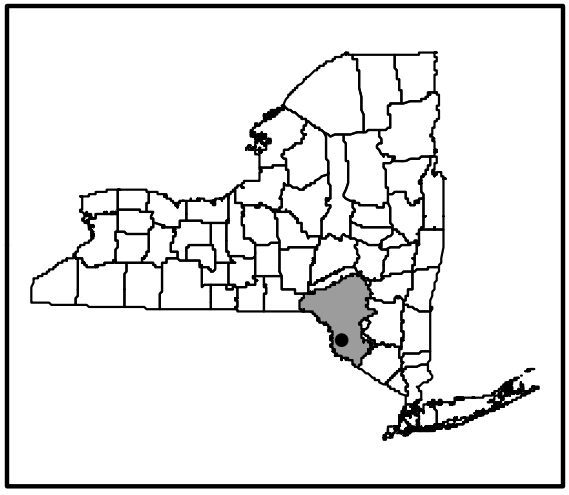
LCI Lake Water Quality Summary

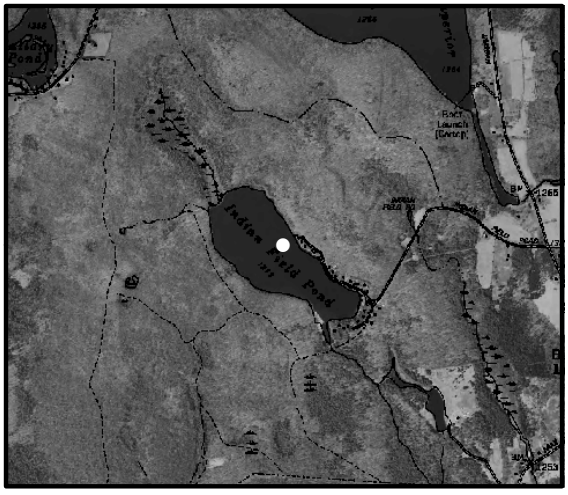
General Information

Lake Name:	**Indian Field Pond**
Location:	Town of Bethel, Sullivan County
Basin:	Delaware River Basin
Size:	31.1 hectares (= 77 acres)
Lake Origins:	natural
Major Tributaries:	none
Lake Tributary to?:	Toronto Reservoir via a minor tributary
Water Quality Classification:	B (best intended use: primary contact recreation)
Sounding Depth:	6.7 meters (= 22 feet)
Sampling Coordinates:	Latitude: 41.65239, Longitude: -74.88495
Sampling Access Point:	private land (Greg Taylor)
Monitoring Program:	Lake Classification and Inventory (LCI) Survey
Sampling Date:	July 28, 2009
Samplers:	David Newman, NYSDEC Division of Water, Albany Steven Finnemore, 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

Indian Field Pond is a private waterbody surrounded almost entirely by forest. The northeastern shore of the pond has about a dozen seasonal use houses/camps. The pond and the land surrounding it are managed by the Indian Field Association and Indian Field Hunting and Fishing Club. The pond currently supports swimming, boating and fishing.

The pond was screened as part of the NYSDEC Division of Water's Lake Classification and Inventory Survey (LCI), as the Division of Water had no previous water quality data from the pond. Due to slightly elevated levels of dissolved phosphorus and slightly reduced water clarity readings the pond may be a candidate for more intensive (monthly) sampling in the summer of 2010, pending sufficient funds in the budget for enhanced monitoring.

Indian Field Pond can generally be characterized as *mesotrophic* or a moderately productive pond. The water clarity reading (TSI = 47, typical of *mesotrophic* lakes) is in the range expected given the phosphorus reading (TSI = 44, typical of *mesotrophic* lakes), but slightly lower than expected given the chlorophyll *a* reading (TSI = 40, at the low end of *mesotrophic* lakes). The water clarity reading may have been slightly reduced due to the light rain and cloud cover observed during sampling. It is likely that normal water clarity and chlorophyll *a* levels were a bit higher than observed during the late July sampling session.

