Lake Lucille Questions and Answers, 2015 CSLAP

Q1. What is the condition of our lake this year?

A1. Water quality conditions in Lake Lucille were close to normal in 2015—algae levels were slightly higher than usual, and water clarity was slightly lower than usual, but recreational assessments were similar to those reported in recent years.

Q2. Is there anything new that showed up in the testing this year?

A2. Chloride testing results were consistent with lakes exhibiting moderate to major impacts from road salt runoff, although no impacts have been monitored or measured in the lake. The shoreline bloom sample collected in mid September was comprised primarily of green algae.

Q3. How does the condition of our lake this year compare with other lakes in the area?

A3. Lake Lucille had lower water clarity, and much higher nutrient and algae levels, than the typical lake in the area. Aquatic plant coverage continues to be much lower than in these other lakes, mostly likely due to very brown water.

Q4. Are there any trends in our lake's condition?

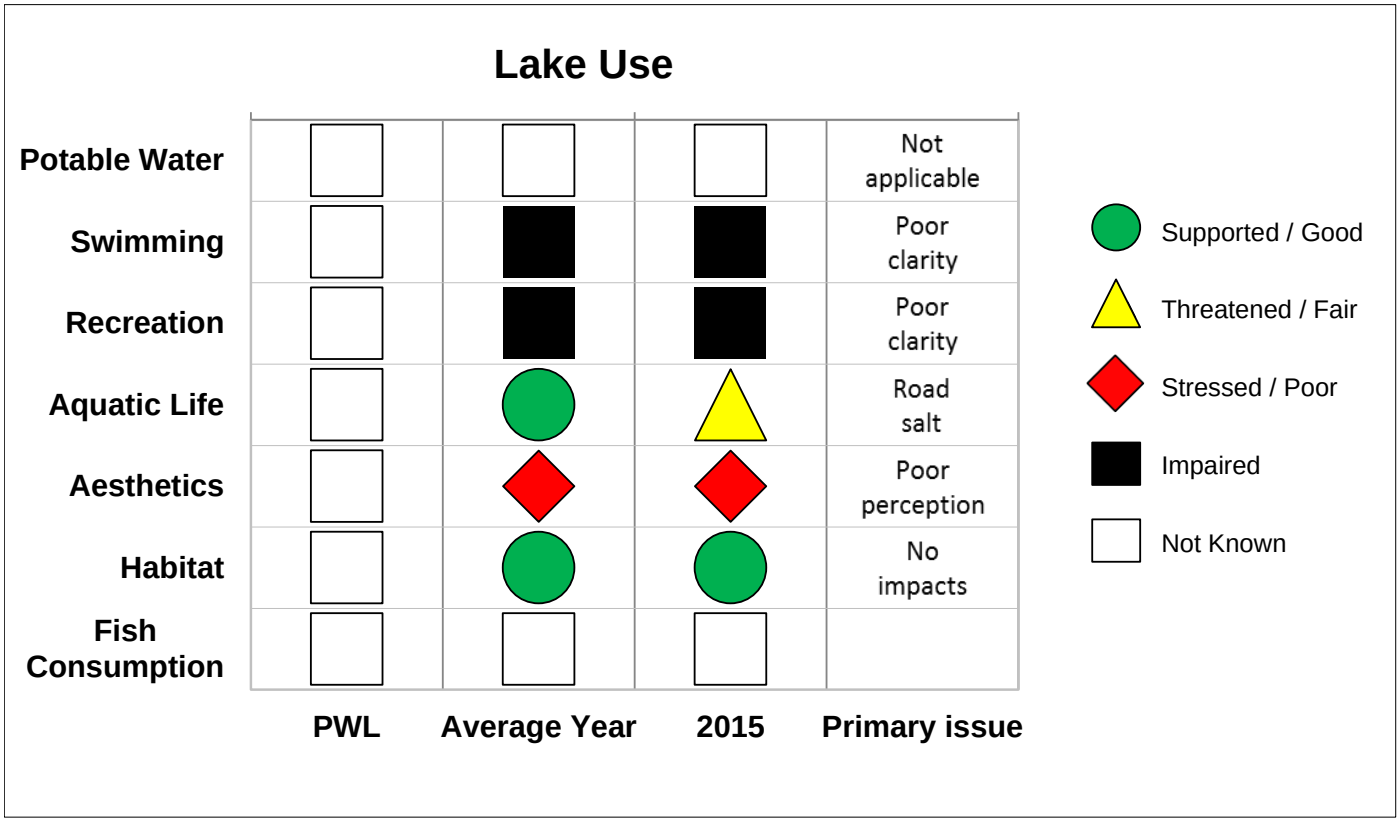
A4. Water clarity has decreased since the mid-1980s, consistent with higher algae levels and a rise in conductivity ove the same period. Water temperatures appear to have increased since the mid-1980s.

Q5. Should we be concerned about the condition of our lake? Are we close to a tipping point?

A5. Lake Lucille does not appear to be susceptible to shoreline blue green algae blooms, despite very high nutrient and open water algae levels. It is not known to what extent poor water clarity and brown water affects lake use, but lake residents should look for any sources of turbidity or eroding materials contributing to the rise in conductivity.

Q6. Are any actions indicated, based on the trends and this year's results?

A6. Individual stewardship activities such as pumping your septic system, growing a buffer of native plants next to the water bodies, and reducing erosion from shoreline properties and runoff into the lake will help to maintain lake health by reducing nutrient and sediment loading to the lake. Visiting boats should be inspected to reduce the risk of new invasive species, since nearby lakes harbor several invasive plants not presently found in the lake.

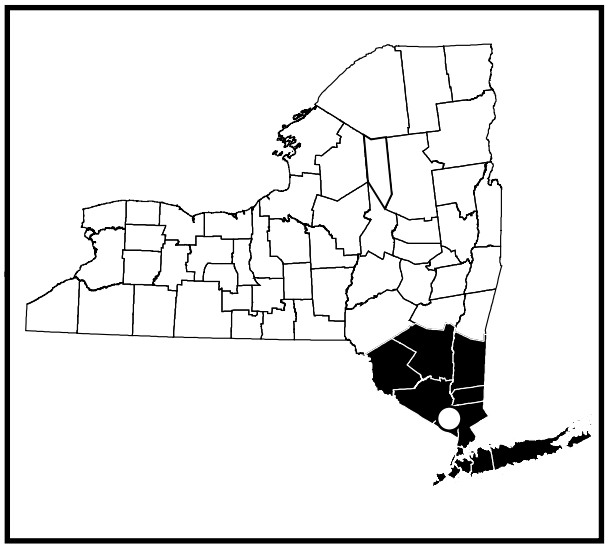


CSLAP 2015 Lake Water Quality Summary:
Lake Lucille

General Lake Information

Location	Town of New City
County	Rockland
Basin	Lower Hudson River
Size	5.2 hectares (13 acres)
Lake Origins	Man-made (13ft x 135ft gravity dam created 1928-1935)
Watershed Area	1091 hectares (2695 acres)
Retention Time	0.01 years
Mean Depth	1.2 meters
Sounding Depth	3.0 meters
Public Access?	None- private access only
Major Tributaries	Unnamed tributaries west and south of lake
Lake Tributary To…	Unnamed outlet to Hackensack River to DeForest Lake
WQ Classification	B (contact recreation = swimming)
Lake Outlet Latitude	41.185
Lake Outlet Longitude	-73.994
Sampling Years	1986-1990, 2012-2015
2015 Samplers	Kathleen Brennan, Judith Andersen, Daniel Petrow, Juli Schaefer, and Rik Paul
Main Contact	Juli Schaefer

Lake Map



Background

Lake Lucille is a 13 acre, class B lake found in the Town of New City in Rockland County, just north of the New York City region of New York State. It was sampled for the first time through CSLAP in 1986 as one of the original 25 lakes.

It is one of two CSLAP lakes among the more than 150 lakes and ponds found in Rockland County, and one of 67 CSLAP lakes among the more than 3680 lakes and ponds in the Lower Hudson River drainage basin.

Lake Uses

Lake Lucille is a Class B lake; this means that the best intended use for the lake is for contact recreation—swimming and bathing, non-contact recreation—fishing and boating, aquatic life, and aesthetics. The lake is used by lake residents and invited guests for swimming and passive boating—the lake has no public access.

It is not known by the report authors if Lake Lucille has recently been stocked as part of any private stocking effort; the lake is not stocked by the state of New York.

General statewide fishing regulations are applicable in Lake Lucille, and there are no lake-specific fish consumption advisories on Lake Lucille.

Historical Water Quality Data

CSLAP sampling was conducted on Lake Lucille from 1986 to 1990 and 2012 to 2015. CSLAP reports for the lake can be found on the NYSFOLA website at http://nysfola.mylaketown.com. The most recent CSLAP report and scorecard for Lake Lucille can also be found on the NYSDEC web page at http://www.dec.ny.gov/lands/77844.html.

Lake Lucille has not been sampled through any of the regional or statewide lake monitoring programs, and no NYSDEC fisheries monitoring has been conducted on the lake. The Health of the Lake Committee has been testing the water quality of Lake Lucille's inlet and outlet streams, as part of a program being conducted by Rockland County's Division of Environmental Resources.

Allied Biological conducted some baseline monitoring in 2012. Water quality conditions were comparable to those measured through CSLAP.

The Hackensack River near Centenary was monitored through the NYSDEC Rotating Intensive Basins (RIBS) stream biomonitoring programs in 2002. This survey found:

"Moderately impacted water quality is assessed for the Hackensack River and West Branch Hackensack River. Sites at West Nyack and Centenary were sampled for macroinvertebrates in 2002. Macroinvertebrate communities were dominated by facultative caddisflies and midges at both sites. ISD denoted municipal/industrial inputs as the primary stressor. No prior data were available for the river."

Lake Association and Management History

Lake Lucille is represented by the Lake Lucille Homeowners Association. The lake association was formed in the 1930s and has conducted a variety of lake management actions in the

intervening 80 years, including dredging, the development of a dam emergency plan, post-Hurricane Irene cleanup, hosting fishing derbies, public education, and contracting with Allied Biological to assess sediment buildup in the lake, conduct water quality monitoring and prepare a bathymetric map.

The lake association maintains a website at http://www.lakelucille.com.

Summary of 2015 CSLAP Sampling Results

Evaluation of 2015 Annual Results Relative to 1986-2014

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 – Lake Lucille" section in Appendix C.

Evaluation of Eutrophication Indicators

Chlorophyll *a* (a measure of algae) readings were slightly higher than normal in 2015 after lower than normal readings in the previous three years. This was consistent with lower water clarity readings, although these readings have decreased over the last several years. However, the within-season variability for these indicators, particularly chlorophyll *a*, is often higher than change from year to year. Phosphorus readings have not exhibited any clear long-term trends, although they were higher in 2015 than in most recent years.

Lake productivity typically decreases over the course of the summer, as manifested in increasing water clarity due to decreasing nutrient and algae levels. However, the opposite pattern was apparent in 2015; water clarity decreased slightly in response to seasonal increases in nutrient and algae levels.

