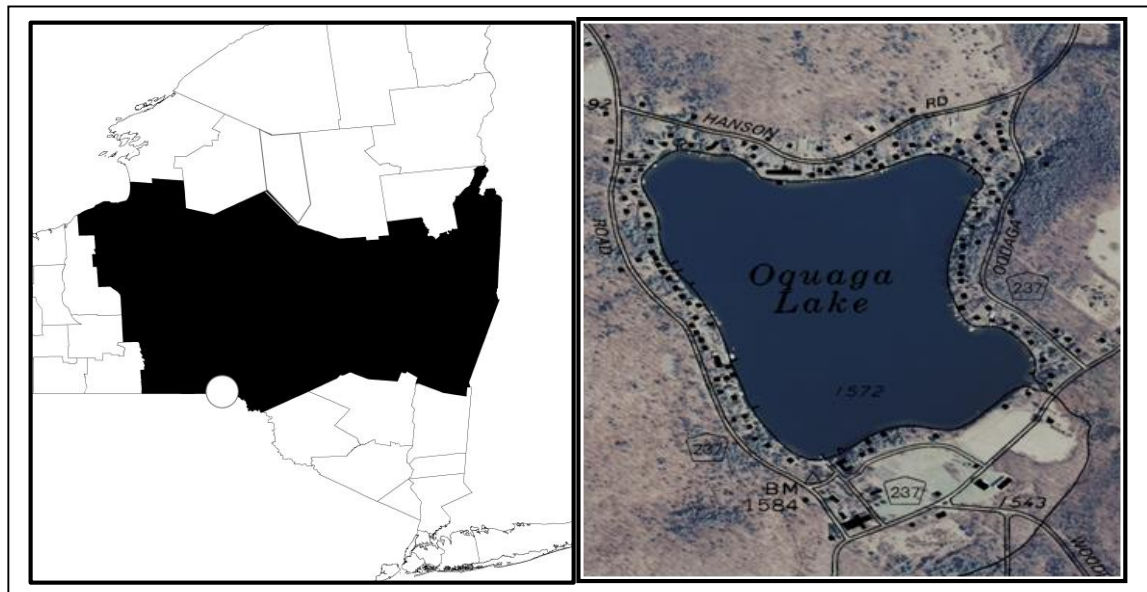


CSLAP 2014 Lake Water Quality Summary: Oquaga Lake

General Lake Information

Location	Town of Deposit
County	Broome
Basin	Delaware River
Size	54.4 hectares (134.4 acres)
Lake Origins	Natural
Watershed Area	630 hectares (1,556 acres)
Retention Time	3.3 years
Mean Depth	13.9 meters
Sounding Depth	35 meters
Public Access?	no
Major Tributaries	no named tribs
Lake Tributary To...	Starboard Creek to West Branch Delaware River
WQ Classification	AA (potable water)
Lake Outlet Latitude	42.020
Lake Outlet Longitude	-75.454
Sampling Years	1987-1992, 2002-2014
2014 Samplers	Mark and Kathleen Millspaugh, Lily DePietro, Diane MacInnes, and Gavin McCoy
Main Contact	Mark Millspaugh

Lake Map



Background

Oquaga Lake is a 134 acre, class AA lake found in the Town of Deposit in Broome County in the Southern Tier region of New York State. It was first sampled as part of CSLAP in 1987.

It is one of five CSLAP lakes among the more than 25 lakes found in Broome County, and one of 15 CSLAP lakes among the more than 240 lakes and ponds in the Delaware River drainage basin.

Lake Uses

Oquaga Lake is a Class AA lake; this means that the best intended use for the lake is for potable water—drinking, contact recreation—swimming and bathing, non-contact recreation—boating and angling, aquatic life, and aesthetics. The lake is used by lake residents and invited guests for non-power boating and swimming, through residential shoreline access to the lake. There is no public access to the lake.

It is not known by the report authors if private stocking occurs in Oquaga Lake; the state of New York does not stock fish in the lake. .

General statewide fishing regulations are applicable in Oquaga Lake. In addition, the open season on trout lasts from April 1st through October 15th, with no size limits and a daily take limit of five trout, with no more than two trout to be greater than 12 inches and no more than five brook trout under eight inches.

There are no lake-specific fish consumption advisories on Oquaga Lake.

Historical Water Quality Data

CSLAP sampling was conducted on Oquaga Lake from 1987 to 1992, and 2002 to 2014. The CSLAP reports for each of the past several years can be found on the NYSFOLA website at <http://nysfola.mylaketown.com>. The most recent CSLAP report and scorecard for Oquaga Lake can also be found on the NYSDEC web page at <http://www.dec.ny.gov/lands/77884.html>.

Oquaga Lake was sampled by the Conservation Department (the predecessor to the NYSDEC) on August 8th, 1935 as part of the Biological Survey of the Delaware River basin. The temperature and oxygen surveys from this study show dissolved oxygen reductions only near the lake bottom (close to 111 feet), and exceeding critical levels for all fish at all depths. Most of the parameters sampled in CSLAP were not analyzed as part of this survey. The results from this survey suggest water quality conditions in 1935 were similar to those measured in 2004.

The field notes from this survey indicate the following:

“Oquaga Lake is a deep body of water (max. 111ft) with excellent chemical conditions on the bottom. Lake trout are present but those caught average small in size. Lake herring are recommended for stocking. The latter should supply a much needed deep-water forage fish for the lake trout. This species taken by the survey party had been feeding on small perch which are not plentiful judging from the gill-net collection. Rock bass dominate the shallow water. Sunfish are scarce along the shores. Only moderate numbers of large small-mouthed bass are recommended for planting since there is too little shallow water which produces bass food.

Furthermore, rooted aquatic plants are scarce and recreational uses have caused the removal of other shelter.

Vegetation is scant.”

Neither the ephemeral inlets to nor the outlet (Starboard Creek) has been monitored through the NYSDEC Rotating Intensive Basins (RIBS) or stream biomonitoring programs.

Lake Association and Management History

Oquaga Lake is served by the Oquaga Lake Association, developed “to preserve, improve and protect Oquaga Lake and the lands adjoining the same and bordering thereon, all located in the Town of Sanford, Broome County, New York; to develop and promote the said territory as a summer resort; to prevent the contamination of the waters thereof; to further and advance the social and general welfare of the said territory and the owners and occupants thereof and the members of this Association; to do any and all acts necessary to carry into effect the foregoing objectives, including acquiring and holding title and property rights in and to the said Oquaga Lake, adjoining lands and springs and water courses in the vicinity.”

The lake association is involved in a variety of activities, including:

- the first lake in the State of New York to prohibit the use of jet skis and other specialty watercraft
- annual well water testing by Benchmark Analytics of Sayre PA
- social activities, including a fishing tournament, opening cocktail party, ring of fire, family day (field games/water sports), annual Meeting

The lake association maintains a web site at <http://www.oquaga.com/> .

Summary of 2014 CSLAP Sampling Results

Evaluation of 2014 Annual Results Relative to 1987-2013

The summer (mid-June through mid-September) average readings are compared to historical averages for all CSLAP sampling seasons in the “Lake Condition Summary” table, and are compared to individual historical CSLAP sampling seasons in the “Long Term Data Plots – Oquaga Lake” section in Appendix C.

Evaluation of Eutrophication Indicators

Water clarity readings were slightly higher than normal in 2013 and 2014. These readings increased from the early 1990s through the early 2000s, and have been fairly stable since then. This is consistent with a decrease in nutrient and algae levels over the same period, and algae levels were also slightly lower than normal in 2013 and 2014.

Water transparency readings increase slightly during the typical summer (June through September), despite a slight seasonal increase in algae and (to a lesser degree) phosphorus readings. No clear seasonal patterns were apparent in 2014, despite a spike in small spike in phosphorus readings and corresponding decrease in water clarity in August. It is not likely that this was a result of the heavy rains in mid-July, since the late July nutrient and clarity readings did not change.

The lake can be characterized as *oligotrophic*, or highly unproductive, based on chlorophyll *a*, Secchi disk transparency, and total phosphorus (all typical of *oligotrophic* lakes). The trophic state indices (TSI) evaluation suggests that each of the trophic indicators is “internally consistent” and could be predicted from the values of the other indicators. Overall trophic conditions are summarized on the Lake Scorecard and Lake Condition Summary Table.

Evaluation of Potable Water Indicators

Algae levels are not high enough to render the lake susceptible to taste and odor compounds or elevated DBP (disinfection by product) compounds that could affect the potability of the water, suggesting no impacts to potable water use from algae. Deepwater phosphorus and ammonia readings are similar to those measured at the lake surface, and deepwater iron, manganese and arsenic levels are low (or at least were historically, since these are no longer measured through CSLAP), suggesting that deepwater intakes may also support potable water use. Potable water conditions, at least as measurable through CSLAP, are summarized in the Lake Scorecard and Lake Condition Summary Table.

Evaluation of Limnological Indicators

Conductivity readings have increased slightly since the late 1980s, and were higher than usual in 2014, but these readings continue to be typical of softwater lakes. Color, pH and total nitrogen readings were slightly lower than usual in 2014, but it is likely that the small changes in each of these indicators have been within the normal range of variability in the lake. NO_x and total nitrogen readings have been slightly higher in the last three years, and ammonia readings have increased slightly over the last decade, although all nitrogen readings remain low. Overall limnological conditions are summarized in the Lake Scorecard and Lake Condition Summary Table.

Evaluation of Biological Condition

The fluoroprobe screening samples analyzed by SUNY ESF in the last few years indicated both very low algae levels and very low blue green algae levels, as expected given the other water quality indicators in the lake. The algae community appears to be comprised of a mix of algae species.

The fish community is comprised of at least one warmwater fish species, and at least three coldwater fish species, based on incomplete inventory information. This suggests that the lake can most likely be characterized as a coldwater fishery.

Macrophyte, zooplankton, and macroinvertebrates have not been evaluated through CSLAP in Oquaga Lake. It is not known if any invasive animals or plants are found in the lake.

Biological conditions in the lake are summarized in the Lake Scorecard and Lake Condition Summary Table.

Evaluation of Lake Perception

Aquatic plant coverage has increased in recent years, particularly since 2004. It is not known if the increase in plant coverage is due to an increase in native or exotic plants; no exotic plants have been reported in the lake. Recreational and water quality assessments have been stable and highly favorable, consistent with higher water transparency readings. Lake perception usually

does not change seasonally, despite a small seasonal increase in plant coverage. No clear seasonal trends were apparent in 2014. Overall lake perception is summarized on the Lake Scorecard and Lake Condition Summary Table.

Evaluation of Local Climate Change

Water temperature readings in the summer index period were lower than normal in 2014, and both air and water temperatures have decreased since the late 1980s. It is not known if this is an indication of the local climate change or if it represents normal variability.

Evaluation of Algal Toxins

Algal toxin levels can vary significantly within blooms and from shoreline to lake, and the absence of toxins in a sample does not indicate safe swimming conditions. Phycocyanin readings have been well below the levels indicating susceptibility for harmful algal blooms (HABs), and the fluoroprobe data from the last several years indicate low susceptibility to blue green algae blooms. An analysis of algae samples indicate algal toxin readings in open water samples well below the levels needed to support safe swimming and potable water use. No shoreline blooms have been reported or sampled.

