LCI Lake Water Quality Summary

Lake Name: Lower Little York Lake

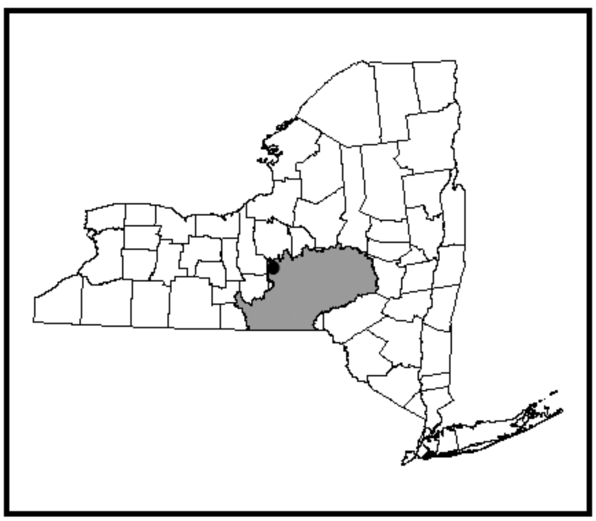
Location: Little York, Town of Homer, Cortland County, New York
Basin: Susquehanna River Basin
Size: 7.8 hectares (19 acres)
Lake Origins: natural
Major Tributaries: Upper Little York Lake **(**West Branch of the Tioughnioga River)
Lake Tributary to?: West Branch of the Tioughnioga River
Water Quality Classification: B (best intended use: primary contact recreation)

Sounding Depth: 2.9 meters (9.5 feet)
Sampling Coordinates: Latitude: 42.69205, Longitude: -76.16388
Sampling Access Point: private property at inlet from Upper Little York Lake

Monitoring Program: Lake Classification and Inventory (LCI) Survey
Sampling Dates: 6/9/2009, 7/13/2009, 8/11/2009 & 9/8/2009
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

Lower Little York Lake is at the southern end (downstream end) of a heavily ponded region of Cortland County that is the headwaters to the West Branch of the Tioughnioga River. The lake is shallow throughout with a slightly deeper channel that runs from inlet from Upper Little York Lake to the highly vegetative southern end of the lake. The lake is surrounded by land in private ownership. There is a forested buffer around most of the lake with residential and agricultural land beyond this buffer. Like the near shore watershed, the larger watershed consists of residential and agricultural lands. The lake is used by local children for fishing and possibly boating and swimming.

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 Susquehanna River Basin. Inclusion in the survey was based on an assessment done on Upper Little York Lake in the late 1990's that found reduced dissolved oxygen levels in the bottom waters of the upper lake and concerns about densities of aquatic plants in both lakes. Both Upper and Lower Little York Lake are on the New York State 2008 Section 303(d) List of Impaired Waters, due the oxygen deficits recorded in Upper Little York Lake.

Lower Little York Lake can generally be characterized as *mesotrophic*, or moderately productive. The water clarity reading (TSI < 50, typical of *mesotrophic* lakes) is expected given the chlorophyll *a* reading (TSI = 42, typical of *mesotrophic* lakes), and the phosphorus reading (TSI = 43, typical of *mesotrophic* lakes). These data indicate that baseline nutrient levels do not support persistent algal blooms in the lake. These data were similar to those seen in Upper Little York Lake in 1998 suggesting that these may be typical for both waterbodies.

The water in the lake was clear with slight algal greenness noted in two of the four sampling events. The clear water and shallow water depth allowed for good observations to be made of the aquatic plant community in the lake. The assessment of the plant community found *Myriophyllum spicatum* (Eurasian watermilfoil), and *Potamogeton crispus* (curlyleaf pondweed), both invasive species that were found in Upper Little York Lake during the 1998 assessment (profiles for both species are included below). In addition several native plant species were also found, including *Ceratophyllum demersum* (coontail), *Chara sp.* (stonewort), *Elodea canadensis* (common waterweed), *Nuphar sp.* (yellow water lily), *Potamogeton amplifolius* (large leaf pondweed), *Potamogeton illinoensis* (Illinois pondweed), *Potamogeton zosteriformis* (flat stemmed pondweed), *Ranunculus* sp. (water crowfoot), and *Stuckenia filiformis* (fineleaf pondweed). In the shallow southern portion of the lake, several plant species were growing in high densities at the lake's surface making paddling a canoe difficult.

