

# LCI Lake Water Quality Summary

## General Information

**Lake Name:**

**Browns Pond (Silver Stream Reservoir)**

**Location:**

Town of New Windsor, Orange County

**Basin:**

Lower Hudson River Basin

**Size:**

~78 hectares (~193 acres)

**Lake Origins:**

Augmented by a dam built in 1923

**Tributaries:**

Minor unnamed

**Watershed Area:**

1.75 square miles

**Lake Tributary to:**

Lake Washington via a diversion in Silver Creek

**Water Quality Classification:**

A (best intended use: drinking water supply)

**Sounding Depth:**

4 meters (13 feet)

**Sampling Coordinates:**

41.47706, -74.08930

**Sampling Access Point:**

City of Newburgh Right-of-way

**Monitoring Program:**

Lake Classification and Inventory (LCI) Survey

**Sampling Date:**

July 20, 2012

**Samplers:**

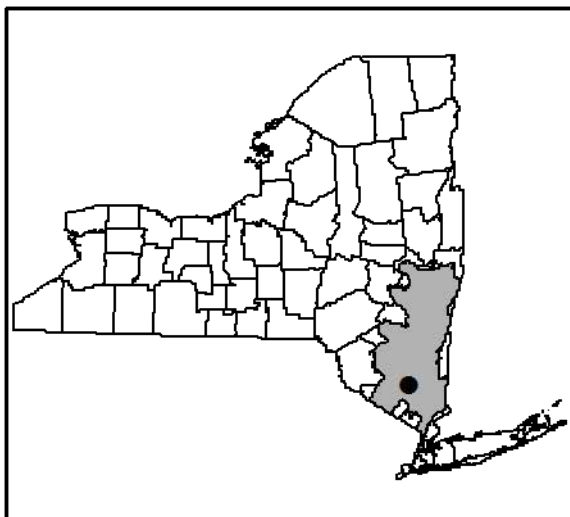
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## Lake Map

(sampling location marked with a circle)



## Background and Lake Assessment

Browns Pond is a moderately sized secondary water supply reservoir, for the City of Newburgh and the Town of New Windsor in Orange County. Over the last several years, both the City of Newburgh and the Town of New Windsor have, for short periods of time, used water from Browns Pond to supplement and/or take the place of, their primary water supplies. The land that surrounds the pond is primarily forested, except for two stretches of shoreline that abut Mt. Airy Road. The greater watershed of Browns Pond is approximately 50% forested with a mix of agricultural lands and low and moderate density housing with a limited amount of commercial and industrial development. Mt. Airy Estates, a subdivision at the southwestern end of the pond, had on a number of occasions between 2003 and 2008 received notices of violation related to stormwater discharges to Brown's Pond and discharging without a permit. Historically, people were able to fish at the pond from boats rented through the City of Newburgh's Recreation Department. Currently fishing and boating are not allowed at Browns Pond.

Browns Pond was included in the 2012 screening (single samples) of lakes and ponds within the Lower Hudson River Basin. The pond was included in this monitoring effort due to a lack of water quality data in the DEC's water quality database. Elevated levels of both chlorophyll *a* and phosphorus were found during this monitoring, due to these findings the pond is a candidate for additional monitoring during the summer of 2013. This additional sampling will include monthly sampling of the pond.

Based on data from the single sampling event, in July of 2012, Browns Pond can be characterized as *eutrophic*, or highly productive. The water clarity reading (TSI = 51, typical of *eutrophic* lakes) was in the expected range, given the phosphorus (TSI = 60, typical of *eutrophic* lakes) and the chlorophyll *a* reading (TSI = 61, typical of *eutrophic* lakes). The trophic indicators show that baseline nutrient levels may support high levels of algae production in the pond. Both the chlorophyll *a* and total phosphorus numbers are above the proposed impairment thresholds, for Class A waters (sources of water supply for drinking). These impairments do not reflect the quality of finished/treated water.

Like most shallow waterbodies, Browns Pond does not exhibit thermal stratification, in which depth zones (warm water on top, cold water on the bottom during the summer) are established during the summer. Temperature and dissolved oxygen readings were consistent throughout the water column. pH readings were found to be above the New York State Water Quality Standard of 9.5. It is common for highly productive waterbodies to experience elevated pH readings.

Browns Pond appears to be typical of alkaline, moderately hard water, shallow lakes in the Lower Hudson River Basin. Other waterbodies, with similar water quality characteristics, often support warm water fish species. A fisheries assessment was conducted in 2006, at Lake Washington, a reservoir downstream of Brown's Pond. This survey found several warm water fish species to be occurring in the lake including: Alewife, yellow bullhead, bluegill, largemouth bass, white and yellow perch, and black crappie. It is likely that Brown's Pond supports a similar fish community, but a fisheries survey would need to be conducted at the pond to fully evaluate the fish community. As stated above, fishing is not currently allowed at Browns Pond.

