LCI Lake Water Quality Summary

General Information

Lake Name: Collins Lake

Location: Village of Scotia, Schenectady County, NY
Basin: Mohawk River Basin
Size: 23 hectares (57 acres)
Lake Origins: Oxbow Lake of the Mohawk River
Major Tributaries: None
Lake Tributary to: Mohawk River via Collins Creek
Watershed Area: ~ ½ Square Mile
Water Quality Classification: B (best intended use: primary contact recreation)

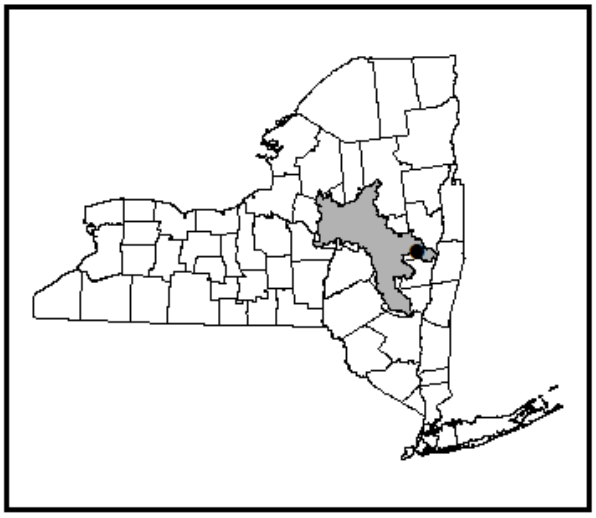
Maximum Sounding Depth: 8.8 meters (29 feet)
Sampling Coordinates: 42.82645,-73.95589
Sampling Access Point: Collins Park Boat Launch

Monitoring Program: Lake Classification and Inventory (LCI) Survey
Sampling Date: 6/20, 7/12, 8/17, 9/27 & 10/17/2011
Samplers: David Newman, Scott Kishbaugh, Cliff Callinan, & Brad Wenskoski NYSDEC Division of Water, Albany
Carrie Buetow NYSDEC Region 4, Schenectady

Contact Information: David Newman, NYSDEC Division of Water
djnewman@gw.dec.state.ny.us; 518-402-8201

Lake Maps

(sampling location marked with a circle)



Background and Lake Assessment

Collins Lake is a 57 acre oxbow lake on the floodplain of the Mohawk River in the village of Scotia, Schenectady County. The lake is used for boating and fishing as well as for swimming from a village operated beach. The lake's watershed is compromised primarily of suburban housing, park land, and athletic fields with a few small patches of forested land. The lake is also known both historically and in present times to receive flood waters from the Mohawk River.

Impacts to recreational use of the lake have been noted as far back as the early 1900's at which time water chestnut (*Trapa natans*) covered large portions of the lake. The subsequent introduction of curlyleaf pondweed (*Potamogeton crispus*) and Eurasian watermilfoil (EWM or *Myriophyllum spicatum*), both invasive species, further reduced the potential for the lake to be used for recreation. Despite dredging and other remediation attempts, conditions continued to decline. In 2005, high bacteria levels forced the public beach to be closed for the majority of the bathing season.

In 2006, as a response to the beach closure, the lake was treated with an herbicide (fluridone) to control nuisance aquatic plants and an aeration system was installed to keep the lake oxygenated throughout the summer. In addition, the flapper valve used to prevent flow from the Mohawk River into the lake was repaired, and the Village ceased dumping plowed snow into the adjadcent parking lots. During August of 2006 the bacteria levels were reduced and the swimming beach was reopened. Also, in 2006 the lake was monitored by the New York State DEC as part of the Lake Classification and Inventory (LCI) Program. The findings from this monitored was that improvements had been made, but water quality conditions were still typical of an impaired lake. Due to the impaired segment listing in the 2010 Waterbody Inventory and Priority Waterbodies List, Collins Lake was included in the 2011 LCI monitoring of lakes in the Mohawk River Basin.

