

Cuba Lake Questions and Answers, 2015 CSLAP

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

A1. Water quality conditions in Cuba Lake were close to normal in 2014 and 2015. Water clarity and nutrient levels were similar to those in previous years. While overall algae levels were lower than usual, shoreline blooms were reported for the first time in many years.

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

A2. Chloride testing results are typical of lakes with low to moderate impacts from road salt runoff, although no biological impacts have been reported or measured.

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

A3. Cuba Lake has slightly higher water clarity, and lower algae and nutrient levels, with fewer instances of blooms than other western NY lakes. Plant coverage is also lower than in many of these lakes, despite the presence of several invasive plant species.

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

A4. Water quality conditions in the lake vary only slightly from year to year, with more favorable conditions (higher clarity, lower algae levels, and generally fewer reports of shoreline harmful algae blooms) in the last decade.

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

A5. Cuba Lake continues to be as susceptible to algae blooms as other nearby lakes, but these do not occur every year (or have not been reported). This suggests the lake may be approaching, but has not yet reached, a tipping point.

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.

Lake Use				
	PWL	Average Year	2015	Primary issue
Potable Water				Not applicable
Swimming				No impacts
Recreation				Algae levels
Aquatic Life				Bottom Oxygen
Aesthetics				Poor perception
Habitat				Invasive plants
Fish Consumption				

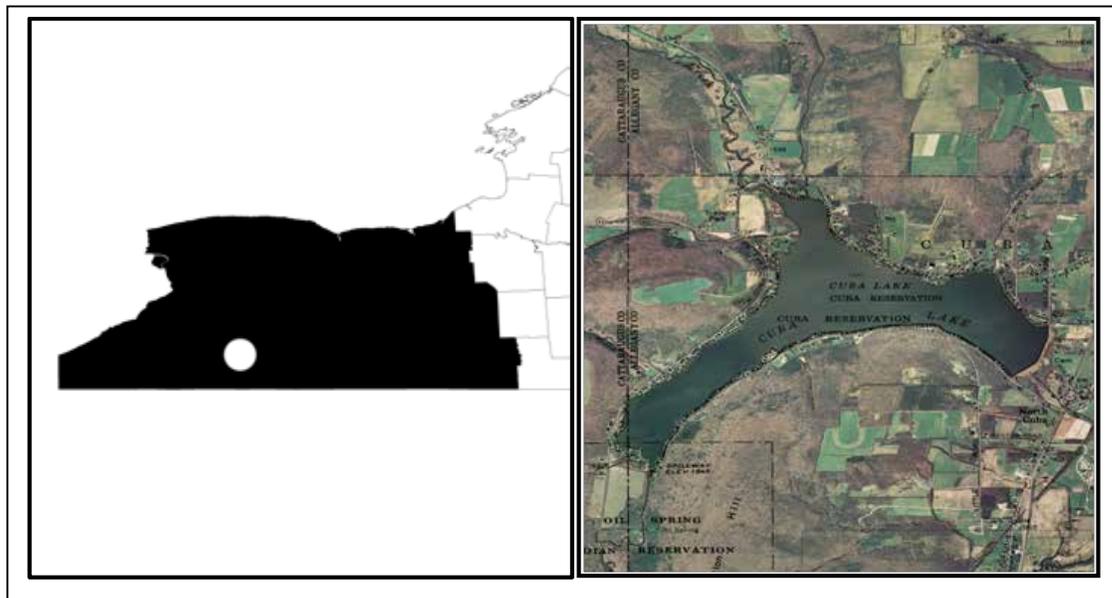
 Supported / Good
 Threatened / Fair
 Stressed / Poor
 Impaired
 Not Known

CSLAP 2015 Lake Water Quality Summary: Cuba Lake

General Lake Information

Location	Town of Cuba
County	Allegheny
Basin	Allegheny River
Size	183.9 hectares (454.2 acres)
Lake Origins	Augmented by 55ft high by 1750ft wide earthen dam (1872)
Watershed Area	6,606 hectares (16,316 acres)
Retention Time	0.3 years
Mean Depth	5.2 meters
Sounding Depth	14.9 meters
Public Access?	boat ramp
Major Tributaries	Rawson Creek
Lake Tributary To...	Cuba Lake outlet to Oil Creek to Olean Creek to Allegheny River
WQ Classification	B (contact recreation = swimming)
Lake Outlet Latitude	42.236
Lake Outlet Longitude	-78.308
Sampling Years	1986-1988, 1990-1991, 1998-2015
2015 Samplers	Scott Barrey and Dana Harvey
Main Contact	Scott Barrey

Lake Map



Background

Cuba Lake is a 454 acre, class B lake found in the Town of Cuba in Allegany County (a small part of the lake is in Cattaraugus County) in western New York State. It was first sampled as part of CSLAP in 1986.

It is the only CSLAP lake among the 235 lakes and ponds found in Allegany County, and one of five CSLAP lakes among the 285 lakes and ponds in the Allegheny River drainage basin.

Lake Uses

Cuba Lake 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—boating, aquatic life, and aesthetics. The lake is used by lake residents and visitors for swimming, power boating and other recreation via shoreline properties and a state boat ramp.

Cuba Lake has been stocked with walleye by the state for many years, generally 2.5 million 0.4 inch fish. Fisheries netting and other surveys have identified bluegill, brown bullhead, carp, largemouth bass, northern pike, pumpkinseed sunfish, rock bass, smallmouth bass, walleye, and yellow perch in the lake.

General statewide fishing regulations are applicable in Cuba Lake. In addition, the open season for trout is April 1st thru October 15th, there is no minimum size limit, but a daily take limit of five fish, with no more than two more than 12 inches.

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

Historical Water Quality Data

CSLAP sampling was conducted on Cuba Lake from 1986 to 1988, 1990 to 1991, and 1998 to 2015. 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 Cuba Lake can also be found on the NYSDEC web page at <http://www.dec.ny.gov/lands/77886.html>.

Cuba Lake was sampled by the NYSDEC as part of the Lake Classification and Inventory (LCI) study of the lake in 1985, and was sampled by the county in 1990. These data showed that water quality conditions in 1985 at the deep hole were probably comparable to those measured through CSLAP. However, the 1993 Secchi disk transparency data also indicates that water quality conditions may be variable from one part of the lake to another- Site 1 corresponds to the northern cove, while Site 2 corresponds to the long arm along the southwest side of the lake (comparison of phosphorus data may not be appropriate given the differences in analytical methodologies between CSLAP labs and those used in other monitoring programs). The water quality differences in other parts of the lake are also apparent from bacteriological data collected by the county. This suggests that water quality assessments through CSLAP should be limited to the area associated with the deep hole near the dam.

Cuba Lake was one of the 12 NYS lakes sampled as part of the National Lake Assessment (NLA) conducted by the US EPA and the NYSDEC. Sampling in Cuba Lake was conducted on July 18th, 2007. The NLA results show the following:

1. Depth profiles showed that the lake is weakly stratified, with a slight temperature decrease below a depth of 5 meters. Hypoxia (reduced, but not depleted dissolved oxygen levels) occurs from a depth of 5 meters to the lake bottom. Slightly lower pH and higher conductivity readings were found in the hypolimnion (bottom waters).
2. Enterococci was not found in the water samples collected near southwest shoreline.
3. The water samples collected from the center of the lake showed slightly less productive (lower phosphorus and higher water clarity) conditions than measured through CSLAP, although the CSLAP data showed lower lake productivity at this time of year than earlier and later in the summer. It is likely that the CSLAP and NLS water chemistry results are comparable. Turbidity and organic carbon levels are low, as expected given the high water clarity and low water color readings, respectively. Chloride levels are low, indicating minimal runoff from road salting operations.
4. The zooplankton community was dominated by large herbivorous rotifers (*Keratella*) and arthropods (*Daphnia*). This suggests that these zooplankton may help to keep algae in balance.
5. The sediment diatom core indicated “intermediate” disturbance, typical of moderately productive lakes

A detailed discussion of the NLA results can be found at <http://www.epa.gov/lakesurvey/>.

Rawson Creek in Rawson was sampled through the NYSDEC Rotating Intensive Basins (RIBS) program and the state stream macroinvertebrate monitoring program. The results from the macroinvertebrate monitoring program were reported as follows in 2001:

“This small stream at Rawson was sampled at two sites in 2001, upstream (above Porter Road) and downstream (below Lyndon Center Road) of a recent spill of silage leachate. Although both sites were assessed as moderately impacted, a significant biological impairment was documented downstream of the spill site....the community was dominated by tolerant aquatic worms and leeches, and all metrics declined compared to upstream values. Dissolved oxygen levels in the stream declined from 7.8 mg/l upstream to 1.1 mg/l downstream. Impacts at the upstream site were likely due to impoundment effects. Re-sampling of the sites is planned to document recovery once the problem is remediated.”

The RIBS sampling in 2002 was conducted during five sampling sessions between April 30th and November 5th, and indicated that phosphorus and nitrogen (particularly nitrate + nitrite) levels were higher than in the lake, and may contribute a significant load of nutrients to the lake. Phosphorus readings in 2002 in the lake were slightly higher than normal, but nitrate levels were not (despite the very high NO_x readings in the Rawson Creek samples throughout 2002). Calcium levels in Rawsons Creek are well above the threshold found to support zebra mussels, so although the open water calcium levels in the lake may not be adequate to allow zebra mussel colonization, mussel communities could survive at least in the portion of the lake near the creek inlet. It is not known if the water chemistry data from 2002 are indicative of normal conditions in Rawsons Creek.

The Cuba Lake outlet was also sampled through the macroinvertebrate monitoring program. The results from the 2001 survey were as follows:

“This stream in the town of Cuba was sampled for macroinvertebrates in 2001. The site was one mile downstream of Cuba Lake, and impoundment effects persisted. The fauna was dominated by filter-feeding caddisflies, and water quality was assessed as slightly impacted.”

Lake Association and Management History

Cuba Lake is served by the Cuba Lake District and the Cuba Lake Cottage Owners Association. The Cottage Owners Association conducts roadside cleanup and other projects. The District is legally defined as a Special District and rents the land from the state Office of General Services (OGS). The District conducts the following lake management activities:

- weed harvesting;
- water testing (bacteria and CSLAP);
- control of spillway;
- evaluate navigation law and work with the Allegany Sheriffs Department to enforce the existing law;
- publicize/explain regulations regarding dam safety;
- taxation (via the taxing district, although most funding comes from NYS OGS lease money);
- development and enforcement of land use regulations;
- dredging projects;
- sediment basin development and maintenance;
- maintain website

The Cuba Lake District maintains a website at www.cubalake.org.

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 – Cuba Lake” section in Appendix C.

Evaluation of Eutrophication Indicators

Lake conditions were again similar in 2015 to those measured in most previous CSLAP sampling seasons. Algae levels were slightly lower than usual, but phosphorus and water clarity readings were close to normal. None of these indicators has exhibited any clear trends over the last 10-15 years, although these conditions were more unstable from 1986 to about 2000.

Lake productivity increases in most years from early July through mid-September; this was also apparent in the last several years. Small and ephemeral shoreline blue green algae blooms were reported in 2015, for the first time in a few years, indicating the lake may still be susceptible to these blooms.

The lake can be characterized as *mesoeutrophic*, or moderately to highly productive, based on water clarity, total phosphorus (both typical of *mesotrophic* lakes), and chlorophyll *a* readings (typical of *eutrophic* lakes). The trophic state indices (TSI) evaluation suggests that chlorophyll *a* readings are usually “outliers”—higher than expected range given the readings of the other indicators. This suggests that the lake may have been susceptible to small changes in phosphorus

readings, consistent with the susceptibility to periodic and small blooms. Overall trophic conditions are summarized on the Lake Scorecard and Lake Condition Summary Table.

Evaluation of Potable Water Indicators

Algae levels may be 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. Hypolimnetic phosphorus and ammonia readings are often much higher than at the lake surface, suggesting that deepwater intakes may be compromised for any “unofficial” potable water use due to deepwater oxygen deficits. Potable water conditions, at least as measurable through CSLAP, are summarized in the Lake Scorecard and Lake Condition Summary Table.

Evaluation of Limnological Indicators

NOx and pH readings were slightly higher than usual in 2015, while calcium levels were slightly lower than usual, although none of these indicators has exhibited any clear long-term trends. Each of the other limnological indicators were close to normal in 2015.

Chloride levels in the 2015 samples, collected for the first time through CSLAP and cited in Appendix A, ranged from 12 to 16 mg/l. These values fall within the low end of “moderate” 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 below the range of values found in most NYS lakes. These readings suggest a low to moderate 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

The fluoroprobe screening samples analyzed by SUNY ESF indicated a mix of algae species with relatively low levels of algae and blue green algae in the open water of the lake in early summer, with seasonal increases in total and blue green chlorophyll levels later in the summer. In some years, this may trigger shoreline blue green algae blooms, as in 2015, although the actual cause of these blooms is not yet understood.

Extensive macrophyte surveys have been conducted through CSLAP in Cuba Lake. At least 19 aquatic plant species have been identified in Cuba Lake, including at least one protected plant species (*Potamogeton confervoides*, water thread pondweed) and at least four exotic plant species (*Myriophyllum spicatum*, Eurasian watermilfoil; *Myriophyllum heterophyllum*, variable watermilfoil; *Najas minor*, brittle naiad; and *Potamogeton crispus*, curly-leafed pondweed) have been found in the lake. The modified floristic quality index (FQI) for the lake indicates that the quality of the aquatic plant community is “fair.”

The composition of the fish community includes a mix of coolwater (at least four species), and warmwater (at least six species) fish species. It is likely that the lake is primarily a warmwater fishery. The health of the lake fisheries appears to be favorable, as evaluated by the NYSDEC in 2003 (<http://www.dec.ny.gov/outdoor/27302.html>). Common carp, an exotic species, have historically been reported at the lake.

The macroinvertebrate and phytoplankton sampling results from the National Lake Assessment for Cuba Lake not yet been interpreted; it is anticipated that these results will be analyzed with the completion of the NYSDEC lake biomonitoring study. The zooplankton analyses were discussed previously in this report.

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

Evaluation of Lake Perception

Water quality assessments, aquatic plant coverage, and recreational assessments were close to normal in 2015, and none of these indicators of lake perception has exhibited any clear long-term changes. Lake perception degrades in most years during the summer (June through October), consistent with increasing lake productivity and plant coverage. Similar assessments were also found in 2015. Overall lake perception is summarized on the Lake Scorecard and Lake Condition Summary Table.

Evaluation of Local Climate Change

Water and air temperatures were slightly higher than usual in 2015, although these readings have not exhibited any clear long-term trends. It is not known if this is an indication of the lack of local climate change or if these changes cannot be well evaluated through CSLAP.

