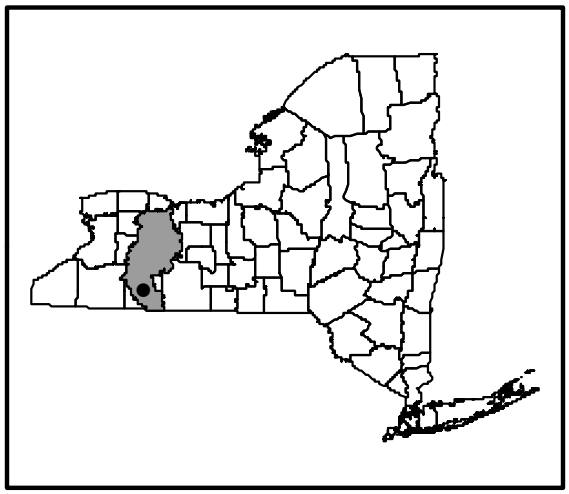
LCI Lake Water Quality Summary

General Information

Lake Name:	**Amity Lake**
Location:	Town of Amity, Allegany County, NY
Basin:	Genesee River Basin
Size:	7.8 hectares (19.25 acres)
Lake Origins:	man-made/ earthen dam
Major Tributaries:	Saunders Pond
Lake Tributary to:	Plum Bottom Creek
Water Quality Classification:	C (best intended use: secondary contact recreation)
Sounding Depth:	3.0 meters (10 feet)
Sampling Coordinates:	Latitude: 42.21913, Longitude: -77.98738
Sampling Access Point:	private land (Amity Lake Association)
Monitoring Program:	Lake Classification and Inventory (LCI) Survey
Sampling Date:	8/ 5/2009, 6/3/2010, 7/6/2010, 8/3/2010, & 9/8/2010
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 Maps

(sampling location marked with a circle)



Background and Lake Assessment

Amity Lake is a small (20 acre) impoundment north of Wellsville in Allegany County. DEC records indicate that the current earthen dam was constructed in the 1960s. The water in the pond flows in from Saunders Pond (just north of Amity Pond) and then into a small tributary that enters Plum Bottom Creek. There are about 35 properties that surround the pond, most with private residences. Much of the watershed for Saunders Pond and Amity Lake is forested with some agricultural land and low density residential housing. Many of the properties on Amity Lake have manicured lawns that run up to the lake shore. Lake shore residences boat and fish in the lake, with many of the properties around the lake having small boat docks.

Amity Lake 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 and chlorophyll *a* readings. Due to these findings Amity Lake was included in the intensive sampling (monthly) of the lakes in the Genesee River Basin during the summer of 2010.

Amity Lake can be characterized as a *eutrophic*, or highly productive. The water clarity readings (trophic state index (TSI) = 49, typical of *mesoeutrophic* lakes) was slightly higher than expected given the phosphorus readings (TSI = 57, typical of *eutrophic* lakes) and the chlorophyll *a* readings (TSI = 58, typical of *eutrophic* lakes). These data indicate that baseline nutrient levels may support algal blooms in the lake. The field crews observed filamentous algae at a few locations around the lake.

The lake typically was observed to have a brownish green or yellow coloration. An examination of the plant community of the lake yielded the following native plant species: *Elodea canadensis* (common waterweed), *Lemna minor* (lesser duck weed), *Potamogeton diversifolius* (variable leaf pondweed), *Potamogeton vaseyi* (Vasey's pondweed), *Typha latifolia* (broadleaf cattail), *Stuckenia filiformis* (fineleaf pondweed), and *Wolffia sp.* (watermeal). In addition, the exotic invasive species *Potamogeton crispus* (curlyleaf pondweed) was also found to be occurring in the lake. Curlyleaf pondweed can out-compete native aquatic plant species and grow to nuisance levels; however this plant is typically an early season plant that dies back before the peak growing season of most other aquatic plants. A resident indicated that grass carp had been stocked in the lake to deal with excessive plant growth. A more intensive, plant specific survey, would provide information on how well the carp are controlling the plant growth.

