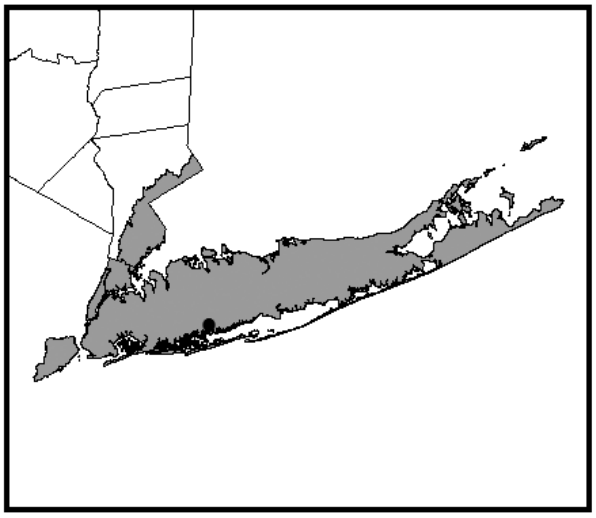
LCI Lake Water Quality Summary

General Information

Lake Name:	**Massapequa Reservoir**
Location:	Massapequa Preserve County Park, Massapequa, Town of Hempstead, Suffolk County, New York
Basin:	Atlantic Ocean/Long Island Sound Basin
Size:	7.8 hectares (19.3 acres)
Lake Origins:	man-made
Major Tributaries:	Massapequa Creek
Lake Tributary to:	Massapequa Creek
Water Quality Classification:	A (best intended use: drinking water supply)
Sounding Depth:	1.6 meters (5 feet)- samples collected from the lake at the outlet
Sampling Coordinates:	Latitude: 40.67773, Longitude: -73.46364
Sampling Access Point:	Parking area off the Sunrise Highway at southern end of the reservoir
Monitoring Program:	Lake Classification and Inventory (LCI) Survey
Sampling Dates:	6/24/2009, 7/21/09, 8/20/2009, 9/22/2009
Samplers:	Scott Kishbaugh, NYSDEC Division of Water 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

Massapequa Reservoir is just north of the Sunrise Highway and is the second largest waterbody in Massapequa Preserve Park. The reservoir and park are managed by Nassau County. The park is popular for walking, running, and biking on the numerous paved and unpaved trails. People use the reservoir for fishing and wildlife viewing. Water enters the reservoir from Massapequa Creek which flows through a few other ponded areas and wetlands before reaching the reservoir. Although much of the course of Massapequa Creek is within confines of the forested preserve, much of the watershed is in the large residential developments on either side of the preserve. Nassau County is currently working to improve water quality throughout the preserve.

The pond was included in the New York State DEC Division of Water's 2009 intensive (monthly sampling) Lake Classification and Inventory (LCI) survey of the Atlantic Ocean/ Long Island Sound (AO/LIS) basin. Inclusion in the survey was based on an "Impacted Segment" listing in The 2000 AO/LIS Waterbody Inventory and Priority Waterbodies List (WIPWL). The WIPWL states:

> Fish consumption in Massapequa Reservoir is impaired due to a specific NYS DOH health advisory that recommends eating no more than one meal per month of white perch because of elevated chlordane concentrations. Although trout stocking was suspended when chlordane problems were identified, it was reinstituted when a cage study indicated no significant uptake in stocked trout. Pond is slowly filling with sediment to the detriment of the fishery. (2000-01 NYS DOH Health Advisories).
>
> Past water quality analyses have noted extremely high nitrate and phosphorus levels and low dissolved oxygen. Sedimentation continues to fill in the reservoir. (DEC/DOW, Region 1, 1998)
>
> The reservoir is included in the Nassau County Suburban Pond Management Plan. The county received state Clean Water/Clean Air Bond Act funding in 2001 to rehabilitate Massapequa Preserve, which include the reservoir. These rehabilitation measures include construction of a stormwater treatment system, restoration of eroding pond/stream banks and construction of a flow augmentation system. (DEC/DOW, Region 1, October 2001).

There continues to be a fish consumption advisory that recommends eating no more than one meal per month of white perch because of elevated chlordane (2009-2010 NYS DOH Health Advisories).

