DeRuyter Reservoir	Tioughnioga Lake Association or DeRuyter Lake Association	Town of DeRuyter	Madison County
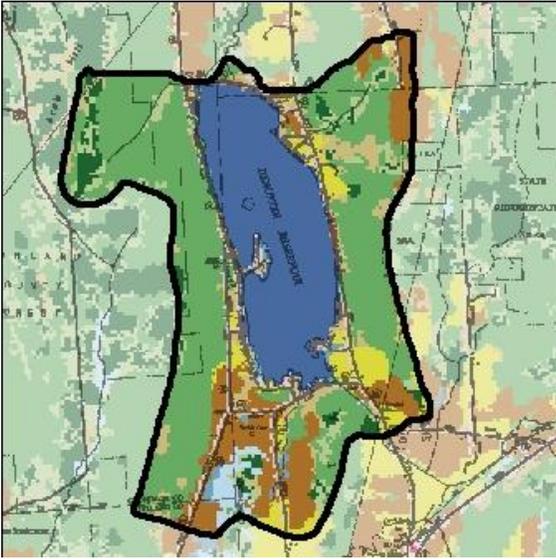
Lake Characteristics	Surface area (ac/ha)	557 / 225
	Max depth (ft/m)	52 / 16
	Mean depth (ft/m)	24 / 7
	Retention time (years)	3.3
	Lake Classification	B
	Dam Classification	0

Watershed Characteristics	Watershed area (ac /ha)	2498/1011
	Watershed / Lake ratio	4
	Lake & wetlands %	19%
	Agricultural %	1%
	Forest, shrub, grasses %	80%
	Residential	<1%
	Urban	0%

CSLAP Participation	Years	1988-2010, 2012-2018
	Volunteers	Kathy Sherlock and Jim Adsitt

Trophic state	HABs Susceptibility	Invasive Vulnerability	PWL Assessment
Mesotrophic	Frequent blooms, Moderate Susceptibility	Invasives present, High Vulnerability	Stressed

Water quality values for DeRuyter Reservoir for the 2018 sampling season. "Seasonal change" shows current year variability. Light red color indicates eutrophic conditions in top table and bloom conditions in bottom table. Summer averages for each of the CSLAP years and long term trend analyses show trends in key water quality indicators over a consistent index period (mid-June thru mid-September).

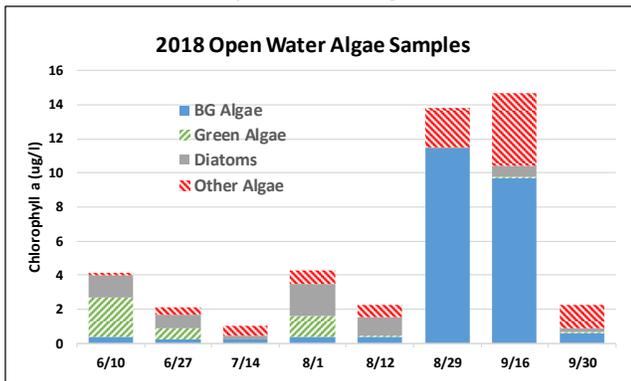| Open Water Indicators	2018 Sampling Results								Seasonal change	Long Term Avg	Long Term Trend?	18 Diff from Avg
	6/10	6/27	7/14	8/1	8/12	8/29	9/16	9/30				
Clarity (m)	5.0	5.1	5.5	4.2	4.5	2.7	0.9	3.8	⌇	3.5	↑↑	no
Surface TP (mg/l)	0.011	0.010	0.014	0.012	0.009	0.018	0.016	0.011	⌇	0.012	no	no
Surface TDP (mg/l)	0.002	0.006	0.014	0.006	0.006	0.006	0.004	0.006	⌇	1.653	no	
Deep TP (mg/l)	0.009	0.009	0.018	0.012	0.011	0.015	0.017	0.014	⌇	0.028	no	
Deep/Surface TP	1	1	1	1	1	1	1	1	⌇	2		
TN (mg/l)	0.371	0.430	0.310	0.457	0.322	0.407	0.382	0.343	⌇	0.376	no	no
TDN (mg/l)	0.463	0.451	0.368	0.382	0.327	0.353	0.337	0.385	⌇			
N:P Ratio	35	45	22	39	34	22	23	31	⌇	26		
Deep/Surface NH4	1	1	2	3	1	4	8	1	⌇	3		
Chl.a (ug/l)	1.4	0.4	1.3	3.6	1.0	11.4	12.3	2.2	⌇	5.0	↓	no
pH	8.1	7.4	7.6	7.7	6.8	7.1	7.5	7.1	⌇	7.8	↓↓	no
Cond (umho/cm)	193	205	195	141	126	130	147	150	⌇	166	↓	no
Upper Temp (degC)	22	21	28	26	27	27	25	20	⌇	22	↑↑	no
Deep Temp (degC)	20	21	24	25	25	25	23	18	⌇	20	↑↑	no
FP BG Chl.a (ug/l)	0	0	0	0	0	11	10	1	⌇	1	no	↑
HABs reported?	no	no	no	no	no	no	no	shore				