Lake Condition Summary

Category	Indicator	Min	Overall Avg	Max	2014 Avg	Classification	2014 Change?	Long-term Change?
Eutrophication Indicators	Water Clarity	1.75	7.39	12.30	8.04	Oligotrophic	Within Normal Range	Increasing Significantly
	Chlorophyll <i>a</i>	0.05	1.93	23.80	0.83	Oligotrophic	Within Normal Range	Decreasing Slightly
	Total Phosphorus	0.002	0.006	0.016	0.005	Oligotrophic	Within Normal Range	No Change
Potable Water Indicators	Hypolimnetic Ammonia	0.00	0.03	0.17	0.02	Close to Surface NH4 Readings	Within Normal Range	Not known
	Hypolimnetic Arsenic	0.34	0.76	1.30		Low Deepwater Arsenic Levels		Not known
	Hypolimnetic Iron	0.01	0.06	0.19		Low Iron Levels		Not known
	Hypolimnetic Manganese	0.01	0.03	0.10		Low Manganese Levels		Not known
Limnological Indicators	Hypolimnetic Phosphorus	0.001	0.008	0.018	0.007	Close to Surface TP Readings	Within Normal Range	Not known
	Nitrate + Nitrite	0.00	0.02	0.18	0.02	Low NOx	Within Normal Range	No Change
	Ammonia	0.00	0.02	0.13	0.03	Low Ammonia	Within Normal Range	No Change
	Total Nitrogen	0.01	0.25	0.71	0.18	Low Total Nitrogen	Within Normal Range	No Change
	pH	5.78	7.39	9.08	7.16	Circumneutral	Within Normal Range	No Change
	Specific Conductance	22	67	127	81	Softwater	Higher than Normal	Increasing Significantly
	True Color	1	5	45	2	Uncolored	Lower Than Normal	No Change
	Calcium	4.4	5.7	7.0	5.6	Not Susceptible to Zebra Mussels	Within Normal Range	No Change
Lake Perception	WQ Assessment	1	1.2	2	1.0	Crystal Clear	Within Normal Range	No Change
	Aquatic Plant Coverage	1	2.1	3	2.6	Subsurface Plant Growth	Within Normal Range	Highly Increasing
	Recreational Assessment	1	1.2	3	1.1	Could Not Be Nicer	Within Normal Range	No Change
Biological Condition	Phytoplankton					Open water-low blue green algae biomass	Not known	Not known
	Macrophytes					Not evaluated through CSLAP	Not known	Not known
	Zooplankton					Not evaluated through CSLAP	Not known	Not known
	Macroinvertebrates					Not evaluated through CSLAP	Not known	Not known
	Fish					Coldwater fishery?	Not known	Not known
	Invasive Species					None observed	Not known	Not known
Local Climate Change	Air Temperature	3	18.3	31	12.3		Lower Than Normal	Decreasing Slightly
	Water Temperature	5	17.9	26	12.1		Lower Than Normal	Decreasing Significantly

Category	Indicator	Min	Overall Avg	Max	2014 Avg	Classification	2014 Change?	Long-term Change?
Harmful Algal Blooms	Open Water Phycocyanin	0	4	33	2	No readings indicate high risk of BGA	Not known	Not known
	Open Water FP Chl.a	0	0	2	0	No readings indicate high algae levels	Not known	Not known
	Open Water FP BG Chl.a	0	0	1	0	No readings indicate high BGA levels	Not known	Not known
	Open Water Microcystis	<DL	0.2	0.5	<0.30	Mostly undetectable open water MC-LR	Not known	Not known
	Open Water Anatoxin a	<DL	<DL	<DL	<DL	Open water Anatoxin-a consistently not detectable	Not known	Not known
	Shoreline Phycocyanin					No shoreline blooms sampled for PC	Not known	Not known
	Shoreline FP Chl.a					No shoreline blooms sampled for FP	Not known	Not known
	Shoreline FP BG Chl.a					No shoreline blooms sampled for FP	Not known	Not known
	Shoreline Microcystis					No shoreline bloom MC-LR data	Not known	Not known
	Shoreline Anatoxin a					No shoreline bloom anatoxin data	Not known	Not known

Evaluation of Lake Condition Impacts to Lake Uses

Oquaga Lake is among the lakes listed on the 2002 Delaware River drainage basin Priority Waterbody List (PWL) as “unassessed”.

Potable Water (Drinking Water)

The CSLAP dataset at Oquaga Lake, including water chemistry data, physical measurements, and volunteer samplers’ perception data, is inadequate to evaluate the use of the lake for potable water. The low algae levels and lack of deepwater anoxia suggest that potable water use should be supported.

Contact Recreation (Swimming)

The CSLAP dataset at Oquaga Lake, including water chemistry data, physical measurements, and volunteer samplers’ perception data, suggests that swimming and contact recreation should be fully supported, although additional information about bacterial levels is needed to evaluate the safety of the water for swimming.

Non-Contact Recreation (Boating and Fishing)

The CSLAP dataset on Oquaga Lake, including water chemistry data, physical measurements, and volunteer samplers’ perception data, suggest that non-contact recreation should be fully supported.

Aquatic Life

The CSLAP dataset on Oquaga Lake, including water chemistry data, physical measurements, and volunteer samplers’ perception data, suggest that aquatic life should be fully supported, although additional data are needed to evaluate the food and habitat conditions for aquatic organisms in the lake.

Aesthetics

The CSLAP dataset on Oquaga Lake, including water chemistry data, physical measurements, and volunteer samplers’ perception data, suggest that aesthetics should be fully supported.

Fish Consumption

There are no fish consumption advisories posted for Oquaga Lake.

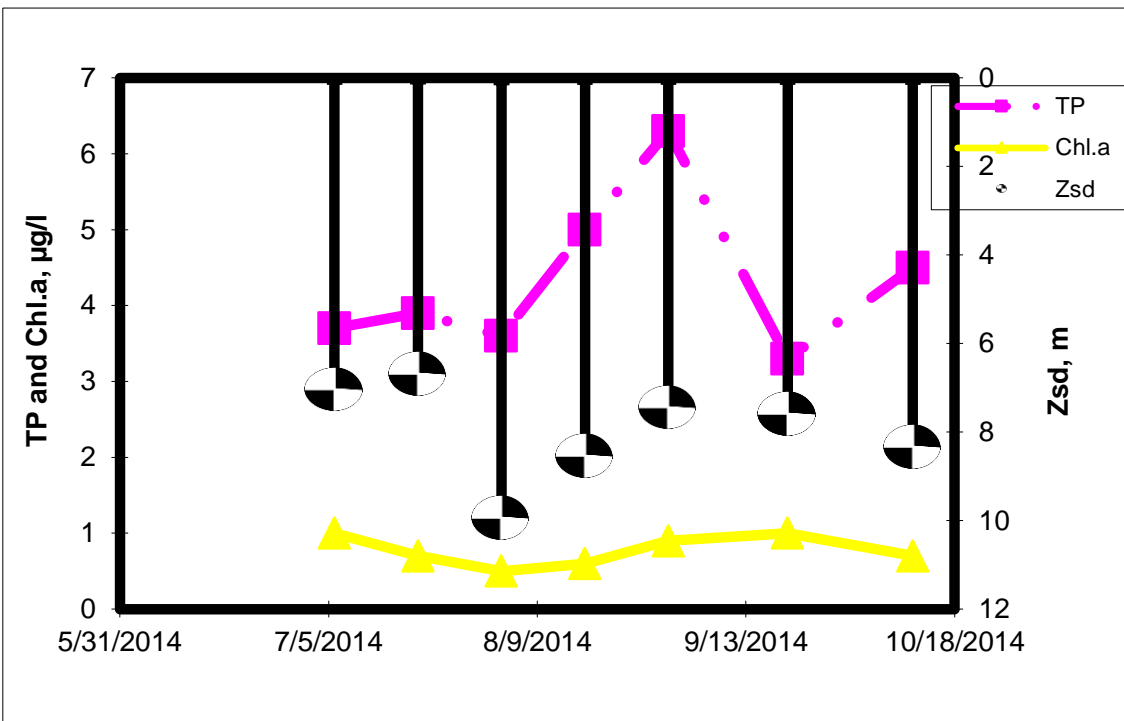
Additional Comments and Recommendations

Aquatic plant survey data may help to determine if the increase in aquatic plant coverage is associated with nuisance or exotic plants. Lake residents should report and avoid exposure to any surface scums or heavily discolored water usually associated with shoreline blue green algae blooms, although these are not expected to be present in Oquaga Lake due to the highly favorable water quality conditions.

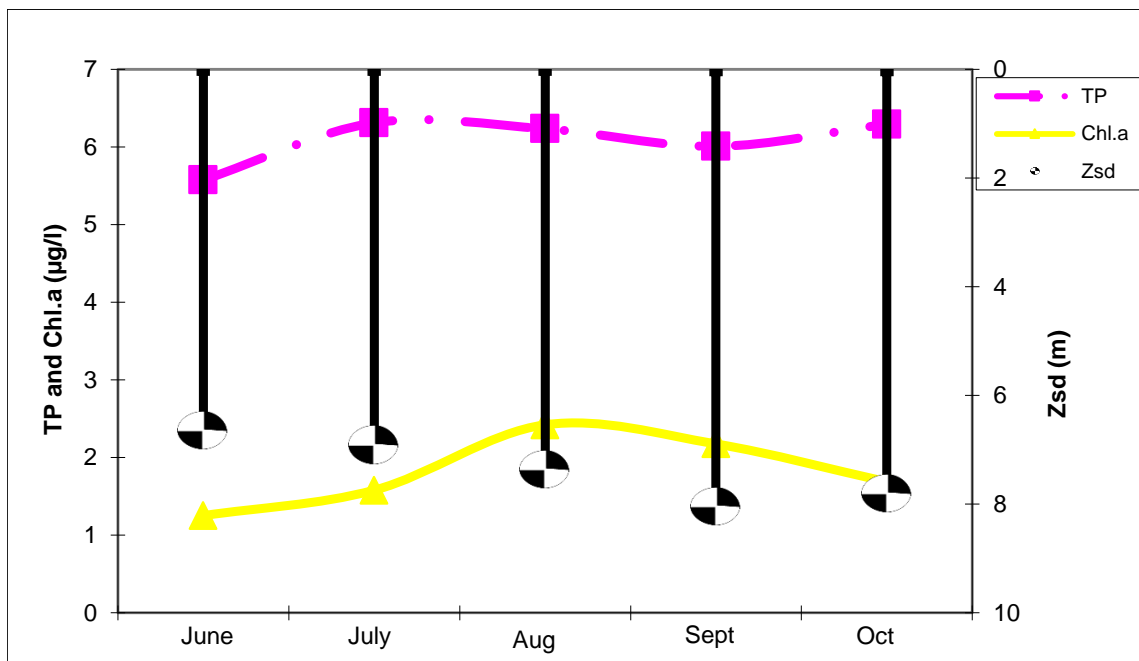
Aquatic Plant IDs-2014

None submitted for identification in 2014.