The lake can be characterized as *eutrophic*, or highly productive, based on water clarity, total phosphorus and chlorophyll *a* readings (all typical of *eutrophic* lakes). The trophic state indices (TSI) evaluation suggests that water clarity readings at times are slightly higher than expected given the water color and algae levels in the lake. However, this observation probably has little influence over management decisions- algae levels and other turbidity would need to be controlled to improve water clarity. Overall trophic conditions are summarized on the Lake Scorecard and Lake Condition Summary Table.

Evaluation of Potable Water Indicators

Algae levels are 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, but the lake is not used for drinking water. 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 substantially over the last three decades (including 2015), perhaps indicative of continued input from external sediment and nutrient sources to the lake. Color readings have also been substantially higher, although it is not known if this was due to the change in laboratories (in 2002) or is related to the rise in conductivity. pH readings have

dropped slightly over the same period, but were close to normal in 2015. NOx readings were lower than normal in 2015 but have not changed much over time.

Chloride levels in the 2015 samples, collected for the first time through CSLAP and cited in Appendix A, ranged from 54 to 69 mg/l. These values fall within the "major" road salt runoff levels cited by the New Hampshire DES. These readings are well below the state potable water quality standard of 250 mg/l and above the range of values found in most NYS lakes. These readings suggest a moderate to high likelihood of biological impacts from road salt. Additional data will help to determine if these represent normal readings for the lake.

Overall limnological conditions are summarized in the Lake Scorecard and Lake Condition Summary Table.

Evaluation of Biological Condition

Phytoplankton samples were collected by Allied Biological in 2012. These analyses showed that

"*The May assemblage had moderate phytoplankton density and diversity with a favorable mix of green algae and golden algae that is normal for the season. The second sample, collected in August showed a significant increase in algal density, specifically in the green algae… No nuisance blue-green algae were observed on either sampling date"*

These results were consistent with the open water fluoroprobe screening samples analyzed by SUNY ESF in the last few years, which showed high algae levels but a very low percentage of blue green algae. The microscopic analysis of these samples showed dominance by green algae, diatoms, or other algal species. Elevated blue green algae levels were measured in the shoreline algal scum samples in 2013, dominated by *Microcystis*, a blue green algae species that often produces toxins. However, no shoreline blooms were reported in 2014, despite high overall algae levels contributing to frequent reports of brown water, and shoreline blooms in 2015 were primarily green algae.

Zooplankton, macroinvertebrate, macrophyte, and fisheries sampling has not been conducted through CSLAP at Lake Lucille. Allied Biological reported that "no vegetation was observed" during their 2012 surveys, consistent with CSLAP assessment data. The composition of the fish community is not known, but is assumed to be comprised of primarily warmwater fish species.

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

Evaluation of Lake Perception

Water quality assessments characterize the lake as having "definite algae greenness, yellowness or brownness", slightly more favorable than in other lakes with very low water clarity. Aquatic plants were not visible from the lake surface at nearly all times, consistent with the Allied Biological observations. Recreational conditions were most often described as "slightly impaired", also more favorable than in other lakes with similar water quality conditions (but perhaps balanced by the lack of invasive weed problems). These conditions were close to normal (usual) in 2015.

Evaluations of lake perception appear to be seasonally stable, although recreational assessments improved slightly during the summer of 2014 and 2015. 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 higher in the last several years (than in the period from 1986 to 2000), suggesting that temperatures may have increased over the last 25-30 years. It is not known if this is an indication of local climate change or if these changes can be evaluated through CSLAP, but the within-season variability continues to be much higher than the difference in annual temperatures over this timeframe.

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. Fluoroprobe algae levels indicate a high susceptibility for algae blooms but perhaps a low susceptibility for harmful (blue green) algal blooms (HABs) in the open water. Shoreline blooms at times show very high blue green algae levels, but algae levels in most samples are dominated by green algae. Both shoreline bloom and open water microcystis and anatoxin levels have been below the thresholds for safe swimming.

Lake Condition Summary

Category	Indicator	Min	Overall Avg	Max	2015 Avg	Classification	2015Change?	Long-term Change?
Eutrophication Indicators	Water Clarity	0.05	1.06	2.50	0.69	Eutrophic	Within Normal Range	No Change
	Chlorophyll *a*	0.21	42.83	289.00	55.69	Eutrophic	Within Normal Range	No Change
	Total Phosphorus	0.008	0.080	0.270	0.086	Eutrophic	Within Normal Range	No Change
Potable Water Indicators	Hypolimnetic Ammonia							Not known
	Hypolimnetic Arsenic							Not known
	Hypolimnetic Iron							Not known
	Hypolimnetic Manganese							Not known
Limnological Indicators	Hypolimnetic Phosphorus							Not known
	Nitrate + Nitrite	0.01	0.43	2.18	0.21	Intermediate NOx	Lower Than Normal	No Change
	Ammonia	0.02	0.16	0.33	0.20	Intermediate Ammonia	Within Normal Range	No Change
	Total Nitrogen	0.56	1.14	4.00	1.06	High Total Nitrogen	Within Normal Range	No Change
	pH	6.58	7.65	8.45	7.74	Alkaline	Within Normal Range	No Change
	Specific Conductance	133	317	475	344	Hardwater	Within Normal Range	Increasing Significantly
	True Color	9	25	90	24	Intermediate Color	Within Normal Range	Increasing Slightly
	Calcium	25.3	33.6	40.3	27.0	Highly Susceptible to Zebra Mussels	Within Normal Range	Decreasing Slightly
Lake Perception	WQ Assessment	3	3.0	3	3.0	Definite Algal Greenness	Within Normal Range	Slightly Improving
	Aquatic Plant Coverage	1	1.1	2	1.0	Plants Not Visible	Within Normal Range	Slightly Improving
	Recreational Assessment	2	3.1	4	3.0	Slightly Impaired	Within Normal Range	Slightly Improving
Biological Condition	Phytoplankton					Open water-low blue green algae biomass	Not known	Not known
	Macrophytes					Not yet evaluated	Not known	Not known
	Zooplankton					Not measured through CSLAP	Not known	Not known
	Macroinvertebrates					Not yet evaluated	Not known	Not known
	Fish					Warmwater fisheries	Not known	Not known
	Invasive Species					None observed	Not known	Not known
Local Climate Change	Air Temperature	7	19.8	35	22.6		Within Normal Range	Increasing Significantly
	Water Temperature	11	20.1	29	23.0		Higher Than Normal	Increasing Significantly

Category	Indicator	Min	Overall Avg	Max	2015 Avg	Classification	2015Change?	Long-term Change?
Harmful Algal Blooms	Open Water Phycocyanin	2	10	27	13	No readings indicate high risk of BGA	Not known	Not known
	Open Water FP Chl.a	5	26	80	21	Some readings indicate high algae levels	Not known	Not known
	Open Water FP BG Chl.a	0	0	2	0	No readings indicate high BGA levels	Not known	Not known
	Open Water Microcystis	<DL	0.2	0.6	<DL	Mostly undetectable open water MC-LR	Not known	Not known
	Open Water Anatoxin a	<DL	0.2	1.5	<DL	Open water Anatoxin-a at times detectable	Not known	Not known
	Shoreline Phycocyanin	1.9	9.7	26.9	9.7	No readings indicate high risk of BGA	Not known	Not known
	Shoreline FP Chl.a	88	1218	3530	3530	All readings indicate very high algae levels	Not known	Not known
	Shoreline FP BG Chl.a	0	72	237	0	Most readings indicate high BGA levels	Not known	Not known
	Shoreline Microcystis	<DL	2.4	4.0	<DL	At times measurable shoreline bloom MC-LR	Not known	Not known
	Shoreline Anatoxin a	<DL	1.0	2.2	<DL	Shoreline bloom Anatoxin-a at times detectable	Not known	Not known

Evaluation of Lake Condition Impacts to Lake Uses

Lake Lucille is not presently among the lakes listed on the Lower Hudson River drainage basin Priority Waterbody List (PWL).

Potable Water (Drinking Water)

The CSLAP dataset at Lake Lucille, including water chemistry data, physical measurements, and volunteer samplers' perception data, is inadequate to evaluate the use of the lake for potable water, and the lake is not used for this purpose. The high algae levels indicate a threat to any "unofficial" potable water use.

Public Bathing

The CSLAP dataset at Lake Lucille, including water chemistry data, physical measurements, and volunteer samplers' perception data, suggests that public bathing, if conducted at a public swimming beach, would be *impaired* by poor water clarity associated with excessive algae and shoreline blooms. Additional information about bacterial levels is needed to evaluate the safety of the water for swimming.

Recreation (Swimming and Non-Contact Uses)

The CSLAP dataset on Lake Lucille, including water chemistry data, physical measurements, and volunteer samplers' perception data, suggest that recreation would also be *impaired* by poor water clarity, although non-contact uses should be fully supported.

Aquatic Life

The CSLAP dataset on Lake Lucille, including water chemistry data, physical measurements, and volunteer samplers' perception data, suggest that aquatic life may be *threatened* by road salt runoff, excessive algae and turbidity. Additional data are needed to evaluate the food and habitat conditions for aquatic organisms in the lake.

Aesthetics and Habitat

The CSLAP dataset on Lake Lucille, including water chemistry data, physical measurements, and volunteer samplers' perception data, suggest that aesthetics may be *poor* due to poor recreational perception associated with periodic shoreline algae blooms, poor water clarity, and excessive open water algae levels. Habitat should be good.

Fish Consumption

There are no fish consumption advisories posted for Lake Lucille.

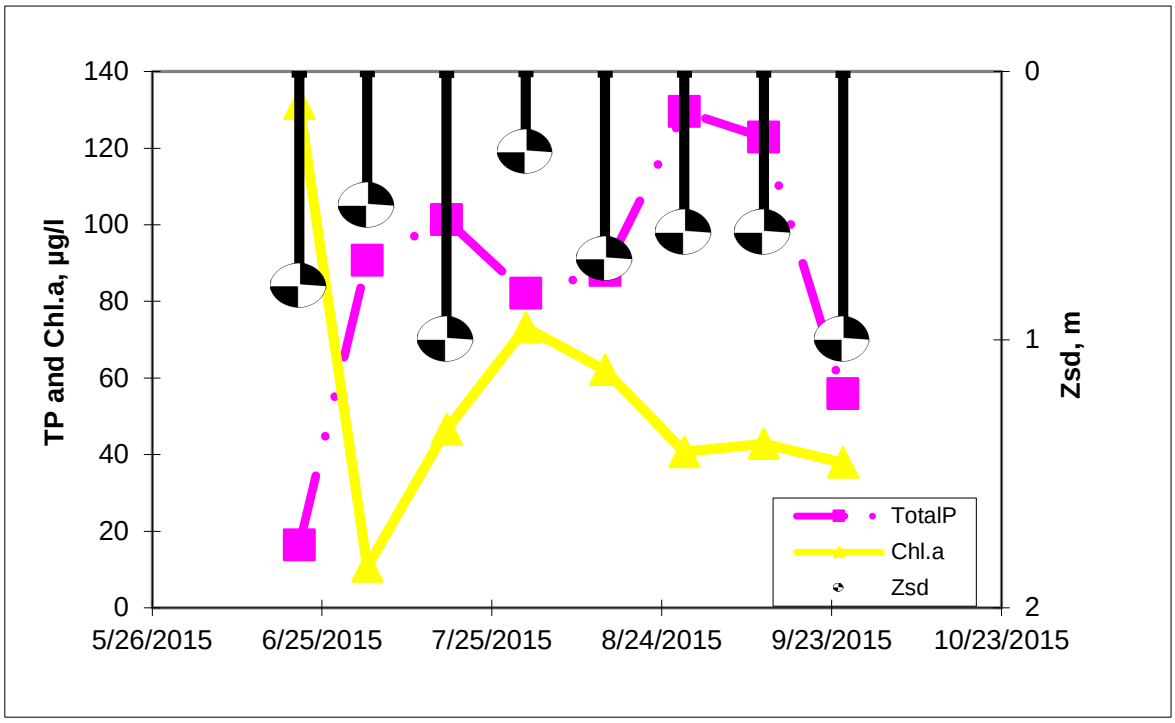
Additional Comments and Recommendations

Additional sampling will help to determine if any invasive plants are found in the lake. Lake residents should continue to report and avoid exposure to any surface scums or heavily discolored water, particularly along the shoreline.