Like most shallow lakes, Lower Little York Lake does not exhibit thermal stratification, in which depth zones (warm water on top, cold water on the bottom during the summer) are established. Temperature and dissolved oxygen reading were comparable throughout the water column. pH readings indicate alkaline water, with all readings falling below the state's maximum guidance value. These readings should be adequate to support most aquatic organisms. The conductivity readings indicate hardwater conditions, typical of other lakes in the area. Both the pH and conductivity readings were consistent with those found in Upper Little York Lake in 1998.

Lower Little York Lake appears to be typical of hardwater, highly 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 probably not supported, given the lack of cold water during the summer. Sodium and chloride levels were elevated and indicate significant impacts from road salting and/ or stormwater runoff through developed areas. None of the other water quality indicators measured through this program indicate water quality problems.

Evaluation of Lake Condition Impacts to Lake Uses

Potable Water (Drinking Water)

Lower Little York Lake is not classified for use as a potable water supply. Although the LCI data are not sufficient to evaluate potable water use, these data indicate that sodium levels were above the state's drinking water standard.

Contact Recreation (Swimming)

Lower Little York Lake is classified for contact recreation. Bacteria data are needed to evaluate the safety of the lake for swimming- these are not collected through the LCI. The data collected through the LCI indicate that swimming in some portions of the lake may be threatened by excessive plant growth. Water clarity readings were 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)

Due to the shallow nature of the lake and limited access, lake it is unlikely that people boat on the lake. Boating on some portions of the lake may be difficult due to the excessive plant growth. During at least one sampling event an individual was seen fishing from the shoreline of the lake. Shoreline fishing may also be impacted by excessive aquatic plant growth.

Aquatic Life

There were no indications of stressors to aquatic life. It is not know if oxygen deficits in Upper Little York Lake may be affecting aquatic life in Lower Little York Lake. More detailed biological studies would need to be conducted to fully evaluated impacts to aquatic life in Lower Little York Lake.

Aesthetics

Excessive aquatic plant growth may detract from aesthetics of the lake.

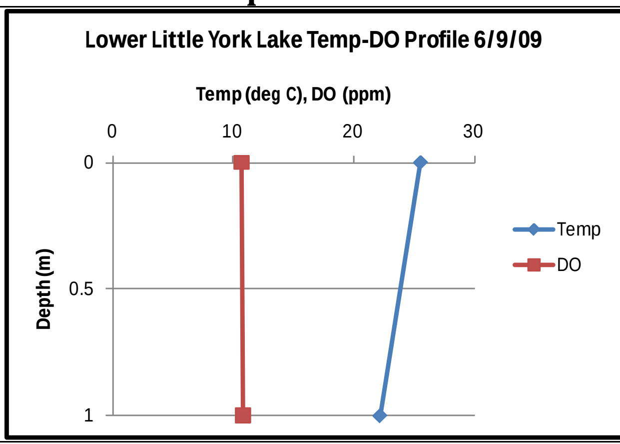
Additional Comments

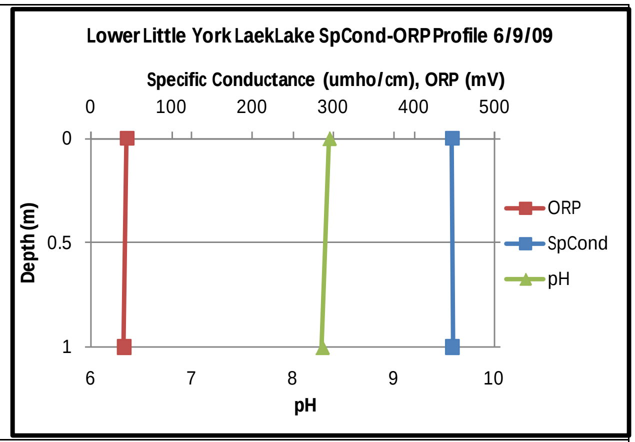
- In almost all cases the data collected at Lower Little York Lake fell in the range of values for the same parameters collected from the surface water samples in Upper Little York Lake in 1998. This would indicate that the data collected on Lower Little York Lake as probably typical for the waterbody.
- 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.