Like most shallow water bodies, Amity Lake is not thermally stratified. Temperature readings were comparable throughout the water column. There was a drop in the dissolved oxygen levels below about 2 meters in the lake during all but the September 2010 sampling event. Oxygen deficits are typically seen in water bodies that have high levels of algal production and decomposition and may negatively impact aquatic life. pH readings indicate alkaline water with two of the four surface readings exceeding the state's water quality standard designated to protect aquatic life. Conductivity readings indicate moderately soft water (low ionic strength). Alkaline waters are typical of lakes with high levels of algae and soft water is typical for this area of New York State.

Amity Lake appears to be typical of softwater, 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 due to the lack of cold oxygen rich water necessary to protect any salmonids or aquatic life susceptible to high summer temperatures.

Total phosphorus levels were 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 bond in the sediments to be released into the water column. Iron and manganese levels were elevated with 60% of the readings above the state's water quality standard; this may lead to taste or odor problems. Elevated iron and manganese levels are typical of lakes experiencing persistent oxygen deficiencies. Chloride and other ion levels were low indicating little impacts from road salting or runoff from developed areas.

Evaluation of Lake Condition Impacts to Lake Uses

Potable Water (Drinking Water)

Amity 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 the use of the lake for a drinking water supply would be *stressed* by elevated levels of phosphorus, algae, iron, and manganese in the water column.

Contact Recreation (Swimming)

Amity Lake is not classified for primary contact recreation- swimming and bathing being the best intended use. The New York State Water Quality Classification of *Class C* states: water quality shall be suitable for primary contact recreation, although other factors may limit the use for this purpose. It is not know if people do swim in the lake. Bacteria data are needed to evaluate the safety of Amity Lake for swimming—these are not collected through the LCI. The data collected through the LCI indicate that swimming may occasionally be *stressed* by low elevated algae and nutrient levels, and low water clarity. Future use of the lake for contact recreation may require management of nutrient sources to help reduce algae levels to provide safe and aesthetically acceptable swimming conditions.

Non-Contact Recreation (Boating and Fishing)

Residents of the lake community currently partake in boating and fishing on the lake. These indicate that non-contact recreational use of the lake may be *threatened* by the presence of curlyleaf pondweed in the lake. The recreational assessment of the lake was recorded as either "excellent for most uses" or "slightly impaired".

Aquatic Life

Oxygen deficits below two meters in the lake may *stress* some aquatic life in the lake. The high pH levels found may possibly *stress* some aquatic life in the lake.

Aesthetics

The aesthetics of the lake may be *stressed* by occasional algae blooms and high densities of aquatic plants.

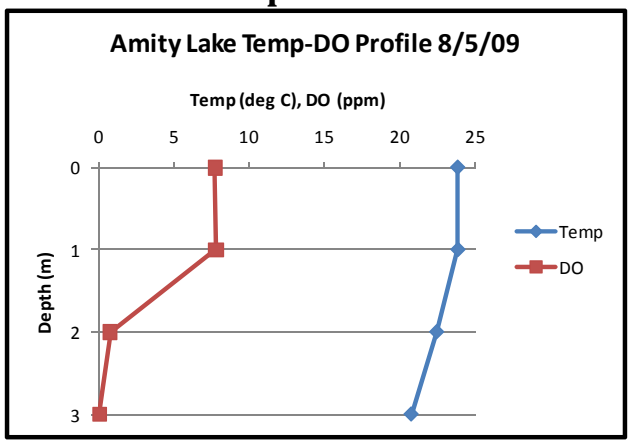
Additional Comments

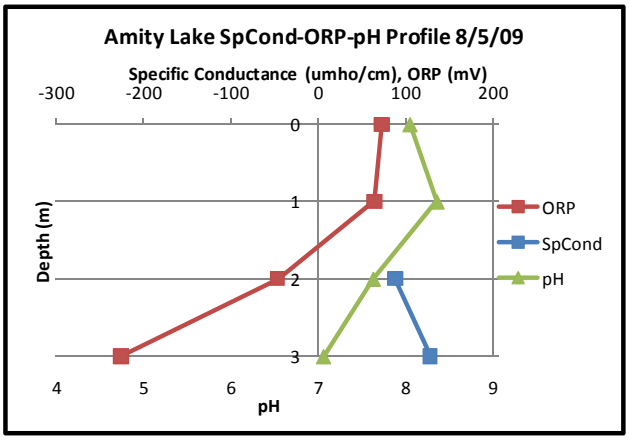
- Identifying and reducing the sources of nutrient levels may help prevent algal blooms. Residence of the lake community should minimize the use of fertilizers used on lawns, insure that septic systems are properly installed and functioning correctly, and disconnected any unregulated discharges to the lake.
- 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.
- Algae identification would determine if the lake may suffer from harmful algal blooms (HABs) and/or the production of algal toxins.

