

LCI Lake Water Quality Summary

General Information

Lake Name: East Mud Lake

Location: Town of Villenova, Chautauqua County, NY

Basin: Allegheny River Basin

Size: 13 hectares (32 acres)

Lake Origins: unknown

Tributaries: Minor ponds and tributaries to the North Branch of Conewango Creek

Watershed Area: 3.3 Square Miles

Lake Tributary to: North Branch Conewango Creek

Water Quality Classification: C (best intended use: secondary contact recreation)

Sounding Depth: 8 meters (26.5 feet)

Sampling Coordinates: 42.43350, -79.09682

Sampling Access Point: Private land

Monitoring Program: Lake Classification and Inventory (LCI) Survey

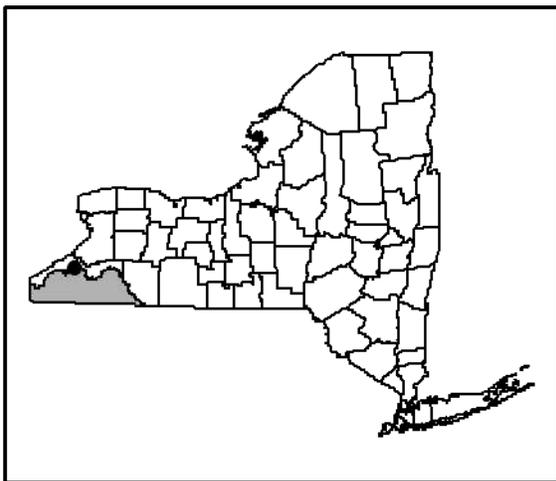
Sampling Date: August 3, 2011

Samplers: Scott Kishbaugh, NYSDEC Division of Water, Albany
Brian Hourigan, NYSDEC Division of Water Buffalo

Contact Information: Scott Kishbaugh, NYSDEC Division of Water
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Lake Map

(sampling location marked with a circle)



Background and Lake Assessment

East Mud Lake is a 30 acre lake in the town of Villanova in northeastern corner of Chautauqua County. The majority of the near shore area as well as the greater watershed of the lake is forested or covered by wetlands. There is a small grass area on the western shoreline of the lake that has several boat docks associated with a small summer housing development. There are a few other properties on the lake that have access to the lake. It is likely that local residents swim, boat and fish on the lake.

The NYSDEC Division of Water lake water quality database had no previous data for the lake, and thus the lake was included in the 2011 Lake Classification and Inventory (LCI) screening program. There were no indications of water quality impairments that would warrant additional monitoring during the summer of 2012.

East Mud Lake can be characterized as *mesoeutrophic*, or moderately productive. The water clarity reading taken in late July (TSI = 44, typical of *mesotrophic* waterbodies) was in the expected range given the total phosphorus reading (TSI = 42, typical of *mesotrophic* waterbodies), and slightly clearer than expected given the chlorophyll *a* reading (TSI = 49, typical of *mesoeutrophic* waterbodies). These data indicate that baseline nutrients do not support persistent algae blooms in the lake, but algal greenness may be apparent at certain times of the year (in response to seasonally elevated phosphorus readings).

In early August, the lake's surface water had a slight green coloration, with the water clarity reading of 3.1 meters (~10 feet). An assessment of the aquatic plants of the lake showed a several native submergent and floating leaf plants. *Najas minor* (brittle naiad) a non-native plant species was also observed. This plant tends not to grow to nuisance levels but nevertheless is of concern. Some additional information about this plant is found at the end of this report. There were also two plant species occurring in the lake that are listed as *threatened* in New York State due to a limited number of known occurrence in the state- *Ceratophyllum echinatum* (prickly hornwort), and *Megalodonta beckii* (water marigold). A more thorough plant specific survey may yield additional plant species.

East Mud Lake 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 early August was in the 3 to 5 meter range. Hypoxic (low oxygen) conditions were observed below 4 meters. pH readings indicate slightly alkaline waters, with conductivity readings indicating hard water (high ionic strength). All of the above parameters were similar to those seen at West Mud Lake with the exception of the dissolved oxygen levels—West Mud Lake goes anoxic (without oxygen) below 4 meters.

East Mud Lake appears to be typical of hard water, weakly colored, slightly alkaline waterbodies. Other water bodies with similar water quality characteristics support warmwater fish species, although the lack of cold oxygen rich water may not be supportive of coldwater fish species. However, fisheries habitat cannot be fully evaluated by the LCI. A fisheries survey would need to be conducted to further evaluate the fisheries of the pond.

The only issue of concern found through the LCI monitoring in 2011 was the occurrence of brittle naiad in the lake. All of the other parameters analyzed were found at levels below the New York State water quality standards and guidance values.

Evaluation of Lake Condition Impacts to Lake Uses

Potable Water (Drinking Water)

East Mud Lake is not classified for use as a potable water supply. The LCI data are not sufficient to fully evaluate potable water use. The only parameter that was analyzed through the LCI that was found to be at levels that would *threaten* potable water use was iron. In addition, waterbodies experiencing oxygen deficit in the bottom waters often have high levels of iron and/or manganese which may cause taste or odor issues with finished; however, due to an equipment failure, a bottom water sample was not collected.