The water appeared to be a light tan or tea colored which occurs naturally due to tannic and/or humic acids entering the pond from the watershed. This tannic color was very common among other lakes sampled in the region. Small yellow pond lilies (*Nuphar microphylla*) were observed near the shore. This is a native plant species although not commonly seen at other lakes in the area. It was noted by a resident that this plant species may be new to the pond or occurring at higher densities than in the past. This may just be a function of more favorable conditions during the summer of 2009. No exotic plants were observed at the pond, although a more intensive plant survey would need to be conducted to completely rule out the existence of exotic plants.

Indian Field Pond exhibits 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 6 meters deep. The thermocline in Indian Field Pond occurred at a depth around four meters in late July. The hypolimnion (bottom waters) was oxygenated at 5 meters but showed hypoxic (poorly oxygenated) conditions at 6 meters. pH readings indicate slightly acidic surface waters with pH decreasing with depth. Other lakes in the Delaware River Basin are typically neutral to slightly acidic. Unfortunately the conductivity meter was not functioning correctly during the sampling event, a common problem in softwater lakes (low ionic strength). Softwater conditions are common among the other lakes in the region. The oxygen reduction potential (ORP) readings increased at the thermocline, indicating that the hypoxic conditions observed are probably not persistent. The depressed OPR readings in the water 1-3 meters deep probably reflect problems with the electronic meter rather than persistent anoxia in those depths.

Indian Field Pond appears to be typical of softwater, weakly colored. Other lakes with similar water quality characteristics often support warmwater fisheries, although fisheries habitat cannot be fully evaluated though this monitoring program. Coldwater fisheries may be threatened given the presence of hypoxic conditions found in the hypolimnion. However, there was no evidence of

elevated ammonia or nitrate, indicating that these hypoxic conditions may not be typical for the pond. It is not know if coldwater fisheries have historically been supported in the lake.

Nitrate readings are low in surface and bottom waters. Surface water phosphorus levels were slightly elevated, although there was very little dissolved phosphorus. This suggests that phosphorus is already tied up in primary production. These data do indicate that phosphorus is the limiting nutrient, which means that additions of phosphorus to the pond from failing septic systems and/or fertilizers may lead to increases in algae production. Deepwater iron and manganese levels were high, typical of water bodies experiencing hypoxic conditions. Chloride and other ions are either undetectable or exhibit low levels, indicating no impacts from road salting or other signs of stormwater runoff through developed areas and are common in lakes lacking development in their watersheds.

Aquatic life cannot be fully evaluated though the LCI; however, the only indication of stressors to aquatic life indicated from these data is the lack of oxygen in the bottom waters.

Evaluation of Lake Condition Impacts to Lake Uses

Potable Water (Drinking Water)

Indian Field Pond is not classified for use as a potable water supply. Although the LCI data are not sufficient to evaluate potable water use, these data suggest that the lake water would require some treatment to serve as a potable water supply, due to elevated levels of iron and manganese in the water.

Contact Recreation (Swimming)

Indian Field Pond is classified for contact recreation-swimming and bathing. It is believed that this use is supported, as was evident by observing a lake shore resident swimming in the lake shortly after sampling was complete. Bacteria data are needed to fully evaluate the safety of swimming- these are not collected through the LCI. The data collected through the LCI indicate that swimming should be supported as water clarity reading was above the state DOH guidance (= 1.2 meters) to protect the safety of swimmers. The growth of aquatic plants at a few places around the shore may hinder swimming in these specific areas.

Non-Contact Recreation (Boating and Fishing)

There was no indication from the data collected that would indicate that boating would be stressed and this use should continue to be supported. The lack of oxygen found in the deepest portion of the lake may stress coldwater fisheries but this cannot be fully evaluated by the LCI.

