



## Background and Lake Assessment

Woodman Pond is owned and managed by the Village of Hamilton as a backup water supply. As a result, access to the lake by the general public is prohibited. Much of the watershed for the lake is agricultural with a few areas of forested land north of Woodman Pond. The majority of the pond's shoreline has a treed buffer with only a single home on the pond. The western portion of the pond is shallow with wetland vegetation. The pond was among the largest water bodies in the Susquehanna River Basin not previously sampled though the NYSDEC Division of Water's Lake Classification and Inventory Survey (LCI), and thus was included in the 2009 survey.

Woodman Pond can generally be characterized as *mesotrophic*, or moderately productive. The average water clarity reading (TSI = 43, typical of *mesotrophic* lakes) was expected given the average phosphorus reading (TSI = 47, typical of *mesotrophic* lakes), and given the average chlorophyll *a* reading (TSI = 43, typical of *mesotrophic* lakes). These data suggest that baseline nutrients do not support persistent algal blooms in the pond.

The surface water from the pond tended to be weakly colored, as is typical for water bodies in this region with low to moderate nutrient levels. Filamentous algae were observed near the pond's inlet during both the August and September sampling events. This may indicate that the inlet stream may be transporting nutrients from the watershed to the pond. The only aquatic plant species reported was the native *Myriophyllum sibiricum* (northern watermilfoil); however, Cornell University Research Ponds conducted a more detailed plant survey of the pond in 2005 and found nine additional aquatic plants, one hybrid species of pondweed, and one emergent plants species (please refer to Cornell report for additional information). Readers are referred to this study for a more complete inventory of aquatic plants in the lake.

Woodman 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 the pond was in the 6 to 7 meter range throughout the summer. The entire hypolimnion (bottom waters) was anoxic (devoid of oxygen) at depths below 8 meters during the July, August and September sampling events with hypoxic (poorly oxygenated) water found during the June sampling event. pH readings indicate slightly alkaline waters, and decrease with depth. Conductivity readings indicate hard water (high ionic strength). The oxygen reduction potential (ORP) readings were well below zero in the hypolimnion during the July, August and September sampling events indicating persistence of the oxygen deficits in the bottom waters.

The lake appears to be typical of hardwater, weakly colored, alkaline lakes. Other lakes with similar water quality characteristics often support warmwater fisheries, although fisheries habitat cannot be fully evaluated through this monitoring program. Coldwater fisheries are unlikely to be supported, given the lack of cold water and high oxygen refugia necessary to protect any salmonids or aquatic life susceptible to high summer temperatures. It is not known if these coldwater fish have historically been supported in the lake.

Phosphorus, ammonia and manganese levels were elevated in the bottom waters, which is typical in lakes that experience oxygen deficits in the bottom waters. Chloride levels were in the moderate range and may indicate impacts from road salting and or other signs of stormwater runoff through developed areas. It is not known if this results in any ecological impacts. All other ion and metal levels were below the state's guidance values.

## Evaluation of Lake Condition Impacts to Lake Uses

### Potable Water (Drinking Water)

Woodman Pond is classified for use as a potable water supply. Currently the pond serves as a backup water supply for the Village of Hamilton. The data collected through the LCI is not sufficient to evaluate potable water use; however these data indicate that manganese levels may impact deepwater intakes.

### Contact Recreation (Swimming)

Public access to the pond is prohibited, preventing the pond to be used for swimming. Bacteria data are needed to evaluate the safety of the Woodman Pond for swimming- these are not collected through the LCI. The data that was collected indicated that the pond would be suitable for swimming as the water clarity readings were above the New York State Department of Health's guidance value of 1.2 meters to protect the safety of swimmers.

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

Public access to the pond is prohibited, preventing the pond from being used for boating and the shoreline of the pond is not suitable for fishing. The data collected through the LCI indicate that if access to the pond were allowed, water quality levels and aquatic plant densities would be sufficient to support both of these uses.

### Aquatic Life

The anoxic conditions and elevated ammonia and manganese levels observed will stress some aquatic life, including salmonids. Additional biological studies would be needed to evaluate any other aquatic life impacts.

### Aesthetics

These data indicate that there are no impacts to the aesthetics of the lake.

### Additional Comments

- Dissolved oxygen, pH and conductivity readings were consistent with those reported in August of 2000 indicating that these data represent normal conditions in Woodman Pond.
- 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.