Chloride levels were below the state's water quality standard, but high enough to suspect the pond receives road salt runoff and/or runoff from developed areas. Total organic carbon (TOC) levels were higher than most seen at other Class A and A(T) waterbodies studied over the last 10 years (3<sup>rd</sup> highest of 42 total). TOC is considered a precursor to disinfection byproduct production. TOC levels above 4 mg/l require that there be a 45% removal of TOC from the source water or may require the use of enhanced coagulation at the water treatment plant (this requirement is based on a running annual average of monthly samples).

An assessment of the aquatic plant community was not conducted at the time of sampling. However, in 2008, the city considered stocking grass carp to control curlyleaf pondweed, an invasive species. Although the city obtained funding for stocking grass carp, they were not stocked due to concerns of the carp being able to get into Silver Stream via the pond's outlet and then dispersing to Lake Washington, this city's primary water supply reservoir. Aquatic plant specific monitoring would be needed to evaluate the current plant community within the pond and to determine the extent of the curlyleaf pondweed population and whether any other invasive plant species are occurring in the pond.

## **Evaluation of Lake Condition Impacts to Lake Uses**

### ***Potable Water (Drinking Water)***

Browns Pond is classified for and used as a secondary potable water supply for the City of Newburgh and the Town of New Windsor. Data collected through the LCI program are not sufficient to fully evaluate potable water use. The LCI data that was collected indicates, that elevated levels of total phosphorus, chlorophyll *a* and total organic carbon, may necessitate the use of advanced coagulation or other improvements at the water treatment plant, to address these elevated levels. In addition, potassium permanganate and copper sulfate have been used in the past to reduce algae levels in the pond (New Windsor Town Board 2006; City of Newburgh, personal communication, 10 May 2013).

### ***Contact Recreation (Swimming)***

Class A waterbodies should also be supportive of contact recreation. Swimming is currently not allowed in the pond by the City of Newburgh. Bacteria data would be needed to evaluate the safety of Browns Pond for swimming; these are not collected through the LCI. Bacteria data are required to be collected by the City of Newburgh from finished water within the City's distribution system. Data collected through the LCI, indicate that swimming could be supported in the pond, assuming low bacteria levels. The water clarity was above the State Department of Health's guidance value of 1.2 meters to protect the safety of swimmers.

### ***Non-Contact Recreation (Boating and Fishing)***

The city does not currently allow fishing or boating at Browns Pond. The data collected through the LCI indicated that these uses may be *stressed* by the occurrence of an invasive plant species.

### ***Aquatic Life***

The high pH level found in the pond may *impair* some species aquatic life in the pond. The high pH level can also increase the toxicity of other substances in the water column. The occurrence of an invasive plant species may also *threaten* the native aquatic life within the pond.

## Aesthetics

These data did not indicate any stressors to the aesthetics of the pond.

## Additional Comments

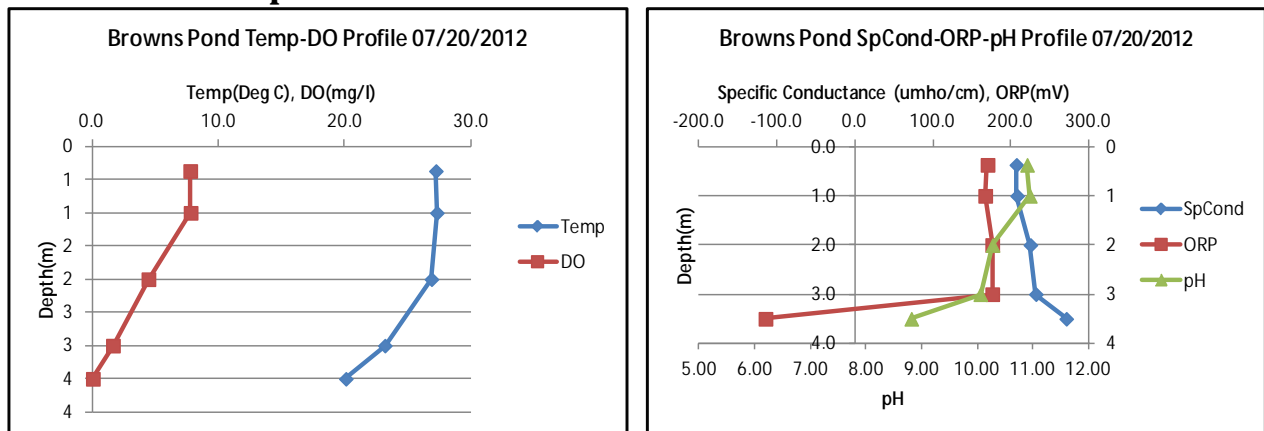
- Periodic surveillance for invasive exotic plant species may help to prevent the establishment and spread of any new invaders, given the escalating problems with exotic species.