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 levels at times approach the thresholds for harmful algal blooms (HABs) in the open water, and shoreline blue green algae blooms were reported in 2015 and prior to 2012. Open water total and blue green algae increases occur during the summer. This is consistent with a seasonal increase in nutrient levels (in some years) and a seasonal drop in water clarity. Algal toxin levels have been low in both open water and shoreline samples over the last few years, although historically there have been some higher algal toxin levels.

Lake Condition Summary

Category	Indicator	Min	Annual Avg	Max	2015 Avg	Classification	2015 Change?	Long-term Change?
Eutrophication Indicators	Water Clarity	0.75	3.02	8.50	2.91	Mesotrophic	Within Normal Range	No Change
	Chlorophyll <i>a</i>	0.10	8.80	80.20	11.77	Eutrophic	Within Normal Range	No Change
	Total Phosphorus	0.003	0.017	0.062	0.017	Mesotrophic	Within Normal Range	No Change
Potable Water Indicators	Hypolimnetic Ammonia	0.02	0.62	1.91	0.98	Highly Elevated Deepwater NH4	Higher than Normal	Not known
	Hypolimnetic Arsenic							Not known
	Hypolimnetic Iron							Not known
	Hypolimnetic Manganese							Not known
Limnological Indicators	Hypolimnetic Phosphorus	0.001	0.244	3.910	0.281	Elevated Deepwater TP	Within Normal Range	Not known
	Nitrate + Nitrite	0.00	0.06	0.30	0.09	Low NOx	Within Normal Range	No Change
	Ammonia	0.00	0.05	0.31	0.05	Low Ammonia	Within Normal Range	No Change
	Total Nitrogen	0.07	0.48	2.84	0.52	Low Total Nitrogen	Within Normal Range	No Change
	pH	5.36	7.67	8.93	8.14	Alkaline	Higher than Normal	No Change
	Specific Conductance	68	121	230	131	Softwater	Within Normal Range	No Change
	True Color	1	12	63	12	Intermediate Color	Within Normal Range	No Change
	Calcium	0.4	14.0	19.3	10.1	May be Susceptible to Zebra Mussels	Within Normal Range	No Change
Lake Perception	WQ Assessment	1	2.3	5	2.3	Not Quite Crystal Clear	Within Normal Range	No Change
	Aquatic Plant Coverage	1	2.5	5	2.4	Subsurface Plant Growth	Within Normal Range	No Change
	Recreational Assessment	1	2.2	5	2.0	Excellent	Within Normal Range	No Change
Biological Condition	Phytoplankton					Open water-low blue green algae biomass; Shoreline-high blue green algae in bloom	Not known	Not known
	Macrophytes					Fair quality of the aquatic plant community	Not known	Not known
	Zooplankton					Dominated by large rotifers and arthropods	Not known	Not known
	Macroinvertebrates					Not yet evaluated from the NLA	Not known	Not known
	Fish					Warmwater fishery	Not known	Not known
	Invasive Species					Common carp, Eurasian watermilfoil, variable watermilfoil, brittle naiad, curly-leafed pondweed	Not known	Not known
Local Climate Change	Air Temperature	3	22.5	34	23.7		Within Normal Range	No Change
	Water Temperature	10	22.1	36	24.3		Higher Than Normal	No Change

Category	Indicator	Min	Annual Avg	Max	2015 Avg	Classification	2015 Change?	Long-term Change?
Harmful Algal Blooms	Open Water Phycocyanin	1	37	440	22	Most readings indicate low risk of BGA	Not known	Not known
	Open Water FP Chl.a	1	4	17	4	Few readings indicate high algae levels	Not known	Not known
	Open Water FP BG Chl.a	0	3	15	2	Few readings indicate high BGA levels	Not known	Not known
	Open Water Microcystis	<DL	<DL	1.4	<DL	Low to undetectable open water microcystins	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	8800	8800	8800		All readings indicate high risk of BGA	Not known	Not known
	Shoreline FP Chl.a	191	1016	1840	1016	All readings indicate very high algae levels	Not known	Not known
	Shoreline FP BG Chl.a	170	826	1482	826	All readings indicate very high BGA levels	Not known	Not known
	Shoreline Microcystis	<DL	4.4	17.0	<DL	At times measurable shoreline bloom MC-LR	Not known	Not known
	Shoreline Anatoxin a	<DL	<DL	<DL	<DL	Shoreline bloom Anatoxin-a consistently not detectable	Not known	Not known

Evaluation of Lake Condition Impacts to Lake Uses

Cuba Lake is presently among the lakes cited on the 2007 Allegheny River Basin Priority Waterbody List (PWL), with public bathing and recreation listed as stressed due to excessive algae and weed growth, and perhaps due to bacteria. The PWL listing for Cuba Lake is provided in Appendix B.

Potable Water (Drinking Water)

The CSLAP dataset at Cuba Lake, 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. These data indicate that potable water use may be compromised by excessive algae growth in the surface waters, and elevated ammonia levels in the bottom waters.

Public Bathing

The CSLAP dataset at Cuba Lake, including water chemistry data, physical measurements, and volunteer samplers' perception data, suggests that public bathing, if conducted at a public swimming beach, may be supported, although this use may be *threatened* by elevated nutrient levels and algal blooms, and lake district data indicate that bathing may be *threatened* by bacteria.

Recreation (Swimming and Non-Contact Uses)

The CSLAP dataset on Cuba Lake, including water chemistry data, physical measurements, and volunteer samplers' perception data, suggest that recreation may at times be *impaired* by excessive algae and shoreline blooms, and *threatened* by Eurasian watermilfoil, variable watermilfoil, brittle naiad, and curly-leafed pondweed. However, in most years, this use is supported with minor impacts.

Aquatic Life

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

Aesthetics and Habitat

The CSLAP dataset on Cuba Lake, including water chemistry data, physical measurements, and volunteer samplers' perception data, suggest that aesthetics may be *fair* due to poor perception triggered by occasional algal blooms, although blooms are not reported in most years. Habitat may be *fair* in some locations due to invasive weeds.

Fish Consumption

There are no fish consumption advisories posted for Cuba Lake.

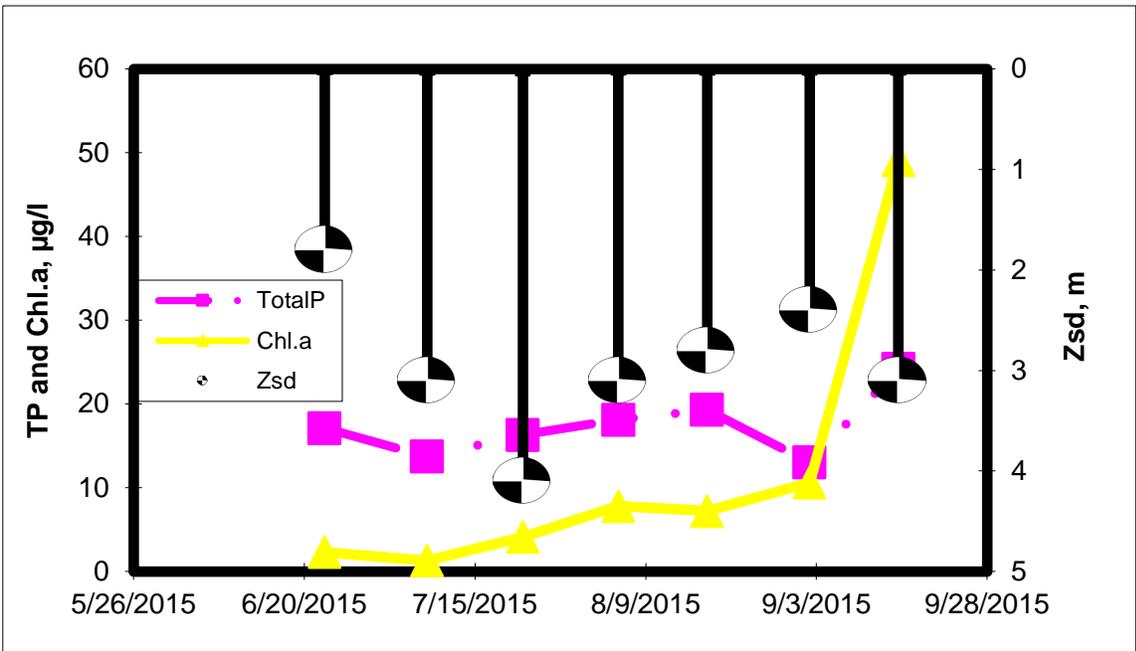
Additional Comments and Recommendations

Any future algae blooms should be closely evaluated for potential risk to swimmers and other recreational users. Lake residents and pets are advised to avoid contact with any surface scums or heavily discolored water.

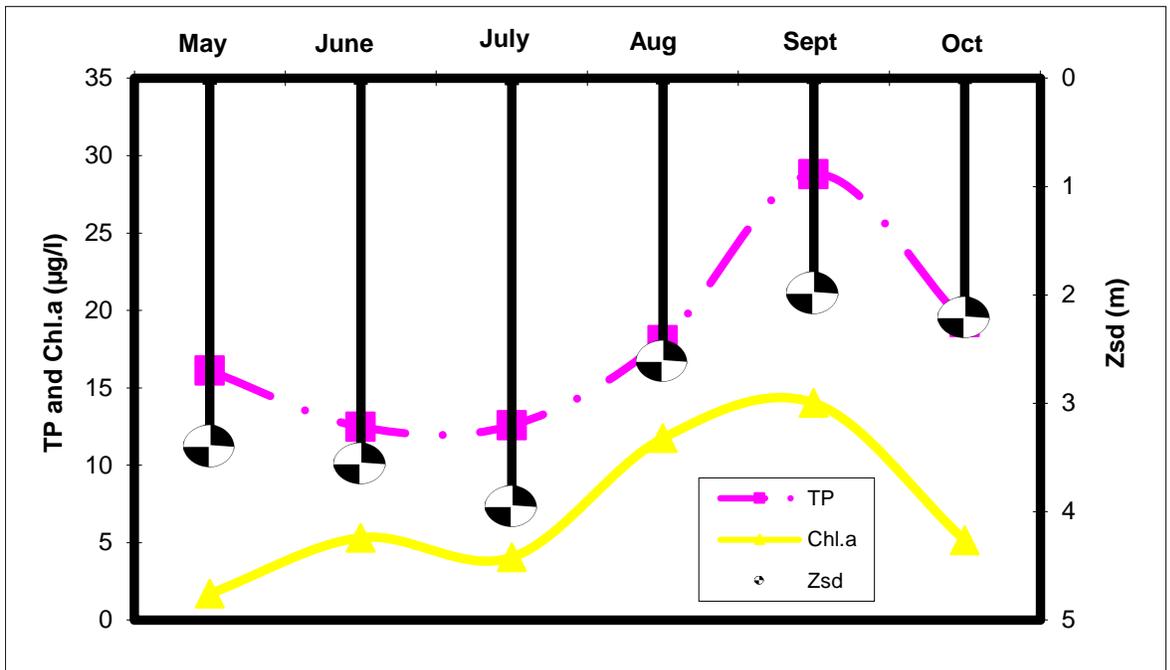
Aquatic Plant IDs-2015

None submitted for identification in 2015.

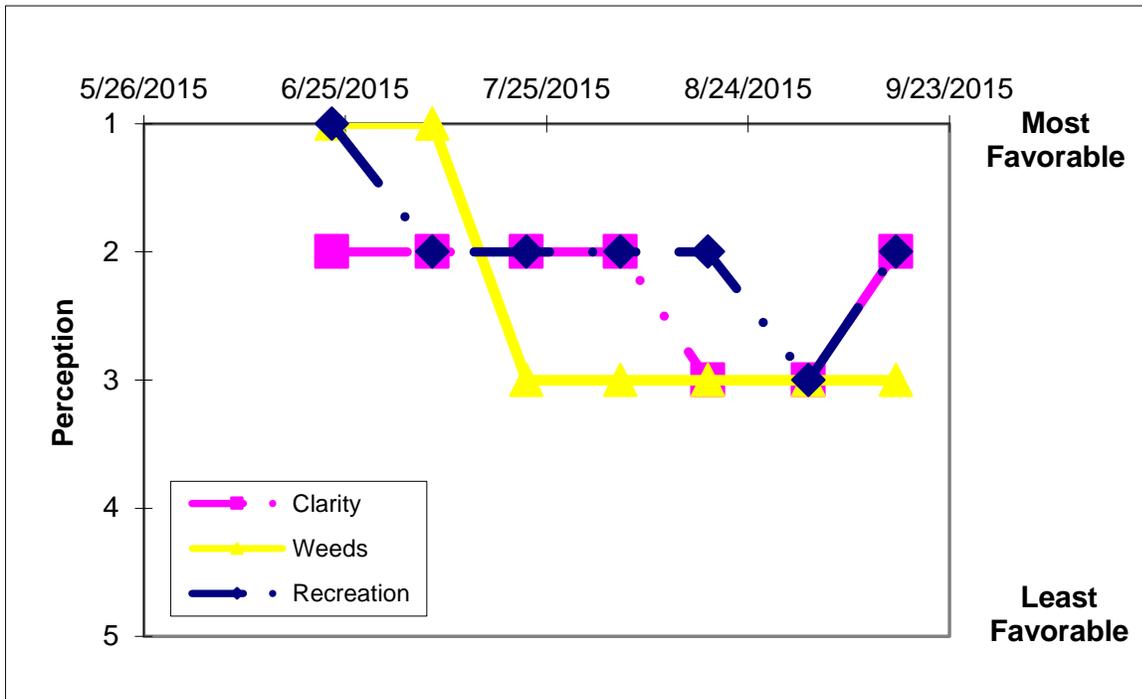
Time Series: Trophic Indicators, 2015



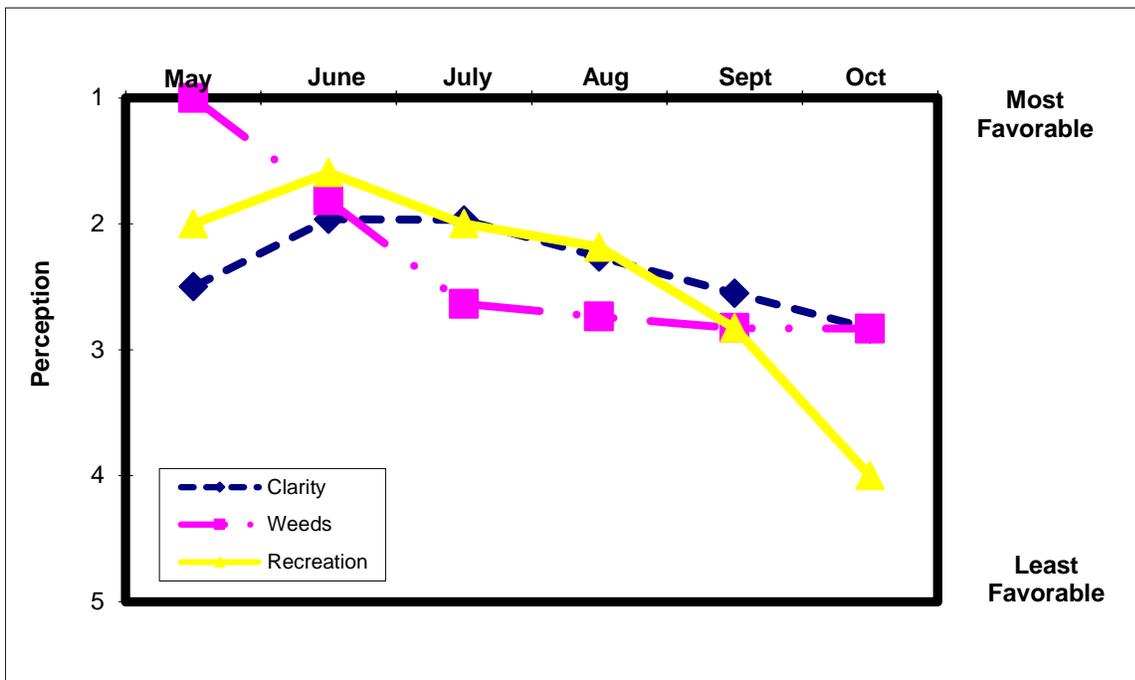
Time Series: Trophic Indicators, Typical Year (1986-2015)



