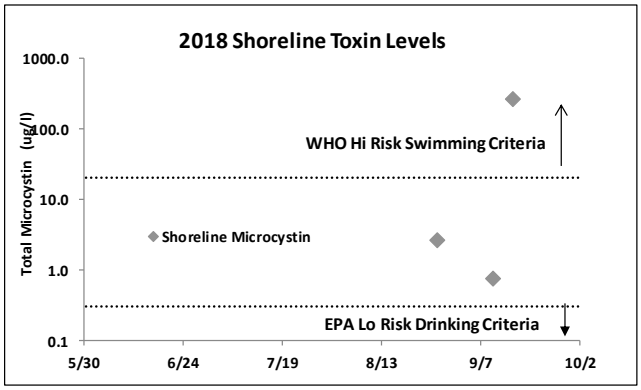
HABs Status Open water Algae



Shoreline Algae

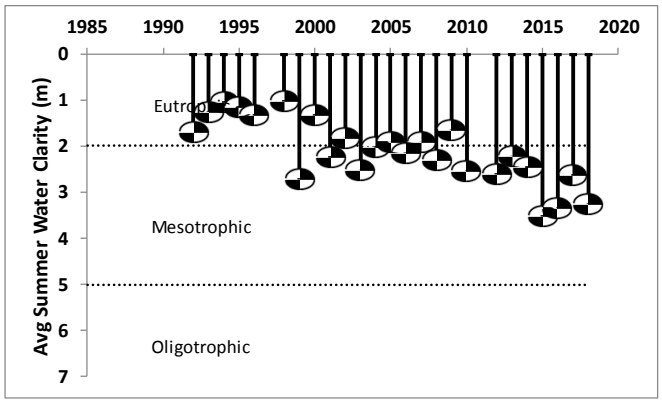




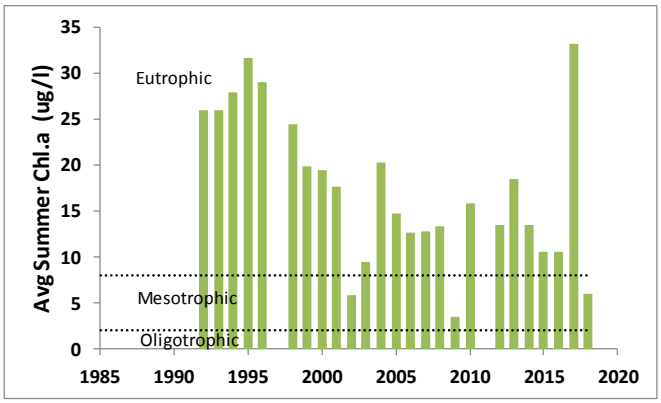


Cossayuna Lake Long Term Trend Analysis

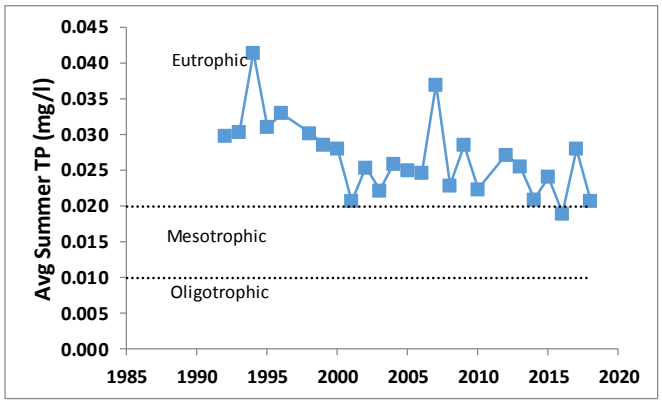
Clarity



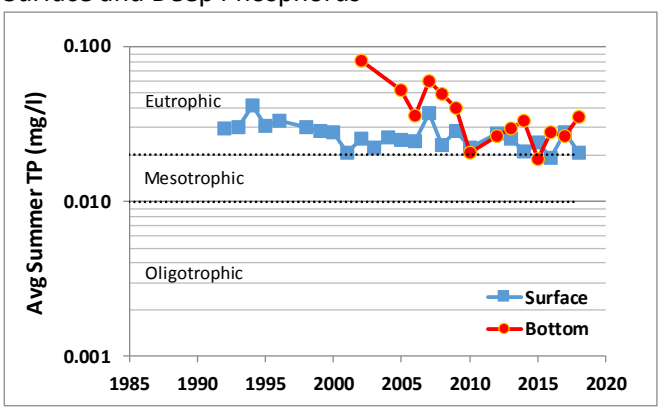
Chlorophyll *a*



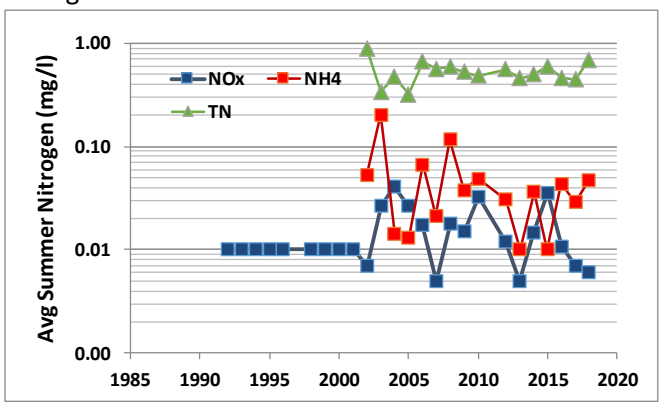
Surface Phosphorus



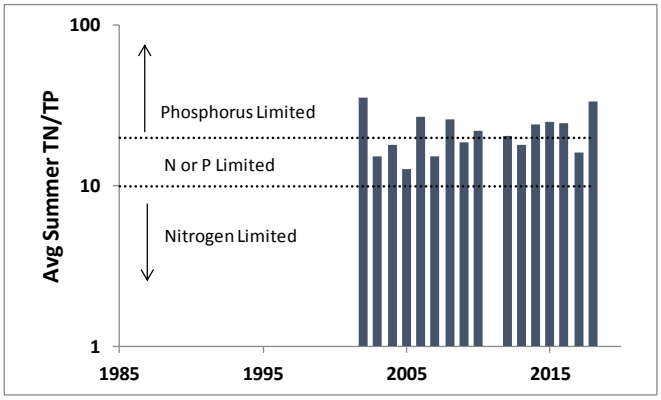
Surface and Deep Phosphorus



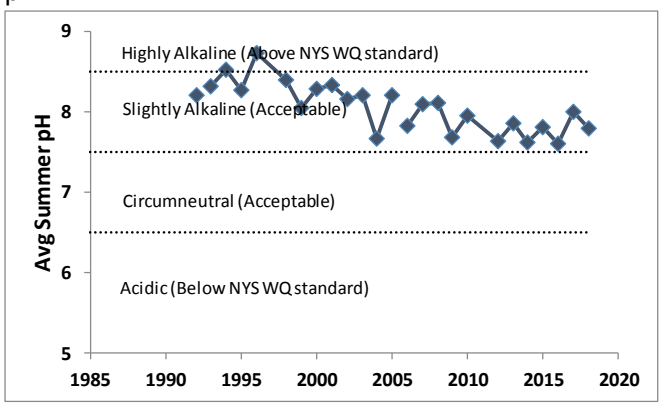
Nitrogen



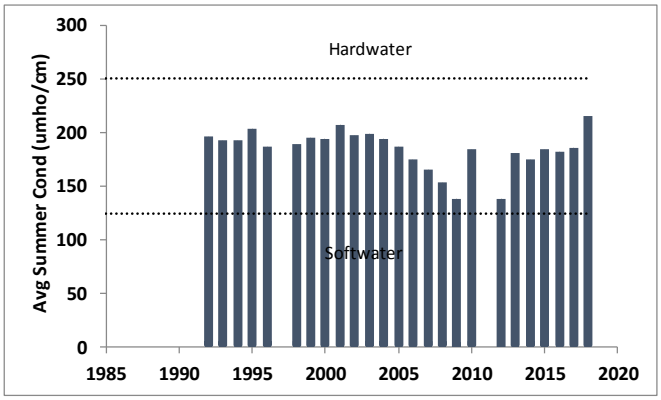
TN : TP



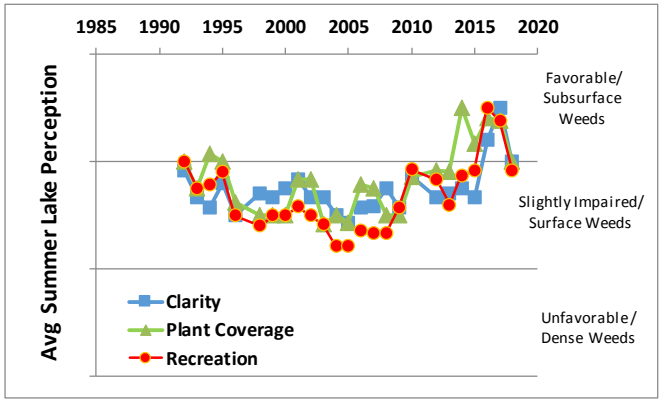
pH



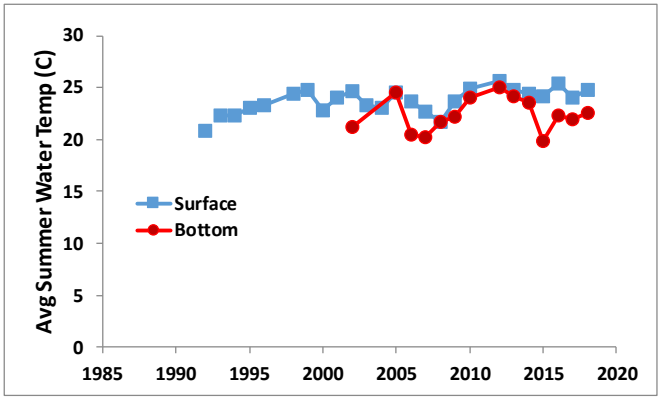
Specific Conductance



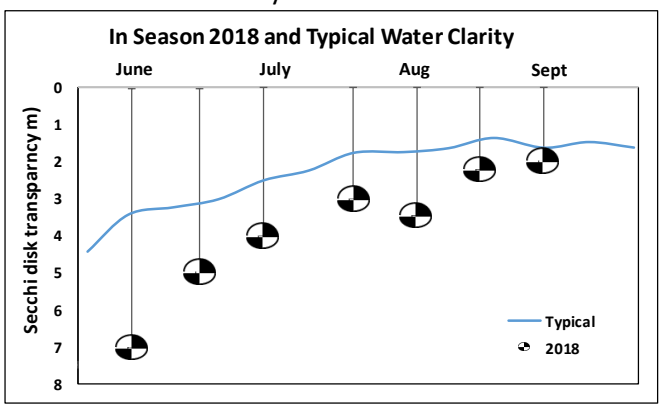
Lake Perception



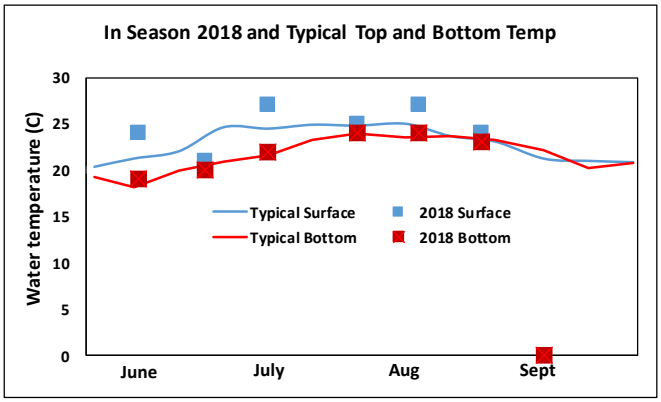
Surface and Deep Temperature



