

Boyd Lake Questions and Answers, 2015 CSLAP

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

A1. It is not yet known if the last two years are representative of normal conditions in Boyd Lake. The CSLAP data showed water quality conditions that were slightly better in 2015 than in 2014- water clarity was higher due to lower nutrient and algae levels, and fewer reported blue green algae blooms.

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

A2. The chloride data were consistent with lakes showing moderate impacts from road salt.

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

A3. Boyd Lake had less favorable water quality- low water clarity and high algae levels with open water blooms- than many other nearby lakes. This may be due to shallower water and higher nutrient levels.

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

A4. Trends cannot be evaluated with only two years of data. Water quality conditions were generally more favorable in 2015 than in 2014.

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

A5. The lake already exhibits significant open water and periodic shoreline algae blooms. Nutrient controls, particularly phosphorus reductions, will be needed to reduce the intensive of problems associated with algae blooms and reduce the likelihood of invasive weeds thriving in the lake.

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 will help to improve lake conditions by reducing nutrient and sediment loading to the lake

Lake Use				
	PWL	Average Year	2015	Primary issue
Potable Water	□	□	□	Not applicable
Swimming	□	□	□	Not applicable
Recreation	□	■	■	Algae blooms
Aquatic Life	□	●	▲	Road Salt
Aesthetics	□	◆	◆	Algae blooms
Habitat	□	●	●	No impacts
Fish Consumption	□	▲	▲	

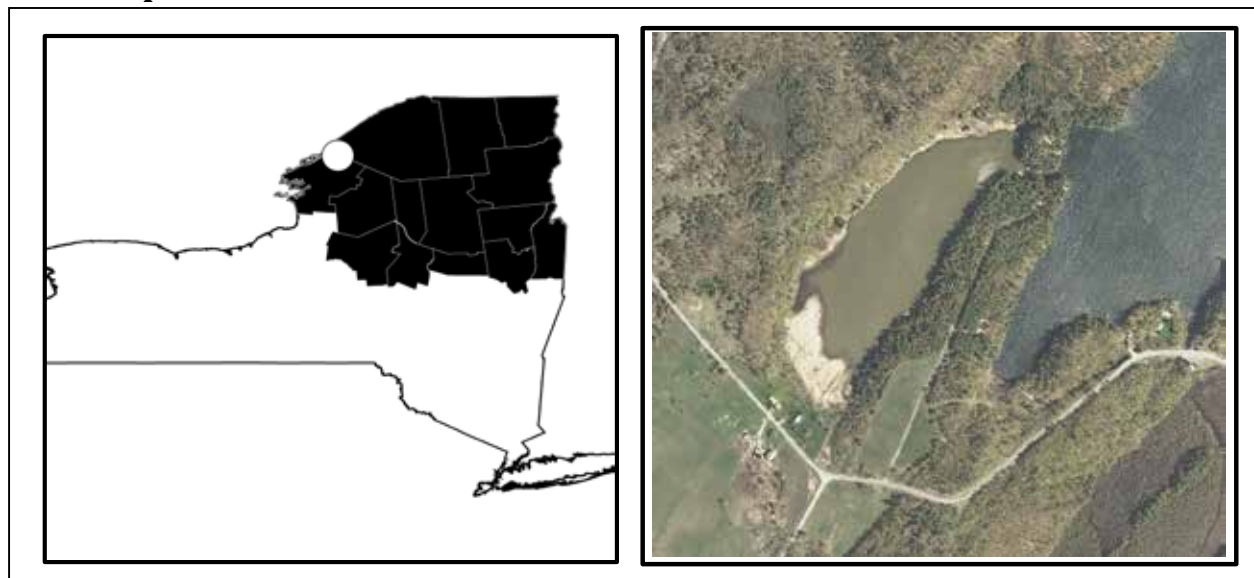
●	Supported / Good
▲	Threatened / Fair
◆	Stressed / Poor
■	Impaired
□	Not Known

CSLAP 2015 Lake Water Quality Summary: Boyd Lake

General Lake Information

Location	Town of Redwood
County	Jefferson
Basin	St. Lawrence River
Size	8.7 hectares (21.4 acres)
Lake Origins	Not known
Watershed Area	120 hectares (296 acres)
Retention Time	0.13 years (estimated)
Mean Depth	0.9 meters (estimated)
Sounding Depth	3.0 meters
Public Access?	none
Major Tributaries	No named tributaries
Lake Tributary To...	Unnamed outlet to Lake of the Woods
WQ Classification	B (contact recreation = swimming)
Lake Outlet Latitude	44.3093
Lake Outlet Longitude	-75.7395
Sampling Years	2014-2015
2015 Samplers	Francis Wood
Main Contact	Walter Dutcher

Lake Map



Background

Boyd Lake is a 21 acre, class B lake found in the Town of Redwood in Jefferson County, in the St. Lawrence River region of New York State. It was first sampled as part of CSLAP in 2014.

It is one of eight CSLAP lakes among the more than 140 lakes found in Jefferson County and one of 26 CSLAP lakes among the more than 1650 lakes and ponds in the St. Lawrence River drainage basin.

Lake Uses

Boyd 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 and fishing; aesthetics and aquatic life. There is no public access to the lake.

It is not known by the report authors if Boyd Lake has been stocked as part of any private stocking efforts. It is not stocked by the state of New York.

General statewide fishing regulations are applicable in Boyd Lake.

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

Historical Water Quality Data

CSLAP sampling was conducted on Boyd Lake for the first time in 2014. The CSLAP reports for the lake can be found on the NYSFOLA website at <http://nysfola.mylaketown.com>, and the most recent CSLAP report can be found on the NYSDEC web page at <http://www.dec.ny.gov/lands/77829.html>.

No other water quality data for the lake have been provided to the NYSDEC.

None of the unnamed ephemeral tributaries to the lake, nor the unnamed outlet of the lake, have been monitored through the NYSDEC Rotating Intensive Basins (RIBS) or stream biomonitoring programs. Lake of the Woods has been sampled periodically through CSLAP.

Lake Association and Management History

Boyd Lake is among the many lakes served by the Indian River Lakes Conservancy, a donor supported land trust organization formed in 1988. The Conservancy is involved in a number of conservation, water quality, and social activities, and is “dedicated to preserving the unique natural resources of the Indian River Lakes Region of Northern New York State”. The Conservancy maintains a website at <http://indianriverlakes.org/>.

Summary of 2015 CSLAP Sampling Results

Evaluation of 2015 Annual Results

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 – Boyd Lake” section in Appendix C.

Evaluation of Eutrophication Indicators

It is not yet known if the 2014 and 2015 data are representative of normal conditions in the lake. Boyd Lake exhibits very high phosphorus levels, resulting in highly elevated algae levels and very low water clarity. However, water clarity was higher in 2015 than in 2014, due to lower algae and nutrient levels.

Lake productivity increases slightly during the summer, with water clarity readings decreasing and nutrient and algae levels increase. This was apparent in both 2014 and 2015. Total and blue green algae levels frequently exceed the DEC bloom criteria, although shoreline blooms are not usually apparent. There is some indication that elevated algae levels in 2015 may have contributed to blue green algae blooms along the southwestern portion of Lake of the Woods.

The lake can be characterized as *eutrophic*, or highly productive, based on water clarity, total phosphorus readings, and chlorophyll *a* readings (all typical of *eutrophic* lakes). The trophic state indices (TSI) evaluation suggests that each of the trophic indicators is “internally consistent”- each indicator (clarity, algae, or nutrients) can be predicted from the value of the other indicators. Overall trophic conditions are summarized on the Lake Scorecard and Lake Condition Summary Table.

Evaluation of Potable Water Indicators

Algae levels are 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

Boyd Lake can be characterized as an alkaline lake with intermediate hardness and color, and high total nitrogen levels; the latter is consistent with high algae levels. However, NO_x and ammonia readings are low, which commonly occurs in eutrophic lakes.