Time Series: Lake Perception Indicators, 2015



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



Appendix B- CSLAP Water Quality Sampling Results for Cuba Lake

LNum	PName	Date	Zbot	Zsd	Zsamp	Tot.P	NO3	NH4	TDN	TN/TP	TColor	pH	Cond25	Ca	Chl.a	Cl
23	Cuba L	6/14/1986	13.5	4.25	1.5	0.008	0.20				5	7.33	114		1.70	
23	Cuba L	6/20/1986	12.5	3.00	1.5	0.011	0.15				2	7.44	119		2.15	
23	Cuba L	6/27/1986	12.5	4.63	1.5	0.007	0.14				5	7.38	118		1.63	
23	Cuba L	7/4/1986	12.5	3.38	1.5	0.008	0.08				5	8.85	112		8.50	
23	Cuba L	7/14/1986	12.5	3.25	1.5	0.010	0.08				2	7.65	118		1.70	
23	Cuba L	7/18/1986	12.5	3.00	1.5	0.010	0.03				5	7.68	125		3.11	
23	Cuba L	7/25/1986	12.5	4.00	1.5	0.011	0.03				5	7.94	118		1.92	
23	Cuba L	8/1/1986	12.3	3.50	1.5	0.013	0.03				10	7.65	119		3.03	
23	Cuba L	8/8/1986	12.3	2.50	1.5	0.014	0.03				10	8.30	104		5.33	
23	Cuba L	8/15/1986	12.5	1.75	1.5	0.017	0.03				18	8.18	121		11.80	
23	Cuba L	8/22/1986	12.5	1.50	1.5	0.023	0.03				5	7.30	131		5.55	
23	Cuba L	8/29/1986	12.5	1.25	1.5	0.014	0.03				2	7.90	125		5.99	
23	Cuba L	9/5/1986	12.5	1.50	1.5	0.018	0.03				8	7.45	131		17.70	
23	Cuba L	9/16/1986	12.5	0.75	1.5	0.017	0.03				12	7.60	130		19.60	
23	Cuba L	9/19/1986	12.5	1.00	1.5	0.023	0.03				7	7.33	133		14.90	
23	Cuba L	6/8/1987	12.5	3.00	1.5	0.013	0.23				5	7.62	112			
23	Cuba L	6/15/1987	12.5	2.50	1.5	0.011					4	7.48	111			
23	Cuba L	6/22/1987	12.5	5.00	1.5	0.005	0.01				10	8.16	108			
23	Cuba L	6/29/1987	12.5	3.50	1.5	0.011	0.17				10	7.73	113		5.70	
23	Cuba L	7/6/1987	12.0	3.30	1.5	0.015	0.13				15	7.56	113		12.50	
23	Cuba L	7/13/1987	12.1	4.50	1.5	0.013					14	7.44	114		5.60	
23	Cuba L	7/20/1987	12.5	3.00	1.5	0.003	0.01				14	7.55	115		7.60	
23	Cuba L	7/27/1987	12.5	2.50	1.5	0.015					10	7.40	117		19.20	
23	Cuba L	7/30/1987	12.5	2.00	1.5	0.019	0.01				9	7.14	119		24.40	
23	Cuba L	8/10/1987	12.5	1.50	1.5	0.015	0.01				12	6.78	122		31.10	
23	Cuba L	8/17/1987	12.5	0.80	1.5	0.020					12	7.48	130		66.60	
23	Cuba L	8/24/1987	12.5	0.95	1.5	0.019	0.01				8				80.20	
23	Cuba L	8/31/1987	12.6	0.80	1.5	0.018					7	7.38	119		72.00	
23	Cuba L	9/8/1987	12.1	1.60	1.5	0.016	0.03				6	6.95	136			
23	Cuba L	9/20/1987	12.3	0.85	1.5	0.028	0.02				8	7.09	133		37.00	
23	Cuba L	6/20/1988	12.5	7.50	1.5	0.010	0.12				12	7.48	123		1.65	
23	Cuba L	7/7/1988	12.0	8.50	1.5	0.009	0.07				10				1.63	
23	Cuba L	8/1/1988	12.0	5.25	1.5	0.006	0.03				6	8.22	125		1.72	
23	Cuba L	8/4/1988	12.0	5.88	1.5	0.010	0.01				6	7.99	130		1.58	
23	Cuba L	8/11/1988	12.5	6.75	1.5	0.009	0.01				5	8.16	127		1.06	
23	Cuba L	7/18/1990	12.8	3.75	1.5	0.010	0.14				8	8.08	114		4.75	
23	Cuba L	8/2/1991	14.0	4.50	1.5		0.01				5	7.69	132		4.00	
23	Cuba L	6/2/1998	7.7	3.15	1.0	0.020	0.28				11	6.66	118		3.03	
23	Cuba L	6/15/1998	7.6	2.85	1.0		0.27				6	6.81	115		3.52	
23	Cuba L	6/30/1998	7.8	1.85	1.0		0.22				4	6.62	132		2.14	
23	Cuba L	7/15/1998	7.6	3.60	1.0		0.16				10	7.35	117		1.73	
23	Cuba L	7/27/1998	8.4	3.70							6	7.98	121		3.92	
23	Cuba L	8/25/1998	8.0	3.45	1.0						6	7.72	126		8.72	
23	Cuba L	9/16/1998	7.7	1.20	2.0	0.024					8	7.53	129		22.90	
23	Cuba L	9/30/1998	7.3	1.55	1.5	0.011					16	7.31	129		24.50	
23	Cuba L	6/2/1999	9.4	5.00	1.5	0.007	0.30				7	6.73	128		1.94	
23	Cuba L	6/16/1999	11.2	4.60	1.5	0.010	0.23				13	7.83	127		2.44	
23	Cuba L	7/13/1999	11.5	6.80	1.5	0.006	0.12				6	7.76	125		1.25	
23	Cuba L	7/29/1999	11.4	5.75	1.5	0.008	0.02				3	7.7	127		1.15	
23	Cuba L	8/10/1999	11.3	2.10	1.5	0.012	0.01				6	6.84	132		11.20	
23	Cuba L	8/18/1999	11.8	2.35	1.5	0.009	0.01				3	7.28	137		16.80	
23	Cuba L	9/7/1999	11.5	1.70	0.6	0.015	0.01				8	6.42	151		16.40	
23	Cuba L	9/22/1999	11.5	1.30		0.029	0.01				6	6.78	137		46.80	
23	Cuba L	6/12/2000		3.80	1.5	0.013	0.28				32	5.36	126		12.00	
23	Cuba L	6/28/2000		3.10	1.5	0.022	0.28				17	6.58	119		71.00	
23	Cuba L	7/23/2000		4.15	1.5	0.016	0.13				14	7.66	126		1.25	
23	Cuba L	8/8/2000		2.65	1.5	0.025	0.04				8	7.89	131		7.70	
23	Cuba L	8/29/2000		2.40		0.028	0.01				16	7.85	134		5.50	
23	Cuba L	5/23/2001	12.0	3.65												
23	Cuba L	6/13/2001	12.7	3.60												
23	Cuba L	6/27/2001	12.6	6.85												
23	Cuba L	7/12/2001	13.0	4.45												
23	Cuba L	7/24/2001	12.7	6.20												

LNum	PName	Date	Zbot	Zsd	Zsamp	Tot.P	NO3	NH4	TDN	TN/TP	TColor	pH	Cond25	Ca	Chl.a	Cl
23	Cuba L	8/8/2001	12.8	4.85												
23	Cuba L	8/22/2001	13.3	2.50												
23	Cuba L	9/1/2001	13.0	2.20												
23	Cuba L	9/19/2001	12.8	1.85												
23	Cuba L	10/3/2001	12.0	1.65												
23	Cuba L	08/21/02	23.2	2.05	23.2	0.019	0.02	0.05	0.53	60.65	7	8.02	123		4.47	
23	Cuba L	08/28/02	21.0	1.80	21.0	0.015	0.00	0.20	0.78	112.16	13	7.63	126			
23	Cuba L	09/12/02		2.40			0.01	0.04	0.55							
23	Cuba L	09/29/02	18.0	1.55			0.01	0.03	0.60							
23	Cuba L	10/01/02	14.2	2.45		0.021		0.57	58.53	8	7.34	136			0.85	
23	Cuba L	10/18/02	17.0	2.45	57.6		0.02	0.19	0.90		8	7.50	129		0.92	
23	Cuba L	10/24/02	12.0	2.30			0.04	0.18	0.60						1.05	
23	Cuba L	6/3/2003	13.4	3.05		0.013	0.27	0.02	0.49	86.24	7	7.72	175	14.0		
23	Cuba L	6/17/2003	13.4	3.15		0.019	0.21	0.03	0.39	45.66	13	7.73	116.2		3.204	
23	Cuba L	7/7/2003	13.4	3.70		0.015	0.12	0.02	0.44	65.49	13	7.73	125		5.237	
23	Cuba L	7/30/2003	13.3	1.45		0.029	0.12	0.00	0.17	12.83	35	7.62	117		2.579	
23	Cuba L	8/12/2003	13.1	1.00		0.021	0.02	0.00	0.28	29.02	63	8.21	114.7	14.0	11.59	
23	Cuba L	8/27/2003	13.1	1.55		0.024	0.02	0.02	0.39	35.46	13	7.71	119.8		13.88	
23	Cuba L	9/10/2003	13.1	2.35		0.021	0.06	0.03			48	7.91	122.8		3.614	
23	Cuba L	9/30/2003	13.1	1.20		0.027	0.04	0.10	0.27	21.61	16	7.63	123.9		19.26	
23	Cuba L	6/17/2004		4.10	1.5	0.013	0.14	0.04	0.50	82.07	20	7.19	114	14.7		
23	Cuba L	6/29/2004	12.9	2.90	1.5	0.012	0.18	0.05	0.29	52.17	15	6.75	125		0.9	
23	Cuba L	7/12/2004	12.5	4.60	1.5	0.007	0.14	0.02	0.63	188.01	13	6.95	125		0.1	
23	Cuba L	7/30/2004	12.5	3.40	1.5	0.017	0.04	0.03	0.30	38.54	9	8.07	104		6.2	
23	Cuba L	8/10/2004	12.8	2.60	1.5		0.06	0.02	0.21		6	7.59	94	16.5	6.8	
23	Cuba L	8/25/2004	13.1	2.70	1.5	0.022	0.01	0.02	0.07	7.41	14	8.2	127		17.6	
23	Cuba L	9/6/2004	13.1	3.60	1.5	0.018	0.02	0.03	0.39	47.38	19	7.05	115		5.6	
23	Cuba L	9/22/2004	13.1	3.20	1.5	0.021	0.03	0.03	0.99	105.34	20	7.59	101		4.0	
23	Cuba L	6/1/2005	13.1	5.80	1.5	0.007	0.04	0.09	0.27	78.83	9	7.86	123	5.7	1.4	
23	Cuba L	6/15/2005	13.1	4.00	1.5	0.008	0.02	0.16	0.35	94.43	6	7.22	93		1.8	
23	Cuba L	7/13/2005	13.7	7.70	1.5	0.010	0.03	0.06	0.29	65.35	16	7.44	95			
23	Cuba L	8/3/2005	13.4	4.20	1.5	0.009	0.01	0.01	0.35	82.13	12	8.24	125		0.6	
23	Cuba L	8/15/2005	13.7	3.50	1.5	0.017	0.03	0.01	0.32	41.27	7	7.80	94	15.1	7.5	
23	Cuba L	8/29/2005	13.7	2.35	1.5	0.017	0.01	0.01	0.30	39.69	15	8.03	230		8.5	
23	Cuba L	9/12/2005	12.8	2.30	1.5	0.016	0.02	0.01	0.27	37.30	8	7.84	124		8.2	
23	Cuba L	9/27/2005		1.75		0.020	0.02	0.01	0.19	21.47	5	7.75	133		10.7	
23	Cuba L	6/9/2006	13.3	1.25	1.5	0.016	0.02	0.02	0.54	76.52	18	7.71	124	15.1	2.78	
23	Cuba L	6/14/2006	13.7	2.30	1.5	0.015	0.02	0.05	0.39	59.39	16	8.08	119		1.80	
23	Cuba L	6/28/2006	13.7	2.70	1.5	0.017	0.02	0.17	0.65	86.79	12	8.37	68		9.36	
23	Cuba L	7/12/2006	13.7	3.12	1.5	0.022	0.01	0.03	0.52	52.79	18	7.93	93		10.16	
23	Cuba L	7/26/2006	13.7	1.70		0.007	0.03	0.02	0.58	180.50	24	8.02	96	17.1	4.27	
23	Cuba L	8/10/2006	13.7	1.75		0.017	0.01	0.02	0.81	104.71		8.01	136		18.92	
23	Cuba L	8/23/2006	13.7	1.40	1.5	0.023	0.01	0.03	0.64	61.05	14	7.97	87		10.03	
23	Cuba L	9/21/2006	13.7	1.45	0.9	0.021	0.01	0.01	0.61	63.54	2	7.58	104		23.42	
23	Cuba L	7/9/2007		2.46		0.008	0.06	0.03	0.39	109.63	5	8.1	124	13.6	1.37	
23	Cuba L	7/25/2007	13.7	2.40	1.5	0.011	0.03	0.04	0.43	87.24	9	8.2	105		1.14	
23	Cuba L	8/6/2007	13.7	2.30	1.5	0.015	0.01	0.01	0.55	81.76	7	7.9	98		4.71	
23	Cuba L	8/21/2007		2.20	1.5	0.019	0.01	0.02	0.50	58.73	14	7.6	127		6.04	
23	Cuba L	9/4/2007		2.20	1.5	0.016	0.01	0.01	0.72	96.28	11	7.7	94	15.3	3.85	
23	Cuba L	9/17/2007		2.15	1.5		0.02	0.01	0.50	4.47	41	7.9	117		20.30	
23	Cuba L-1	6/16/2008	13.9	3.95	1.5	0.010	0.03	0.02	0.25	58.30	9	7.44	88	14.1		
23	Cuba L-1	6/30/2008	14.7	3.90	1.5	0.014	0.03	0.03	0.28	43.18	8	7.64	106		0.38	
23	Cuba L-1	7/14/2008	13.0	3.85	1.5	0.011	0.02	0.01	0.17	35.11	9	8.14	127		0.60	
23	Cuba L-1	7/28/2008	12.7	2.35	1.5	0.013	0.01	0.03	0.28	46.63	22	7.75	77		1.20	
23	Cuba L-1	8/11/2008	14.9	1.95	1.5	0.015	0.01	0.04	0.25	35.99	25	7.83	119	14.1	2.40	
23	Cuba L-1	8/25/2008	14.7	1.65	1.5	0.022	0.00	0.06	0.28	27.73	15	8.12	121		4.00	
23	Cuba L-1	9/8/2008	13.6	1.70	1.5	0.022	0.00	0.01	0.35	35.81	14	7.64	94		0.20	
23	Cuba L-1	9/22/2008	13.5	1.70	1.5	0.019	0.02	0.02	0.28	32.36	12	6.90	111		3.77	
23	Cuba L-1	06/22/2009	13.4	2.65	1.5	0.014	0.04		0.52	83.34	12			16.3	1.65	
23	Cuba L-1	07/06/2009	13.2	3.60	1.5	0.011	0.03	0.31	0.67	130.25	12				0.48	
23	Cuba L-1	07/20/2009	13.1	5.55	1.5	0.017	0.02	0.19	0.57	75.81	15				0.49	
23	Cuba L-1	08/06/2009	13.1	3.65	1.5	0.017	0.03	0.02	0.25	31.74	19				0.10	
23	Cuba L-1	08/17/2009	12.5	2.75	1.5	0.016	0.01	0.02	0.28	37.85	24	8.23	94	19.3	0.70	
23	Cuba L-1	08/31/2009	13.2	1.90	1.5	0.027	0.01	0.05	0.38	30.57	35	7.28	102		8.30	
23	Cuba L-1	09/14/2009	13.4	2.65	1.5	0.023	0.02	0.03	0.35	33.00	24	7.55	80		0.90	
23	Cuba L-1	09/30/2009				0.032	0.01	0.08	0.43	29.13	22	7.31	130		1.99	