In Season Water Clarity



In Season Water Temperature



Scorecard

Lake Use

	PWL	Average Year	2018	Primary issue
Potable Water	●	■	◆	Algae levels
Swimming	◆	◆	●	Algae blooms
Recreation	■	■	◆	Algae blooms
Aquatic Life	◆	▲	●	Invasive animals
Aesthetics	◆	◆	▲	Algae blooms
Habitat	◆	◆	◆	Invasive plants
Fish Consumption	●	□	□	Not applicable

● Supported / Good
▲ Threatened / Fair
◆ Stressed / Poor
■ Impaired
□ Not Known

CSLAP sampling summary- Cossayuna Lake, 2018

Q. What is the condition of the lake?
A. Cossayuna Lake continues to be mesoeutrophic, or moderately to highly productive, based on moderate water clarity, high algae levels (chlorophyll a), and high nutrient (phosphorus) levels. Soluble nutrients were analyzed for the first time in 2018. Some of the phosphorus in the lake is soluble, indicating some potential for more algae growth. Most of the nitrogen in the lake is soluble. The lake has slightly alkaline, intermediate hardness water, low water color, and moderately high nitrogen levels.

Q. How did 2018 compare to previous years?
A. Water clarity and specific conductance readings were higher than normal in 2018. Each of the other water quality indicators was close to normal in 2018.

Q. How does this lake compare to other nearby lakes?
A. Compared to other nearby lakes, Cossayuna Lake usually has higher pH, conductivity, calcium levels, and chloride levels. The lake usually has similar water quality and recreational assessments, and similar aquatic plant coverage (although the latter may be mediated by the use of herbicides or other plant management actions).

