Cossayuna Lake, Washington Co., Cossayuna Lake Improvement Association

NEW YORK STATE OF OPPORTUNITY | **Department of Environmental Conservation**

Lakes and Wetlands   Agricultural   Urban

Forest, shrubs, and grasses   Residential

Lake Characteristics

Surface Area (ac/ha)		659	267
Max Depth (ft/m)		25	8
Mean Depth (ft/m)		12	4
Retention Time (years)		0.80	
Water Class		A	
Dam Class		A	

Watershed Characteristics

Watershed Area(ac/ha)	7534	3049
Watershed/Lake Ratio	11	
Lake and Wetlands	17.0%	
Agricultural	20.7%	
Forests, shrubs, grasses	56.6%	
Residential	5.6%	
Urban	0.0%	

CSLAP Participation

Years	1992-1996, 1998-1999, 2001-2010, 2012-2017
Volunteers	Gene Henry, Lynn Clauer, Richard Snyder

Trophic State	HABs Susceptibility	Invasive Vulnerability	PWL Assessment
Mesoeutrophic	Moderate	High	Impaired

2017 Sampling Results

Open Water Indicators	6/14	7/19	8/7	8/28	9/11	9/18	9/25	10/2	Seasonal Change	Long Term Avg.
Chl.a (µg/L)	.1	2.4	7.8	24.8		4	12.6	13		18.4
BG Chl.a (µg/L)	.2	.2	4.7	5.9	6	1.3	1.4	2		4.3
Clarity (m)	3	4.3	3	1.8	1.6	2.7	2.5	2.3		2.0
pH	6.8	8.3	7.5	8.1	8.2	9.1	8.3	7.8		8.0
Cond (µmho/cm)	195	188.9	190	172.9	193.2	201.4	190.8	204.8		185
Surf Temp (°C)	27	26	25	25	20	24	24	19		23
Bott Temp (°C)	18	21	24	23	20	19		19		21
TN (mg/L)	.28	.351	.339	.443	.662	.259	.56	.477		0.540
TP (mg/L)	.018	.014	.022	.035	.042	.017	.027	.033		0.028
Deep TP (mg/L)	.022	.028	.026	.028	.024	.048	.045	.024		0.040
Surface N:P Ratio	16	25	15	13	16	15	21	14		

Shoreline bloom and HABs notifications

Date of first listing	Date of last listing	# of weeks on DEC notification list	# of weeks with updates
10/13/2017	10/27/2017	2	1

Shoreline HAB Sample Dates 2017

HAB Indicators	HAB Criteria										
BGA	25 µg/L	NA									
Microcystin	20 µg/L	NA									
Anatoxin-a		NA									

HAB Status

2017 Open Water Algae Samples

2017 Open Water Algae Samples

Chloropyhll a (µg/L) vs dates 6/14, 7/19, 8/7, 8/28, 9/11, 9/18, 9/25, 10/2

Bluegreen | Green | Diatoms | Cryptophyta
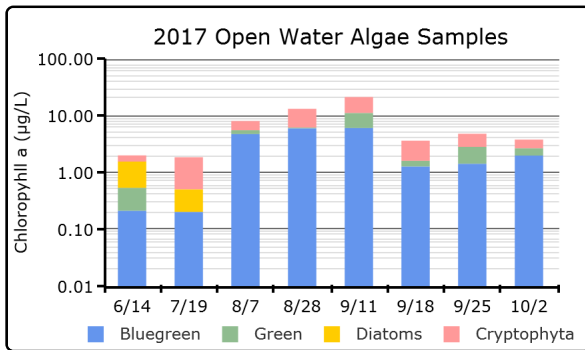
2017 Shoreline Algae Samples

2017 Open Water Toxin Levels

2017 Open Water Toxin Levels

Total Microcystin (µg/L)