Based on data collected in June, July and August of 2011 Collins Lake can generally be characterized as *eutrophic*, or highly productive. The average water clarity reading (TSI = 51, typical of *eutrophic* lakes) was in the expected range given the average phosphorus reading (TSI = 47, typical of *mesotrophic* lakes), and the average chlorophyll *a* reading (TSI = 57, typical of *eutrophic* lakes). In comparison to the data collected in 2006, there appears to be improvements to water clarity, total phosphorus and chlorophyll *a* with lower summer average, minimum and maximum TSI values for all three parameters. These improvements were also seen when looking at data collected in 1996 and 1984. While slight improvements have been made, the 2011 total phosphorus values remain moderate to high with the August 2011 value above the state's guidance value of 20 g/l, water clarity levels in July and August were at a level that *threatens* swimming, and chlorophyll *a* levels during June July and August were in the *stressed* to *impaired* range for swimming. Bacteria levels remain sufficiently low to maintain the swimming beach, although bacteria was not monitored through the 2011 LCI.

Collins Lake was noted to have a green to greenish brown coloration from June to August with turbidity being noted in July and August as impacting recreational conditions. Eurasian watermilfoil was observed to be growing densely at the surface throughout the shallow portions of the lake. It appears that the reduced EWM densities after the fluridone treatment lasted until around 2009, although a native plant (common waterweed, *Elodea canadensis*) was the dominant plant in the lake (and in other nearby lakes) in 2010. Water chestnut and curlyleaf pondweed

were not observed during the 2011 sampling; however, macrophyte evaluation was not the focus of the LCI monitoring. Coontail (*Ceratophyllum demersum*) and white waterlilies (*Nymphaea sp.)*, both native aquatic plants, were also noted to be growing in the lake in 2011. Common waterweed was not observed during any sampling session. Two emergent invasive species, common reed (*Phragmites australis*) and purple loosestrife (*Lythrum salicaria*) were also noted to be occurring around the fringes of the lake.

Collins Lake was not thermally stratified at any time in 2011. Even the deepest portion of the lake remaining oxygenated between June and August, this is an improvement from conditions seen in the summer of 2006 where the lakes was weakly stratified at the deepest point of the lake with oxygen levels dropping off at 7 meters and below. Before the aerators were installed (early 2006), the lake was known to thermally stratify with the entire thermocline consistently anoxic (lack of oxygen) throughout the summer. Data from 1996 shows that the thermocline was somewhere in the 3 to 5 meter depth range throughout the summer with anoxia below the thermocline. It is likely that the improved deepwater oxygen conditions were due to the lake aeration, although it is not known if destratification resulted in any impacts to the lake fisheries (salmonids are probably not native to the lake).

Summer 2011 pH readings indicate slightly basic/alkaline waters with no readings violating water quality standards. Conductivity readings indicate hard water. Hard water is found in other nearby lakes and in the Mohawk River. The conductivity readings for the lake are higher than those seen in the river and in other nearby lakes. Looking at conductivity data through time shows a gradual increase with the 2011 values being the highest recorded.

Based on summer 2011 data, Collins Lake appears to be typical of urban/suburban hard water uncolored, alkaline lakes. Other lakes with similar water quality characteristics often support warmwater fisheries, although fisheries habitat cannot be fully evaluated through this monitoring program. Local fishermen report that the lake does support a warmwater fishery, with largemouth bass, white crappie, black crappie, bluegill, pumpkinseed, yellow perch, northern pike and brown bullhead able to be caught in the lake. The aerators that were installed in the lake do provide oxygen to the bottom of the lake; however, as the lake no longer thermally stratifies it is unlikely that coldwater fish species would be supported in the lake.

Total phosphorus levels were above the state's guidance value during the August sampling event and at the guidance value in June and July. Sodium levels were found to be above the state's guidance value for drinking water (although the lake does not support this use) and chloride levels may indicate impacts from road salting or storm water inputs, although they are below water quality standards were high. All other parameters analyzed for through the LCI fell below the state's guidance values.

Evaluation of Lake Condition Impacts to Lake Uses

Potable Water (Drinking Water)

Collins Lake is not classified for use as a potable water supply. LCI data are not sufficient to evaluate potable water use; however, the data collected suggest that the lake water would require

substantial treatment to serve as a potable water supply, due to elevated phosphorus and sodium levels.