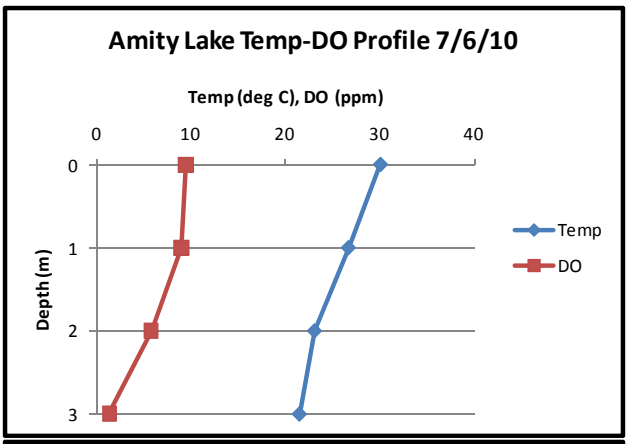
Aquatic Plant IDs

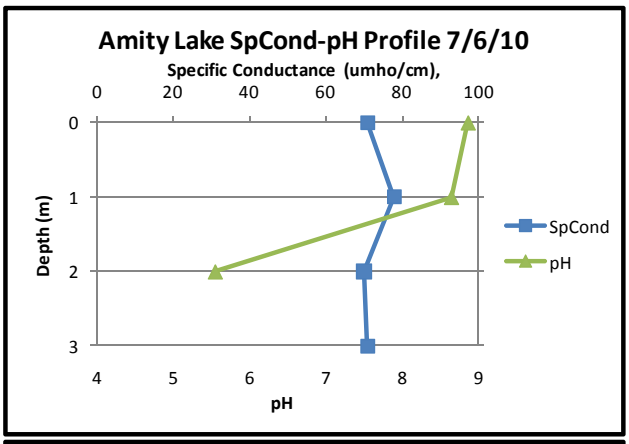
Exotic Plants:	*Potamogeton crispus* (curly leaf pondweed)
Native Plants:	*Elodea canadensis* (common waterweed) *Lemna minor* (lesser duckweed) *Potamogeton diversifolius* (variable leaf pondweed) *Potamogeton vaseyi* (Vasey's pondweed) *Typha latifolia* (broadleaf cattail) *Stuckenia filiformis* (fineleaf pondweed) *Wolffia sp.* (watermeal)

Time Series: Depth Profiles






Amity Lake Temp-DO Profile 7/6/10
Temp (deg C), DO (ppm)
0
10
20
30
40
Depth (m)
0
1
2
3
Temp
DO


