

LCI Lake Water Quality Summary

General Information

Lake Name: Diver's Lake

Location: Town of Alabama, Genesee County, NY

Basin: Niagara River Basin

Size: 2.6 hectares (6.5 acres)

Lake Origins: Natural/Glacial Lake

Major Tributaries: Spring fed

Lake Tributary to: none

Water Quality Classification: C (best intended use: primary contact recreation)

Sounding Depth: 7.5 meters (25 feet)

Sampling Coordinates: 43.04089, -78.39954

Sampling Access Point: Private land (Meiser)

Monitoring Program: Lake Classification and Inventory (LCI) Survey

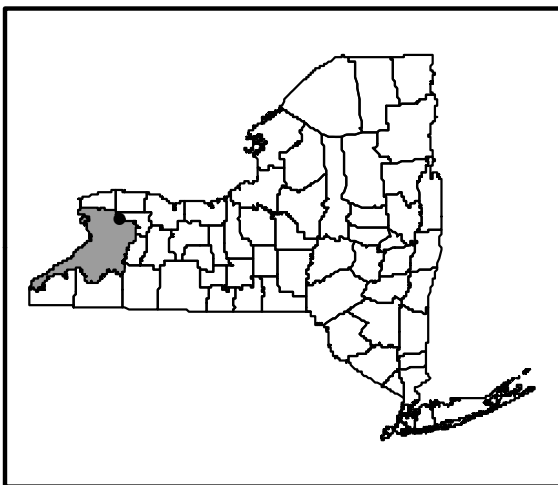
Sampling Date: 8/4/2010, 6/9, 7/5, 8/2, & 9/13/2011

Samplers: David Newman & Scott Kishbaugh NYSDEC Division of Water, Albany
Bill Murray, Brian Hourigan, & Richard Rink NYSDEC Division of Water, Buffalo

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Lake Map

(sampling location marked with a circle)



Background and Lake Assessment

Diver's Lake (also known as Spirit, Hidden or Devils Lake) is a 7 acre spring fed kettle lake of glacial origin. The lake is one of the only natural lakes in Genesee County. The lake and area around it are known for the prehistoric people who inhabited the area and mined Onondaga chert/flint from the 70 foot high escarpment near the eastern shoreline of the lake. The lake and land around it was part of the Tonawanda Indian Reservation until 1838, and the lake is still considered sacred ground by the Senecas (Prisch 1976). McCarthy and Newman (1961) reported that the lake historically had a steel-blue color and was very clear.

A local landowner indicated that the lake was historically used for harvesting ice in the winter. In more recent times the lake has been used for irrigating the nearby crop fields. Currently the land surrounding the lake is mostly agricultural, although there is a forested buffer around most of the lake. There is no public access, and the lake supports very limited shoreline fishing. The lake at one time had been about half the current size, but the water level has risen as indicated by a ring of dead partially submerged trees around the shoreline of the lake.

Diver's Lake was included in the 2010 NYS DEC Division of Water's Lake Classification and Inventory Survey (LCI) screening program. Inclusion in the LCI was based on a lack of water quality data in the Division of Water's database. Due to the elevated phosphorus and algae levels, the lake was also sampled monthly during the summer of 2011.

Diver's Lake can be characterized as *eutrophic* or highly productive. The average water clarity reading from the five sampling events (TSI = 51, typical of *eutrophic* waterbodies) was expected given the average total phosphorus reading (TSI = 59, typical of *eutrophic* waterbodies) and the average chlorophyll *a* reading (TSI = 54, typical of *eutrophic* waterbodies). These data indicated that elevated nutrient levels may support algae blooms in the lake. An algal bloom was observed to be occurring in the lake in early August of 2011, with an algal scum surrounding the tops of the aquatic plants in the shallow areas of the lake.