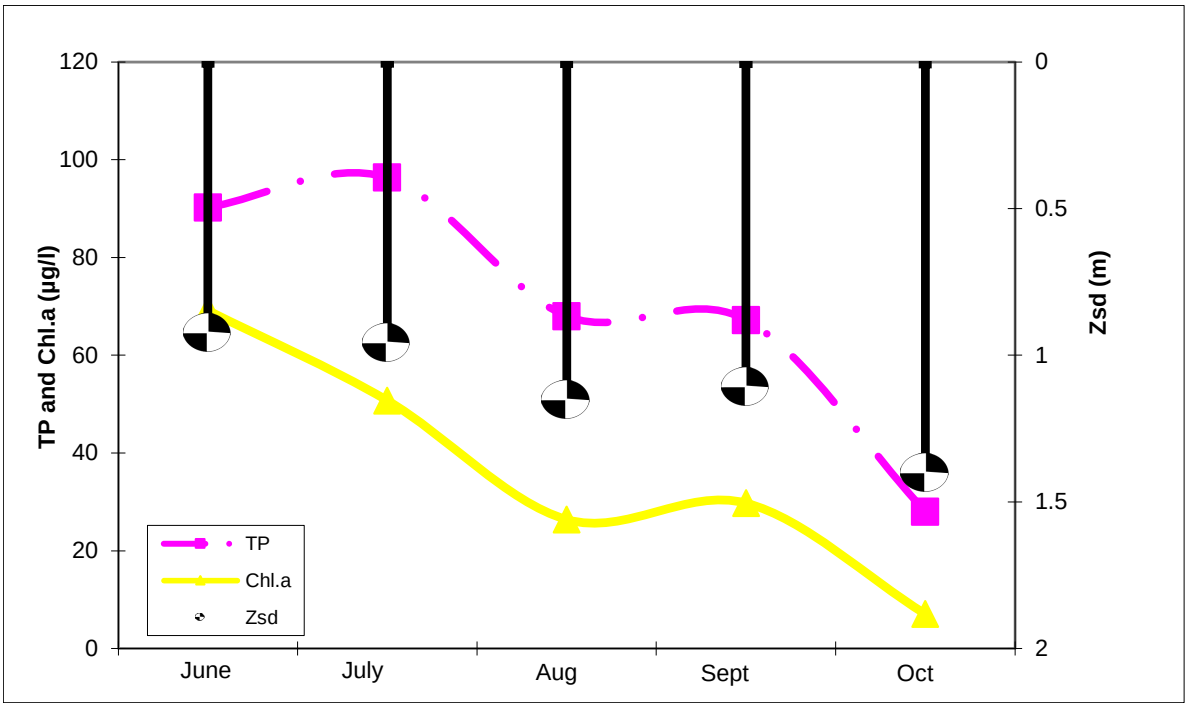
Aquatic Plant IDs-2015

None submitted for identification in 2015.

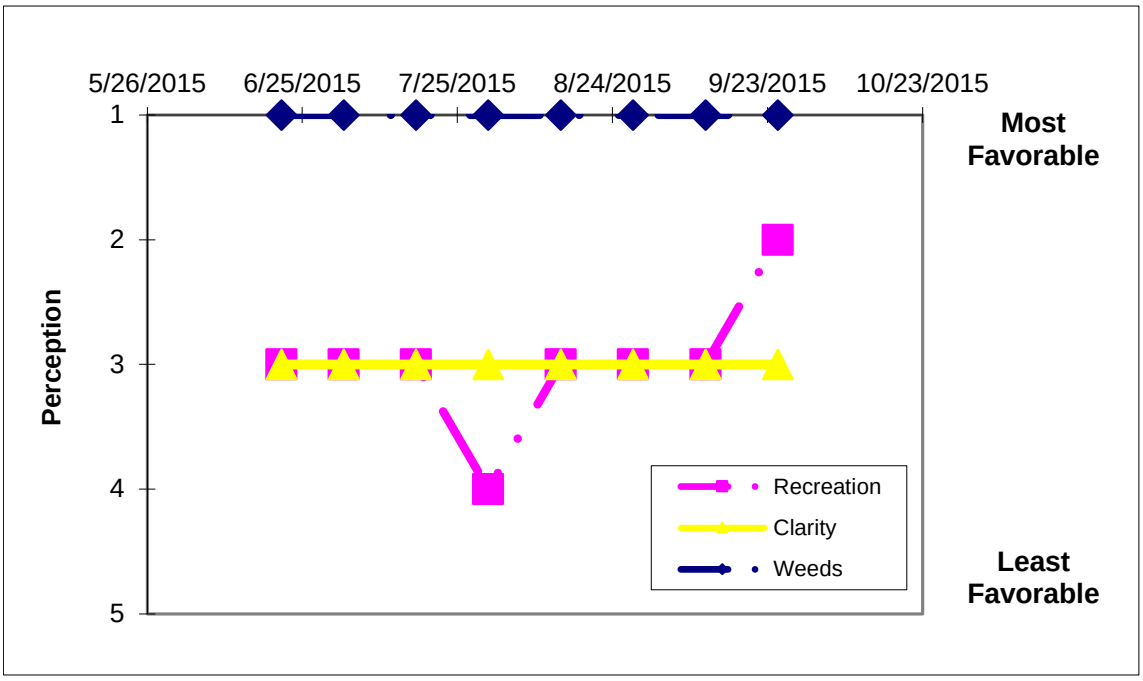
Time Series: Trophic Indicators, 2015



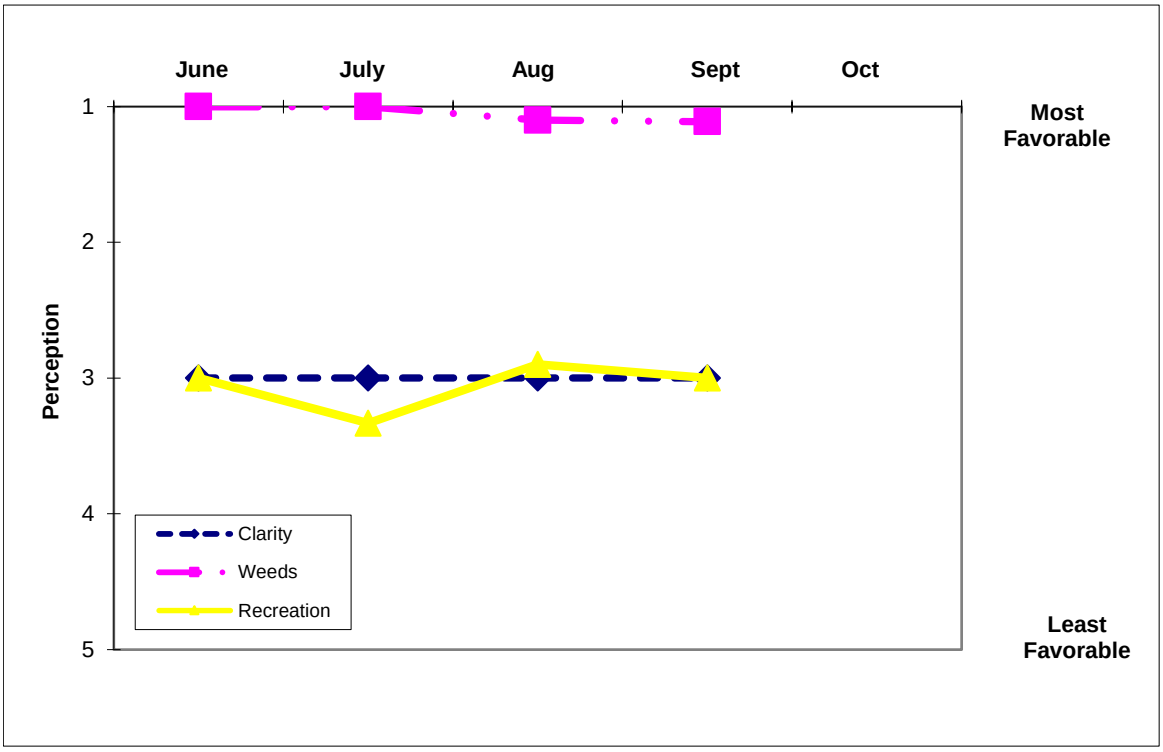
Time Series: Trophic Indicators, Typical Year (1986-2015)



Time Series: Lake Perception Indicators, 2015



Time Series: Lake Perception Indicators, Typical Year (1986-2015)



