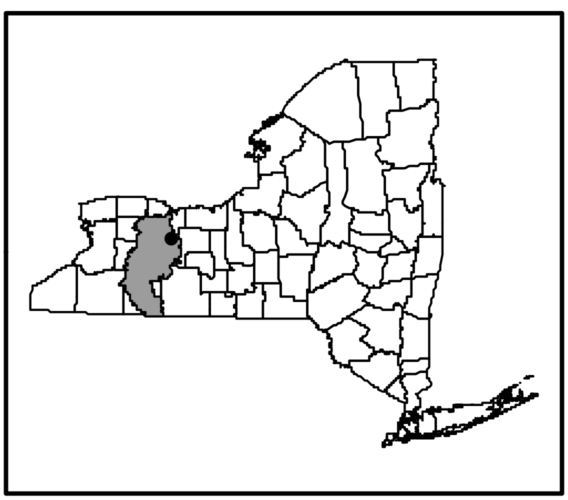
LCI Lake Water Quality Summary

General Information

Lake Name:	**Long Pond**
Location:	Town of Lima, Livingston County, NY
Basin:	Genesee River Basin
Size:	5.2 hectares (12.8 acres)
Lake Origins:	glacial kettle
Major Tributaries:	none
Lake Tributary to:	Honeoye Creek via wetlands and a unnamed tributary
Water Quality Classification:	C (best intended use: secondary contact recreation)
Maximum Sounding Depth:	12.8 meters (42 feet)
Sampling Coordinates:	Latitude: 42.89705, Longitude: -77.5634
Sampling Access Point:	private land (Brian Laux)
Monitoring Program:	Lake Classification and Inventory (LCI) Survey
Sampling Date:	8/3/09, 6/2/10, 7/7/10, 8/5/10 & 9/9/10
Samplers:	David Newman, Scott Kishbaugh, Alene Onion, Erik Posner, & Lorraine Holdridge, 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

Long Pond is one of four ponds in an area known as Lima Ponds. This area is known to be geologically and botanically diverse. Long Pond is a private waterbody (no public access points) surrounded by land owned by two private landowners. The majority of the pond's shoreline is forested with some agricultural fields within the watershed. The pond is currently used for fishing and water skiing.

Long Pond was screened (single sample) through the NYSDEC Division of Water's Lake Classification and Inventory (LCI) program in the summer of 2009, due to a lack of water quality data in the Division of Water's database. This survey found slightly elevated phosphorus, chlorophyll *a*, and ammonia readings. Due to these findings Long Pond was included in the intensive sampling (monthly) of the lakes in the Genesee River Basin during the summer of 2010.

Long Pond can generally be characterized as *mesoeutrophic*, or moderately to highly productive. The average water clarity reading (TSI = 48, typical of *mesotrophic* water bodies) was in the expected range given the average total phosphorus reading (TSI = 50, typical of *mesoeutrophic* water bodies) and the chlorophyll *a* reading (TSI = 50, typical of *mesoeutrophic* water bodies). These data indicate that phosphorus levels in the pond are high enough to support algal blooms. Observations made during the July 2010 sampling event indicate that a bloom was occurring in early July.

The pond usually had a green to yellow tint, most likely due to algae in the water column. A wide variety of native aquatic vegetation was observed to be growing in the pond (see list below). The exotic invasive species *Myriophyllum spicatum* (Eurasian watermilfoil) was also found to be occurring in the pond. This species is known to grow to high densities, outcompeting native vegetation and may grow to levels that can impact recreational uses of the waterbodies it inhabits (see plant profile below).

Long 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 Long Pond was at a depth of 3 to 4 meters throughout the summer. The hypolimnion (bottom waters) was hypoxic (poorly oxygenated) with anoxic (devoid of oxygen) conditions below 5 to 6 meters. The surface pH readings indicate alkaline conditions consistently within the state water quality standards (6.5 to 8.5). Conductivity readings indicate hard water (high ionic strength), typical of other lakes sampled in the Genesee River Basin.

Long Pond appears to be typical of hard water, weakly colored lakes. Other lakes with similar water quality characteristics often support warmwater fisheries, although fisheries habitat cannot be fully evaluated though this monitoring program. Coldwater fisheries are unlikely to be supported, given the lack of cold water <u>and</u> high oxygen refugia necessary to protect any salmonids or aquatic life susceptible to high summer temperatures, as well as elevated deepwater ammonia readings. It is not known if coldwater fish have historically been supported in the pond.