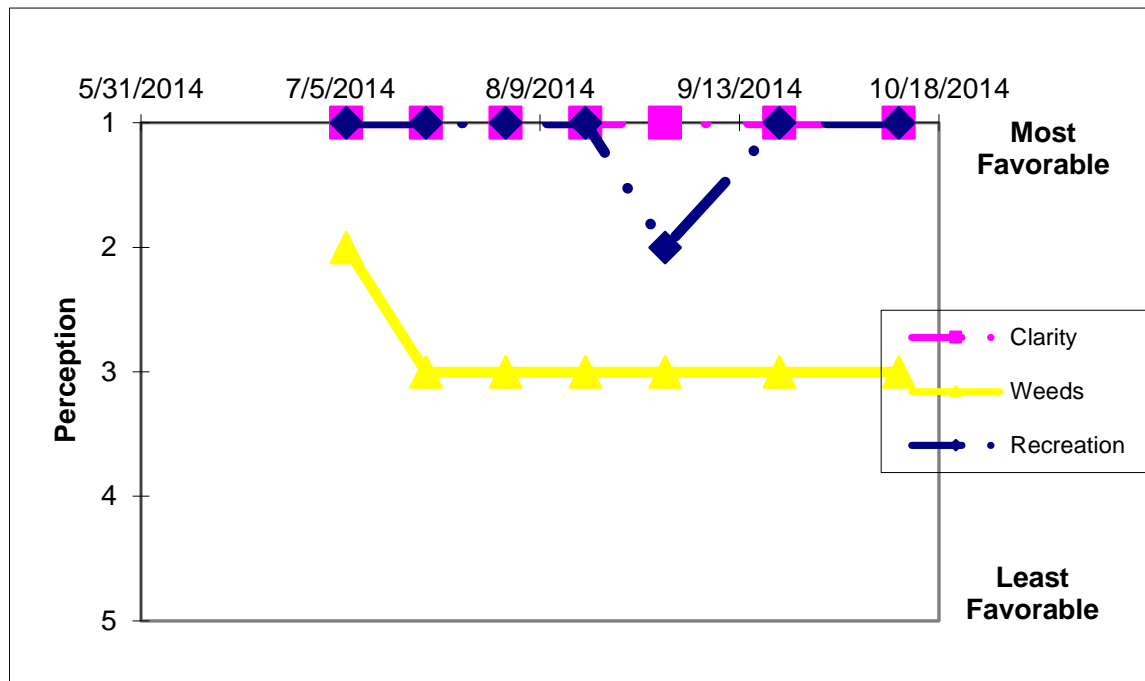
Time Series: Trophic Indicators, 2014



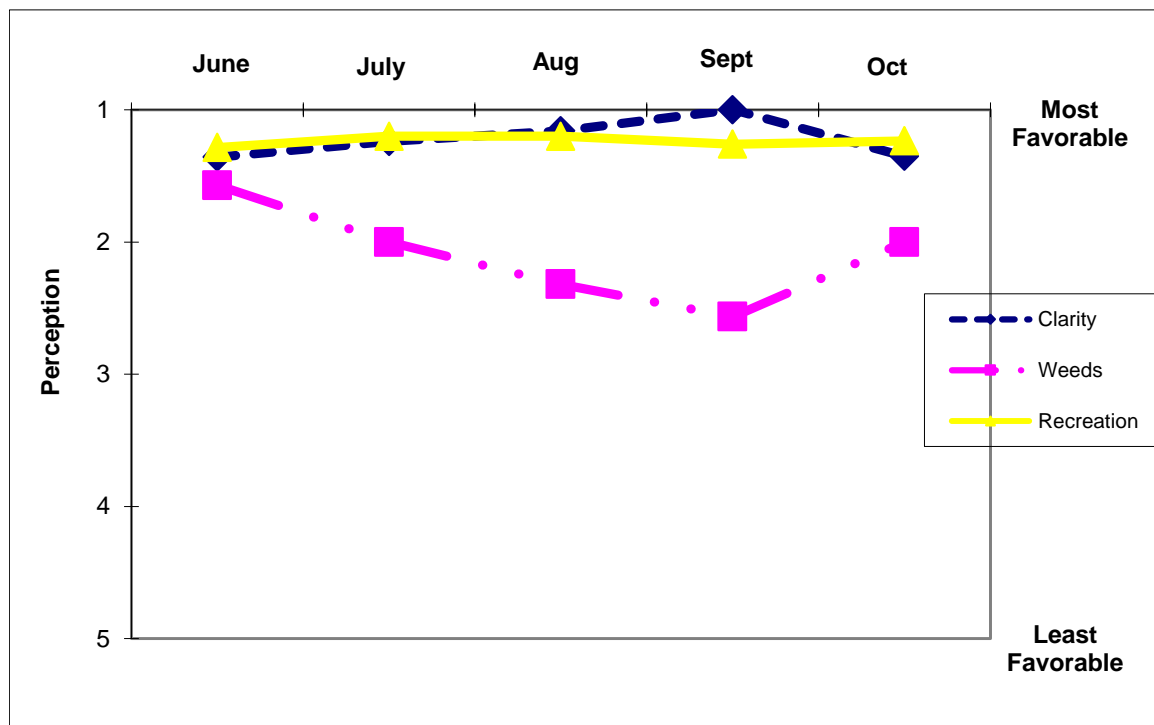
Time Series: Trophic Indicators, Typical Year (1987-2014)



Time Series: Lake Perception Indicators, 2014



Time Series: Lake Perception Indicators, Typical Year (1987-2014)



Appendix A- CSLAP Water Quality Sampling Results for Oquaga Lake

LNum	PName	Date	Zbot	Zsd	Zsamp	Tot.P	NO3	TKN	TN	TN/TP	TColor	pH	Cond25	Ca	Chl.a
30	Oquaga L	6/13/1987	30.0	3.63	1.5	0.005	0.02				8	7.15	55		
30	Oquaga L	6/21/1987	30.0	5.75	1.5	0.007	0.02				9	7.16	54		1.20
30	Oquaga L	7/5/1987	30.0	5.25	1.5	0.009	0.01				5	7.08	54		2.70
30	Oquaga L	7/11/1987	30.0	5.75	1.5	0.006	0.01				2	7.04	54		
30	Oquaga L	7/19/1987	27.0	5.50	1.5	0.003	0.01				6	7.07	54		2.70
30	Oquaga L	7/26/1987	30.0	3.88	1.5	0.006	0.01				5	6.95	54		6.40
30	Oquaga L	8/3/1987	30.0	2.75	1.5	0.009	0.01				5	6.88	55		19.20
30	Oquaga L	8/10/1987	30.0	3.38	1.5	0.008	0.01				5	6.85	55		14.40
30	Oquaga L	8/17/1987	30.0	5.25	1.5	0.005	0.01				6	7.13	56		1.70
30	Oquaga L	8/23/1987	30.0	5.25	1.5	0.005	0.01				4	7.07	53		3.90
30	Oquaga L	8/30/1987	30.0	4.50	1.5	0.005	0.01				6	7.49	53		
30	Oquaga L	9/7/1987	30.0	5.25	1.5	0.012	0.18				3	7.16	56		9.90
30	Oquaga L	9/16/1987	30.0	6.00	1.5	0.005	0.02				2	7.39	63		5.00
30	Oquaga L	10/10/1987	30.0	4.25	1.5	0.007	0.01				6	7.11	54		10.60
30	Oquaga L	10/23/1987	30.0	4.63	1.5										
30	Oquaga L	7/1/1988	30.0	5.75	1.5	0.007	0.01				5	6.33	61		3.25
30	Oquaga L	7/13/1988	30.0	6.50	1.5	0.009					4	8.06	66		4.66
30	Oquaga L	7/21/1988	30.0	5.00	1.5	0.011	0.01				5	7.39	57		2.74
30	Oquaga L	7/28/1988	30.0	6.25	1.5	0.006					5	7.55	57		1.06
30	Oquaga L	8/4/1988	30.0	6.00	1.5	0.005	0.01				3	7.98	60		1.37
30	Oquaga L	8/11/1988	30.0	5.50	1.5	0.006					8				1.63
30	Oquaga L	8/18/1988	30.0	5.50	1.5	0.006	0.01				7	7.14	56		2.07
30	Oquaga L	8/25/1988	30.0	4.75	1.5	0.006					7				2.15
30	Oquaga L	9/2/1988	30.0	5.50	1.5	0.008	0.01				3	7.78	57		2.00
30	Oquaga L	9/15/1988	30.0	5.75	1.5	0.005	0.01				3	7.62	60		3.18
30	Oquaga L	7/10/1989	30.0	4.88	1.5	0.005	0.01				3	7.85	57		2.33
30	Oquaga L	8/2/1989	30.0	4.25	1.5	0.007					2	7.40	58		1.20
30	Oquaga L	8/9/1989	30.0	4.25	1.5	0.009					2	7.89	55		
30	Oquaga L	8/19/1989	30.0	5.25	1.5	0.010	0.01				4	7.83	56		0.43
30	Oquaga L	8/26/1989	30.0	5.13	1.5	0.013					2	7.44			2.22
30	Oquaga L	9/4/1989	30.0	4.75	1.5	0.008					2	7.36	56		4.11
30	Oquaga L	9/13/1989	30.0	5.63	1.5	0.007	0.01				2	7.54	58		3.05
30	Oquaga L	7/14/1990	30.0	4.25	1.5	0.011	0.01				5	7.23	64		3.01
30	Oquaga L	7/20/1990	30.0	5.25	1.5	0.007					3	7.54	57		0.63
30	Oquaga L	8/3/1990	30.0	5.25	1.5	0.008	0.01				1	7.89	56		2.08
30	Oquaga L	8/20/1990	30.0	5.75	1.5	0.006					3	7.29	79		2.43
30	Oquaga L	9/1/1990	30.0	6.25	1.5	0.004	0.01				2	6.60	57		1.34
30	Oquaga L	9/11/1990	30.0	6.50	1.5	0.012					1	6.75	57		2.21
30	Oquaga L	9/27/1990	30.0	6.25	1.5	0.008	0.01				3	7.74	57		2.75
30	Oquaga L	7/1/1991	30.0	6.50	1.5	0.008	0.01				2	7.61	59		1.26
30	Oquaga L	7/15/1991	30.0	6.25	1.5	0.007					3	7.52	59		2.41
30	Oquaga L	7/28/1991	30.0	5.75	1.5	0.007	0.01				2	7.63	57		2.90
30	Oquaga L	8/13/1991	30.0	4.50	1.5	0.010					2	7.29	58		6.88
30	Oquaga L	8/26/1991	30.0	2.75	1.5	0.011	0.01				4	6.95	58		13.40
30	Oquaga L	9/9/1991	30.0	1.75	1.5	0.012					45	7.60	59		23.80
30	Oquaga L	6/25/1992	30.0	5.75	1.5	0.008					2	7.69	60		1.98
30	Oquaga L	7/24/1992	30.0	4.45	1.5	0.011					4	7.75	59		4.48
30	Oquaga L	10/4/1992	30.0	3.50	1.5	0.014	0.01				5	7.68	60		6.97
30	Oquaga L	06/23/02	16.0	5.45	1.5	0.007	0.00	0.02	0.40	129.58	8	7.52	72		1.17
30	Oquaga L	07/07/02	30.0	6.45	1.5	0.003	0.00	0.05	0.26	165.55	9				0.95
30	Oquaga L	07/21/02	30.0	8.15	1.5	0.007	0.01	0.05	0.29	93.72	6	7.47	73		0.56
30	Oquaga L	08/05/02	30.0	9.85	1.5	0.005	0.00	0.06	0.40	168.44	3	7.37	73		0.64
30	Oquaga L	08/18/02	30.0	10.20	1.5	0.005	0.01	0.03	0.40	163.73	3	6.90	74		0.97
30	Oquaga L	09/02/02	30.0	12.30	1.5	0.003	0.00	0.01	0.37	238.35	2	7.21	74		1.25
30	Oquaga L	09/25/02	26.0	9.58		0.006	0.00	0.02	0.53	206.89					
30	Oquaga L	10/06/02		6.85			0.01	0.03	0.26		7	7.46	73		0.48
30	Oquaga L	10/20/02	30.0	7.55		0.006	0.01	0.05	0.37	128.89	5	7.26	72		0.41
30	Oquaga L	6/30/2003	30.0	5.50	1.0	0.007	0.01	0.01	0.19	61.36	7	7.16	73	6.1	
30	Oquaga L	7/13/2003	30.0	5.05		0.006	0.00	0.00	0.16	60.51	10	7.20	72		1.72
30	Oquaga L	7/27/2003	30.0	5.90		0.011	0.00	0.00	0.03	5.15		7.08	70		1.19
30	Oquaga L	8/12/2003	30.0	9.70	1.5	0.004	0.01	0.00	0.18	100.44	11	6.41	78		1.58
30	Oquaga L	8/25/2003	30.0	9.50		0.003	0.03	0.01	0.23	151.53		7.14	72	6.2	0.23
30	Oquaga L	9/2/2003	30.0	6.90		0.005	0.00	0.00	0.18	83.53	8	7.15	72		0.13