Appendix A- CSLAP Water Quality Sampling Results for Lake Lucille

LNum	PName	Date	Zbot	Zsd	Zsamp	Tot.P	NO3	NH4	TDN	TN/TP	TColor	pH	Cond25	Ca	Chl.a	Cl
1	L Lucille	7/17/1986	2.5	2.50	1.5	0.050	0.38				20	7.82	227		0.21	
1	L Lucille	7/24/1986	2.2	2.25	1.5	0.037	0.06				12	7.76	254		3.70	
1	L Lucille	7/31/1986	2.2	0.25	1.5	0.270	0.55				55	7.46	133		1.60	
1	L Lucille	8/7/1986	3.2	1.50	1.5	0.008	0.35				65	7.48	198		0.99	
1	L Lucille	8/11/1986	2.5	1.75	1.5	0.067	0.34				25	7.91	452		11.30	
1	L Lucille	8/21/1986	2.5	2.50	1.5	0.025	0.55				18	7.59	323		1.63	
1	L Lucille	8/28/1986	2.5	2.50												
1	L Lucille	9/4/1986	2.3	2.25	1.5	0.020	0.28				13	7.85	294		2.15	
1	L Lucille	9/11/1986	2.5	2.50	1.5	0.051	0.40				13	8.29	317		26.60	
1	L Lucille	9/18/1986	2.5	2.13	1.5	0.026	0.21				10	7.99	281			
1	L Lucille	6/21/1987	3.4	1.50	1.5	0.072	0.43				38	7.36	333			
1	L Lucille	6/28/1987	2.7	0.80	1.5	0.160	0.42				19	7.25	318			
1	L Lucille	7/5/1987	2.3	1.00	1.5	0.130	0.58				16	7.31	318		109.00	
1	L Lucille	7/12/1987	2.5	1.50	1.5	0.085	0.42				16	7.16	306		289.00	
1	L Lucille	7/19/1987	2.5	1.00	1.5	0.053	0.49				23	7.14	259		170.00	
1	L Lucille	7/26/1987	2.5	1.20	1.5	0.087	0.37				20	7.37	307		111.00	
1	L Lucille	8/2/1987	2.5	1.50	1.5	0.064	0.05				16	7.60	296		42.90	
1	L Lucille	8/8/1987	2.5	1.00	1.5	0.071	0.62				35	7.58	200		22.20	
1	L Lucille	8/9/1987	2.5	2.00	1.5	0.071	0.64				34	7.26	216		42.90	
1	L Lucille	8/16/1987	2.5	1.00	1.5	0.068	0.34				18	7.47	276		123.00	
1	L Lucille	8/23/1987	2.5	1.00	1.5	0.078	0.01				22	7.36	279		59.20	
1	L Lucille	8/30/1987	2.5	1.00	1.5	0.077	0.55				21	7.45	245		31.10	
1	L Lucille	9/6/1987	2.5	1.00	1.5	0.076	0.31				9	7.20	301		130.00	
1	L Lucille	9/13/1987	2.5	1.00	1.5	0.076	0.65				25	6.67	281		120.00	
1	L Lucille	9/20/1987	2.5	1.00	1.5	0.077	0.39				30	7.19	244			
1	L Lucille	9/27/1987	2.5	1.00	1.5	0.075	0.67				14	7.41	313			
1	L Lucille	6/8/1988	2.5	1.00	1.5	0.070	0.37				16	8.29	352		85.00	
1	L Lucille	6/19/1988	2.5	1.00	1.5	0.140	0.37				15	7.72	377		214.00	
1	L Lucille	6/26/1988	2.5	0.75	1.5	0.120	0.21				15	7.86	373		68.80	
1	L Lucille	7/3/1988	2.5	0.50	1.5	0.150	0.02				15	7.97	356		139.00	
1	L Lucille	7/10/1988	2.5	0.10	1.5	0.140	0.02				15	8.25	339		96.80	
1	L Lucille	7/17/1988	2.5	0.70	1.5	0.180	0.02				25	8.34	339		87.30	
1	L Lucille	7/24/1988	2.5	0.50	1.5	0.160	0.34				22	7.90	268		59.90	
1	L Lucille	7/31/1988	3.0	1.00	1.5	0.083	0.23				20	7.64	278		45.90	
1	L Lucille	8/3/1988	2.3	1.50	1.5	0.093	0.23				16	7.79	316		40.00	
1	L Lucille	8/14/1988	2.5	1.00	1.5	0.083	0.03				10	8.30	329			
1	L Lucille	8/21/1988	3.0	1.00	1.5	0.087	0.23				12	7.37	318		17.00	
1	L Lucille	8/28/1988	2.0	1.00	1.5	0.058	0.44				16	7.42	267		28.10	
1	L Lucille	9/4/1988	2.5	0.50	1.5	0.100	0.43				13	7.56	299		2.58	
1	L Lucille	9/11/1988	2.5	1.00	1.5	0.050	0.26				16	7.81	274		20.00	
1	L Lucille	6/25/1989	2.0	0.70	1.5	0.070	0.77				25	8.04	284		30.40	
1	L Lucille	7/2/1989	2.0	1.00	1.5	0.039	0.78				16	7.91	328		14.80	
1	L Lucille	7/9/1989	2.1	1.30	1.5	0.061	0.71				27	6.58	310		6.45	
1	L Lucille	7/16/1989	2.0	1.50	1.5	0.053	0.52				24	7.97	340		9.44	
1	L Lucille	7/23/1989	2.0	0.50	1.5	0.064	0.49				15	7.82	304		12.50	
1	L Lucille	7/30/1989	1.8	1.50	1.5	0.072	0.69				15	7.33	372		3.18	
1	L Lucille	8/6/1989	2.0	1.50	1.5	0.055	0.38				15	8.28	348			
1	L Lucille	8/12/1989	2.0	0.50	1.5	0.130	0.50				27	7.87	207		6.07	
1	L Lucille	8/20/1989	2.1	0.50	1.5	0.082	0.66				27	7.57	260		12.30	
1	L Lucille	8/27/1989	2.0	1.50	1.5	0.073	0.68				16	8.26	339		18.10	
1	L Lucille	9/3/1989	2.1	0.90	1.5	0.082	0.39				18	8.45	347		51.80	
1	L Lucille	9/10/1989	2.0	1.30	1.5	0.050	0.29				13	8.09	364		11.60	
1	L Lucille	9/17/1989	2.0	1.50	1.5	0.050	0.50				17	8.37	319		0.71	
1	L Lucille	9/24/1989	2.0	0.30	1.5	0.092	0.62				42	7.62	228		3.07	
1	L Lucille	10/1/1989	2.5	1.50	1.5		2.18					8.19	305		3.52	
1	L Lucille	7/1/1990	2.3	0.05	1.5	0.160	0.82				25	7.51	238		18.00	
1	L Lucille	7/15/1990	2.3	1.10	1.5	0.071	0.48					7.87	216		2.49	
1	L Lucille	7/29/1990	2.3	1.20	1.5	0.041	0.71					7.54	265		24.80	
1	L Lucille	8/12/1990	3.3	1.00	1.5	0.085	0.33				34	8.13	271		1.47	
1	L Lucille	8/26/1990	3.2	0.50	1.5	0.022	0.99				14	8.36	334		4.85	
1	L Lucille	9/9/1990	2.7	1.25	1.5	0.028	0.33				12	7.66	347		8.86	
1	L Lucille	9/23/1990	2.5	2.00	1.5	0.027	0.81				17				4.05	
1	L Lucille	10/7/1990	2.3	1.30	1.5	0.056	0.77				15	8.12	336		10.60	

LNum	PName	Date	Zbot	Zsd	Zsamp	Tot.P	NO3	NH4	TDN	TN/TP	TColor	pH	Cond25	Ca	Chl.a	Cl
1	L Lucille	6/22/2012	2.8	1.00		0.075	0.22	0.05	0.87	25.38	66	7.66	362	36.2	71.20	
1	L Lucille	7/6/2012	2.9	1.09	1.5	0.127	0.32	0.19	1.36	23.67	90	7.09	397		11.30	
1	L Lucille	7/6/2012														
1	L Lucille	7/22/2012	2.9	0.72	1.5	0.082			0.94	25.30	75	7.34	347		32.60	
1	L Lucille	8/3/2012	3.0	0.93	1.5	0.080	0.29	0.33	1.24	33.92	22				26.50	
1	L Lucille	8/17/2012	2.9	0.76	1.5	0.091	0.46	0.29	1.20	28.89	26	7.54	337	37.5	13.80	
1	L Lucille	8/31/2012	2.9	1.32	1.5	0.072	0.14	0.27	1.01	30.95		7.10	342			
1	L Lucille	9/14/2012	0.9	0.77	1.5	0.066	0.39	0.09	1.02	33.92	9	6.92	301		25.00	
1	L Lucille	9/14/2012														
1	L Lucille	9/28/2012	3.0	0.85	1.5	0.063	0.56	0.15	1.32	45.84	31	6.96	320		0.60	
1	L Lucille	6/21/2013	2.9	0.85	1.5	0.074	0.62	0.03	1.26	37.44	55	7.50	341		77.50	
1	L Lucille	7/5/2013	2.9	1.45	1.5	0.088			1.27	31.91	17	7.54	394		45.40	
1	L Lucille	7/10/2013														
1	L Lucille	7/19/2013	3.0	1.10	1.5	0.063	0.42	0.08	0.83	28.94	23	7.58	429		7.20	
1	L Lucille	8/2/2013		0.77	1.5	0.024			1.28	119.07	20	7.40	419		39.10	
1	L Lucille	8/16/2013	2.9	0.68	1.5	0.067	0.24	0.02	0.68	22.46	28	8.21	315		80.20	
1	L Lucille	8/30/2013	2.9	1.27	1.5	0.053			0.92	38.35	33	7.58	389		35.80	
1	L Lucille	9/13/2013		0.27	1.5	0.161	0.99	0.02	1.27	17.37	35	7.91	222		9.50	
1	L Lucille	9/27/2013	2.9	0.88	1.5	0.064			0.80	27.23	20	7.55	337		64.10	
1	L Lucille	6/20/2014	2.9	0.84	1.5	0.105	0.21	0.11	1.17	24.46	65	7.22	351	33.4	13.20	
1	L Lucille	7/5/2014	3.0	0.40	1.5	0.122			4.00	72.13	65	7.49	255		30.60	
1	L Lucille	7/18/2014	3.0	0.60	1.5	0.053	0.30	0.29	1.27	53.03	36	7.06	318		8.90	
1	L Lucille	8/1/2014	3.0	0.93	1.5	0.070			0.56	17.64	45	7.80	424		4.10	
1	L Lucille	8/15/2014	2.9	0.83	1.5	0.069	0.01	0.22	0.78	24.79	37	7.36	408	40.3	26.30	
1	L Lucille	9/2/2014		0.65	1.5	0.085			1.02	26.42	42	7.52	429		57.80	
1	L Lucille	9/12/2014	2.9	0.83	1.5	0.070	0.14	0.16	1.12	35.24	11	7.34	403		47.50	
1	L Lucille	9/26/2014	1.5		1.5	0.046			0.77	37.34	11	7.37	407		47.40	
1	L Lucille	6/21/2015	3.0	0.80	1.5	0.016	0.13	0.15	0.94	57.01	11	7.50	459	25.3	131.50	
1	L Lucille	7/3/2015	2.9	0.50	1.5	0.091			1.26	13.93	42	7.42	353		10.70	
1	L Lucille	7/17/2015	2.9	1.00	1.5	0.101	0.24	0.31	1.12	11.07	22	7.32	475		46.60	69.1
1	L Lucille	7/31/2015	3.0	0.30	1.5	0.082	0.19	0.15	0.97	11.83	21	8.26	248		73.20	
1	L Lucille	8/14/2015	2.9	0.70	1.5	0.088			1.19	13.52	12	7.77	289	28.7	62.10	
1	L Lucille	8/28/2015	2.9	0.60	1.5	0.130			1.12	8.62	47	8.31	237		40.70	
1	L Lucille	9/11/2015	3.0	0.60	1.5	0.123	0.30	0.20	1.18	9.63	15	7.57	337		42.80	53.5
1	L Lucille	9/11/2015			bloom											
1	L Lucille	9/25/2015	2.9	1.00	1.5	0.056			0.72	12.83	25	7.79	359		37.90	