Total phosphorus levels in the surface water samples were elevated above the state's guidance value during all of the sampling events, with a high percentage of the total phosphorus being soluble (available for primary production in the form of algae). This is common among lakes experiencing oxygen deficiencies, which allows phosphorus bound in the sediments to be released into the water column. Phosphorus, ammonia and manganese readings were elevated in the bottom waters, typical of other persistently anoxic lakes. Arsenic was also found above the laboratories detection limit in two of the bottom water samples, though below water quality standards. Elevated arsenic levels in bottom waters can be associated with persistent anoxic conditions. The alkalinity reading showed the pond has a moderate buffering capacity to neutralize acidic inputs. Chloride and other ion levels are low, typical of lakes in rural watersheds.

Evaluation of Lake Condition Impacts to Lake Uses

Potable Water (Drinking Water)

Long Pond is not classified for use as a potable a water supply. Although the LCI data are not sufficient to evaluate potable water use, these data suggest deep water intakes for drinking water would be *stressed* by ammonia and manganese levels. While deep waster arsenic concentrations were below water quality standards, they may indicate a potential *threat* to the use of pond water for drinking purposes.

Contact Recreation (Swimming)

Long Pond is not classified for contact recreation, swimming and bathing, although the pond currently supports this use. Bacteria data are needed to evaluate the safety of Long Pond for swimming, these data are not collected through the LCI. The data collected by the LCI show that water clarity is sufficiently high enough to provide for safe swimming conditions, although swimming may be *threatened* by occasional algae blooms and slightly elevated nutrient levels, particularly in the bottom waters. The density of vegetation growing in the shallow near shore areas may also hinder swimming in these areas of the pond, although this would be less of an issue in deeper water areas of the pond.

Non-Contact Recreation (Boating and Fishing)

Long Pond is classified for non-contact recreational use and does currently support both boating and fishing. Vegetation in the shallow near-shore areas did make paddling to open water difficult for the field staff, and this vegetation may hinder the ability to fish from the shore of the pond. Recreational use of the pond was assessed to be "slightly impaired" due to high densities of aquatic plants in the shallower near shore areas of the pond. The occurrence of Eurasian watermilfoil in the pond may *threaten* recreational use of the pond.

Aquatic Life

Elevated ammonia levels in hypolimnion may *stress* any aquatic life living in the deeper portions of the pond. Aquatic life support in Long Pond is also *threatened* by low hypolimnetic dissolved oxygen levels and elevated hypolimnetic iron levels.

Aesthetics

Occasional algal blooms and high densities of aquatic plants may *threaten* the aesthetics of the pond.

