

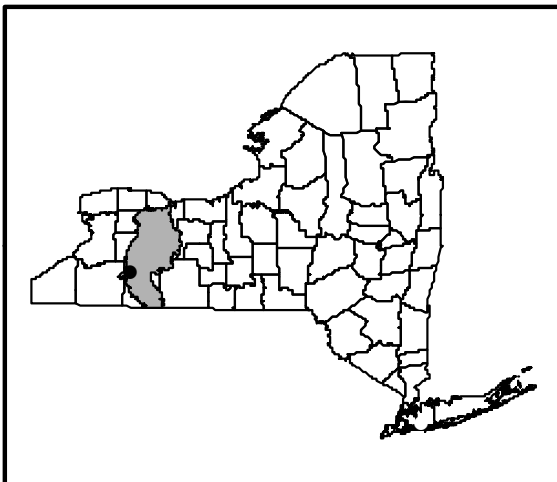
LCI Lake Water Quality Summary

General Information

Lake Name:	Moss Lake
Location:	Town of Caneadea, Allegany County, NY
Basin:	Genesee River Basin
Size:	5.2 hectares (= 12.8 acres)
Lake Origins:	natural
Major Tributaries:	none
Lake Tributary to:	none
Water Quality Classification:	C (best intended use: secondary contact recreation)
Max Sounding Depth:	2.7 meters (9 feet)
Sampling Coordinates:	Latitude: 42.39872, Longitude: -78.18602
Sampling Access Point:	Moss Lake Preserve (TNC)
Monitoring Program:	Lake Classification and Inventory (LCI) Survey
Sampling Date:	8/4/09, 6/3/10, 7/6/10, 8/4/10, & 9/8/10
Samplers:	David Newman, Scott Kishbaugh, Alene Onion, Erik Posner, & Lorraine Holdridge, 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

Moss Lake is a small kettlehole lake/bog owned and managed as part of the Moss Lake Preserve by the Natural Conservancy's Central & Western New York Chapter. Currently the lake is used for passive recreation as part of the preserve, with nature trails and a boardwalk surrounding the lake. Visitors to the preserve are asked to stay on the trails and boardwalk; boating and fishing are not permitted on the lake. The lake is surrounded by hardwood and hemlock forest and fields. The Central & Western New York Chapter's website has additional information about the preserve, and the formation of the lake and bog community.

Moss Lake was screened (single sample) through the NYSDEC Division of Water's Lake Classification and Inventory (LCI) program in the summer of 2009, due to a lack of water quality data in the Division of Water's database. This survey found elevated levels of phosphorus, chlorophyll *a*, and low water clarity. Due to these findings Moss Lake was included in the intensive sampling (monthly) of the lakes in the Genesee River Basin during the summer of 2010.

Moss Lake can be characterized as a *dystrophic* lake. *Dystrophic* lakes tend to have low water clarity with the water typically being brown. These lakes often have low calcium levels, with naturally low pH levels (less than 5.4) and oxygen deficits near their bottoms (NY Natural Heritage Program 2002). Specifically, Moss Lake was found to have low water clarity (less than 1.5 meters), high true color readings with the water color on all occasion described as brown, pH readings less than 5.5, and oxygen deficits in the final meter of the water column, and very low calcium levels. Moss Lake also tended to have high chlorophyll *a* levels which the literature suggests may be due to large populations of a single species of algae such as *Gonyostomum semen* (Gabka and Owsiany 2006). Algal identification would need to be performed to confirm this.

Rooted floating leaf aquatic plants were observed at several places on the lake. These consisted of water lilies, water shield, slender leaf pondweed and aquatic mosses. The Nature Conservancy's website also indicates that common bladderwort, a submergent carnivorous plant, may also be found in the lake. No exotic plants were observed, however a more intensive survey of the plants life would need to be conducted to completely rule out the existence of exotic plants.

Like most shallow lakes, Moss Lake does not exhibit thermal stratification, in which depth zones (warm water on top, cold water on the bottom during the summer) are established. Temperature was comparable throughout the water column; however, there was a sharp drop off in dissolved oxygen content starting at a depth of two meters. pH readings indicate acidic water, with conductivity readings indicate soft water.

The characteristics of bogs lead to low diversity and abundance of most aquatic organisms. However, Moss Lake does support a moderate sized population of small brown bullhead (*Ameiurus nebulosus*). A fisheries survey would need to be completed to determine if any of fish species are present.

Moss Lake showed elevated levels phosphorus and iron, although chloride and other ions were either undetectable or exhibited very low levels. Low chloride and other ion levels are typical for lakes in rural watershed that lack development.