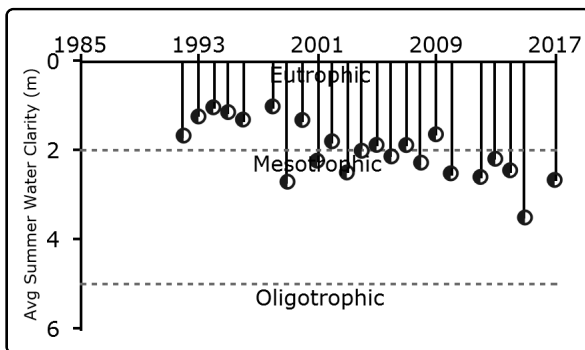WHO Hi Risk Swimming Criteria ↑

EPA Low Risk Drinking Criteria ↓
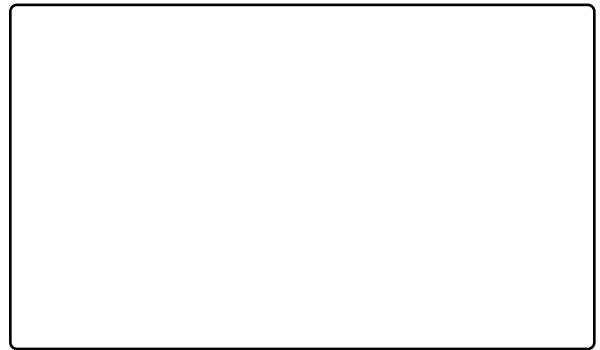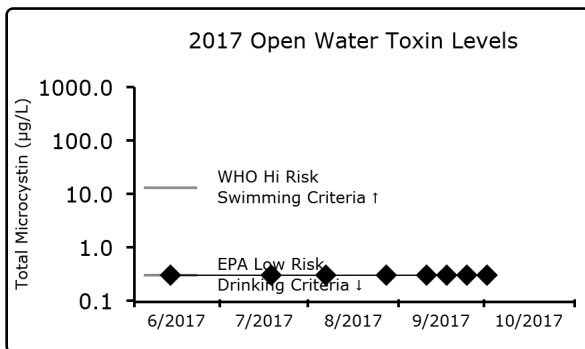
2017 Shoreline Toxin Levels
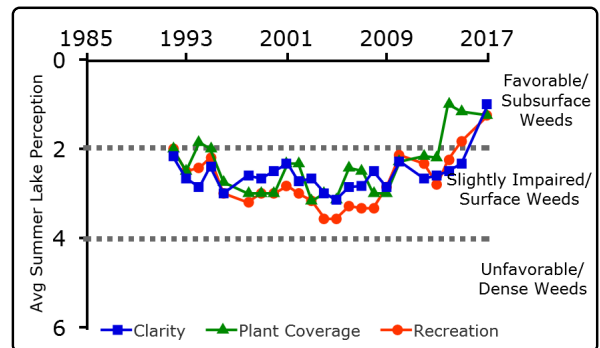
Cossayuna Lake Long Term Trend Analysis

Clarity

Avg Summer Water Clarity (m)

Eutrophic

Mesotrophic

Oligotrophic

Chlorophyll a

Avg Summer Chl.a (µg/L)

Eutrophic

Surface and Deep Phosphorus

Avg Summer TP (mg/L)

Surface | Bottom

Eutrophic

Mesotrophic

Oligotrophic

Lake Perception

Avg Summer Lake Perception

Favorable/ Subsurface Weeds

Slightly Impaired/ Surface Weeds

Unfavorable/ Dense Weeds
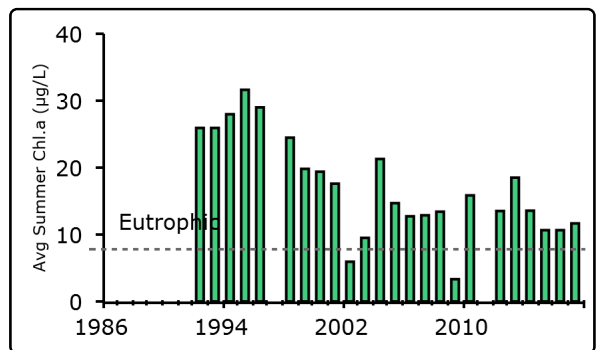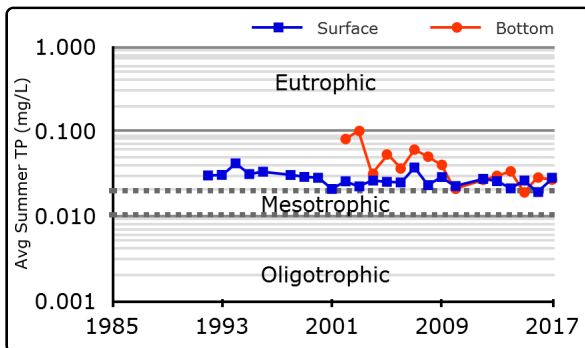
Clarity | Plant Coverage | Recreation