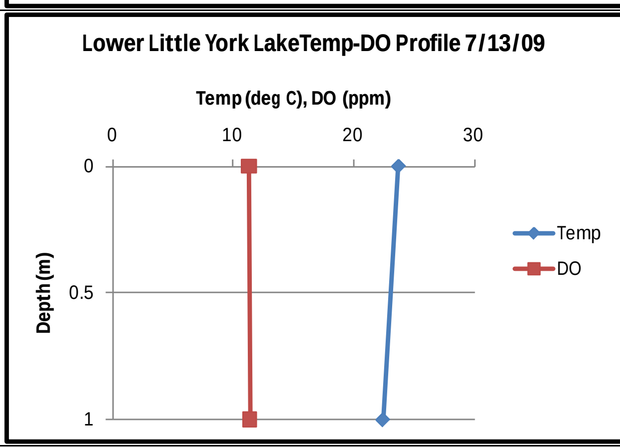
Aquatic Plant IDs

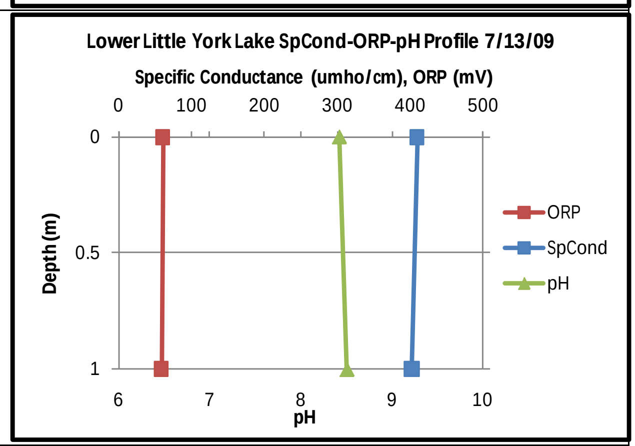
Exotic:	*Myriophyllum spicatum* (Eurasian watermilfoil)
	Potamogeton crispus (curlyleaf pondweed)
Native:	*Ceratophyllum demersum* (coontail)
	Chara sp. (stonewort)
	Elodea canadensis (common waterweed)
	Nuphar sp. (yellow water lily)
	Potamogeton amplifolius (large leaf pondweed)
	Potamogeton illinoensis (Illinois pondweed)
	Potamogeton zosteriformis (flat stemmed pondweed)
	Ranunculus sp. (water crowfoot)
	Stuckenia filiformis (fineleaf pondweed)