Q. Are there any (statistically significant) trends?
A. Since 1992, water clarity has increased significantly, surface water temperatures have increased slightly, and deep phosphorus, and pH decreased significantly. Surface phosphorus levels have decreased slightly. None of the other water quality indicators has exhibited any clear long-term trends.

Q. Has the lake experienced harmful algal blooms (HABs)?
A. Water quality conditions indicate a moderate susceptibility to blooms, with frequent blooms along the shoreline or in the open water. The open water algal community in the lake is usually comprised of intermediate cyanobacteria levels. This community is dominated by *Anabaena* (now called *Dolichospermum)*, with some *Microcystis* and *Lyngbya.* Overall open water algae levels are high. Open water toxin levels are consistently below recreational levels of concern. Shoreline blooms have been documented in the lake, comprised primarily of cyanobacteria dominated by *Lyngbya, Microcystis*, and *Anabaena*. The shoreline algal community at times exhibits high toxin levels.

In 2018, overall algae levels were high, with cyanobacteria the most common taxa in open water samples, and with intermediate cyanobacteria levels. Open water toxin levels

were at times low but detectable in 2018. Shoreline blooms in 2018 were documented in the lake, comprised primarily of cyanobacteria with high toxin levels. The most common taxa were *Lyngbya* and *Dolichosprmum*.

Q. Have any aquatic invasive species (AIS) been reported?
A. There are invasive plants reported or present at Cossayuna Lake, and invasives have been reported in nearby waterbodies. Invasives species reported in the lake include Eurasian watermilfoil, curly leafed pondweed, water chestnut and brittle naiad. Zebra mussels has been reported in Cossayuna Lake. Cossayuna Lake has high vulnerability for new invasives, based on calcium levels and public access, and the presence of AIS.

Q. Are any lake uses likely to be affected by these conditions?
A. Cossayuna Lake supports recreation and public bathing use. Public water supply is impaired by high frequency of algae levels above criteria protecting potable water use, and impacted by raw water cyanotoxins, open water HABs, and deepwater pollutants. Public bathing is stressed by open water HABs, but less impacted than previously due to trends toward improving water quality. Recreation is impaired by HABs, and impacted by high frequency of algae levels above criteria protecting recreational use, shoreline cyanotoxins, and shoreline HABs. Aquatic life is threatened by presence of invasive animals. Aesthetics are poor due to HABs, and impacted by excessive phosphorus levels, poor recreational perception, and poor water quality perception. Habitat is fair due to need for aquatic plant (weed) management, and impacted by presence of invasive aquatic plants. Fish Consumption use is considered to be unassessed. There are no health advisories limiting the consumption of fish from this waterbody (beyond the general advice for all waters). However, due to the lack of actual fish sampling data, fish consumption use is noted as unassessed, rather than fully supported but unconfirmed.

How to Read the Report

This guide provides a description of the CSLAP report by section and a glossary. The sampling site is indicated in the header for lakes with more than one routine sampling site.

Physical Characteristics influence lake quality:

- Surface area is the lake's surface in acres and hectares.
- Max depth is the water depth measured at the deepest part of the lake in feet and meters.
- Mean depth is either known from lake bathymetry or is 0.46 of the maximum depth.
- Retention time is the time it takes for water to pass through a lake in years. This indicates the influence of the watershed on lake conditions.
- Lake classification describes the "best uses" for this lake. Class AA, AAspec, and A lakes may be used as sources of potable water. Class B lakes are suitable for contact recreational activities, like swimming. Class C lakes are suitable for non-contact recreational activities, including fishing, although they may still support swimming. The addition of a T or TS to any of these classes indicates the ability of a lake to support trout populations and/or trout spawning.
- Dam classification defines the hazard class of a dam. Class A, B, C, and D dams are defined as low, intermediate, high, or negligible/no hazard dams in that order. "0" indicates that no class has been assigned to a particular dam, or that no dam exists.

Watershed characteristics influence lake water quality:

- Watershed area in acres and hectares
- Land use data come from the most recent (2011) US Geological Survey National Land Use Cover dataset

CSLAP Participation lists the sampling years and the current year volunteers.