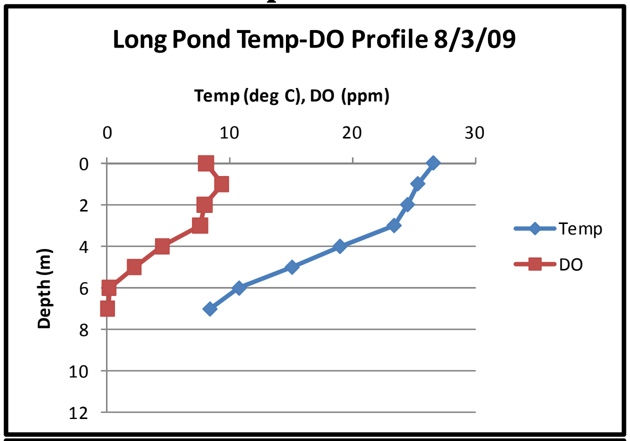
Additional Comments

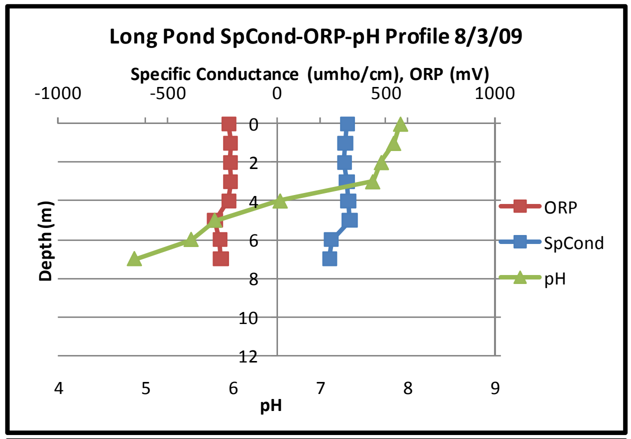
1. Algae identification would determine if the pond may suffer from harmful algal blooms (HABs) and/or the production of algal toxins. This may be conducted in the future by the LCI.
2. Periodic surveillance for invasive exotic plant species may help to prevent the establishment and spread of any new invaders, given the escalating problems with exotic aquatic weeds.
3. Power boating and water skiing on the pond may lead to increased shoreline erosion due to wave action especially in a pond as narrow as Long Pond. In addition turbulence caused by propellers may resuspend nutrients bound in the sediment on the bottom of the pond making them more available to fuel primary production in the form of algae. There is an article by Mosisch and Arthington (2004) that reviews many papers published on the topic of the ecological impacts to freshwater systems from power boating (see references below). Enforcement of the state no-wake zone within 100 feet of shore may limit use of the pond for this purpose.

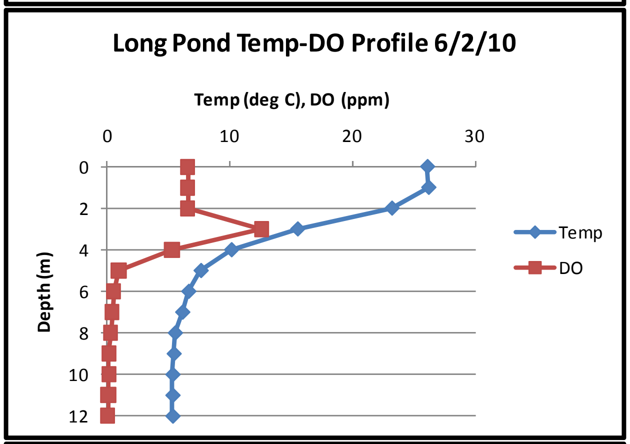
Aquatic Plant IDs

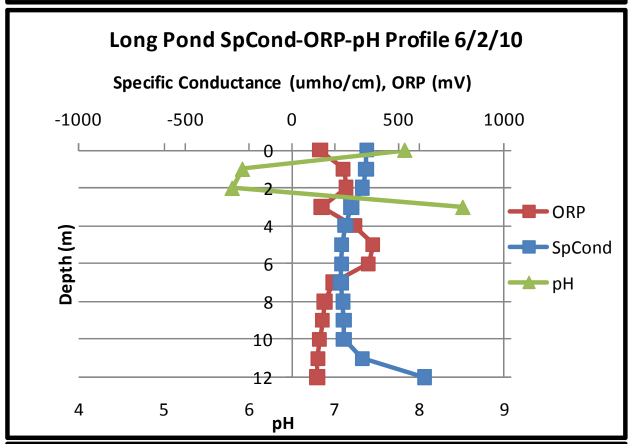
Exotic Plants:	*Myriophyllum spicatum* (Eurasian watermilfoil)
Native Plants:	*Potamogeton natans* (floating brownleaf pondweed)
	Chara sp (Stonewort
	Nuphar sp. (yellow water lily)
	Utricularia vulgaris (common bladderwort)
	Elodea nuttallii (western waterweed)
	Najas flexilis (slender naiad)
	Stuckenia pectinatus (Sago pondweed)
	Sagittaria sp. (arrowhead)
	Zosterella dubia (water stargrass)
	Ceratophyllum demersum (coontail)
	Pontederia cordata (pickerelweed)
	Nymphaea sp. (white water lily)
	Lemna trisulca (star duckweed)
	Potamogeton obtusifolius (bluntleaf pondweed)