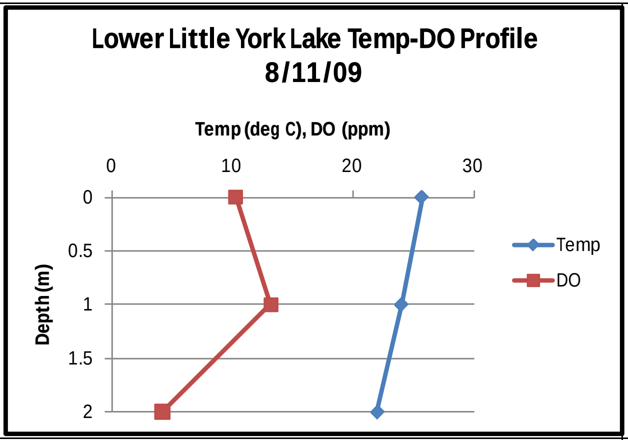
Time Series: Depth Profiles

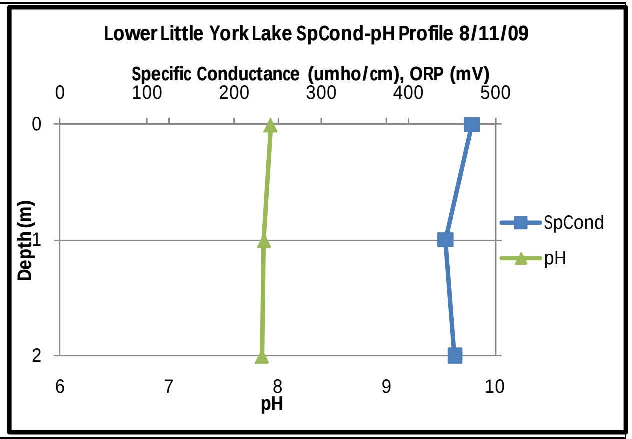


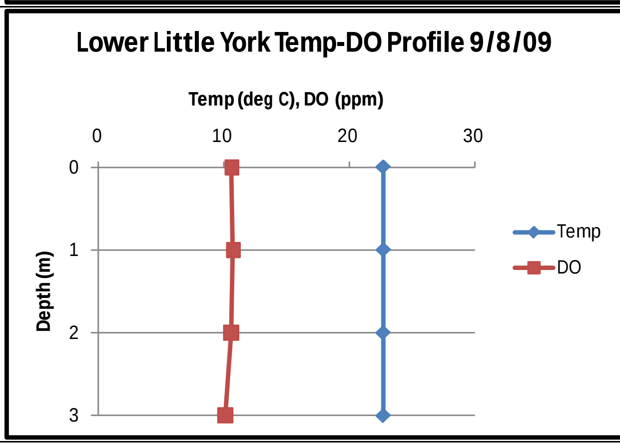


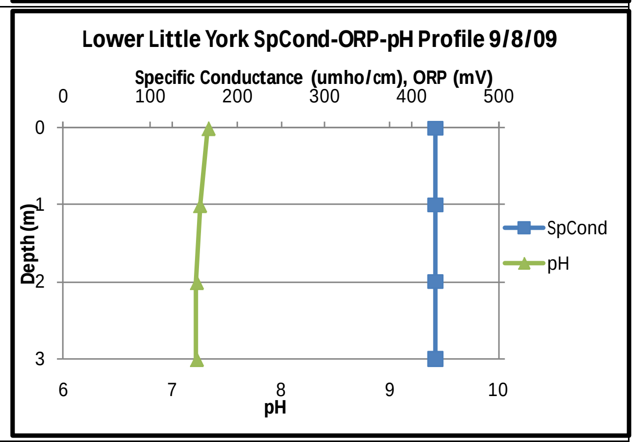




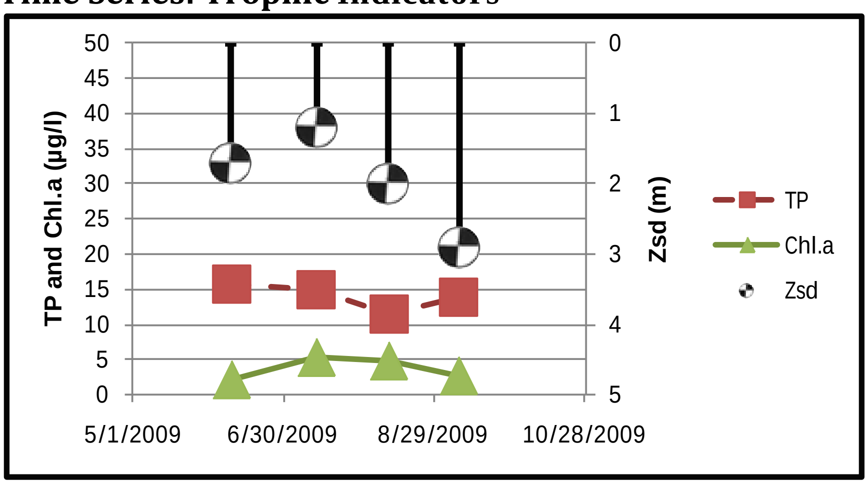








Time Series: Trophic Indicators



*Due the shallowness of the lake the Secchi disk could always be seen on the bottom of the lake preventing an actual reading from being taken. The actual readings were at least those represented above.

WQ Sampling Results

Surface Samples

	UNITS	N	MIN	AVG	MAX	Scientific Classification	Regulatory Comments
SECCHI	meters	4	>1.2	>2	> 2.9	Mesotrophic*	No readings violate DOH guidelines
TSI-Secchi			<57.4	< 50.0	< 44.7	Mesotrophic*	No pertinent water quality standards
TP	mg/l	4	0.0116	0.0141	0.0158	Mesotrophic	No readings violate DEC guidance value
TSI-TP			39.5	42.3	43.9	Mesotrophic	No pertinent water quality standards
TSP	mg/l	4	0.0031	0.008	0.0162	High % soluble Phosphorus	No pertinent water quality standards
NOx	mg/l	4	0.438	0.5248	0.616	Elevated nitrate	No readings violate DEC WQ standards
NH4	mg/l	4	0.02	0.03	0.035	Low ammonia	No readings violate DEC WQ standards
TKN	mg/l	4	0.4	0.46	0.57	Low organic nitrogen	No pertinent water quality standards
TN/TP	mg/l	4	126.68	156.28	192.69	Phosphorus Limited	No pertinent water quality standards
CHLA	ug/l	4	2.14	3.74	5.3	Mesotrophic	No pertinent water quality standards
TSI-CHLA			38.1	43.5	47.0	Mesotrophic	No pertinent water quality standards
Alkalinity	mg/l	4	144	154.8	160	Moderately Buffered	No pertinent water quality standards
TCOLOR	ptu	4	5	56.3	200	Highly Colored	No pertinent water quality standards
TOC	mg/l	4	3.7	4.2	4.7		No pertinent water quality standards
Ca	mg/l	4	36.2	39.7	41.5	Strongly Supports Zebra Mussels	No pertinent water quality standards
Fe	mg/l	4	0.046	0.081	0.112		No readings violate DEC WQ standards
Mn	mg/l	4	0.0081	0.011	0.0161		No readings violate DEC WQ standards
Mg	mg/l	4	14.7	15.7	16.4		No readings violate DEC WQ standards
K	mg/l	4	0.637	0.89	1.17		No pertinent water quality standards
Na	mg/l	4	22.9	24.33	25.1		100% of readings violate DEC standards
Cl	mg/l	4	39.9	42.55	44.9	Significant road salt runoff	No readings violate DEC WQ standards
SO4	mg/l	4	7.2	8.9	9.9		No readings violate DEC WQ standards

*Due the shallowness of the lake the Secchi disk could always be seen on the bottom of the lake preventing an actual reading from being taken. The scientific classification of *mesotrophic* for Secchi and TSI-Secchi are based on the average depth recorded of 2 meters.