From June to August of 2011 the lake had a green appearance with a water clarity reading consistently above the water quality standard of 1.2 meters to protect the safety of swimmers. An assessment of the aquatic plant community in the lake yielded four native species. In addition, *Potamogeton crispus* (curlyleaf pondweed), an exotic invasive species, was also found to be growing in the lake. This plant can grow to high densities and outcompete some of the native vegetation. A more thorough plant specific survey of the lake may yield additional aquatic plants species in the lake.

Like most NYS lakes greater than 6 meters in depth, Diver's Lake exhibited thermal stratification throughout the summer of 2011. The thermocline was in the 3 to 4 meter depth range throughout the entire summer with anoxic (lack of dissolved oxygen) conditions being generally observed below 4 meters. In 2011, pH values were elevated, but stayed below the NYS water quality standard of 8.5. Conductivity readings indicate hardwater.

Diver's Lake appears to be typical of deep, hardwater, weakly colored, alkaline lakes. Other lakes with similar water quality characteristics often support warmwater fisheries; however, fisheries habitat cannot be fully evaluated through this monitoring program. Coldwater fish and

other organisms susceptible to high summer water temperatures are unlikely to be supported in the lake due to a lack of cold oxygen rich waters. Small fish and frogs were observed in the lake by the field crew, indicating that the lake is supporting at least some forms of aquatic life.

Evaluation of Lake Condition Impacts to Lake Uses

Potable Water (Drinking Water)

Diver's Lake is not classified for nor used for a potable water supply. Although the LCI data are not sufficient to evaluate potable water use, these data suggest that surface water withdrawals may be *threatened* by elevated iron levels. Ammonia, iron and manganese levels would *impair* deepwater withdrawals.

Contact Recreation (Swimming)

Diver's Lake is not classified for contact recreation, and it is unlikely that local property owners swim in the lake. Bacteria data are needed to evaluate the safety of Diver's Lake for swimming; however, these are not collected through the LCI. The data collected through the LCI indicate that contact recreational use of the lake may be *stressed* by low water clarity in response to high algae levels (elevated chlorophyll *a* readings) and by high densities of aquatic plants growing to the lake's surface.

Non-Contact Recreation (Boating and Fishing)

Diver's Lake is classified for non-contact recreational uses, including boating and fishing. The lake is occasionally used for fishing and rarely for boating. The high densities of aquatic plants growing to the surface may *stress* boating and fishing in the lake. The recreational suitability of the lake was described by DEC samplers as "slightly impaired."

Aquatic Life

Aquatic life support in Diver's Lake may be *threatened* by low hypolimnetic dissolved oxygen levels and the occurrence of curlyleaf pondweed may *threaten* the ecological community of the lake.

Aesthetics

These data indicate that the high algae levels and high densities of aquatic plants may *stress* the aesthetics of the lake.

Additional Comments

- Periodic surveillance for invasive exotic plant species may help to prevent the establishment and spread of any new invaders, given the escalating problems with exotic aquatic weeds.

Aquatic Plant IDs

Exotic Plants:

***Potamogeton crispus* (curlyleaf pondweed)**

Native Plants:

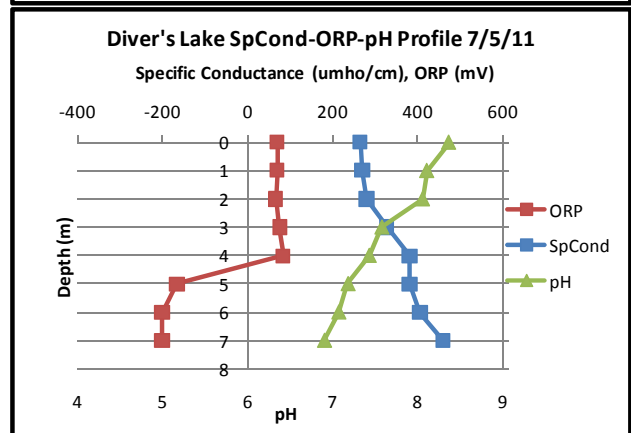
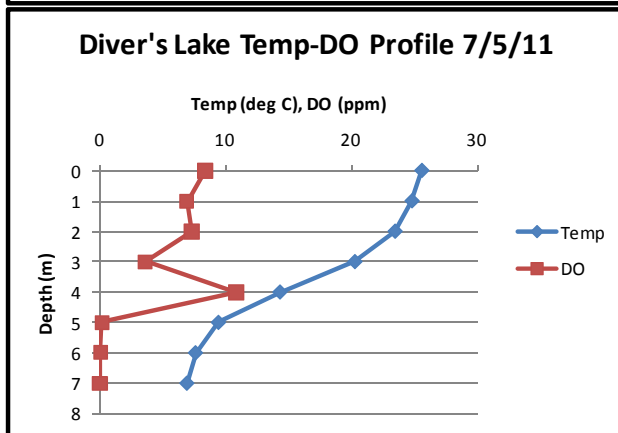
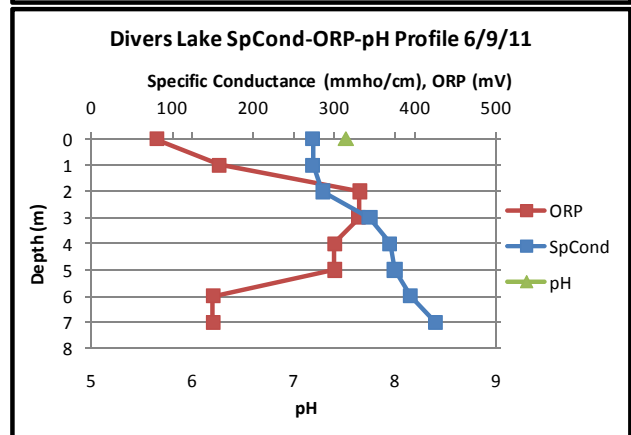
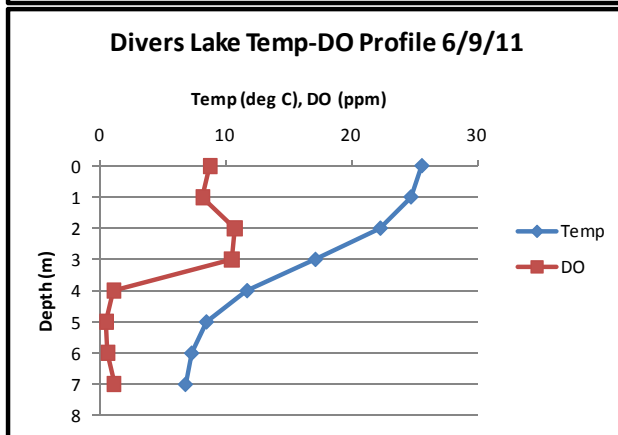
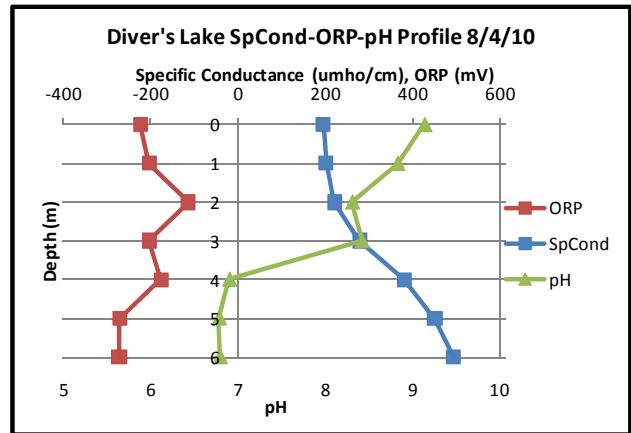
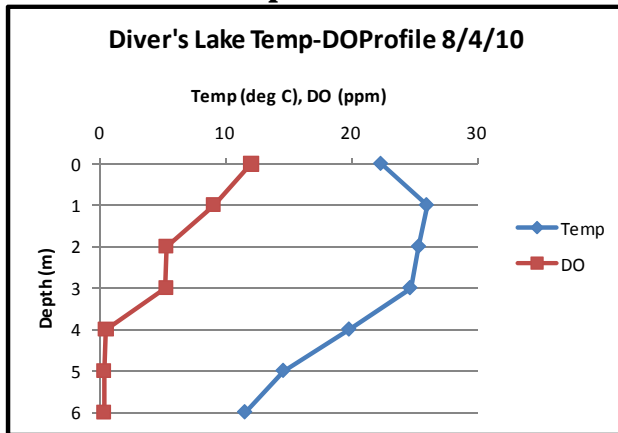
Potamogeton foliosus (leafy pondweed)