Contact Recreation (Swimming)

Collins Lake is classified for contact recreation and the village of Scotia does operate a swimming beach. Bacteria data are needed to evaluate the safety of the lake for swimming; however the LCI does not collect bacteria data. These data are collected on a regular basis throughout the swimming season by the Village of Scotia. The data collected through the LCI indicate that water clarity and chlorophyll levels *impair* the use of the lake, and total phosphorus levels and the occurrence of one or more invasive aquatic plant species *threaten* the ability of the lake to be used for swimming.

Non-Contact Recreation (Boating and Fishing)

Collins Lake is a classified for non-contact recreation and is regularly used for fishing and boating. The data collected through the LCI indicate that the occurrence of one or more invasive plant species may *threaten* non-contact recreational use of the lake.

Aquatic Life

Based on summer 2011 data there are *no known impacts* to aquatic life with dissolved oxygen levels being sufficiently high throughout the water column and pH values falling within the non-impacted range, although the presence of one or more aquatic invasive plant species may ultimately *threaten* the biological condition and aquatic life in the lake.

Aesthetics

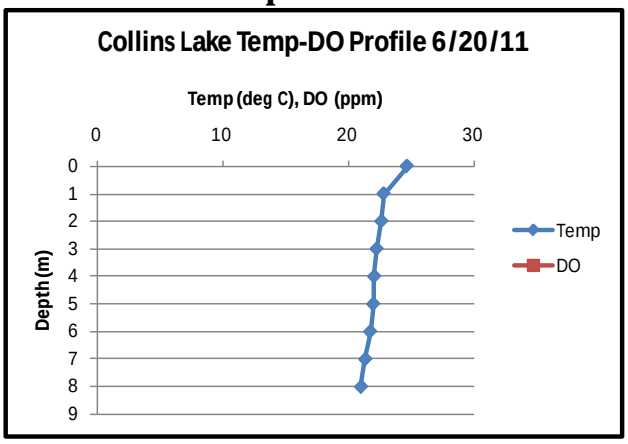
Aesthetics are known to be *stressed* based on low water clarity, elevated algae levels and high densities of aquatic plants.

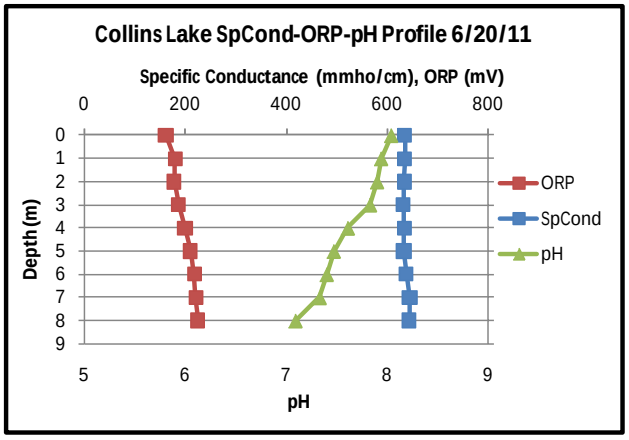
Sampling Post Tropical Storm Irene and Lee

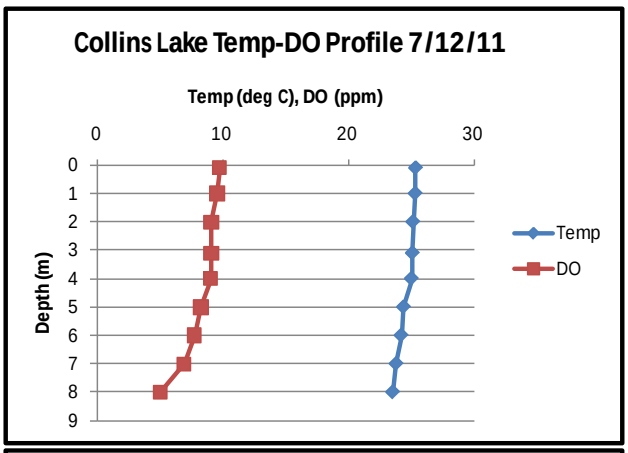
At the end of August and beginning of September, Tropical Storm Irene and Lee caused major flooding along the Mohawk River. The flooding of the Mohawk River in the vicinity of Collins Lake overtopped the Schonowee Dike which separates the river from Collins Park. This allowed water from the river to directly enter Collins Lake, short-circuiting the flapper valve. Similar flooding of the river into the lake did historically occur, but has only occurred a few times since the Schonowee Dike was constructed in 1804. The September sampling of Collins Lake had to be pushed back two weeks to allow flood waters to recede and the roads near the lake to reopen. The park remained closed to the public through at least mid October.

