

LCI Lake Water Quality Summary

General Information

Lake Name: Sand Pond

Location: Town of Highland and Lumberland, Sullivan County

Basin: Delaware River Basin

Size: 44.0 hectares (= 109 acres)

Lake Origins: natural

Major Tributaries: no known inlet

Lake Tributary to?: Halfway Brook via unnamed minor tributary

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

Sounding Depth: 19.8 meters (= 65 feet)

Sampling Coordinates: Latitude: 41.51248, Longitude: -74.84240

Sampling Access Point: private beach (Derrick Richardson)

Monitoring Program: Lake Classification and Inventory (LCI) Survey

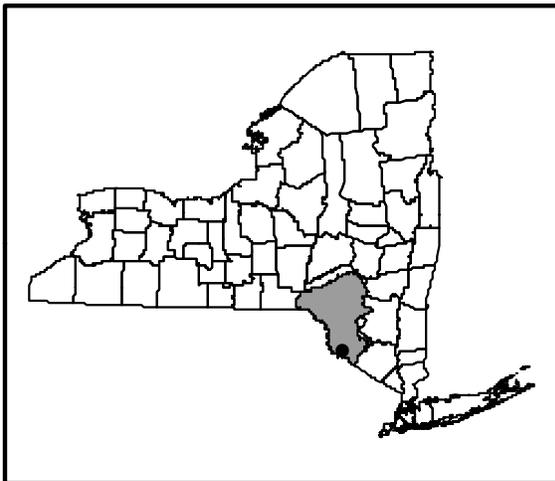
Sampling Date: 7/30/09

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

Sand Pond is a private waterbody surrounded by land owned by a single private landowner (Derrick Richardson). The entire shoreline of the lake is forested except for a small private beach used solely by the property owner and his guest. NYSDEC Division of Water's Lake Classification and Inventory Survey (LCI) had no previous water quality data for the lake and thus the lake was included in the 2009 LCI Delaware River Basin screening program. Due to the lack of public access and lack of perceived use impairments, the lake will not be considered for the 2010 intensive (monthly) monitoring program within the Delaware River Basin.

Sand Pond can generally be characterized as an *oligotrophic* lake, or an unproductive lake. The water clarity reading (TSI = 38, typical of *oligotrophic* lakes) is slightly lower than expected given the phosphorus (TSI = 29, typical of *oligotrophic* lakes) reading. The chlorophyll *a* reading was below the laboratory detection limit (typical of *oligotrophic* lakes). The Secchi disk reading of 4.5 meters is on the high end of *mesotrophic* (moderately productive lake); however, it is believed that water clarity is typically slightly greater than observed here, given the 17 foot Secchi disk reading recorded during a private monitoring effort in 2008. The lower clarity reading was probably due to the large amount of rainfall received the previous day (up to 4 inches reported in neighboring areas) and due to the high wind condition experienced during sampling, making it hard to obtain an accurate Secchi disk reading. The low nitrogen and phosphorus levels indicate that the conditions observed in late July are typical of the pond, with the pond not supporting high production of algae.

The water was almost crystal clear with no real green or tan color to the water. No rooted exotic or native aquatic plants were visible at the informal beach or other locations in the pond. There were a few native grasses growing in the shallow areas near the informal beach. The lack of aquatic vegetation was atypical compared to other lakes that were sampled in the Delaware River Basin.

The 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 six meters deep. Due to the high wind it was difficult to accurately determine the depth at which stratification occurs, but based on the 2008 data it is probably in the 7 to 8 meter range. Low productivity lakes typically have oxygen rich water in the hypolimnion (bottom waters) throughout the summer, as was apparent in the 2008 data. pH reading indicate slightly acidic surface waters which was typical for other lakes in the region. Conductivity readings indicate soft water (low ionic strength) which is also typical of other nearby lakes.

Chloride and other ions levels were undetectable or low in both the surface and bottoms waters, indicating there is little influence from road salting or other stormwater, which would be expected with no major inlet to the pond and the lack of paved roads in the watershed. None of the other water quality indicators measured through this program indicated water quality problems.

Aquatic life cannot be fully evaluated though the LCI. pH and oxygen levels are fully supportive of aquatic life, but low nutrient levels may inhibit primary production, as was apparent with the lack of aquatic vegetation.