LNum	PName	Date	Zbot	Zsd	Zsamp	Tot.P	NO3	TKN	TN	TN/TP	TColor	pH	Cond25	Ca	Chl.a
30	Oquaga L	9/28/2003	30.0	9.45		0.006	0.00	0.01	0.23	85.30	7	6.68	69		0.50
30	Oquaga L	10/13/2003	30.0	9.35		0.007	0.00	0.00	0.22	72.49	6	7.18	74		1.12
30	Oquaga L	6/13/2004	30+	6.10	1.0	0.004	0.01	0.02			16	6.54	74		3.22
30	Oquaga L	6/29/2004	30+	10.20	1.0	0.003	0.01	0.01	0.27	214.45	9	5.78	80		0.10
30	Oquaga L	7/2/2004	30+	8.90	1.0										
30	Oquaga L	7/11/2004	30+	8.40	1.0	0.002	0.01	0.01	0.32		7	6.75	81		1.40
30	Oquaga L	7/25/2004				0.006	0.01	0.01	0.34	130.81	2	6.55	75		0.05
30	Oquaga L	8/10/2004	30+	9.40	1.0	0.007	0.02	0.02	0.36	122.79	2	6.80	76	5.0	1.80
30	Oquaga L	8/22/2004	30+	11.30	1.0	0.004	0.02	0.01	0.32	183.57	27	7.49	84		1.00
30	Oquaga L	9/6/2004		9.10		0.004	0.02	0.02	0.39	206.50	1	7.95	57		0.30
30	Oquaga L	9/26/2004	30+	7.40	1.5	0.003	0.02	0.01	0.48	299.97	2	7.08	50		0.70
30	Oquaga L	6/19/2005	30+	6.60	1.5	0.007	0.01	0.01	0.14	46.55	1	6.80	49	5.7	1.4
30	Oquaga L	7/9/2005	30+	5.50	1.5	0.004	0.07	0.01	0.10	54.86	1	7.40	68		0.7
30	Oquaga L	7/24/2005	30+	6.80	1.5	0.004	0.01	0.01	0.01	2.53	6	7.54	60		0.1
30	Oquaga L	8/9/2005	30+	6.10	1.5	0.005	0.01	0.01	0.11	48.53	1	7.42	70		0.8
30	Oquaga L	9/5/2005				0.006	0.01	0.01	0.19	65.71	9	7.86	56	7.0	0.3
30	Oquaga L	9/17/2005	30+	6.35		0.007	0.09	0.01	0.12	36.94	7	7.59	78		0.2
30	Oquaga L	10/9/2005	30+	6.75		0.005	0.01	0.01	0.10	45.14	4	7.82	35		0.2
30	Oquaga L	10/22/05	30+	4.73		0.009	0.01	0.01	0.06	16.31	6	7.37	22		1.2
30	Oquaga L	6/25/2006				0.004	0.03	0.02	0.42	209.99	27	8.07	127	5.8	0.67
30	Oquaga L	7/9/2006	30+	5.60	1.5	0.006	0.01	0.01	0.26	100.28	19	7.10	54		0.24
30	Oquaga L	7/23/2006	30+	5.70	1.5	0.007	0.03	0.02	0.47	157.57	18	7.52	66		1.62
30	Oquaga L	8/6/2006	30+	7.30	1.5	0.006	0.02	0.02	0.43	153.96		7.38	76		0.53
30	Oquaga L	8/20/2006	30+	9.25		0.004	0.02	0.03	0.64	352.26	5	8.28	55	5.8	0.69
30	Oquaga L	9/4/2006	30+	8.95		0.006			0.40	137.65	6	7.56	62		0.90
30	Oquaga L	9/17/2006	30+	10.80		0.005	0.02	0.05	0.47	229.64	10	6.68	66		0.44
30	Oquaga L	10/8/2006	30+	11.65	1.5	0.006	0.03	0.02	0.41	140.40	12	7.33	72		0.66
30	Oquaga L	7/8/2007	30+	10.80	1.0	0.005	0.06	0.02	0.51	218.19	1	7.17	75	5.1	1.06
30	Oquaga L	7/21/2007	30+	10.10	1.0	0.006	0.01	0.01	0.23	81.73	5	8.10	57		0.96
30	Oquaga L	8/28/2007	30+	8.85	1.0	0.005	0.00	0.01	0.44	215.91	2	7.67	60		0.68
30	Oquaga L	8/19/2007	30+	8.40	1.0	0.009	0.01	0.01	0.39	91.64	1	7.65	37		1.23
30	Oquaga L	9/3/2007	30+	8.25	12.0	0.006	0.00	0.02	0.45	156.93	6	8.20	68	6.5	0.44
30	Oquaga L	9/16/2007	30+	7.95		0.004	0.01	0.01	0.41	206.88	6	8.26	55		0.66
30	Oquaga L	10/7/2007	30+	9.05	1.5	0.009	0.06	0.11	0.71	174.26	3	7.50	62		0.77
30	Oquaga L	10/20/2007	30+	7.45	1.5		0.09	0.03	0.57		4	7.78	56		1.27
30	Oquaga L	6/15/2008	30+	6.55	1.0	0.007	0.03	0.02	0.33	108.82	2	7.60	86	5.8	
30	Oquaga L	6/30/2008	~20	6.75		0.004	0.01	0.04	0.21	111.81	4	7.34	75		1.26
30	Oquaga L	7/13/2008	30+	6.55	1.0	0.004	0.01	0.10	0.20	121.02	8	7.46	70		1.24
30	Oquaga L	8/3/2008	30+	10.20	1.0	0.002	0.01	0.03	0.17	195.29	3	7.51	64		1.03
30	Oquaga L	8/16/2008	30+	8.90	1.0	0.006	0.01	0.01	0.20	74.93		7.43	69	5.4	0.95
30	Oquaga L	9/1/2008		9.65	1.0	0.004	0.01	0.01	0.29	174.83	5	7.43	69		0.41
30	Oquaga L	9/20/2008	20.0	9.25	1.0	0.007	0.01	0.09	0.31	105.71	5	7.39	69		0.74
30	Oquaga L	10/11/2008	30+	8.35		0.008	0.01	0.05	0.37	107.99	6	8.43	59		0.62
30	Oquaga L	06/29/2009	18.5	5.25	1.5	0.004	0.01	0.01	0.08	44.18	8	7.25	59	5.4	0.95
30	Oquaga L	07/12/2009	30.0	9.15	1.5	0.002	0.01	0.00	0.12	170.50	14	6.29	67		0.74
30	Oquaga L	08/02/2009	30.0	8.20	1.5	0.006	0.05	0.03	0.16	56.22	8	8.89	33		0.53
30	Oquaga L	08/16/2009	30.0	8.25	1.5	0.005	0.02	0.02	0.18	83.42	7	6.81	51		0.60
30	Oquaga L	09/07/2009	33.0	10.25		0.005	0.02	0.01	0.16	79.20	8	7.16	55	4.4	0.70
30	Oquaga L	09/20/2009	30.0	8.85	1.0	0.005	0.01	0.03	0.11	49.15	4	7.74	56		0.90
30	Oquaga L	10/04/2009	33.0	10.40	1.0	0.004	0.01	0.01	0.10	52.00	6	7.21	63		0.79
30	Oquaga L	10/17/2009	33.0	7.28	1.5	0.006	0.01	0.01	0.13	45.75	2	7.79	67		1.00
30	Oquaga L	6/13/2010		10.40		0.004	0.02	0.02			1	8.17	64	5.8	0.10
30	Oquaga L	7/5/2010	30+	11.00		0.004	0.02	0.02	0.20	111.65	4	7.02	67		0.50
30	Oquaga L	7/18/2010	30+	10.25	1.0	0.004	0.02	0.02	0.18	94.29	6	7.31	90		0.80
30	Oquaga L	7/31/2010	30+	11.65	1.0	0.004	0.02	0.03	0.23	126.50	4	8.45	94		0.80
30	Oquaga L	8/16/2010	30+	10.80	1.5	0.004	0.01	0.01	0.23	141.17	7	7.36	66	4.8	1.00
30	Oquaga L	9/5/2010	30.0	10.75		0.004	0.02	0.02	0.05	31.26	6	7.52	70		0.90
30	Oquaga L	9/26/2010	30+	11.15		0.005	0.11	0.09	0.27	115.92	7	7.43	90		1.00
30	Oquaga L	10/10/2010	30+	7.90	1.0	0.006	0.03	0.03	0.29	104.87	10	6.99	90		1.80
30	Oquaga L	6/12/2011	30+	7.95		0.008	0.01	0.03	0.01	1.39	1	7.79	87	6.2	2.00
30	Oquaga L	7/10/2011	30+	8.78	1.0	0.016	0.01	0.02	0.17	22.96	1	6.96	95		0.80
30	Oquaga L	7/24/2011	33.5	7.05	1.0	0.009	0.01	0.01	0.15	36.83	7	8.14	58		0.50
30	Oquaga L	8/7/2011	30+	8.95	1.0	0.009	0.01	0.02	0.25	60.92	8	8.14	90		1.00
30	Oquaga L	8/21/2011	30+	9.90	1.0	0.011	0.01	0.01	0.01	1.05	4			6.0	0.80
30	Oquaga L	9/4/2011	30+	8.85	1.0		0.01	0.01	0.19	11.99	13	9.08	94		0.60
30	Oquaga L	9/19/2011	30+	8.85	1.0	0.007	0.02	0.03	0.10	31.78	11	7.70	79		1.50

LNum	PName	Date	Zbot	Zsd	Zsamp	Tot.P	NO3	TKN	TN	TN/TP	TColor	pH	Cond25	Ca	Chl.a
30	Oquaga L	10/9/2011	30+	8.65		0.006	0.01	0.02	0.33	117.21	7	6.76	83		1.10
30	Oquaga L	6/24/2012	30+	7.10	1.5	0.004	0.02	0.03	0.16	82.37	4	7.85	81	4.8	1.40
30	Oquaga L	7/15/2012	30+	7.90	1.5	0.005	0.01	0.13	0.14	66.96	5	7.60	85		0.60
30	Oquaga L	7/29/2012	30+	8.40	1.5	0.005	0.01	0.13	0.15	70.68	4	8.12	81		0.70
30	Oquaga L	8/12/2012	30+	9.95	1.5	0.006	0.02	0.03	0.16	61.75	4	6.71	82		0.90
30	Oquaga L	8/27/2012	30+	9.15	1.5	0.005	0.01	0.13	0.09	43.06	1	6.72	79	6.1	1.00
30	Oquaga L	9/16/2012		10.48	1.5	0.008	0.01	0.02	0.13	35.75	4	7.05	81		0.70
30	Oquaga L	10/7/2012	30+	11.55	1.5	0.004	0.01	0.02	0.15	74.19	5	6.62	63		0.60
30	Oquaga L	10/20/2012	30.0	10.28	1.5	0.007	0.03	0.02	0.18	58.67	5	7.38	73		1.10
30	Oquaga L	6/30/2013	33.0	4.85	1.5	0.006	0.01	0.01	0.13	48.40	6	7.99	82		0.90
30	Oquaga L	7/14/2013	30+	6.85	1.0	0.008			0.20	53.16	5	7.42	70		0.60
30	Oquaga L	8/4/2013	30+	8.75	1.5	0.004	0.01	0.02	0.12	66.54	4	7.45	83		1.10
30	Oquaga L	8/18/2013	30+	10.50	1.5	0.004			0.31	162.65	7	7.97	72		0.80
30	Oquaga L	9/1/2013	30+	9.40	1.5	0.004	0.01	0.02	0.23	129.96	6	7.45	83		1.00
30	Oquaga L	9/15/2013	30+	8.55	1.5	0.005			0.30	135.57	11	7.49	74		0.70
30	Oquaga L	9/28/2013	30+	9.45	1.5	0.005	0.01	0.02	0.29	123.11	4	7.33	57		0.60
30	Oquaga L	10/13/2013	30+	7.70		0.005			0.32	147.41	6	7.18	82		0.70
30	Oquaga L	6/22/2014	30+	8.70	1.5	0.006	0.00	0.02	0.20	77.00	2	7.11	78	5.9	1.20
30	Oquaga L	7/6/2014	30+	7.05	1.5	0.004			0.19	112.97	2	7.25	83		1.00
30	Oquaga L	7/20/2014	30+	6.70	1.5	0.004	0.05	0.05	0.18	101.54	2	6.35	85		0.70
30	Oquaga L	8/3/2014	30+	9.95	1.5	0.004			0.16	98.39	2	7.75	82		0.50
30	Oquaga L	8/17/2014	30+	8.55	1.5	0.005	0.01	0.02	0.17	76.56	2	7.51	83	5.4	0.60
30	Oquaga L	8/31/2014	30+	7.45	1.5	0.006			0.18	61.46	2	7.76	86		0.90
30	Oquaga L	9/20/2014	30+	7.60	1.5	0.003	0.01	0.02	0.17	110.00	2	7.12	65		1.00
30	Oquaga L	10/11/2014	30+	8.35	1.5	0.005			0.16	79.20	2	6.42	85		0.70
30	Oquaga L	06/23/02	16.0			0.008	0.01	0.02	0.39	46.14					
30	Oquaga L	07/07/02	30.0			0.006	0.00	0.04	0.29	48.10					
30	Oquaga L	07/21/02	30.0			0.017	0.01	0.08	0.48	28.53					
30	Oquaga L	08/05/02	30.0			0.008	0.00	0.04	0.39	48.65					2.58
30	Oquaga L	08/18/02	30.0			0.007	0.02	0.04	0.46	65.00					
30	Oquaga L	09/02/02	30.0	8.15			0.00	0.01	0.37						
30	Oquaga L	09/25/02	26.0	9.58	24.0	0.008	0.00	0.04	0.37	46.20					
30	Oquaga L	10/06/02		6.85	20.0		0.01	0.05	0.34						
30	Oquaga L	10/20/02	30.0	7.55	15.0		0.01	0.05	0.33						
30	Oquaga L	6/30/2003				0.006	0.01	0.02	0.16	24.91					
30	Oquaga L	7/13/2003				0.005	0.00	0.00	0.14	28.54					
30	Oquaga L	7/27/2003			13.0	0.016	0.00	0.00	0.03	1.53					
30	Oquaga L	8/12/2003				0.010	0.00	0.00	0.19	19.31					
30	Oquaga L	8/25/2003			12.5	0.006	0.01	0.00	0.09	14.86					
30	Oquaga L	9/2/2003				0.005	0.01	0.04	0.16	30.09					
30	Oquaga L	9/28/2003				0.006	0.00	0.01	0.19	33.44					
30	Oquaga L	10/13/2003				0.006	0.00	0.00	0.11	16.95					
30	Oquaga L	6/13/2004				0.013	0.01	0.02							
30	Oquaga L	6/29/2004				0.007	0.01	0.01	0.27	41.04					
30	Oquaga L	7/11/2004				0.003	0.01	0.01	0.25	97.70					
30	Oquaga L	7/25/2004				0.012	0.01	0.03	0.17	14.87					
30	Oquaga L	8/10/2004				0.005	0.01	0.02	0.13	26.07					
30	Oquaga L	8/22/2004				0.008	0.02	0.02	0.01	0.61					
30	Oquaga L	9/6/2004				0.007	0.02	0.03							
30	Oquaga L	6/19/2005				0.009									
30	Oquaga L	7/9/2005				0.007									
30	Oquaga L	7/24/2005				0.005									
30	Oquaga L	8/9/2005				0.005									
30	Oquaga L	9/5/2005				0.012									
30	Oquaga L	9/17/2005			13.0	0.011									
30	Oquaga L	10/9/2005			10.0	0.009									
30	Oquaga L	10/22/05				0.008									
30	Oquaga L	6/25/2006				0.007									
30	Oquaga L	7/9/2006	30+			0.009									
30	Oquaga L	7/23/2006	30+			0.010									
30	Oquaga L	8/6/2006	30+			0.014									
30	Oquaga L	8/20/2006	30+		15.0	0.008									
30	Oquaga L	9/4/2006	30+		20.0	0.006									
30	Oquaga L	9/17/2006	30+		12.0	0.006									
30	Oquaga L	10/8/2006	30+			0.008									
30	Oquaga L	7/8/2007				0.009									