Cossayuna Lake Long Term Trend Analysis

Nitrogen
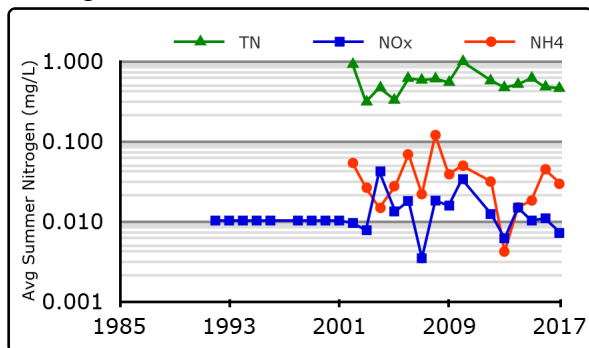
pH
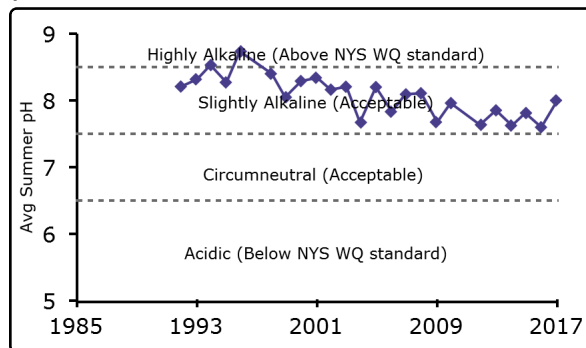
Temperature
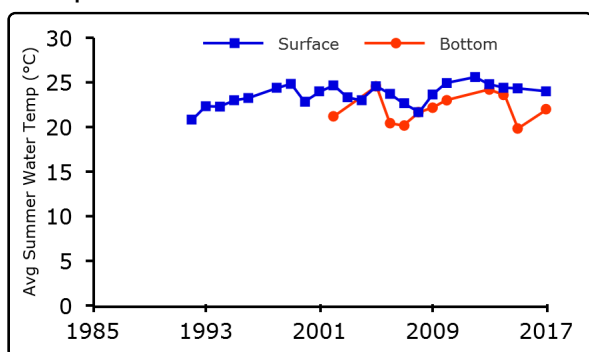
Specific Conductance
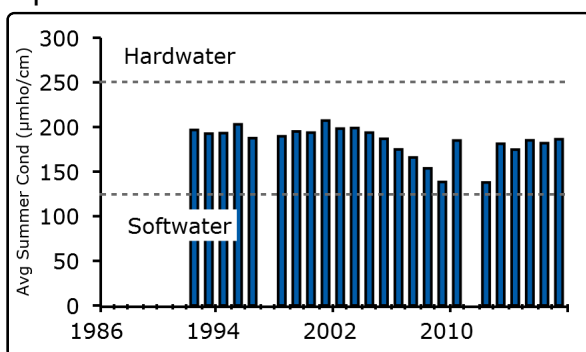
Cossayuna Lake In-Season Analysis

In Season Temperature

In Season 2017 and Typical Top and Bottom Temp

In Season Water Clarity

In Season 2017 and Typical Water Clarity

Scorecard

Lake Use

	PWL	Average Year	2017	Primary Issue
Potable Water	🟢 Supported/Good	⬛ Impaired	⬛ Impaired	**Algae levels**
Swimming	🔴 Stressed/Poor	⬛ Impaired	🟢 Supported/Good	**Algae blooms**
Recreation	⬛ Impaired	⬛ Impaired	🔴 Stressed/Poor	**Algae levels**
Aquatic Life	🔴 Stressed/Poor	🔺 Threatened/Fair	🟢 Supported/Good	**Invasive animals**
Aesthetics	☐ Not Known	🔴 Stressed/Poor	🔴 Stressed/Poor	**Algae blooms**
Habitat	☐ Not Known	🔴 Stressed/Poor	🔴 Stressed/Poor	**Invasive plants**
Fish Consumption	☐ Not Known	☐ Not Known	☐ Not Known	**Not applicable**

Legend:
- 🟢 Supported/Good
- 🔺 Threatened/Fair
- 🔴 Stressed/Poor
- ⬛ Impaired
- ☐ Not Known

Summary

2017 compared to prior years: Cossayuna Lake is now characterized as *mesoeutrophic* (moderately to highly productive), although the lake was historically considered eutrophic. The change reflects a long-term improvement in water quality. Water clarity was higher than usual in 2017, due to lower than usual surface and deep phosphorus and chlorophyll levels that were lower than usual during most of the summer.

Compared to nearby lakes: Cossayuna Lake has slightly lower water clarity, due to slightly higher nutrient and algae levels, than other nearby (Upper Hudson River basin) lakes. However, trophic conditions continue to improve. Aquatic plant coverage is usually more extensive than in nearby lakes, but these are variable in response to management with herbicides. Plant coverage was much lower than usual in 2017, perhaps due to the use of endothall and 2,4-D to control excessive weeds.

Trends: Phosphorus readings have decreased significantly over the last 25 years, resulting in decreasing algae levels (though perhaps not in 2017), decreasing pH, and increasing water clarity. This improvement has occurred despite increasing water temperatures; the latter may in response to local climate change.

Algal blooms and HABS: Cossayuna Lake periodically exhibits large shoreline blue green algae (cyanobacteria) blooms comprised of multiple species, with some elevated toxin levels. Although total and blue green algae levels rise in the open water during the typical summer, open water blooms are uncommon and toxin levels are low. It is not known if these blooms affect water intakes, but drinking water users should be aware of this potential risk. No open water blooms were reported in 2017, although the lake may have exhibited some shoreline blooms in late fall.

Aquatic invasive species: Cossayuna Lake has Eurasian watermilfoil, curly leafed pondweed, and zebra mussels. The lake is susceptible to additional AIS due to mesoeutrophic conditions and public access. This has led to the use of herbicides and other management tools to control excessive weed growth.

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, to prevent additional AIS from entering the lake. Continued monitoring for invasive species is warranted. Continued algae bloom education and monitoring for HABs is recommended, given at least periodic bloom occurrences on the lake.

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, and provides suggested actions for lake management.

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 **NH₄** (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.

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 indicate hardwater, and low 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

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.