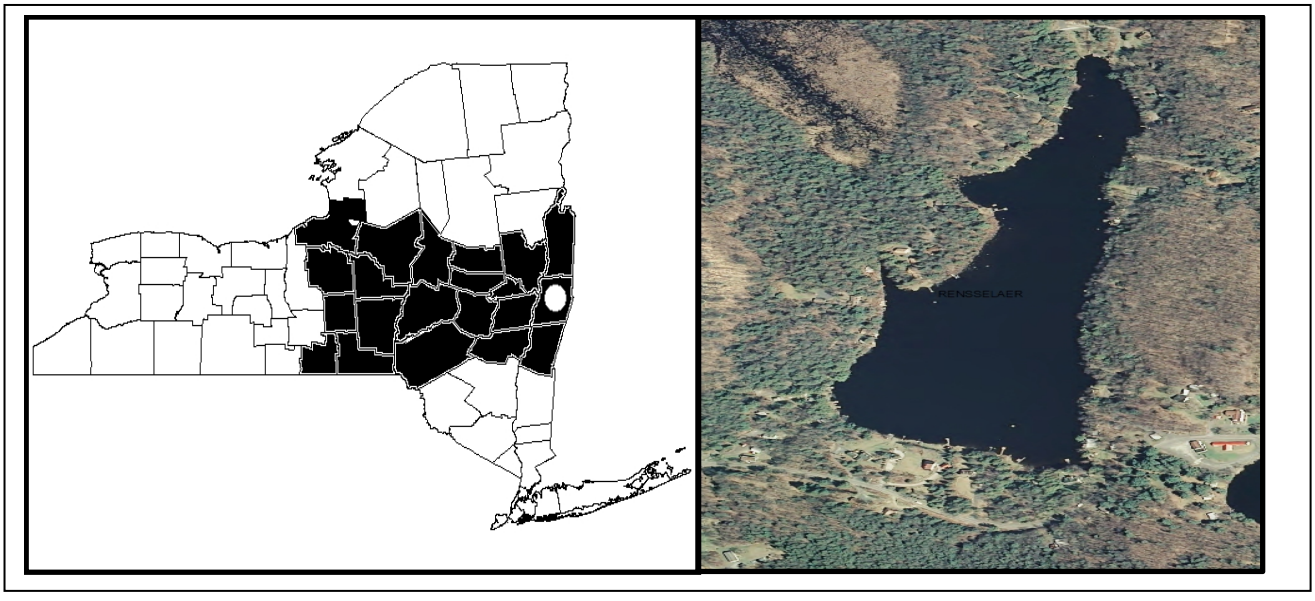
CSLAP 2013 Lake Water Quality Summary:
Big Bowman Lake

General Lake Information

Location	Town of Sand Lake
County	Rensselaer
Basin	Lower Hudson River
Size	13.0 hectares (32 acres)
Lake Origins	Natural?
Watershed Area	235 hectares (580 acres)
Retention Time	0.4 years (estimated)
Mean Depth	4.5 meters (estimated)
Sounding Depth	9.6 meters
Public Access?	none
Major Tributaries	Unnamed ephemeral inlet
Lake Tributary To…	Unnamed outlet to Poesten Kill to (Lower) Hudson River
WQ Classification	B (contact recreation = swimming)
Lake Outlet Latitude	42.650437
Lake Outlet Longitude	- 73.488622
Sampling Years	2013
2013 Samplers	Matt LaFleur, Matt Robillata, John Walsh, Barb Mark, Bruce Sowalski
Main Contact	Bruce Sowalski

Lake Map



Background

Big Bowman Lake is a 32 acre, class B lake found in the Town of Sand Lake in Rensselaer County, just east of the Capital District region of New York State. It was first sampled as part of CSLAP in 2013.

It is one of 11 CSLAP lakes among the more than 55 lakes found in Rensselaer County, and one of 50 CSLAP lakes among the more than 350 lakes and ponds in the Lower Hudson River drainage basin

Lake Uses

Big Bowman 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. Motorized boating is prohibited, as per a 1998 ordinance passed by the town of Sand Lake, consistent with a long-standing informal policy on the lake and in support of swimming and other passive uses of the lake. There is a very small (2 feet long by 0.5 foot high) dam on the west side of the lake. There is no public access to the lake.

It is not known by the report authors if Big Bowman 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 Big Bowman Lake.

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

Historical Water Quality Data

CSLAP sampling was conducted on Big Bowman Lake for the first time in 2013. The CSLAP reports for the lake will eventually be found on the NYSFOLA website at http://nysfola.mylaketown.com, and the NYSDEC web page at http://www.dec.ny.gov/lands/77846.html.

The lake was sampled as part of the Biological Survey of the Lower Hudson River by the state Conservation Department (predecessor to the NYSDEC) on August 29th, 1934. At that time, the lake was weakly stratified, with an oxygen deficit near the bottom. Water clarity (15 feet) was substantially higher than that measured in CSLAP in 2013. The lake was described as having "abundant vegetation", although specific plant species in the lake were not identified. Bullhead catfish, chain pickerel, common sunfish, large and smallmouth bass, and zebra darter were cited as "common" fish.