Ammonia, pH, and conductivity readings were slightly higher in 2015 than in 2014, while total nitrogen, color and calcium levels were lower. Additional data will help to determine if the range of readings in these indicators represent normal variability.

Chloride levels in the 2015 samples, collected for the first time through CSLAP and cited in Appendix A, were around 23 mg/l. These values fall within the “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 within than 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

It is not known if phytoplankton, zooplankton, macrophyte, or macroinvertebrate studies have been conducted at the lake. The fluoroprobe data indicates high algae levels, and many of the highest overall algae levels were comprised primarily of blue green algae. The dominance of

blue green algae increases over the summer and increases as total algae levels rise. However, shoreline blooms are not apparent (or are not reported) during most of the summer.

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

Evaluation of Lake Perception

The lake is most often described as “substantially impaired” for most recreational uses, due water quality conditions described as having “high algae levels”. This is consistent with the water quality conditions in the lake. Aquatic plants usually grow below the lake surface, growing to the lake surface (only) in late summer. Plant coverage was more extensive in 2015 than in 2014, perhaps due to slightly higher water clarity. These assessments degrade during the summer, consistent with a seasonal increase in lake productivity. Additional years of data will help to determine if these assessments are representative of normal conditions in the lake. Overall lake perception is summarized on the Lake Scorecard and Lake Condition Summary Table.

Evaluation of Local Climate Change

It is not yet known if air or water temperature readings have exhibited any clear long-term changes, if these readings could indicate local climate change or if any changes can be evaluated through CSLAP. Water temperatures were slightly higher in 2015 than in 2014.

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 readings regularly exceed levels associated with harmful algal blooms (HABs) in the main body of the lake, although shoreline blooms are usually not reported. The most significant open water blooms have been dominated by blue green algae. Open water microcystin (algal toxin) levels are consistently not detectable, although a shoreline bloom sample in 2015 exhibited high toxins. Lake residents, visitors and pets are advised to avoid exposure to any surface scums or heavily discolored water.

Lake Condition Summary

Category	Indicator	Min	Overall Avg	Max	2015 Avg	Classification	2015 Change?	Long-term Change?
Eutrophication Indicators	Water Clarity	0.10	0.47	0.80	0.62	Eutrophic	Higher than in 2014	Not yet known
	Chlorophyll <i>a</i>	20.20	57.74	128.50	40.46	Eutrophic	Lower than in 2014	Not yet known
	Total Phosphorus	0.022	0.109	0.235	0.088	Eutrophic	Lower than in 2014	Not yet known
Potable Water Indicators	Hypolimnetic Ammonia							
	Hypolimnetic Arsenic							
	Hypolimnetic Iron							
	Hypolimnetic Manganese							
Limnological Indicators	Hypolimnetic Phosphorus							
	Nitrate + Nitrite	0.00	0.01	0.02	0.01	Low NOx	Similar in both years	Not yet known
	Ammonia	0.03	0.10	0.35	0.14	Intermediate Ammonia	Higher than in 2014	Not yet known
	Total Nitrogen	0.79	1.43	2.41	1.26	High Total Nitrogen	Lower than in 2014	Not yet known
	pH	6.66	7.79	9.57	7.85	Alkaline	Higher than in 2014	Not yet known
	Specific Conductance	107	142	166	153	Intermediate Hardness	Higher than in 2014	Not yet known
	True Color	10	17	27	14	Intermediate Color	Lower than in 2014	Not yet known
	Calcium	11.7	13.2	14.2	13.0	May be Susceptible to Zebra Mussels	Lower than in 2014	Not yet known
Lake Perception	WQ Assessment	3	3.7	4	3.6	High Algae Levels	Similar in both years	Not yet known
	Aquatic Plant Coverage	1	2.3	3	3.0	Subsurface Plant Growth	Greater coverage in 2014	Not yet known
	Recreational Assessment	4	4.5	5	4.6	Substantially Impaired	Similar in both years	Not yet known
Biological Condition	Phytoplankton					Open water-high blue green algae biomass		
	Macrophytes					Excellent quality of the aquatic plant community		
	Zooplankton					Not measured through CSLAP		
	Macroinvertebrates					Not measured through CSLAP		
	Fish					Not measured through CSLAP		
	Invasive Species					None observed		
Local Climate Change	Air Temperature	19	26.8	34	25.8		Lower than in 2014	Not yet known
	Water Temperature	15	23.9	29	26.2		Higher than in 2014	Not yet known
Harmful Algal Blooms	Open Water Phycocyanin	5	132	307	106	Most readings indicate high risk of BGA	Not yet known	Not yet known
	Open Water FP Chl.a	0	40	79	31	Most readings indicate high algae levels	Not yet known	Not yet known
	Open Water FP BG Chl.a	0	26	60	12	Most readings indicate high BGA levels	Not yet known	Not yet known
	Open Water Microcystis	<DL	0.3	1.1	<DL	Mostly undetectable open water MC-LR	Not yet known	Not yet known
	Open Water Anatoxin a	<DL	<DL	<DL	<DL	Open water Anatoxin-a consistently not detectable	Not yet known	Not yet known
	Shoreline Phycocyanin					No shoreline blooms sampled for PC	Not yet known	Not yet known
	Screening FP Chl.a	15	11724	35113	17579	Most readings indicate high algae levels	Not yet known	Not yet known
	Screening FP BG Chl.a	7	11716	35113	17571	Most readings indicate high BGA levels	Not yet known	Not yet known
	Shoreline Microcystis	<DL	13.3	37.8	19.0	Occasionally high shoreline bloom MC-LR	Not yet known	Not yet known
	Shoreline Anatoxin a	<DL	<DL	<DL		Shoreline bloom Anatoxin-a consistently not detectable	Not yet known	Not yet known

Evaluation of Lake Condition Impacts to Lake Uses

Boyd Lake is not presently among the lakes listed on the St. Lawrence River drainage basin Priority Waterbody List (PWL).

Potable Water (Drinking Water)

The CSLAP dataset at Boyd 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. The high algae levels indicate threats to any "unofficial" potable water use.

Public Bathing

The CSLAP dataset at Boyd Lake, including water chemistry data, physical measurements, and volunteer samplers' perception data, suggests that public bathing, if established at a swimming beach, would be *impaired* by excessive algae, poor water clarity and open water and shoreline blue green algae blooms. However, the lake is not classified for this use. Additional information about bacterial levels is needed to evaluate the safety of the water for swimming.

Contact Recreation (Swimming and Non-Contact Uses)

The CSLAP dataset on Boyd Lake, including water chemistry data, physical measurements, and volunteer samplers' perception data, suggest that recreation should be *impaired* by excessive algae, poor water clarity and open water and shoreline blue green algae blooms.

Aquatic Life

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

Aesthetics and Habitat

The CSLAP dataset on Boyd Lake, including water chemistry data, physical measurements, and volunteer samplers' perception data, suggest that aesthetics may be *stressed* by excessive algae blooms and poor water clarity, consistent with reports that the lake "looks bad". Habitat may be fully supported.

Fish Consumption

There are no fish consumption advisories posted for Boyd Lake; this use may be *threatened* by algae blooms.

