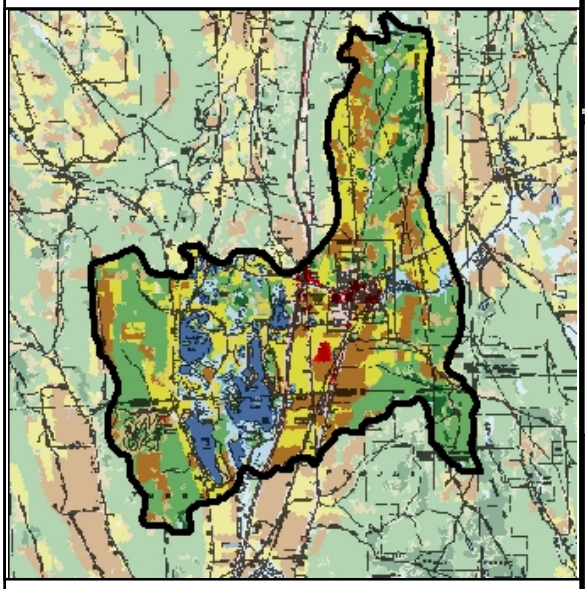
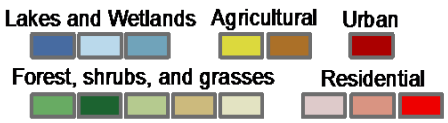
Tully Lake, Cortland, Onondaga Co., Tully Lake Property Owners Association

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation





Lake Characteristics	Surface Area (ac/ha)	230	93
	Max Depth (ft/m)		
	Mean Depth (ft/m)	15	5
	Retention Time (years)	10.58	
	Water Class	B	
	Dam Class	A	
Watershed Characteristics	Watershed Area(ac/ha)	9687	3920
	Watershed/Lake Ratio	42	
	Lake and Wetlands	13.4%	
	Agricultural	36.6%	
	Forests, shrubs, grasses	41.0%	
	Residential	8.6%	
	Urban	0.3%	
CSLAP Participation	Years	2012-2017	
	Volunteers	Carl Kirshbaum, Chris Kruth, Jeffrey Schardt, Melinda Portmess	

Trophic State	HABs Susceptibility	Invasive Vulnerability	PWL Assessment
Mesotrophic	Low	High	Threatened

Open Water Indicators	2017 Sampling Results								Seasonal Change	Long Term Avg.
	6/14	6/28	7/10	7/23	8/5	8/19	9/4	9/10		
Chl.a (µg/L)	3.9	4.2	4.9	8	3.7	3	3	3.5		4.5
BG Chl.a (µg/L)	0.1	0.8	0.2	0.0	0.0	0.4	0.3	0.3		0.4
Clarity (m)	3.7	4.8	4	4	3.8	4.1	3.5	3.5		4.2
pH	7.5	8.0	7.7	7.6	7.8	7.3	7.3	7.3		7.8
Cond (µmho/cm)	526.9	564.9	296	410	521.6	531.9	518	544.5		478
Surf Temp (°C)	25	21	23	25	24	24	20	18		23
Bott Temp (degC)		14	15	20	23	16	17	18		16
TN (mg/L)	.9	.906	.961	1.107	.798	.684	.563	.525		0.637
TP (mg/L)	.01	.011	.019	.019	.013	0	.015	.015		0.015
Deep TP (mg/L)	.013	.029	.021	.015	.011	.05	.027	.027		0.033
N:P Ratio	90	82	51	58	61		38	35		

Shoreline bloom and HABs notifications

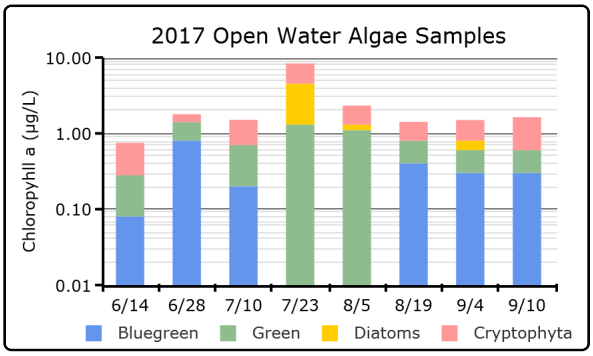
Date of first listing	Date of last listing	# of weeks on DEC notification list	# of weeks with updates
9/1/2017	10/6/2017	5	2