Big Bowman Lake was also sampled in 1987 as part of the Adirondack Lake Survey Corporation (ALSC) study of about 1600 high elevation lakes in New York state, including a number in the Lower Hudson River basin. That study evaluated the chemical and biological condition of the lake. The biological monitoring results from this study are discussed below. The ALSC study showed higher water clarity but similar phosphorus readings than in the 2013 CSLAP study of the lake, suggesting only limited water quality changes over the last 15-25 years. The lake was strongly stratified (significant temperature gradient from top to bottom), and deepwater oxygen levels were high, consistently with the deepwater chemistry results. Calcium levels indicate little

susceptibility to zebra mussel infestations, although slightly elevated chloride levels indicate some lake impacts associated with road salting operations.

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

Lake Association and Management History

Big Bowman Lake is represented by the Big Bowman Lake Association. It is not known if the lake association maintains a website, or the extent of their lake management activities.

Summary of 2013 CSLAP Sampling Results

Evaluation of 2013 Annual and Monthly Results Relative to 2006-2012

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 – Big Bowman Lake" section in Appendix D. However, since this is the first year of CSLAP sampling for the lake, these comparisons are not yet available.

Evaluation of Eutrophication Indicators

Lake productivity varies slightly from week to week during the summer, with no clear seasonal trends. It is not yet known if the trophic conditions- measurements of water clarity, algae levels, and nutrient concentrations- recorded in 2013 are typical for Big Bowman Lake, or if these readings were affected by unusual weather or other phenomena. A shoreline alga bloom sample collected in late July showed slightly elevated algae levels, with the algae community dominated by green algae and diatoms, not blue green algae.

The lake can be characterized as *mesoeutrophic*, or moderately to highly productive, based on total phosphorus and chlorophyll *a* readings (typical of *mesotrophic* lakes) and water clarity readings (typical of *eutrophic* lakes). Water transparency is also influenced by the natural color of the water. However, the trophic state indices (TSI) evaluation suggests that phosphorus readings are slightly lower than expected given the algae levels (as measured by chlorophyll *a*), and water transparency (as measured by the Secchi disk). This indicates that small changes in phosphorus levels in the lake may result in a substantial increase in algae levels, which in turn could result in significant decreases in water clarity. Overall trophic conditions are summarized on the Lake Scorecard and Lake Condition Summary Table.

Evaluation of Potable Water Indicators

Algae levels at times 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. Potable water conditions, at least as measurable through CSLAP, are summarized in the Lake Scorecard and Lake Condition Summary Table.

Evaluation of Limnological Indicators

Ammonia readings are relatively low, and well below the state water quality standards. Total nitrogen readings are also low despite open water algae levels that at times are slightly elevated. pH and conductivity readings are typical of slightly alkaline lakes with soft water, similar to other lakes on the plateau in Rensselaer County. Color readings may be high enough to be apparent to the casual observer- a slight brown color may be apparent. Calcium samples could not be analyzed (due to a lab instrumentation problem), but given the low conductivity, it is likely that calcium levels are below the threshold associated with susceptibility to zebra mussels. Zebra mussels have not been reported in the lake, although they are found in other lakes in the region. Nitrogen to phosphorus ratios show that algae growth is more likely to be controlled by phosphorus than nitrogen. 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 2013 fluoroprobe data indicates moderate to low algae levels and very low blue green algae levels in most open water (away from the shoreline) samples, suggesting a low susceptibility to harmful algal blooms in the open water. The reported showling bloom in late August was comprised of non-blue green algae species.

The ALSC study in 1987 found a fisheries community dominated by yellow perch and rock bass. Using a fish index for biotic integrity (IBI) developed by the state of Minnesota, the quality of the fish community in 1987 would have been identified as “good”, based on the high percentage of intolerant fish species. There were at least 12 plant species (6 submergent, 3 floating leaf, and 3 emergent species) found in the lake in 1987, including curly-leafed pondweed (*Potamogeton crispus*), an invasive submergent plant species. The overall quality of the aquatic plant community was probably “fair”. An evaluation of the benthic macroinvertebrate community suggests that macroinvertebrates are “favorable”, consistently with the favorable water quality conditions. It is not known if these assessments remain accurate at this time.

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

Evaluation of Lake Perception

Recreational, water quality and aquatic plant assessments were generally favorable and seasonally stable in 2013, consistent with the seasonally stable water quality conditions. The lake is most frequently described as having “slightly impaired” for most recreational uses, due to water with “definite algae greenness” and plant growth at the surface of the lake (but not growing densely). Recreational impacts were more likely to be associated with “excessive weeds” than “poor water clarity” or “excessive algae”. Additional (future) 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.

Evaluation of Algal Toxins

Algal toxin levels can vary significantly within blooms and from shoreline to lake, and the absence of toxins in a sample does not indicate safe swimming conditions. Phycocyanin and fluoroprobe algae levels have been well below the levels indicating susceptibility for harmful algal blooms (HABs) in the main body of the lake, and open water microcystis (algae toxin) levels have been well below the thresholds for safe swimming. The single shoreline bloom sample in late August showed high algae but low blue green algae levels, and as a result, toxin levels were low.