## Aquatic Plant IDs

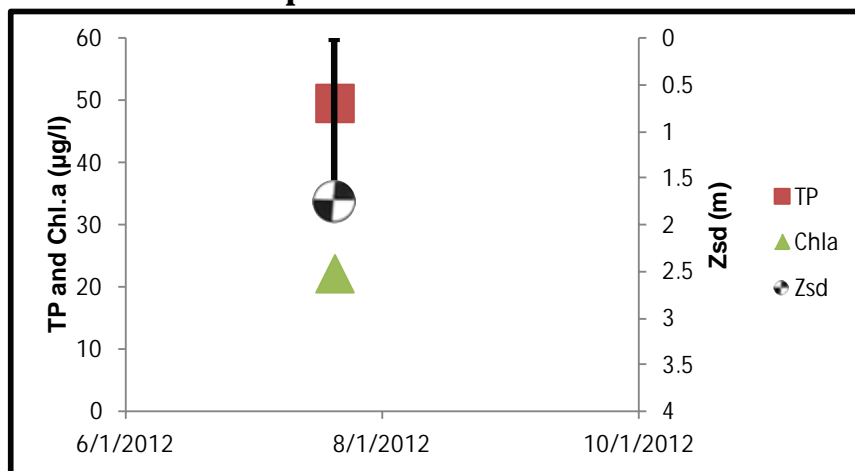
Exotic Plants: *Potamogeton crispus* (curlyleaf pondweed), known to occur in the pond but not observed during water quality sampling

Native Plants: *Lemna minor* (duck weed)

## Time Series: Depth Profiles



## Time Series: Trophic Indicators



## WQ Sampling Results

### Surface Samples

	UNITS	Reading	Scientific Classification	Regulatory Comments
SECCHI	meters	1.75	Eutrophic	Readings does not violate DOH guidance value
TSI-Secchi		51.9	Eutrophic	No pertinent water quality standards
<b>TP</b>	<b>mg/l</b>	<b>0.0497</b>	<b>Eutrophic</b>	<b>Sample exceeds proposed impairment threshold for Class 'A' waters</b>
TSI-TP		60.4	Eutrophic	No pertinent water quality standards
TSP	mg/l	0.0185	High % soluble Phosphorus	No pertinent water quality standards
NOx	mg/l	0.0126	Low nitrate	Reading does not violate guidance
NH4	mg/l	0.023	Low ammonia	Reading does not violate guidance
TKN	mg/l	0.94	Elevated organic nitrogen	No pertinent water quality standards
TN/TP	mg/l	42.17	Phosphorus Limited	No pertinent water quality standards
<b>CHLA</b>	<b>ug/l</b>	<b>22.3</b>	<b>Eutrophic</b>	<b>Sample exceeds proposed impairment threshold for Class 'A' waters</b>
TSI-CHLA		61.06	Eutrophic	No pertinent water quality standards
Alkalinity	mg/l	56.2	Moderately Buffered	No pertinent water quality standards
TCOLOR	ptu	29	Weakly Colored	No pertinent water quality standards
<b>TOC</b>	<b>mg/l</b>	<b>7.8</b>	<b>Elevated risk of DBP formation</b>	No pertinent water quality standards
Ca	mg/l	18.4	Minimally Supports Zebra Mussels	No pertinent water quality standards
Fe	mg/l	0.163		Reading does not violate water quality standards
Mn	mg/l	0.022		Reading does not violate water quality standards
Mg	mg/l	3.99		Reading does not violate water quality standards
K	mg/l	1.79		No pertinent water quality standards
Na	mg/l	15.8		Reading does not violate water guidance value
Cl	mg/l	25.6	Moderate road salt runoff	Reading does not violate water quality standards
SO4	mg/l	4.1		Reading does not violate water quality standards
Si	mg/l	2.64		No pertinent water quality standards

### Lake Perception

	UNITS	Reading	Scientific Classification	Regulatory Comments
WQ Assessment	1-5, 1 best	4	High Algal Greenness	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	3	Slightly Impaired	No pertinent water quality standards

## References

New Windsor Town Board. 2006, Minutes from the July 5, 2006 town board meeting. Available from: <http://docs.newwindsor-ny.gov:8080/docushare/dsweb/View/Collection-10834>.

## 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, = $60 - 14.41 * \ln(\text{Secchi})$

### 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), = $(\text{TKN} + \text{NO}_x) * 2.2 / \text{TP}$ > 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, = $9.81 * \ln(\text{CHLA}) + 30.6$
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
SO <sub>4</sub>	= sulfate, mg/l Detection limit = 2 mg/l; NYS standard = 250 mg/l
Si	= dissolved silica, mg/l Detection limit = 0.01mg/l; no NYS standard or guidance value

### ***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 (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	= <b>water quality assessment</b> , 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	= <b>weed coverage/density assessment</b> , 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	= <b>swimming/aesthetic assessment</b> , 5 point scale; 1 = could not be nicer, 2 = excellent, 3= slightly impaired, 4 = substantially impaired, 5 = lake not usable