Wolf Lake, Sullivan Co., Wolf Lake Incorporated

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)	320	130
Max Depth (ft/m)	16	5
Mean Depth (ft/m)	7	2
Retention Time (years)	0.80	
Water Class	B	
Dam Class	A	

Watershed Characteristics		
Watershed Area(ac/ha)	1312	531
Watershed/Lake Ratio	4	
Lake and Wetlands	25.6%	
Agricultural	0.0%	
Forests, shrubs, grasses	74.1%	
Residential	0.3%	
Urban	0.0%	

CSLAP Participation		
Years	1987-1992, 1995, 1997-2001, 2013-2017
Volunteers	John Kwiatkowskii, Mitch Levanthal, Rick Tompkins

Trophic State	HABs Susceptibility	Invasive Vulnerability	PWL Assessment
Mesoeutrophic	Moderate	Low	Threatened

Open Water Indicators	2017 Sampling Results								Seasonal Change	Long Term Avg.
	6/11	6/25	7/9	7/23	8/6	8/19	9/4	9/17		
Chl.a (µg/L)	10.4	26.7	11.5	53.8	88.8	149.8	59.4	48.2	∿	12.0
BG Chl.a (µg/L)	1.3	0.5	2.8	32.9	33.0	59.4	29.1	16.7	∿	0.4
Clarity (m)	1	1.9	1.9	.6	.8	.5	.5	.7	∿	2.4
pH	6.0	7.9	7.6	8.3	7.9	8.3	9.1	9.2	∿	7.0
Cond (µmho/cm)	161	172.5	190.2	214	181.2	195.5	213.5	105.8		54
Surf Temp (°C)	23	23	25	28	25	25	18	22	∿	22
TN (mg/L)	.351	.529	.606	.384	.804	1.56	.862	.907	∿	0.373
TP (mg/L)	.031	.053	.04	.104	.109	.136	.103	.087	∿	0.019
N:P Ratio	11	10	15	4	7	11	8	10	∿	

Shoreline bloom and HABs notifications

Date of first listing	Date of last listing	# of weeks on DEC notification list	# of weeks with updates
		0	

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)

10.00
1.00
0.10
0.01

5/28 6/10 6/25 7/9 7/23 8/6 8/20 9/2

■ Bluegreen ■ Green ■ Diatoms ■ Cryptophyta
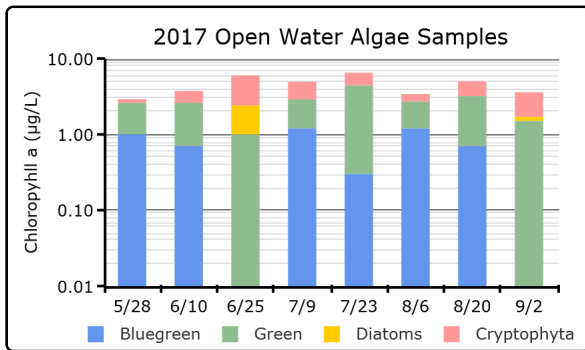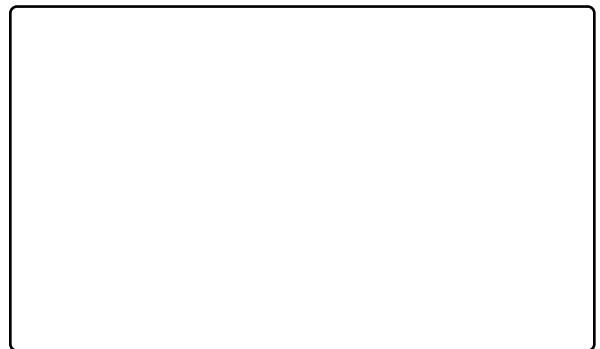
2017 Shoreline Algae Samples

2017 Open Water Toxin Levels

2017 Open Water Toxin Levels

Total Microcystin (µg/L)