Contact Recreation (Swimming)

East Mud Lake is not classified for primary contact recreation- swimming and bathing being the best intended use. Bacteria data are needed to evaluate the safety of East Mud Lake for swimming—these are not collected through the LCI. The data that was collected through the LCI indicated *no known impact* to the ability to the lake to be used for swimming, should the lake be used for this purpose by lakefront residents.

Non-Contact Recreation (Boating and Fishing)

The data collected through the LCI also indicate *no known impact* to boating and fishing on the lake. High densities of floating leaf aquatic plants may *threaten* boating and fishing in certain areas of lake.

Aquatic Life

Organisms susceptible to high summer temperature may be *stressed* due to a lack of cold oxygen rich water in the pond during the summer. Additional biological studies would need to be conducted to further evaluate impacts to aquatic life.

Aesthetics

These data indicate *no known impact* to the aesthetics of the lake.

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.
- A common problem throughout the state for small waterbodies in rural areas is high nutrient levels which may be due to failing septic systems. To prevent septic system failures, the systems need to be properly inspected and maintained at regular intervals.

Aquatic Plant IDs

Exotic Plants:

Najas minor (brittle naiad)

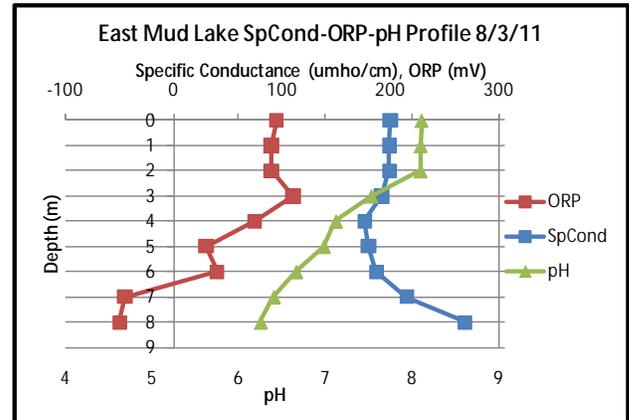
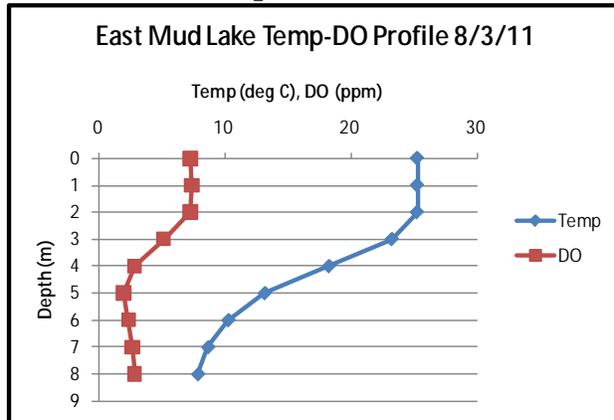
Native Plants:

Potamogeton amplifolius (largeleaf pondweed)
Potamogeton epihydrus (ribbonleaf pondweed)
Potamogeton robbinsii (Robbins' pondweed)
Nuphar sp. (yellow waterlily)
Nymphaea sp. (white waterlily)
Myriophyllum verticillatum (whorl-leaf watermilfoil)

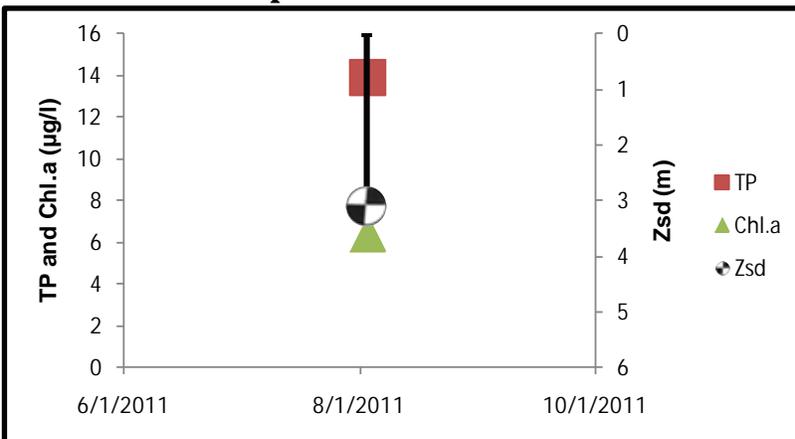
State Listed Plants:

Ceratophyllum echinatum (prickly hornwort) (**threatened**)
Megalodonta beckii (water marigold) (**threatened**)