LNum	PName	Date	Zbot	Zsd	Zsamp	Tot.P	NO3	NH4	TDN	TN/TP	TColor	pH	Cond25	Ca	Chl.a	Cl
23	Cuba L	6/7/2010	12.2	2.25	1.5	0.014	0.11	0.03			5	7.74	134	15.3	2.20	
23	Cuba L	6/21/2010	13.2	3.25	1.5	0.011	0.09	0.02	0.64	132.21	7	8.12	141		0.10	
23	Cuba L	7/6/2010	12.1	5.75	1.5	0.014	0.05	0.05	0.37	56.55	5	8.13	139		0.10	
23	Cuba L	7/19/2010	13.1	3.35	1.5	0.014	0.01	0.02	0.24	36.77	7	8.13	131		0.30	
23	Cuba L	8/2/2010	13.0	2.25	1.5	0.019	0.01	0.02	0.37	42.94	12	7.96	139	19.0	6.10	
23	Cuba L	8/16/2010	13.2	2.05	1.5	0.022	0.06	0.06	0.42	41.90	9	8.14	145		8.30	
23	Cuba L	8/31/2010	13.1	1.75	1.5	0.026	0.01	0.02	0.44	37.75	19	8.14	148		17.10	
23	Cuba L	9/13/2010	13.1	1.55	1.5	0.062	0.01	0.03	0.42	14.88	1	7.46	152		2.50	
23	Cuba L	10/8/2010														
23	Cuba L	10/8/2010	grab	HAB												
23	Cuba L	5/30/2011	12.8	3.15	1.5	0.016	0.17	0.06	0.36	48.51	20	7.30	109	12.0	1.70	
23	Cuba L	6/14/2011	12.7	2.35	1.5	0.015	0.10	0.06	0.26	37.34	15	8.17	101		4.80	
23	Cuba L	6/28/2011	12.5	4.05	1.5	0.018	0.09	0.11	0.37	46.25	10	7.16	109		1.20	
23	Cuba L	7/12/2011	12.6	4.25	1.5	0.011	0.06	0.05	0.34	67.82	10	8.21	142		1.50	
23	Cuba L	7/26/2011	12.5	3.75	1.5	0.010	0.01	0.01	0.33	70.53	11	8.32	108	15.6	2.80	
23	Cuba L	8/10/2011	12.5	2.35	1.5	0.015	0.01	0.01	0.43	62.65	8	7.76	115		6.10	
23	Cuba L	8/23/2011	12.4	2.35	1.5	0.026	0.01	0.01	0.45	37.65	12	8.02	118		15.90	
23	Cuba L	9/8/2011	12.4	2.05	1.5	0.010	0.02	0.02	0.46	100.76	25	7.80	132		10.50	
23	Cuba L	6/18/2012	12.8	3.5	1.50	0.013	0.01	0.04	0.23	39.53	7	8.32	128	16.5	1.80	
23	Cuba L	7/2/2012	12.5	5.3	1.50	0.009	0.01	0.02	0.23	55.62	11	7.47	117		1.10	
23	Cuba L	7/17/2012		5.4	1.50	0.014	0.01	0.03	0.16	25.17	9	8.15	124		1.60	
23	Cuba L	7/31/2012	12.3	4.7	1.50	0.013	0.01	0.02	0.28	45.15	8	8.29	130		2.10	
23	Cuba L	8/14/2012	12.2	3.9	1.50	0.038	0.01	0.02	0.39	22.84	11	7.21	100	17.5	2.60	
23	Cuba L	8/28/2012	12.5	3.9	1.50	0.016	0.01	0.02	0.38	52.15	8	7.80	130		2.00	
23	Cuba L	9/11/2012	12.4	2.7	1.50	0.020	0.01	0.04	0.29	32.66	7	7.80	139		7.20	
23	Cuba L	9/25/2012	12.4	2.2	1.50	0.029	0.01	0.04	0.23	17.60	17	7.05	128		8.50	
23	Cuba L	6/25/2013	12.4	3.2	1.50	0.012	0.09	0.04	0.85	160.02	11	7.70	114		4.30	
23	Cuba L	7/9/2013	12.6	3.7	1.50	0.010			0.30	68.98	12	7.75	123		1.10	
23	Cuba L	7/23/2013	12.3	3.2	1.50	0.017	0.01	0.01	0.28	36.15	13	7.76	106		5.80	
23	Cuba L	8/6/2013	12.3	2.9	1.50	0.016			0.45	60.76	9	7.91	127			
23	Cuba L	8/20/2013	12.4	2.2	1.50	0.024	0.01	0.01	0.49	44.64	15	8.93	133		12.50	
23	Cuba L	9/3/2013	12.2	1.9	1.50	0.047			0.52	24.35	15	8.10	112		20.20	
23	Cuba L	9/17/2013	12.2	1.4	1.50	0.026	0.01	0.16	0.48	40.57	35	7.33	103		5.30	
23	Cuba L	10/1/2013	12.2	2.4	1.50	0.019			0.52	59.98	13	7.31	137		7.70	
23	Cuba L	7/8/2014	12.3	2.95	1.5	0.017	0.18	0.31	2.84	373.74	16	7.83	115.1	13.4	4.60	
23	Cuba L	7/22/2014	12.1	3.15	1.5	0.017			0.64	84.33	13	7.37	123.9		5.50	
23	Cuba L	8/6/2014	12.2	3.25	1.5		0.03	0.09	2.41	116.58	12	7.80	115.9		5.70	
23	Cuba L	8/19/2014	12.4	2.55	1.5	0.016			0.62	85.09	12	7.37	115.7		6.40	
23	Cuba L	9/3/2014		3.75	1.5	0.018	0.01	0.02	0.34	42.01	12	7.87	124.9	14.8	5.20	
23	Cuba L	9/16/2014	12.2	2.45	1.5	0.017			1.53	192.82	9	7.58	123.2		9.40	
23	Cuba L	9/30/2014	12.2	2.45	1.5	0.017	0.01	0.21	0.43	54.87	11	7.63	121.3		14.60	
23	Cuba L	10/14/2014	12.1	2.10	1.5	0.018			0.49	61.28	12	7.13	133.6		15.20	
23	Cuba L	6/23/2015	12.1	1.80	1.5	0.017	0.25	0.06	0.55	32.05	6	7.87	139.5	9.5	2.30	
23	Cuba L	7/8/2015	12.2	3.10	1.5	0.014			0.62	45.04	16	8.36	129.6		1.30	
23	Cuba L	7/22/2015	12.3	4.10	1.5	0.016	0.11	0.05	0.68	41.60	16	8.24	129.3		4.10	12.2
23	Cuba L	8/5/2015	21.0	3.10	1.5	0.018			0.44	24.53	17	8.44	134		7.80	
23	Cuba L	8/18/2015	12.1	2.80	1.5	0.019	0.01	0.04	0.50	26.11	9	8.23	133.3	10.7	7.20	
23	Cuba L	8/18/2015				Bloom										
23	Cuba L	9/2/2015				bloom										
23	Cuba L	9/2/2015	21.0	2.40	1.5	0.013			0.55	42.15	13	7.93	126.5		10.60	
23	Cuba L	6/2/1998					0.020									
23	Cuba L	7/15/1998					0.018									
23	Cuba L	7/27/1998					0.023									
23	Cuba L	08/21/02	23.2	2.05	1.5		0.03	0.25	0.76							
23	Cuba L	08/28/02	21.0	1.80	1.5	0.112	0.00	0.37	0.94	8.39						
23	Cuba L	09/12/02		2.40	1.5		0.00	0.43	0.85							
23	Cuba L	09/29/02	18.0	1.55	1.5		0.00	0.79	1.08							
23	Cuba L	10/01/02	14.2	2.45	1.5	0.027			1.16	43.02						
23	Cuba L	10/18/02	17.0		1.5		0.03	0.24	0.72							
23	Cuba L	10/24/02	12.0	2.30	1.5		0.03	0.18	0.58							
23	Cuba L	6/3/2003				0.301	0.28	0.26	0.52	1.73						
23	Cuba L	6/17/2003				0.115	0.07	0.54	0.36	3.14						
23	Cuba L	7/7/2003				0.311	0.01	0.84	0.60	1.93						
23	Cuba L	7/30/2003			12.0	0.061	0.03	0.51	0.30	4.95						
23	Cuba L	8/12/2003				0.221	0.01	1.02	0.86	3.90						
23	Cuba L	8/27/2003			12.6	0.177	0.00	1.07	0.18	1.02						

LNum	PName	Date	Zbot	Zsd	Zsamp	Tot.P	NO3	NH4	TDN	TN/TP					NO2
23	Cuba L	9/10/2003			12.6	0.244	0.02	1.18							
23	Cuba L	9/30/2003			12.6	0.231	0.01	1.38	0.00						
23	Cuba L	6/17/2004			12.8	0.072	0.08	0.56	0.70	9.73					
23	Cuba L	6/29/2004	12.9		12.9	0.051	0.07	0.35	0.34	6.69					
23	Cuba L	7/12/2004	12.5		9.4		0.01	0.51	0.29						
23	Cuba L	7/30/2004	12.5		12.5	0.092	0.32	0.08	0.56	6.07					
23	Cuba L	8/10/2004	12.8		12.8	0.019	0.01	0.47	0.44	22.62					
23	Cuba L	8/25/2004	13.1		12.6	0.286	0.02	0.89	0.35	1.24					
23	Cuba L	9/6/2004	13.1		13.1	0.264	0.01	0.84	0.36	1.38					
23	Cuba L	9/22/2004	13.1		13.1	0.472	0.02	1.21	0.57	1.20					
23	Cuba L	6/1/2005			13.1	0.033									
23	Cuba L	6/15/2005			13.1	0.037									
23	Cuba L	7/13/2005			13.7	0.098									
23	Cuba L	8/3/2005			13.1	0.239									
23	Cuba L	8/15/2005			13.7	0.219									
23	Cuba L	8/29/2005			13.7	0.201									
23	Cuba L	9/12/2005			12.2	0.304									
23	Cuba L	9/27/2005			12.2	0.284									
23	Cuba L	6/9/2006	13.3		12.8	0.013									
23	Cuba L	6/14/2006	13.7		13.3	0.019									
23	Cuba L	6/28/2006	13.7		13.3	0.157									
23	Cuba L	7/12/2006	13.7		13.3	0.281									
23	Cuba L	7/26/2006	13.7		13.3	0.016									
23	Cuba L	8/10/2006	13.7		13.1	0.026									
23	Cuba L	8/23/2006	13.7		13.3	0.314									
23	Cuba L	9/21/2006	13.7		13.1	0.262									
23	Cuba L-1	6/16/2008	13.9		12.9	0.043									
23	Cuba L-1	6/30/2008	14.7		13.2	0.015									
23	Cuba L-1	7/14/2008	13.0		11.5	0.176									
23	Cuba L-1	7/28/2008	12.7		11.7	0.542									
23	Cuba L-1	8/11/2008	14.9		13.4	0.586									
23	Cuba L-1	8/25/2008	14.7		13.2	0.376									
23	Cuba L-1	9/8/2008	13.6		12.1	0.405									
23	Cuba L-1	9/22/2008	13.5		12.0	0.785									
23	Cuba L-1	06/22/2009			12.4	0.022		0.50							
23	Cuba L-1	07/06/2009			12.5	0.063		0.68							
23	Cuba L-1	07/20/2009			12.6	0.386		0.67							
23	Cuba L-1	08/06/2009			12.5	0.014		0.36							
23	Cuba L-1	08/17/2009			11.5	0.033		0.03							
23	Cuba L-1	08/31/2009			12.7	0.387		1.48							
23	Cuba L-1	09/14/2009			12.5	0.161		0.82							
23	Cuba L-1	09/30/2009				0.041		0.08							
23	Cuba L-1	6/7/2010	12.2		12.2	0.018		0.46							
23	Cuba L-1	6/21/2010	13.2		12.9	0.016		0.24							
23	Cuba L-1	7/6/2010	12.1		12.0	0.015		0.21							
23	Cuba L-1	7/19/2010	13.1		12.6	0.164		0.34							
23	Cuba L-1	8/2/2010	13.0		12.8	0.050		0.51							
23	Cuba L-1	8/16/2010	13.2		12.8	0.213		0.88							
23	Cuba L-1	8/31/2010	13.1		12.8	0.182		0.70							
23	Cuba L-1	9/13/2010	13.1		12.5	0.266		1.03							
23	Cuba L	5/30/2011	12.8		12.2	0.037		0.33							0.01
23	Cuba L	6/14/2011	12.7		12.2	0.013		0.30							0.01
23	Cuba L	6/28/2011	12.5		12.3	0.021		0.20							0.01
23	Cuba L	7/12/2011	12.6		12.3	0.174		0.72							0.01
23	Cuba L	7/26/2011	12.5		12.3	0.240		0.62							0.01
23	Cuba L	8/10/2011	12.5		12.3	0.057		0.24							0.01
23	Cuba L	8/23/2011	12.4		12.2	0.190		0.59							0.01
23	Cuba L	9/8/2011	12.4		12.2	0.399		1.07							0.01
23	Cuba L	6/18/2012			12.2	0.001		0.24							0.01
23	Cuba L	7/2/2012			12.3	0.007		0.31							0.01
23	Cuba L	7/17/2012			12.2	0.280		0.69							0.00
23	Cuba L	7/31/2012			12.2	0.029		0.67							0.00
23	Cuba L	8/14/2012			12.1	0.032		0.39							0.00
23	Cuba L	8/28/2012			12.4	0.044		0.65							0.00
23	Cuba L	9/11/2012			12.3	0.320		0.20							0.00
23	Cuba L	9/25/2012			12.2	0.001		0.64							0.00