Shoreline HAB Sample Dates 2017

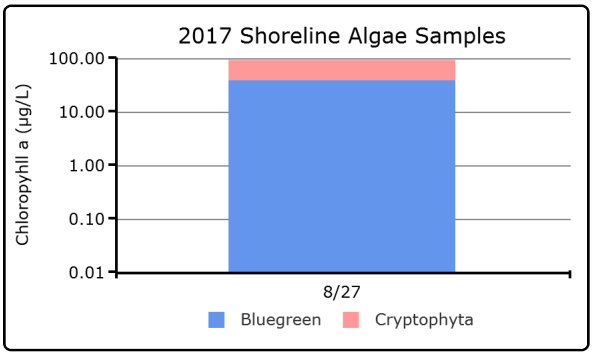
HAB Indicators	HAB Criteria	8/27									
BGA	25 µg/L	38									
Microcystin	20 µg/L	ND									
Anatoxin-a		ND									

HAB Status

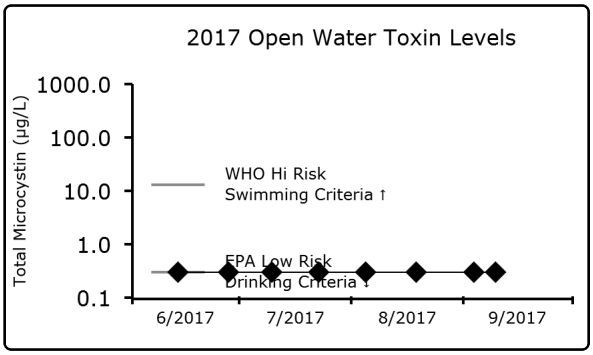
2017 Open Water Algae Samples



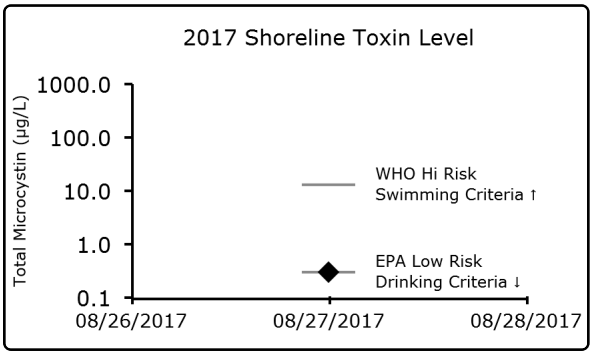
2017 Shoreline Algae Samples



2017 Open Water Toxin Levels

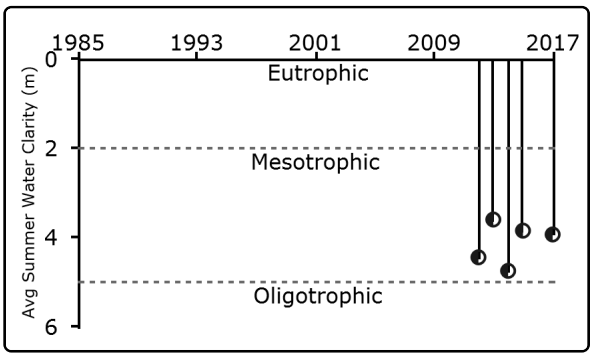


2017 Shoreline Toxin Levels

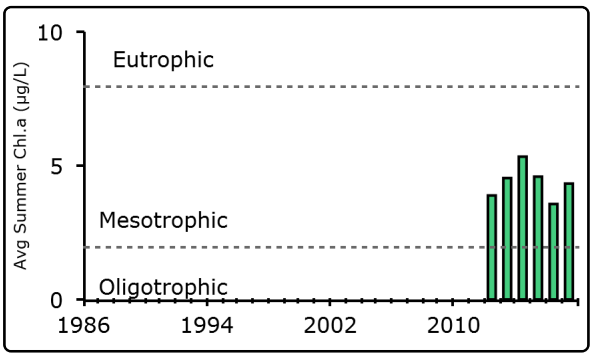


Tully Lake Long Term Trend Analysis

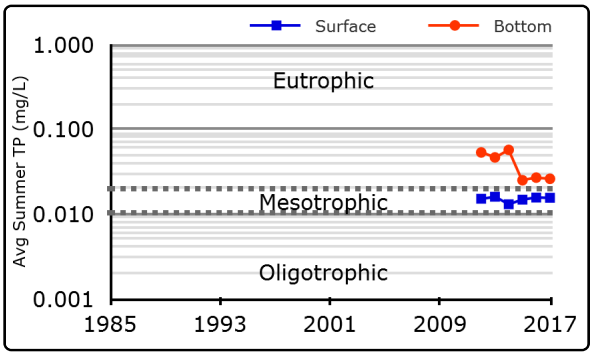
Clarity



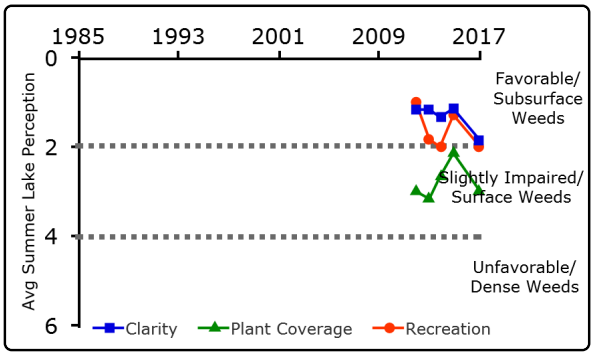
Chlorophyll a



Surface and Deep Phosphorus

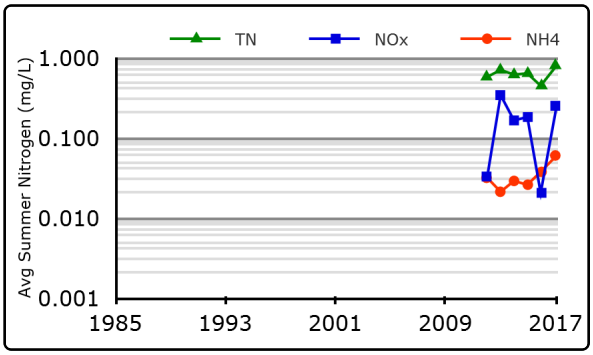


Lake Perception

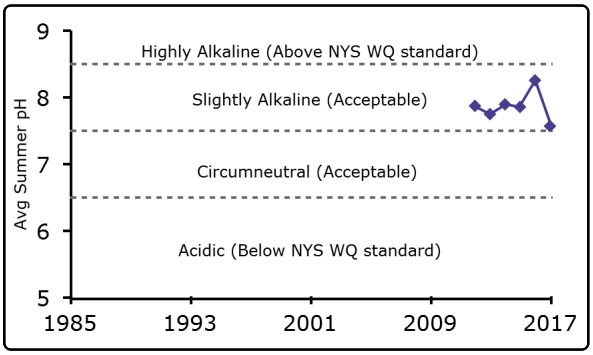


Tully Lake Long Term Trend Analysis

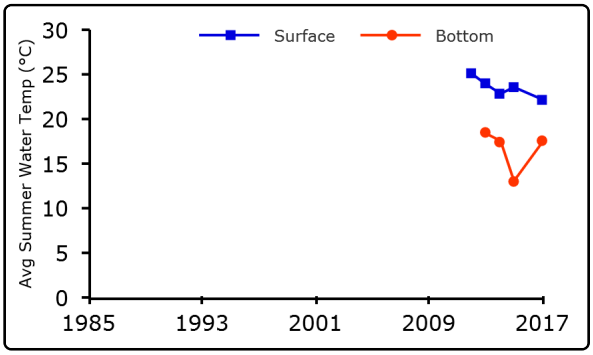
Nitrogen



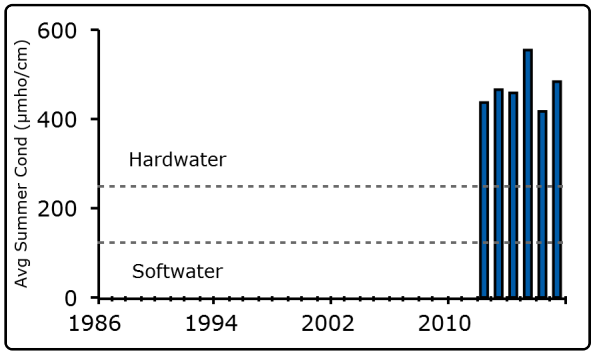
pH



Temperature

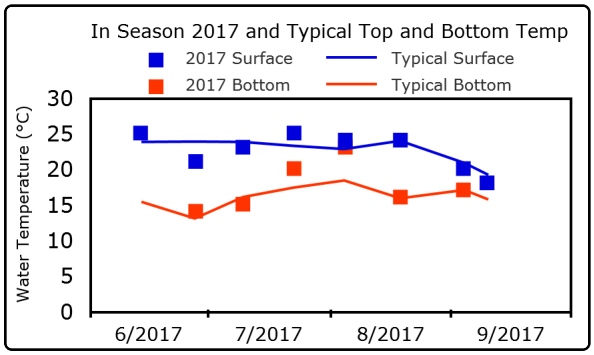


Specific Conductance

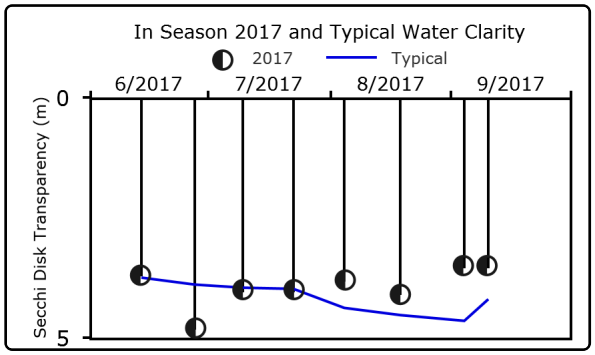


Tully Lake In-Season Analysis

In Season Temperature



In Season Water Clarity



Scorecard

Lake Use

	PWL	Average Year	2017	Primary Issue
Potable Water	□	□	□	**Not applicable**
Swimming	●	●	●	**No impacts**
Recreation	▲	◆	▲	**Algae blooms**
Aquatic Life	▲	●	●	**No impacts**
Aesthetics	□	◆	▲	**Algae blooms**