Shoreline bloom and HABs notifications

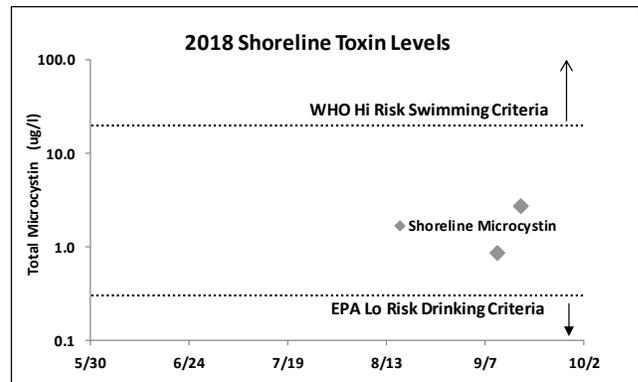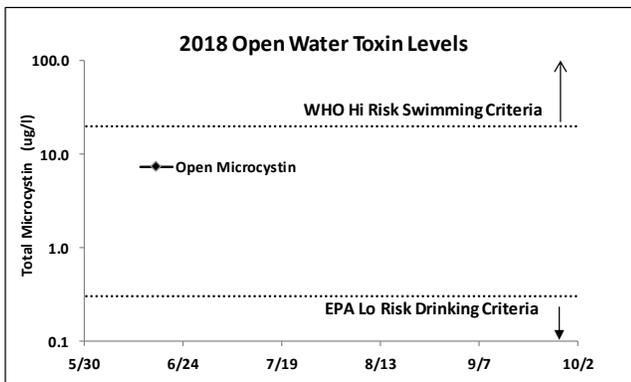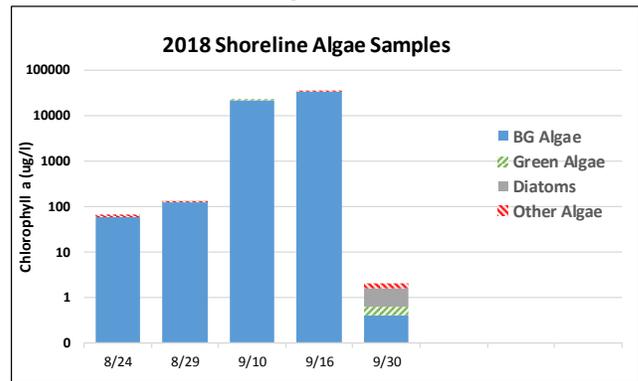| Date of first listing	Date of last listing	# weeks on the DEC notification list	# Weeks with updates
8/31/2018	9/21/2018	4	3