Aquatic Life

The only indication that aquatic life may be stressed is the hypoxic conditions seen in the hypolimnion. Additional biological studies would need to be conducted to fully evaluate aquatic life.

Aesthetics

There was no indication from the data collected that would indicate a threat to the aesthetics of the pond.

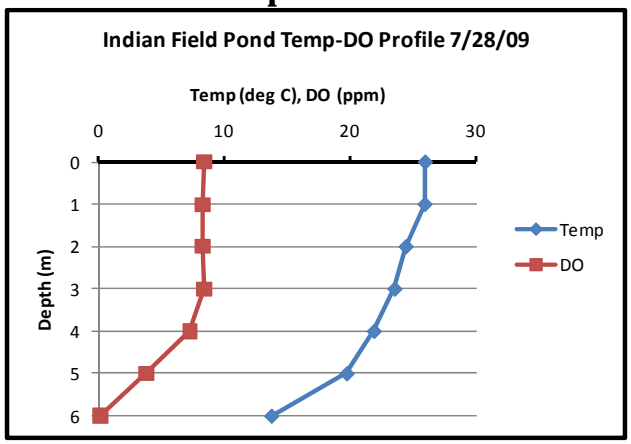
Additional Comments

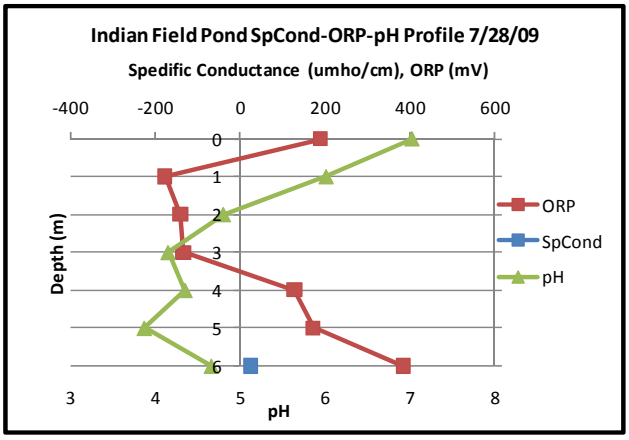
1. Algae identification would determine if the lake may suffer from harmful algal blooms (HABs) and/or the production of algal toxins. This may be conducted in the future through the LCI.
2. Periodic surveillance for invasive exotic plant species may help to prevent the establishment and spread of any new invaders, given the escalating problems with exotic aquatic weeds in some nearby lakes. Keeping firm to a policy of not allowing outside boats on the pond will go a long way to preventing the spread of invasive plants to the pond.

Aquatic Plant IDs

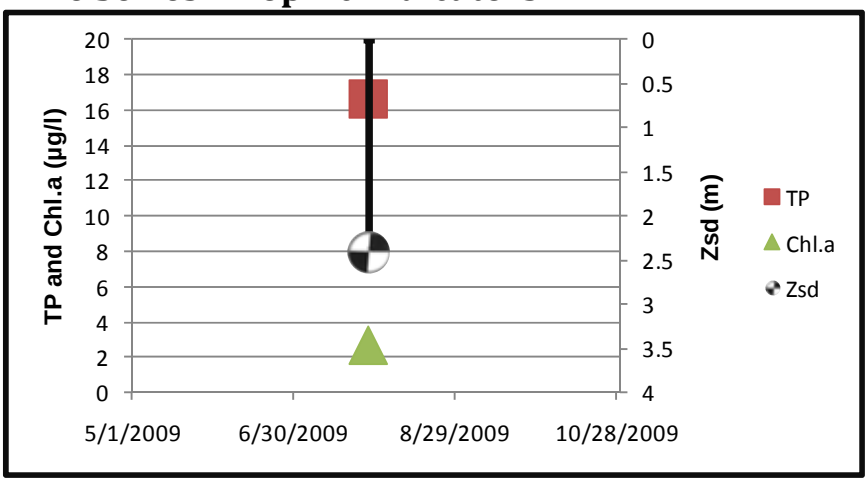
Exotic Plants: None
Native Plants: *Nuphar microphylla* (small yellow pond lily)