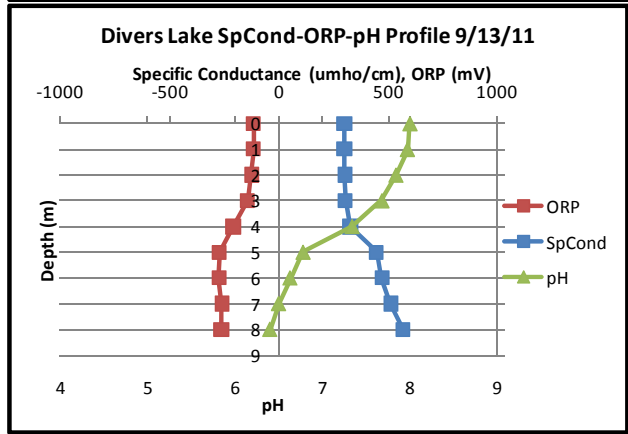
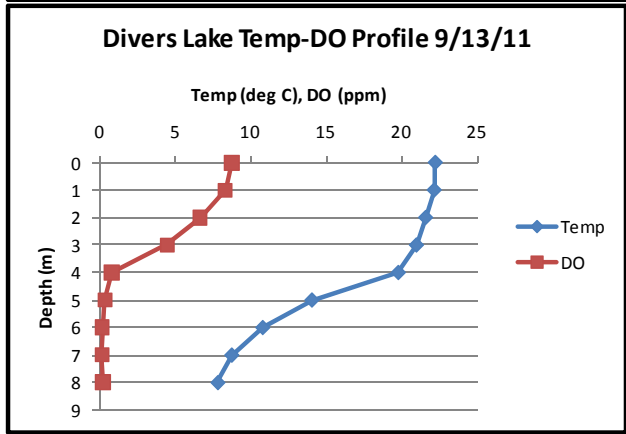
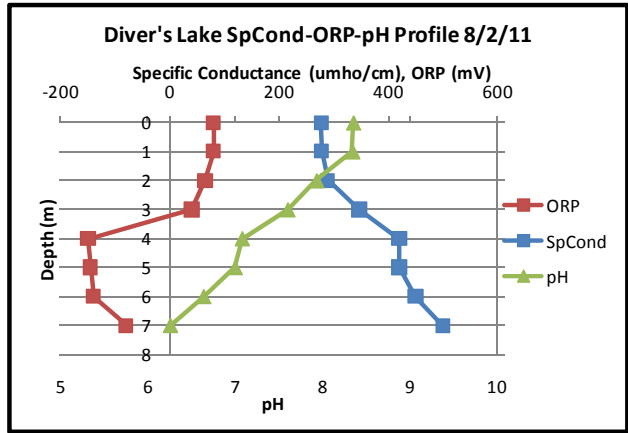
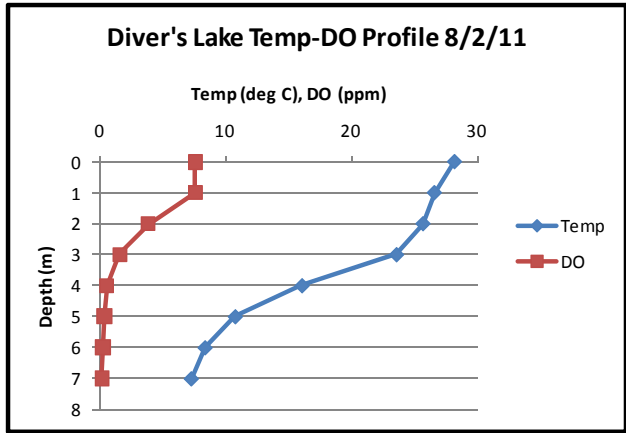
Ceratophyllum demersum (coontail)

