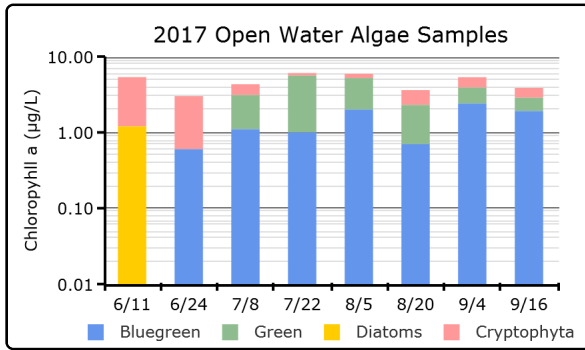
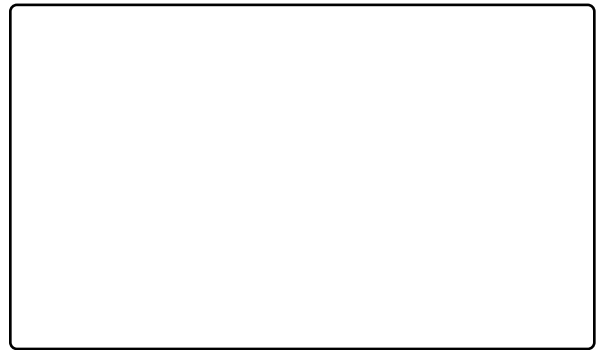