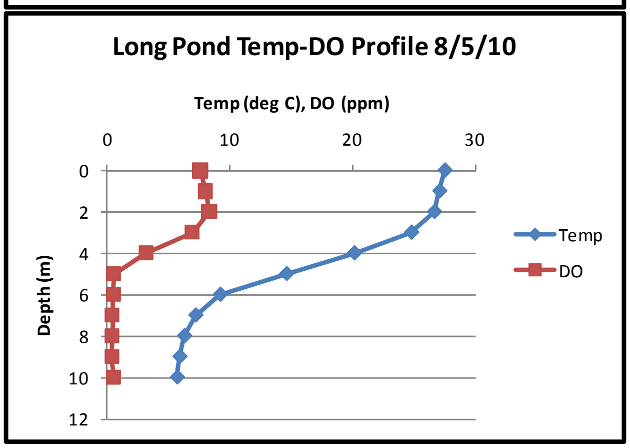
Time Series: Depth Profiles

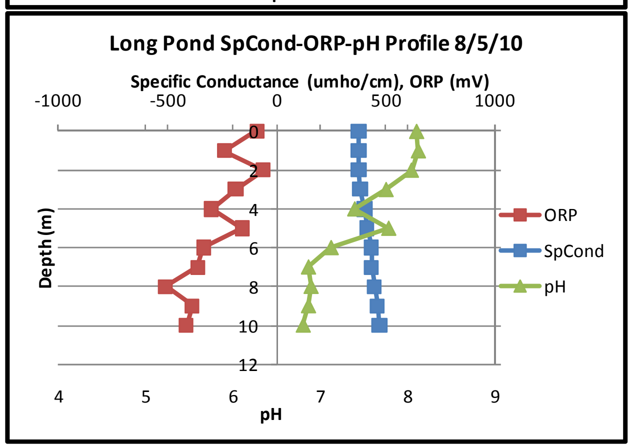


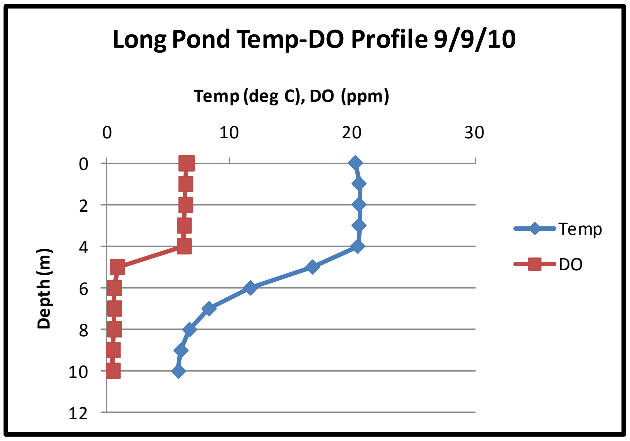


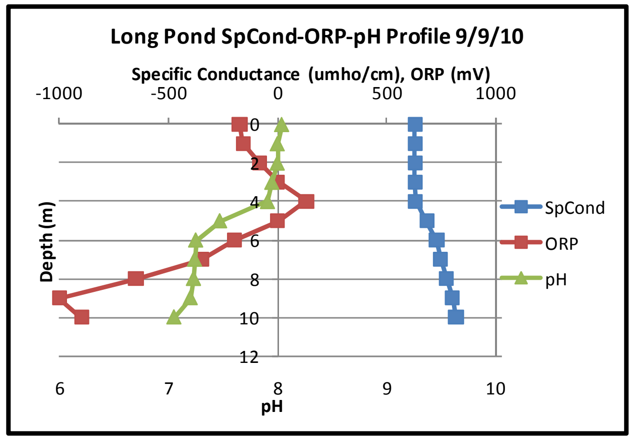




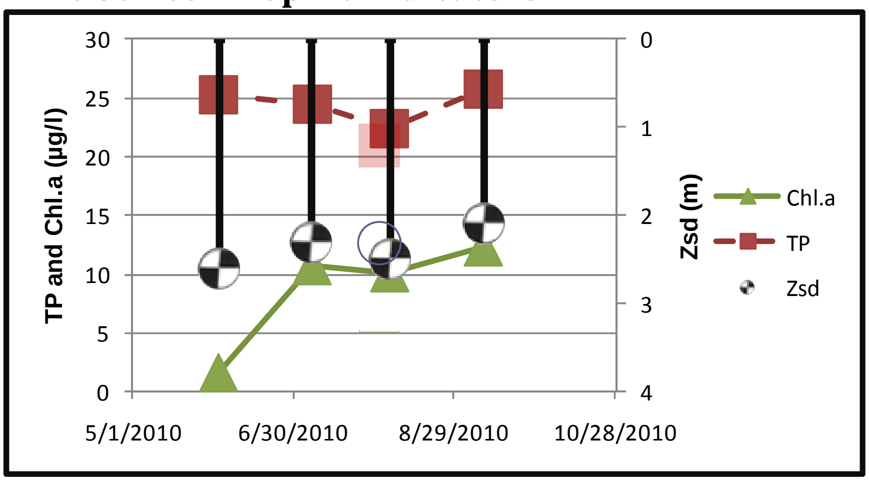








Time Series: Trophic Indicators



* transparent symbols represent the August 3, 2009 data

WQ Sampling Results

Surface Samples

	UNITS	N	MIN	AVG	MAX	Scientific Classification	Regulatory Comments
SECCHI	meters	5	2.1	2.36	2.6	Mesotrophic	No readings violate DOH guidance value
TSI-Secchi			49.3	47.63	46.2	Mesotrophic	No pertinent water quality standards
TP	mg/l	5	0.0209	0.02378	0.0258	Mesotrophic	100% of readings violate water quality standards
TSI-TP			48.0	49.81	51.0	Mesotrophic	No pertinent water quality standards
TSP	mg/l	5	0.0062	0.01198	0.0267	High % soluble Phosphorus	No pertinent water quality standards
NOx	mg/l	5	0.0025	0.0034	0.0039	Low nitrate	No readings violate water quality standards
NH4	mg/l	5	ND	0.0132	0.024	Low ammonia	No readings violate water quality standards
TKN	mg/l	5	0.74	0.84	0.95	Elevated organic nitrogen	No pertinent water quality standards
TN/TP	mg/l	5	64.57	78.72	93.66	Phosphorus Limited	No pertinent water quality standards
CHLA	ug/l	5	1.6	8.32	12.3	Eutrophic	No pertinent water quality standards
TSI-CHLA			35.2	49.42959	55.2	Mesotrophic	No pertinent water quality standards
Alkalinity	mg/l	5	160	165.2	172	Moderately Buffered	No pertinent water quality standards
TCOLOR	ptu	5	15	16	20	Weakly Colored	No pertinent water quality standards
TOC	mg/l	5	8.6	9.94	11.7		No pertinent water quality standards
Ca	mg/l	5	36.3	40.18	43	Strongly Supports Zebra Mussels	No pertinent water quality standards
Fe	mg/l	5	0.021	0.0298	0.0449		No readings violate water quality standards
Mn	mg/l	5	0.0129	0.02034	0.0247		No readings violate water quality standards
Mg	mg/l	5	14.2	16.02	17		No readings violate water quality standards