Shoreline HAB Sample Dates 2018

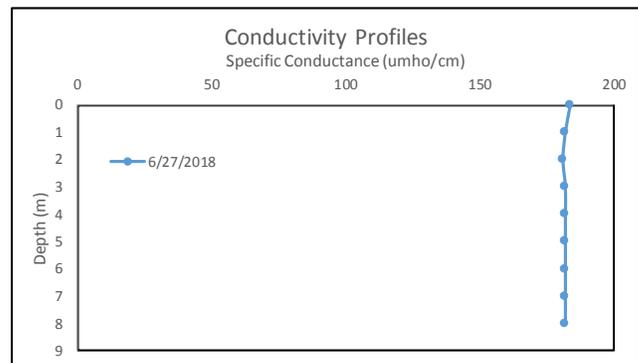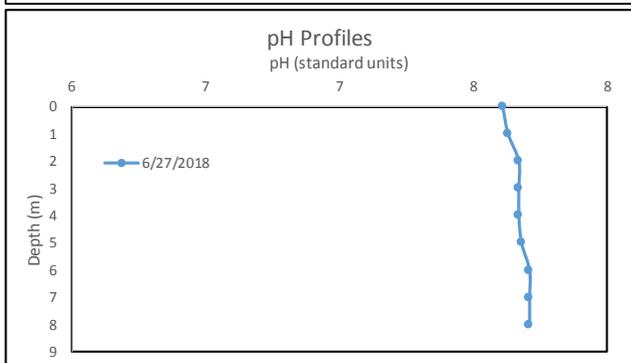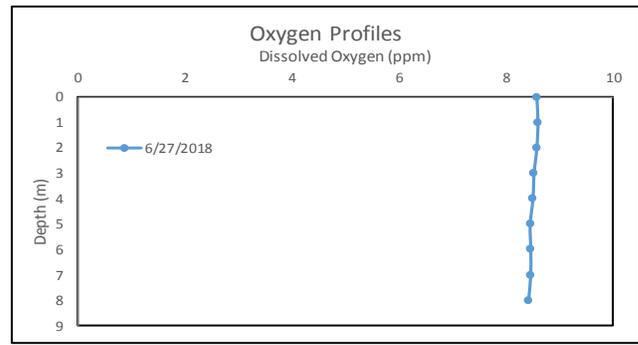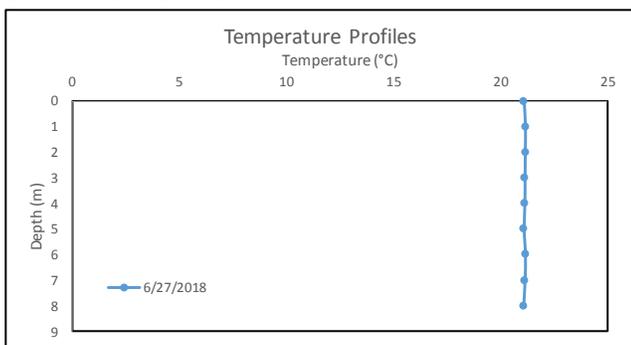| HAB Indicators	HAB criteria	8/24/2018	8/29/2018	9/10/2018	9/16/2018	9/30/2018
BGA	25 - 30 ug/L	60.3	123.7	22576.1	35028.5	0.4
microcystin	20 ug/L	ND	ND	0.9	2.7	ND
anatoxin - a	4 ug/L					

