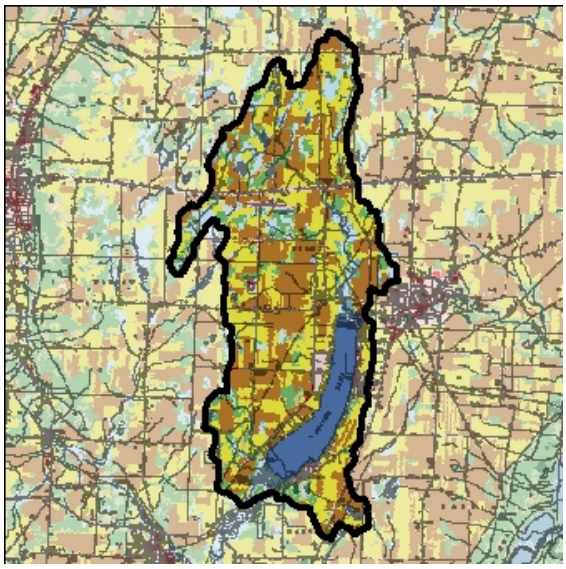
Silver Lake	Silver Lake Association	Towns of Perry and Castille	Wyoming County



Lake Characteristics		
	Surface area (ac/ha)	813 / 329
	Max depth (ft/m)	38 / 12
	Mean depth (ft/m)	24 / 7
	Retention time (years)	1.2
	Lake Classification	A
	Dam Classification	B

Watershed Characteristics		
	Watershed area (ac /ha)	12924/5230
	Watershed / Lake ratio	16
	Lake & wetlands %	19%
	Agricultural %	62%
	Forest, shrub, grasses %	12%
	Residential	7%
	Urban	0%

CSLAP Participation		
	Years	1986-1991, 1995-1997, 2006-2013, 2015-2016
	Volunteers	Frank Bright

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

Water quality values for Silver Lake for the 2016 sampling season. "Seasonal change" shows current year variability. Light red color indicates eutrophic conditions in top table and bloom conditions in bottom table.

Open Water Indicators	2016 Sampling Results								Seasonal change	Long Term Avg	Long Term Trend?
	6/19	7/4	7/17	8/5	8/14	9/4	9/18				
Clarity (m)	3.1	2.8	2.9	2.1	2.3	2.5	2.5			2.3	no
TP (mg/l)	0.028	0.029	0.054	0.016	0.021	0.037	0.029			0.041	no
Deep TP (mg/l)	0.033	0.029	0.054	0.017	0.023	0.031	0.021			0.205	no
TN (mg/l)	0.666	0.559	0.875	0.501	0.685	0.652	0.550			0.936	no
N:P Ratio	24	19	16	31	33	17	19			23	no
Chl.a (ug/l)	13.4	12.3	14.8	5.1	5.4	12.8	7.7			19.6	no
pH	8.1	8.1	8.3	7.7	8.1	7.6	7.9			8.0	no
Cond (umho/cm)	233	322	245	276	310	304	271			283	no
Upper Temp (degC)	23	24	26	25	25	25	23			21	↑
Deep Temp (degC)	21	19	22	21	21	24	21			18	↑↑
BG Chl.a (ug/l)	0	6	12		2	10	0			7	no
HABs reported?	no	no	no	no	no	no	no				

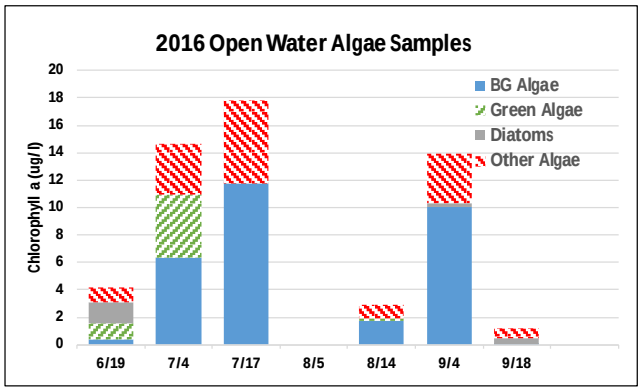
Shoreline bloom and HABs notifications

Date of first listing	Date of last listing	# weeks on the DEC notification list	# Weeks with updates