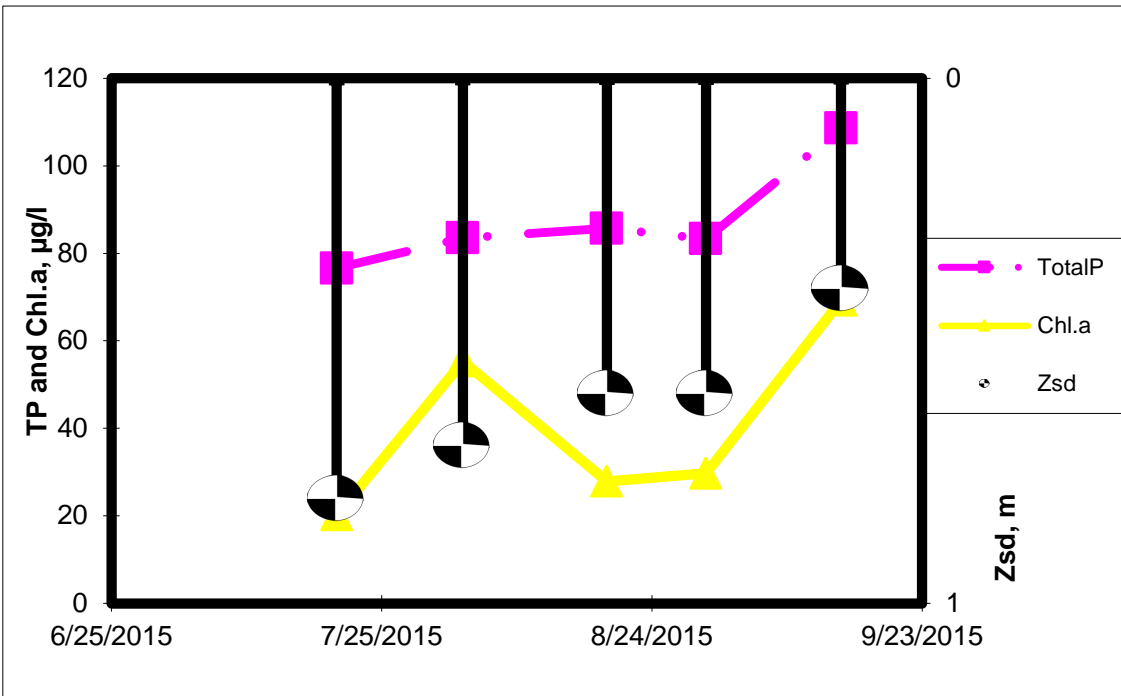
Additional Comments and Recommendations

Aquatic plant surveys should be conducted at Boyd Lake to determine if other invasive species found in nearby lakes, including Eurasian watermilfoil, are present in the lake. Shoreline surveillance should continue to look for the presence of shoreline algae blooms, and these blooms should be reported to lake users and visitors to help protect recreational uses.

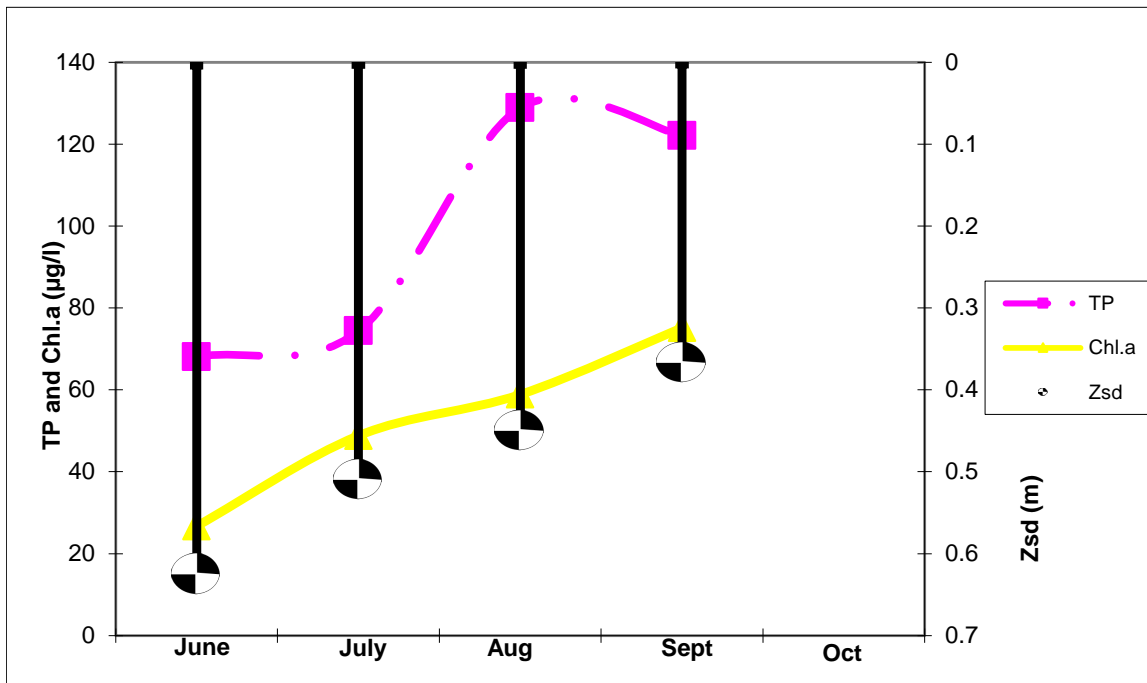
Aquatic Plant IDs-2015

None submitted for identification.