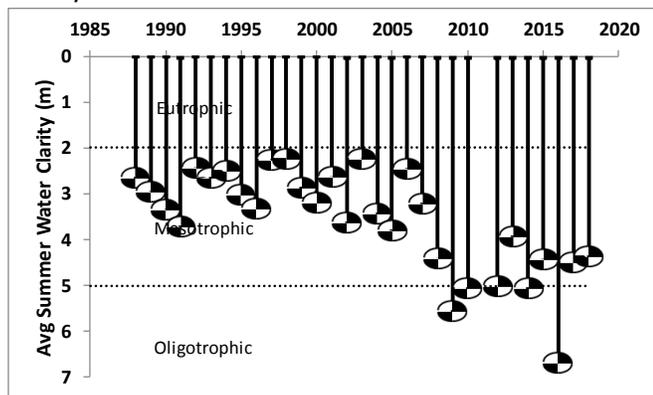## HABs Status   Open water Algae   Shoreline Algae

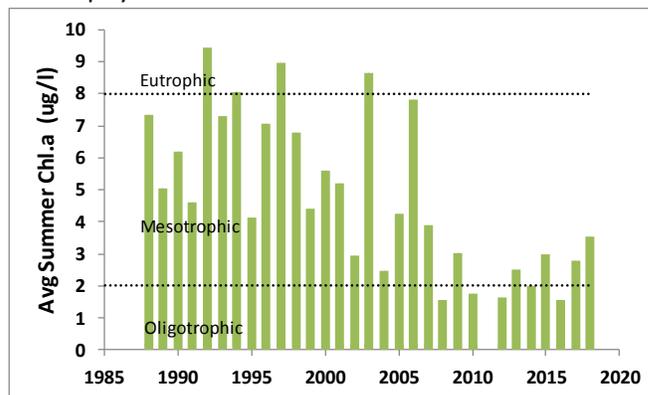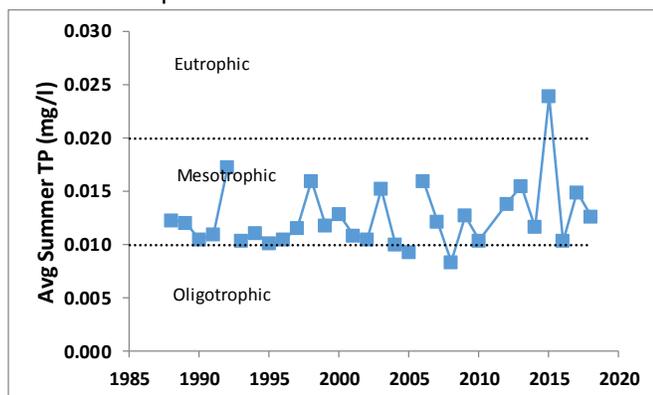## Site Visit Profiles

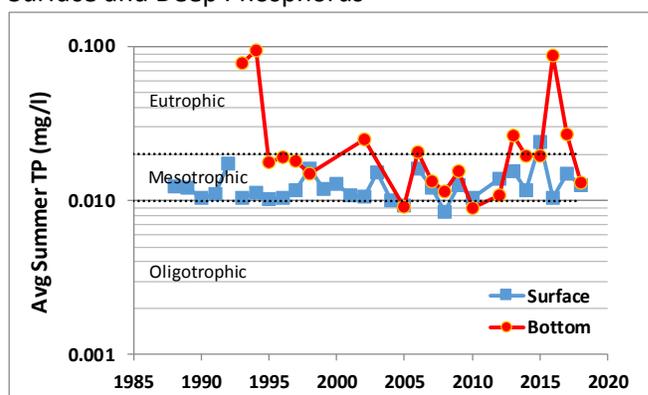# DeRuyter Reservoir Long Term Trend Analysis
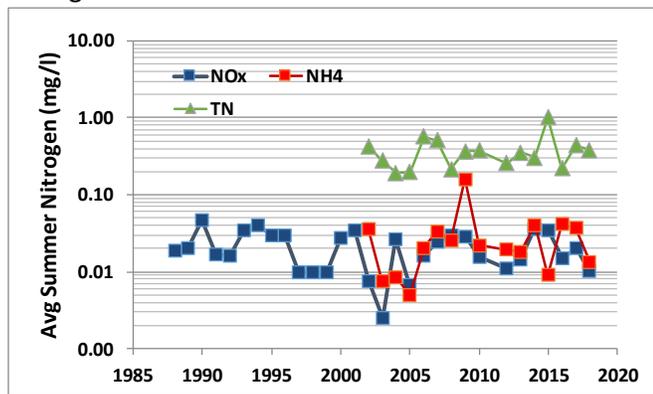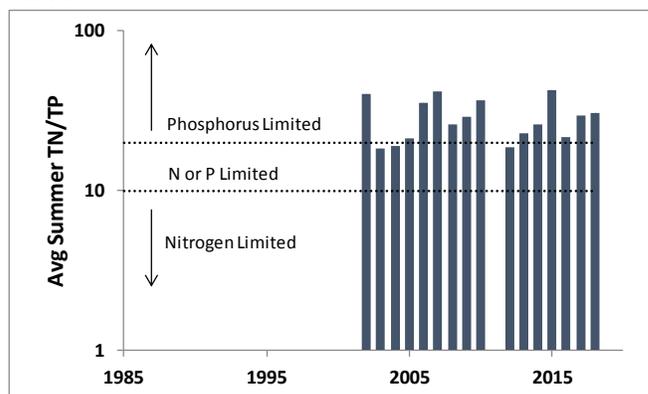
Clarity

