

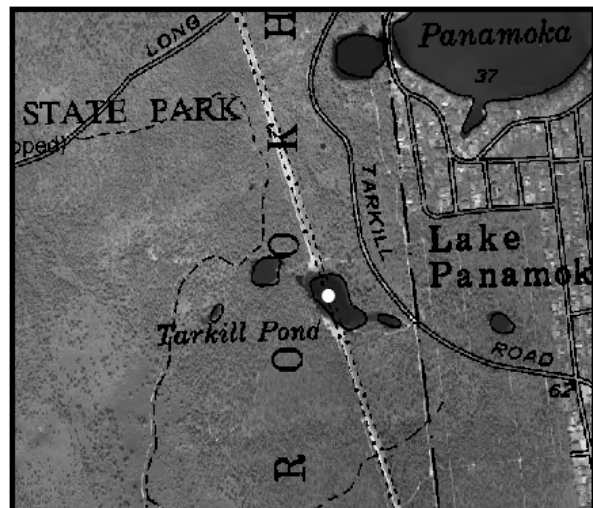
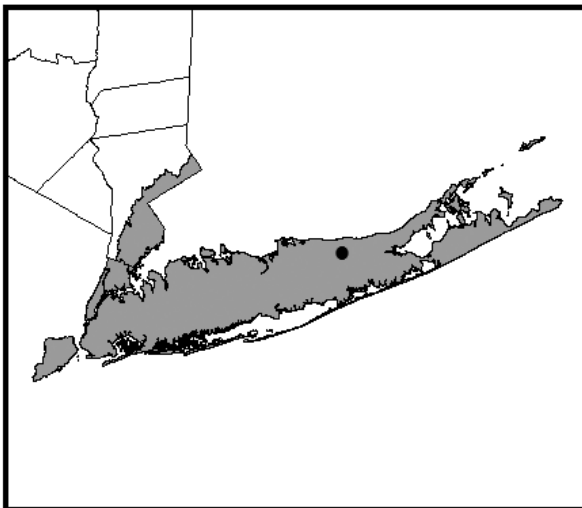
LCI Lake Water Quality Summary

General Information

Lake Name:	Tarkill Pond
Location:	Brookhaven State Park, Town of Brookhaven, Suffolk County, New York
Basin:	Atlantic Ocean/Long Island Sound Basin
Size:	1.5 hectares (3.7 acres)
Lake Origins:	natural
Major Tributaries:	none (seepage)
Lake Tributary to?:	none
Water Quality Classification:	C (best intended use: secondary contact recreation)
Sounding Depth:	2.1 meters (7 feet)
Sampling Coordinates:	Latitude: 40.91635, Longitude: -72.85463
Sampling Access Point:	Mountain Bike Trail (Brookhaven State Park)
Monitoring Program:	Lake Classification and Inventory (LCI) Survey
Sampling Date:	September 23, 2009
Samplers:	David Newman, NYSDEC Division of Water, Albany Steven Finnemore, NYSDEC Division of Water, Albany
Contact Information:	Scott Kishbaugh, NYSDEC Division of Water sakishba@gw.dec.state.ny.us ; 518-402-8282

Lake Map

(sampling location marked with a circle)



Background and Lake Assessment

Tarkill Pond is the largest pond in Brookhaven State Park which is part of the larger Long Island Pine Barrens Habitat Complex. The park itself is almost entirely undeveloped with the primary intended uses of the park being mountain biking and hiking on maintained trails. The pond is considered a coastal plain pond and as such is completely groundwater fed and has no outlet; water levels fluctuates seasonally and annually with the height of the local water table. The ponds in this area of Long Island are considered by the US Fish and Wildlife Service (1997) to be of “global significance” due to rare plant and animal species that these ponds support. The park manager indicated that some time ago locals stocked largemouth bass in the pond and now locals do occasionally fish in the pond. The park staff is working on a project to control the invasive emergent plant *Phragmites australis* (common reed). The park manager also indicated that Tarkill Pond on rare occasion has been connected with a smaller pond to the northwest. All of the area surrounding the pond is in Long Island Pine Barrens habitat except for a power line corridor that runs through the center of the pond.

Tarkill Pond was included in the 2009 Lake Classification and Inventory (LCI) survey of the Atlantic Ocean/Long Island Sound Basin at the request of the State Office of Parks Recreation and Historic Preservation (OPRHP), to provide OPRHP additional water quality information for the pond. Tarkill Pond also appears on the 2000 Atlantic Ocean/Long Island Sound Basin Waterbody Inventory and Priority Waterbodies List as an “Unassessed Water.”

Tarkill Pond can generally be characterized as *mesotrophic*, or moderately productive. The water clarity reading (TSI = 49, typical of *mesotrophic* lakes) was lower than expected given the phosphorus reading (TSI = 33, typical of *oligotrophic* lakes), but was expected given the chlorophyll *a* reading (TSI = 47, typical of *mesotrophic* lakes). These data suggest that baseline nutrient levels do not support persistent algae blooms in the pond.