Evaluation of Lake Condition Impacts to Lake Uses

Potable Water (Drinking Water)

Moss Lake is not classified for potable water supply. Although the LCI data are not sufficient to evaluate potable water use, these data suggest the use of the lake for as a potable water surly would be *stressed* by high iron and phosphorus levels.

Contact Recreation (Swimming)

Moss Lake is not classified for contact recreation- swimming and bathing- swimming is not currently allowed at the lake. Bacteria data are needed to evaluate the safety of Moss Lake for swimming, these data are not collected through the LCI. The data collected through the LCI indicate that swimming may be *stressed* due to elevated algae and nutrient levels, and by low water clarity.

Non-Contact Recreation (Boating and Fishing)

Moss Lake is currently classified for non-contact reaction (boating and fishing) being its best intended use. These uses are currently not allowed at the lake, although these activities would likely be supported at the lake.

Aquatic Life

The low pH of the water may *impair* aquatic life, while elevated iron levels may *threaten* aquatic life in the lake. However, many of the aquatic organisms found at Moss Lake may have adapted to the water quality conditions found at the lake. Low dissolved oxygen readings in the bottom meter of the lake may also *stress* aquatic life.

Aesthetics

These data indicate that aesthetics may be *threatened* by reduced water clarity, although it is unlikely that this affects the existing uses of the lake and surrounding preserve.

Additional Comments

1. 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. Signs to educate preserve visitors to the threat of invasive species may also help deter aquarium dumps or other unintended human introductions.
2. Members of the public were observed feeding the bullhead with bread. The volunteer that overseer of the preserve indicated that this was a common practice and was viewed as a tourist attraction. Language on The Central & Western New York Chapter's website asks visitors to Moss Lake not to "feed the bullhead fish"; however, the signage at the lake asks visitors to the preserve to limit the amount of bread being fed to one slice per person. Preventing the public from feeding the fish may be difficult as this practice is almost seen

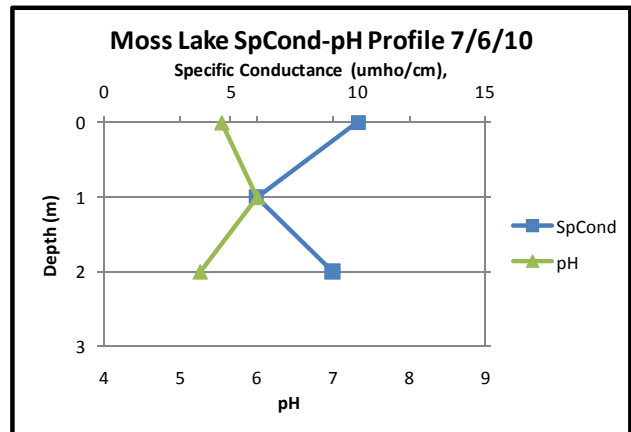
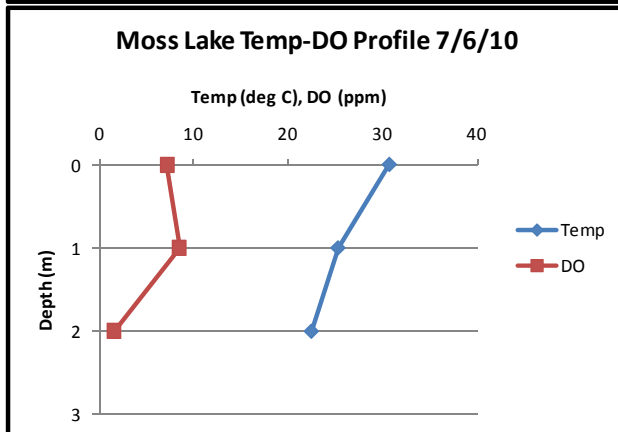
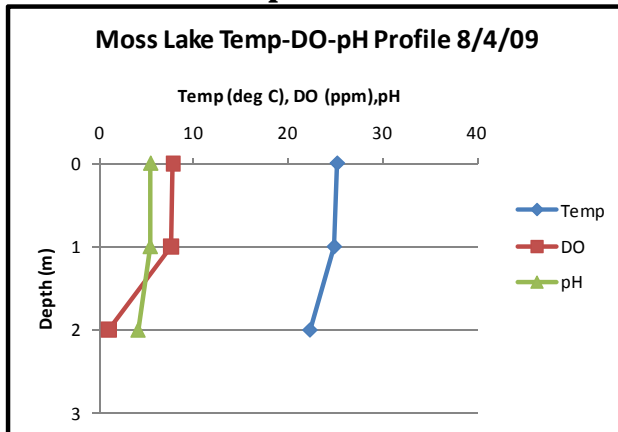
as a tradition. A study done by Turner and Ruhl (2007) looks at phosphorus loading from bread and other items fed to fish in a large reservoir (see references below).