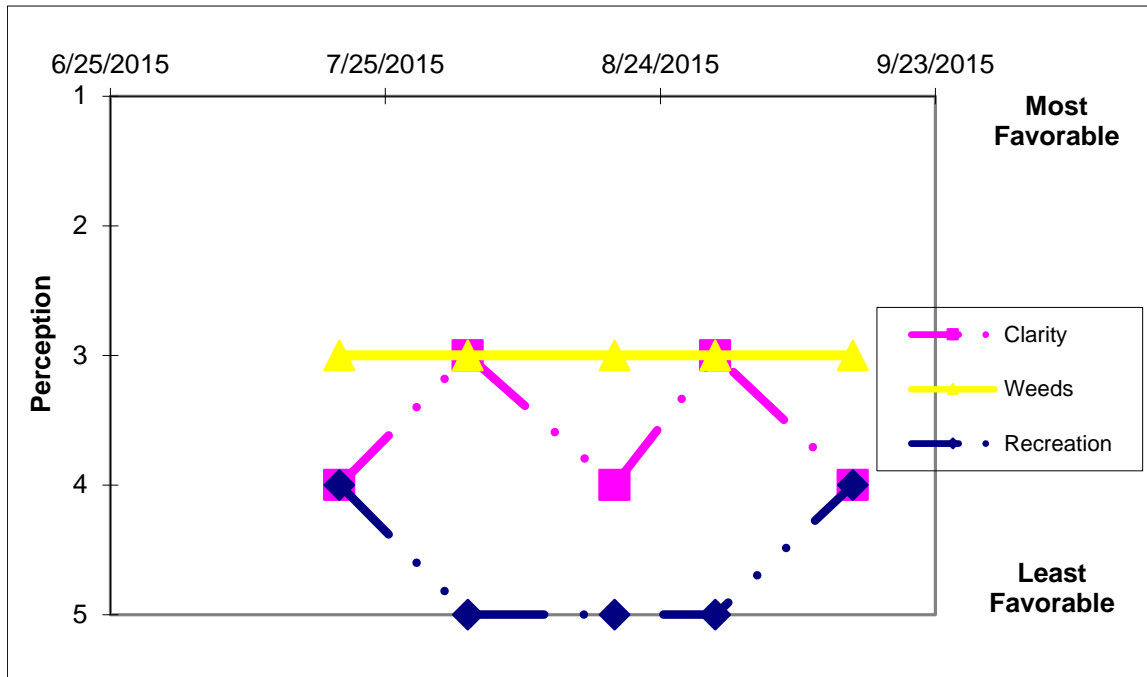
Time Series: Trophic Indicators, 2015



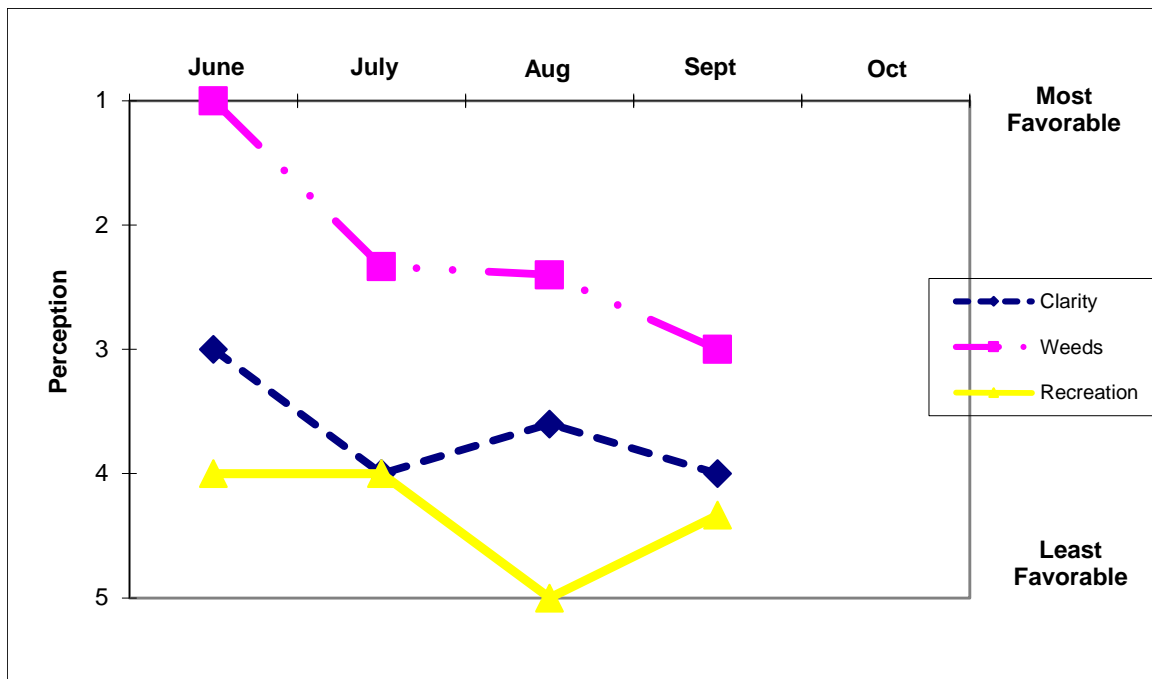
Time Series: Trophic Indicators, Typical Year (2014-2015)



Time Series: Lake Perception Indicators, 2015



Time Series: Lake Perception Indicators, Typical Year (2014-2015)



Appendix A- CSLAP Water Quality Sampling Results for Boyd Lake

LNum	PName	Date	Zbot	Zsd	Zsamp	Tot.P	NO3	NH4	TDN	TN/TP	TColor	pH	Cond25	Ca	Chl.a	Cl
237	Boyd Lake	6/9/2014	2.6	0.75	1.5									12.7		
237	Boyd Lake	6/9/2014														
237	Boyd Lake	6/22/2014	2.3	0.50	1.5	0.068			0.8	25.49	12	6.66	132		26.7	
237	Boyd Lake	7/6/2014	2.0	0.40	1.5	0.022	0.02	0.03	1.2	124.5	21	8.23	106.5		55.6	
237	Boyd Lake	7/20/2014	3.0	0.33	1.5	0.125			1.9	33.77	24	7.26	135.4		70.6	
237	Boyd Lake	8/10/2014	2.0	0.10	1.0	0.235	0.02	0.1	2.4	22.56	18	9.57	131	14.2	129	
237	Boyd Lake	8/24/2014	3.0	0.25	1.5	0.158			1.8	25.24	27		140.6		52.9	
237	Boyd Lake	9/7/2014	3.0	0.40	1.5	0.138	0.01	0.07	1.4	22.08	18	7.25	150.7		77.2	
237	Boyd Lake	9/20/2014	3.0	0.30	1.5	0.120			1.3	23.54	16	7.42	143.6		79.1	
237	Boyd Lake	7/20/2015	6.2	0.80	1.5	0.077	0	0.04	1.3	16.62	18	7.52	166.2	14.2	20.2	
237	Boyd Lake	8/03/2015	6.2	0.70	1.5	0.084			1.3	16.1	18	7.89	157		55.3	
237	Boyd Lake	8/19/2015	6.2	0.60	1.5	0.086	0.02	0.03	1.3	15.22	10	8.03	152.6		27.9	22.3
237	Boyd Lake	9/16/2015			Bloom											
237	Boyd Lake	9/18/2015			bloom											
237	Boyd Lake	8/30/2015	6.2	0.60	1.5	0.083			1.3	15.58	15	8.23	147		29.7	
237	Boyd Lake	9/14/2015	6.2	0.40	1.5	0.109	0.01	0.35	1.1	10.01	11	7.59	144.6	11.7	69.2	

LNum	PName	Date	Site	TAir	TH20	QA	QB	QC	QD	QF	QG	AQ-PC	AQ-Chla	MC-LR	Ana-a	Cylin	FP-Chl	FP-BG	HAB form	Shore HAB
237	Boyd Lake	6/9/2014	epi	25	20	3	1	4	146	4	0	4.5	10.0				0.0	0.0	a	
237	Boyd Lake	6/9/2014	bloom											<3.66	<0.20	<0.003	15.0	6.5	a	h
237	Boyd Lake	6/22/2014	epi	27	24	3	1	4	1	4	0	32.2	2.5	<0.60			17.8	7.7	h	
237	Boyd Lake	7/6/2014	epi	24	24	4	1	4	15	0	0	167.0	4.3	<0.60			58.1	38.0	h	
237	Boyd Lake	7/20/2014	epi	27	24	4	3	4	134	4	4	186.2	2.2	<0.90			49.6	44.6	h	h
237	Boyd Lake	8/10/2014	epi	34	29	4	2	5	134	4	4	307.0	5.9				79.4	59.9	b	b
237	Boyd Lake	8/24/2014	epi	30	21	4	1	5	134	4	4	129.1	1.7	<2.13	<0.32	<0.004	41.1	32.1	b	b
237	Boyd Lake	9/7/2014	epi	31	23	4	3	4	134	4	4	195.0	2.00	<0.64	<0.14	<0.002	55.2	48.9	d	d
237	Boyd Lake	9/20/2014	epi	21	15	4	3	5	1345	4	4	137.7	2.2	<0.48	<0.04	<0.001	48.1	39.2	d	d
237	Boyd Lake	7/20/2015	epi	26	28	4	3	4	1	0	0	15.0	5.8	<0.45	<0.004	<0.023	29.7	0.0	l	l
237	Boyd Lake	8/03/2015	epi	25	27	3	3	5	35	7	7	113.2	5.5	<0.57	<0.010	<0.054	30.3	10.5	l	l
237	Boyd Lake	8/19/2015	epi	33	28	4	3	5	13	0	0	54.5	4.6	<0.57	<0.017	<0.042	22.3	5.6	l	l
237	Boyd Lake	9/16/2015	Bloom											<0.78	<0.019	<0.044	45.0	29.7		b
237	Boyd Lake	9/18/2015	Bloom											37.78	<0.019	<0.044	35112.5	35112.5		a
237	Boyd Lake	8/30/2015	epi	26	26	3	3	5	134	0	0			<0.99	<0.069	<0.062			l	l
237	Boyd Lake	9/14/2015	epi	19	22	4	3	4	1345	4	4	240.4	3.7	<0.54	<0.005	<0.021	43.0	29.9	l	l