Amity Lake SpCond-pH Profile 7/6/10
Specific Conductance (umho/cm),
0
20
40
60
80
100
Depth (m)
0
1
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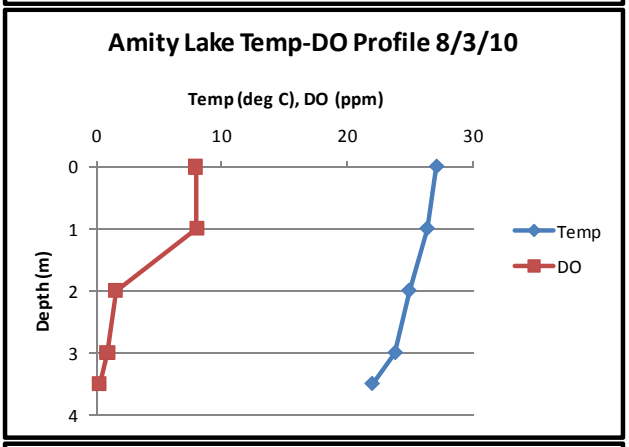
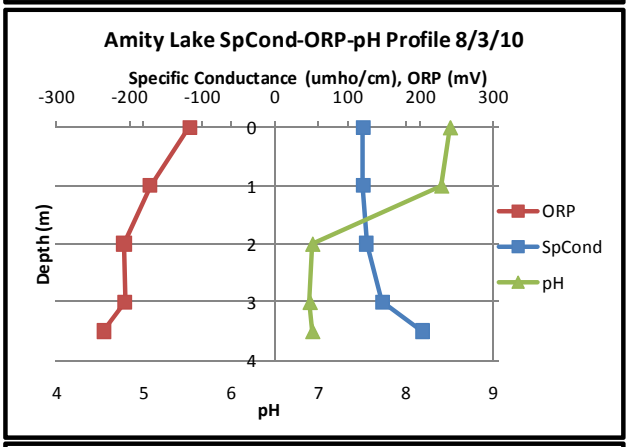
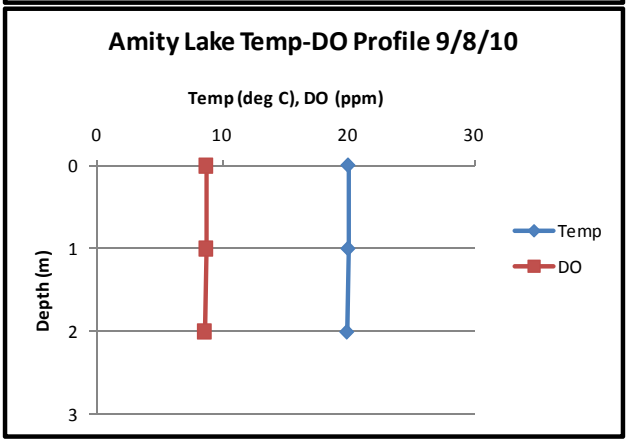
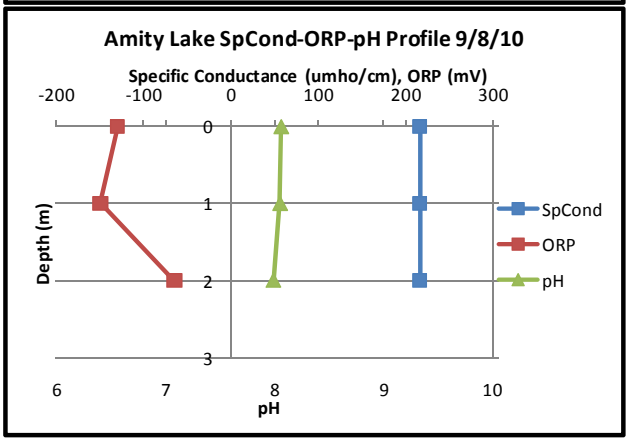
3
4
5
6
7
8
9
pH
SpCond
pH

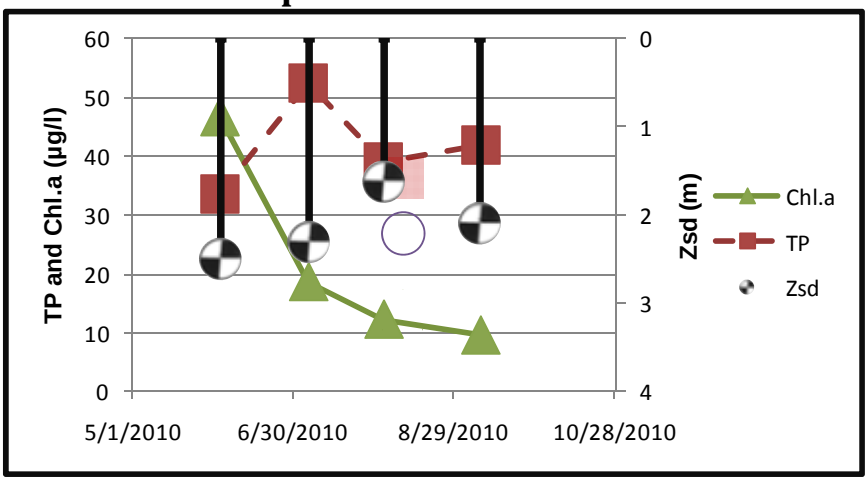

Amity Lake Temp-DO Profile 8/3/10
Temp (deg C), DO (ppm)
0
10
20
30
Depth (m)
0
1
2
3
4
Temp
DO