Evaluation of Lake Condition Impacts to Lake Uses

Potable Water (Drinking Water)

Sand Pond is not classified for use as a potable water supply. LCI data are not sufficient to evaluate potable water use, but the data collected do not show any threats that would hinder Sand Pond from being used as a drinking water supply.

Contact Recreation (Swimming)

Sand Pond is classified for contact recreation- swimming and bathing- it is believed that this use is currently supported. Bacteria data are needed to evaluate the safety of Sand Pond for swimming- these are not collected through the LCI. The data collected through the LCI indicate that swimming is an acceptable use due to the high water clarity and low levels of algae.

Non-Contact Recreation (Boating and Fishing)

Boating on the lake is currently supported. Angling may also be supported; however, low nutrient levels may suppress any fish populations.

Aquatic Life

Additional biological studies would need to be conducted to evaluate the aquatic life of Sand Pond; however, there were no indication aquatic life may be stressed.

Aesthetics

These data indicate that aesthetics should be fully supported, due to the lack of problems with excessive algae, poor water clarity, or invasive weeds.

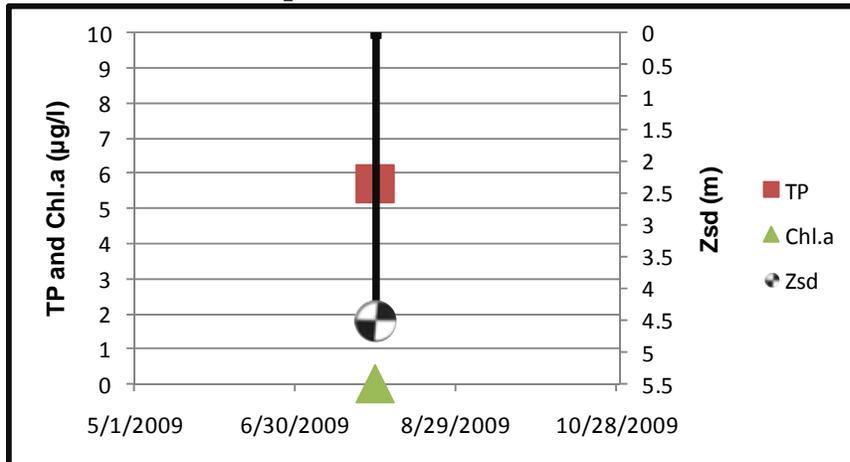
Additional Comments

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. The current policy of not allowing outside boats and limited access to the lake should minimize the risk of the introduction of exotic species to the lake.
2. Water quality conditions can be evaluated by the use of water clarity measurements, previously conducted on the lake. This surrogate for nutrient and algae levels is easy to measure and may provide some early warnings of changes in water quality conditions, recognizing that multiple measurements may need to be collected to evaluate normal variability.

Aquatic Plant IDs

Exotic Plants: None observed
Native Plants: None observed

Time Series: Trophic Indicators



WQ Sampling Results: Sand Pond

Surface Samples

| | UNITS | Reading | Scientific Classification | Regulatory Comments |
|------------|--------|---------|-----------------------------------|--|
| SECCHI | meters | 4.5 | Mesotrophic | Readings does not violate DOH guidance value |
| TSI-Secchi | | 38.3 | Oligotrophic | No pertinent water quality standards |
| TP | mg/l | 0.0057 | Oligotrophic | Readings does not violate DEC guidance values |
| TSI-TP | | 29.2 | Oligotrophic | No pertinent water quality standards |
| TSP | mg/l | ND | Little available phosphorus | No pertinent water quality standards |
| NOx | mg/l | 0.0086 | Low nitrate | Reading does not violate guidance |
| NH4 | mg/l | 0.025 | Low ammonia | Reading does not violate guidance |
| TKN | mg/l | 0.34 | Low organic nitrogen | No pertinent water quality standards |
| TN/TP | mg/l | 134.55 | Phosphorus Limited | No pertinent water quality standards |
| CHLA | ug/l | ND | Oligotrophic | No pertinent water quality standards |
| TSI-CHLA | | ND | Oligotrophic | No pertinent water quality standards |
| Alkalinity | mg/l | 8.6 | Poorly Buffered | No pertinent water quality standards |
| TCOLOR | ptu | ND | Uncolored | No pertinent water quality standards |
| TOC | mg/l | 3.7 | | No pertinent water quality standards |
| Ca | mg/l | 3.57 | Does Not Support Zebra Mussels | No pertinent water quality standards |
| Fe | mg/l | 0.0347 | | Reading does not violate water quality standards |
| Mn | mg/l | 0.0258 | | Reading does not violate water quality standards |
| Mg | mg/l | 1.11 | | Reading does not violate water quality standards |
| K | mg/l | 0.274 | | No pertinent water quality standards |
| Na | mg/l | 0.809 | | Reading does not violate water quality standards |
| Cl | mg/l | ND | Little impact from road salt | Reading does not violate water quality standards |
| SO4 | mg/l | 4 | | Reading does not violate water quality standards |