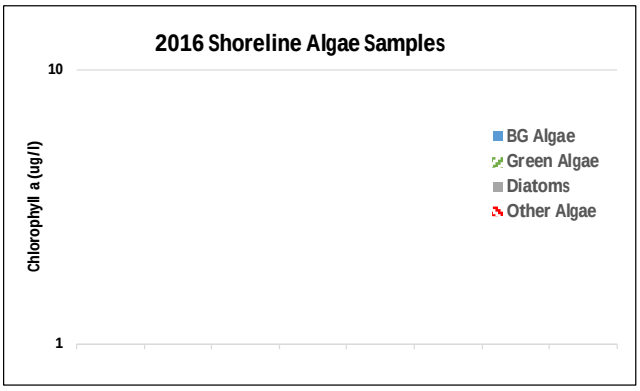
	Shoreline HAB sample dates 2016
HAB Indicators / **HAB criteria**	
BGA: 25 - 30 ug/L	No shoreline HABs samples 2016
microcystin: 20 ug/L	
anatoxin - a: 4 ug/L	

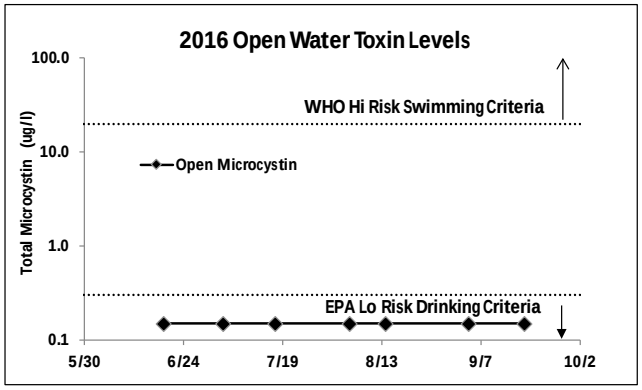
HABs Status

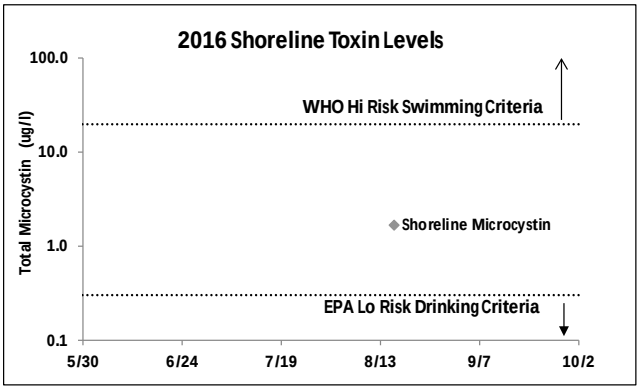
Open water Algae



Shoreline Algae

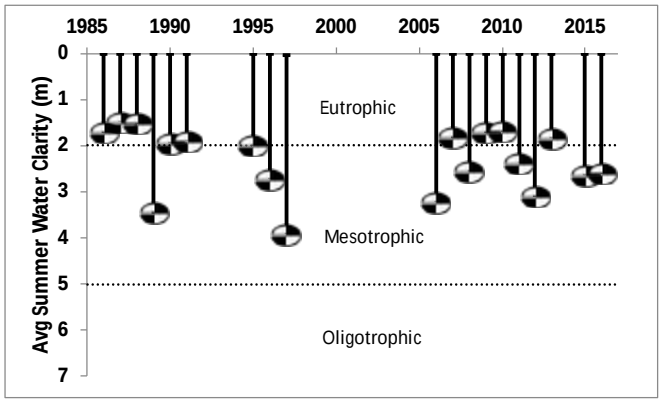




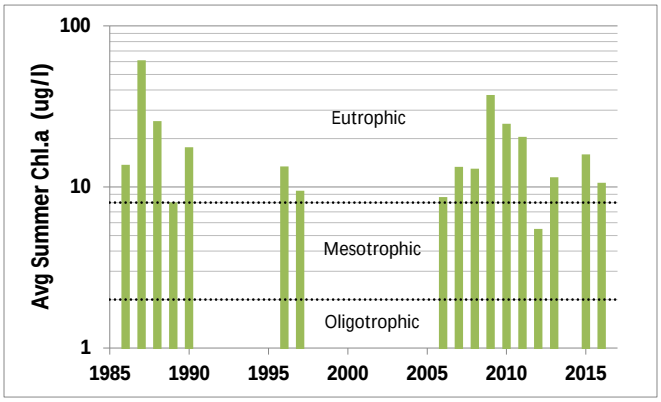


Silver Lake Long Term Trend Analysis