HAB Status

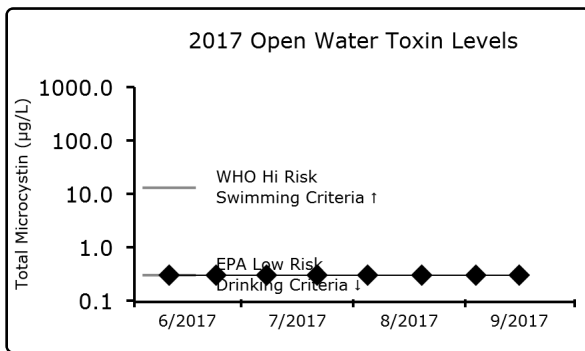
2017 Open Water Algae Samples



2017 Shoreline Algae Samples



2017 Open Water Toxin Levels

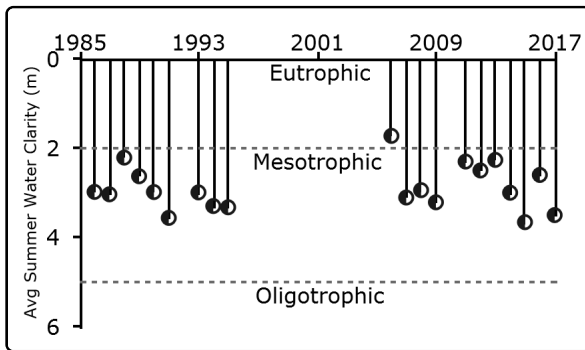


2017 Shoreline Toxin Levels

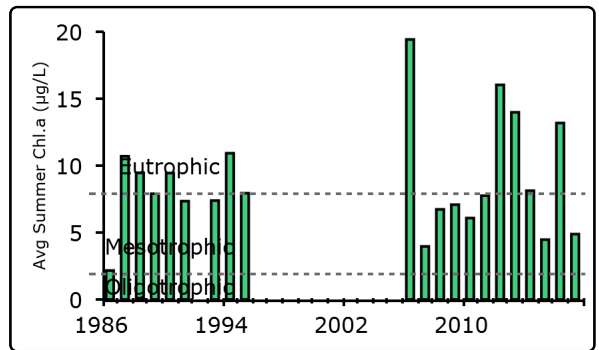


Lake Waccabuc Long Term Trend Analysis

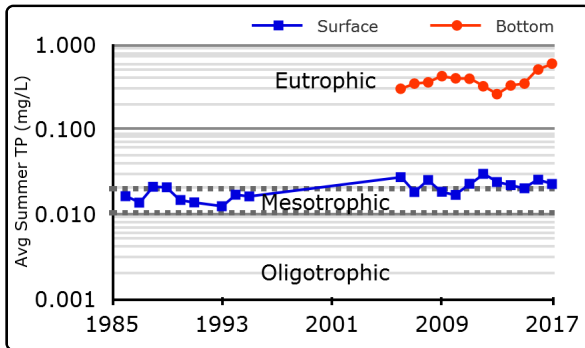
Clarity



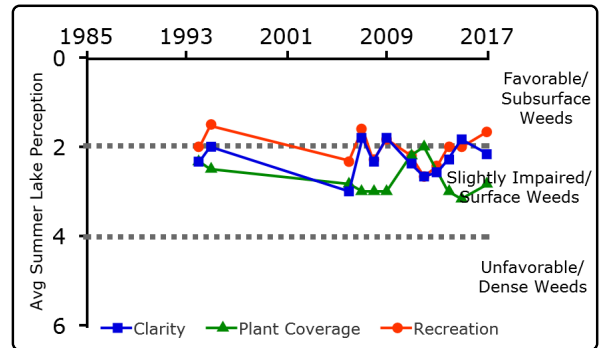
Chlorophyll a



Surface and Deep Phosphorus

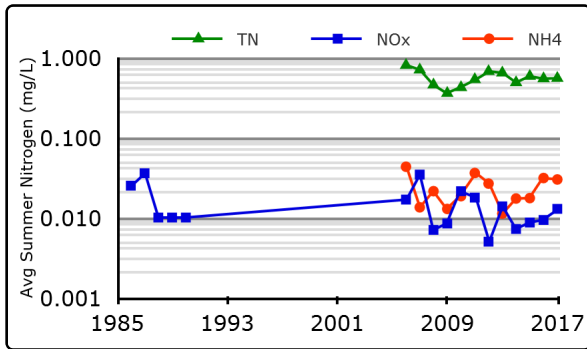


Lake Perception

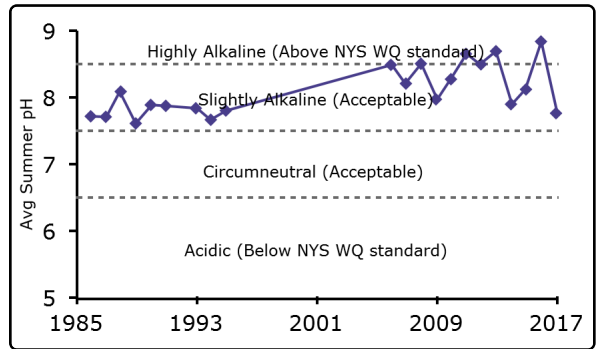


Lake Waccabuc Long Term Trend Analysis

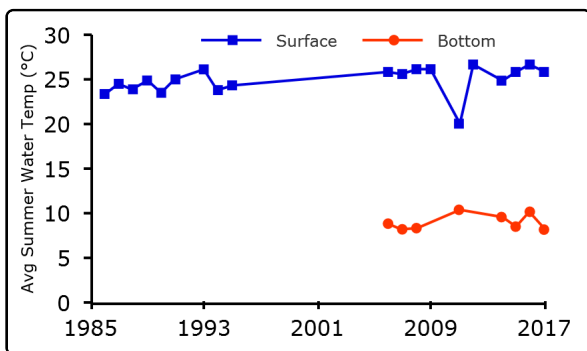
Nitrogen



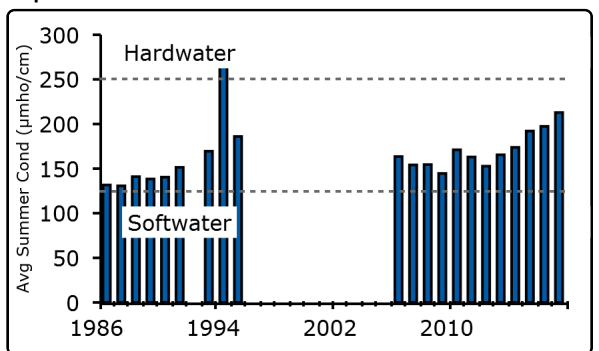
pH



Temperature

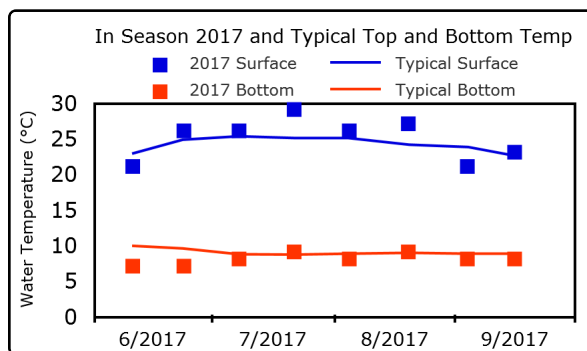


Specific Conductance

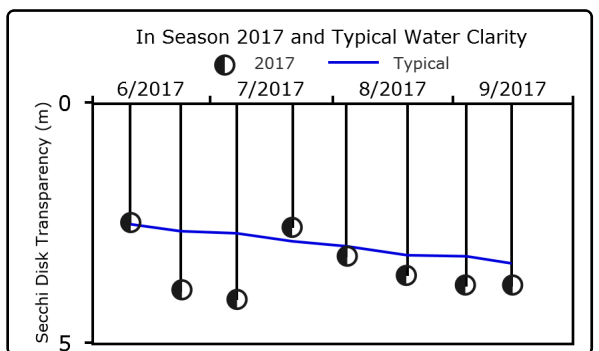


Lake Waccabuc In-Season Analysis

In Season Temperature
























In Season Water Clarity



Scorecard

Lake Use

	PWL	Average Year	2017	Primary Issue
Potable Water				Algae levels
Swimming				Algae blooms
Recreation				Algae blooms
Aquatic Life				Bottom Oxygen
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: Lake Waccabuc is *mesoeutrophic*, or moderately to highly productive, based on moderate water clarity readings and moderate to elevated nutrient (phosphorus) and algae (chlorophyll *a*) levels. Water clarity significantly higher than usual in 2017, consistent with lower algae levels and despite similar nutrient levels similar to those measured in previous years (although deepwater phosphorus levels were higher than usual). The higher water transparency may have contributed to more favorable recreational assessments. Conductivity was higher than usual in 2017.