Massapequa Reservoir can generally be characterized as *mesoeutrophic*, or moderately to highly productive. The water clarity reading (TSI < 53, typical of *eutrophic* lakes) was expected given the average phosphorus reading (TSI = 49, typical of *mesoeutrophic* lakes), and the average chlorophyll *a* reading (TSI = 48, typical of *mesoeutrophic* lakes). These data indicate that nutrient levels are in the moderate to high range and may occasionally be high enough to produce algal blooms. It should be noted that Secchi disk transparency readings cannot be accurately measured, since the disk is visible while sitting on the bottom of the lake (the lake depth is comparable at the outlet and the deepest portions of the lake). However, the phosphorus and chlorophyll *a* data suggest that the actual Secchi disk transparency readings are probably only slightly higher than recorded during these sampling sessions.

The reservoir was observed to have a slightly turbid appearance, with algal greenness noted during the August and September sampling events. Massapequa Reservoir had the highest water clarity among the waterbodies sampled in Nassau County. Several rooted aquatic plants species were observed in the

reservoir and included: the native *Ceratophyllum demersum* (coontail), *Zosterella dubia* (water star grass), *Elatine sp.* (waterwort), and the invasive species *Myriophyllum aquaticum* (parrot feather). Parrot feather often can outcompete native vegetation and grow to nuisance levels (see plant profile below).

Like most shallow water bodies, Massapequa Reservoir does not exhibit thermal stratification, in which depth zones (warm water on top, cold water on bottom during the summer) are established. Temperature and dissolved oxygen readings were consistent throughout the water column. pH reading indicate alkaline waters, which is typical of ponds exhibiting high levels of algae. The August pH reading exceeded the state pH water quality standard of 8.5. Values above 8.5 may result in impacts to aquatic life. The conductivity readings indicate hard water (high ionic strength). High conductivity levels were typical among other ponds sampled in Nassau County and can be attributed to high levels of dissolved salts associated with runoff from developed areas.

Massapequa Reservoir appears to be typical of other hardwater, uncolored, alkaline water bodies. Other lakes with similar water quality characteristics often support warmwater fisheries, although fisheries habitat cannot be fully evaluated through this monitoring program. Coldwater fish species may not survive well in the reservoir due to the lack of cold water during the summer. The June sampling event did show that subsurface water was cool, but it is unknown if this can be maintained throughout the summer in much of the lake. The augmentation of the stream flow with cold water and dredging portions of the reservoir as is proposed by the county may make trout survival in the reservoir more likely in the future.

A sediment sample was taken from the pond and analyzed for contaminates as well as toxicity. Sediment from the pond was found to have levels of endrin above the Threshold Effect Concentration (TEC). The TEC represents the concentration below which adverse effects to sediment biota are not expected to occur. Endrin is an organochloride that was used in pesticides. It is known to be very toxic to aquatic organisms including fish, invertebrates and phytoplankton. The Microtox® analysis showed the sediment to be slightly toxic.

Chloride levels were in the high range and indicate significant impacts due to road salting and/or runoff through developed areas. Sodium levels from all four sampling events were above the state drinking water standard. Only the July total phosphorus levels exceeded the state's guidance value. This is atypical among the other Nassau County water bodies that were sampled, which regularly exceed the total phosphorus guidance value. Iron levels exceeded the state's guidance value on two occasions. Organic nitrogen levels were low, atypical for other Nassau County water bodies.

Evaluation of Lake Condition Impacts to Lake Uses

Potable Water (Drinking Water)

Massapequa Reservoir is classified for use as a potable water supply; however, it is not believed that the lake is currently used for this purpose. Although the LCI data are not sufficient to evaluate potable water use, these data suggest that the lake water would require substantial treatment to serve as a potable water supply. Surface water withdrawals may be impacted by elevated sodium, and iron levels and the presence of endrin in the soil.

Contact Recreation (Swimming)

It is unknown if people currently or historically swam in the reservoir. Bacteria data are needed to evaluate the safety of Massapequa Reservoir for swimming-these are not collected through the LCI

program. The water clarity reading taken in June was above the State Department of Health minimum of 1.2 meters to protect the safety of swimmers. Rooted aquatic vegetation covers large portions of the reservoir in the summer and would make it difficult for people to swim in the reservoir.