Lake Condition Summary

Category	Indicator	Min	Overall Avg	Max	2013 Avg	Classification	2013 Change?	Long-term Change?
Eutrophication Indicators	Water Clarity	1.40	1.82	2.38	1.82	Eutrophic		
	Chlorophyll *a*	2.10	7.84	11.90	7.84	Mesotrophic		
	Total Phosphorus	0.013	0.015	0.022	0.015	Mesotrophic		
Potable Water Indicators	Hypolimnetic Ammonia					Highly Elevated Deepwater NH4		
	Hypolimnetic Arsenic							
	Hypolimnetic Iron							
	Hypolimnetic Manganese							
Limnological Indicators	Hypolimnetic Phosphorus							
	Nitrate + Nitrite	0.01	0.01	0.01	0.01	Low NOx		
	Ammonia	0.01	0.01	0.03	0.01	Low Ammonia		
	Total Nitrogen	0.31	0.42	0.49	0.42	Low Total Nitrogen		
	pH	7.03	7.38	7.84	7.38	Circumneutral		
	Specific Conductance	88	120	163	120	Softwater		
	True Color	26	35	53	35	Intermediate Color		
	Calcium					Highly Susceptible to Zebra Mussels		
Lake Perception	WQ Assessment	2	2.3	3	2.3	Not Quite Crystal Clear		
	Aquatic Plant Coverage	3	3.0	3	3.0	Surface Plant Growth		
	Recreational Assessment	1	2.5	3	2.5	Excellent		
Biological Condition	Phytoplankton					Open water-low blue green algae biomass; Shoreline-high blue green algae in bloom		
	Macrophytes					Fair quality of the aquatic plant community		
	Zooplankton					Not measured through CSLAP		
	Macroinvertebrates					"Favorable" quality of the macroinvertebrate community		
	Fish					Coolwater fishery; "good" quality in 1987		
	Invasive Species					Potamogeton crispus		
Local Climate Change	Air Temperature	12	22.5	33	22.5			
	Water Temperature	14	19.4	25	19.4			

Category	Indicator	Min	Overall Avg	Max	2013 Avg	Classification	2013 Change?	Long-term Change?
Harmful Algal Blooms	Open Water Phycocyanin	2	3	4	3	No readings indicate high risk of BGA		
	Open Water FP Chl.a	3	5	8	5	No readings indicate high algae levels		
	Open Water FP BG Chl.a	0	0	0	0	No readings indicate high BGA levels		
	Open Water Microcystis	<DL	0.2	0.4	0.2	Mostly undetectable open water MC-LR		
	Open Water Anatoxin a	<DL	<DL	<DL	<DL	Open water Anatoxin-a consistently not detectable		
	Shoreline Phycocyanin					No shoreline blooms sampled for PC		
	Screening FP Chl.a	109.1	109.1	109.1	109.1	All readings indicate very high algae levels		
	Screening FP BG Chl.a	10.1	10.1	10.1	10.1	Some readings indicate high BGA levels		
	Shoreline Microcystis	0.7	0.7	0.7	0.7	Mostly undetectable shoreline bloom MC-LR		
	Shoreline Anatoxin a	8.2	8.2	8.2	8.2	Shoreline bloom Anatoxin-a at times detectable		

Evaluation of Lake Condition Impacts to Lake Uses

Big Bowman Lake is not presently among the lakes listed on the Delaware River drainage basin Priority Waterbody List (PWL).

Potable Water (Drinking Water)

The CSLAP dataset at Big Bowman 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 occasionally elevated algae levels indicate a threat to any "unofficial" potable water use.

Contact Recreation (Swimming)

The CSLAP dataset at Big Bowman Lake, including water chemistry data, physical measurements, and volunteer samplers' perception data, suggests that swimming and contact recreation is *fully supported*, although this use may be threatened by invasive weeds and shoreline blooms. Additional information about bacterial levels is needed to evaluate the safety of the water for swimming.

Non-Contact Recreation (Boating and Fishing)

The CSLAP dataset on Big Bowman Lake, including water chemistry data, physical measurements, and volunteer samplers' perception data, suggest that non-contact recreation may be *stressed* by excessive weeds. However, these impacts are reported to be associated with bladderwort, a native plant species.

Aquatic Life

The CSLAP dataset on Big Bowman Lake, including water chemistry data, physical measurements, and volunteer samplers' perception data, suggest that aquatic life may be *threatened* by invasive plants (curly leafed pondweed). Additional data are needed to evaluate the food and habitat conditions for aquatic organisms in the lake.

Aesthetics

The CSLAP dataset on Big Bowman Lake, including water chemistry data, physical measurements, and volunteer samplers' perception data, suggest that aesthetics may be *stressed* by shoreline blooms and excessive weed growth, and *threatened* by invasive plants.

Fish Consumption

There are no fish consumption advisories posted for Big Bowman Lake.