K	mg/l	5	1.62	1.83	2.00		No pertinent water quality standards
Na	mg/l	5	10.1	10.64	10.9		No readings violate water quality standards
Cl	mg/l	5	15.9	16.16	16.4	Moderate road salt runoff	No readings violate water quality standards
SO4	mg/l	5	4.5	4.7	5.1		No readings violate water quality standards

Bottom Samples

	UNITS	N	MIN	AVG	MAX	Scientific Classification	Regulatory Comments
TP-bottom	mg/l	5	0.189	0.509	0.916	Elevated deepwater phosphorus	No pertinent water quality standards
TSP-bottom	mg/l	5	0.224	0.41166	0.834	High % soluble phosphorus	No pertinent water quality standards
NOx-bottom	mg/l	5	0.0029	0.0045	0.0095	No evidence of DO depletion	No readings violate water quality standards
NH4-bottom	mg/l	5	1.41	3.45	6.13	Evidence of DO depletion	60% of readings violate DOH guidelines
TKN-bottom	mg/l	5	2.78	4.44	7.14		No pertinent water quality standards
Alk-bottom	mg/l	5	186	197	207	Moderately Buffered	No pertinent water quality standards
TCOLOR-bottom	ptu	5	20	20	20	Weakly Colored	No pertinent water quality standards
TOC-bottom	mg/l	5	8.6	9.64	11.4		No pertinent water quality standards
Ca-bottom	mg/l	5	45.9	47.18	49.7		Strongly Supports Zebra Mussels
Fe-bottom	mg/l	5	0.098	0.205	0.368	May have some taste/odor	No readings violate water quality standards
Mn-bottom	mg/l	5	0.898	1.648	1.95	Taste or odor likely	100% of readings violate water quality standards
Mg-bottom	mg/l	5	15.4	16.44	17.5		No readings violate water quality standards
K-bottom	mg/l	5	2.32	2.544	2.75		No pertinent water quality standards
Na-bottom	mg/l	5	10.7	11.26	11.7		No readings violate water quality standards
Cl-bottom	mg/l	5	16.9	17.44	18.1		No readings violate water quality standards
SO4-bottom	mg/l	5	2.2	3.44	4.6	May have rotten egg odor	No readings violate water quality standards
As-bottom	mg/l	3	ND	0.325	0.475	Threat to deep potable water intakes	No readings violate water quality standards