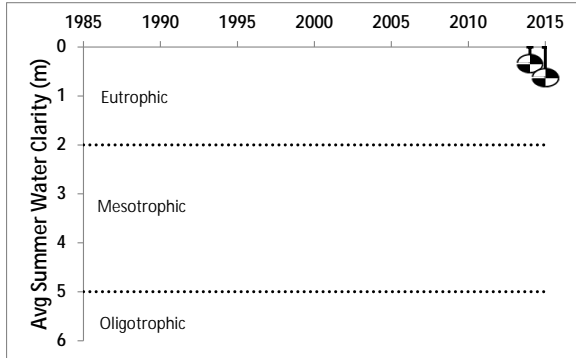
Legend Information

<i>Indicator</i>	<i>Description</i>	<i>Detection Limit</i>	<i>Standard (S) / Criteria (C)</i>
General Information			
Lnum	lake number (unique to CSLAP)		
Lname	name of lake (as it appears in the Gazetteer of NYS Lakes)		
Date	sampling date		
Field Parameters			
Zbot	lake depth at sampling point, meters (m)		
Zsd	Secchi disk transparency or clarity	0.1m	1.2m (C)
Zsamp	water sample depth (m) (epi = epilimnion or surface; bot = bottom)	0.1m	none
Tair	air temperature (C)	-10C	none
TH20	water temperature (C)	-10C	none
Laboratory Parameters			
Tot.P	total phosphorus (mg/l)	0.003 mg/l	0.020 mg/l (C)
NOx	nitrate + nitrite (mg/l)	0.01 mg/l	10 mg/l NO3 (S), 2 mg/l NO2 (S)
NH4	total ammonia (mg/l)	0.01 mg/l	2 mg/l NH4 (S)
TN	total nitrogen (mg/l)	0.01 mg/l	none
TN/TP	nitrogen to phosphorus (molar) ratio, = (TKN + NOx)*2.2/TP		none
TCOLOR	true (filtered) color (ptu, platinum color units)	1 ptu	none
pH	powers of hydrogen (S.U., standard pH units)	0.1 S.U.	6.5, 8.5 S.U. (S)
Cond25	specific conductance, corrected to 25C (umho/cm)	1 umho/cm	none
Ca, 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)	variable	none
Cyl	Cylindrospermopsis (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: Boyd Lake

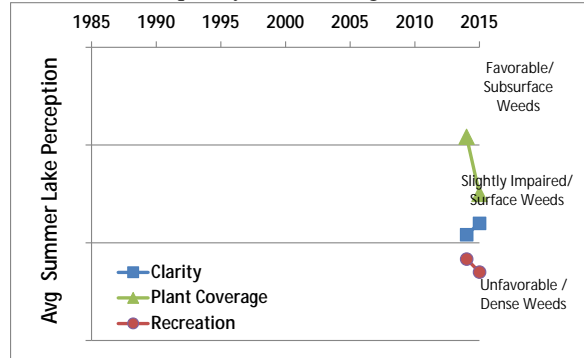
Long Term Trends: Water Clarity

- Water clarity higher in 2015 than in 2014
- Most readings typical of *eutrophic* lakes



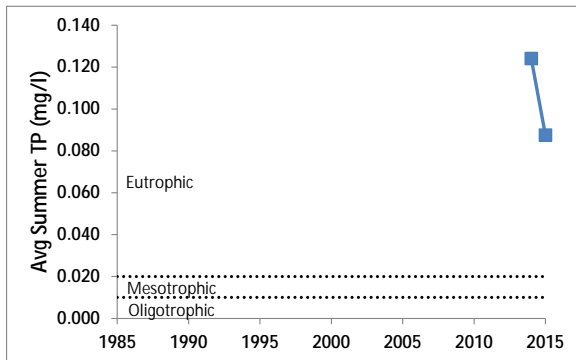
Long Term Trends: Lake Perception

- 2015: poorer rec, better clarity, more weeds
- Recreational perception more closely tied to water quality than weed growth



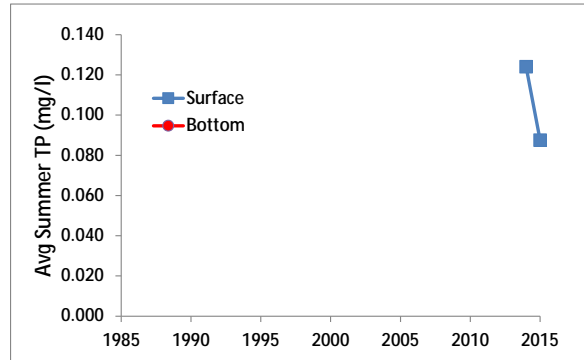
Long Term Trends: Phosphorus

- Lower phosphorus in 2015 than in 2014
- Most readings typical of *eutrophic* lakes



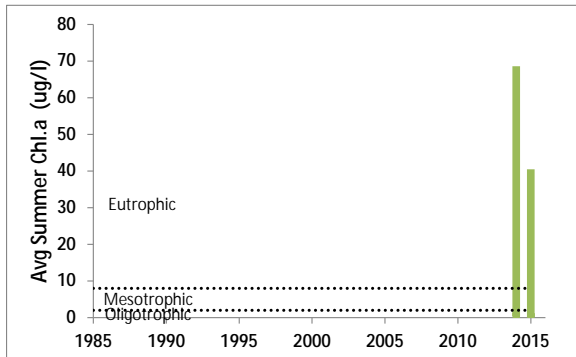
Long Term Trends: Bottom Phosphorus

- Boyd Lake not thermally stratified
- Deepwater TP levels probably similar to surface TP levels



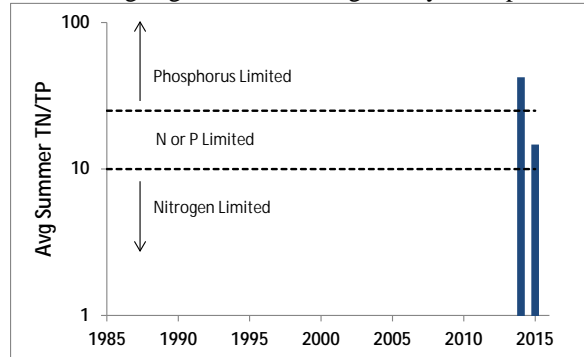
Long Term Trends: Chlorophyll a

- Lower algae levels in 2015 than in 2014
- Most readings typical of *eutrophic* lakes with seasonal increases



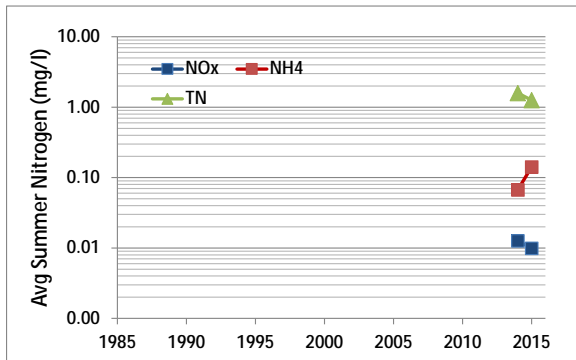
Long Term Trends: N:P Ratio

- Lower N:P in 2015 than in 2014
- Most readings indicate phosphorus limits algae growth, but nitrogen may be important



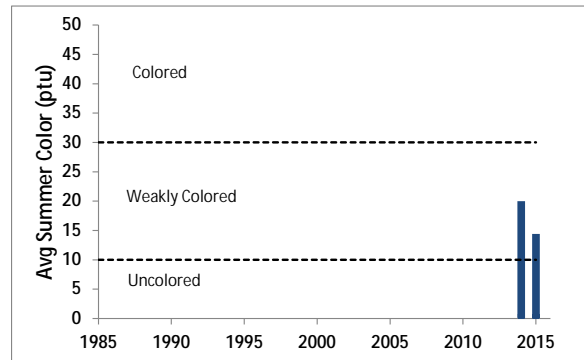
Long Term Trends: Nitrogen

- 2015: ↓ NOx and TN; ↑ NH4
- Relatively high total nitrogen, but low ammonia and NOx



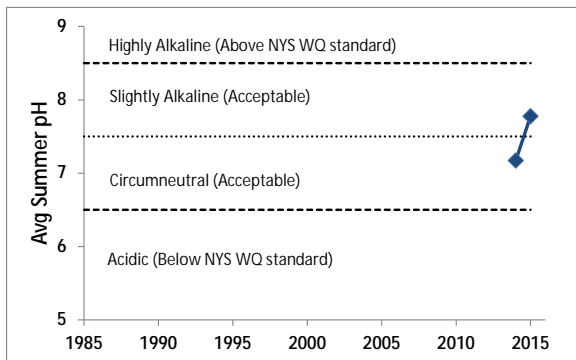
Long Term Trends: Color

- Color readings lower in 2015 than in 2014
- Most readings typical of *weakly colored* lakes