1000.0
100.0
10.0
1.0
0.1

WHO Hi Risk Swimming Criteria ↑

EPA Low Risk Drinking Criteria ↓

5/2017 6/2017 7/2017 8/2017 9/2017
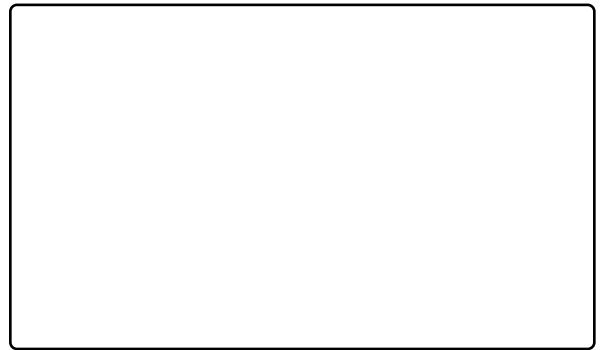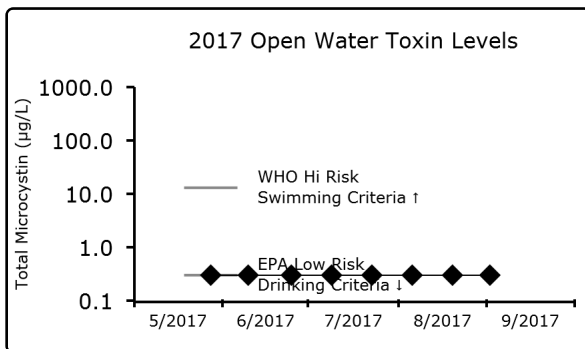
2017 Shoreline Toxin Levels

Wolf Lake Long Term Trend Analysis

Clarity

Avg Summer Water Clarity (m)

1985 1993 2001 2009 2017

0
2
4
6

Eutrophic

Mesotrophic

Oligotrophic

Chlorophyll a

Avg Summer Chl.a (µg/L)

30
20
10
0

Eutrophic

Mesotrophic
Oligotrophic

1986 1994 2002 2010
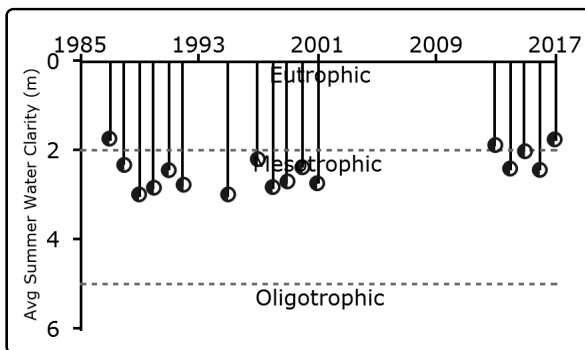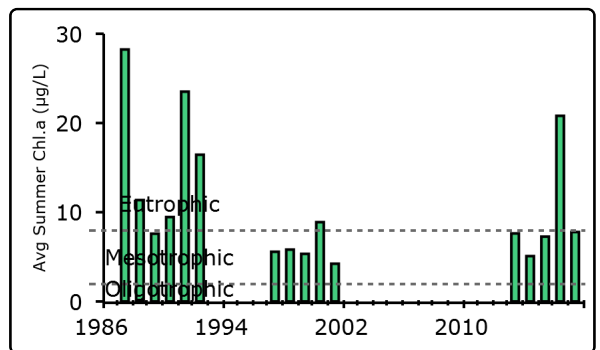
Surface and Deep Phosphorus

Avg Summer TP (mg/L)