Stuckenia filiformis (slender leaf pondweed)

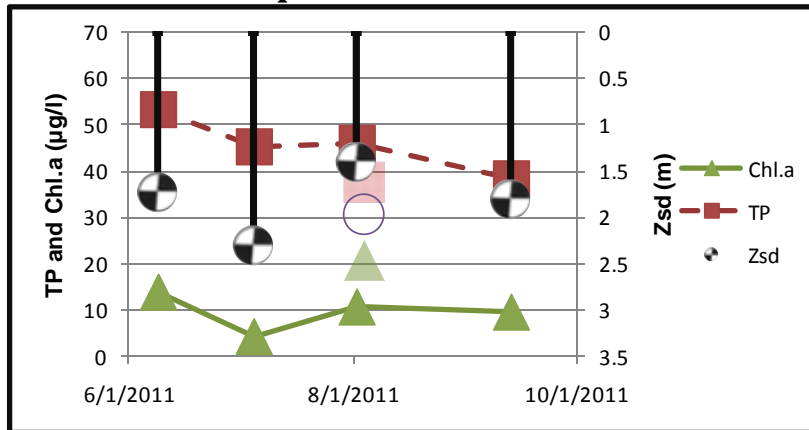
Najas sp. (water nymph)

Time Series: Depth Profiles





Time Series: Trophic Indicators



* transparent markers represent the August 4, 2010 data

WQ Sampling Results

Surface Samples

	UNITS	N	MIN	AVG	MAX	Scientific Classification	Regulatory Comments
SECCHI	meters	5	1.4	1.836	2.3	Eutrophic	No readings violate DOH guidance value
TSI-Secchi			48.0	51.4	55.2	Eutrophic	No pertinent water quality standards
TP	mg/l	5	0.0376	0.044	0.0531	Eutrophic	100% of readings violate water quality standards
TSI-TP			56.4	58.6	61.4	Eutrophic	No pertinent water quality standards
TSP	mg/l	5	0.0085	0.0110	0.0157	Little available phosphorus	No pertinent water quality standards
NOx	mg/l	5	ND	0.009	0.0271	Low nitrate	No readings violate water quality standards
NH4	mg/l	5	ND	0.014	0.027	Low ammonia	No readings violate water quality standards
TKN	mg/l	5	0.73	0.872	0.98	Elevated organic nitrogen	No pertinent water quality standards
TN/TP	mg/l	5	35.43	44.43	49.62	Phosphorus Limited	No pertinent water quality standards
CHLA	ug/l	5	4.3	11.86	20.8	Eutrophic	No pertinent water quality standards
TSI-CHLA			44.93	53.68	60.37	Eutrophic	No pertinent water quality standards
Alkalinity	mg/l	5	93.7	125.94	144	Moderately Buffered	No pertinent water quality standards
TCOLOR	ptu	5	14	21	29	Weakly Colored	No pertinent water quality standards
TOC	mg/l	5	5.9	7.02	7.9		No pertinent water quality standards
Ca	mg/l	5	19.4	30.46	36.2	Strongly Supports Zebra Mussels	No pertinent water quality standards
Fe	mg/l	5	0.0283	0.056	0.100		No readings violate water quality standards
Mn	mg/l	5	0.0142	0.039	0.0617		No readings violate water quality standards
Mg	mg/l	5	14.2	15.22	16.1		No readings violate water quality standards
K	mg/l	5	0.104	0.761	1.4		No pertinent water quality standards
Na	mg/l	5	1.1	2.006	2.49		No readings violate water quality standards
Cl	mg/l	5	3.8	4.72	5.4	Minor road salt runoff	No readings violate water quality standards
SO4	mg/l	5	4.5	6.22	8.1		No readings violate water quality standards

