

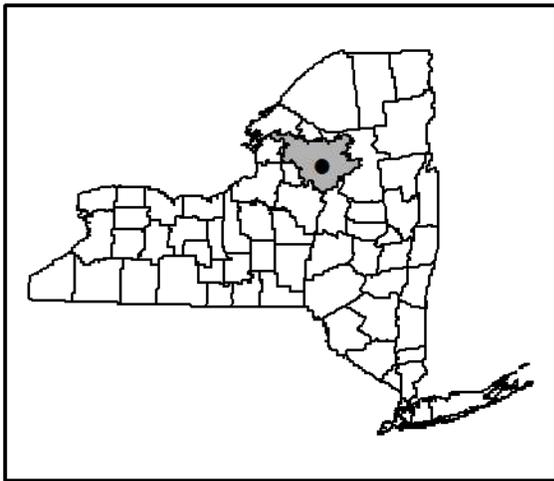
LCI Lake Water Quality Summary

General Information

Lake Name:	Copper Lake
Location:	Town of Grieg, Lewis County
Basin:	Black River
Size:	24 hectares (60 acres)
Lake Origins:	Natural
Tributaries:	Copper Creek
Watershed Area:	190 hectares (460 acres)
Lake Tributary to:	Moose River via Copper and Pine Creeks
Water Quality Classification:	C(T) (best intended use: secondary contact recreation) (T) waters shall be suitable for trout survival
Sounding Depth:	6.9 meters (22.5 feet)
Sampling Coordinates:	43.6661, -75.14217
Sampling Access Point:	Private land (Copper Lake Association)
Monitoring Program:	Lake Classification and Inventory (LCI) Survey
Sampling Date:	September 20, 2012
Samplers:	David Newman, NYSDEC Division of Water, Albany Brad Wenskoski, NYSDEC Division of Water, Albany
Contact Information:	David Newman, NYSDEC Division of Water djnewman@gw.dec.state.ny.us ; 518-402-8201

Lake Map

(sampling location marked with a circle)



Background and Lake Assessment

Copper Lake is an approximately 60 acre lake, near the southern edge of the Ha-De Ron Dah Wilderness Area, in the western Adirondacks. All of the land surrounding the lake, approximately 775 acres, is privately held, by about 20 individual property owners. Other than a small number of camps around the lake shore, there is no development within the rest of the lake's watershed. There is no public access to the lake nor the land that surrounds it, with only a narrow and rough private ATV trail that leads to the lake.

The NYSDEC Division of Water's lake water quality database had no previous data for the lake, and thus the lake was included in the 2012 Lake Classification and Inventory (LCI) screening program. Based on data from the single sampling event, in late September of 2012, Copper Lake can be characterized as *mesotrophic*, or moderately unproductive. The water clarity reading (TSI = 46, typical of *mesotrophic* lakes) was in the expected range given the chlorophyll *a* reading (TSI = 47, typical of *mesotrophic* lakes). The phosphorus (TSI = 36, typical of *oligotrophic* lakes) was lower than expected given the water clarity and chlorophyll *a* readings. It is likely that the collection of multiple samples throughout the summer would help in explain the apparent disparity between the phosphorus and chlorophyll *a* level. The low phosphorus level indicates that the lake is unlikely to support high levels of primary production, in the form of algae.

A quick assessment of the aquatic plant community, of the lake, found only a small number of native plant species. All of the observed species are commonly found in the other Adirondack lakes. The overall abundance of the aquatic vegetation was described to be sparse and typical of other lakes in the area. A more thorough plant specific survey would be needed to adequately assess the plant community of the lake, and rule out the existence of any invasive species.

Copper Lake exhibited week thermal stratification, in which depth zones (warm water on top, cold water on the bottom during the summer) are established, as in most NYS lakes greater than six meters deep. The thermocline in the lake was at four to five meters in late September. Below this point, hypoxic (low level of dissolved oxygen) conditions were observed. The pH readings were around 6.75 in the surface waters, indicating no apparent effects of acid precipitation. Conductivity readings indicate soft water, as is typical for Adirondack lakes and ponds, due to the underlying soils.

Copper Lake appears typical of circum-neutral, soft water, colored lake in the Adirondacks. Other waterbodies, with similar water quality characteristics, often support warm water fish species. Due to the shallow depth of the lake, and the low dissolved oxygen levels in the bottom waters, cold water fish species may not be supported in the lake. In the mid 1980's, fisheries surveys were conducted at several nearby lakes; these surveys found predominately warmwater fish species, including white suckers, brown bullhead, common and golden shiners, pumpkinseed and a small number of brook and brown trout (Adirondack Lake Survey Cooperation 2013). One of the private land owners indicated, that at one time Copper Lake did support trout. A fisheries specific survey would need to be conducted at Copper Lake to fully evaluate the current fish community, of the lake.