Lake Perception

	UNITS	N	MIN	AVG	MAX	Scientific Classification	Regulatory Comments
WQ Assessment	1-5, 1 best	5	3	2.8	3	Definite Algal Greenness	No pertinent water quality standards
Weed Assessment	1-5, 1 best	5	3	3.2	4	Plants Grow to Lake Surface	No pertinent water quality standards
Recreational Assessment	1-5, 1 best	5	2	2.8	4	Slightly Impaired	No pertinent water quality standards

References

Mosisch, T.D. and A.H. Arthington. 2004. Impacts of Recreational Power Boating on Freshwater Ecosystems. Buckley, R, editor. Environmental Impacts of Ecotourism. Ecotourism Book Series, Volume 2. Cambridge, MA: CABI Publishing. p. 125-154.

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(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
As	=arsenic, mg/l Detection limit = 0.236 mg/l; NYS standard = 10 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

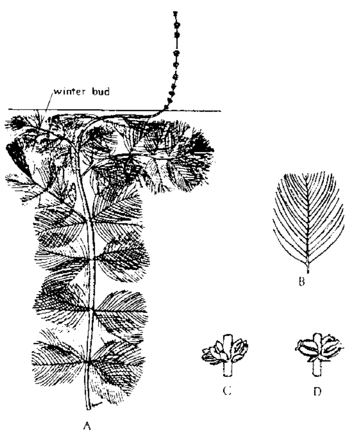
Lake Assessment

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

SPECIES NAME: *Myriophyllum spicatum*

COMMON NAME: Eurasian water milfoil

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, *Myriophyllum spicatum* 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



Myriophyllum spicatum: A. habit of submersed form with emergent inflorescence, × ½. B. leaf, × 1. C. flowers, × 2. D. fruits, × 2.

DISTRIBUTION IN UNITED STATES: locally abundant and aggressive from Quebec and New England west to Ontario, Michigan, Wisconsin, and British Columbia, south to Florida, Oklahoma, Texas, Washington, California, and Mexico (the range of this plant continues to increase each year)

DISTRIBUTION IN NEW YORK: found in increasing amounts throughout the State, except in the interior Adirondacks and the Long Island area (although it has recently been discovered in both locations)

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

COMMENTS: while some species of *Myriophyllum* have earned a reputation for aggressive and opportunistic growth, most of the species in this genus are not nearly so robust, and often peacefully coexist with other submergent plants. The individual species within the *Myriophyllum* genus are superficially similar, so complete plants, including flowers (often pink) and fruits, are often needed for positive identification. The leaf structures and patterns of the milfoil closely resemble those of the *Ceratophyllum* (coontail) and *Utricularia* (bladderwort), and as a result, these plants are often confused for each other, particularly when viewed from a slight distance. Peak growth for most species is in mid-summer. *M. spicatum* is distinguished from other milfoils by having smaller flower-leaf structures on the emergent spike, flat-topped ends on the upper most submerged leaves, and red tips during the peak growing season and white to slightly pinkish stems. *Myriophyllum* spreads and reproduces vegetatively. This is one of the most discussed and well-known plants in the state, due to its propensity to form dense canopies that overwhelm the underlying native plant populations. Improved surveillance has greatly expanded the known range of this species within the state, though the range may have concurrently extended due to spread from boat traffic, waterfowl, and water transport from infected to uncontaminated lakes. Appropriate control strategies avoid excessive fragmentation.

Line drawing- Crowe, G.E. and C.B. Hellquist. Aquatic and wetlands plants of northeastern North America. 2000