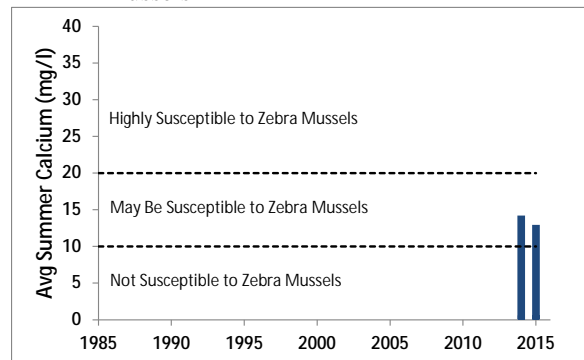
Long Term Trends: pH

- Higher pH in 2015 than in 2014
- Most readings typical of *circumneutral* lakes



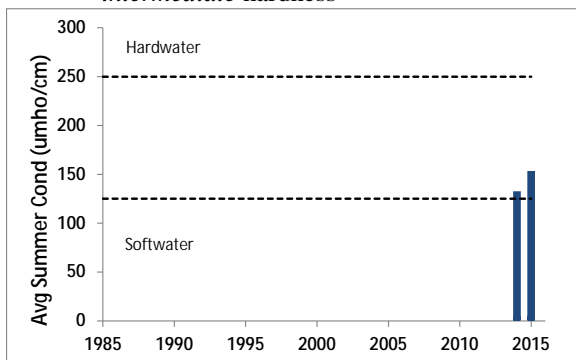
Long Term Trends: Calcium

- Lower calcium levels in 2015 than in 2014
- Likely intermediate susceptibility to zebra mussels



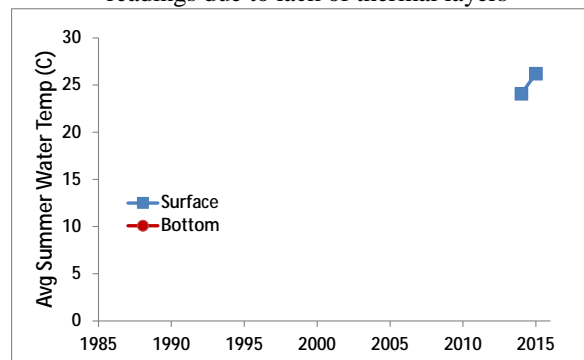
Long Term Trends: Conductivity

- Higher conductivity in 2015 than in 2014
- Most readings typical of lakes with *intermediate* hardness



Long Term Trends: Water Temperature

- Higher water temperature in 2015 than 2014
- Deepwater temperature similar to surface readings due to lack of thermal layers



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.