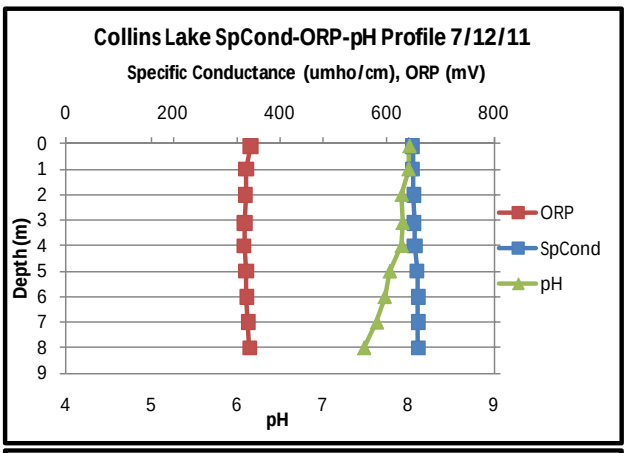
The September and October sampling events showed a marked decline in water clarity with readings of less than 1 meter and the water being a much darker brown color than earlier in the year. In late September the lake was thermally stratified at 1-2 meters in depth with very low dissolved oxygen levels below 1 meter in depth. This extreme stratification was not seen in mid October, when there was almost no temperature difference between the surface and 4 meters in depth and no reduction in dissolved oxygen in the top 4 meters. Conductivity levels were much lower in September than earlier in the season. Despite some "recovery" in October, conductivity levels were still below those seen earlier in the season. This drop and then raise in conductivity corresponded to a similar drop and rebound of sodium and chloride levels. The reduction in water clarity was evident with the true color readings in the 4-6ptu range before the storms and 22ptu in September and 16ptu in October. September and October total phosphorus levels were almost double those seen before the storms, likely due to large inputs of organic material from the Mohawk River. High levels of iron and manganese were seen in September and October with the October iron level being above the state's water quality standard. It is yet to be seen what if any long term impacts these flooding events will have on the overall water quality of the lake. Collecting data during the summer of 2012 and comparing it to the LCI data collected during 2011 would help determine long-term impacts of the storms.