Chlorophyll *a*

Surface Phosphorus

Surface and Deep Phosphorus

Nitrogen

TN : TP

pH
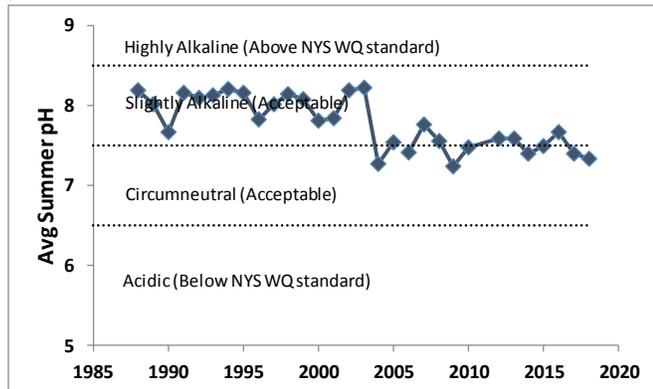
Specific Conductance
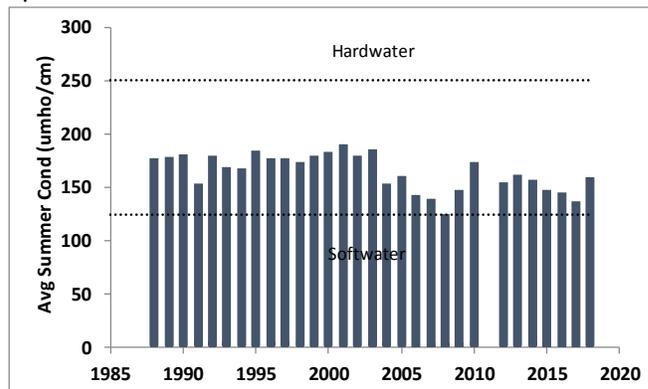
Lake Perception
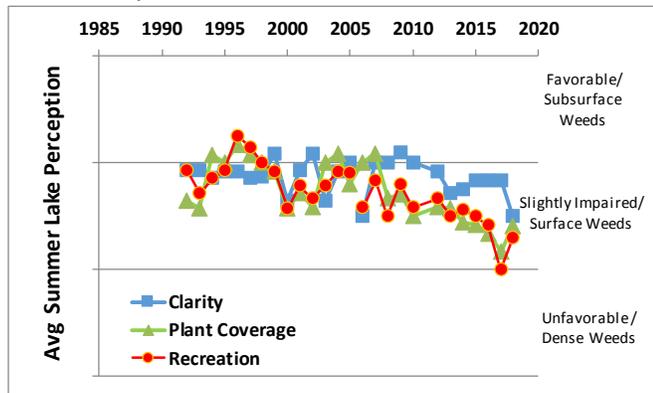
Surface and Deep Temperature
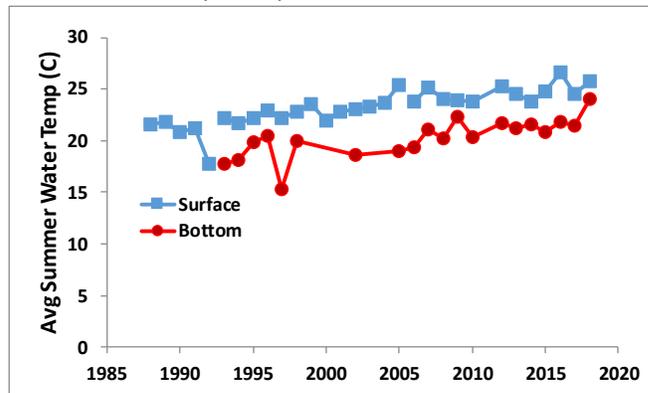
In Season Water Clarity