Habitat	□	◆	◆	**Invasive plants**
Fish Consumption	□	□	□	**Not applicable**

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

Summary

2017 compared to prior years: Tully Lake continues to be a *mesotrophic*, or moderately productive lake, based on intermediate water clarity, nutrient and algae levels. Deepwater phosphorus levels were slightly lower than usual, while total nitrogen levels were higher than usual. Each of the other water quality indicators, and lake perception, was close to usual. Shoreline cyanobacteria (blue green algae) blooms have been reported in the last two years.

Compared to nearby lakes: Tully Lake has slightly higher water clarity, and lower nutrient and algae levels, than other nearby (Central region) lakes. Aquatic plant coverage is slightly higher than in many of these other lakes, perhaps due to AIS. Chloride levels are above the 75th percentile for New York lakes, suggesting an elevated potential for aquatic life impacts from road salt (but these impacts have not been reported).

Trends: Deepwater phosphorus readings may have decreased over the last decade, while water quality assessments have degraded, despite the lack of clear changes in water quality conditions. None of the other water quality indicators. pH has increased slightly, but these changes have not been statistically significant.

Algal blooms and HABS: Water quality conditions indicated only a moderate susceptibility to blooms, although a shoreline bloom in 2016 was comprised of *Oscillatoria*, and a 2017 shoreline bloom was comprised of *Planktothrix* and other cyanobacteria (blue green algae) taxa. Toxin levels were low in these shoreline bloom samples. Open water algae levels are low and are composed of a mix of algae species, with low toxin levels.

Aquatic invasive species: Eurasian watermilfoil, curly leafed pondweed, and starry stonewort are found in Tully Lake. This suggests only a high vulnerability for AIS infestations, particularly given available public access. Chloride levels are high enough to support zebra mussels, but these haven't been reported in Tully 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, since nearby lakes harbor several invasive plants and zebra mussels not presently found in this lake. Continued monitoring for invasive species is warranted. Continued algae bloom education and monitoring for HABs is recommended, since shoreline blooms have periodically been reported in the lake. These blooms should be avoided.

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 **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.

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.