—■— Surface   ·····

1.000
0.100
0.010
0.001

Eutrophic

Mesotrophic

Oligotrophic

1985 1993 2001 2009 2017

Lake Perception

Avg Summer Lake Perception

1985 1993 2001 2009 2017

0
2
4
6

Favorable/ Subsurface Weeds

Slightly Impaired/ Surface Weeds

Unfavorable/ Dense Weeds
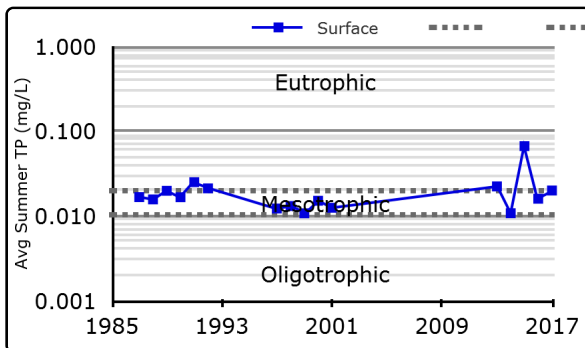
—■— Clarity —▲— Plant Coverage —●— Recreation
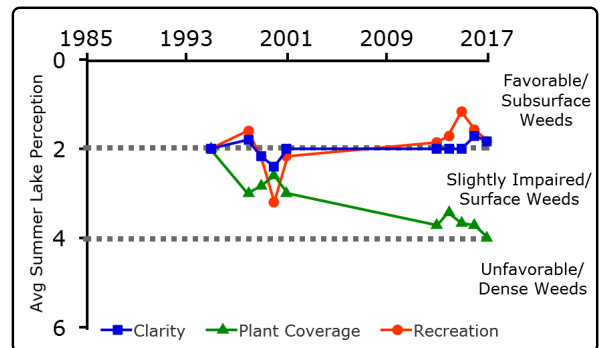
Wolf Lake Long Term Trend Analysis

Nitrogen
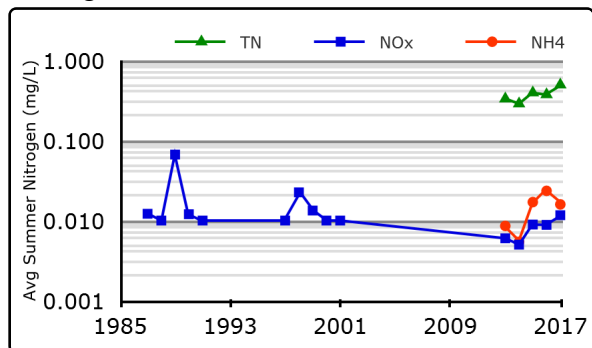
pH
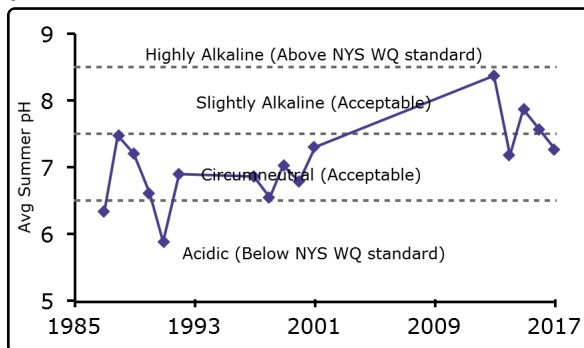
Temperature
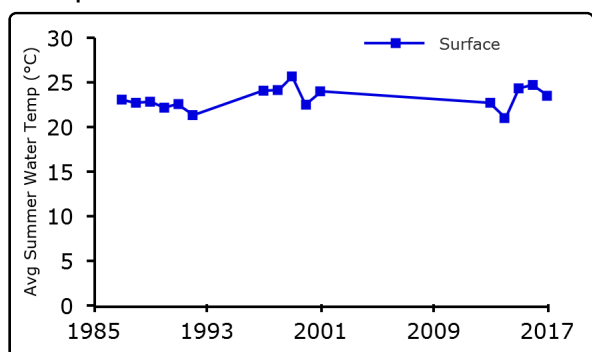
Specific Conductance
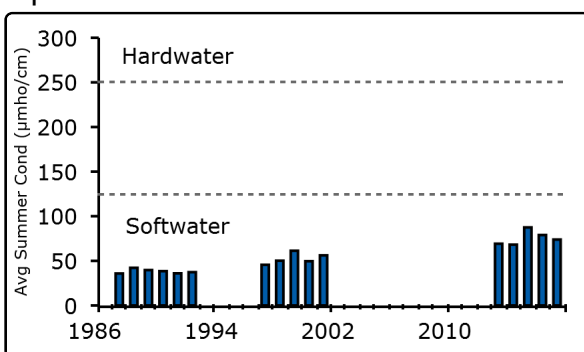
Wolf Lake In-Season Analysis