LNum	PName	Date	Site	TAir	TH20	QA	QB	QC	QD	QF	QG	AQ-PC	AQ-Chla	MC-LR	Ana-a	Cyl	FP-Chl	FP-BG	HABform	Shore HAB
1	L Lucille	7/17/1986	epi	19	20															
1	L Lucille	7/24/1986	epi	19	23															
1	L Lucille	7/31/1986	epi	16	17															
1	L Lucille	8/7/1986	epi	20	17															
1	L Lucille	8/11/1986	epi	21	20															
1	L Lucille	8/21/1986	epi	19	19															
1	L Lucille	8/28/1986	epi	15	15															
1	L Lucille	9/4/1986	epi	15	15															
1	L Lucille	9/11/1986	epi	18	15															
1	L Lucille	9/18/1986	epi	7	12															
1	L Lucille	6/21/1987	epi	20	20															
1	L Lucille	6/28/1987	epi	12	17															
1	L Lucille	7/5/1987	epi	18	18															
1	L Lucille	7/12/1987	epi	24	22															
1	L Lucille	7/19/1987	epi	26	20															
1	L Lucille	7/26/1987	epi	26	23															
1	L Lucille	8/2/1987	epi	17	21															
1	L Lucille	8/8/1987	epi	28	22															
1	L Lucille	8/9/1987	epi	18	19															
1	L Lucille	8/16/1987	epi	20	21															
1	L Lucille	8/23/1987	epi	18	20															
1	L Lucille	8/30/1987	epi	15	16															
1	L Lucille	9/6/1987	epi	12	11															
1	L Lucille	9/13/1987	epi	16																

LNum	PName	Date	Site	TAir	TH20	QA	QB	QC	QD	QF	QG	AQ-PC	AQ-Chla	MC-LR	Ana-a	Cyl	FP-Chl	FP-BG	HABform	Shore HAB
1	L Lucille	9/20/1987	epi	12	14															
1	L Lucille	9/27/1987	epi	8	12															
1	L Lucille	6/8/1988	epi	16	18															
1	L Lucille	6/19/1988	epi	20	20															
1	L Lucille	6/26/1988	epi	20	20															
1	L Lucille	7/3/1988	epi	17	19															
1	L Lucille	7/10/1988	epi	21	22															
1	L Lucille	7/17/1988	epi	23	23															
1	L Lucille	7/24/1988	epi	20	21															
1	L Lucille	7/31/1988	epi	20	21															
1	L Lucille	8/3/1988	epi	27	25															
1	L Lucille	8/14/1988	epi	27	25															
1	L Lucille	8/21/1988	epi	12	19															
1	L Lucille	8/28/1988	epi	19	20															
1	L Lucille	9/4/1988	epi	15	17															
1	L Lucille	9/11/1988	epi	14	16															
1	L Lucille	6/25/1989	epi	18	18															
1	L Lucille	7/2/1989	epi	18	20															
1	L Lucille	7/9/1989	epi	19	20															
1	L Lucille	7/16/1989	epi	16	20															
1	L Lucille	7/23/1989	epi	22	20															
1	L Lucille	7/30/1989	epi	17	20															
1	L Lucille	8/6/1989	epi	22	24															
1	L Lucille	8/12/1989	epi	19	17															
1	L Lucille	8/20/1989	epi	18	18															
1	L Lucille	8/27/1989	epi	12	16															
1	L Lucille	9/24/1989	epi	9	14															
1	L Lucille	10/1/1989	epi	9	13															
1	L Lucille	7/1/1990	epi	22	21															
1	L Lucille	7/15/1990	epi	20	19															
1	L Lucille	7/29/1990	epi	23	23															
1	L Lucille	8/12/1990	epi	23	20															
1	L Lucille	8/26/1990	epi	20	19															
1	L Lucille	9/9/1990	epi	15	18															
1	L Lucille	9/23/1990	epi	13	15															
1	L Lucille	10/7/1990	epi	13	16															
1	L Lucille	6/22/2012	epi	32	28	3	1	3	1	0	0	11.10	10.40	<0.30	<0.413		20.84	0.00	I	
1	L Lucille	7/6/2012	epi	30	28	3	1	3	16	4	4	5.00	7.60	<0.30	<0.392		30.53	0.00	D	
1	L Lucille	7/6/2012	bloom											<0.60	<0.820		93.00	12.00	D	
1	L Lucille	7/22/2012	epi	26	25	3	1	3	1	0	0	6.10	7.60	<0.30	<0.328		25.58	0.00		
1	L Lucille	8/3/2012	epi	35	26	3	1	3	1	0	0	8.70	13.80	<0.30	<0.659		48.14	0.00	F	
1	L Lucille	8/17/2012	epi	23	24	3	1	3	1	0	0	10.20	1.90	<0.30	<0.223		8.14	0.47	F	
1	L Lucille	8/31/2012	epi	26	23	3	1	3	0	0	0	9.40	6.70				41.36	0.00	I	
1	L Lucille	9/14/2012	epi	21	21	3	1	3	1	0	0	1.90	6.90	0.47	1.51		21.00	0.00	EF	
1	L Lucille	9/14/2012	bloom											3.97	2.15		87.51	40.90		
1	L Lucille	9/28/2012	epi	17	19	3	1	4	15	0	0	3.90	3.50	<0.30	<3.205		17.91	0.00	F	
1	L Lucille	6/21/2013	epi	23	20	3	1	3	1	3	1	6.60	21.40	<0.30	<0.370		20.00	0.00	I	I
1	L Lucille	7/5/2013	epi	29	26	3	1	3	1	3	1	25.90	9.30	<0.30	<0.510		12.00	0.00	fi	I
1	L Lucille	7/10/2013	bloom											3.04	<0.750		1162.50	236.50	de	
1	L Lucille	7/19/2013	epi	30	29	3	1	3	1	3	1	13.30	8.20	<0.30	<0.910		11.90	0.00	fi	
1	L Lucille	8/2/2013	epi	26	23	3	2	3	1	3	2	6.60	12.20	0.61	<0.390		24.00	0.00		
1	L Lucille	8/16/2013	epi	19	21	3	1	3	16	3	1	12.00	28.50	<0.30	<0.510		35.40	0.00	fi	
1	L Lucille	8/30/2013	epi	23	23	3	1	3	1	3	1	6.80	13.50	<0.30	<1.100		18.00	0.00	F	D
1	L Lucille	9/13/2013	epi	21	21	3	1	4	146	3	1	8.90	5.60	<0.30	<0.100		7.70	0.00	I	
1	L Lucille	9/27/2013	epi	16	16	3	2	3	1	3	2	8.20	26.80	<0.30	<10.600		27.80	0.00		I
1	L Lucille	6/20/2014	epi	23	22	3	1	3	146	7	0	6.40	11.80	<0.47	<0.44	<0.002	80.20	0.00	f	
1	L Lucille	7/5/2014	epi	23	21	3	1	4	14	0	0	7.60	2.20	<0.62	<0.03	<0.002	12.30	0.00	bh	
1	L Lucille	7/18/2014	epi	22	22	3	1	4	146	0	0	5.90	5.80	<0.39	<0.09	<0.002	26.20	0.00	f	i
1	L Lucille	8/1/2014	epi	23	23	3	1	2	18	0	0	11.20	7.00	<0.33	<0.01	<0.002	50.40	0.00	f	f
1	L Lucille	8/15/2014	epi	20	22	3	1	3	1	0	0	26.90	1.80	<0.39	<0.03	<0.001	16.00	2.10	f	f
1	L Lucille	9/2/2014	epi	20	23	3	1	2	1	0	0	5.00	5.80	<0.29	<0.14	<0.002	39.00	0.00	f	

LNum	PName	Date	Site	TAir	TH20	QA	QB	QC	QD	QF	QG	AQ-PC	AQ-Chla	MC-LR	Ana-a	Cyl	FP-Chl	FP-BG	HABform	Shore HAB
1	L Lucille	9/12/2014	epi	18	21	3	1	3	1	4	4	3.40	4.80	<0.24	<0.03	<0.001	36.10	0.00	f	f
1	L Lucille	9/26/2014	epi	23	18	3	1	3	16	4	4	2.50	3.60	<0.19	<0.12	<0.001	35.50	0.00	f	f
1	L Lucille	6/21/2015	epi	29	24	3	1	3	1	0	0	14.60	10.90	<0.55	<0.004	<0.024	43.70	0.00	I	I
1	L Lucille	7/3/2015	epi	20	22	3	1	3	14	0	0	14.90	1.20	<0.63	<0.010	<32.565	4.90	0.00	F	
1	L Lucille	7/17/2015	epi	22	23	3	1	3	1	0	0	9.40	3.20	<0.30	<0.009	<0.049	14.90	0.00	FGH	I
1	L Lucille	7/31/2015	epi	23	25	3	1	4	146	0	0	13.28	3.00	<0.19	<0.004	<0.015	11.80	0.00	I	I
1	L Lucille	8/14/2015	epi	25	23	3	1	3	16	0	0	8.30	7.50	<0.65	<0.005	<0.015	32.00	0.00	I	I
1	L Lucille	8/28/2015	epi	22	24	3	1	3	1	0	0			<0.49	<0.003	<0.014	21.40	0.00	BF	I
1	L Lucille	9/11/2015	epi	21	23	3	1	3	15	4	4	15.30	5.20	<0.40	<0.009	<0.022	15.40	0.00	A	A
1	L Lucille	9/11/2015	epi							0	0						3530.30	0.00		
1	L Lucille	9/25/2015	epi	19	20	3	1	2	1	0	0	12.00	4.70	<0.30	<0.007	<0.035	22.40	0.00	I	I

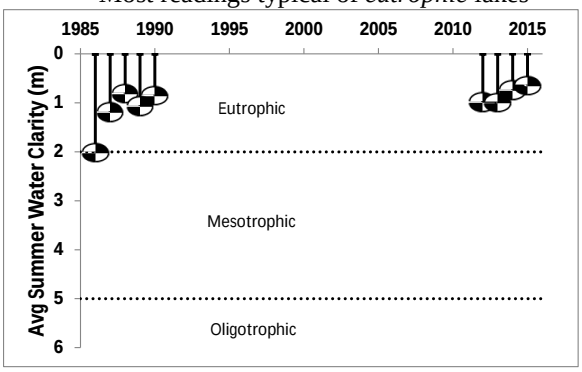
Legend Information

Indicator	*Description*	*Detection Limit*	*Standard (S) / Criteria (C)*
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, Cl	Calcium, chloride (mg/l)	1 mg/l	none
Chl.a	chlorophyll a (ug/l)	0.01 ug/l	none
Fe	iron (mg/l)	0.1 mg/1	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 (aquaflor) (unitless)	1 unit	none
AQ-Chl	Chlorophyll *a* (aquaflor) (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	Cylindrospermposin (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: Lake Lucille

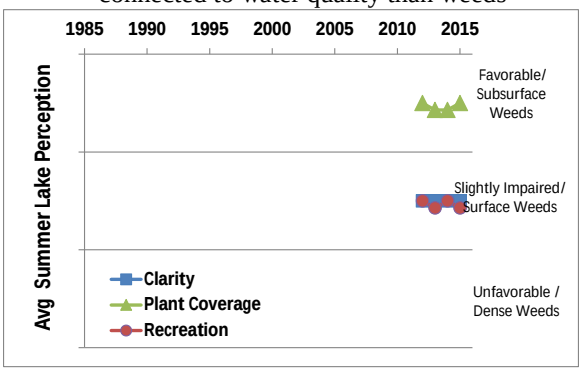
Long Term Trends: Water Clarity

- Drop in 2012-15 may be part of a longer-term trend
- Most readings typical of *eutrophic* lakes