Time Series: Depth Profiles






Collins Lake Temp-DO Profile 7/12/11
Temp (deg C), DO (ppm)
Depth (m)
Temp
DO


Collins Lake SpCond-ORP-pH Profile 7/12/11
Specific Conductance (umho/cm), ORP (mV)
Depth (m)
pH
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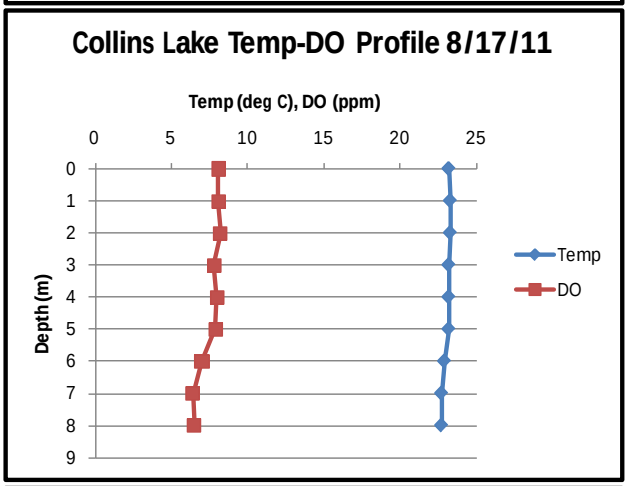
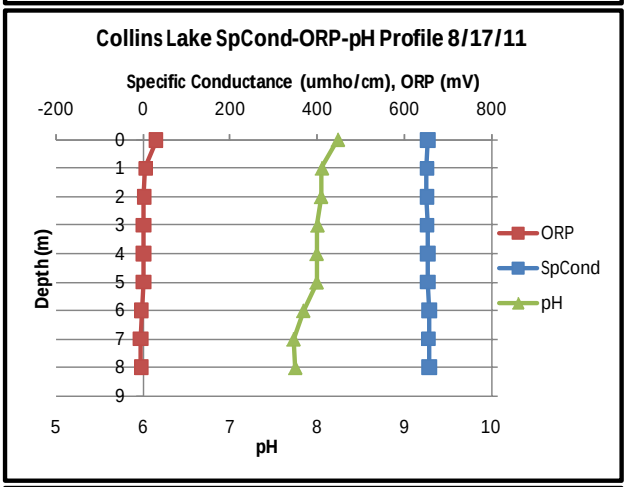
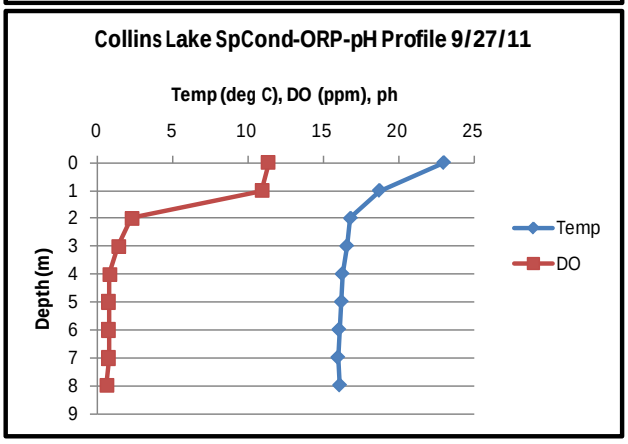
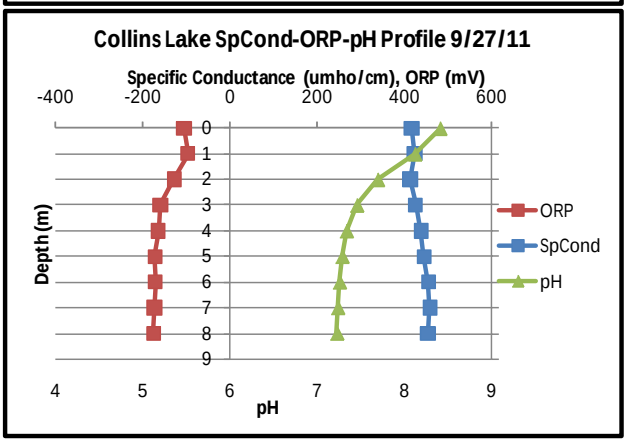
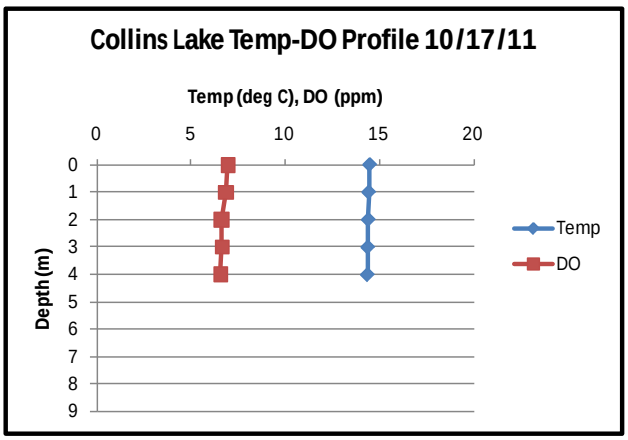
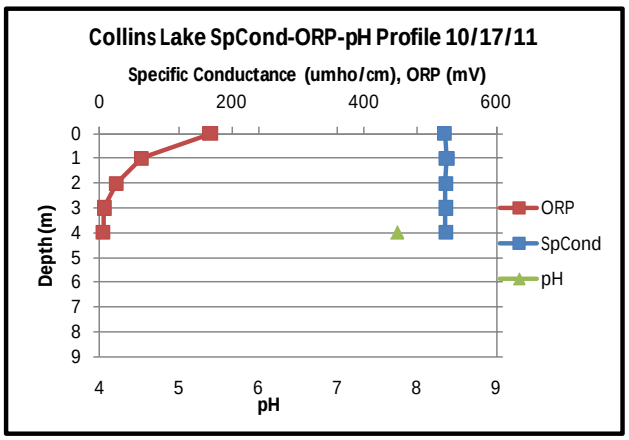