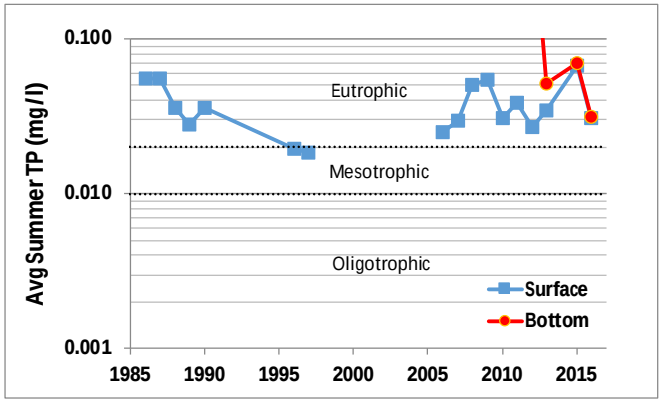
Clarity



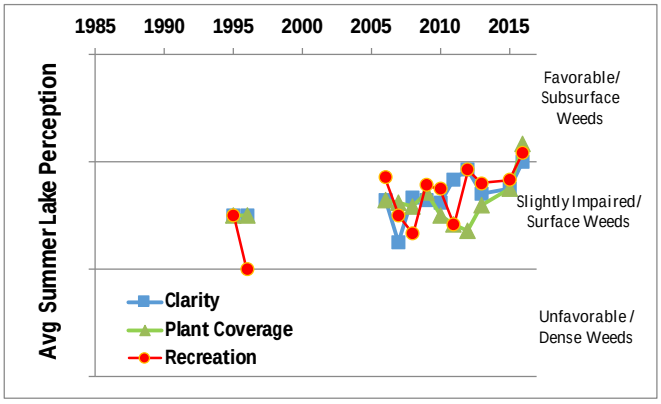
Chlorophyll a



Surface and Deep Phosphorus

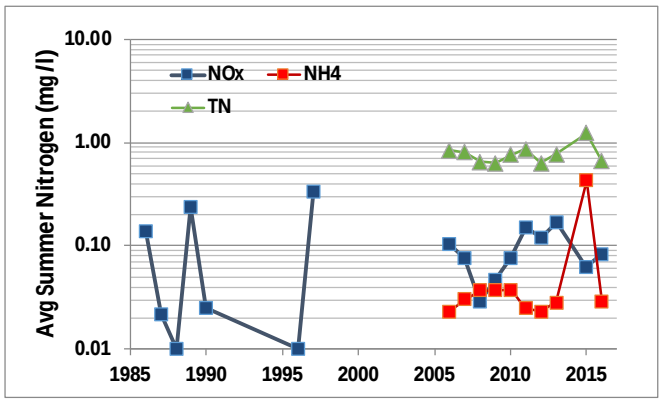


Lake Perception

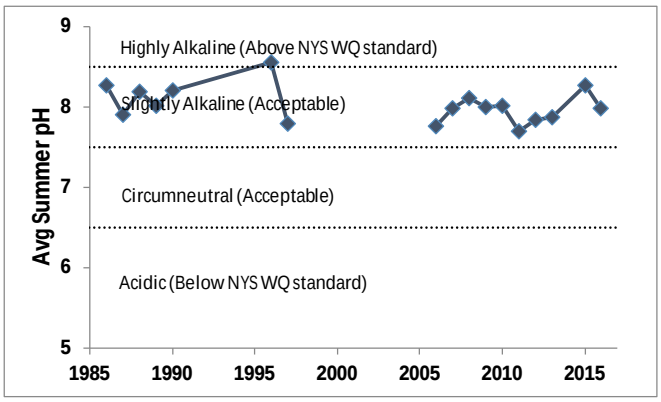


Silver Lake Long Term Trend Analysis

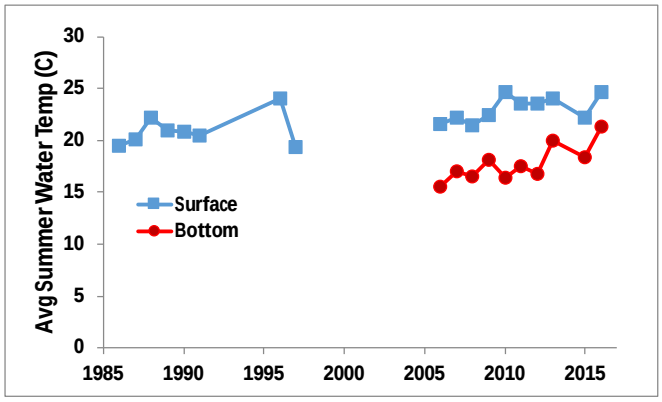
Nitrogen



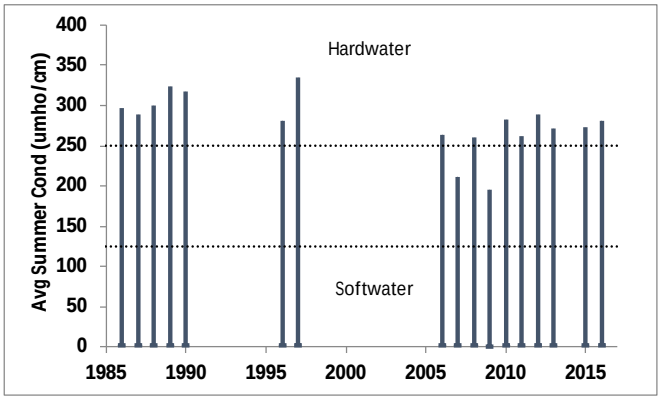
pH



Temperature

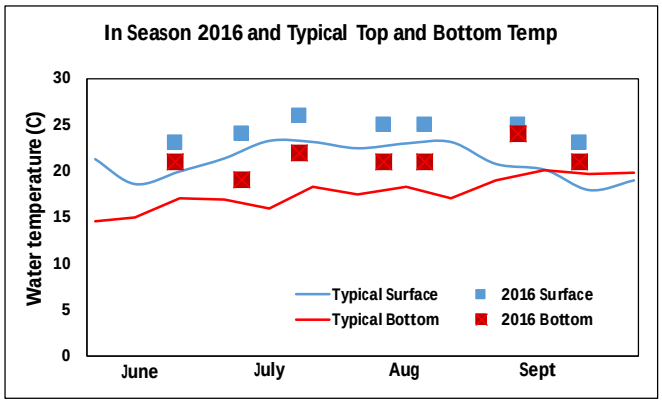


Conductivity