Chloride levels were below the laboratory detection limit, which would be expected, due to a lack of development in the lake's watershed. The alkalinity levels were also low, indicating the lake has little to no buffering capacity to acidic inputs. This is also common to many Adirondack Lakes, due to low level of carbonates in the underlying soil. Iron and manganese levels, in the hypolimnion, were above the state's drinking water quality standard, and would likely cause taste and/or odor problems with water withdrawn from the lake's hypolimnion. Elevated levels of iron and manganese, in the bottom waters, are often associated with hypoxic and anoxic conditions, which allow these metals, bound to the bottom sediments, to be release into the water column. None of the other parameters evaluated through the LCI were detected above level of concern.

Evaluation of Lake Condition Impacts to Lake Uses

Potable Water (Drinking Water)

Copper Lake is not classified, nor used as a potable water supply. Data collected through the LCI program are not sufficient to fully evaluate potable water use. These data indicate that bottom water withdrawals may experience taste and odor problems associated with elevated iron and manganese levels.

Contact Recreation (Swimming)

Copper Lake is not classified for swimming. The New York State Water Quality Classification of *Class C* states that "water quality shall be suitable for primary contact recreation, although other factors may limit the use for this purpose". It is not known if individuals swim in the lake. Bacteria data are needed to evaluate the safety of Copper Lake for swimming; these are not collected through the LCI. Data collected though the LCI indicate that swimming should be supported in the lake. The water clarity was well above the State Department of Health's guidance value of 1.2 meters to protect the safety of swimmers.

Non-Contact Recreation (Boating and Fishing)

Copper Lake is classified for non-contact recreation including boating and fishing. Several of the private land owners are known to canoe and kayak on the lake, with one individual operating a small boat with an outboard motor. The data collected through the LCI do not indicate any impacts to boating and fishing on the lake.

Aquatic Life

The hypoxic conditions in the bottom waters of the lake may not be supportive of cold water organisms. A landowner indicated that loons are commonly seen on the lake. The presence of loons is often an indicator of a healthy aquatic ecosystem. A biological survey of the lake would be needed to fully evaluate the impacts of low pH and any other stressors to aquatic life.

Aesthetics

These data did not indicate any stressors to the aesthetics of the lake.

Additional Comments

- The remoteness of the lake and the limited development on the lake shore and within the greater watershed has helped to protect Copper Lake from environmental degradation. This should be kept in mind if any future development is considered on the lake shore or within the lake's watershed.
- Any boats or other equipment that is brought to the lake should be cleaned and allowed adequate drying time to prevent the introduction of aquatic invasive species.
- 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 species.

Aquatic Plant IDs

Exotic Plants:

None observed

Native Plants:

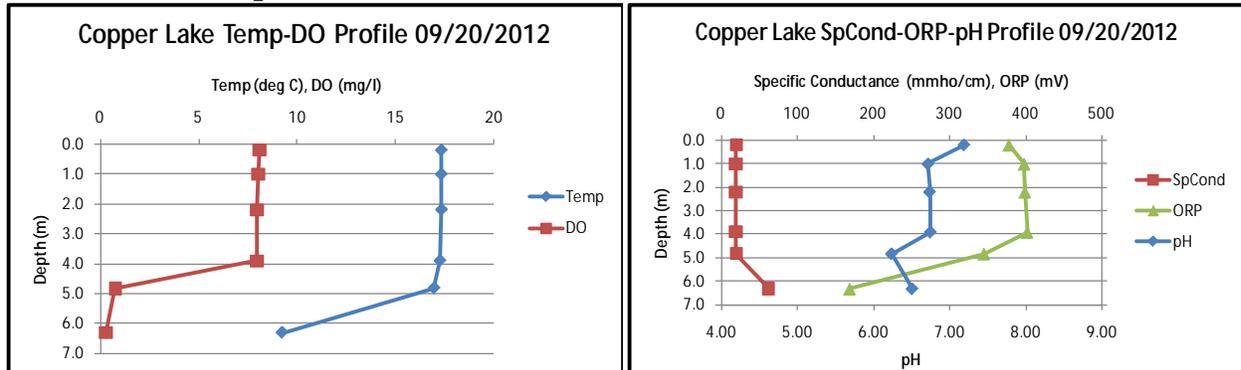
Brasenia schreberi (watershield)

Eriocaulon septangulare (pipewort)

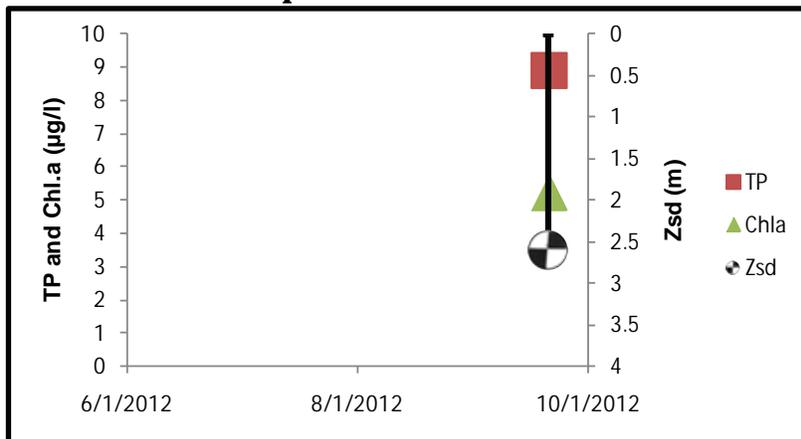
Nymphaea sp. (native waterlily)