Bottom Samples

	UNITS	N	MIN	AVG	MAX	Scientific Classification	Regulatory Comments
TP-bottom	mg/l	4	0.327	0.8045	1.44	Elevated deepwater phosphorus	No pertinent water quality standards
TSP-bottom	mg/l	4	0.22	0.655	1.21	High % soluble phosphorus	No pertinent water quality standards
NOx-bottom	mg/l	4	ND	0.00448	0.0089	No evidence of DO depletion	No readings violate water quality standards
NH4-bottom	mg/l	4	3.49	5.875	11	Evidence of DO depletion	100% of readings violate DOH guidelines
TKN-bottom	mg/l	4	4.34	7.0475	12.6		No pertinent water quality standards
Alk-bottom	mg/l	4	204	227.25	262	Moderately Buffered	No pertinent water quality standards
TCOLOR-bottom	ptu	4	21	30.75	39	Highly Colored	No pertinent water quality standards
TOC-bottom	mg/l	4	6.9	8.4	10.2		No pertinent water quality standards
Ca-bottom	mg/l	4	51	58.375	66	Strongly Supports Zebra Mussels	No pertinent water quality standards
Fe-bottom	mg/l	4	0.201	0.317	0.515	Taste or odor likely	50% of readings violate water quality standards
Mn-bottom	mg/l	4	0.704	1.339	2.42	Taste or odor likely	100% of readings violate water quality standards
Mg-bottom	mg/l	4	15.9	17.075	18		No readings violate water quality standards
K-bottom	mg/l	4	3.09	3.09	3.09		No pertinent water quality standards
Na-bottom	mg/l	4	2.41	2.513	2.66		No readings violate water quality standards
Cl-bottom	mg/l	4	5.3	5.9	6.7		No readings violate water quality standards
SO4-bottom	mg/l	4	ND	5.8	7.7	May have rotten egg odor	No readings violate water quality standards
As-bottom	mg/l	4	ND	ND	0.236	Threat to deep potable water intakes	No readings violate guidance values

Lake Perception

	UNITS	N	MIN	AVG	MAX	Scientific Classification
WQ Assessment	1-5, 1 best	5	2	3	4	Definite Algal Greenness
Weed Assessment	1-5, 1 best	5	3	3.4	4	Plants Grow to Lake Surface
Recreational Assessment	1-5, 1 best	5	2	3	4	Slightly Impaired

References:

McCarthy, R.L. and H.Newman. 1961. Prehistoric People of Western New York. Adventures in Western New York History Buffalo and Erie County Historical Society: 7(1-16).

Prisch, B.C. 1976. The Divers Lake Quarry Site Genesee County, New York. The Bulletin: Journal of the New York State Archaeological Association. 66:8-17.

Legend Information

General Legend Information

Surface Samples	= integrated sample collected in the first 2 meters of surface water
Bottom Samples	= grab sample collected from a depth of approximately 1 meter from the lake bottom
SECCHI	= Secchi disk water transparency or clarity - measured in meters (m)
TSI-SECCHI	= Trophic State Index calculated from Secchi, = $60 - 14.41 * \ln(\text{Secchi})$