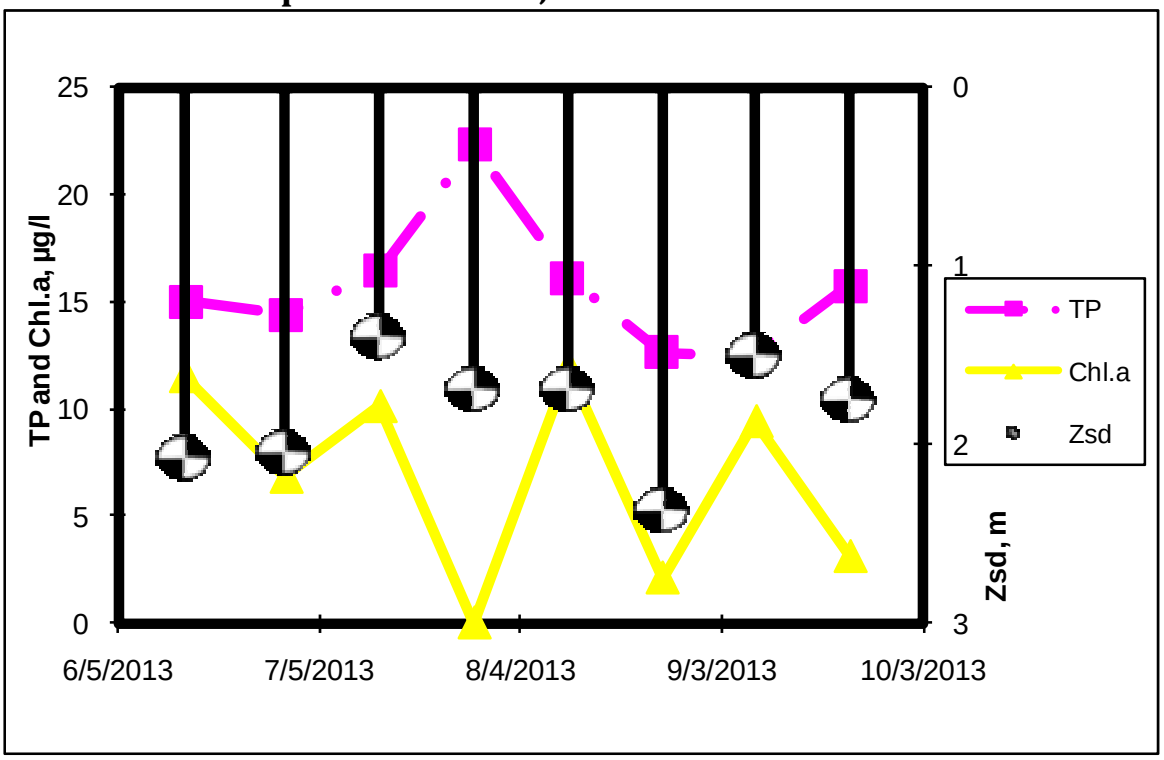
Additional Comments and Recommendations

Additional data will help to determine if the conditions measured and reported in 2013 are typical for Big Bowman Lake.

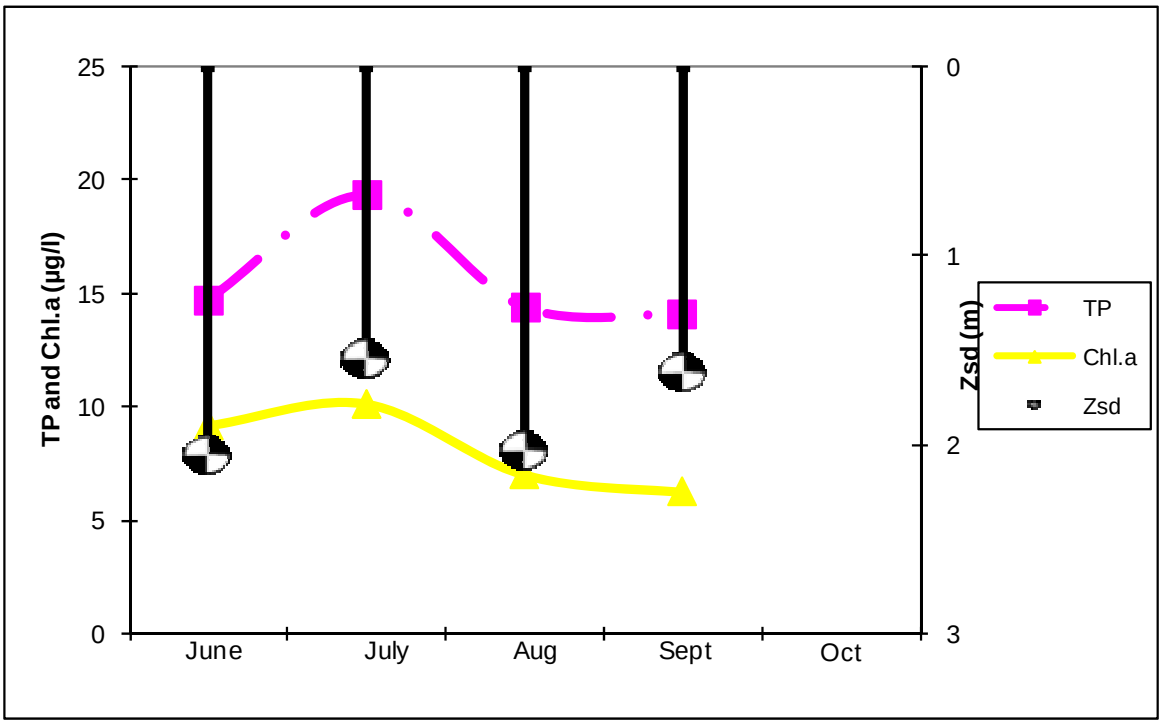
Aquatic Plant IDs-2013

None submitted for identification.