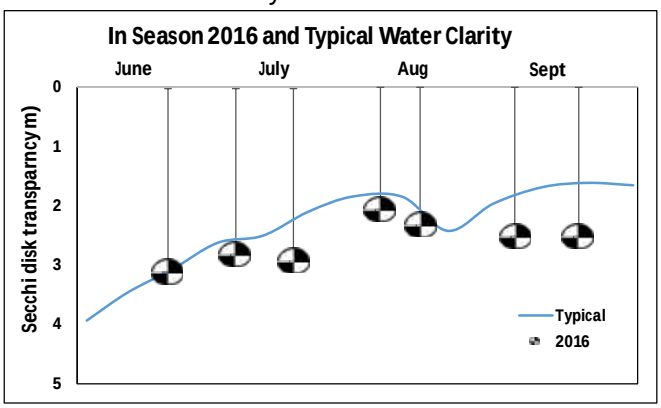


Silver Lake In-Season Analysis

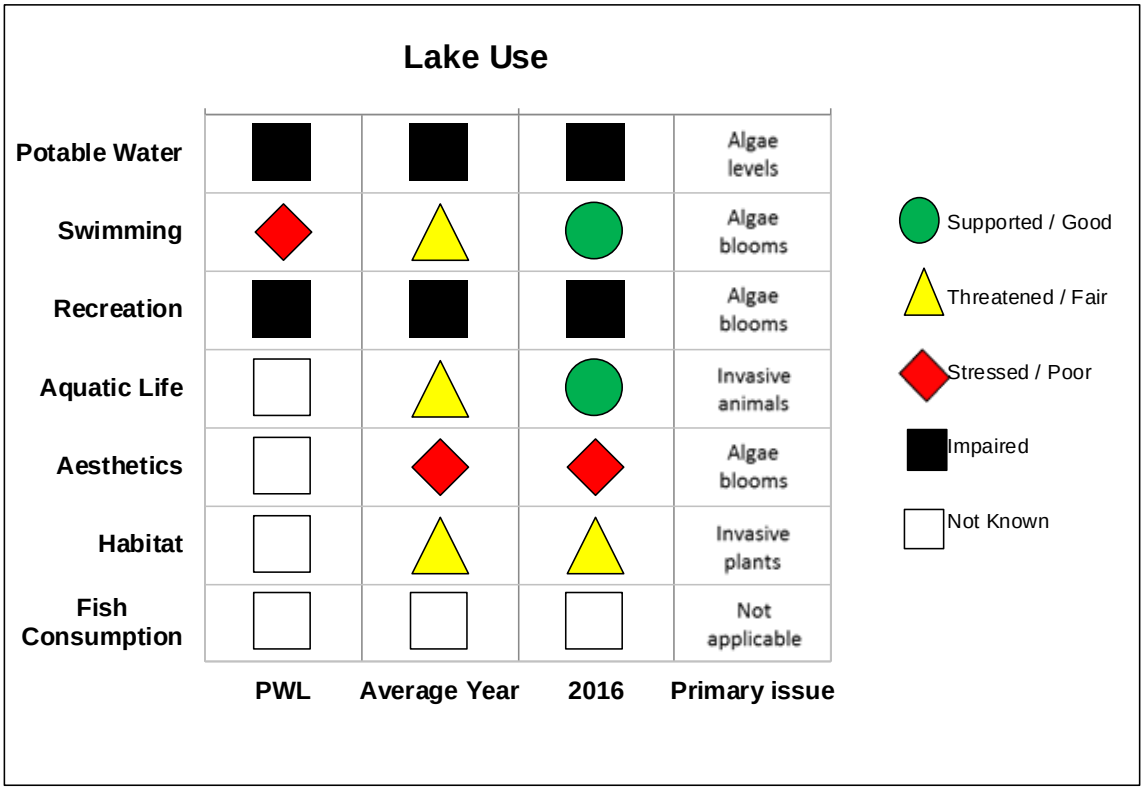
In Season Temperature



In Season Water Clarity



Scorecard



Summary

2016 compared to prior years: Silver Lake continues to be a mesoeutrophic, or moderately to highly productive lake. However, water clarity was higher than usual in 2016, due to lower nutrient (phosphorus and nitrogen) and algae levels. This resulted in more favorable water quality and recreational assessments.

Compared to nearby lakes: Silver Lake has higher water clarity, due to lower nutrient and algae levels, than other nearby (Western region) lakes. Aquatic plant coverage is usually similar to the coverage in many of these other lakes, but plant coverage was lower in 2016. Chloride levels are above the 75th percentile for New York lakes, suggesting some potential for aquatic life impacts from road salt (although these have not been reported).