Non-Contact Recreation (Boating and Fishing)

People do currently fish from the shoreline of the reservoir. Boating is not permitted in the reservoir although the shallow water depth and the high density of rooted aquatic plants may make boating difficult in much of the reservoir. There were no indications of stressor to fishing in the reservoir. The reservoir may not support cold water fish species, although the proposed improvements to the reservoir and creek may make the reservoir more suitable for trout survival. There does continue to be a fish consumption advisory that recommends eating no more than one meal per month of white perch because of elevated chlordane (2009-2010 NYS DOH Health Advisories).

Aquatic Life

Elevated nutrient levels and elevated pH may have negative impacts on the aquatic life in the reservoir, as does the sediments, based on the sediment pesticides data and Microtox® sampling data. Parrot feather may outcompete native aquatic plants species. Additional biological studies would need to be conducted to fully evaluated impacts to aquatic life.

Aesthetics

The presence of large densities of rooted aquatic plants, including the invasive plant parrot feather, may detract from the aesthetics of the reservoir; however, it is unlikely that this deters individuals from using the preserve for non-contact recreation.

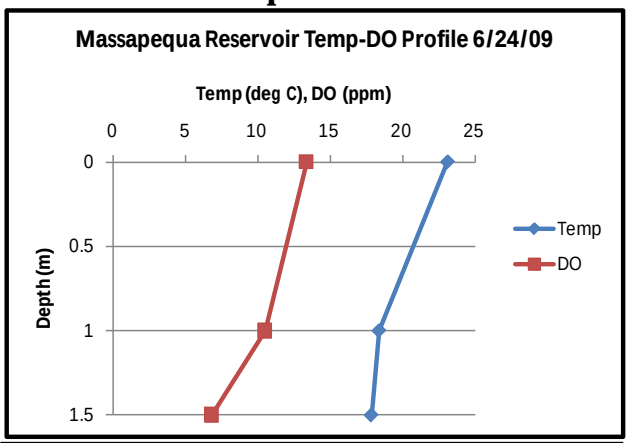
Additional Comments

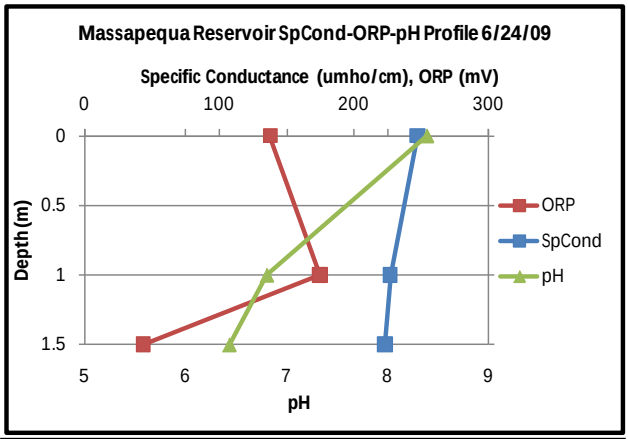
- Periodic surveillance for invasive exotic plant species may help to prevent the establishment and spread of any new invaders, given the escalating problems with exotic aquatic weeds on Long Island.
- Water quality monitoring should be conducted on a regular basis during and after the proposed improvement projects to determine what impacts these projects have on water quality and aquatic life.