LNum	PName	Date	Zbot	Zsd	Zsamp	Tot.P	NO3	TKN	TN	TN/TP			Fe	Mn	As
30	Oquaga L	7/21/2007				0.008									
30	Oquaga L	8/8/2007				0.008									
30	Oquaga L	8/19/2007				0.010									
30	Oquaga L	9/3/2007				0.010									
30	Oquaga L	9/16/2007				0.006									
30	Oquaga L	10/7/2007				0.018									
30	Oquaga L	10/20/2007				0.007									
30	Oquaga L	6/15/2008	30+			0.011									
30	Oquaga L	6/30/2008	~20		15.0	0.008									
30	Oquaga L	7/13/2008	30+			0.009									
30	Oquaga L	8/3/2008	30+			0.014									
30	Oquaga L	9/1/2008			10.0	0.007									
30	Oquaga L	9/20/2008	20.0		20.0	0.008									
30	Oquaga L	10/11/2008	30+		25.0	0.006									
30	Oquaga L	06/29/2009			12.0	0.008		0.00							
30	Oquaga L	07/12/2009			12.0	0.001									
30	Oquaga L	08/02/2009				0.007		0.01							
30	Oquaga L	08/16/2009			10.0	0.006									
30	Oquaga L	09/07/2009				0.005		0.01					0.10	0.10	1.20
30	Oquaga L	09/20/2009			10.0	0.005									
30	Oquaga L	10/04/2009			12.0	0.009		0.01					0.10	0.10	0.34
30	Oquaga L	10/17/2009			18.0	0.005									
30	Oquaga L	6/13/2010			30.0	0.011		0.01					0.03		
30	Oquaga L	7/18/2010	30+		12.0	0.006		0.17					0.03		
30	Oquaga L	8/16/2010	30+		12.0	0.008		0.02					0.03		1.30
30	Oquaga L	9/26/2010	30+		10.0	0.007		0.02					0.17		
30	Oquaga L	6/12/2011	30+		10.0	0.010		0.03					0.01	0.01	
30	Oquaga L	7/24/2011	33.5		12.0	0.009		0.02					0.01	0.01	
30	Oquaga L	8/21/2011	30+		12.0	0.008		0.02					0.01	0.01	0.50
30	Oquaga L	9/19/2011	30+		12.0	0.008		0.02					0.01	0.01	0.50
30	Oquaga L	6/24/2012			12.0	0.014		0.04							
30	Oquaga L	7/15/2012			10.0								0.03	0.02	
30	Oquaga L	7/29/2012			12.0	0.007		0.03							
30	Oquaga L	8/12/2012			12.0								0.19	0.02	
30	Oquaga L	8/27/2012			12.0	0.006		0.03							
30	Oquaga L	9/16/2012			12.0								0.07	0.02	1.00
30	Oquaga L	10/7/2012			12.0	0.004		0.02							
30	Oquaga L	10/20/2012			12.0								0.11	0.02	0.50
30	Oquaga L	6/30/2013			15.0	0.012		0.01							
30	Oquaga L	7/14/2013			30.0	0.014									
30	Oquaga L	8/4/2013			30.0			0.02							
30	Oquaga L	8/18/2013			15.0										
30	Oquaga L	9/1/2013			15.0	0.006		0.02							
30	Oquaga L	9/15/2013			15.0										
30	Oquaga L	9/28/2013			15.0	0.012		0.09							
30	Oquaga L	10/13/2013													
30	Oquaga L	6/22/2014			15.0	0.009		0.03							
30	Oquaga L	7/6/2014			12.0	0.005									
30	Oquaga L	7/20/2014			12.0	0.008		0.03							
30	Oquaga L	8/3/2014			12.0	0.006									
30	Oquaga L	8/17/2014			12.0	0.005		0.02							
30	Oquaga L	8/31/2014			12.0	0.008									
30	Oquaga L	9/20/2014			12.0	0.012		0.02							
30	Oquaga L	10/11/2014			12.0	0.006									

LNum	PName	Date	Site	TAir	TH20	QA	QB	QC	QD	QF	QG	AQ-PC	AQ-Chla	MC-LR	Ana-a	Cylin	FP-Chl	FP-BG	HAB-form	Shore HAB
30	Oquaga L	6/13/1987	epi	23	19															
30	Oquaga L	6/21/1987	epi	21	23															
30	Oquaga L	7/5/1987	epi	24	23															
30	Oquaga L	7/11/1987	epi	85	78															
30	Oquaga L	7/19/1987	epi	29	25															
30	Oquaga L	7/26/1987	epi	30	26															
30	Oquaga L	8/3/1987	epi	25	24															
30	Oquaga L	8/10/1987	epi	25	24															
30	Oquaga L	8/17/1987	epi	29	26															
30	Oquaga L	8/23/1987	epi	16	23															
30	Oquaga L	8/30/1987	epi	26	19															
30	Oquaga L	9/7/1987	epi	22	18															
30	Oquaga L	9/16/1987	epi	22	19															
30	Oquaga L	10/10/1987	epi	13	14															
30	Oquaga L	10/23/1987	epi	17	12															
30	Oquaga L	7/1/1988	epi	19	17															
30	Oquaga L	7/13/1988	epi	28	24															
30	Oquaga L	7/21/1988	epi	18	23															
30	Oquaga L	7/28/1988	epi	26	24															
30	Oquaga L	8/4/1988	epi	25	26															
30	Oquaga L	8/11/1988	epi	27	25															
30	Oquaga L	8/18/1988	epi	21	23															
30	Oquaga L	8/25/1988	epi	20	21															
30	Oquaga L	9/2/1988	epi	23	21															
30	Oquaga L	9/15/1988	epi	14	16															
30	Oquaga L	7/10/1989	epi	20	22															
30	Oquaga L	8/2/1989	epi	22	24															
30	Oquaga L	8/9/1989	epi	20	20															
30	Oquaga L	8/19/1989	epi	21	24															
30	Oquaga L	8/26/1989	epi	21	21															
30	Oquaga L	9/4/1989	epi	18	20															
30	Oquaga L	9/13/1989	epi	21	21															
30	Oquaga L	7/20/1990	epi	30	25															
30	Oquaga L	8/3/1990	epi	27	24															
30	Oquaga L	8/20/1990	epi	15	21															
30	Oquaga L	9/1/1990	epi	25	23															
30	Oquaga L	9/11/1990	epi	20	21															
30	Oquaga L	9/27/1990	epi	21	13															
30	Oquaga L	7/1/1991	epi	18	26															
30	Oquaga L	7/15/1991	epi	25	22															
30	Oquaga L	7/28/1991	epi	23	24															
30	Oquaga L	8/13/1991	epi	24	23															
30	Oquaga L	8/26/1991	epi	18	23															
30	Oquaga L	9/9/1991	epi	20	22															
30	Oquaga L	6/25/1992	epi	23	19	1	1	1												
30	Oquaga L	7/24/1992	epi	17	20	1	1	1	5											
30	Oquaga L	10/4/1992	epi	19	16															
30	Oquaga L	06/23/02	epi	20	17	1	1	1												
30	Oquaga L	07/07/02	epi	25	19	1	1	1												
30	Oquaga L	07/21/02	epi	25	22	1	2	1												
30	Oquaga L	08/05/02	epi	22	24	1	2	1												
30	Oquaga L	08/18/02	epi	24		1	2	1												
30	Oquaga L	09/02/02	epi	23	22	1	2	1												
30	Oquaga L	09/25/02	epi	13																
30	Oquaga L	10/06/02	epi	16		2	1	1	5											
30	Oquaga L	10/20/02	epi	10		1	1	2	5											
30	Oquaga L	6/30/2003	epi	21	22	1	1	1												
30	Oquaga L	7/13/2003	epi	17	21	1	1	1	5											
30	Oquaga L	7/27/2003	epi	24		2	1	2												
30	Oquaga L	8/12/2003	epi			1	1	1												
30	Oquaga L	8/25/2003	epi	16	19	1	2	1												

LNum	PName	Date	Site	TAir	TH20	QA	QB	QC	QD	QF	QG	AQ-PC	AQ-Chla	MC-LR	Ana-a	Cylin	FP-Chl	FP-BG	HAB-form	Shore HAB
30	Oquaga L	9/2/2003	epi	16	17	1	1	3	5											
30	Oquaga L	9/28/2003	epi		16	1	1	2	5											
30	Oquaga L	10/13/2003	epi	16	12	1	1	1												
30	Oquaga L	6/13/2004	epi	21	19	2	2	1	5											
30	Oquaga L	6/29/2004	epi	18	19	1	2	1	0											
30	Oquaga L	7/2/2004	epi	19	20	1	2	1	0											
30	Oquaga L	7/11/2004	epi	21	20	1	2	1	0											
30	Oquaga L	8/10/2004	epi	23	18	1	2	1	0											
30	Oquaga L	8/22/2004	epi			1	2	1	0											
30	Oquaga L	9/6/2004	epi	18	17	1	3	1	5											
30	Oquaga L	9/26/2004	epi	17	15	1	2	1	0											
30	Oquaga L	6/19/2005	epi	16	15	1	2	2	5											
30	Oquaga L	7/9/2005	epi	15	17	1	2	2	5											
30	Oquaga L	7/24/2005	epi	20		1	2	1	0											
30	Oquaga L	8/9/2005	epi	22	20	1	2	1	0											
30	Oquaga L	9/17/2005	epi	15	17	1	2	1	5											
30	Oquaga L	10/9/2005	epi		11	1	1	1	5											
30	Oquaga L	10/22/05	epi	7	8	2	1	1	158											
30	Oquaga L	7/9/2006	epi	18		2	2	1	0											
30	Oquaga L	7/23/2006	epi	17	19	2	2	1	5											
30	Oquaga L	8/6/2006	epi	17	20	2	2	1	0											
30	Oquaga L	8/20/2006	epi	18	17	2	2	2	8											
30	Oquaga L	9/4/2006	epi	16	14	1	2	1	5											
30	Oquaga L	9/17/2006	epi	18	15	1	2	1	0											
30	Oquaga L	10/8/2006	epi	12	10	1	2	1	0											
30	Oquaga L	7/8/2007	epi	21	15	1	2	1	0											
30	Oquaga L	7/21/2007	epi	19	16	1	2	1	0											
30	Oquaga L	8/8/2007	epi	16	18	1	2	1	0											
30	Oquaga L	8/19/2007	epi	11	16	1	2	1	5											
30	Oquaga L	9/3/2007	epi	18	15	1	3	1	0											
30	Oquaga L	9/16/2007	epi	10	14	1	2	1	5											
30	Oquaga L	10/7/2007	epi	14	13	2	2	1	5											
30	Oquaga L	10/20/2007	epi	13	10	1	1	1	5											
30	Oquaga L	6/15/2008	epi	18	10	1	2	1	0											
30	Oquaga L	6/30/2008	epi	18	15	1	2	1	8											
30	Oquaga L	7/13/2008	epi	16	18	1	2	2	5											
30	Oquaga L	8/3/2008	epi	17	18	1	2	1	0											
30	Oquaga L	8/16/2008	epi	13	15	1	2	1	0											
30	Oquaga L	9/1/2008	epi	26	15	1	3	1	7											
30	Oquaga L	9/20/2008	epi	17	14	1	3	1	8											
30	Oquaga L	10/11/2008	epi	21	10	1	2	1	0											
30	Oquaga L	06/29/2009	epi	21	15	2	2	2	1											
30	Oquaga L	07/12/2009	epi	17	13	1	3	1	8											
30	Oquaga L	08/02/2009	epi	15	16	1	2	1	5											
30	Oquaga L	08/16/2009	epi	27	24	1	3	1	2											
30	Oquaga L	08/24/2009	bloom											0.00						
30	Oquaga L	09/07/2009	epi	18	14	1	3	2	8			11.38		0.00						
30	Oquaga L	09/20/2009	epi	17	13	1	3	1	0			11.26								
30	Oquaga L	10/04/2009	epi	10	9	1	2	1	8			16.13								
30	Oquaga L	10/17/2009	epi	3	5	1	2	1	5					0.00						
30	Oquaga L	6/13/2010	epi	21	20	2	1	2	0	0	0									
30	Oquaga L	7/5/2010	epi	31	22	1	2	1	7	0	0									
30	Oquaga L	7/18/2010	epi	25	23	1	2	1	0	0	0									
30	Oquaga L	7/31/2010	epi	20	21	1	3	1	0	0	0									
30	Oquaga L	8/16/2010	epi	23	18	1	3	1	0	0	0	3.00		0.00						
30	Oquaga L	9/5/2010	epi	9	14	1	3	1	0	0	0									
30	Oquaga L	9/26/2010	epi	6	11	1	3	1	0	0	0	15.00		0.00						
30	Oquaga L	10/10/2010	epi	7	9	2	3	1	1	0	0			0.00						
30	Oquaga L	6/12/2011	epi	12	18	1	1	1	5	0	0	0.80	0.50							
30	Oquaga L	7/10/2011	epi	23	15	2	2	1	0	0	0	1.50	0.30							
30	Oquaga L	7/24/2011	epi	19	19	1	1	1	0	0	0	1.50	0.17	0.90	<0.5	<0.1				