Trends: Water temperatures (surface and bottom) have increased in the last three decades in Silver Lake. Recreational assessments appear to have improved, coincident with a decrease in plant coverage, but these changes have not been statistically significant.

Algal blooms and HABS: Silver Lake experiences frequent shoreline and periodic open water blue green algae blooms, although none were reported in 2016. These blooms are comprised of *Microcystis, Anabaena* and Lyngbya, and at times the shoreline blooms have elevated toxin levels.

Aquatic invasive species: Eurasian watermilfoil, curly leafed pondweed, zebra mussels and rudd have been documented in Silver Lake, indicating a high vulnerability to AIS introductions. Plant coverage may have decreased in recent years, although it is not known if invasive plants have been managed in the lake.

Indicated Actions: Individual stewardship activities such as pumping your septic system, growing a buffer of native plants next to the water bodies, and reducing erosion from shoreline properties and runoff into the lake will help to improve lake health by reducing nutrient and sediment loading to the lake. Visiting boats should be inspected to reduce the risk of new invasive species, and continued monitoring for invasive species is warranted. Continued algae bloom education and monitoring is recommended. Shoreline blooms should be avoided.

How to Read the Report

Welcome to the new and improved Citizens Statewide Lake Assessment Program individual lake report! In order to make this individual lake report as easy to digest as possible for the average reader, the length of the report has been greatly reduced. We hope that presenting the data in a more succinct manner will draw in more readers and hold their attention. Unfortunately, this new format leaves little room for definitions of terms, so we are including this section primarily as a glossary of terms for which the average reader may not know the definition.

The report begins with the lake name, town, and county, as well as the current NYS Federation of Lake Associations association, if one exists. The next section contains some physical characteristics of the lake. The surface area is the two dimensional area of the lakes surface and is given in units of acres and hectares. The max depth is the water depth measured at the deepest part of the lake and is given in units of feet and meters. The mean depth is either known from a rigorous study of the bathymetry of the lake or is calculated as 0.46 times the maximum depth and is given in units of feet and meters. The retention time is the time it takes for a drop of water to pass through a lake, given in units of years. The lake classification is a letter defining the “best uses” for this particular lake, based on the legal classification assigned by New York state. 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. The dam classification is a letter defining the hazard class of a dam if one exists. Class A, B, C, and D dams are defined as low, intermediate, high, or negligible/no hazard dams in that order. A “0” indicates that no class has been assigned to a particular dam, or that no dam exists.

The next section contains some watershed characteristics including the watershed area in acres and hectares and the land use composition of the watershed. A watershed is the entire area that will drain to a particular lake and is constrained by the topology and hydrology of the land. The watershed area was calculated by the US Geological Survey “StreamStats” program. This area map was then used to calculate land uses from the most recent (2011) National Land Use Cover data on the NYSDEC ArcGIS mapping program. The map itself is shown on the left side of the front page. In general, blue colors show water, green and light brown show forested or shrub land, yellow and dark brown are agriculture, and pink to red is developed land.The program participation section lists the years the lake has been sampled through CSLAP and the names of the 2016 samplers.

The next section includes four boxes. The trophic state of a lake refers to its nutrient loading and productivity- in other words, how much algae is produced, and the cause (nutrients) and outcome (changes in clarity) of this algae growth. 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 somewhere in the middle. For most lakes, the nutrient of concern is phosphorus. A more productive lake will

support more plant life, which may be good for warmwater fish, but may lower the quality of the lake if growth becomes excessive.

The harmful algal bloom susceptibility section contains a summary of the available historical HAB data. Although the factors that lead to the formation of HAB's is not yet well-understood, a history of HAB occurrences and high nutrient levels may indicate a susceptibility in the lake that could result in more HAB events in the future.