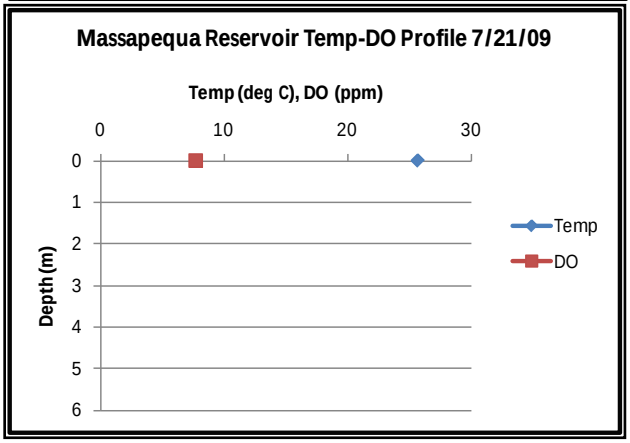
Aquatic Plant IDs

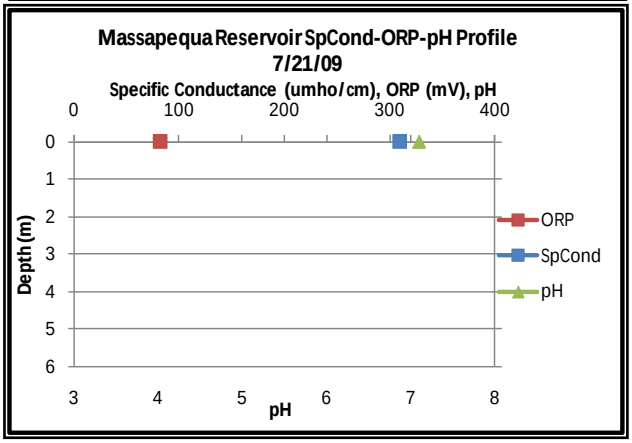
Exotic:	*Myriophyllum aquaticum* (parrot feather)
Native:	*Ceratophyllum demersum* (coontail)
	Zosterella dubia (water star grass)
	Elatine sp. (waterwort)