Amity Lake SpCond-ORP-pH Profile 8/3/10
Specific Conductance (umho/cm), ORP (mV)
-300
-200
-100
0
100
200
300
Depth (m)
0
1
2
3
4
4
5
6
7
8
9
pH
ORP
SpCond
pH


Amity Lake Temp-DO Profile 9/8/10
Temp (deg C), DO (ppm)
0
10
20
30
Depth (m)
0
1
2
3
Temp
DO


Amity Lake SpCond-ORP-pH Profile 9/8/10
Specific Conductance (umho/cm), ORP (mV)
-200
-100
0
100
200
300
Depth (m)
0
1
2
3
6
7
8
9
10
pH
SpCond
ORP
pH

Time Series: Trophic Indicators



* transparent symbols represent the August 5, 2009 data

WQ Sampling Results

Surface Samples

	UNITS	N	MIN	AVG	MAX	Scientific Classification	Regulatory Comments
SECCHI	meters	5	1.63	2.15	2.5	Mesotrophic	No readings violate DOH guidance value
TSI-Secchi			53.0	49.0	46.8	Mesotrophic	No pertinent water quality standards
TP	mg/l	5	0.0337	0.04	0.0525	Eutrophic	100% of readings violate water quality standards
TSI-TP			54.8	57.3	61.2	Eutrophic	No pertinent water quality standards
TSP	mg/l	5	0.0109	0.0166	0.035	High % soluble Phosphorus	No pertinent water quality standards
NOx	mg/l	5	ND	0.00512	0.01	Low nitrate	No readings violate water quality standards
NH4	mg/l	5	ND	0.0064	0.012	Low ammonia	No readings violate water quality standards
TKN	mg/l	5	0.36	0.54	0.69	Phosphorus Limited	No pertinent water quality standards
TN/TP	mg/l	5	20.95	32.89	49.01	Nutrient Limitation Unclear	No pertinent water quality standards
CHLA	ug/l	5	9.6	20.26	46.8	Eutrophic	No pertinent water quality standards
TSI-CHLA			52.8	58.43	68.3	Eutrophic	No pertinent water quality standards
Alkalinity	mg/l	5	36	42.74	47.1	Poorly Buffered	No pertinent water quality standards
TCOLOR	ptu	5	20	30	40	Weakly Colored	No pertinent water quality standards
TOC	mg/l	5	5.3	5.42	5.6		No pertinent water quality standards
Ca	mg/l	5	12.3	12.94	13.8	Minimally Supports Zebra Mussels	No pertinent water quality standards
Fe	mg/l	5	0.479	0.6138	0.955	Taste or odor likely	No readings violate water quality standards
Mn	mg/l	5	0.152	0.3884	0.687	Taste or odor likely	60% of readings violate water quality standards
Mg	mg/l	5	2.5	2.84	3.09		No readings violate water quality standards
K	mg/l	5	0.584	0.774	0.981		No pertinent water quality standards
Na	mg/l	5	4.19	5.138	6.03		No readings violate water quality standards
Cl	mg/l	5	5.4	6.5	7.5	Minor road salt runoff	No readings violate water quality standards
SO4	mg/l	5	3.2	3.76	4.9		No readings violate water quality standards

2009 & 2010 Lake Perception

	UNITS	N	MIN	AVG	MAX	Scientific Classification	Regulatory Comments
WQ Assessment	1-5, 1 best	5	2	2.8	3	Definite Algal Greenness	No pertinent water quality standards
Weed Assessment	1-5, 1 best	5	2	2.6	3	Plants Grow to Lake Surface	No pertinent water quality standards
Recreational Assessment	1-5, 1 best	5	2	2.4	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
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 = 1.0 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 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