LNum	PName	Date	Zbot	Zsd	Zsamp	Tot.P	NO3	NH4	TDN	TN/TP	TColor	pH	Cond25	Ca	Chl.a	Cl
23	Cuba L	6/25/2013			12.2	0.255		0.45								
23	Cuba L	7/9/2013			12.5	3.910										
23	Cuba L	7/23/2013			12.1	0.203		0.93								
23	Cuba L	8/6/2013			12.2	0.173										
23	Cuba L	8/20/2013			12.4	1.198		1.91								
23	Cuba L	9/3/2013			12.0	0.184										
23	Cuba L	9/17/2013			12.2	0.626		0.02								
23	Cuba L	10/1/2013			12.1	1.954										
23	Cuba L	7/8/2014			12.2	0.048		0.46								
23	Cuba L	7/22/2014			12.1	0.082										
23	Cuba L	8/6/2014			12.2	1.342		1.33								
23	Cuba L	8/19/2014			12.2	0.261										
23	Cuba L	9/3/2014			12.1	0.191		0.75								
23	Cuba L	9/16/2014			12.0	0.083										
23	Cuba L	9/30/2014			12.0	0.336		1.41								
23	Cuba L	10/14/2014			12.0	0.055										
23	Cuba L	6/24/2015			12.0	0.067		0.57								
23	Cuba L	7/8/2015			12.1	0.032										
23	Cuba L	7/22/2015			12.2	0.058		0.45								
23	Cuba L	8/5/2015			20.0	0.047										
23	Cuba L	8/18/2015			12.0	0.305		1.18								
23	Cuba L	9/2/2015			20.0	0.333										
23	Cuba L	9/15/2015			11.5	1.127		1.71								
23.2	Cuba L-2	6/16/2008	8.0	4.15	1.5	0.008	0.04	0.03	0.27	78.43	12	7.50	85	12.6		
23.2	Cuba L-2	6/30/2008	7.4	4.25	1.5	0.010	0.02	0.02	0.28	63.58	10	7.42	100		0.95	
23.2	Cuba L-2	7/14/2008	7.1	2.70	1.5	0.015	0.13	0.01	0.15	21.59	10	7.91	125		0.91	
23.2	Cuba L-2	7/28/2008	7.4	3.15	1.5	0.013	0.01	0.03	0.36	64.15	22	7.56	83		0.20	
23.2	Cuba L-2	8/11/2008	7.7	2.05	1.5	0.017	0.01	0.03	0.31	40.18	13	7.55	125	14.7	2.02	
23.2	Cuba L-2	8/25/2008	8.4	1.60	1.5	0.021	0.00	0.02	0.30	32.51	31	8.00			3.72	
23.2	Cuba L-2	9/8/2008	8.4	1.45	1.5	0.023	0.00	0.01	0.34	31.84	11	7.80	111		3.96	
23.2	Cuba L-2	9/22/2008	7.6	2.35	1.5	0.018	0.01	0.01	0.32	39.18	8	7.49	113		2.85	
23.3	Cuba L-3	6/16/2008	5.0	3.85	1.5	0.008	0.05	0.04	0.29	82.89	16	7.41	82	13.9		
23.3	Cuba L-3	6/30/2008	4.8	2.15	1.5	0.011	0.02	0.03	0.32	62.12	8	7.77	90		0.69	
23.3	Cuba L-3	7/14/2008	4.4	2.10	1.5	0.018	0.01	0.02	0.17	20.36	11	7.71	118		1.06	
23.3	Cuba L-3	7/28/2008	4.9	2.35	1.5	0.014	0.01	0.02	0.23	36.00	16	7.65	84		0.77	
23.3	Cuba L-3	8/11/2008	4.8	1.65	1.5	0.019	0.01	0.04	0.28	33.11	10	7.50	126	15.4	2.72	
23.3	Cuba L-3	8/25/2008	4.5	1.70	1.5	0.020	0.00	0.06	0.22	23.79	12	7.47	125		2.72	
23.3	Cuba L-3	9/8/2008	3.9	1.35	1.5	0.029	0.00	0.02	0.37	28.78	14	7.61	107		3.93	
23.3	Cuba L-3	9/22/2008	4.9	2.15	1.5	0.018	0.01	0.01	0.27	32.84	12	7.37	118		2.61	

LNum	PName	Date	Site	TAir	TH20	QA	QB	QC	QD	QE	QF	QG	AQ-PC	AQ-Chla	MC-LR	Ana-a	Cyl	FP-Chl	FP-BG	HAB form	Shore HAB
23	Cuba L	6/14/1986	epi	17	21																
23	Cuba L	6/20/1986	epi	20	20																
23	Cuba L	6/27/1986	epi	19	21																
23	Cuba L	7/4/1986	epi	15	20																
23	Cuba L	7/14/1986	epi	18	22																
23	Cuba L	7/18/1986	epi	22	22																
23	Cuba L	7/25/1986	epi	24	25																
23	Cuba L	8/1/1986	epi	19	23																
23	Cuba L	8/8/1986	epi	19	24																
23	Cuba L	8/15/1986	epi	22	21																
23	Cuba L	8/22/1986	epi	18	20																
23	Cuba L	8/29/1986	epi	11	18																
23	Cuba L	9/5/1986	epi	20	19																
23	Cuba L	9/16/1986	epi	17	10																
23	Cuba L	9/19/1986	epi	14	16																
23	Cuba L	6/8/1987	epi	20	18																
23	Cuba L	6/15/1987	epi	16	19																
23	Cuba L	6/22/1987	epi	17	20																
23	Cuba L	6/29/1987	epi	16	18																
23	Cuba L	7/6/1987	epi	20	18																
23	Cuba L	7/13/1987	epi	23	23																
23	Cuba L	7/20/1987	epi	22	22																

LNum	PName	Date	Site	TAir	TH20	QA	QB	QC	QD	QE	QG	AQ-PC	AQ-Chla	MC-LR	Ana-a	Cyl	FP-Chl	FP-BG	HAB form	Shore HAB
23	Cuba L	7/27/1987	epi	20	23															
23	Cuba L	7/30/1987	epi	25	25															
23	Cuba L	8/10/1987	epi	20	23															
23	Cuba L	8/17/1987	epi	24	21															
23	Cuba L	8/24/1987	epi	16	21															
23	Cuba L	8/31/1987	epi	14	18															
23	Cuba L	9/8/1987	epi	20	18															
23	Cuba L	9/20/1987	epi	18	19															
23	Cuba L	6/20/1988	epi	29	22															
23	Cuba L	7/7/1988	epi	34	24															
23	Cuba L	8/1/1988	epi	24	25															
23	Cuba L	8/4/1988	epi	26	28															
23	Cuba L	8/11/1988	epi	33	26															
23	Cuba L	7/18/1990	epi	27	23															
23	Cuba L	8/2/1991	epi	28	24															
23	Cuba L	6/2/1998	epi	21	21	2	2	2	5											
23	Cuba L	6/15/1998	epi	22	20	2	2	2												
23	Cuba L	6/30/1998	epi	26	26	2	3	2												
23	Cuba L	7/15/1998	epi	28	25	2	2	1												
23	Cuba L	7/27/1998	epi	22	24	2	2	1												
23	Cuba L	8/25/1998	epi	22	27	2	2	2												
23	Cuba L	9/16/1998	epi	21	23	3	2	3												
23	Cuba L	9/30/1998	epi	16	20															
23	Cuba L	6/2/1999	epi	19	20	1	1	1												
23	Cuba L	6/16/1999	epi	13	20	1	1	1												
23	Cuba L	7/13/1999	epi	18	23	2	2	1												
23	Cuba L	7/29/1999	epi	29	25	2	2	1												
23	Cuba L	8/10/1999	epi	16	22	3	3	3	1											
23	Cuba L	8/18/1999	epi	22	24	2	3	2												
23	Cuba L	9/7/1999	epi	22	21	2	3	3	2											
23	Cuba L	9/22/1999	epi	12	16	3	2	3	5											
23	Cuba L	6/12/2000	epi	20		2	1	1	5											
23	Cuba L	6/28/2000	epi	21	24	3	1	3	1											
23	Cuba L	7/23/2000	epi	19	23	2	3	1												
23	Cuba L	8/8/2000	epi	27	24	2	3	2												
23	Cuba L	8/29/2000	epi	23	23	3	2	2												
23	Cuba L	5/23/2001	epi			3	1	2	6											
23	Cuba L	6/13/2001	epi			3	1	2	6											
23	Cuba L	6/27/2001	epi			2	2	1												
23	Cuba L	7/12/2001	epi			2	3	2	5											
23	Cuba L	7/24/2001	epi			2	3	2	2											
23	Cuba L	8/8/2001	epi			2	5	2	2											
23	Cuba L	8/22/2001	epi			2	3	2												
23	Cuba L	9/1/2001	epi			3	3	3	1											
23	Cuba L	9/19/2001	epi			3	3	4	1											
23	Cuba L	10/3/2001	epi			3	3	5	1											
23	Cuba L	08/21/02	hypo	29		3	2	3	8											
23	Cuba L	08/28/02	hypo	22	24	3	1	2												
23	Cuba L	09/12/02	epi	24	23															
23	Cuba L	09/29/02	epi	19	21	5	3	4	135											
23	Cuba L	10/01/02	epi	24	21	4	2	4	38											
23	Cuba L	10/18/02	epi	15	14	3	3	4	5											
23	Cuba L	10/24/02	epi	3	11	3	3	5	58											
23	Cuba L	6/3/2003	epi	20	16	2	1	1	5											
23	Cuba L	6/17/2003	epi	22	19	2	1	1												
23	Cuba L	7/7/2003	epi	22	24	2	2	2												
23	Cuba L	7/30/2003	epi	25	22	3	2	3	146											
23	Cuba L	8/12/2003	epi	29	24	3	3	4	1456											
23	Cuba L	8/27/2003	epi	27		2	3	2												
23	Cuba L	9/10/2003	epi	27	22	2	3	2												
23	Cuba L	9/30/2003	epi	17	16	3	3	2												

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	HAB form	Shore HAB
23	Cuba L	6/17/2004	epi	23	22	1	1	1	0											
23	Cuba L	6/29/2004	epi	22	20	2	1	2	0											
23	Cuba L	7/12/2004	epi	33	23	2	2	1	0											
23	Cuba L	7/30/2004	epi	30	22	2	3	2	0											
23	Cuba L	8/10/2004	epi	23	22	3	2	2	0											
23	Cuba L	8/25/2004	epi	27	22	2	3	2	0											
23	Cuba L	9/6/2004	epi	28	23	2	3	2	0											
23	Cuba L	9/22/2004	epi	28	20	3	2	1	0											
23	Cuba L	6/1/2005	epi	23	18	1	1	1	0											
23	Cuba L	6/15/2005	epi	23	24	2	1	1	0											
23	Cuba L	7/13/2005	epi	32	26	1	1	1	0											
23	Cuba L	8/3/2005	epi	31	36	2	3	1	0											
23	Cuba L	8/15/2005	epi	34		2	3	2	0											
23	Cuba L	8/29/2005	epi	21	22	3	3	2	0											
23	Cuba L	9/12/2005	epi	25	21	3	3	3	1											
23	Cuba L	9/27/2005	epi	20	20	3	3	4	1											
23	Cuba L	6/9/2006	epi	21	19	3	3	2	0											
23	Cuba L	6/14/2006	epi	26	20	3	3	3	123											
23	Cuba L	6/28/2006	epi		24	2	1	2	0											
23	Cuba L	7/12/2006	epi	22	24	2	3	3	5											
23	Cuba L	7/26/2006	epi	27	24	2	3	2	0											
23	Cuba L	8/10/2006	epi	21	25	3	3	3	0											
23	Cuba L	8/23/2006	epi	25	23	3	3	2	0											
23	Cuba L	9/21/2006	epi	16	18	3	3	3	5											
23	Cuba L	7/9/2007	epi	30	24	2	3	1	5											
23	Cuba L	7/25/2007	epi	25	25	2	2	2	0											
23	Cuba L	8/6/2007	epi	28	27	2	3	2	0											
23	Cuba L	8/21/2007	epi	17	21	2	2	2	0											
23	Cuba L	9/4/2007	epi	28	24	2	3	2	0											
23	Cuba L	9/17/2007	epi	20	20	2	3	4	1											
23	Cuba L-1	6/16/2008	epi	21	23	2	3	2	8											
23	Cuba L-1	6/30/2008	epi	23	22	1	3	1	8											
23	Cuba L-1	7/14/2008	epi	21	24	1	3	2	8											
23	Cuba L-1	7/28/2008	epi	25	24	2	3	2	8											
23	Cuba L-1	8/11/2008	epi	18	23	2	2	2	0											
23	Cuba L-1	8/25/2008	epi	26	24	2	2	2	0											
23	Cuba L-1	9/8/2008	epi	22	22	3	2	2	0											
23	Cuba L-1	9/22/2008	epi	17	19	2	2	2	0											
23	Cuba L-1	06/22/2009	epi	23	21	2	2	1	0											
23	Cuba L-1	07/06/2009	epi	22	21	2	3	2	1											
23	Cuba L-1	07/20/2009	epi	21	21	2	4	2	0											
23	Cuba L-1	08/06/2009	epi	20	22	2	3	2	0			43.00		0.02						
23	Cuba L-1	08/17/2009	epi	32	26	2	2	2	0											
23	Cuba L-1	08/31/2009	epi	16	20	2	2	2	0											
23	Cuba L-1	09/14/2009	epi	21	20	3	3	3	0			51.03		0.15						
23	Cuba L-1	09/30/2009	epi									93.08		0.06						
23	Cuba L	6/7/2010	epi	17	21	3	3	2	0	0	0			0.16						
23	Cuba L	6/21/2010	epi	25	23	2	3	2	0	0	0									
23	Cuba L	7/6/2010	epi	30	25	2	3	2	0	0	0		3.80							
23	Cuba L	7/19/2010	epi	25	26	2	3	2	0	0	0		2.00							
23	Cuba L	8/2/2010	epi	25	25	3	3	2	0	0	0	43.00	1.60							
23	Cuba L	8/16/2010	epi	25	25	3	3	3	0	0	0		1.50							
23	Cuba L	8/31/2010	epi	24	24	3	3	3	1	4	4		3.80							
23	Cuba L	9/13/2010	epi	19	19							440.00	5.80							
23	Cuba L	10/8/2010	grab									120.00	1.20							
23	Cuba L	10/8/2010	grab			2	1	2	0	0	0	8800								
23	Cuba L	5/30/2011	epi	29	24	2	1	2	0	0	0									
23	Cuba L	6/14/2011	epi	16	22	2	1	2	0	0	0	9.60		0.02						
23	Cuba L	6/28/2011	epi	27	24	2	2	2	0	0	0	5.80								
23	Cuba L	7/12/2011	epi	26	26	2	3	2	0	0	0	6.30								
23	Cuba L	7/26/2011	epi	26	27	2	3	2	0	0	0	14.00		0.15						