Time Series: Depth Profiles





Time Series: Trophic Indicators



WQ Sampling Results

Surface Samples

	UNITS	Reading	Scientific Classification	Regulatory Comments
SECCHI	meters	2.4	Mesotrophic	Readings does not violate DOH guidance value
TSI-Secchi		47.4	Mesotrophic	No pertinent water quality standards
TP	mg/l	0.0166	Mesotrophic	Readings does not violate DEC guidance values
TSI-TP		44.6	Mesotrophic	No pertinent water quality standards
TSP	mg/l	0.0039	Little available phosphorus	No pertinent water quality standards
NOx	mg/l	0.006	Low nitrate	Reading does not violate guidance
NH4	mg/l	ND	Low ammonia	Reading does not violate guidance
TKN	mg/l	0.29	Low organic nitrogen	No pertinent water quality standards
TN/TP	mg/l	39.23	Phosphorus Limited	No pertinent water quality standards
CHLA	ug/l	2.7	Mesotrophic	No pertinent water quality standards
TSI-CHLA		40.3	Mesotrophic	No pertinent water quality standards
Alkalinity	mg/l	ND	Poorly Buffered	No pertinent water quality standards
TCOLOR	ptu	15	Weakly Colored	No pertinent water quality standards
TOC	mg/l	4.6		No pertinent water quality standards
Ca	mg/l	1.82	Does Not Support Zebra Mussels	No pertinent water quality standards
Fe	mg/l	0.0643		Reading does not violate water quality standards
Mn	mg/l	0.0423		Reading does not violate water quality standards
Mg	mg/l	0.555		Reading does not violate water quality standards
K	mg/l	0.371		No pertinent water quality standards
Na	mg/l	1.11		Reading does not violate water quality standards
Cl	mg/l	ND	Little impact from road salt	Reading violates water quality standards
SO4	mg/l	4.3		Reading does not violate water quality standards

Bottom Samples

	UNITS	Reading	Scientific Classification	Regulatory Comments
TP-bottom	mg/l	0.032		No pertinent water quality standards
TSP-bottom	mg/l	0.0058	Little available phosphorus	No pertinent water quality standards
NOx-bottom	mg/l	0.0037	No evidence of DO depletion	Reading does not violate water quality standards
NH4-bottom	mg/l	ND	No evidence of DO depletion	Reading violates water quality standards
TKN-bottom	mg/l	0.25		No pertinent water quality standards
Alk-bottom	mg/l	2.3	Poorly Buffered	No pertinent water quality standards
TCOLOR-bottom	ptu	30	Weakly Colored	No pertinent water quality standards
TOC-bottom	mg/l	4.2		No pertinent water quality standards
Ca-bottom	mg/l	2.17	Does Not Support Zebra Mussels	No pertinent water quality standards
Fe-bottom	mg/l	0.685	Taste or odor likely	Reading violates water quality standards

Bottom Samples (continued)

	UNITS	Reading	Scientific Classification	Regulatory Comments
Mn-bottom	mg/l	0.322	Taste or odor likely	Reading violates water quality standards
Mg-bottom	mg/l	0.639		Reading does not violate water quality standards
K-bottom	mg/l	0.406		
Na-bottom	mg/l	1.07		Reading does not violate water quality standards
Cl-bottom	mg/l	ND		Reading does not violate water quality standards
SO4-bottom	mg/l	5.8		Reading does not violate water quality standards
As-bottom	mg/l	ND	No evidence of potable water threats	Reading does not violate water quality standards

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	3	Plants Grow to Lake Surface	No pertinent water quality standards
Recreational Assessment	1-5, 1 best	2	Excellent for Most Uses	No pertinent water quality standards

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(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
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
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