In Season 2018 and Typical Water Clarity
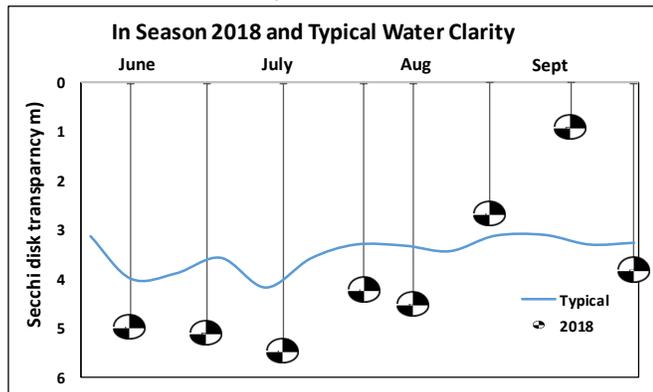
In Season Water Temperature

In Season 2018 and Typical Top and Bottom Temp
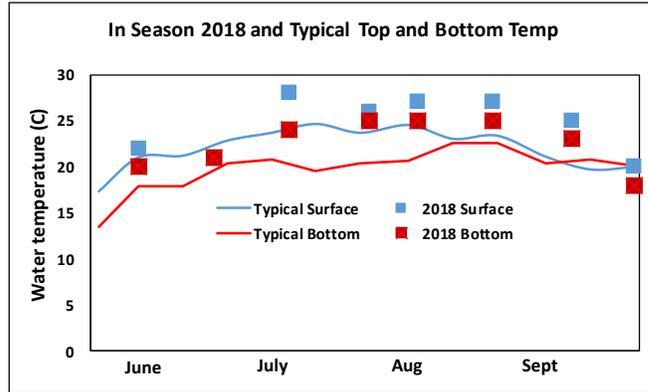
Scorecard

Lake Use

	PWL	Average Year	2018	Primary issue
Potable Water	Not Known	Not Known	Not Known	Not applicable
Swimming	Supported / Good	Stressed / Poor	Stressed / Poor	Algae blooms
Recreation	Stressed / Poor	Stressed / Poor	Stressed / Poor	Algae blooms
Aquatic Life	Supported / Good	Threatened / Fair	Supported / Good	Invasive animals
Aesthetics	Supported / Good	Stressed / Poor	Stressed / Poor	Poor perception
Habitat	Threatened / Fair	Stressed / Poor	Stressed / Poor	Invasive plants
Fish Consumption	Supported / Good	Not Known	Not Known	Not applicable

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

CSLAP sampling summary- DeRuyter Reservoir, 2018

Q. What is the condition of the lake?
A. DeRuyter Reservoir continues to be mesotrophic, or moderately productive, based on moderate water clarity, moderate algae levels (chlorophyll a), and moderate nutrient (phosphorus) levels. Soluble nutrients were analyzed for the first time in 2018. Most of the phosphorus in the lake is soluble, indicating a high potential for more algae growth. Most of the nitrogen in the lake is soluble. The lake has near neutral pH, intermediate hardness water, low water color, and moderately low nitrogen levels.