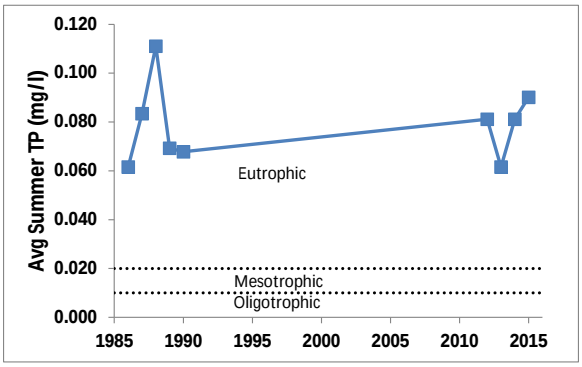
Long Term Trends: Lake Perception

- Stable perception
- Recreational perception more closely connected to water quality than weeds



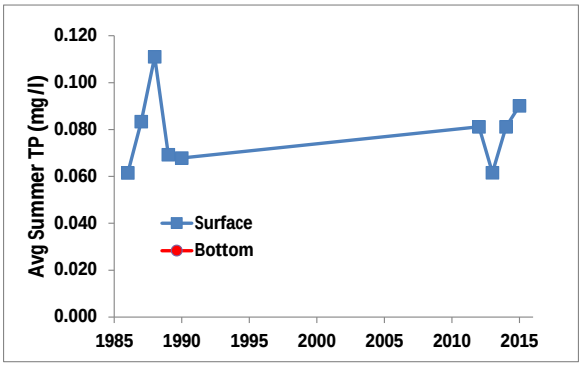
Long Term Trends: Phosphorus

- No clear trends; typical of shallow lakes
- Most readings typical of *highly eutrophic* lakes



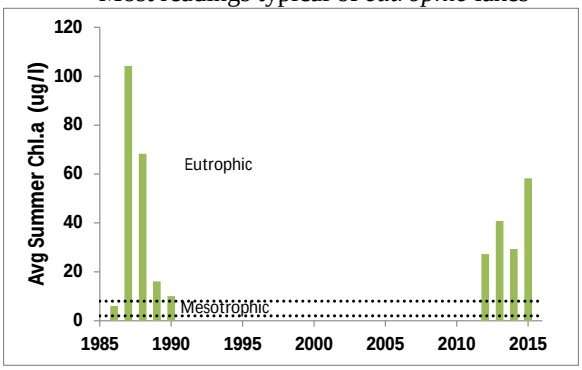
Long Term Trends: Bottom Phosphorus

- No bottom TP readings
- Likely that surface and bottom TP readings are similar in shallow lakes



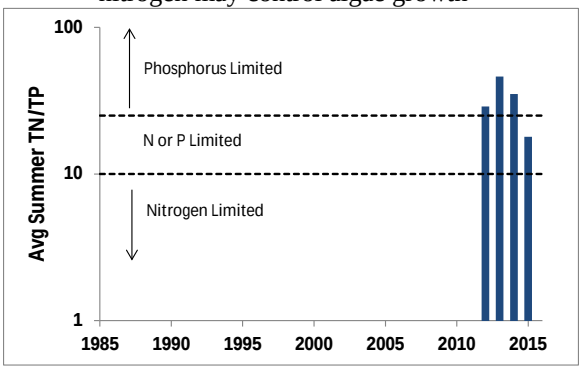
Long Term Trends: Chlorophyll a

- Slightly lower last 3 yrs, but highly variable algae levels, as in many shallow lakes
- Most readings typical of *eutrophic* lakes



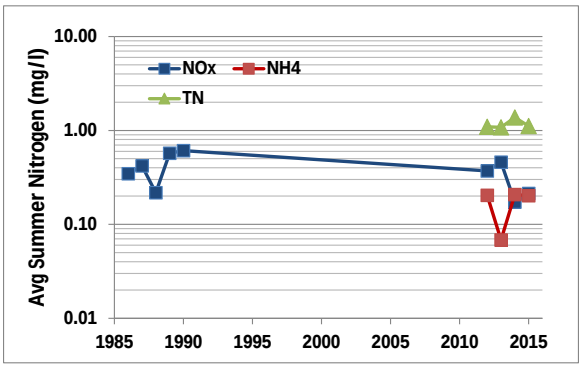
Long Term Trends: N:P Ratio

- Some variability year to year
- Most readings indicate phosphorus or nitrogen may control algae growth



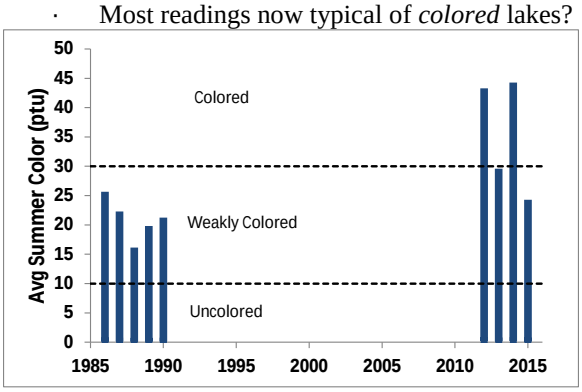
Long Term Trends: Nitrogen

- NOx, NH4, TN readings variable year to year
- Moderate to high nitrate and total nitrogen; low ammonia



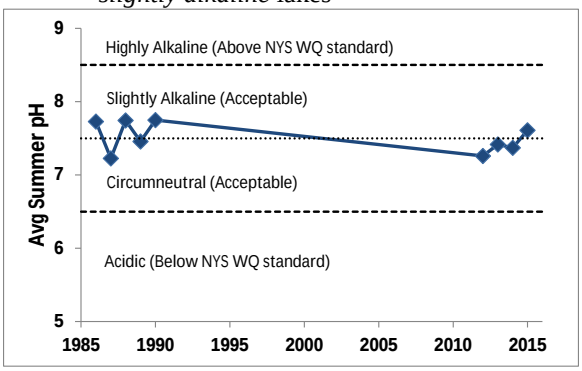
Long Term Trends: Color

- Higher 2012-15 readings likely reflect 2002 lab change (seen in most CSLAP lakes)
- Most readings now typical of *colored* lakes?



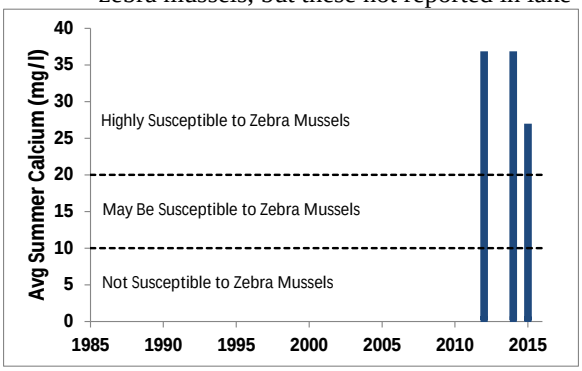
Long Term Trends: pH

- Recent readings in range of historical
- Most readings typical of *circumneutral* to *slightly alkaline* lakes



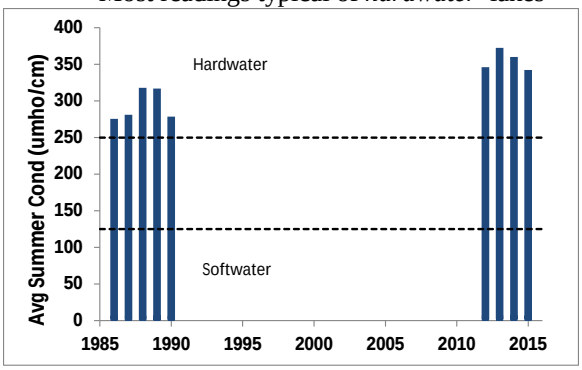
Long Term Trends: Calcium

- Lower in 2015; not yet known if this is trend
- Most readings indicate high susceptibility to zebra mussels, but these not reported in lake



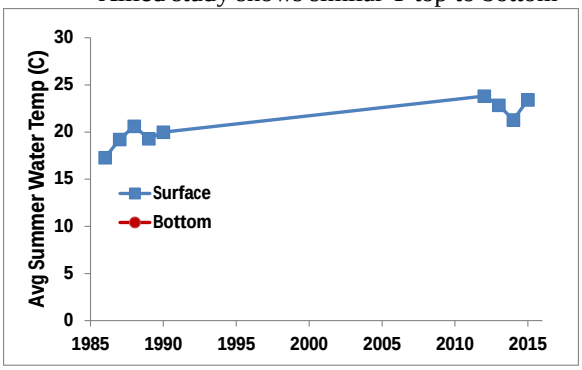
Long Term Trends: Conductivity

- Apparent increase since late 1980s but stable over last four years
- Most readings typical of *hardwater* lakes



Long Term Trends: Water Temperature

- Higher 2012-15 temps might be part of long trend toward increasing temperatures
- Allied study shows similar T top to bottom



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 25-30 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.