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	HAB form	Shore HAB
23	Cuba L	8/10/2011	epi	24	25	2	2	2	0	0	0	32.20		0.06						
23	Cuba L	8/23/2011	epi	19	22	3	3	3	0	0	0	82.00		0.16						
23	Cuba L	9/8/2011	epi	15	21	3	3	2	0	0	0									
23	Cuba L	6/18/2012	epi	20	22	2	2	2	0	0	0	6.10	0.30	<0.30	<0.417		0.76	0.42		
23	Cuba L	7/2/2012	epi	27	25	2	3	3	0	0	0	2.50	0.20	0.37	<0.392		1.23	0.91		
23	Cuba L	7/17/2012	epi	30	26	2	3	2	0	0	0	1.40	0.20	<0.30	<0.392		1.10	0.70		
23	Cuba L	7/31/2012	epi	26	26	2	3	2	0	0	0	4.20	0.40	<0.30	<0.292		2.03	0.69	I	
23	Cuba L	8/14/2012	epi	26	25	2	3	2	0	0	0	3.60	0.40	0.35	<0.552		2.61	1.89	I	
23	Cuba L	8/28/2012	epi	24	24	2	3	3	2			10.00	0.30	0.33	<0.551		2.14	1.64	I	
23	Cuba L	9/11/2012	epi	16	22	2	3	3	2	0	0	20.80	0.50	0.39	<3.299		1.88	1.56	I	
23	Cuba L	9/25/2012	epi	20	19	2	3	3	0	0	0	49.10	0.70	<0.30	<3.205		4.15	3.26	I	
23	Cuba L	6/25/2013	epi	29	25	3	3	3	16	0	4	7.30	1.10	<0.30	<0.410		1.10	0.70		I
23	Cuba L	7/9/2013	epi	22	25	2	3	3	2	0	0	8.70	1.80	<0.30	<0.510		1.60	0.30	I	I
23	Cuba L	7/23/2013	epi	30	28	2	3	2	0	0	0	15.70	3.40	<0.30	<0.370		3.90	1.20	I	I
23	Cuba L	8/6/2013	epi	20	13	2	3	2	0	0	0	13.50	2.30	1.44	<0.400		4.00	1.50	I	I
23	Cuba L	8/20/2013	epi	28	24	3	3	2	0	0	0	107.80	3.00				16.60	14.50	I	I
23	Cuba L	9/3/2013	epi	19	24	3	3	3	0	0	0	54.60	8.10	<0.30	<0.570		15.30	7.70	I	I
23	Cuba L	9/17/2013	epi	15	19	3	3	3	0	0	0	40.50	4.50	<0.30	<19.130		6.40	2.60	I	I
23	Cuba L	10/1/2013	epi	24	20	3	3	2	1	0	0	91.00	4.00	<0.30	<0.100		12.90	9.80	I	I
23	Cuba L	7/8/2014	epi	25	24	2	2	2	0	0	0	4.7	0.3	<0.40	<0.48	<0.001	0.7	0.0	i	i
23	Cuba L	7/22/2014	epi	29	25	2	3	2	0	0	0	3.8	0.2	<0.39	<0.24	<0.002	1.0	0.1	i	i
23	Cuba L	8/6/2014	epi	24	23	2	3	2	0	0	0	8.1	0.3	<0.35	<0.10	<0.002	1.9	0.8	i	i
23	Cuba L	8/19/2014	epi	28	23	2	3	2	0	0	0	10.3	0.5	<0.26	<0.10	<0.002	2.6	0.7	i	i
23	Cuba L	9/3/2014	epi	25	24	3	2	2	0			17.3	0.2	<0.29	<0.14	<0.002	2.4	0.9	i	i
23	Cuba L	9/16/2014	epi	19	19	3	2	2	0	0	0	27.1	0.4	<0.28	<0.03	<0.001	6.3	4.3	i	i
23	Cuba L	9/30/2014	epi	23	23	3	3	2	0	0	0	46.1	0.6	<0.59	<0.85	<0.001	9.5	6.6	i	i
23	Cuba L	10/14/2014	epi	23	15	3	3	2	0	0	0	30.1	0.4	<0.73	<0.06	<0.001	8.7	6.2	i	i
23	Cuba L	6/23/2015	epi	28	24	2	1	1	0	0	0	6.9	0.5	<0.65	<0.007	<0.000	1.7	0.2	I	I
23	Cuba L	7/8/2015	epi	21	23	2	1	2	0	0	0	0.8	0.3	<0.76	<0.005	<0.028	0.8	0.2	I	I
23	Cuba L	7/22/2015	epi	22	25	2	3	2	0	0	0			<0.30	<0.002	<0.014	1.7	1.0	I	I
23	Cuba L	8/5/2015	epi	23	25	2	3	2	0	0	0	15.8	1.1	<0.18	<0.002	<0.009	3.6	1.2	I	I
23	Cuba L	8/18/2015	epi	24	25	3	3	2	0	0	0	26.6	0.6	<0.28	<0.008	<0.021	5.4	3.2	D	D
23	Cuba L	8/18/2015	hypo											<0.88	<0.071	<0.046	1840	1482		d
23	Cuba L	9/2/2015	hypo											<0.43	<0.020	<0.058	191.4	169.7		
23	Cuba L	9/2/2015	epi	23	24	3	3	3	0	0	0	27.2	0.6	<0.45	<0.031	<0.028	5.2	3.6	D	D
23	Cuba L	9/15/2015	epi	25	24	2	3	2	0	0	0	52.6	0.4	<0.37	<0.009	<0.022	7.7	6.5	I	I
23	Cuba L	08/21/02	hypo	29		3	2	3	8											
23	Cuba L	08/28/02	hypo	22	24	3	1	2												
23	Cuba L	09/12/02	hypo	24	17															
23	Cuba L	09/29/02	hypo	19	16	5	3	4	135											
23	Cuba L	10/01/02	hypo	24	14	4	2	4	38											
23	Cuba L	10/24/02	hypo	3	14	3	3	5	58											
23	Cuba L	6/17/2004	hypo		12															
23	Cuba L	6/29/2004	hypo		13															
23	Cuba L	7/12/2004	hypo		15															
23	Cuba L	7/30/2004	hypo		13															
23	Cuba L	8/10/2004	hypo		14															
23	Cuba L	8/25/2004	hypo		15															
23	Cuba L	9/6/2004	hypo		14															
23	Cuba L	9/22/2004	hypo		13															
23	Cuba L	6/1/2005	hypo		11															
23	Cuba L	6/15/2005	hypo		12															
23	Cuba L	8/3/2005	hypo		13															
23	Cuba L	8/15/2005	hypo		12															
23	Cuba L	8/29/2005	hypo		12															
23	Cuba L	9/12/2005	hypo		13															
23	Cuba L	9/27/2005	hypo		13															
23	Cuba L	6/9/2006	hypo		13															
23	Cuba L	6/14/2006	hypo		12															
23	Cuba L	6/28/2006	hypo		14															
23	Cuba L	7/12/2006	hypo		13															

LNum	PName	Date	Site	TAir	TH20															
23	Cuba L	7/26/2006	hypo		14															
23	Cuba L	8/10/2006	hypo		16															
23	Cuba L	9/21/2006	hypo		13															
23	Cuba L	7/9/2007	hypo		12															
23	Cuba L	7/25/2007	hypo		14															
23	Cuba L	8/6/2007	hypo		18															
23	Cuba L	8/21/2007	hypo		12															
23	Cuba L	9/4/2007	hypo		13															
23	Cuba L	9/17/2007	hypo		13															
23	Cuba L-1	6/16/2008	hypo		14															
23	Cuba L-1	6/30/2008	hypo		15															
23	Cuba L-1	7/14/2008	hypo		14															
23	Cuba L-1	7/28/2008	hypo		15															
23	Cuba L-1	8/11/2008	hypo		12															
23	Cuba L-1	8/25/2008	hypo		15															
23	Cuba L-1	9/8/2008	hypo		14															
23	Cuba L-1	9/22/2008	hypo		11															
23	Cuba L-1	06/22/2009	hypo		17															
23	Cuba L-1	07/06/2009	hypo		16															
23	Cuba L-1	07/20/2009	hypo		14															
23	Cuba L-1	08/06/2009	hypo		17															
23	Cuba L-1	08/17/2009	hypo		17															
23	Cuba L-1	08/31/2009	hypo		14															
23	Cuba L-1	09/14/2009	hypo		16															
23	Cuba L-1	6/7/2010	hypo		13															
23	Cuba L-1	6/21/2010	hypo		14															
23	Cuba L-1	7/6/2010	hypo		15															
23	Cuba L-1	7/19/2010	hypo		15															
23	Cuba L-1	8/2/2010	hypo		14															
23	Cuba L-1	8/16/2010	hypo		14															
23	Cuba L-1	8/31/2010	hypo		14															
23	Cuba L	5/30/2011	hypo		12															
23	Cuba L	6/14/2011	hypo		12															
23	Cuba L	6/28/2011	hypo		13															
23	Cuba L	7/12/2011	hypo		12															
23	Cuba L	7/26/2011	hypo		13															
23	Cuba L	8/10/2011	hypo		13															
23	Cuba L	8/23/2011	hypo		12															
23	Cuba L	9/8/2011	hypo		12															
23	Cuba L	6/18/2012	hypo		13															
23	Cuba L	7/2/2012	hypo		14															
23	Cuba L	7/17/2012	hypo		13															
23	Cuba L	8/14/2012	hypo		14															
23	Cuba L	8/28/2012	hypo		15															
23	Cuba L	9/11/2012	hypo		13															
23	Cuba L	9/25/2012	hypo		15															
23	Cuba L	6/25/2013	hypo		13															
23	Cuba L	7/9/2013	hypo		13															
23	Cuba L	7/23/2013	hypo		14															
23	Cuba L	8/6/2013	hypo		14															
23	Cuba L	8/20/2013	hypo																	
23	Cuba L	9/3/2013	hypo		14															
23	Cuba L	9/17/2013	hypo		13															
23	Cuba L	10/1/2013	hypo		15															
23	Cuba L	7/8/2014	hypo		15															
23	Cuba L	7/22/2014	hypo		21															
23	Cuba L	8/6/2014	hypo		15															
23	Cuba L	8/19/2014	hypo		13															
23	Cuba L	9/3/2014	hypo		16															
23	Cuba L	9/16/2014	hypo		14															
23	Cuba L	9/30/2014	hypo		14															
23	Cuba L	10/14/2014	hypo		14															

LNum	PName	Date	Site	TAir	TH20	LNum	PName	Date	Site	TAir	TH20	LNum	PName	Date	Site	TAir	TH20	LNum	PName	Date	
23	Cuba L	6/24/2015	hypo		11																
23	Cuba L	7/8/2015	hypo		12																
23	Cuba L	7/22/2015	hypo		14																
23	Cuba L	8/5/2015	hypo		14																
23	Cuba L	8/18/2015	hypo		13																
23	Cuba L	9/2/2015	hypo		15																
23	Cuba L	9/15/2015	hypo		14																
23.2	Cuba L-2	6/16/2008	hypo		23																
23.2	Cuba L-2	6/30/2008	hypo		23																
23.2	Cuba L-2	7/14/2008	hypo		23																
23.2	Cuba L-2	7/28/2008	hypo		25																
23.2	Cuba L-2	8/11/2008	hypo		23																
23.2	Cuba L-2	8/25/2008	hypo		24																
23.2	Cuba L-2	9/8/2008	hypo		21																
23.2	Cuba L-2	9/22/2008	hypo		19																
23.3	Cuba L-3	6/16/2008	hypo		23																
23.3	Cuba L-3	6/30/2008	hypo		22																
23.3	Cuba L-3	7/14/2008	hypo		23																
23.3	Cuba L-3	7/28/2008	hypo		24																
23.3	Cuba L-3	8/11/2008	hypo		21																
23.3	Cuba L-3	8/25/2008	hypo		24																
23.3	Cuba L-3	9/8/2008	hypo		21																
23.3	Cuba L-3	9/22/2008	hypo		19																

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 = surface, hypo = 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/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)	0.3 ug/l	none
Cyl	Cylindrospermopsis (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 B: Priority Waterbody Listing for Cuba Lake

Cuba Lake (0201-0016)

Minor Impacts

Waterbody Location Information

Revised: 02/26/2007

Water Index No:	Pa-53-54-11- 5-P115	Drain Basin:	Allegheny River
Hydro Unit Code:	05010001/100	Str Class:	B
Waterbody Type:	Lake	Reg/County:	9/Allegheny Co. (2)
Waterbody Size:	454.4 Acres	Quad Map:	CUBA (M-07-2)
Seg Description:	entire lake		

Water Quality Problem/Issue Information (CAPS indicate MAJOR Use Impacts/Pollutants/Sources)

Use(s) Impacted	Severity	Problem Documentation
Public Bathing	Stressed	Known
Recreation	Stressed	Known

Type of Pollutant(s)

Known: NUTRIENTS (phosphorus)
Suspected: D.O./OXYGEN DEMAND, PATHOGENS
Possible: ---

Source(s) of Pollutant(s)

Known: ---
Suspected: AGRICULTURE, FAILING ON-SITE SYST, Streambank Erosion
Possible: ---

Resolution/Management Information

Issue Resolvability:	1 (Needs Verification/Study (see STATUS))	
Verification Status:	4 (Source Identified, Strategy Needed)	
Lead Agency/Office:	ext/WQCC	Resolution Potential: Medium
TMDL/303d Status:	n/a ()	

Further Details

Recreational use in Cuba Lake are known to experience minor impacts due to nutrient loads and resulting plant and algae growth. This assessment is based primarily on long-term sampling at a single site in the lake. It has been suggested that conditions vary in other parts of the lake and this possibility should be investigated. The impact of water quality conditions on public bathing use and aquatic life support should also be more fully evaluated. Nonpoint source nutrient loads from agricultural activities in the watershed and inadequate onsite wastewater treatment systems serving lakeside residences are the suspected sources of impacts to the lake.