Potamogeton sp. (native broadleaf pondweed)

Time Series: Depth Profiles



Time Series: Trophic Indicators



WQ Sampling Results

Surface Samples

	UNITS	Reading	Scientific Classification	Regulatory Comments
SECCHI	meters	2.6	Mesotrophic	Readings does not violate DOH guidance value
TSI-Secchi		46.2	Mesotrophic	No pertinent water quality standards
TP	mg/l	0.0089	Oligotrophic	Reading does not violate DEC guidance values
TSI-TP		35.7	Oligotrophic	No pertinent water quality standards
TSP	mg/l	ND	Little available phosphorus	No pertinent water quality standards
NOx	mg/l	0.0458	Low nitrate	Reading does not violate guidance
NH4	mg/l	ND	Low ammonia	Reading does not violate guidance
TKN	mg/l	0.25	Low organic nitrogen	No pertinent water quality standards
TN/TP	mg/l	73.12	Phosphorus Limited	No pertinent water quality standards
CHLA	ug/l	5.25	Mesotrophic	No pertinent water quality standards
TSI-CHLA		46.87	Mesotrophic	No pertinent water quality standards
Alkalinity	mg/l	4	Poorly Buffered	No pertinent water quality standards
TCOLOR	ptu	28	Weakly Colored	No pertinent water quality standards
TOC	mg/l	5.4		No pertinent water quality standards
Ca	mg/l	2.32	Does Not Support Zebra Mussels	No pertinent water quality standards
Fe	mg/l	0.195		Reading does not violate water quality standards
Mn	mg/l	0.0359		Reading does not violate water quality standards
Mg	mg/l	0.477		Reading does not violate water quality standards
K	mg/l	0.593		No pertinent water quality standards
Na	mg/l	1.09		Reading does not violate water guidance value
Cl	mg/l	ND	Little impact from road salt	Reading does not violate water quality standards
SO4	mg/l	2.7		Reading does not violate water quality standards
Si	mg/l	4.06		No pertinent water quality standards

Bottom Samples

	UNITS	Reading	Scientific Classification	Regulatory Comments
TP-bottom	mg/l	0.0206		No pertinent water quality standards
TSP-bottom	mg/l	0.0044	Little available phosphorus	No pertinent water quality standards
NOx-bottom	mg/l	0.0154	No evidence of DO depletion	Reading does not violate water quality standard
NH4-bottom	mg/l	0.275	Evidence of DO depletion	Reading does not violate water quality standard
TKN-bottom	mg/l	0.59		No pertinent water quality standards
Alk-bottom	mg/l	10	Poorly Buffered	No pertinent water quality standards
TCOLOR-bottom	ptu	165	Highly Colored	No pertinent water quality standards
TOC-bottom	mg/l	7.6		No pertinent water quality standards
Ca-bottom	mg/l	3.71	Does Not Support Zebra Mussels	No pertinent water quality standards
Fe-bottom	mg/l	7.14	Taste or odor likely	Readings violates class 'A' water quality standard (not applicable to Copper Lake)
Mn-bottom	mg/l	0.479	Taste or odor likely	Reading violate class 'A' water quality standard (not applicable to Copper Lake)
Mg-bottom	mg/l	0.553		Reading does not violate water quality standard
K-bottom	mg/l	0.766		No pertinent water quality standards
Na-bottom	mg/l	0.995		Reading does not violate water quality standard
Cl-bottom	mg/l	ND		Reading does not violate water quality standard
SO4-bottom	mg/l	ND		Reading does not violate water quality standard
Si-bottom	mg/l	7.35		No pertinent water quality standards
As-bottom	mg/l	ND		Reading does not violate water quality standard

Lake Perception

	UNITS	Reading	Scientific Classification	Regulatory Comments
WQ Assessment	1-5, 1 best	2	Not Quite Crystal Clear	No pertinent water quality standards
Weed Assessment	1-5, 1 best	2	Plants Visible Below Surface	No pertinent water quality standards
Recreational Assessment	1-5, 1 best	2	Excellent for Most Uses	No pertinent water quality standards

References

Adirondack Lake Survey Cooperation. 2013. Available online at <http://www.adirondacklakessurvey.org>.

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
Si	= dissolved silica, mg/l Detection limit = 0.01 mg/l; no NYS standard or guidance value
As	= arsenic, mg/l Detection limit = 0.001 mg/l; NYS standard = 0.01 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