LNum	PName	Date	Site	TAir	TH20	QA	QB	QC	QD	QF	QG	AQ-PC	AQ-Chla	MC-LR	Ana-a	Cylin	FP-Chl	FP-BG	HAB-form	Shore HAB
30	Oquaga L	8/7/2011	epi	15	17	1	1	1	0	0	0	32.70	5.80							
30	Oquaga L	8/21/2011	epi	14	15	1	3	1	0	0	0									
30	Oquaga L	9/4/2011	epi	18	15	1	3	1	0	0	0	4.90	3.40							
30	Oquaga L	9/19/2011	epi	9	17	1	3	2	0	3	3	3.00	0.80							
30	Oquaga L	10/9/2011	epi	15	10	2	3	2	0	0	0	4.40	1.20							
30	Oquaga L	6/24/2012	epi	17	14	2	3	1	0	0	0	3.10	0.30	<0.30	<0.428		0.65	0.25	F	
30	Oquaga L	7/15/2012	epi	14	17	2	3	2	8	7	0	0.10	0.20	<0.30	<0.423		0.98	0.31		
30	Oquaga L	7/29/2012	epi	14	16	2	3	2	0	0	0	2.80	0.20	<0.30	<0.292		0.49	0.00		
30	Oquaga L	8/12/2012	epi	12	16	2	3	1	0	0	0	2.40	0.20	<0.30	<0.537		1.61	1.15		
30	Oquaga L	8/27/2012	epi	11	19	2	3	2	0	0	0	0.10	0.20	<0.30	<0.551					
30	Oquaga L	9/16/2012	epi	11	12	1	3	1	0	0	0	0.80	0.10	0.45	<3.299		0.66	0.61		
30	Oquaga L	10/7/2012	epi	4	8	2	3	2	0	0	0	1.40	0.20	<0.30	<3.205		0.56	0.27		
30	Oquaga L	10/20/2012	epi	7	8	1	3	1	0	0	0	1.60	0.20	<0.30	<3.205		0.42	0.00		
30	Oquaga L	6/30/2013	epi	30	19	2	1	2	1	5	0	2.60	1.20	<0.30	<0.610		1.40	0.00	I	I
30	Oquaga L	7/14/2013	epi		25	1	2	1	0	0	0	0.80	1.00	<0.30	<0.490		0.80	0.00	I	I
30	Oquaga L	8/4/2013	epi	16	23	1	3	2	0	3	3	0.90	0.80	0.38	<0.390		0.90	0.00	I	I
30	Oquaga L	8/18/2013	epi	17	24	1	3	2	0	3	3	1.70	0.80	<0.30	<0.390		0.10	0.00	I	I
30	Oquaga L	9/1/2013	epi	19	25	1	3	1	0	0	0	1.70	0.50	<0.30	<1.100		0.10	0.00	I	I
30	Oquaga L	9/15/2013	epi	12	22	1	3	1	0	0	3	1.30	0.40	<0.30	<0.100		0.00	0.00	I	I
30	Oquaga L	9/28/2013	epi	15	18	1	3	2	0	0	0	0.80	0.40	<0.30	<0.100		0.00	0.00	I	I
30	Oquaga L	10/13/2013	epi			1	3	2	0	0	0	2.40	0.50	<0.30	<0.090		0.00	0.00	I	I
30	Oquaga L	6/22/2014	epi	18	15	1	1	1	0	0	0	0.05	0.20	<0.58	<0.44	<0.002	0.31	0.00	i	i
30	Oquaga L	7/6/2014	epi	17	16	1	2	1	0	0	0	0.05	0.10	<0.62	<0.03	<0.002	0.00	0.00	i	i
30	Oquaga L	7/20/2014	epi	11	14	1	3	1	0	0	0	1.40	0.10	<0.39	<0.24	<0.002	0.00	0.00	i	i
30	Oquaga L	8/3/2014	epi	13	13	1	3	1	0	3	0	0.50	0.10	<0.33	<0.01	<0.002	0.00	0.00	i	i
30	Oquaga L	8/17/2014	epi	10	12	1	3	1	5	0	0	0.80	0.10	<0.39	<0.03	<0.001	0.00	0.00	i	i
30	Oquaga L	8/31/2014	epi	12	11	1	3	2	0	0	0	0.20	0.10	<0.64	<0.16	<0.002	0.00	0.00	i	i
30	Oquaga L	9/20/2014	epi	9	9	1	3	1	0	0	0	1.30	0.10	<0.48	<0.04	<0.001	0.18	0.00	i	i
30	Oquaga L	10/11/2014	epi	9	7	1	3	1	0	0	0	9.50	0.20	<0.88	<0.12	<0.001	0.06	0.00	i	i
30	Oquaga L	09/02/02	hypo	23	10	2	1	2	0	0	0			0.00						
30	Oquaga L	09/25/02	hypo	13	14	1	2	1	7	0	0	11.38		0.00						
30	Oquaga L	10/06/02	hypo	16	9	1	2	1	0	0	0	11.26								
30	Oquaga L	10/20/02	hypo	10	12	1	3	1	0	0	0	16.13								
30	Oquaga L	9/17/2005	hypo		6															
30	Oquaga L	10/9/2005	hypo		4															
30	Oquaga L	10/22/05	hypo		5															
30	Oquaga L	8/20/2006	hypo		4															
30	Oquaga L	9/4/2006	hypo		4															
30	Oquaga L	9/17/2006	hypo		6															
30	Oquaga L	6/30/2008	hypo		4															
30	Oquaga L	9/20/2008	hypo		5															
30	Oquaga L	10/11/2008	hypo		6															
30	Oquaga L	08/16/2009	hypo		5															
30	Oquaga L	09/07/2009	hypo		5															
30	Oquaga L	10/04/2009	hypo		4															
30	Oquaga L	10/17/2009	hypo		4															
30	Oquaga L	6/13/2010	hypo		15															
30	Oquaga L	7/18/2010	hypo		14															
30	Oquaga L	8/16/2010	hypo		10															
30	Oquaga L	9/26/2010	hypo		6															
30	Oquaga L	6/12/2011	hypo		9															
30	Oquaga L	7/24/2011	hypo		4															
30	Oquaga L	8/21/2011	hypo		4															
30	Oquaga L	9/19/2011	hypo		5															
30	Oquaga L	6/24/2012	hypo		4															
30	Oquaga L	7/15/2012	hypo		4															
30	Oquaga L	7/29/2012	hypo		5															
30	Oquaga L	8/12/2012	hypo		6															
30	Oquaga L	8/27/2012	hypo		5															
30	Oquaga L	9/16/2012	hypo		5															
30	Oquaga L	10/7/2012	hypo		7															

LNum	PName	Date	Site	TAir	TH20	QA	QB	QC	QD	QF	QG	AQ-PC	AQ-Chla	MC-LR	Ana-a	Cylin	FP-Chl	FP-BG	HAB-form	Shore HAB
30	Oquaga L	10/20/2012	hypo		3															
30	Oquaga L	6/30/2013	hypo		4															
30	Oquaga L	7/14/2013	hypo		9															
30	Oquaga L	8/4/2013	hypo		5															
30	Oquaga L	8/18/2013	hypo		5															
30	Oquaga L	9/1/2013	hypo		6															
30	Oquaga L	9/15/2013	hypo		5															
30	Oquaga L	9/28/2013	hypo		5															
30	Oquaga L	6/22/2014	hypo		4															
30	Oquaga L	7/6/2014	hypo		4															
30	Oquaga L	7/20/2014	hypo		5															
30	Oquaga L	8/3/2014	hypo		5															
30	Oquaga L	8/17/2014	hypo		5															
30	Oquaga L	8/31/2014	hypo		4															
30	Oquaga L	9/20/2014	hypo		5															
30	Oquaga L	10/11/2014	hypo		5															