Compared to nearby lakes: Lake Waccabuc has slightly higher water clarity, and slightly lower nutrient and algae levels, than other nearby (Lower Hudson region) lakes. Aquatic plant coverage is similar to the coverage in many of these other lakes. Chloride levels are between the 50th and 75th percentile of New York state lakes, indicating the potential for aquatic life impacts (although no aquatic life impacts have been documented). Water quality is similar in Lake Waccabuc and Lake Oscaleta, and slightly more favorable in these lakes than in Lake Rippowam.

Trends: Water temperatures have increased substantially in recent years, and phosphorus and pH have also increased. Lake perception may have degraded (though it was favorable in 2017), and conductivity appears to have increased, but these latter changes have not been statistically significant.

Algal blooms and HABS: Lake Waccabuc exhibits at least periodic shoreline blooms. The 2016 blooms were dominated by *Microcystis* and *Anabaena*, as in some previous years, and toxin levels in some samples are elevated. Open water algae communities include a mix of species, including periodic *Anabaena* spikes, but toxin levels are usually low. It is not known if these blooms affect water intakes. No shoreline or open water blooms were reported in Lake Waccabuc (at least during the CSLAP sampling season) in 2017.

Aquatic invasive species: Several AIS, including Eurasian watermilfoil, curly-leafed pondweed, water chestnut, and brittle naiad, have been reported on Lake Waccabuc. It appears that the Brazilian elodea infestation has been extirpated. However, the large number of AIS indicates that the lake is susceptible to other AIS introductions. Calcium levels are probably below the threshold needed to support zebra mussels, and these invasive mussels have not been found in Lake Waccabuc.

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 for HABS is recommended, particularly since shoreline blooms are at least periodically reported in Lake Waccabuc.

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 **NO_x** (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.