Q. How did 2018 compare to previous years?
A. Blue green chlorophyll a readings were higher than normal in 2018. Each of the other water quality indicators was close to normal in 2018.

Q. How does this lake compare to other nearby lakes?
A. Compared to other nearby lakes, DeRuyter Reservoir usually has lower chlorophyll a levels, phosphorus readings, and conductivity. DeRuyter Reservoir usually has similar water quality and recreational assessments, and similar aquatic plant coverage.

Q. Are there any (statistically significant) trends?
A. Since 1988, water clarity, surface water temperatures, bottom water temperatures, and calcium levels have increased significantly. Color readings have increased slightly. pH has decreased significantly. Chlorophyll a and conductivity have decreased slightly. Recreational assessments, have degraded significantly. Aquatic plant coverage has degraded slightly.

Q. Has the lake experienced harmful algal blooms (HABs)?
A. Water quality conditions indicate a moderate susceptibility to blooms, though frequent blooms along the shoreline or in the open water have been documented. The open water algal community in the lake is usually comprised of intermediate cyanobacteria levels. Overall open water algae levels are low. Open water toxin levels are consistently below recreational levels of concern. Shoreline blooms have been documented in the lake, comprised primarily of cyanobacteria dominated by *Dolichospermum*, with some *Gloeotrichia*. The shoreline algal community exhibits high toxin levels.

In 2018, overall algae levels were intermediate, with cyanobacteria the most common taxa in open water samples, and with intermediate cyanobacteria levels. Open water toxin levels were undetectable. Shoreline blooms in 2018 were documented in the lake,

comprised primarily of cyanobacteria with at times low but detectable toxin levels. The most common taxa were *Anabaena* and *Gloeotrichia*.

Q. Have any aquatic invasive species (AIS) been reported?
A. There are invasive plants reported or present at DeRuyter Reservoir, although invasives have not been reported in nearby waterbodies. Invasives species reported in the lake include Eurasian watermilfoil. Zebra mussels and banded mystery snail have been reported in DeRuyter Reservoir. DeRuyter Reservoir has high vulnerability for new invasives, based on calcium levels and public access, and the presence of AIS in the lake.

Q. Are any lake uses likely to be affected by these conditions?
A. DeRuyter Reservoir supports recreation and public bathing use. This waterbody is not designated for use as a public water supply. Public bathing and recreation are stressed by shoreline cyanotoxins, and impacted by shoreline HABs, despite trends toward improving water quality. Aquatic life is threatened by presence of invasive animals. Aesthetics are poor due to poor recreational perception, and impacted by poor water quality perception, and the presence of invasive aquatic plants. Habitat is fair due to need for aquatic plant (weed) management, and impacted by dense surface aquatic plant growth, surface aquatic plant growth, and the presence of invasive aquatic plants. Fish Consumption use is considered to be unassessed. There are no health advisories limiting the consumption of fish from this waterbody (beyond the general advice for all waters). However, due to the lack of actual fish sampling data, fish consumption use is noted as unassessed, rather than fully supported but unconfirmed.

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, including comparisons to historical data from this lake, and results from nearby lakes.

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. TSP, or total soluble phosphorus, was collected in 2018 and discussed in the lake narrative section.

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. This is an extracted chlorophyll measurement.

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 (> 250) usually indicate hardwater, and low readings (< 125) usually 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. This is an "unextracted" estimate using a fluoroprobe. This result is not as accurate as the extracted chlorophyll measurement described above.

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.