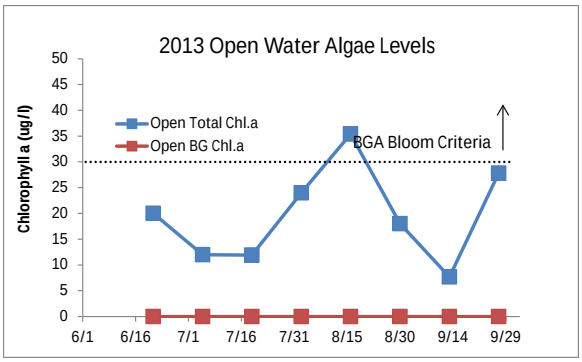


Figure D1:
2013 Open Water Total and BGA Chl.a

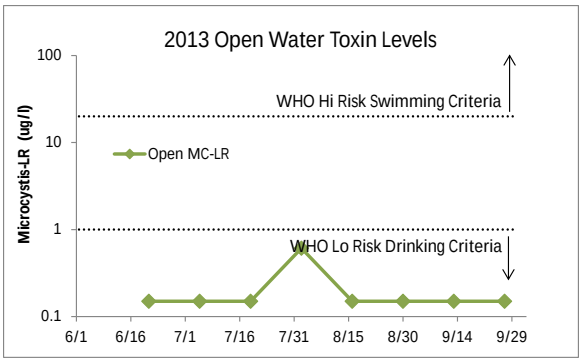


Figure D2:
2013 Open Water Microcystin-LR

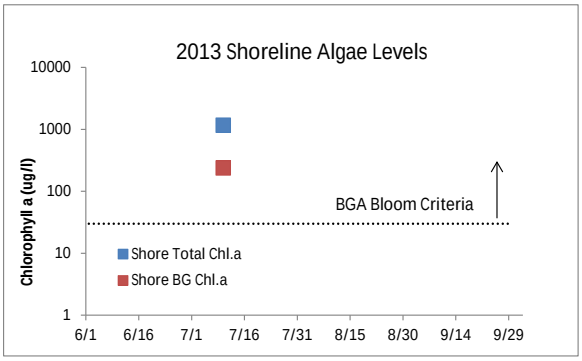


Figure D3:
2013 Shoreline Total and BGA Chl.a

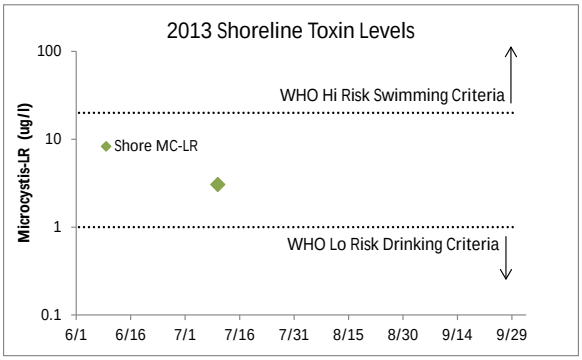


Figure D4:
2013 Shoreline Microcystin-LR

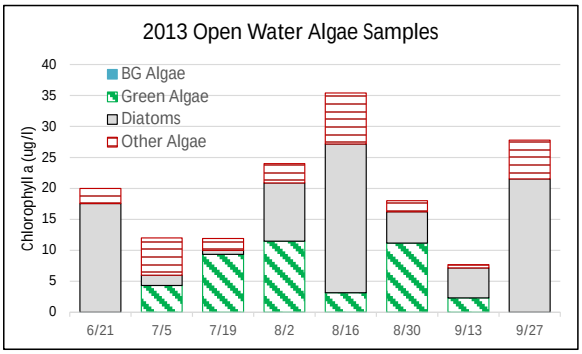


Figure D5:
2013 Open Water Algae Types

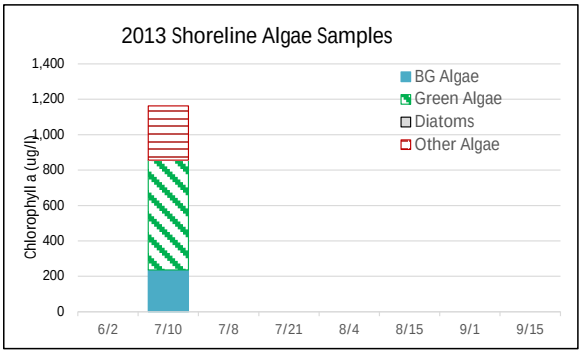


Figure D6:
2013 Shoreline Algae Types

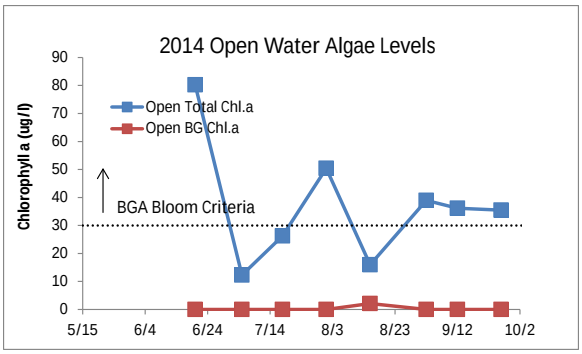


Figure D7:
2014 Open Water Total and BGA Chl.a

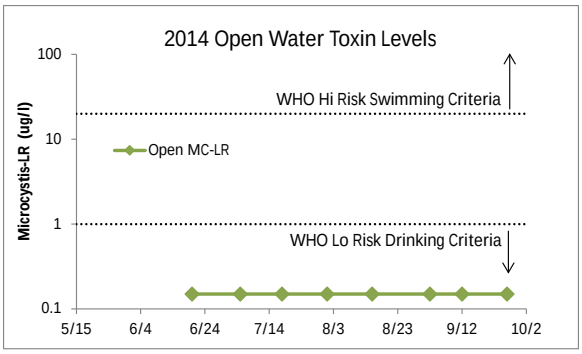


Figure D8:
2014 Open Water Microcystin-LR

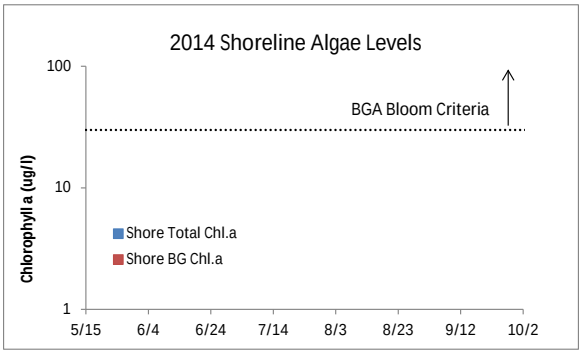


Figure D9:
2014 Shoreline Total and BGA Chl.a

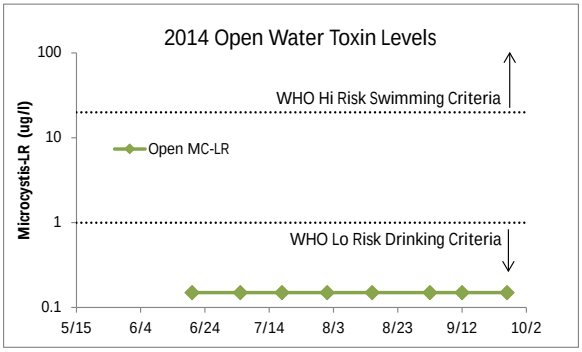


Figure D10:
2014 Shoreline Microcystin-LR

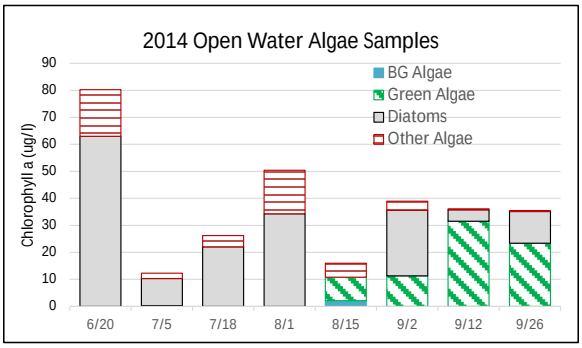


Figure D11:
2014 Open Water Algae Types

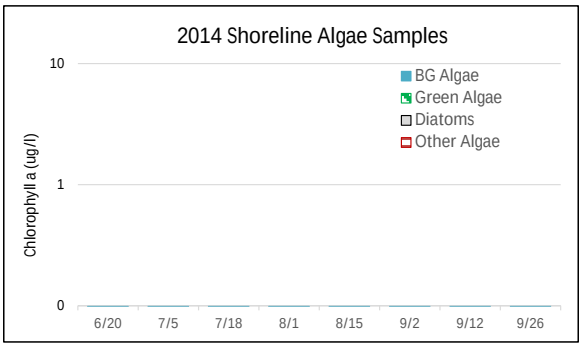


Figure D12:
2014 Shoreline Algae Types

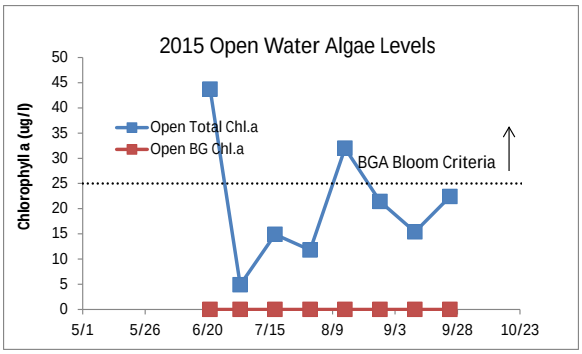


Figure D13:
2015 Open Water Total and BGA Chl.a

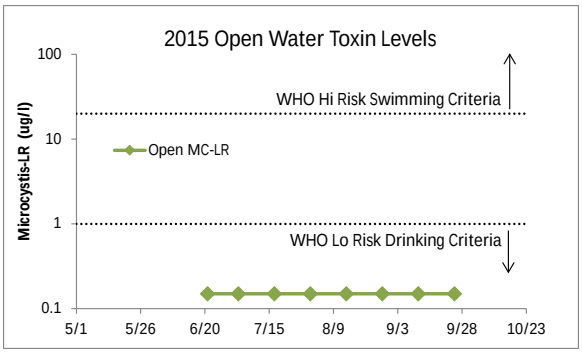


Figure D14:
2015 Open Water Microcystin-LR

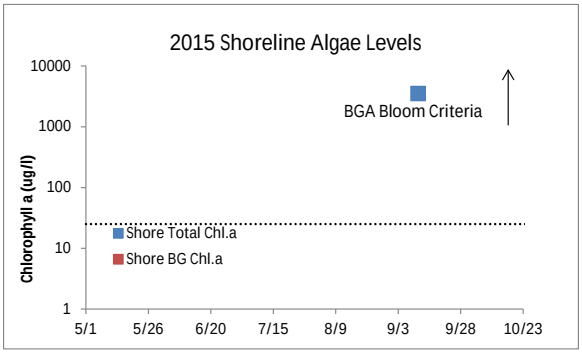


Figure D15:
2015 Shoreline Total and BGA Chl.a

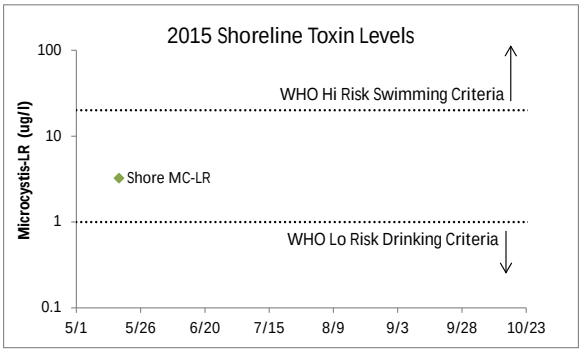


Figure D16:
2015 Shoreline Microcystin-LR

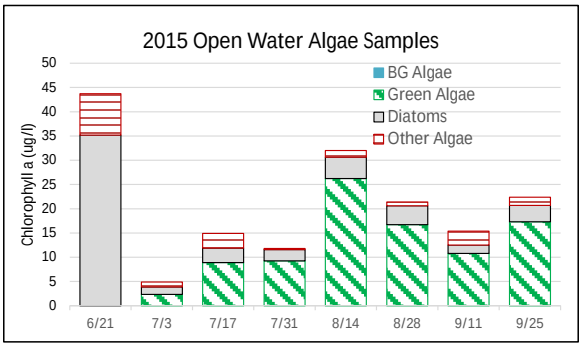


Figure D17:
2015 Open Water Algae Types

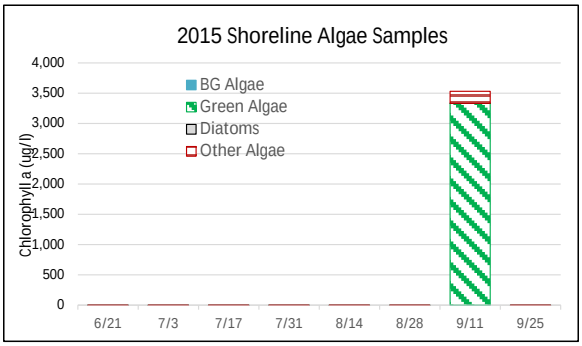


Figure D18:
2015 Shoreline Algae Types

Appendix E:
AIS Species in Rockland County

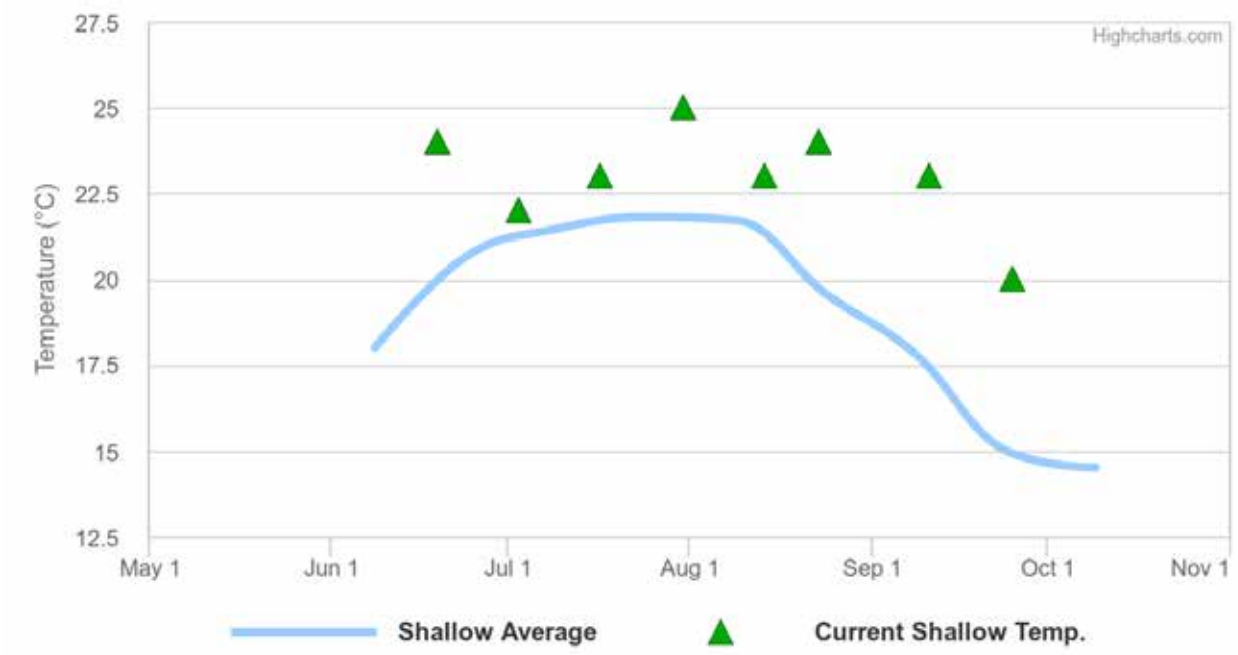
The table below shows the invasive aquatic plants and animals that have been documented in Rockland County, as cited in either the iMapInvasives database (http://www.imapinvasives.org/) or in the NYSDEC Division of Water database. These databases may include some, but not all, non-native plants or animals 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 - Rockland County			