The water had a slight yellow coloration, probably due to the bottom sandy substrate being visible from the surface of the pond. Cut *Phragmites* was observed at the pond’s edge, with the cutting being part of a continuing effort to eliminate the species from the pond’s margins. There were a few rooted aquatic plants species present in the pond, these consisted of *Nuphar sp.* (yellow water lily), *Utricularia purpurea* (purple bladderwort), and *Eleocharis acicularis* (needle spikerush). With the survey taking place in September, some early season aquatic plant species may have been missed.

Like most shallow water bodies, Tarkill Pond was not thermally stratified. Temperature and dissolved oxygen readings were comparable throughout the water column. pH readings indicate slightly acidic water. Available literature would suggest acidic water is common in coastal plain ponds in the Long Island Pine Barrens. Conductivity readings indicate soft water (low ionic strength), which is also common for coastal plain ponds in the Long Island Pine Barrens.

Tarkill Pond appears to be typical of coastal plain ponds with soft acidic water. Due to these ponds being strictly groundwater fed and lacking outlets, most do not have fish populations unless fish were introduced. The park manager suggested that this was the case at Tarkill Pond, and the observation of a fish lure stuck on vegetation in the pond would suggest that fish may be surviving in Tarkill Pond. Chloride and other ion levels were low as would be expected in a

watershed lacking development. None of the other water quality indicators measured through this program indicate water quality problems at the pond.

Evaluation of Lake Condition Impacts to Lake Uses

Potable Water (Drinking Water)

Tarkill Pond is not classified for use as a potable water supply. LCI data are not sufficient to evaluate potable water use, however from the data collected there were no indication that would suggest a threat to this use.

Contact Recreation (Swimming)

Tarkill Pond is not classified for primary contact recreation. It is not know if people visiting the park swim in the pond. Bacteria data are needed to evaluate the safety of Tarkill Pond for swimming-these are not collected through the LCI program. The data collected did not indicate any water quality parameters that would prevent the pond from being acceptable for this use. The water clarity reading was above the New York State Department of Health's minimum of 1.2 meters to protect the safety of swimmers.

Non-Contact Recreation (Boating and Fishing)

Tarkill Pond is presently used for fishing. The size of the pond and the lack of vehicle access to the pond prevent the pond from being used for boating. If stands of *Phragmites* were allowed to grow around the ponds margins, this may make fishing difficult from the shoreline. Any fish in the pond were more than likely purposefully introduced.

Aquatic Life

Although aquatic life cannot be fully evaluated through the LCI program, these data did not indicate any stressors to the native aquatic life in the pond. Fish introduced to the pond may negatively impact the native flora and fauna found in coastal plain ponds; however, no direct impacts from fish were observed. Additional biological studies would be needed to fully evaluate any impacts to the aquatic life in the pond.

Aesthetics

These data would indicate that there are no impacts to the aesthetics of Tarkill Pond.

Additional Comments

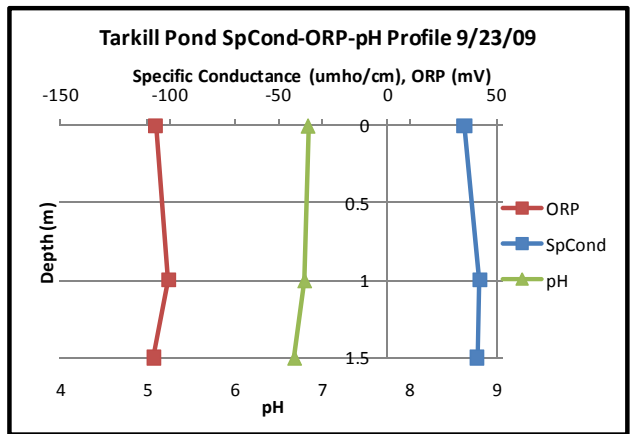
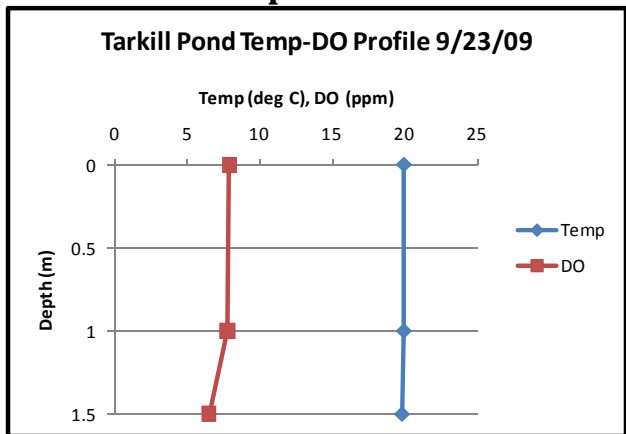
1. Periodic surveillance for invasive exotic plant species may help to prevent the establishment and spread of any new invaders, given the escalating problems with exotic aquatic weeds on Long Island.
2. The *Phragmites* control project should be continued as this species can form dense stands displacing native vegetation and altering animal habitat.
3. The continued enforcement of restrictions on all terrain vehicle use in the park will minimize potential impacts to the pond from erosion.
4. There is limited peer reviewed literature on coastal plain ponds; however, Brookhaven Nation Laboratory's Environmental Protection Division runs a research and internship program that has had several projects looking at different aspects of coastal plain ponds.