Time Series: Depth Profiles



Time Series: Trophic Indicators



WQ Sampling Results

Surface Samples

	UNITS	Reading	Scientific Classification	Regulatory Comments
SECCHI	meters	3.1	Mesotrophic	Readings does not violate DOH guidance value
TSI-Secchi		43.7	Mesotrophic	No pertinent water quality standards
TP	mg/l	0.0139	Mesotrophic	Reading does not violate DEC guidance values
TSI-TP		42.1	Mesotrophic	No pertinent water quality standards
TSP	mg/l	0.0061	High % soluble Phosphorus	No pertinent water quality standards
NOx	mg/l	0.0021	Low nitrate	Reading does not violate guidance
NH4	mg/l	0.013	Low ammonia	Reading does not violate guidance
TKN	mg/l	0.39	Low organic nitrogen	No pertinent water quality standards
TN/TP	mg/l	62.06	Phosphorus Limited	No pertinent water quality standards
CHLA	ug/l	6.40	Mesotrophic	No pertinent water quality standards
TSI-CHLA		48.8	Mesotrophic	No pertinent water quality standards
Alkalinity	mg/l	84	Moderately Buffered	No pertinent water quality standards
TCOLOR	ptu	19	Weakly Colored	No pertinent water quality standards
TOC	mg/l	5.1		No pertinent water quality standards
Ca	mg/l	27.9	Minimally Supports Zebra Mussels	No pertinent water quality standards
Fe	mg/l	0.0921		Reading does not violate water quality standards
Mn	mg/l	0.0221		Reading does not violate water quality standards
Mg	mg/l	6.21		Reading does not violate water quality standards
K	mg/l	0.523		No pertinent water quality standards
Na	mg/l	5.09		Reading does not violate water guidance value
Cl	mg/l	7.8	Minor road salt runoff	Reading does not violate water quality standards
SO4	mg/l	4.7		Reading does not violate water quality standards

Lake Perception

	UNITS	Reading	Scientific Classification	Regulatory Comments
WQ Assessment	1-5, 1 best	2	Not Quite Crystal Clear	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	2	Excellent for Most Uses	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
 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
As	=arsenic, mg/l Detection limit = 3.2 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 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

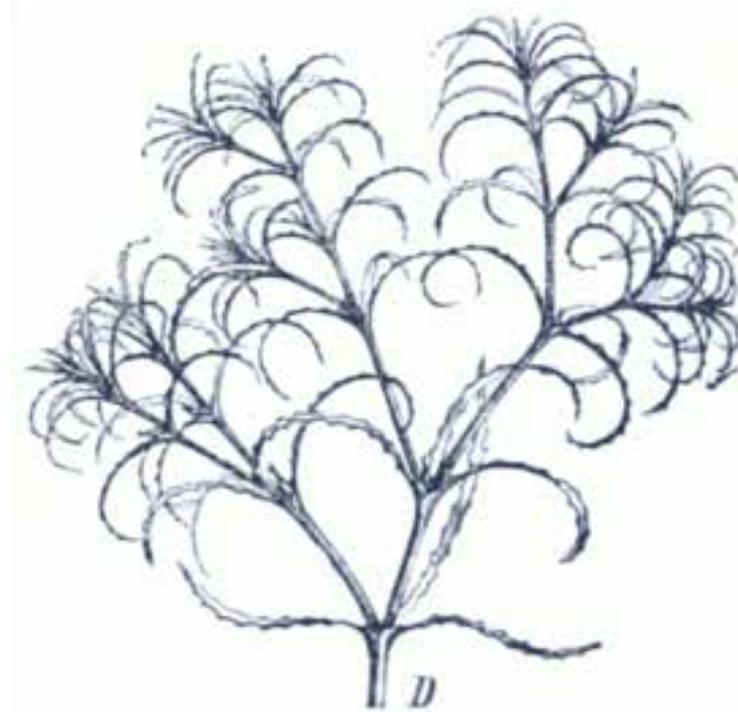
Lake Assessment

- WQ Assessment = **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: *Najas minor*

COMMON NAME: slender naiad or brittle naiad or minor naiad

ECOLOGICAL VALUE: see above. *Najas minor* is an exotic species introduced to the Hudson River area from Europe, and has little specific significance as a wildlife food source.



DISTRIBUTION IN UNITED STATES: not native- introduced in the last fifty years along the Hudson River basin, with little regional or national distribution, although in recent years it has become more established in large freshwater lakes, reservoirs, and streams in the southeastern states, the Great Lakes basin. Its range now extends from western New England west to Michigan and Indiana, and south to Florida, Mississippi, and Arkansas. It is found primarily in alkaline waters, and was introduced from Europe.

DISTRIBUTION IN NEW YORK: locally established in brackish and fresh water of river

bays and small ponds along the Hudson River (north to Albany), with a few occurrences in the Great Lakes basin and Long Island.

DEGREE OF NUISANCE: while this plant generally does not become abundant to nuisance levels, since it is a non-native species, introduction into otherwise unoccupied sediment can result in prolific growth

COMMENTS: the coloration of this plant range from olive green to reddish. It reproduces by seed and fragmentation. It is characterized by a spiky or coarse (finely toothed) appearance of the leaflets, and rough texture. It is usually, but not always, also characterized by a recurvature of the leaves.

Line drawing: http://de.wikipedia.org/wiki/Bild:Najas_spp_GS253.png