The invasive vulnerability section indicates if aquatic invasive species (AIS) are found in this lake or in nearby lakes. Invasive species are non-native and tend to rapidly colonize a waterbody once introduced, leaving little space for native species. Lakes with invasives or near other lakes with invasives are vulnerable to introductions of new AIS.

The next section is the priority waterbody list (PWL) assessment section. The PWL is a statewide inventory of the waters of New York State that DEC uses to track support (or impairment) of water uses, overall assessment water quality, causes and sources of water quality impact/impairment, and the status of restoration, protection and other water quality activities and efforts. A PWL assessment is broken into categories that include the following: potable water, swimming or public bathing, recreation, aquatic life, aesthetics, habitat, and fish consumption. All of the categories except aesthetics and habitat are accessed on a scale to determine if each of the listed uses are supported. The scale goes from best to worst in the following progression: fully supported, threatened, stressed, impaired, and 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 for each lake can be found on the DEC website by searching on "PWL" and the lake basin, at http://www.dec.ny.gov/chemical/36730.html#WIPWL.

The rest of the report contains a collection of tables and charts. A glossary of all the water quality and HABs indicators used in the plots and tables is included below. Of particular note are the seasonal change and trend columns in the table. The long term trend column tells you if there is an increasing or decreasing trend, or no change, over time- one arrow equals a weak trend, and two arrows equals a strong trend. This may not agree with the seasonal change sparkline chart, which only shows the 2016 summer trends. Whether an increasing or decreasing trend is good for the lake depends on the indicator being evaluated, but in general green is good, red is bad. .

The next table contains a summary of open water and shoreline HABs data for the lake, along with the associated HAB notification information. Open water (mid lake) samples are collected routinely during each CSLAP sampling session. If a HAB is suspected, a sample from the worst part of the bloom (usually along the shoreline) is collected and sent in for laboratory confirmation. A HAB notification is added to the HAB database where entries are updated on a weekly basis. Additional information- samples or visual reports- are used to update these listings. The data graphs include the World Health Organization (WHO) high risk criteria to protect swimmers and the EPA low risk criteria to protect those using *treated* (not raw lake) water for drinking.

The Long Term Trend Analysis includes graphs showing the summer (mid-June thru mid-September) average for several of the key CSLAP water quality indicators, for each of the

years the lake was sampled through CSLAP. The graphs include relevant criteria (trophic categories, water quality standards,…) and boundaries separating these criteria.

The In-Season Analysis picks out two indicators- water temperature and water clarity- that are most frequently considered by lake residents as indicative of seasonal changes. These graphs are generated at any time during the sampling season for any CSLAP samplers that enters CSLAP data into the NYSFOLA on-line data entry program. The plots in this report show 2016 data compared to the normal seasonal variability for this lake.

The next section of the report includes Lake Use Scorecard. The 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. The scorecard also includes a column that lists some primary issues that could impact specific use categories. Multiple issues could affect each designated use, but only the primary issue is listed.

The final section of the report is the Lake Summary. This includes a brief summary of the 2016 and historical CSLAP data for the lake. It is essentially the same as the Q&A section of the previous CSLAP reports, and with the Lake Use Scorecard, represents perhaps the most easily understood single page summary of the CSLAP data for the lake. This was intentionally created as the last page of the report to allow easy copying and distribution to lake association members, neighbors and others interested in the condition of the lake and the results from the CSLAP sampling.

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.

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 (ug/l): Chlorophyll a, measured in micrograms per liter

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 and 9.

Cond (umho/cm): Specific conductance is a measure of the conductivity of water. A higher value indicates the presence of more dissolved ions that help conduct electricity. Conductivity results may indicate hard or softwater conditions with high ion concentrations resulting in hardwater.

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

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

BG Chl.a (ug/L): Chlorophyll a from blue-green algae, measured in micrograms per liter

HABs Reported?: Were any algal blooms reported within a week of the dates listed, and, if so, were they located along the shoreline, in open water, or both?

BGA: Blue-green algae

Microcystin: 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: Another type of toxin that may be produced in a HAB and may be more dangerous as it 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.