Key lake status indicators summarize lake conditions:

- Trophic state of a lake refers to its nutrient loading and productivity, measured by phosphorus, algae, and clarity. An oligotrophic lake has low nutrient and algae levels (low productivity) and high clarity while a eutrophic lake has high nutrient and algae levels (high productivity) and low clarity. Mesotrophic lakes fall in the middle.
- Harmful algal bloom susceptibility summarizes the available historical HAB data and indicates the potential for future HAB events.
- Invasive vulnerability indicates whether aquatic invasive species are found in this lake or in nearby lakes, indicating the potential for further introductions.
- Priority waterbody list (PWL) assessment is based on the assessment of use categories and summarized as fully supported, threatened, stressed, impaired, or precluded. Aesthetics and habitat are evaluated as good, fair, or poor. The cited PWL assessment reflects the "worst" assessment for the lake. The full PWL assessment can be found at http://www.dec.ny.gov/chemical/36730.html#WIPWL.

Current year sampling results

- Results for each of the sampling sessions in the year are in tabular form. The seasonal change graphically shows the current year results. Red shading indicates eutrophic readings.
- HAB notification periods on the DEC website, updated weekly http://www.dec.ny.gov/chemical/83310.html
- Shoreline HAB sample dates and results. Samples are collected from the area that appears to have the worst bloom. Red shading indicates a confirmed HAB.
- HAB sample algae analysis. Algae types typically change during the season. These charts show the amount of the different types of algae found in each mid-lake or shoreline sample. Samples with high levels of BGA are HABs. The second set of charts show the level of toxins found in open water and shoreline samples compared to the World Health Organization (WHO) guidelines.
- If there are more than ten shoreline bloom samples collected in a year, bloom sample information is instead summarized by month (May-Oct.) as minimum, average, and maximum values for blue-green algae and microcystin.

Long Term Trend Analysis puts the current year findings in context. Summer averages (mid-June thru mid-September) for each of the CSLAP years show trends in key water quality indicators. The graphs include relevant criteria (trophic categories, water quality standards, etc.) and boundaries separating these criteria.

In-Season Analysis shows water temperature and water clarity during the sampling season. These indicate seasonal changes and show the sample year results compared to the typical historical readings for those dates.

The Lake Use Scorecard presents the results of the existing Priority Waterbody List assessment for this lake in a graphical form and compares it to information from the current year and average values from CSLAP data and other lake information. Primary issues that could impact specific use categories are identified, although more issues could also affect each designated use.

The Lake Summary reviews and encapsulates the data in the lake report, including comparisons to historical data from this lake, and results from nearby lakes.

Glossary of water quality and HAB indicators

Clarity (m): The depth to which a Secchi disk lowered into the water is visible, measured in meters. Water clarity is one of the trophic indicators for each lake.

TP (mg/L): Total phosphorus, measured in milligrams per liter at the lake surface (1.5 meters below the surface). TP includes all dissolved and particulate forms of phosphorus. TSP, or total soluble phosphorus, was collected in 2018 and discussed in the lake narrative section.

Deep TP: Total phosphorus measured in milligrams per liter at depth (1-2 meters above the lake bottom at the deepest part of the lake)

TN: Total nitrogen, measured in milligrams per liter at the lake surface. TN includes all forms of nitrogen, including **NOx** (nitrite and nitrate) and **NH_4** (ammonia).

N:P Ratio: The ratio of total nitrogen to total phosphorus, unitless (mass ratio). This ratio helps determine if a lake is phosphorous or nitrogen limited.

Chl.a (µg/L): Chlorophyll a, measured in micrograms per liter. Indicates the amount of algae in the water column. This is an extracted chlorophyll measurement.

pH: A range from 0 to 14, with 0 being the most acidic and 14 being the most basic or alkaline. A healthy lake generally ranges between 6.5 and 8.5.

Cond (µmho/cm): Specific conductance is a measure of the conductivity of water. A higher value indicates the presence of more dissolved ions. High ion concentrations (> 250) usually indicate hardwater, and low readings (< 125) usually show softwater.

Upper Temp (°C): Surface temperature, measured in degrees Celsius

Deep Temp (°C): Bottom temperature, measured in degrees Celsius

BG Chl.a (µg/L): Chlorophyll a from blue-green algae, measured in micrograms per liter. This is an "unextracted" estimate using a fluoroprobe. This result is not as accurate as the extracted chlorophyll measurement described above.

HABs: Harmful Algal Blooms. Algal blooms that have the appearance of cyanobacteria (BGA)

BGA: Blue-green algae, also known as cyanobacteria

Microcystin (µg/L): The most common HAB liver toxin; total microcystin above 20 micrograms per liter indicates a "high toxin" bloom. However, ALL BGA blooms should be avoided, even if toxin levels are low.

Anatoxin-a (µg/L): A toxin that may be produced in a HAB which targets the central nervous system. Neither EPA nor NYS has developed a risk threshold for anatoxin-a, although readings above 4 micrograms per liter are believed to represent an elevated risk.