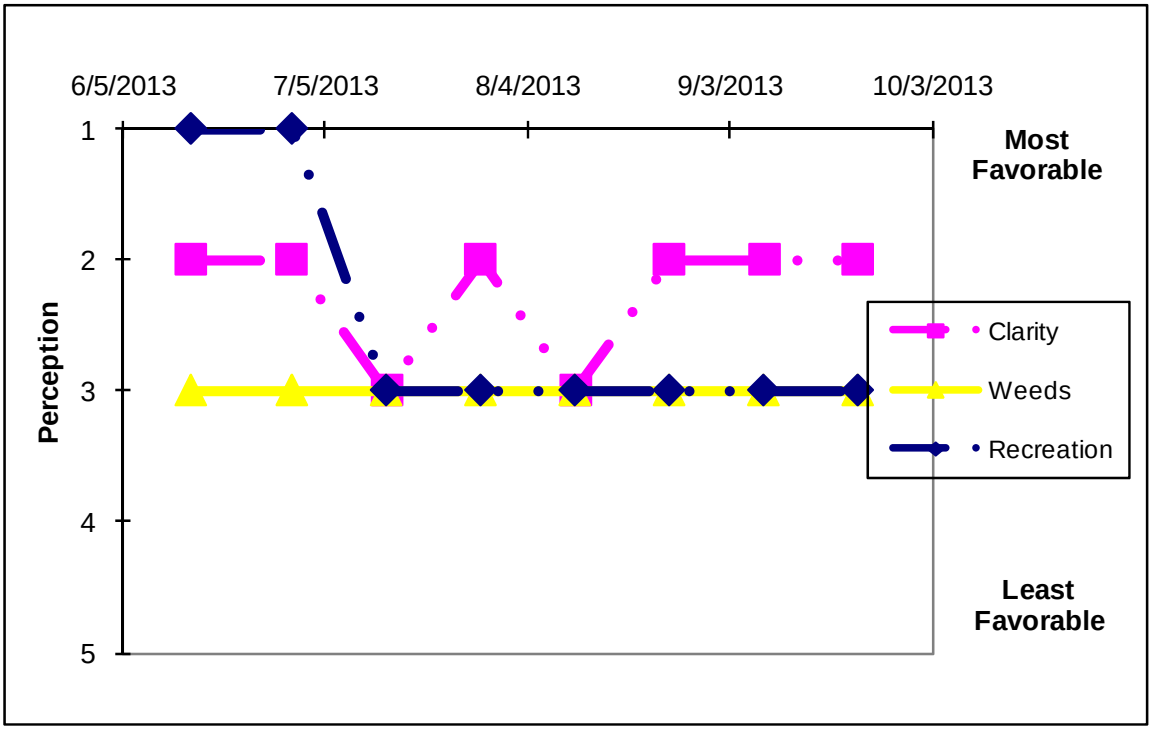
Time Series: Trophic Indicators, 2013



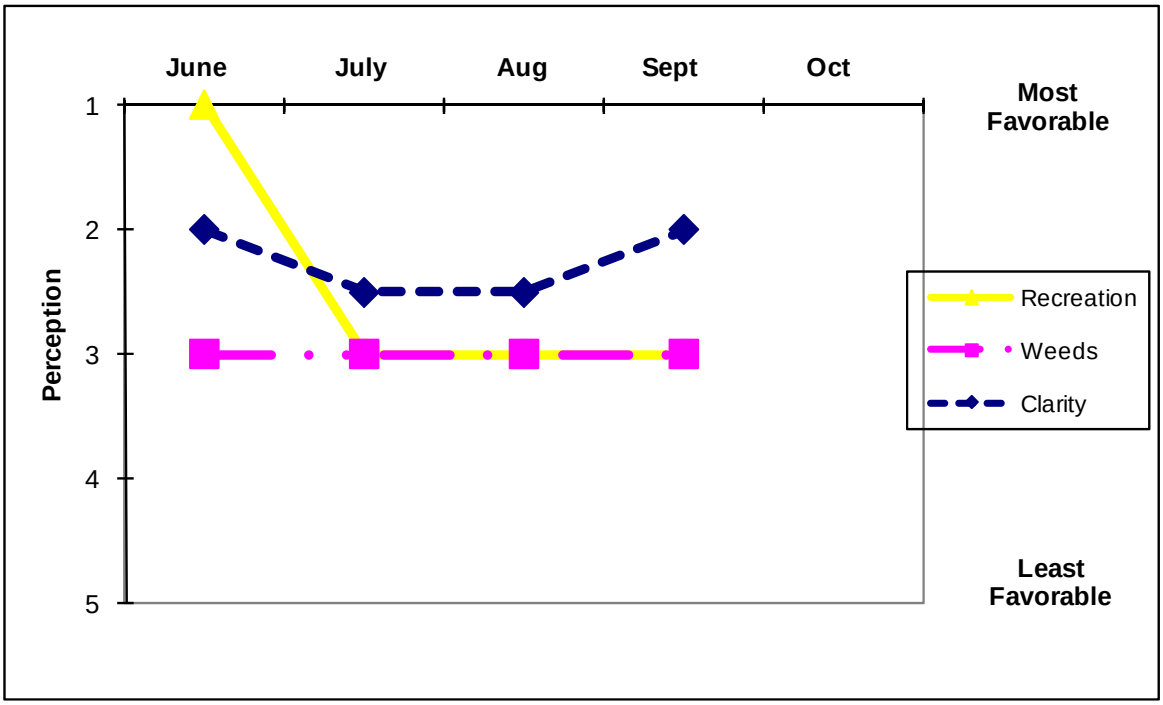
Time Series: Trophic Indicators, Typical Year (2013)



Time Series: Lake Perception Indicators, 2013



Time Series: Lake Perception Indicators, Typical Year (2013)