Collins Lake Temp-DO Profile 8/17/11
Temp (deg C), DO (ppm)
Depth (m)
Temp
DO


Collins Lake SpCond-ORP-pH Profile 8/17/11
Specific Conductance (umho/cm), ORP (mV)
Depth (m)
pH
ORP
SpCond
pH

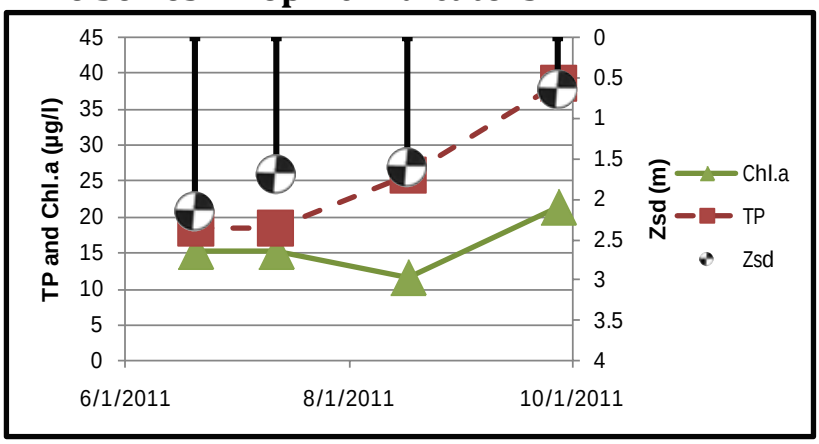

Collins Lake SpCond-ORP-pH Profile 9/27/11
Temp (deg C), DO (ppm), ph
Depth (m)
Temp
DO


Collins Lake SpCond-ORP-pH Profile 9/27/11
Specific Conductance (umho/cm), ORP (mV)
Depth (m)
pH
ORP
SpCond
pH





Time Series: Trophic Indicators



WQ Sampling Results

Surface Samples June, July & August 2011

	UNITS	N	MIN	AVG	MAX	Scientific Classification	Regulatory Comments
SECCHI	meters	3	1.6	1.82	2.15	Eutrophic	No readings violate DOH guidance value
TSI-Secchi			53.2	51.4	49.0	Eutrophic	No pertinent water quality standards
TP	mg/l	3	0.0184	0.02	0.0259	Mesotrophic	33% of readings violate water quality standards
TSI-TP			46.1	47.3	51.0	Mesotrophic	No pertinent water quality standards
TSP	mg/l	3	0.0047	0.006	0.0086	High % soluble Phosphorus	No pertinent water quality standards
NOx	mg/l	3	0.0654	0.1907	0.253	Potentially high nitrate	No readings violate water quality standards
NH4	mg/l	3	0.057	0.06	0.061	Low ammonia	No readings violate water quality standards
TKN	mg/l	3	0.32	0.46	0.53	Low organic nitrogen	No pertinent water quality standards
TN/TP	mg/l	3	32.74	73.33	93.62	Phosphorus Limited	No pertinent water quality standards
CHLA	ug/l	3	11.7	14.1	15.3	Eutrophic	No pertinent water quality standards
TSI-CHLA			54.7	56.5	57.4	Eutrophic	No pertinent water quality standards
Alkalinity	mg/l	3	153	153.7	155	Moderately Buffered	No pertinent water quality standards
TCOLOR	ptu	3	4	4.7	6	Uncolored	No pertinent water quality standards
TOC	mg/l	3	2.8	3.1	3.2		No pertinent water quality standards
Ca	mg/l	3	46.4	47.6	50.1	Strongly Supports Zebra Mussels	No pertinent water quality standards
Fe	mg/l	3	0.125	0.146	0.189		No readings violate water quality standards
Mn	mg/l	3	0.0263	0.0293	0.0354		No readings violate water quality standards
Mg	mg/l	3	14.2	14.4	14.8		No readings violate water quality standards
K	mg/l	3	1.66	1.66	1.66		No pertinent water quality standards
Na	mg/l	3	57	57.97	59.9		100% of readings violate water quality guidance values
Cl	mg/l	3	95.4	96.2	97.8	Significant road salt runoff	No readings violate water quality standards
SO4	mg/l	3	16.6	17.6	18.1		No readings violate water quality standards