Write ups on these projects can be found online at <http://www.bnl.gov/esd/wildlife/research.asp>.

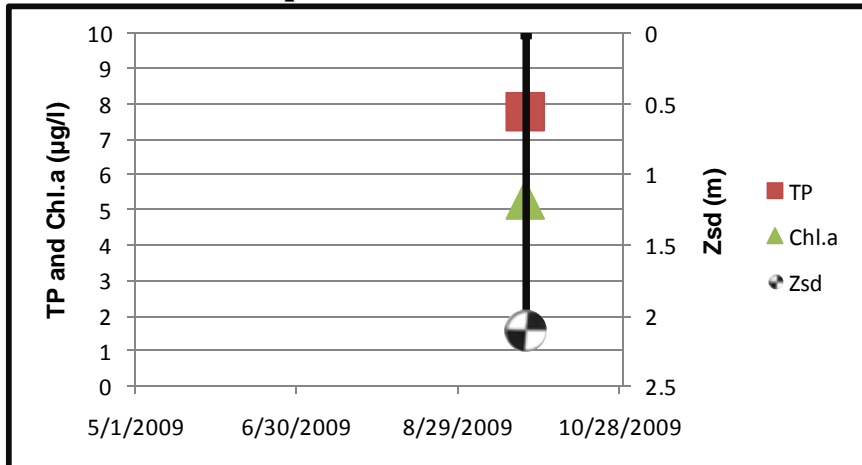
Aquatic Plant IDs

Exotic Plants: no aquatic species observed
 Native Plants: *Eleocharis acicularis* (needle spikerush)
Nuphar sp. (yellow water lily)
Utricularia purpurea (purple bladderwort)

Time Series: Depth Profiles



Time Series: Trophic Indicators



*Secchi disk was on the bottom of the pond at 2.1 meters and was still visible

WQ Sampling Results

Surface Samples

	UNITS	Reading	Scientific Classification	Regulatory Comments
SECCHI	meters	>2.1*	Mesotrophic*	Reading does not violate DOH guidance value
TSI-Secchi		<49.3*	Mesotrophic*	No pertinent water quality standards
TP	mg/l	0.0078	Oligotrophic	Reading does not violate DEC guidance values
TSI-TP		33.7	Oligotrophic	No pertinent water quality standards
TSP	mg/l	0.0105	High % soluble Phosphorus	No pertinent water quality standards
NOx	mg/l	0.0041	Low nitrate	Reading does not violate guidance
NH4	mg/l	0.055	Low ammonia	Reading does not violate guidance
TKN	mg/l	0.56	Intermediate organic nitrogen	No pertinent water quality standards
TN/TP	mg/l	159.11	Phosphorus Limited	No pertinent water quality standards
CHLA	ug/l	5.3	Mesotrophic	No pertinent water quality standards
TSI-CHLA		47.0	Mesotrophic	No pertinent water quality standards
Alkalinity	mg/l	23.8	Poorly Buffered	No pertinent water quality standards
TCOLOR	ptu	15	Weakly Colored	No pertinent water quality standards
TOC	mg/l	5.6		No pertinent water quality standards
Ca	mg/l	3.4	Does Not Support Zebra Mussels	No pertinent water quality standards
Fe	mg/l	0.119		Reading does not violate water quality standards
Mn	mg/l	0.0108		Reading does not violate water quality standards
Mg	mg/l	4.31		Reading does not violate water quality standards
K	mg/l	0.474		No pertinent water quality standards
Na	mg/l	2.97		Reading does not violate water quality standards
Cl	mg/l	4.5	Minor road salt runoff	Reading does not violate water quality standards
SO4	mg/l	4.3		Reading does not violate water quality standards

* The Secchi disk could be seen on the bottom of the pond at 2.1 meters not allowing a true water clarity reading. The actual reading would be greater than 2.1 meters. The *Scientific Classification* and *Regulatory Comments* are based on a reading of 2.1 meters.

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

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, = $14.42 \cdot \ln(\text{TP} \cdot 1000) + 4.15$
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), = $(\text{TKN} + \text{NOx}) \cdot 2.2 / \text{TP}$ > 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, = $9.81 \cdot \ln(\text{CHLA}) + 30.6$
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 = 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

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

References

- U.S. Fish and Wildlife Service. 1997. Significant Habitats and Habitat Complexes of the New York Bight Watershed. Southern New England – New York Bight Coastal Ecosystems Program. Charlestown, Rhode Island.