Appendix A- CSLAP Water Quality Sampling Results for Big Bowman Lake

LNum	PName	Date	Zbot	Zsd	Zsamp	Tot.P	NO3	NH4	TDN	TN/TP	TColor	pH	Cond25	Ca	Chl.a
235	Bowman Lake	6/15/2013	8.70	2.08	1.50	0.015		0.02	0.43	63.07		7.08	132		11.50
235	Bowman Lake	6/30/2013	6.10	2.05	1.50	0.014					36	7.71	121		6.80
235	Bowman Lake	7/14/2013		1.40	1.50	0.016					28	7.35	128		10.10
235	Bowman Lake	7/28/2013	5.50	1.70	1.50	0.022					53	7.39	107		
235	Bowman Lake	7/28/2013			bloom										
235	Bowman Lake	8/11/2013	9.60	1.70	1.50	0.016		0.03			26	7.31	88		11.90
235	Bowman Lake	8/25/2013	5.00	2.38	1.00	0.013					33	7.32	110		2.10
235	Bowman Lake	9/8/2013	7.80	1.50	1.50	0.013			0.38	67.38	42	7.03	110		9.40
235	Bowman Lake	9/22/2013	8.90	1.75	1.50	0.014					27	7.84	163		3.10

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
235	Bowman Lake	6/15/2013	epi	22	18	2	3	1	6	0	0	3.20	4.70	<0.30	<0.440		4.30	0.00	I	I
235	Bowman Lake	6/30/2013	epi	27	22	2	3	1	0	4	0	2.30	3.90	<0.30	<0.650		3.60	0.00	I	I
235	Bowman Lake	7/14/2013	epi	33	25	3	3	3	12	0	0	1.50	5.40	<0.30	<0.490		5.50	0.00	EFGH	
235	Bowman Lake	7/28/2013	bloom	22	21	2	3	3	25	0	0	3.20	9.50	<0.30	<0.400		7.50	0.00	I	I
235	Bowman Lake	7/28/2013	epi											0.68	8.24		109.10	10.10		
235	Bowman Lake	8/11/2013	epi	23	18	3	3	3	2	0	0	1.80	8.70	<0.30	<0.340		7.70	0.00	I	I
235	Bowman Lake	8/25/2013	epi	24	21	2	3	3	2	5		3.60	3.60	<0.30	<0.390		2.70	0.00	I	I
235	Bowman Lake	9/8/2013	epi	17	16	2	3	3	25	0	0	2.80	5.80	0.38	<1.240		4.70	0.00	HI	
235	Bowman Lake	9/22/2013	epi	12	14	2	3	3	25	0	0	4.00	4.80	<0.30	<19.130		3.50	0.00	I	I

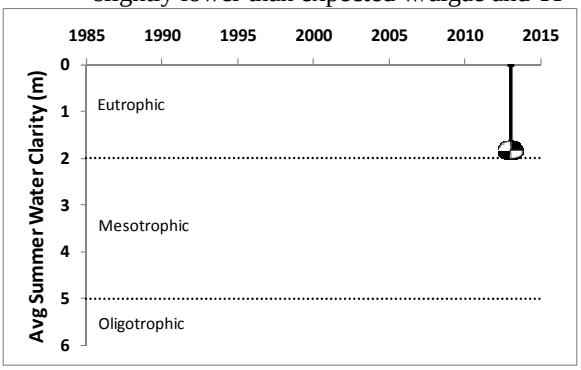
Legend Information

Indicator	*Description*	*Detection Limit*	*Standard (S) / Criteria (C)*
General Information			
Lnum	lake number (unique to CSLAP)		
Lname	name of lake (as it appears in the Gazetteer of NYS Lakes)		
Date	sampling date		
Field Parameters			
Zbot	lake depth at sampling point, meters (m)		
Zsd	Secchi disk transparency or clarity	0.1m	1.2m (C)
Zsamp	water sample depth (m) (epi = epilimnion or surface; bot = bottom)	0.1m	none
Tair	air temperature (C)	-10C	none
TH20	water temperature (C)	-10C	none
Laboratory Parameters			
Tot.P	total phosphorus (mg/l)	0.003 mg/l	0.020 mg/l (C)
NOx	nitrate + nitrite (mg/l)	0.01 mg/l	10 mg/l NO3 (S), 2 mg/l NO2 (S)
NH4	total ammonia (mg/l)	0.01 mg/l	2 mg/l NH4 (S)
TN	total nitrogen (mg/l)	0.01 mg/l	none
TN/TP	nitrogen to phosphorus (molar) ratio, = (TKN + NOx)*2.2/TP		none
TCOLOR	true (filtered) color (ptu, platinum color units)	1 ptu	none
pH	powers of hydrogen (S.U., standard pH units)	0.1 S.U.	6.5, 8.5 S.U. (S)
Cond25	specific conductance, corrected to 25C (umho/cm)	1 umho/cm	none
Ca	calcium (mg/l)	1 mg/l	none
Chl.a	chlorophyll a (ug/l)	0.01 ug/l	none
Fe	iron (mg/l)	0.1 mg/1	1.0 mg/l (S)
Mn	manganese (mg/l)	0.01 mg/l	0.3 mg/l (S)
As	arsenic (ug/l)	1 ug/l	10 ug/l (S)
AQ-PC	Phycocyanin (aquaflor) (unitless)	1 unit	none
AQ-Chl	Chlorophyll *a* (aquaflor) (ug/l)	1 ug/l	none
MC-LR	Microcystis-LR (ug/l)	0.01 ug/l to 0.6 ug/l	1 ug/l potable (C) 20 ug/l swimming (C)
Ana	Anatoxin-a (ug/l)	variable	none
Cyl	Cylindrospermposin (ug/l)	0.1 ug/l	none
FP-Chl, FP-BG	Fluoroprobe total chlorophyll, fluoroprobe blue-green chlorophyll (ug/l)	0.1 ug/l	none
Lake Assessment			
QA	water quality assessment; 1 = crystal clear, 2 = not quite crystal clear, 3 = definite algae greenness, 4 = high algae levels, 5 = severely high algae levels		
QB	aquatic plant assessment; 1 = no plants visible, 2 = plants below surface, 3 = plants at surface, 4 = plants dense at surface, 5 = surface plant coverage		
QC	recreational assessment; 1 = could not be nicer, 2 = excellent, 3 = slightly impaired, 4 = substantially impaired, 5 = lake not usable		
QD	reasons for recreational assessment; 1 = poor water clarity, 2 = excessive weeds, 3 = too much algae, 4 = lake looks bad, 5 = poor weather, 6 = litter/surface debris, 7 = too many lake users, 8 = other		
QF, QG	Health and safety issues today (QF) and past week (QG); 0 = none, 1 = taste/odor, 2 = GI illness humans/animals, 3 = swimmers itch, 4 = algae blooms, 5 = dead fish, 6 = unusual animals, 7 = other		
HAB form, Shore HAB	HAB evaluation; A = spilled paint, B = pea soup, C = streaks, D = green dots, E = bubbling scum, F = green/brown tint, G = duckweed, H = other, I = no bloom		