Surface Samples September & October 2011

	UNITS	N	MIN	AVG	MAX	Scientific Classification	Regulatory Comments
SECCHI	meters	1	0.65	0.65	0.65	Eutrophic	100% of readings violate DOH guidelines
TSI-Secchi			66.2	66.2	66.2	Eutrophic	No pertinent water quality standards
TP	mg/l	2	0.0387	0.04	0.0441	Eutrophic	50% of readings violate water quality standards
TSI-TP			56.8	57.3	58.7	Eutrophic	No pertinent water quality standards
TSP	mg/l	2	0.0516	0.0581	0.0645	High % soluble Phosphorus	No pertinent water quality standards
NOx	mg/l	2	0.138	0.138	0.225	Potentially high nitrate	No readings violate water quality standards
NH4	mg/l	2	ND	0.005	0.067	Low ammonia	No readings violate water quality standards
TKN	mg/l	2	0.49	0.55	0.6	Intermediate organic nitrogen	No pertinent water quality standards
TN/TP	mg/l	2	35.70	38.43	41.16	Phosphorus Limited	No pertinent water quality standards
CHLA	ug/l	2	21.4	21.4	25.6	Eutrophic	No pertinent water quality standards
TSI-CHLA			60.7	60.7	62.4	Eutrophic	No pertinent water quality standards
Alkalinity	mg/l	2	136	148.5	161	Moderately Buffered	No pertinent water quality standards
TCOLOR	ptu	2	16	22	22	Weakly Colored	No pertinent water quality standards
TOC	mg/l	2	3.2	3.6	4		No pertinent water quality standards
Ca	mg/l	2	50.5	54.1	57.6	Strongly Supports Zebra Mussels	No pertinent water quality standards
Fe	mg/l	2	0.302	0.726	1.15	Taste or odor likely	50% of readings violate water quality standards
Mn	mg/l	2	0.195	0.2375	0.28		No readings violate water quality standards
Mg	mg/l	2	8.26	9.33	10.4		No readings violate water quality standards
K	mg/l	2	2.35	2.5	2.64		No pertinent water quality standards
Na	mg/l	2	25.5	30.15	34.8		50% of readings violate water quality guidance values
Cl	mg/l	2	44.5	55.55	66.6	Significant road salt runoff	No readings violate water quality standards
SO4	mg/l	2	12.2	12.2	14.4		No readings violate water quality standards

Lake Perception June, July & August 2011

	UNITS	N	MIN	AVG	MAX	Scientific Classification
Water Clarity Assessment	1-5, 1 best	3	3	3	3	Definite Algal Greenness
Weed Assessment	1-5, 1 best	3	3	3.67	4	Dense Plant Growth at Lake Surface
Recreational Assessment	1-5, 1 best	3	3	3	3	Slightly Impaired