Bottom Samples

| | UNITS | Reading | Scientific Classification | Regulatory Comments |
|---------------|-------|---------|-----------------------------------|--|
| TP-bottom | mg/l | 0.0087 | | No pertinent water quality standards |
| TSP-bottom | mg/l | 0.0048 | High % soluble phosphorus | No pertinent water quality standards |
| NOx-bottom | mg/l | 0.0113 | No evidence of DO depletion | Reading does not violate water quality standards |
| NH4-bottom | mg/l | 0.039 | No evidence of DO depletion | Reading does not violate water quality standards |
| TKN-bottom | mg/l | 0.24 | | No pertinent water quality standards |
| Alk-bottom | mg/l | 10.5 | Poorly Buffered | No pertinent water quality standards |
| TCOLOR-bottom | ptu | ND | Uncolored | No pertinent water quality standards |
| TOC-bottom | mg/l | 3.1 | | No pertinent water quality standards |
| Ca-bottom | mg/l | 3.83 | Does Not Support Zebra Mussels | No pertinent water quality standards |
| Fe-bottom | mg/l | 0.025 | | Reading does not violate water quality standards |

Bottom Samples (continued)

| | UNITS | Reading | Scientific Classification | Regulatory Comments |
|------------|-------|---------|---------------------------|--|
| Mn-bottom | mg/l | 0.0172 | | Reading does not violate water quality standards |
| Mg-bottom | mg/l | 1.31 | | Reading does not violate water quality standards |
| K-bottom | mg/l | 0.247 | | No pertinent water quality standards |
| Na-bottom | mg/l | 0.737 | | Reading does not violate water quality standards |
| Cl-bottom | mg/l | ND | | Reading does not violate water quality standards |
| SO4-bottom | mg/l | 4.1 | | 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 | 1 | Plants Usually Not Visible | No pertinent water quality standards |
| Recreational Assessment | 1-5, 1 best | 1 | Could Not Be Nicer | No pertinent water quality standards |

Legend Information

General Legend Information

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|-----------------|--|
| 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) |

| | |
|------------|--|
| TSI-CHLA | Detection limit = 2 µg/l; no NYS standard or guidance value |
| ALKALINITY | = Trophic State Index calculated from CHLA, = $9.81 * \ln(\text{CHLA}) + 30.6$ = total alkalinity in mg/l as calcium carbonate |
| TCOLOR | Detection limit = 10 mg/l; no NYS standard or guidance value = true (filtered or centrifuged) color, platinum color units (ptu) |
| TOC | Detection limit = 5 ptu; no NYS standard or guidance value = total organic carbon, mg/l |
| Ca | Detection limit = 1 mg/l; no NYS standard or guidance value = calcium, mg/l |
| Fe | Detection limit = 1 mg/l; no NYS standard or guidance value = iron, mg/l |
| Mn | Detection limit = 0.1 mg/l; NYS standard = 0.3 mg/l = manganese, mg/l |
| Mg | Detection limit = 0.01 mg/l; NYS standard = 0.3 mg/l = magnesium, mg/l |
| K | Detection limit = 2 mg/l; NYS standard = 35 mg/l = potassium, mg/l |
| Na | Detection limit = 2 mg/l; no NYS standard or guidance value = sodium, mg/l |
| Cl | Detection limit = 2 mg/l; NYS standard = 20 mg/l = chloride, mg/l |
| SO4 | Detection limit = 2 mg/l; NYS standard = 250 mg/l = sulfate, mg/l |

Field Parameters

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|--------|--|
| 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 (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

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|-------------------------|--|
| 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 |