### Aquatic Plant IDs

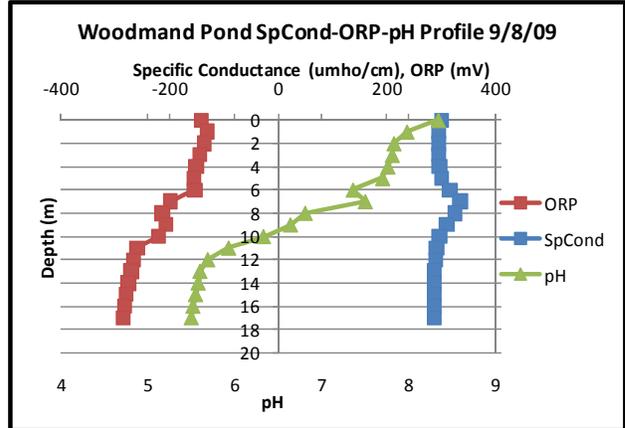
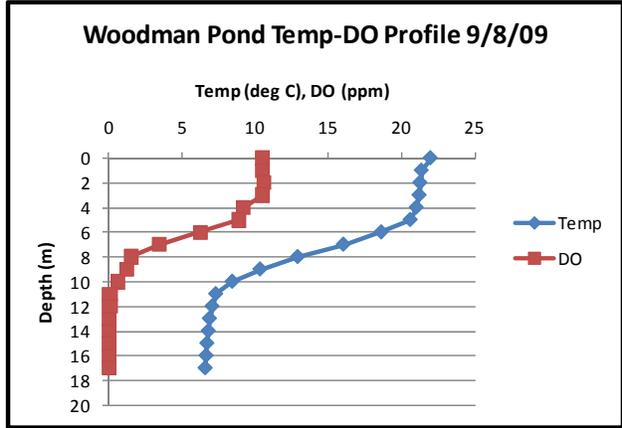
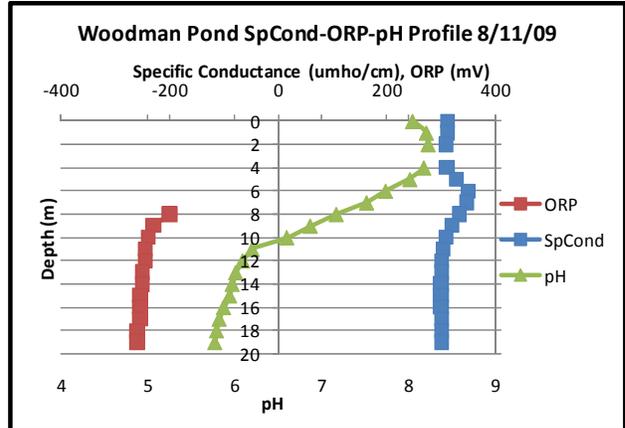
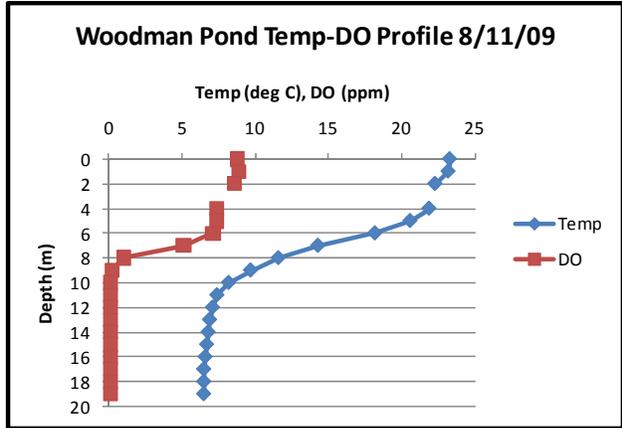
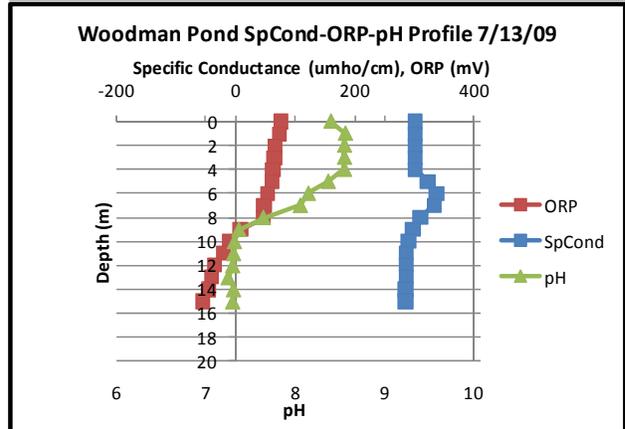
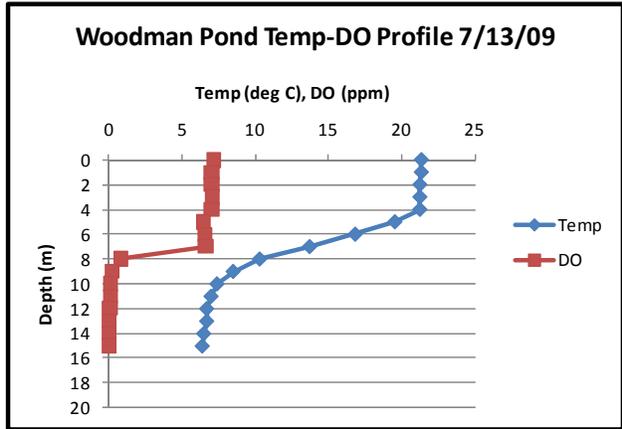
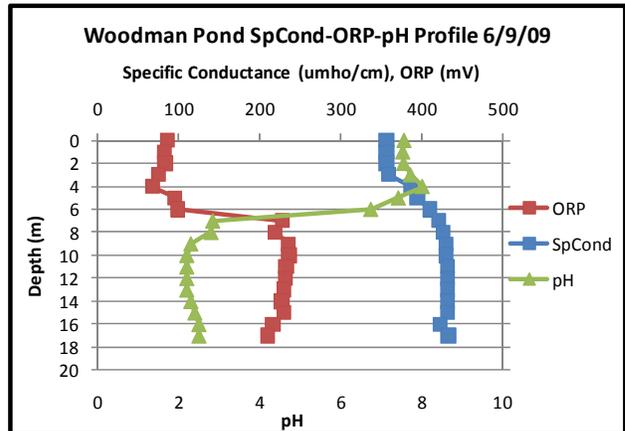
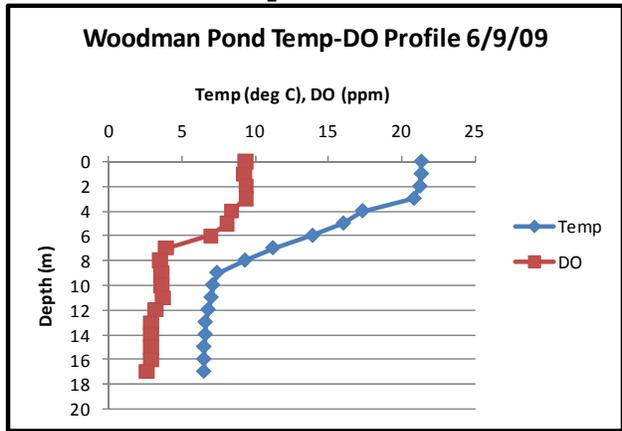
Exotic Plants:

None observed

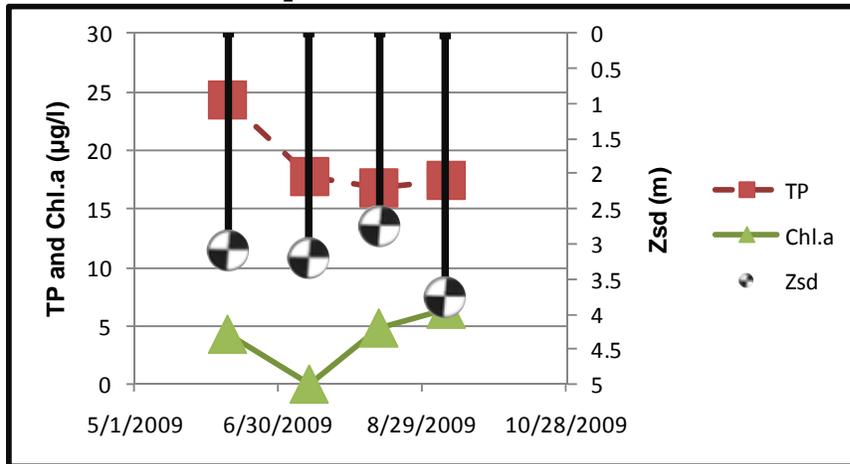
Native Plants:

*Myriophyllum sibiricum* (northern watermilfoil)