Historical LCI Data from Collins Lake

DATE	Sample Depth	SECCHI	TP	TSP	TKN	SKN	NO3	NH4	pH	SpCond	ANC	TCOLOR	CHLA	TOC	SO4	CL
5/11/1982	1.0	2.50	0.034	ND	ND	ND	ND	ND	8.10	76	1190.0	ND	ND	ND	ND	ND
8/10/1982	1.0	1.30	0.024	0.005	0.36	0.32	ND	0.023	8.30	381	1370.0	ND	25.90	3.4	ND	ND
8/10/1982	8.0		0.250	0.008	2.80	2.80	ND	2.800	7.00	420	1890.0	ND	ND	3.6	ND	ND
4/12/1984	2.0	2.00	0.022	ND	ND	ND	ND	ND	8.35	465	1000.0	2	7.20	ND	ND	ND
6/6/1984	1.0	3.50	0.019	0.010	0.34	0.30	0.30	0.028	8.08	335	780.0	2	5.20	2.2	31.0	51.00
6/6/1984	8.0		0.067	0.012	2.00	1.20	0.08	0.730	7.75	400	1150.0	3	17.90	3.0	26.0	53.00
7/25/1984	1.0	1.00	0.055	0.006	0.88	0.19	ND	0.058	8.30	490	1570.0	ND	20.40	3.3	24.0	48.00
7/25/1984	7.0		0.047	0.009	3.60	2.20	ND	1.600	7.80	500	1750.0	ND	ND	3.1	17.0	51.00
8/14/1984	1.0	1.25	0.042	0.011	0.52	0.24	ND	0.036	8.40	480	1350.0	ND	15.10	3.1	10.0	54.00
8/14/1984	7.0		0.065	0.037	3.40	3.20	ND	2.300	7.50	510	1890.0	5	ND	3.6	15.0	51.00
10/23/1984	1.0	1.33	0.034	0.007	0.44	0.24	0.15	0.055	8.16	540	1660.0	12	23.30	3.7	32.0	60.00
4/30/1985	2.0	1.75	0.038	0.008	0.42	0.38	0.24	0.030	8.22	400	1020.0	5	9.40	2.0	31.0	48.00
5/31/1996	1.5	2.5	0.018	0.005	0.33	0.18	0.30	0.02	8.23	566	2820	5	7.1			
5/31/1996	8.0		0.037	0.003												
6/21/1996	1.5	2.0	0.018	0.008	0.35	0.25	0.30	0.04	8.25	589	2840	5	12.8			
6/21/1996	6.0		0.034	0.009												
7/15/1996	1.5	0.8	0.047	0.003	0.40	0.17	ND	-0.01	6.72	537	2480	5	50.0			
7/15/1996	6.0		0.046	0.003												
8/9/1996	1.5	1.1	0.033	0.007	0.29	0.16	ND	0.02	7.41	624	3300	5	31.0			
8/9/1996	7.0		0.038	0.005												
9/6/1996	1.5	1.0	0.029	0.006	0.30	0.17	ND	0.09	7.38	642	3580	5	36.0			
9/6/1996	6.0		0.031	0.004												
9/27/1996	1.5	1.0	0.033	0.003	0.34	0.25	0.04	0.14	8.34	507	2340	2	44.7			
9/27/1996	6.0		0.030	0.006												
10/18/1996	1.5	1.3	0.027	0.003	0.30	0.17	0.18	0.17	8.28	518	2280	2	29.6			
10/18/1996	6.0		0.029	0.003												

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(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(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), = (TKN + NOx)*2.2/TP > 30 suggests phosphorus limitation, < 10 suggests nitrogen limitation
CHLA	= chlorophyll *a*, micrograms per liter (µg/l) or parts per billion (ppb) Detection limit = 2 µg/l; no NYS standard or guidance value
TSI-CHLA	= Trophic State Index calculated from CHLA, = 9.81*ln(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 = 0.3 mg/l for class A waters 1.0 mg/l for class B & C waters
Mn	= manganese, mg/l Detection limit = 0.01 mg/l; NYS standard = 0.3 mg/l for class A waters 1.0 mg/l for class B & C waters
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
As	=arsenic, mg/l Detection limit = 3.2 mg/l; NYS standard = 10 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 25ºC, micromho per centimeter (µmho/cm) Detection limit = 1 µmho/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