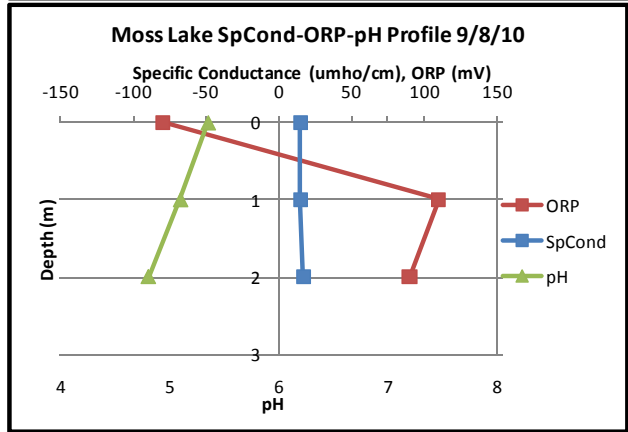
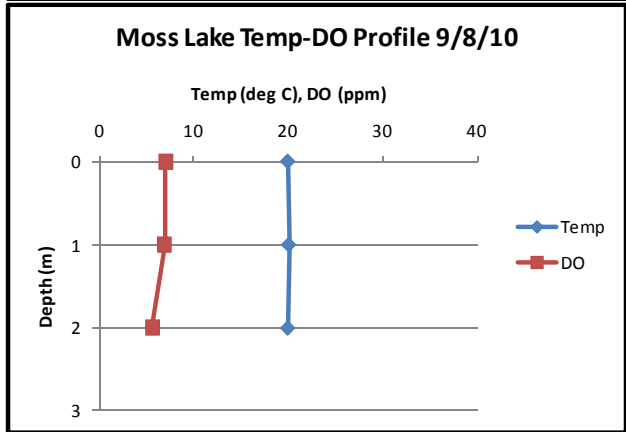
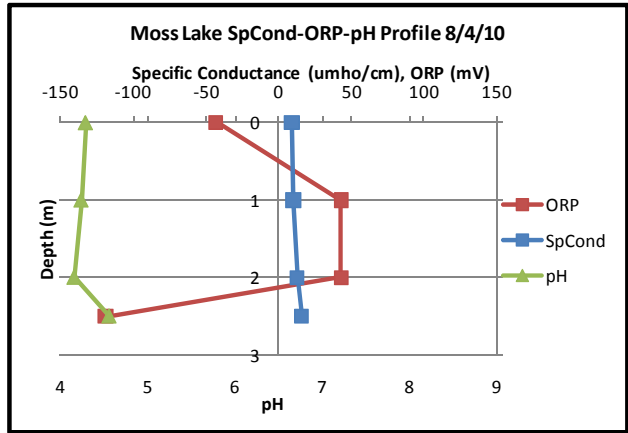
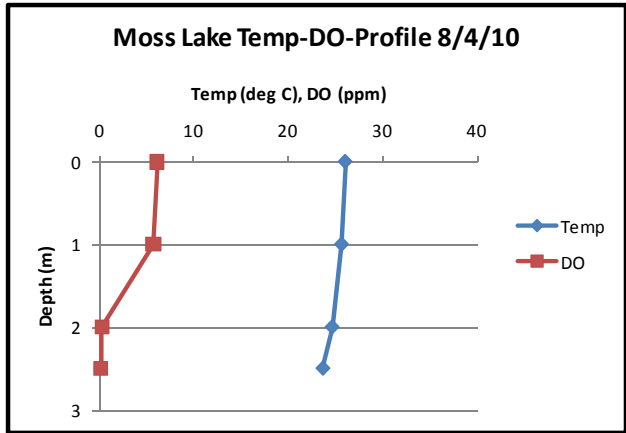
Aquatic Plant IDs

Exotic Plants: None

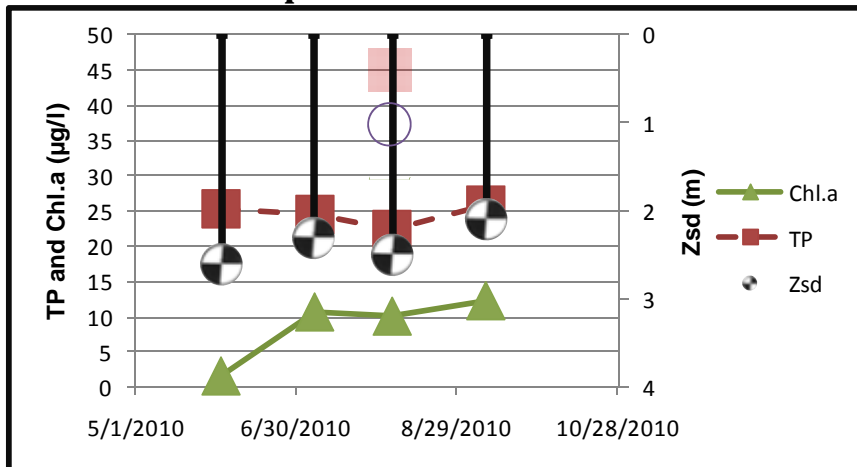
Native Plants: *Brasenia schreberi* (water shield)
Nymphaea sp. (white water lily)
Nuphar sp. (yellow water lily)
Stuckenia filiformis (slender leaf pondweed)
Fontinalis sp. (aquatic moss)