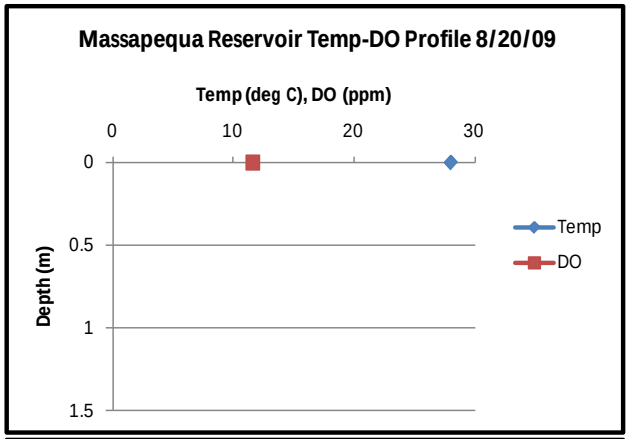
Time Series: Depth Profiles

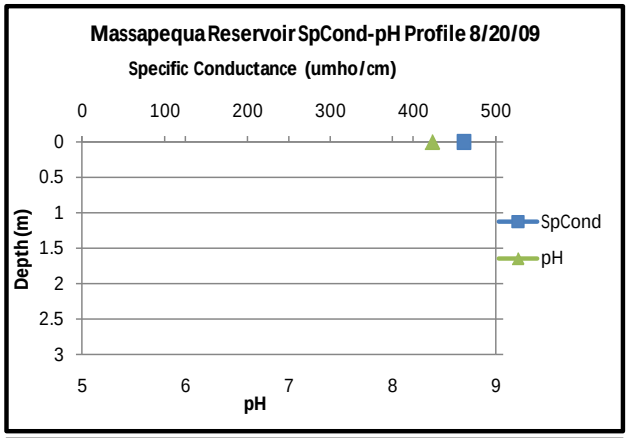


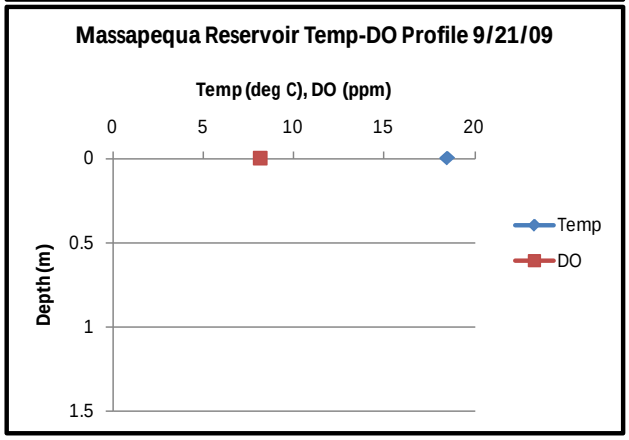


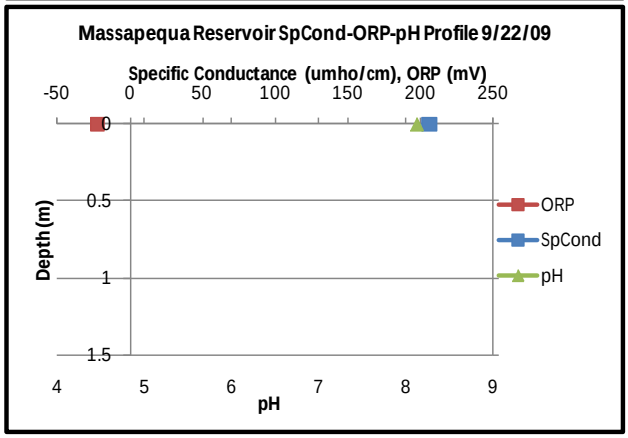




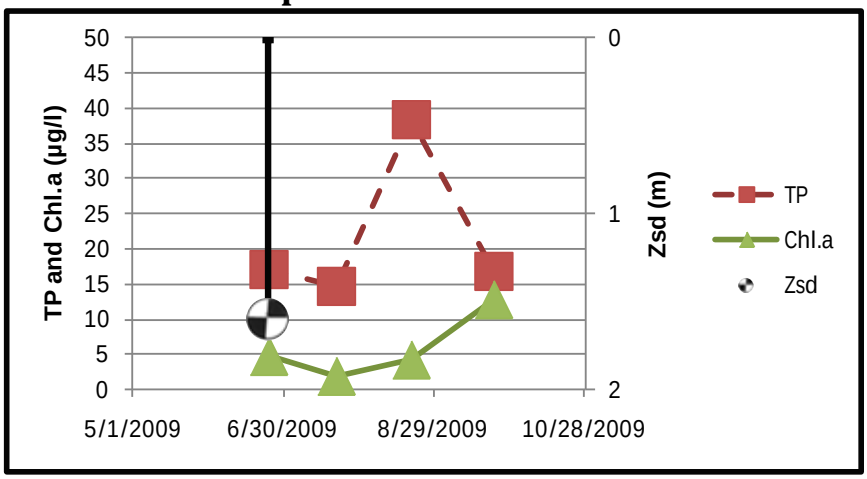








Time Series: Trophic Indicators



WQ Sampling Results

Surface Samples

	UNITS	N	MIN	AVG	MAX	Scientific Classification	Regulatory Comments
SECCHI	meters	1	>1.6	>1.6	>1.6	Eutrophic	No readings violate DOH guidance value
TSI-Secchi			<53.2	<53.2	<53.2	Eutrophic	No pertinent water quality standards
TP	mg/l	4	0.0147	0.0217	0.0383	Eutrophic	25% of readings violate DOH guidelines
TSI-TP			42.9	48.5	56.7	Mesotrophic	No pertinent water quality standards
TSP	mg/l	4	0.008	0.0116	0.0155	High % soluble Phosphorus	No pertinent water quality standards
NOx	mg/l	4	0.757	1.3018	1.82	Elevated nitrate	No readings violate DOH guidance value
NH4	mg/l	4	0.02	0.024	0.028	Low ammonia	No readings violate DOH guidance value
TKN	mg/l	4	0.34	0.46	0.57	Low organic nitrogen	No pertinent water quality standards
TN/TP	mg/l	4	76.22	212.21	293.76	Phosphorus Limited	No pertinent water quality standards
CHLA	ug/l	4	2	5.98	12.8	Mesotrophic	No pertinent water quality standards
TSI-CHLA			37.4	48.1	55.6	Mesotrophic	No pertinent water quality standards
Alkalinity	mg/l	4	29.5	32.4	36	Poorly Buffered	No pertinent water quality standards
TCOLOR	ptu	4	ND	10.6*	20	Uncolored	No pertinent water quality standards
TOC	mg/l	4	3.3	3.7	4		No pertinent water quality standards
Ca	mg/l	4	16.1	17.4	18.4	Minimally Supports Zebra Mussels	No pertinent water quality standards
Fe	mg/l	4	0.0916	0.228	0.329	May have some taste/odor	50% of readings violate DOH guidelines
Mn	mg/l	4	0.0226	0.0482	0.11		No readings violate DOH guidance value
Mg	mg/l	4	3.09	3.94	5.75		No readings violate DOH guidance value
K	mg/l	4	1.97	2.36	3.05		No pertinent water quality standards
Na	mg/l	4	32.4	40.4	54.6		100% of readings violate DOH guidelines
Cl	mg/l	4	56.1	60.43	67.6	Significant road salt runoff	No readings violate DOH guidance value
SO4	mg/l	4	17.6	19.08	20.5		No readings violate DOH guidance value

* The true color average was calculated with non-detects being treated as equal to half the detection limit or 2.5ptu.