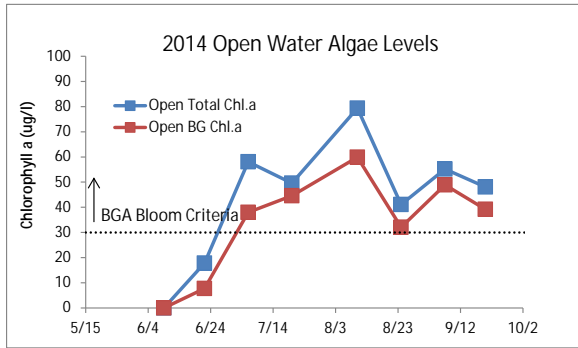


Figure D1:
2014 Open Water Total and BGA Chl.a

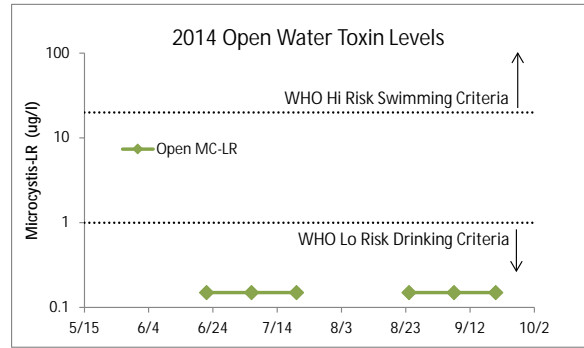


Figure D2:
2014 Open Water Microcystin-LR

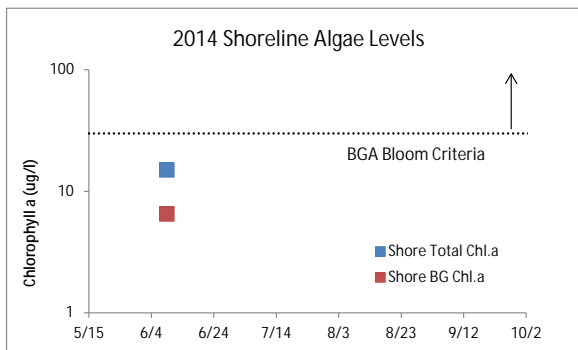


Figure D3:
2014 Shoreline Total and BGA Chl.a

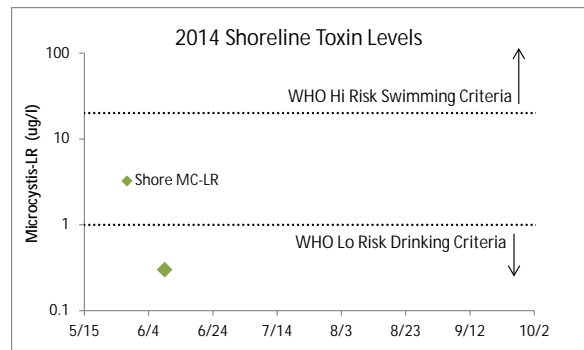


Figure D4:
2014 Shoreline Microcystin-LR

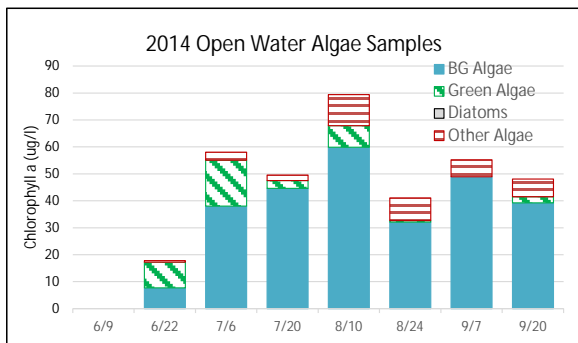


Figure D5:
2014 Open Water Algae Types

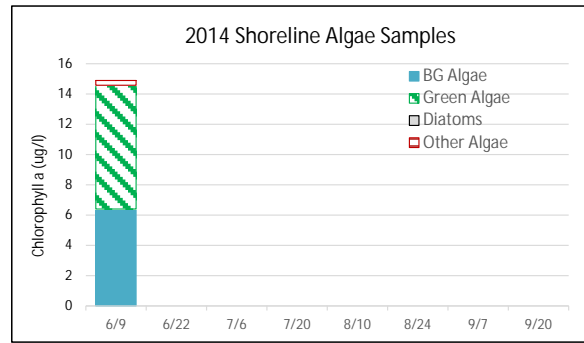


Figure D6:
2014 Shoreline Algae Types

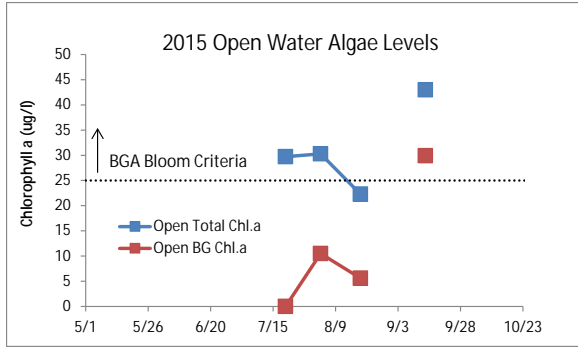


Figure D7:
2015 Open Water Total and BGA Chl.a

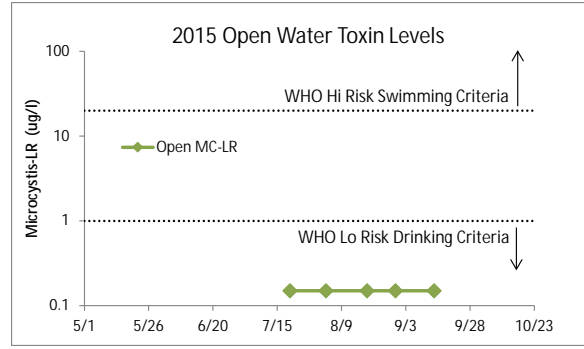


Figure D8:
2015 Open Water Microcystin-LR

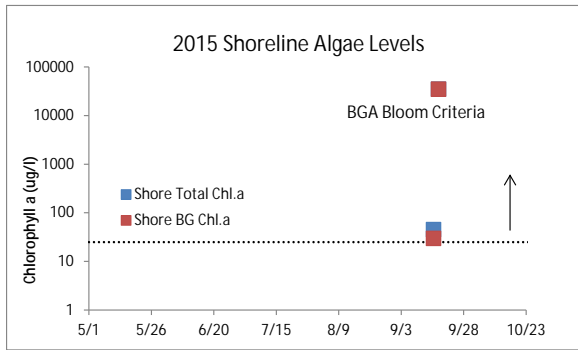


Figure D9:
2015 Shoreline Total and BGA Chl.a

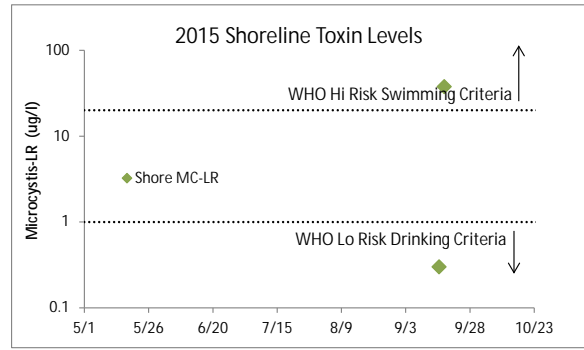


Figure D10:
2015 Shoreline Microcystin-LR

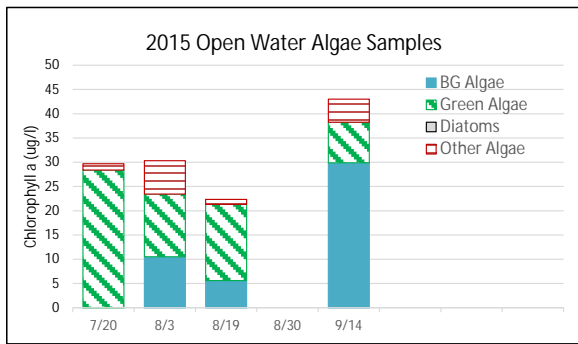


Figure D11:
2015 Open Water Algae Types

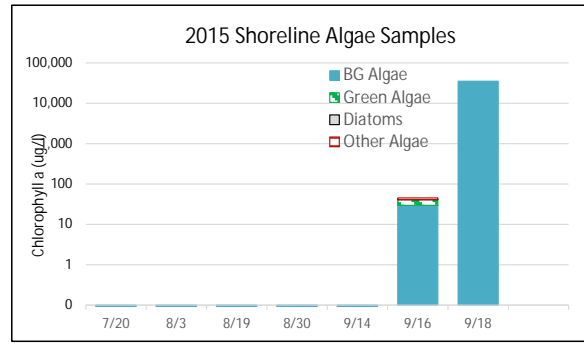


Figure D12:
2015 Shoreline Algae Types

Appendix E: AIS Species in Jefferson County

The table below shows the invasive aquatic plants and animals that have been documented in Jefferson 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).

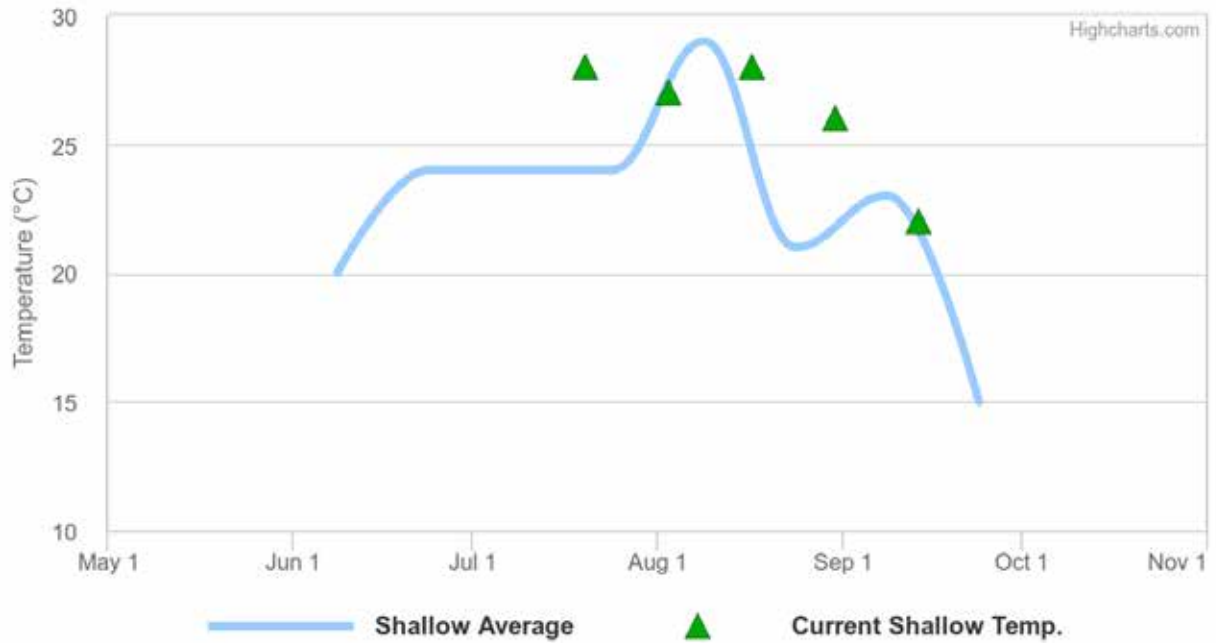
This list is not complete, but instead represents only those species that have been reported and verified within the county. If any additional aquatic invasive species (AIS) are known or suspected in these or other waterbodies in the county, this information should be reported through iMap invasives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

Aquatic Invasive Species - Jefferson County			
Waterbody	Kingdom	Common name	Scientific name
Black Pond	Animal	Common carp	<i>Cyprinus carpio</i>
Black Pond	Plant	European frogbit	<i>Hydrocharis morsus-ranae</i>
Black Pond	Plant	Curly leafed pondweed	<i>Potamogeton crispus</i>
Butterfield Lake	Plant	Eurasian watermilfoil	<i>Myriophyllum spicatum</i>
Cranberry Pond	Plant	European frogbit	<i>Hydrocharis morsus-ranae</i>
Crooked Creek	Plant	European frogbit	<i>Hydrocharis morsus-ranae</i>
Floodwood Pond	Plant	Common carp	<i>Cyprinus carpio</i>
Floodwood Pond	Plant	European frogbit	<i>Hydrocharis morsus-ranae</i>
Floodwood Pond	Plant	Eurasian watermilfoil	<i>Myriophyllum spicatum</i>
Floodwood Pond	Plant	Brittle naiad	<i>Najas minor</i>
Floodwood Pond	Plant	Curly leafed pondweed	<i>Potamogeton crispus</i>
Floodwood Pond	Plant	Water chestnut	<i>Trapa natans</i>
Goose Pond	Plant	Eurasian watermilfoil	<i>Myriophyllum spicatum</i>
Hyde Lake	Plant	Eurasian watermilfoil	<i>Myriophyllum spicatum</i>
Lake of the Isles	Plant	Eurasian watermilfoil	<i>Myriophyllum spicatum</i>
Lake of the Woods	Plant	Eurasian watermilfoil	<i>Myriophyllum spicatum</i>
Lake Ontario	Plant	Flowering-rush	<i>Butomus umbellatus</i>
Lake Ontario	Animal	Common carp	<i>Cyprinus carpio</i>
Lake Ontario	Animal	Quagga mussel	<i>Dreissena bugensis</i>
Lake Ontario	Animal	Zebra mussel	<i>Dreissena polymorpha</i>
Lake Ontario	Plant	European frogbit	<i>Hydrocharis morsus-ranae</i>
Lake Ontario	Plant	Eurasian watermilfoil	<i>Myriophyllum spicatum</i>
Lake Ontario	Plant	Brittle naiad	<i>Najas minor</i>
Lake Ontario	Animal	Round goby	<i>Neogobius melanostomus</i>