Cuba Lake has been sampled as part of the NYSDEC Citizen Statewide Lake Assessment Program (CSLAP) beginning in 1986 thru 1990 and from 1998 thru the present. An Interpretive Summary report of the findings of this sampling was published in 2006. These data indicate that the lake continues to be best characterized mesoeutrophic, or moderately to highly productive. This most recent assessment is consistent with assessment from previous years, although water quality conditions reflected in the CSLAP sampling have been variable from year to year; ranging from oligotrophic (1988) to eutrophic (1987, 2000, 2003). Phosphorus levels in the lake occasionally (23% of the samples collected) exceed the state guidance values indicating impacted/stressed recreational uses. Corresponding transparency measurements rarely fail to meet what is minimally recommended for swimming beaches. Readings for pH typically fall within the state water quality standard range of 6.5 to 8.5. The bottom waters of Cuba Lake have elevated nutrient (phosphorus and ammonia) levels, consistent with oxygen depletion near the lake bottom (and reports of hydrogen sulfide

odors in bottom samples, also associated with oxygen depletion). It is not known if this has resulted in any fisheries impacts. (DEC/DOW, BWAM/CSLAP, February 2006)

Public perception of the lake and its uses is also evaluated as part of the CSLAP effort. These assessments indicate recreational suitability of the lake to be highly favorable, consistent with previous assessments. The recreational suitability of the lake is described most frequently as "could not be nicer" or "excellent." The lake itself is most often described as "not quite crystal clear," an assessment that is slightly more favorable than suggested by measured water quality characteristics. Assessments have noted that aquatic plants only occasionally grow to the lake surface but do not significantly impact recreational uses. Aquatic plants are dominated by a mix of native and non-native species. (DEC/DOW, BWAM/CSLAP, February 2006)

This lake waterbody is designated class B, suitable for use as a public bathing beach, general recreation and aquatic life support, but not as a public water supply. Water quality monitoring by NYSDEC focuses primarily on support of general recreation and aquatic life. Samples to evaluate the bacteriological condition and bathing use of the lake or to evaluate contamination from organic compounds, metals or other inorganic pollutants have not been collected as part of the CSLAP monitoring program. Monitoring to assess potable water supply and public bathing use is generally the responsibility of state and/or local health departments.

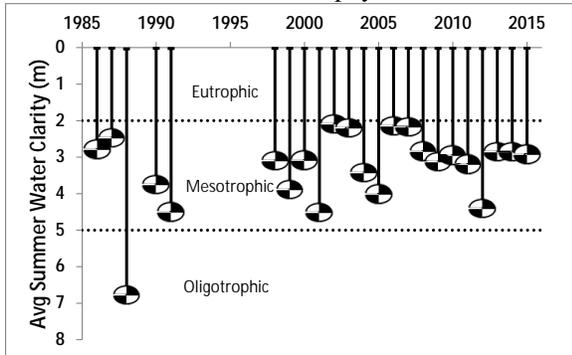
Previous assessments have cited inadequate on-site septic systems that serve about 300 seasonal and some year-round lakeside residences as suspected/possible sources of water quality impact. The most recent investigations have not identified obvious septic systems failures, but small lot sizes and poor soils limit properly designed systems. A recent sewer district proposal was narrowly accepted by local voters. Nonpoint agricultural sources are also suspected of contributing to impacts in the lake. (DEC/DOW, Region 9, March 2007)

Continued sampling of the lake through the NYSDEC CSLAP effort is expected. This future sampling is being discussed and planned with an emphasis on the need for more current data that is targeted toward specific issues (particularly the impact of on-site septic systems) as well as bacteriological sampling - not typically a part of CSLAP - that reflects the specific data needs (e.g., frequency) associated with existing water quality standards. In addition, sampling at additional sites in order to provide a more comprehensive whole lake assessment is also being considered. (DEC/DOW, BWAM/RIBS, March 2007)

Appendix C- Long Term Trends: Cuba Lake

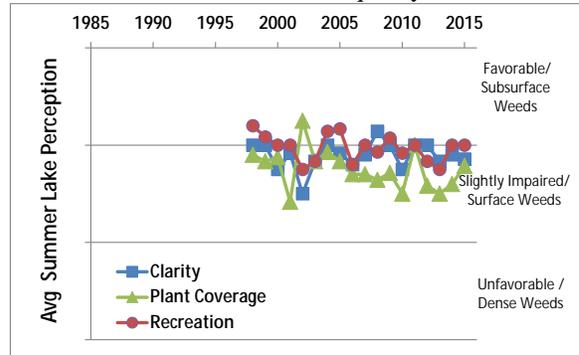
Long Term Trends: Water Clarity

- No clear trends
- Most readings typical of *mesotrophic* lakes, consistent with chlorophyll *a* data



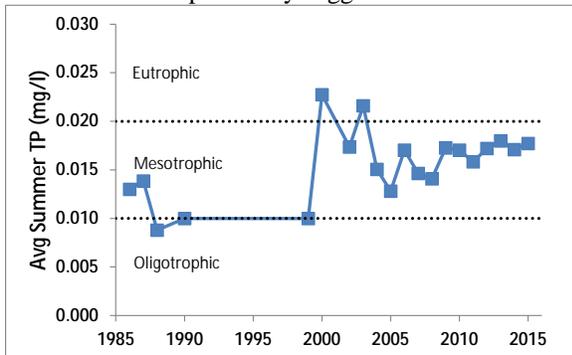
Long Term Trends: Lake Perception

- No trends apparent
- Recreational perception usually more linked to weeds than to water quality



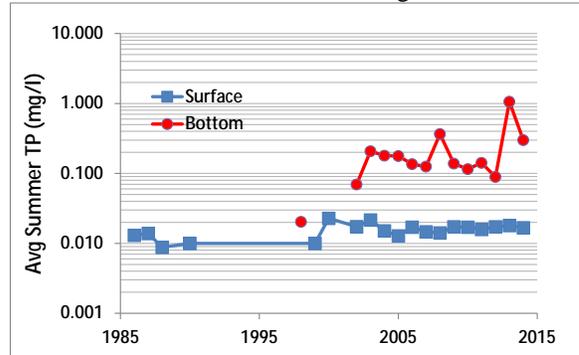
Long Term Trends: Phosphorus

- Very stable recent years
- Most readings typical of *mesotrophic* lakes, but TP spikes may trigger blooms



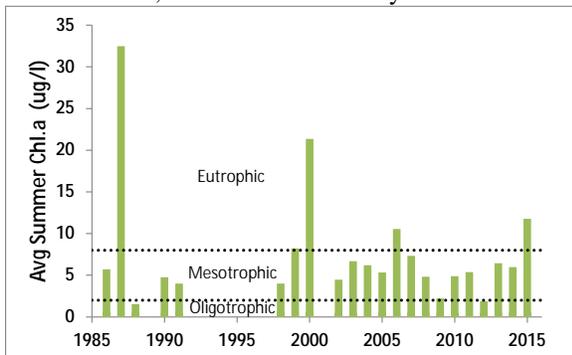
Long Term Trends: Bottom Phosphorus

- Deepwater TP >> surface TP and rising
- Indicates deepwater anoxia and potential source of surface TP loading



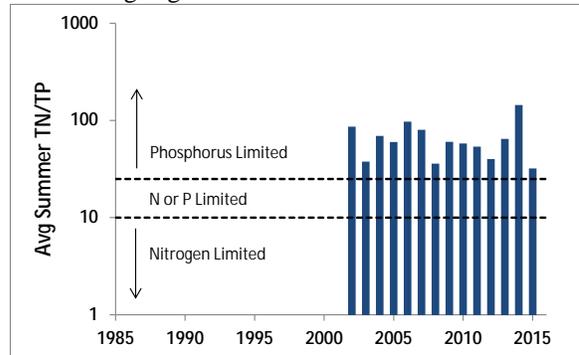
Long Term Trends: Chlorophyll a

- Some variability year to year
- Most readings still typical of *mesotrophic* lakes, consistent with clarity and TP



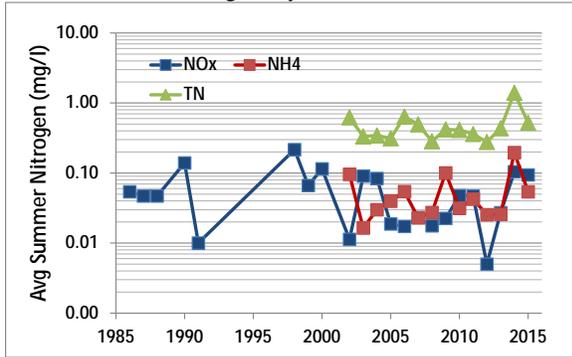
Long Term Trends: N:P Ratio

- No long term trends apparent
- Most readings indicate phosphorus limits algae growth



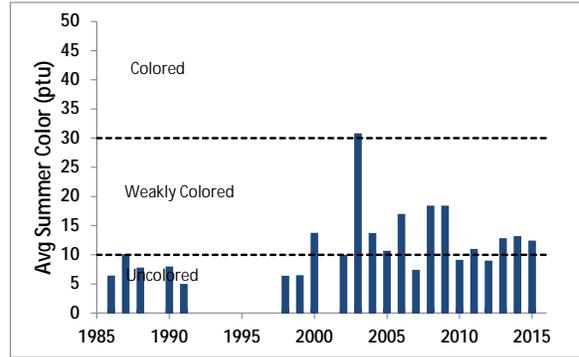
Long Term Trends: Nitrogen

- No clear trends in any N indicator
- Most nitrogen readings low; most higher NOx readings may be natural



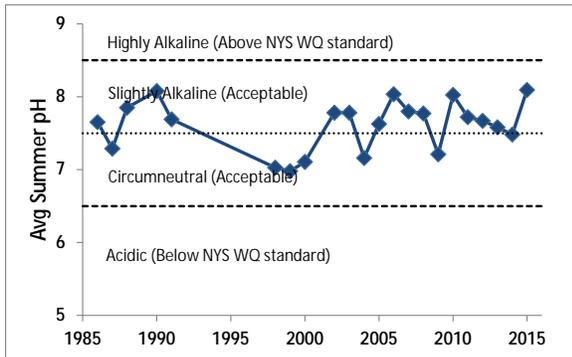
Long Term Trends: Color

- No long term trends apparent
- Most readings typical of *weakly colored to uncolored* lakes



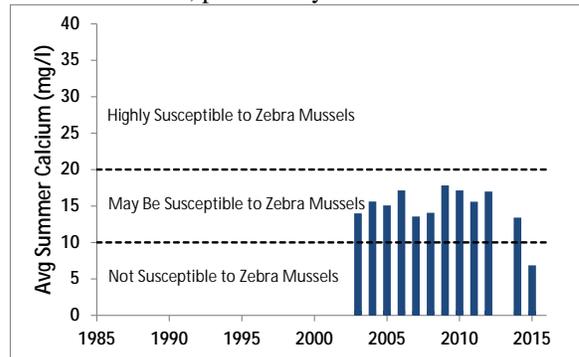
Long Term Trends: pH

- No long term trends; perhaps \uparrow since 2000
- Most readings typical of *slightly alkaline to circumneutral* lakes



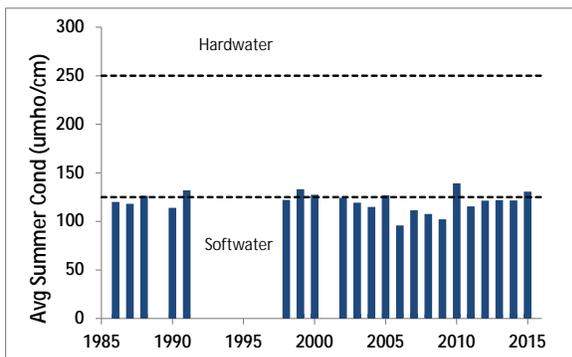
Long Term Trends: Calcium

- No long term trends apparent
- Readings indicate some risk for zebra mussels, particularly near concrete walls



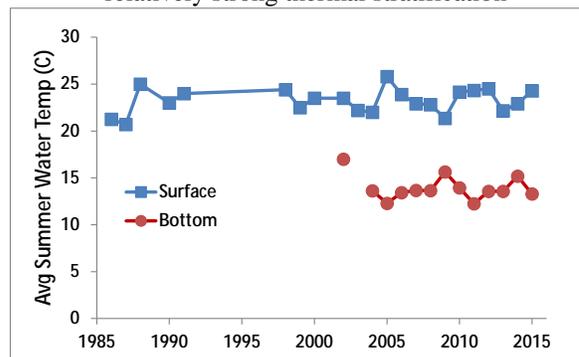
Long Term Trends: Conductivity

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



Long Term Trends: Water Temperature

- No trends apparent in surface temperatures
- Lower bottom temperature readings indicate relatively strong thermal 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 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.