Lake Perception

	UNITS	N	MIN	AVG	MAX	Scientific Classification	Regulatory Comments
WQ Assessment	1-5, 1 best	4	2	2.5	3	Definite Algal Greenness	No pertinent water quality standards
Weed Assessment	1-5, 1 best	4	3	4	5	Dense Plant Growth at Lake Surface	No pertinent water quality standards
Recreational Assessment	1-5, 1 best	4	3	3.75	4	Substantially Impaired	No pertinent water quality standards

Legend Information

General Legend Information

Surface Samples = integrated sample collected in the first 2 meters of surface water
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(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

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

References

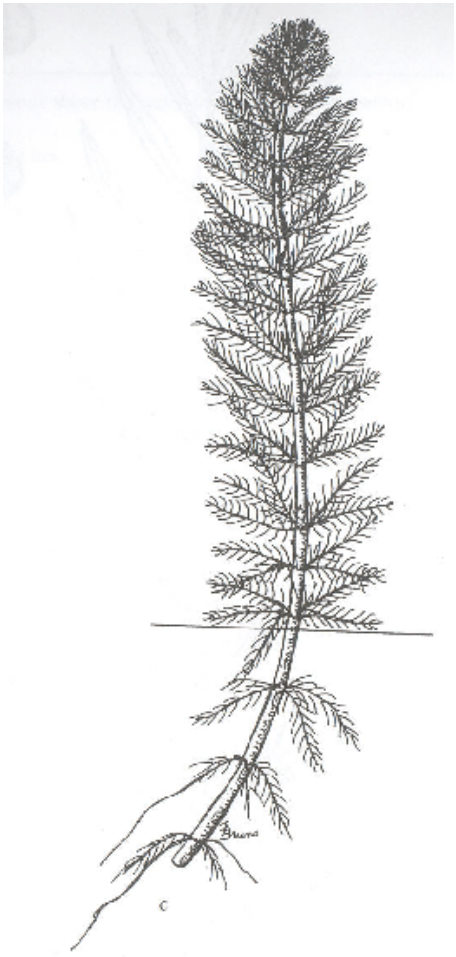
NYSDEC. 2002. The 2000 Atlantic Ocean/ Long Island Sound Basin Waterbody Inventory and Priority Waterbodies List. NYSDEC, Albany, NY.
Available online at http://www.dec.ny.gov/docs/water_pdf/pwlatlv202.pdf.

NYSDOH. 2009. Chemicals in Sportfish and Game 2009-2010 Health Advisories. NYSDOH, Albany, NY.
Available online at http://nyhealth.gov/environmental/outdoors/fish/fish.htm.

SPECIES NAME: ***Myriophyllum aquaticum***

COMMON NAME: parrotfeather

ECOLOGICAL VALUE: like most submergents, *Myriophyllum* harbors aquatic insects, provides hiding, nurseries, and spawning areas for amphibians and fish, and provides some food for waterfowl. However, like *Myriophyllum spicatum*, *Myriophyllum aquaticum* may dominate a water system, restricting boat traffic, recreational activities and water movement. While infestations of milfoil create favorable shelter for small fishes and invertebrates, they also commonly crowds out more desirable waterfowl plants



DISTRIBUTION IN UNITED STATES: in shallow water and margins of ponds, lakes and streams from Long Island and central NY west to Arizona, Washington, Oregon and California, south to Florida and Texas. It is naturalized from South America and becoming widely established in North and Central America.

DISTRIBUTION IN NEW YORK: found only in Long Island and parts of central New York.

DEGREE OF NUISANCE: like most exotics, *M. aquaticum* establishes easily, and once established, often becomes the dominant plant in the macrophyte community, growing abundantly to nuisance levels

COMMENTS: *Myriophyllum aquaticum* is most likely introduced into waterways through export from aquaria, since this is a very common plant in the aquaria trade. It is also known as parrotfeather and water feather, and was historically referred to as *Myriophyllum brasilliense* and *Myriophyllum proserpinacoides*.