In Season Temperature
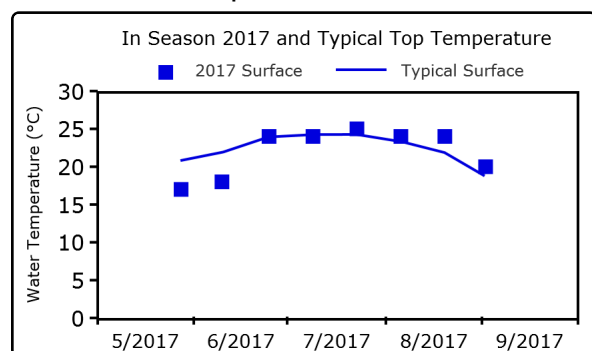
In Season Water Clarity

Scorecard

Lake Use
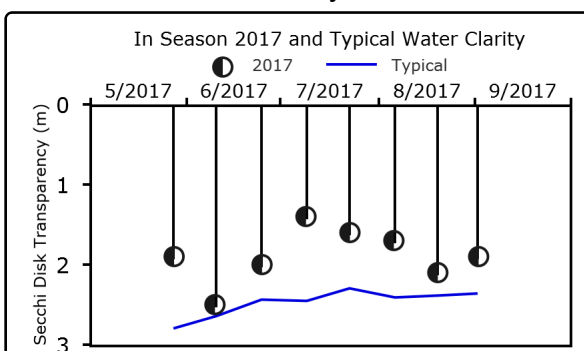
	PWL	Average Year	2017	Primary Issue
Potable Water	☐	☐	☐	**Not applicable**
Swimming	🟢	🟢	🟢	**No impacts**
Recreation	🟢	🔴	🔴	**Algae levels**
Aquatic Life	🔺	🟢	🟢	**No impacts**
Aesthetics	☐	🔺	🔺	**Poor perception**
Habitat	☐	🟢	🟢	**No impacts**
Fish Consumption	☐	☐	☐	**Not applicable**

Legend:

🟢 Supported/Good

🔺 Threatened/Fair

🔴 Stressed/Poor

⬛ Impaired

☐ Not Known

Summary

2017 compared to prior years: Wolf Lake continues to be *mesotrophic*, or moderately productive, although algae levels in some years are more typical of *eutrophic* (highly productive) lakes. Algae levels (as measured by chlorophyll *a*) were lower than usual in 2017, but so was water clarity, and conductivity were slightly higher than usual in 2017. This suggests at least some of these indicators vary normally from year to year. Aquatic plant coverage was substantially higher than usual in 2017, but it is (still) assumed that this is due to native plant growth, not invasive weeds.

Compared to nearby lakes: Wolf Lake has similar water clarity, but lower nutrient and algae levels, compared to other nearby (mid-Hudson region) lakes. Aquatic plant coverage is higher than in many of these other lakes, especially in 2017, despite the lack of AIS. Chloride levels were between the 50th and 75th percentile for New York state lakes, indicating some potential for aquatic life impacts from road salt (although no impacts have not been reported).

Trends: pH, conductivity, nitrogen and coverage of aquatic plants has increased in Wolf Lake since the late 1980s, suggesting the lake is no longer weakly acidic. It is not known if the change in nitrogen and plant coverage is related to the other water quality changes. None of the other CSLAP indicators has exhibited any significant changes over this period.

Algal blooms and HABS: Periodic *Microcystis* blooms have been previously reported in Wolf Lake, despite water quality conditions that are not particularly conducive to these blooms. Open water conditions have exhibited low to moderate algae levels with a mix of algal species. Toxin levels have been low in all samples. No blooms were reported in 2017.

Aquatic invasive species: No AIS have been found in Wolf Lake, or in any other lakes within five miles. This indicates a low vulnerability to AIS, due in part to the lack of public access 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, particularly since blooms are periodically observed in 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.

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.