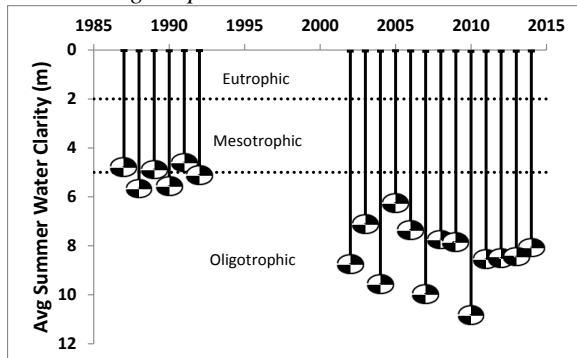
Legend Information

<i>Indicator</i>	<i>Description</i>	<i>Detection Limit</i>	<i>Standard (S) / Criteria (C)</i>
General Information			
Lnum	lake number (unique to CSLAP)		
Lname	name of lake (as it appears in the Gazetteer of NYS Lakes)		
Date	sampling date		
Field Parameters			
Zbot	lake depth at sampling point, meters (m)		
Zsd	Secchi disk transparency or clarity	0.1m	1.2m (C)
Zsamp	water sample depth (m) (epi = epilimnion or surface; bot = bottom)	0.1m	none
Tair	air temperature (C)	-10C	none
TH20	water temperature (C)	-10C	none
Laboratory Parameters			
Tot.P	total phosphorus (mg/l)	0.003 mg/l	0.020 mg/l (C)
NOx	nitrate + nitrite (mg/l)	0.01 mg/l	10 mg/l NO3 (S), 2 mg/l NO2 (S)
NH4	total ammonia (mg/l)	0.01 mg/l	2 mg/l NH4 (S)
TN	total nitrogen (mg/l)	0.01 mg/l	none
TN/TP	nitrogen to phosphorus (molar) ratio, = (TKN + NOx)*2.2/TP		none
TCOLOR	true (filtered) color (ptu, platinum color units)	1 ptu	none
pH	powers of hydrogen (S.U., standard pH units)	0.1 S.U.	6.5, 8.5 S.U. (S)
Cond25	specific conductance, corrected to 25C (umho/cm)	1 umho/cm	none
Ca	calcium (mg/l)	1 mg/l	none
Chl.a	chlorophyll a (ug/l)	0.01 ug/l	none
Fe	iron (mg/l)	0.1 mg/l	1.0 mg/l (S)
Mn	manganese (mg/l)	0.01 mg/l	0.3 mg/l (S)
As	arsenic (ug/l)	1 ug/l	10 ug/l (S)
AQ-PC	Phycocyanin (aquafior) (unitless)	1 unit	none
AQ-Chl	Chlorophyll a (aquafior) (ug/l)	1 ug/l	none
MC-LR	Microcystis-LR (ug/l)	0.01 ug/l	1 ug/l potable (C) 20 ug/l swimming (C)
Ana	Anatoxin-a (ug/l)	variable	none
Cyl	Cylindrospermopsin (ug/l)	0.1 ug/l	none
FP-Chl, FP-BG	Fluoroprobe total chlorophyll, fluoroprobe blue-green chlorophyll (ug/l)	0.1 ug/l	none
Lake Assessment			
QA	water quality assessment; 1 = crystal clear, 2 = not quite crystal clear, 3 = definite algae greenness, 4 = high algae levels, 5 = severely high algae levels		
QB	aquatic plant assessment; 1 = no plants visible, 2 = plants below surface, 3 = plants at surface, 4 = plants dense at surface, 5 = surface plant coverage		
QC	recreational assessment; 1 = could not be nicer, 2 = excellent, 3 = slightly impaired, 4 = substantially impaired, 5 = lake not usable		
QD	reasons for recreational assessment; 1 = poor water clarity, 2 = excessive weeds, 3 = too much algae, 4 = lake looks bad, 5 = poor weather, 6 = litter/surface debris, 7 = too many lake users, 8 = other		
QF, QG	Health and safety issues today (QF) and past week (QG); 0 = none, 1 = taste/odor, 2 = GI illness humans/animals, 3 = swimmers itch, 4 = algae blooms, 5 = dead fish, 6 = unusual animals, 7 = other		
HAB form, Shore HAB	HAB evaluation; A = spilled paint, B = pea soup, C = streaks, D = green dots, E = bubbling scum, F = green/brown tint, G = duckweed, H = other, I = no bloom		

Appendix C- Long Term Trends: Oquaga Lake

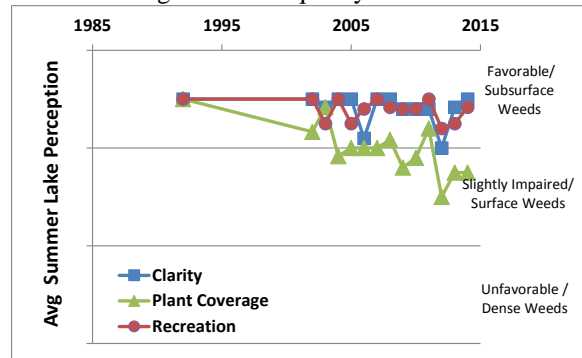
Long Term Trends: Water Clarity

- Clarity ↑ early 90s-early 10s; steady since
- Most readings now consistently typical of *oligotrophic* lakes



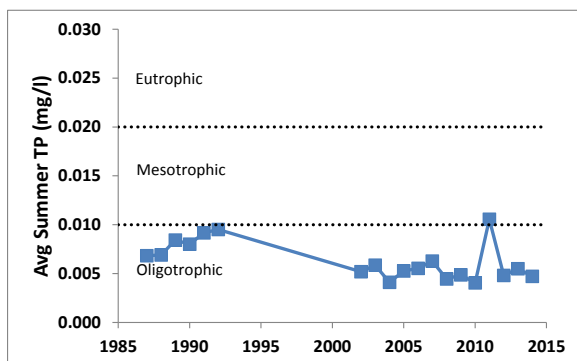
Long Term Trends: Lake Perception

- Plant coverage ↑ since early 00s
- Recreational perception not closely linked to changes in water quality or weeds



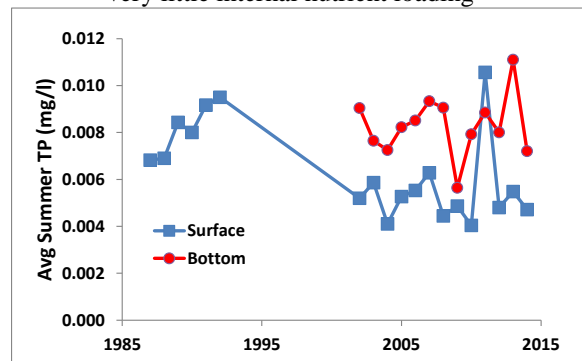
Long Term Trends: Phosphorus

- TP ↓ early 90s-early 00s; stable since then
- Most readings typical of *oligotrophic* lakes



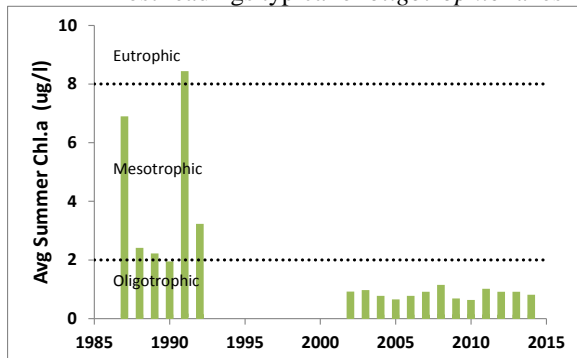
Long Term Trends: Bottom Phosphorus

- Deep TP similar to and synced w/surface TP
- Low deepwater TP and temperature indicates very little internal nutrient loading



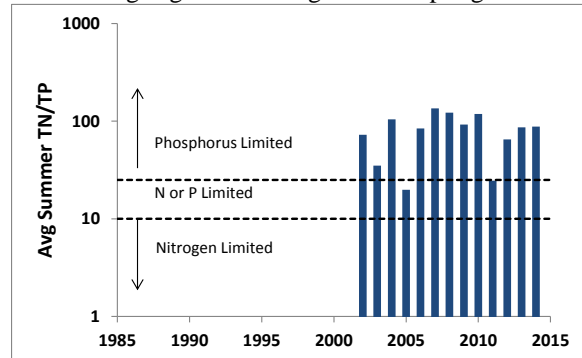
Long Term Trends: Chlorophyll a

- Algae levels ↓ early 90s-early 00s; consistent with ↑ water clarity and ↓ TP
- Most readings typical of *oligotrophic* lakes



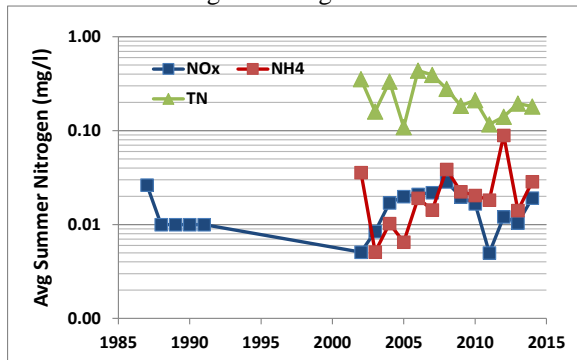
Long Term Trends: N:P Ratio

- No apparent trends
- Most readings indicate phosphorus limits algae growth during most sampling seasons



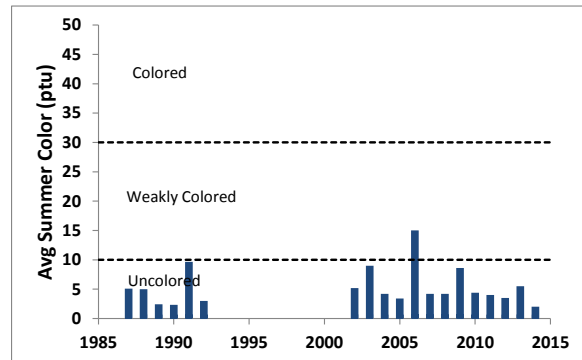
Long Term Trends: Nitrogen

- \uparrow NO_x and NH₄ last 3 years
- Usually low to very low NO_x, ammonia, and total nitrogen readings



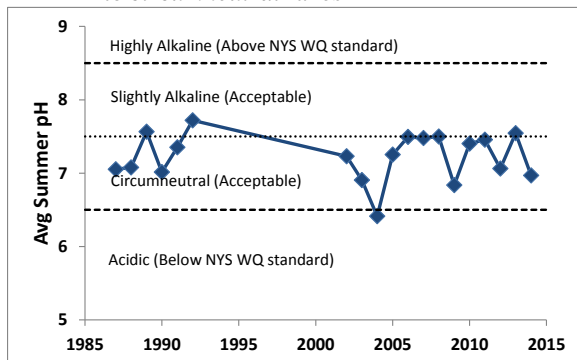
Long Term Trends: Color

- No trends apparent
- Most readings typical of *uncolored* lakes



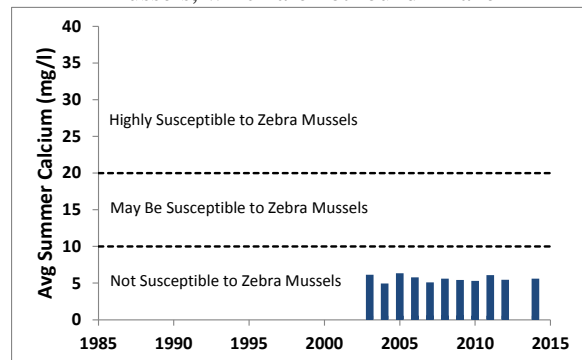
Long Term Trends: pH

- No trends apparent; variable year to year
- Most readings indicative of *slightly alkaline* to *circumneutral* lakes



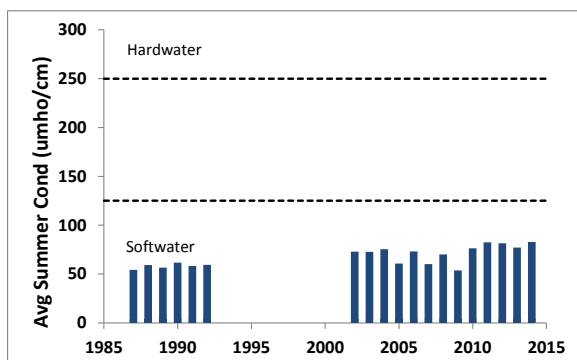
Long Term Trends: Calcium

- No trends apparent
- Data indicates low susceptibility to zebra mussels, which are not found in lake



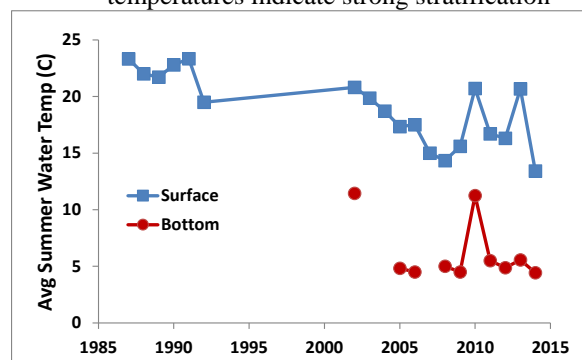
Long Term Trends: Conductivity

- Conductivity \uparrow early 90s- present
- Most readings typical of *softwater* lakes



Long Term Trends: Water Temperature

- Surface readings decreasing long term
- Large difference in surface and bottom temperatures indicate strong stratification



Appendix D: Algae Testing Results from SUNY ESF Study

Most algae are harmless, naturally present, and an important part of the food web. However excessive algae growth can cause health, recreational, and aesthetic problems. Some algae can produce toxins that can be harmful to people and animals. High quantities of these algae are called harmful algal blooms (HABs). CSLAP lakes have been sampled for a variety of HAB indicators since 2008. This was completed on selected lakes as part of a NYS DOH study from 2008-2010. In 2011, enhanced sampling on all CSLAP lakes was initiated through an EPA-funded project that has continued through the current sampling season. This study has evaluated a number of HAB indicators as follows:

- Algae types - blue green, green, diatoms, and "other"
- Algae densities
- Microscopic analysis of bloom samples
- Algal toxin analysis

Some of these results are reported in other portions of these reports. This appendix the seasonal change in blue green algae, other algae types, and the primary algal toxin (microcystin-LR, a liver toxin). Analysis was completed on open water samples and, for some lakes, shoreline samples that were collected when visual evidence of blooms were apparent. Results are compared to the DEC criteria of 30 ug/l blue green chlorophyll a and 20 ug/l microcystin-LR (based on the World Health Organization (WHO) threshold for unsafe swimming conditions) and the WHO provisional criteria for long-term protection of treated water supplies (= 1 ug/l microcystin-LR). The data for algae types are drawn from a high end fluorometer used by SUNY ESF. While these results are useful for timely approximation of lake conditions, they are not as accurate as the total chlorophyll results measured as a regular part of CSLAP since 1986 in all open water samples. Therefore these results are used judiciously in the assessment of sampled waterbodies.