Time Series: Depth Profiles





Time Series: Trophic Indicators



* transparent symbols represent the 8/4/2009 values.

WQ Sampling Results

Surface Samples

	UNITS	N	MIN	AVG	MAX	Scientific Classification	Regulatory Comments
SECCHI	meters	5	1	1.114	1.4	Eutrophic	80% of readings violate DOH guidelines
TSI-Secchi			60.0	58.44	55.2	Eutrophic	No pertinent water quality standards
TP	mg/l	5	0.0406	0.05196	0.0664	Eutrophic	100% of readings violate water quality standards
TSI-TP			57.5	61.08	64.6	Eutrophic	No pertinent water quality standards
TSP	mg/l	5	0.0093	0.0132	0.0176	High % soluble Phosphorus	No pertinent water quality standards
NOx	mg/l	5	ND	0.0040	0.0057	Low nitrate	No readings violate water quality standards
NH4	mg/l	5	ND	ND	ND	Low ammonia	No readings violate water quality standards
TKN	mg/l	5	0.72	1.012	1.6	Elevated organic nitrogen	No pertinent water quality standards
TN/TP	mg/l	5	32.79	42.72	53.19	Phosphorus Limited	No pertinent water quality standards
CHLA	ug/l	5	12.8	31.88	46.7	Eutrophic	No pertinent water quality standards
TSI-CHLA			55.6	63.6	68.3	Eutrophic	No pertinent water quality standards
Alkalinity	mg/l	5	ND	1.4	2	Poorly Buffered	No pertinent water quality standards
TCOLOR	ptu	5	50	57	75	Highly Colored	No pertinent water quality standards
TOC	mg/l	5	11.5	12.02	13.5		No pertinent water quality standards
Ca	mg/l	5	0.621	0.82	1.02	Does Not Support Zebra Mussels	No pertinent water quality standards
Fe	mg/l	5	0.293	0.425	0.636	Taste or odor likely	No readings violate water quality standards
Mn	mg/l	5	0.029	0.0349	0.0422		No readings violate water quality standards
Mg	mg/l	5	0.238	0.250	0.267		No readings violate water quality standards
K	mg/l	5	0.341	0.461	0.611		No pertinent water quality standards
Na	mg/l	5	0.391	0.4906	0.582		No readings violate water quality standards
Cl	mg/l	5	ND	ND	ND	Little impact from road salt	No readings violate water quality standards
SO4	mg/l	5	ND	ND	ND		No readings violate water quality standards

Lake Perception

	UNITS	N	MIN	AVG	MAX	Scientific Classification	Regulatory Comments
WQ Assessment	1-5, 1 best	5	3	3	3	Definite Algal Greenness	No pertinent water quality standards
Weed Assessment	1-5, 1 best	5	3	3	3	Plants Grow to Lake Surface	No pertinent water quality standards
Recreational Assessment	1-5, 1 best	5	2	2.8	4	Slightly Impaired	No pertinent water quality standards

References

(NY Natural Heritage Program) Edinger, G.J., D.J. Evans, S. Gebauer, T.G. Howard, D.M. Hunt, and A.M. Olivero (editors). 2002. Ecological Communities of New York State. Second Edition. A revised and expanded edition of Carol Reschke's Ecological Communities of New York State. (Draft for review). New York Natural Heritage Program, New York State Department of Environmental Conservation, Albany, NY. Available from <http://www.dec.ny.gov/animals/29392.html>.

Gabka, M and P.M. Owsiaany. 2006. Shallow humic lakes of the Wielkopolska region – relation between dystrophy and eutrophy in lake ecosystems. Limnological Review 6:95-102.

Turner, A.M and N.Ruhl. 2007. Phosphorus Loadings Associated with a Park Tourist Attraction: Limnological Consequences of Feeding the Fish. Environment Management 39:526-533.

Legend Information

General Legend Information

Surface Samples = integrated sample collected in the first 2 meters of surface water
 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 *a*, 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