Appendix D- Long Term Trends: Big Bowman Lake

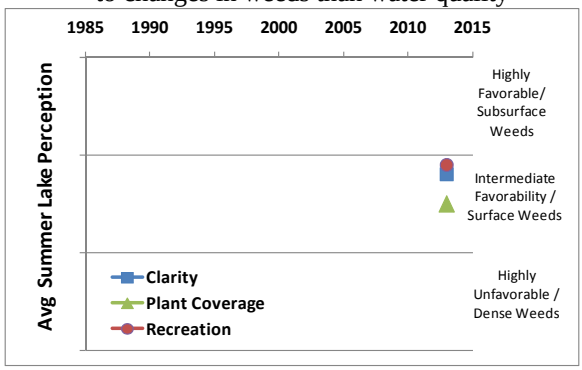
Long Term Trends: Water Clarity

- Too early to detect any trends
- Most readings typical of *eutrophic* lakes, slightly lower than expected w/algae and TP



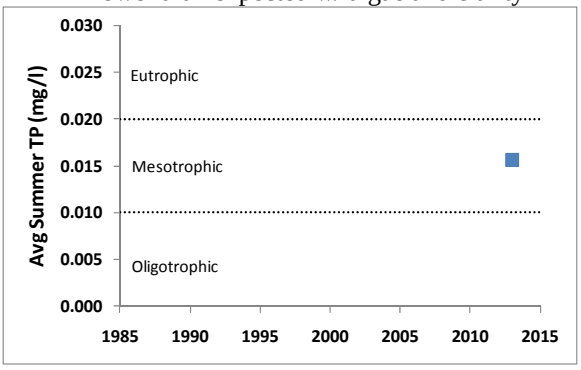
Long Term Trends: Lake Perception

- Too early to detect any trends
- Recreational perception more closely linked to changes in weeds than water quality



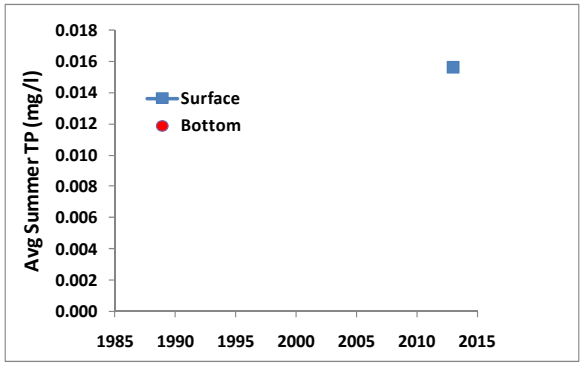
Long Term Trends: Phosphorus

- Too early to detect any trends
- Most readings typical of *mesotrophic* lakes, lower than expected w/ algae and clarity