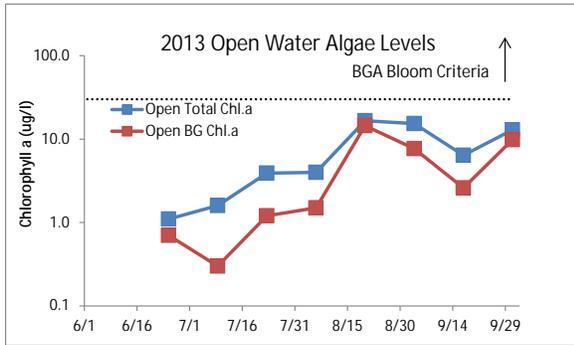


Figure D1:
2013 Open Water Total and BGA Chl.a

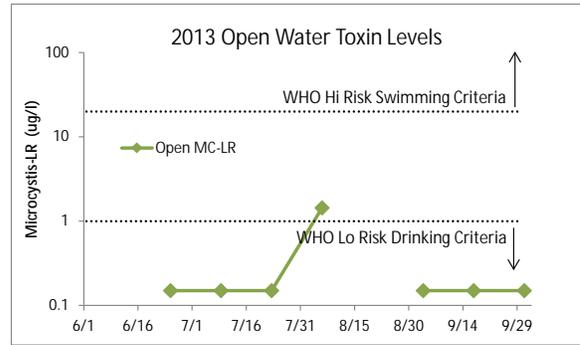


Figure D2:
2013 Open Water Microcystin-LR



Figure D3:
2013 Shoreline Total and BGA Chl.a

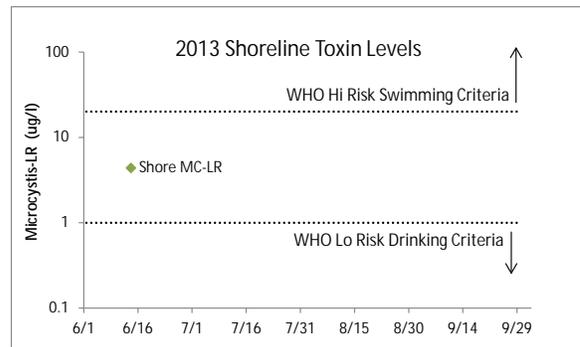


Figure D4:
2013 Shoreline Microcystin-LR

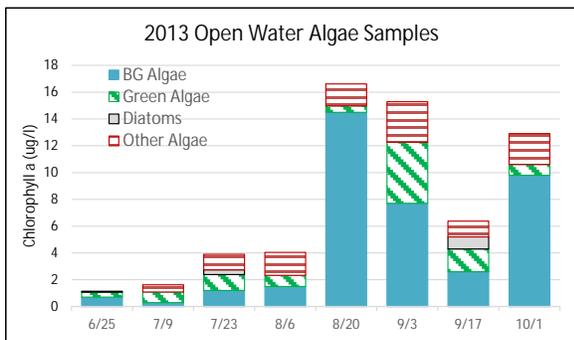


Figure D5:
2013 Open Water Algae Types

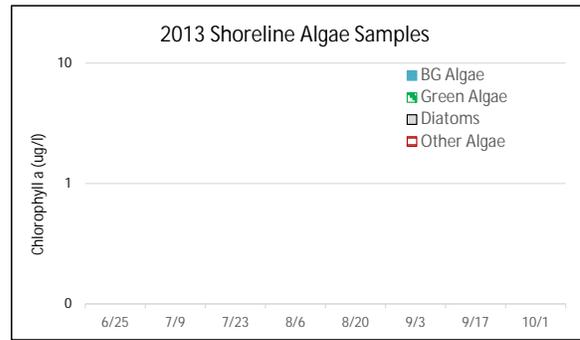


Figure D6:
2013 Shoreline Algae Types

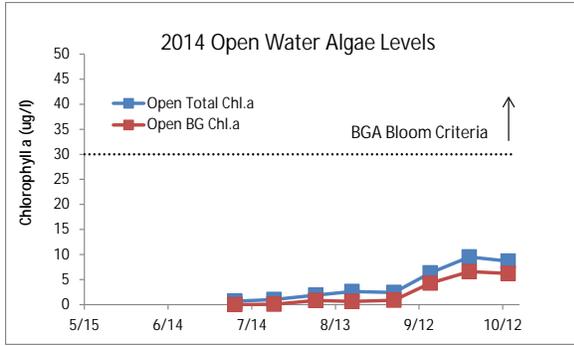


Figure D7:
2014 Open Water Total and BGA Chl.a

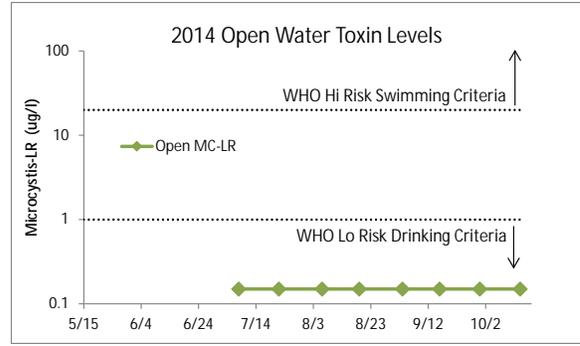


Figure D8:
2014 Open Water Microcystin-LR



Figure D9:
2014 Shoreline Total and BGA Chl.a

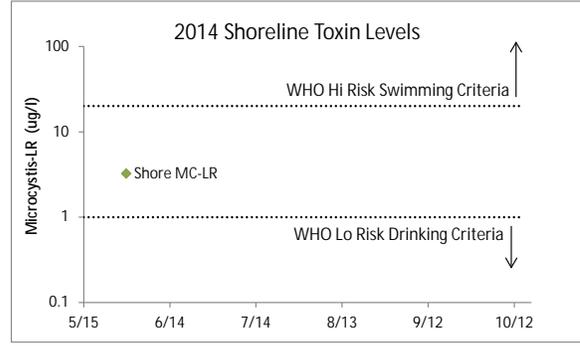


Figure D10:
2014 Shoreline Microcystin-LR

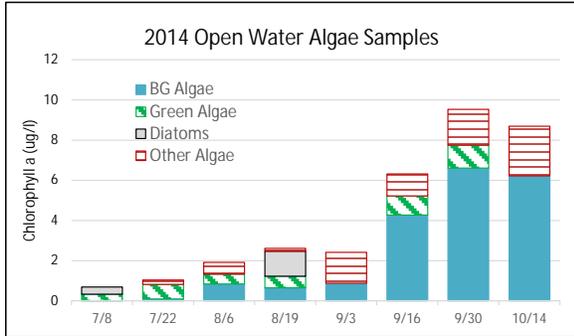


Figure D11:
2014 Open Water Algae Types

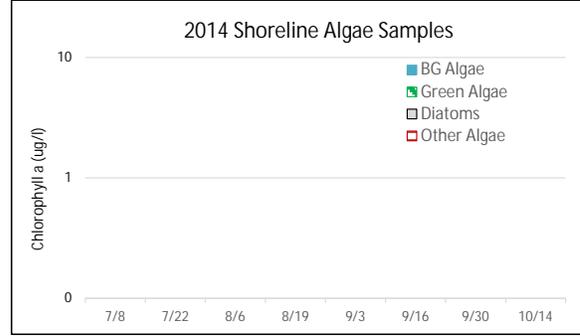


Figure D12:
2014 Shoreline Algae Types

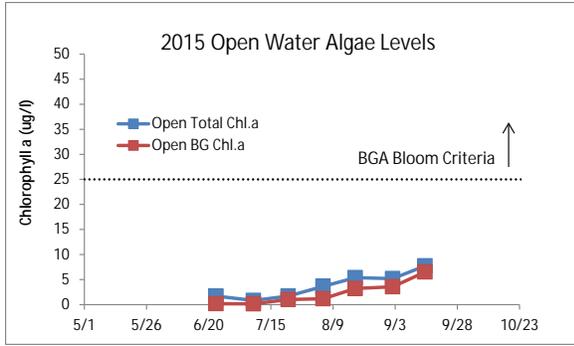


Figure D13:
2015 Open Water Total and BGA Chl.a

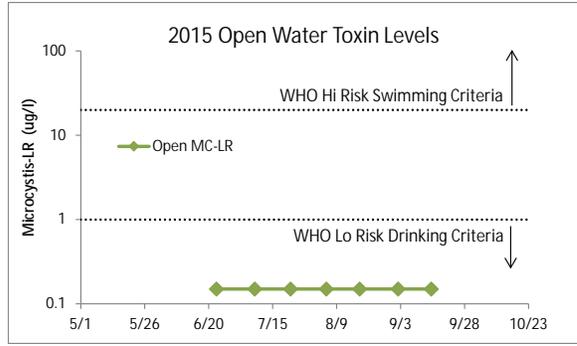


Figure D14:
2015 Open Water Microcystin-LR

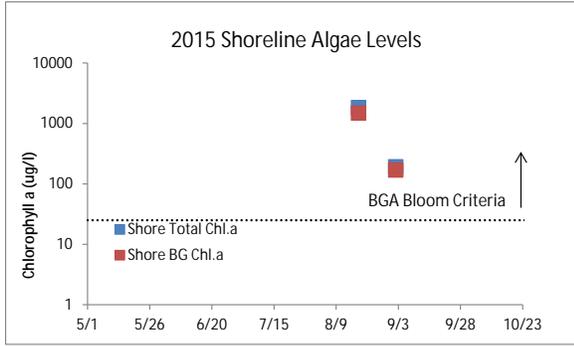


Figure D15:
2015 Shoreline Total and BGA Chl.a

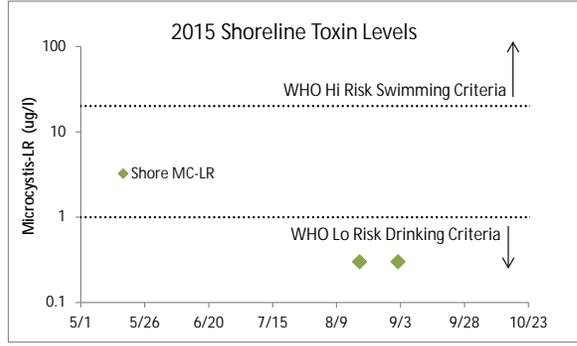


Figure D16:
2015 Shoreline Microcystin-LR

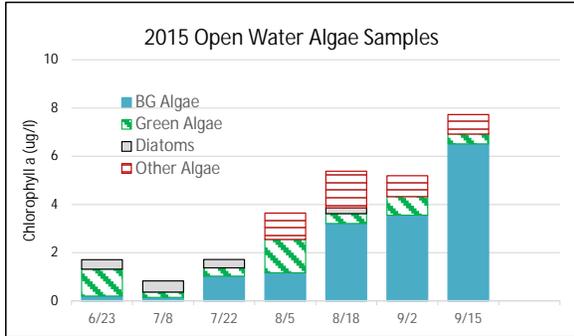


Figure D17:
2015 Open Water Algae Types

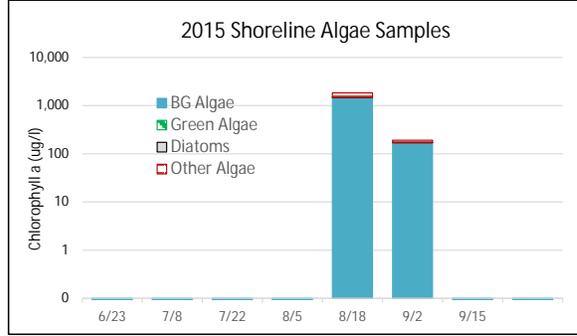


Figure D18:
2015 Shoreline Algae Types

Appendix E: AIS Species in Allegany County

The table below shows the invasive aquatic plants and animals that have been documented in Allegany 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 – Allegany County			
Waterbody	Kingdom	Common name	Scientific name
Ag-Tech Lake	Plant	Eurasian watermilfoil	Myriophyllum spicatum
Amity Lake	Plant	Curly leafed pondweed	Potamogeton crispus
Cuba Lake	Animal	Common Carp	Cyprinus carpio
Cuba Lake	Plant	Eurasian watermilfoil	Myriophyllum spicatum
Cuba Lake	Plant	Brittle naiad	Najas minor
Cuba Lake	Plant	Curly leafed pondweed	Potamogeton crispus
Rushford Lake	Animal	Common carp	Cyprinus carpio
Rushford Lake	Plant	Brittle naiad	Najas minor

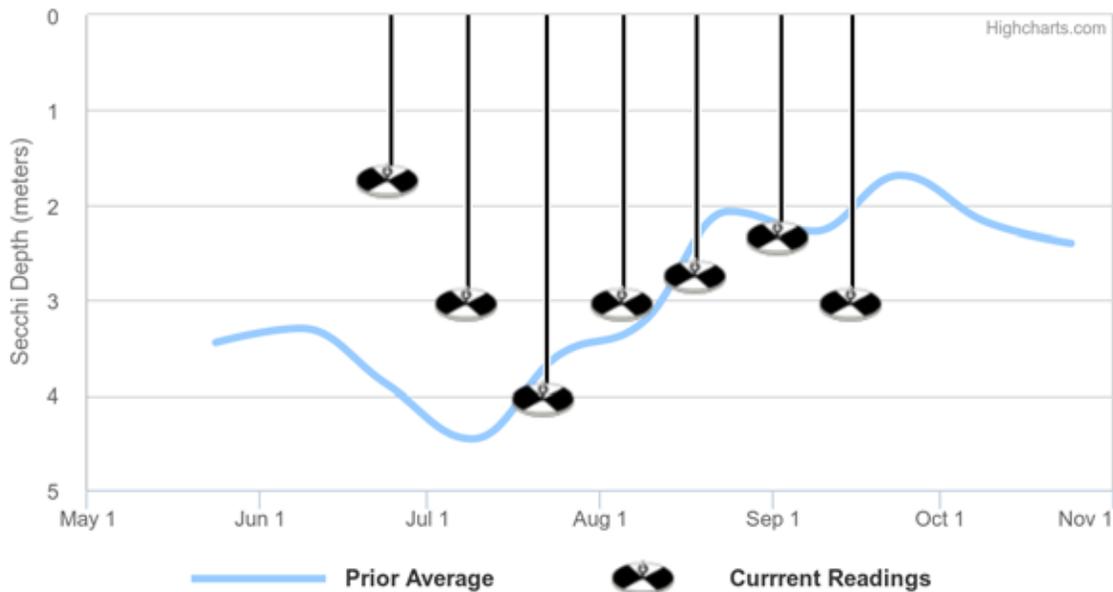
Appendix F: Current Year vs. Prior Averages for Cuba Lake

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. This year's deep water sample temperatures are tending to be lower than normal when compared to the average of readings collected from 2002 to 2014.

Current Year Secchi Readings vs. Prior Average



This year's session Secchi readings are about the same as the average of readings collected from 1986 to 2014

Appendix G: Watershed and Land Use Map for Cuba 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.