Waterbody	**Kingdom**	**Common name**	**Scientific name**
Congers Lake	Plant	Curly leafed pondweed	*Potamogeton crispus*
Cranberry Pond	Plant	Variable watermilfoil	*Myriophyllum heterophyllum*
Cranberry Pond	Plant	Eurasian watermilfoil	*Myriophyllum spicatum*
Cranberry Pond	Plant	Curly leafed pondweed	*Potamogeton crispus*
Foxwood Pond	Plant	Eurasian watermilfoil	*Myriophyllum spicatum*
Haverstraw Bay	Plant	Eurasian watermilfoil	*Myriophyllum spicatum*
Hessian Lake	Animal	Red-eared slider turtle	*Trachemys scripta elegans*
Hudson River	Animal	Zebra mussel	*Dreissena polymorpha*
Hudson River	Plant	Water chestnut	*Trapa natans*
Hudson River, Iona Island	Plant	Eurasian watermilfoil	*Myriophyllum spicatum*
Lake Sebago	Plant	Fanwort	*Cabomba caroliniana*
Lake Sebago	Plant	Brazilian elodea	*Egeria densa*
Lake Sebago	Plant	Eurasian watermilfoil	*Myriophyllum spicatum*
Lake Sebago	Animal	Red-eared slider turtle	*Trachemys scripta elegans*
Rockhill Pond	Plant	Eurasian watermilfoil	*Myriophyllum spicatum*
Rockland Lake	Plant	Eurasian watermilfoil	*Myriophyllum spicatum*
Rockland Lake	Plant	Brittle naiad	*Najas minor*
Rockland Lake	Plant	Curly leafed pondweed	*Potamogeton crispus*
Stoney Point Battlefield Pond	Plant	Eurasian watermilfoil	*Myriophyllum spicatum*
Swartout Lake	Plant	Curly leafed pondweed	*Potamogeton crispus*

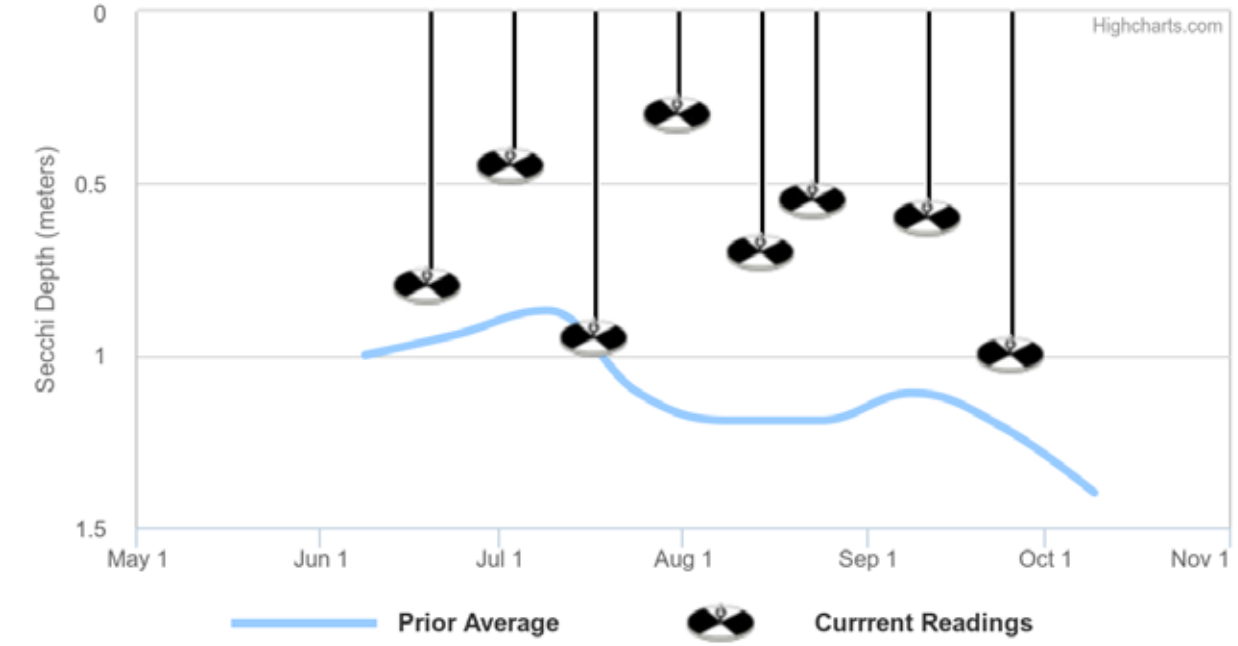
Appendix F: Current Year vs. Prior Averages for Lake Lucille

Current Year Water Temperatures vs. Prior Average

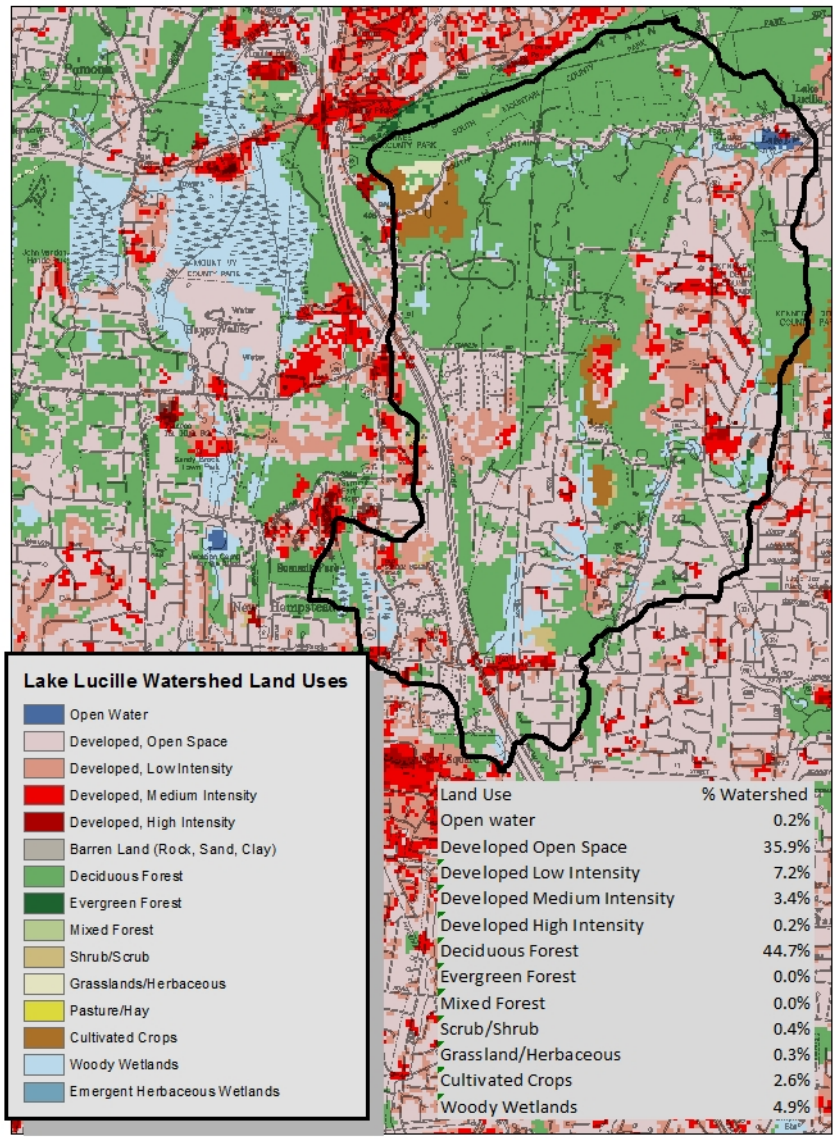


This year's shallow water sample temperatures are tending to be higher than normal when compared to the average of readings collected from 1986 to 2014.

Current Year Secchi Readings vs. Prior Average



This year's session Secchi readings are tending to be lower than normal when compared to the average of readings collected from 1986 to 2014

Appendix G: Watershed and Land Use Map for Lake Lucille

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.