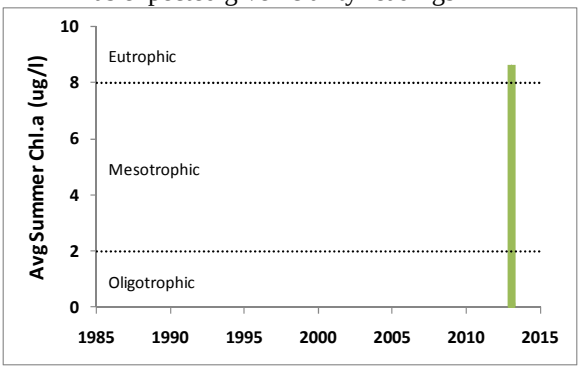
Long Term Trends: Bottom Phosphorus

- Too early to detect any trends
- Bottom TP not (yet) collected through CSLAP



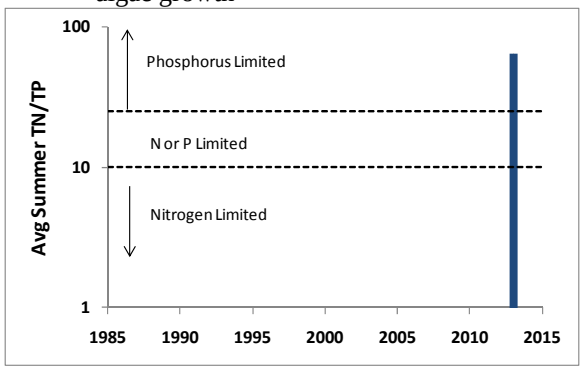
Long Term Trends: Chlorophyll a

- Too early to detect any trends
- Most readings typical of *mesotrophic* lakes, as expected given clarity readings



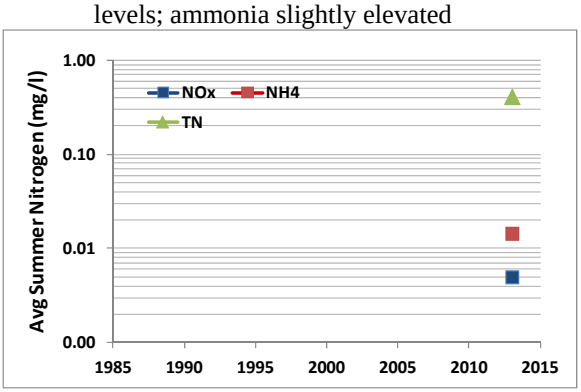
Long Term Trends: N:P Ratio

- Too early to detect any trends
- Most readings indicate phosphorus limits algae growth



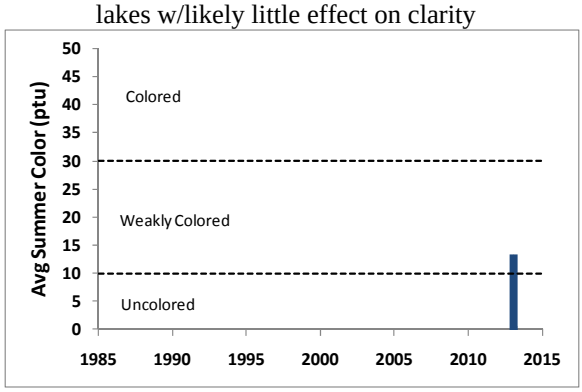
Long Term Trends: Nitrogen

- Too early to detect any trends (no NOx)
- TN elevated, consistent with high algae levels; ammonia slightly elevated



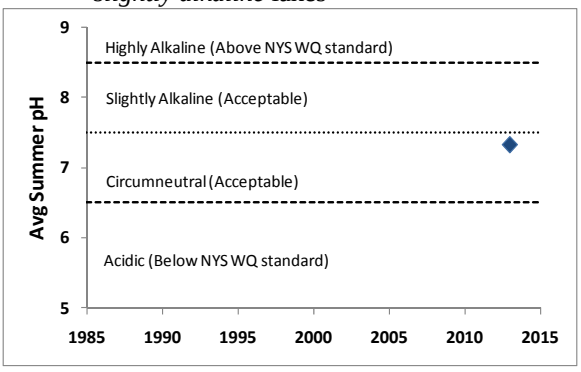
Long Term Trends: Color

- Too early to detect any trends
- Most readings typical of *weakly colored* lakes w/likely little effect on clarity



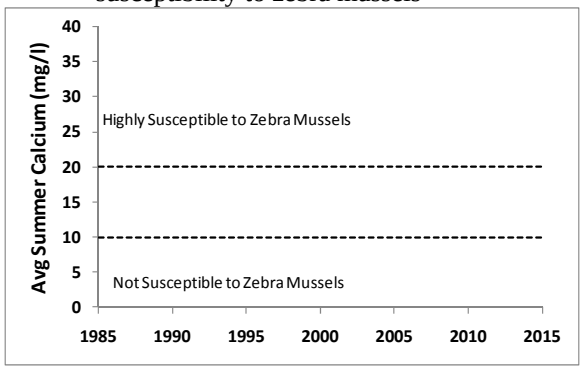
Long Term Trends: pH

- Too early to detect any trends
- Most readings typical of *circumneutral* to *slightly alkaline* lakes



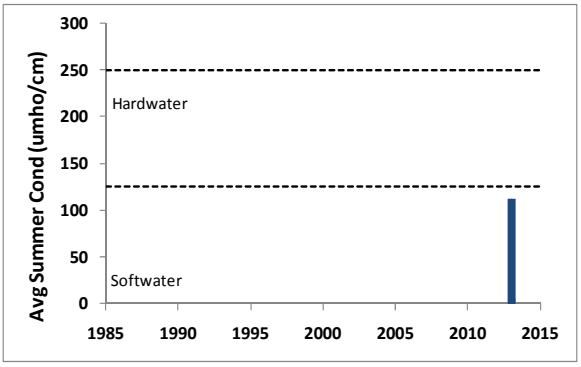
Long Term Trends: Calcium

- No data yet available
- Readings will likely indicate low susceptibility to zebra mussels



Long Term Trends: Conductivity

- Too early to detect trends
- Most readings typical of lakes with *soft water*



Long Term Trends: Water Temperature

- Too early to detect trends
- No deepwater temperature data (yet) available