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	3	3.75	4	Dense Plant Growth at Lake Surface	No pertinent water quality standards
Recreational Assessment	1-5, 1 best	4	3	3.25	4	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
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

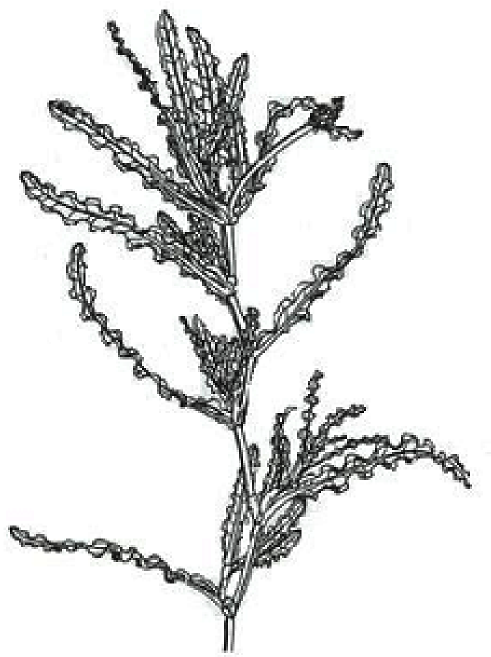
WQ Assessment	**= water quality assessment**, 5 point scale, 1= crystal clear, 2 = not quite crystal clear, 3 = definite algae greenness, 4 = high algae levels, 5 = severely high algae levels
Weed Assessment	**= weed coverage/density assessment**, 5 point scale, 1 = no plants visible, 2 = plants below 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

Plant Profiles

SPECIES NAME: *Potamogeton crispus*

COMMON NAME: curlyleaf pondweed

ECOLOGICAL VALUE: While this is not a native plant to New York state, it has become well established in many lakes and does not disrupt the aquatic ecosystem as do other (recently-introduced) exotics, although it still can out-compete native species and dominate a macrophyte community, particularly in late spring and early summer (before the peak growing season for other native and non-native macrophytes).



DISTRIBUTION IN UNITED STATES: In hard or brackish, often polluted waters, naturalized from Europe and common in New England, western Massachusetts, with a range extending from Quebec west to Minnesota, south to Alabama and Texas, and scattered throughout the western states

DISTRIBUTION IN NEW YORK: widespread and often abundant along the Hudson River and Finger Lakes basins, with some occurrences in far western New York

DEGREE OF NUISANCE: *Potamogeton crispus* may establish easily and grow abundantly, reaching nuisance levels, although the extent of coverage and nuisance conditions is limited by the growing season (winter through early-mid summer)

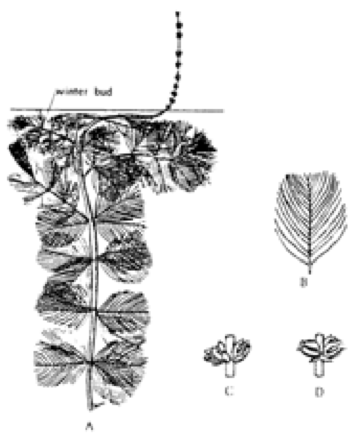
COMMENTS: *Potamogeton* is a highly variable genus within the pondweed family. Species within the genus often are characterized by two leaf types- firm floating leaves and thin emersed leaves. Many mature species have flowers borne in spikes (for wind pollination), conspicuous in early summer. Identification of the individual species can be extremely difficult, particularly among the narrow-leaved pondweeds. The *Potamogeton* are distinguished from the other genus within the pondweed family by having alternate leaves (unlike the *Zanichellia* and *Najas*), and by their presence in fresh or estuarine waters (unlike the *Zostera*). There are nearly 30 species found within New York State, some quite rare and others extremely common. *P. crispus* is one of the four major non-native exotic plant species in New York state, and has served as the impetus for several lake restoration and plant management programs. However, it naturally dies out in many lakes by early to mid summer, often to be replaced by other monocultures. It is characterized by finely-toothed leaf margins and a 'lasagna'-like leaf appearance.

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

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