Waterbody	Kingdom	Common name	Scientific name
Lake Ontario	Plant	Starry stonewort	<i>Nitellopsis obtusa</i>
Lake Ontario	Animal	Allegheny crayfish	<i>Orconectes obscurus</i>
Lake Ontario	Plant	Curly leafed pondweed	<i>Potamogeton crispus</i>
Lake Ontario	Plant	Water chestnut	<i>Trapa natans</i>
Lakeview Pond	Animal	Common carp	<i>Cyprinus carpio</i>
Lakeview Pond	Plant	Eurasian watermilfoil	<i>Myriophyllum spicatum</i>
Lakeview Pond	Plant	Curly leafed pondweed	<i>Potamogeton crispus</i>
Lakeview Pond	Plant	European frogbit	<i>Hydrocharis morsus-ranae</i>
Millsite Lake	Plant	Eurasian watermilfoil	<i>Myriophyllum spicatum</i>
Millsite Lake	Plant	Banded mystery snail	<i>Viviparus georgianus</i>
Moon Lake	Plant	Eurasian watermilfoil	<i>Myriophyllum spicatum</i>
Moon Lake	Plant	Curly leafed pondweed	<i>Potamogeton crispus</i>
Mud Lake	Plant	Eurasian watermilfoil	<i>Myriophyllum spicatum</i>
Mud Lake	Plant	European frogbit	<i>Hydrocharis morsus-ranae</i>
Muskellunge Lake	Animal	Rudd	<i>Scardinius erythrophthalmus</i>
North Colwell Pond	Plant	Brittle naiad	<i>Najas minor</i>
North Colwell Pond	Plant	Water chestnut	<i>Trapa natans</i>
North Colwell Pond	Plant	Eurasian watermilfoil	<i>Myriophyllum spicatum</i>
North Pond	Plant	European frogbit	<i>Hydrocharis morsus-ranae</i>
North Pond	Plant	Eurasian watermilfoil	<i>Myriophyllum spicatum</i>
Payne Lake	Plant	Eurasian watermilfoil	<i>Myriophyllum spicatum</i>
Payne Lake	Plant	Curly leafed pondweed	<i>Potamogeton crispus</i>
Perch Lake	Plant	Eurasian watermilfoil	<i>Myriophyllum spicatum</i>
Perch Lake	Plant	Curly leafed pondweed	<i>Potamogeton crispus</i>
Pleasant Lake	Plant	European frogbit	<i>Hydrocharis morsus-ranae</i>
Pleasant Lake	Plant	Eurasian watermilfoil	<i>Myriophyllum spicatum</i>
Red Lake	Plant	Eurasian watermilfoil	<i>Myriophyllum spicatum</i>
Red Lake	Animal	Common carp	<i>Cyprinus carpio</i>
Saint James Lake	Animal	Common carp	<i>Cyprinus carpio</i>
Saint James Lake	Plant	European frogbit	<i>Hydrocharis morsus-ranae</i>
Saint James Lake	Animal	Round goby	<i>Neogobius melanostomus</i>
Saint James Lake	Plant	Water chestnut	<i>Trapa natans</i>
Sixberry Lake	Plant	Eurasian watermilfoil	<i>Myriophyllum spicatum</i>
South Colwell Pond	Plant	European frogbit	<i>Hydrocharis morsus-ranae</i>
South Colwell Pond	Plant	Eurasian watermilfoil	<i>Myriophyllum spicatum</i>
South Colwell Pond	Plant	Curly leafed pondweed	<i>Potamogeton crispus</i>
South Colwell Pond	Plant	Water chestnut	<i>Trapa natans</i>
South Colwell Pond	Plant	Brittle naiad	<i>Najas minor</i>
St. Lawrence River	Animal	Zebra mussel	<i>Dreissena polymorpha</i>
St. Lawrence River	Plant	European frogbit	<i>Hydrocharis morsus-ranae</i>
St. Lawrence River	Plant	Eurasian watermilfoil	<i>Myriophyllum spicatum</i>
St. Lawrence River	Plant	Starry stonewort	<i>Nitellopsis obtusa</i>
St. Lawrence River	Plant	Curly leafed pondweed	<i>Potamogeton crispus</i>

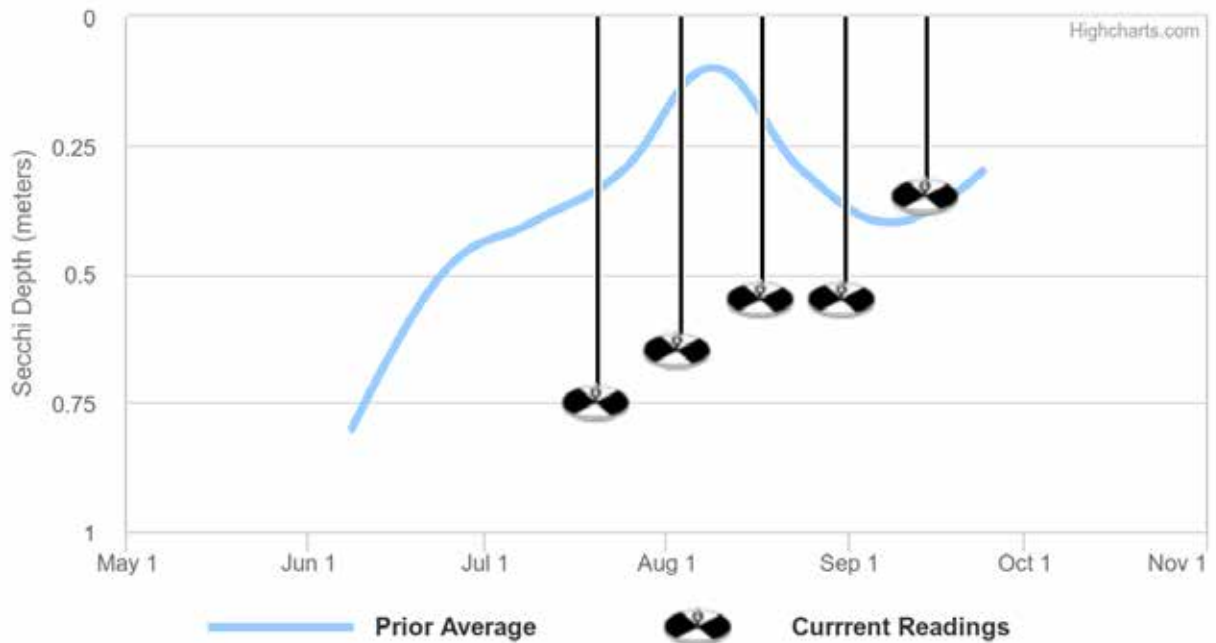
Appendix F: Current Year vs. Prior Averages for Boyd Lake

Current Year Water Temperatures vs. Prior Average



There are not enough shallow water sample temperatures to determine a trend for the current year when compared to the average of readings collected during 2014.

Current Year Secchi Readings vs. Prior Average



There are not enough session Secchi readings to determine a trend for the current year when compared to the average of readings collected during 2014.

Appendix G: Watershed and Land Use Map for Boyd 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.