Two separate samples are evaluated. A sample is taken at the CSLAP sample point at the deepest point of the lake at every sample session. In addition, shoreline samples can be taken when a bloom is visible. It should be noted that shoreline conditions can vary significantly over time and from one location to another. The shoreline bloom sampling results summarized below are not collected as routinely as open water samples, and therefore represent snapshots in time. It is assumed that sampling results showing high blue green algae and/or toxin levels indicate that algae blooms may be common and/or widespread on these lakes. However, the absence of elevated blue green algae and toxin levels does not assure the lack of shoreline blooms on these lakes. Elevated open water readings may indicate a higher likelihood of shoreline blooms, but in some lakes, these shoreline blooms have not been (well) documented.

The results from these samples are summarized within the CSLAP report for the lake.

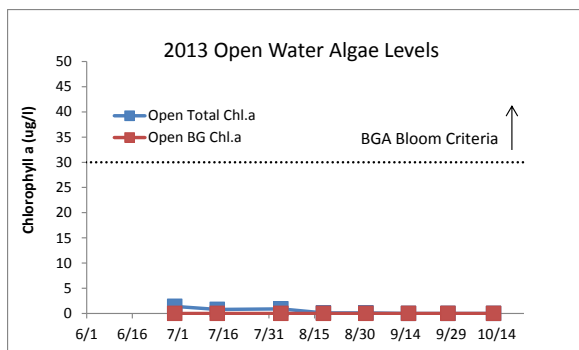


Figure D1:
2013 Open Water Total and BGA Chl.a

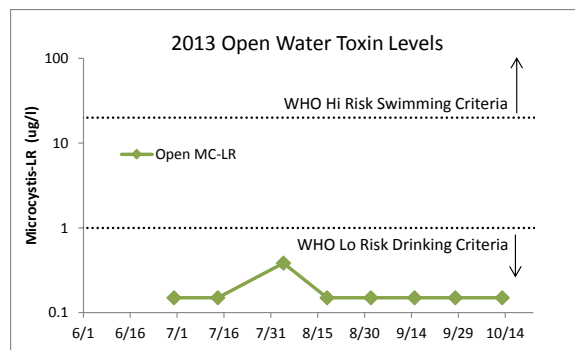


Figure D2:
2013 Open Water Microcystin-LR

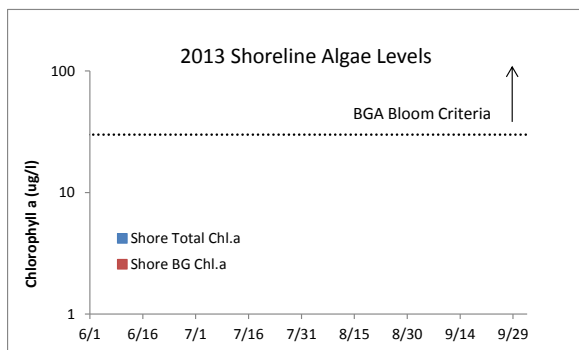


Figure D3:
2013 Shoreline Total and BGA Chl.a

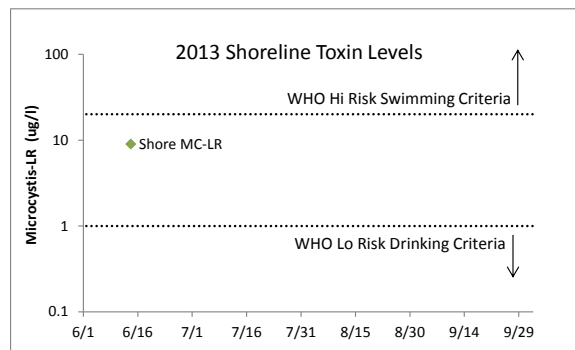


Figure D4:
2013 Shoreline Microcystin-LR

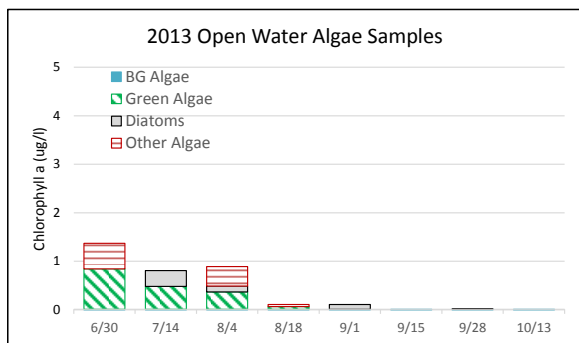


Figure D5:
2013 Open Water Algae Types

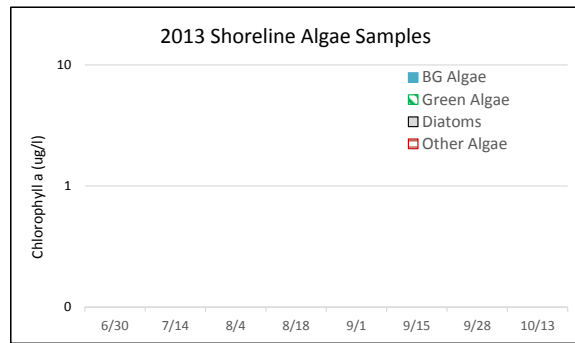


Figure D6:
2013 Shoreline Algae Types

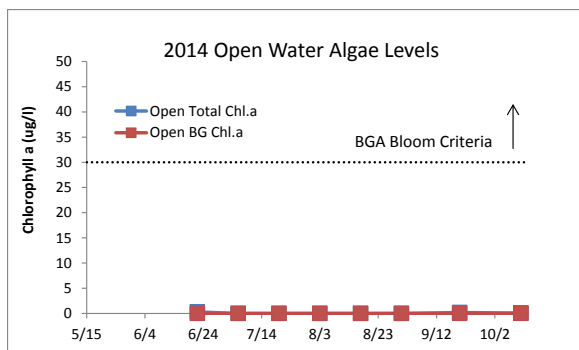


Figure D7:
2014 Open Water Total and BGA Chl.a

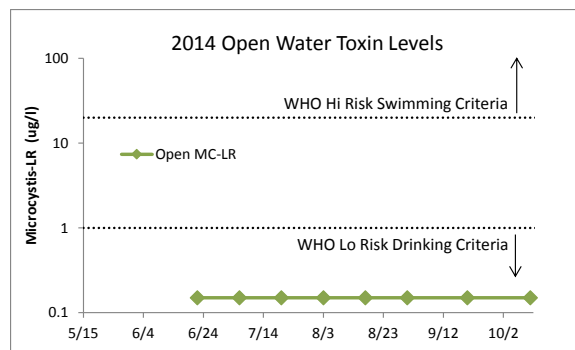


Figure D8:
2014 Open Water Microcystin-LR

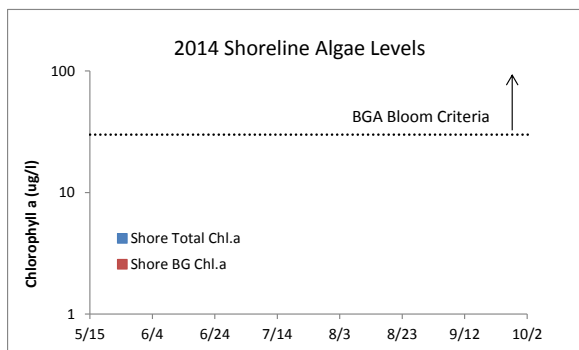


Figure D9:
2014 Shoreline Total and BGA Chl.a

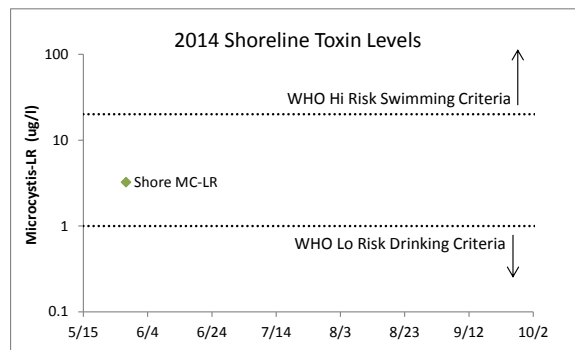


Figure D10:
2014 Shoreline Microcystin-LR

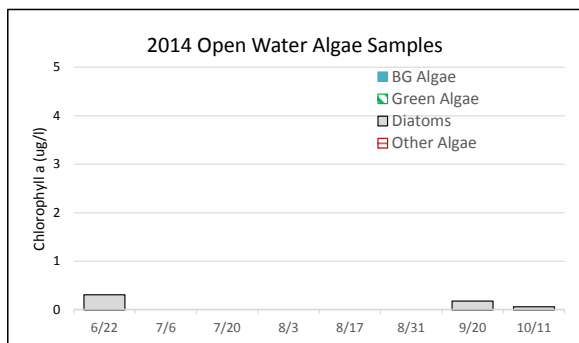


Figure D11:
2014 Open Water Algae Types

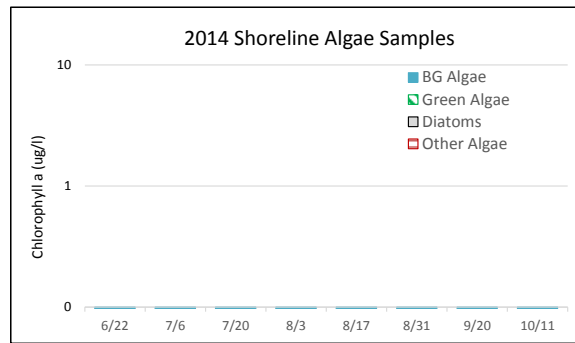


Figure D12:
2014 Shoreline Algae Types

Appendix E: AIS Species in Broome County

The table below shows the invasive aquatic plants and animals that have been documented in Broome County, as cited in either the iMapInvasives database (<http://www.imapinvasives.org/>) or in the NYSDEC Division of Water database. These databases may include some, but not all, non-native plants or animals that have not been identified as “Prohibited and Regulated Invasive Species” in New York state regulations (6 NYCRR Part 575; http://www.dec.ny.gov/docs/lands_forests_pdf/islist.pdf).

This list is not complete, but instead represents only those species that have been reported and verified within the county. If any additional aquatic invasive species (AIS) are known or suspected in these or other waterbodies in the county, this information should be reported through iMap invasives or by contacting NYSDEC at dowinfo@dec.ny.gov.

Aquatic Invasive Species - Broome County			
Waterbody	Kingdom	Common name	Scientific name
Arctic Lake	Plant	Eurasian watermilfoil	<i>Myriophyllum spicatum</i>
Arctic Lake	Plant	Eurasian watermilfoil	<i>Myriophyllum spicatum</i>
Beaver Lake	Animal	Banded mystery snail	<i>Viviparus georgianus</i>
Chenango River	Animal	Asian Clam	<i>Corbicula fluminea</i>
Deer Lake	Plant	Water chestnut	<i>Trapa natans</i>
Susquehanna River near Binghamton	Animal	Asian Clam	<i>Corbicula fluminea</i>
Susquehanna River near Five Mile Pt	Animal	Asian Clam	<i>Corbicula fluminea</i>
Susquehanna River near Kirkwood	Animal	Asian Clam	<i>Corbicula fluminea</i>
Susquehanna River	Animal	Zebra mussel	<i>Dreissena polymorpha</i>
Susquehanna River	Plant	Eurasian watermilfoil	<i>Myriophyllum spicatum</i>
Taft Pond	Plant	Eurasian watermilfoil	<i>Myriophyllum spicatum</i>
Taft Pond	Plant	Curly leafed pondweed	<i>Potamogeton crispus</i>
Unnamed Pond 1	Plant	Hydrilla	<i>Hydrilla verticillata</i>
Unnamed Pond 2	Plant	Hydrilla	<i>Hydrilla verticillata</i>
Whitney Point Reservoir	Plant	Eurasian watermilfoil	<i>Myriophyllum spicatum</i>

Appendix F: Watershed and Land Use Map for Oquaga Lake

This watershed and land use map was developed using USGS StreamStats and ESRI ArcGIS using the 2006 land use satellite imagery. The actual watershed map and present land uses within this watershed may be slightly different due to the age of the underlying data and some limits to the use of these tools in some geographic regions and under varying flow conditions. However, these maps are intended to show the approximate extent of the lake drainage basin and the major land uses found within the boundaries of the basin.