# Time Series: Depth Profiles



## Time Series: Trophic Indicators



## WQ Sampling Results

### Surface Samples

	UNITS	N	MIN	AVG	MAX	Scientific Classification	Regulatory Comments
SECCHI	meters	4	2.75	3.2	3.75	Mesotrophic	No readings violate DOH guidance value
TSI-Secchi			45.4	43.2	41.0	Mesotrophic	No pertinent water quality standards
TP	mg/l	4	0.0168	0.0191	0.0243	Mesotrophic	25% of readings violate DOH guidelines
TSI-TP			44.8	46.7	50.1	Mesotrophic	No pertinent water quality standards
TSP	mg/l	4	0.0031	0.0088	0.0168	High % soluble Phosphorus	No pertinent water quality standards
NOx	mg/l	4	0.0036	0.0049	0.008	Low nitrate	No readings violate DOH guidance value
NH4	mg/l	4	0.012	0.019	0.027	Low ammonia	No readings violate DOH guidance value
TKN	mg/l	4	0.46	0.52	0.6	Intermediate organic nitrogen	No pertinent water quality standards
TN/TP	mg/l	4	49.61	61.29	75.88	Phosphorus Limited	No pertinent water quality standards
CHLA	ug/l	4	ND	4.12*	6.4	Mesotrophic	No pertinent water quality standards
TSI-CHLA			ND	42.6*	48.8	Mesotrophic	No pertinent water quality standards
Alkalinity	mg/l	4	119	127	144	Moderately Buffered	No pertinent water quality standards
TCOLOR	ptu	4	5	15	20	Weakly Colored	No pertinent water quality standards
TOC	mg/l	4	4.3	4.6	4.8		No pertinent water quality standards
Ca	mg/l	4	25.4	28.9	35.2	Minimally Supports Zebra Mussels	No pertinent water quality standards
Fe	mg/l	4	0.0204	0.057	0.0937		No readings violate DOH guidance value
Mn	mg/l	4	0.0173	0.0291	0.0485		No readings violate DOH guidance value
Mg	mg/l	4	16	16.43	16.8		No readings violate DOH guidance value
K	mg/l	4	0.599	0.74	0.94		No pertinent water quality standards
Na	mg/l	4	10.9	12.1	12.8		No readings violate DOH guidance value
Cl	mg/l	4	21.1	22.63	23.4	Moderate road salt runoff	No readings violate DOH guidance value
SO4	mg/l	4	11	11.93	13.3		No readings violate DOH guidance value

\* The chlorophyll *a* average was calculated with non-detects being treated as equal to half the detection limit or 1.0 ug/l.

## Bottom Samples

	UNITS	N	MIN	AVG	MAX	Scientific Classification	Regulatory Comments
TP-bottom	mg/l	4	0.0162	0.0369	0.0597		No pertinent water quality standards
TSP-bottom	mg/l	4	0.0048	0.023	0.0455	High % soluble phosphorus	No pertinent water quality standards
NOx-bottom	mg/l	4	0.0033	0.0724	0.204	Evidence of DO depletion	No readings violate DOH guidance value
NH4-bottom	mg/l	4	0.296	0.63	0.881	Evidence of DO depletion	No readings violate DOH guidance value
TKN-bottom	mg/l	4	0.59	0.97	1.31		No pertinent water quality standards
Alk-bottom	mg/l	4	190	193.8	199	Moderately Buffered	No pertinent water quality standards
TCOLOR-bottom	ptu	4	5	16.3	30	Weakly Colored	No pertinent water quality standards
TOC-bottom	mg/l	4	2.6	2.8	2.9		No pertinent water quality standards
Ca-bottom	mg/l	4	49.2	51.8	53.7		Strongly Supports Zebra Mussels
Fe-bottom	mg/l	4	0.0086	0.0189	0.0309		No readings violate DOH guidance value
Mn-bottom	mg/l	4	0.0889	0.435	0.681	Taste or odor likely	50% of readings violate DOH guidelines
Mg-bottom	mg/l	4	15.7	16.6	17.5		No readings violate DOH guidance value
K-bottom	mg/l	4	0.91	0.99	1.06		No pertinent water quality standards
Na-bottom	mg/l	4	10.6	11.3	12		No readings violate DOH guidance value
Cl-bottom	mg/l	4	18.1	20.7	22.2		No readings violate DOH guidance value
SO4-bottom	mg/l	4	10.6	11.88	13.8		No readings violate DOH guidance value

## Lake Perception

	UNITS	N	MIN	AVG	MAX	Scientific Classification	Regulatory Comments
WQ Assessment	1-5, 1 best	4	2	2.25	3	Not Quite Crystal Clear	No pertinent water quality standards
Weed Assessment	1-5, 1 best	4	2	3	4	Plants Grow to Lake Surface	No pertinent water quality standards
Recreational Assessment	1-5, 1 best	4	2	2.5	3	Slightly Impaired	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  
 N = number of samples  
 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	= <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