Laboratory Parameters

ND	= Non-Detect, the level of the analyte in question is at or below the laboratory's detection limit
TP	= total phosphorus- milligrams per liter (mg/l) Detection limit = 0.003 mg/l; NYS Guidance Value = 0.020 mg/l
TSI-TP	= Trophic State Index calculated from TP, = $14.42 * \ln(\text{TP} * 1000) + 4.15$
TSP	= total soluble phosphorus, mg/l Detection limit = 0.003 mg/l; no NYS standard or guidance value
NOx	= nitrate + nitrite nitrogen, mg/l Detection limit = 0.01 mg/l; NYS WQ standard = 10 mg/l
NH4	= total ammonia, mg/l Detection limit = 0.01 mg/l; NYS WQ standard = 2 mg/l
TKN	= total Kjeldahl nitrogen (= organic nitrogen + ammonia), mg/l Detection limit = 0.01 mg/l; no NYS standard or guidance value
TN/TP	= Nitrogen to Phosphorus ratio (molar ratio), = $(\text{TKN} + \text{NOx}) * 2.2 / \text{TP}$ > 30 suggests phosphorus limitation, < 10 suggests nitrogen limitation
CHLA	= chlorophyll <i>a</i> , micrograms per liter ($\mu\text{g/l}$) or parts per billion (ppb) Detection limit = 2 $\mu\text{g/l}$; no NYS standard or guidance value
TSI-CHLA	= Trophic State Index calculated from CHLA, = $9.81 * \ln(\text{CHLA}) + 30.6$
ALKALINITY	= total alkalinity in mg/l as calcium carbonate Detection limit = 10 mg/l; no NYS standard or guidance value
TCOLOR	= true (filtered or centrifuged) color, platinum color units (ptu) Detection limit = 5 ptu; no NYS standard or guidance value
TOC	= total organic carbon, mg/l Detection limit = 1 mg/l; no NYS standard or guidance value
Ca	= calcium, mg/l Detection limit = 1 mg/l; no NYS standard or guidance value
Fe	= iron, mg/l Detection limit = 0.1 mg/l; NYS standard = 1.0 mg/l
Mn	= manganese, mg/l Detection limit = 0.01 mg/l; NYS standard = 0.3 mg/l
Mg	= magnesium, mg/l Detection limit = 2 mg/l; NYS standard = 35 mg/l
K	= potassium, mg/l Detection limit = 2 mg/l; no NYS standard or guidance value
Na	= sodium, mg/l Detection limit = 2 mg/l; NYS standard = 20 mg/l
Cl	= chloride, mg/l Detection limit = 2 mg/l; NYS standard = 250 mg/l

SO4 = sulfate, mg/l
Detection limit = 2 mg/l; NYS standard = 250 mg/l

Field Parameters

Depth = water depth, meters
Temp = water temperature, degrees Celsius
D.O. = dissolved oxygen, in milligrams per liter (mg/l) or parts per million (ppm)
NYS standard = 4 mg/l; 5 mg/l for salmonids
pH = powers of hydrogen, standard pH units (S.U.)
Detection limit = 1 S.U.; NYS standard = 6.5 and 8.5
SpCond = specific conductance, corrected to 25°C, micromho per centimeter ($\mu\text{mho/cm}$)
Detection limit = 1 $\mu\text{mho/cm}$; no NYS standard or guidance value
ORP = Oxygen Reduction Potential, millivolts (MV)
Detection limit = -250 mV; no NYS standard or guidance value

Lake Assessment

WQ Assessment = **water quality assessment**, 5 point scale, 1= crystal clear, 2 = not quite crystal clear, 3 = definite algae greenness, 4 = high algae levels, 5 = severely high algae levels
Weed Assessment = **weed coverage/density assessment**, 5 point scale, 1 = no plants visible, 2 = plants below surface, 3 = plants at surface, 4 = plants dense at surface, 5 = plants cover surface
Recreational Assessment = **swimming/aesthetic assessment**, 5 point scale; 1 = could not be nicer, 2 = excellent, 3= slightly impaired, 4 = substantially impaired, 5 = lake not usable