

Yankee Lake Questions and Answers, 2015 CSLAP

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

A1. The condition of Yankee Lake was close to normal in 2015- water clarity and algae levels were similar to the long-term average. Phosphorus readings were substantially higher than usual, but these data may represent bottle contamination (at the factory), given similarly high readings in other lakes.

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

A2. Chloride sampling results are typical of lakes with significant impacts from road salt runoff, although no impacts have been measured or reported.

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

A3. Yankee Lake had slightly higher water clarity, and slightly lower algae levels, than most other nearby lakes (although it is not known if phosphorus readings were higher due to some issues with the data). Aquatic plant coverage was lower than in many other nearby lakes, and no invasive plants have been found in the lake.

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

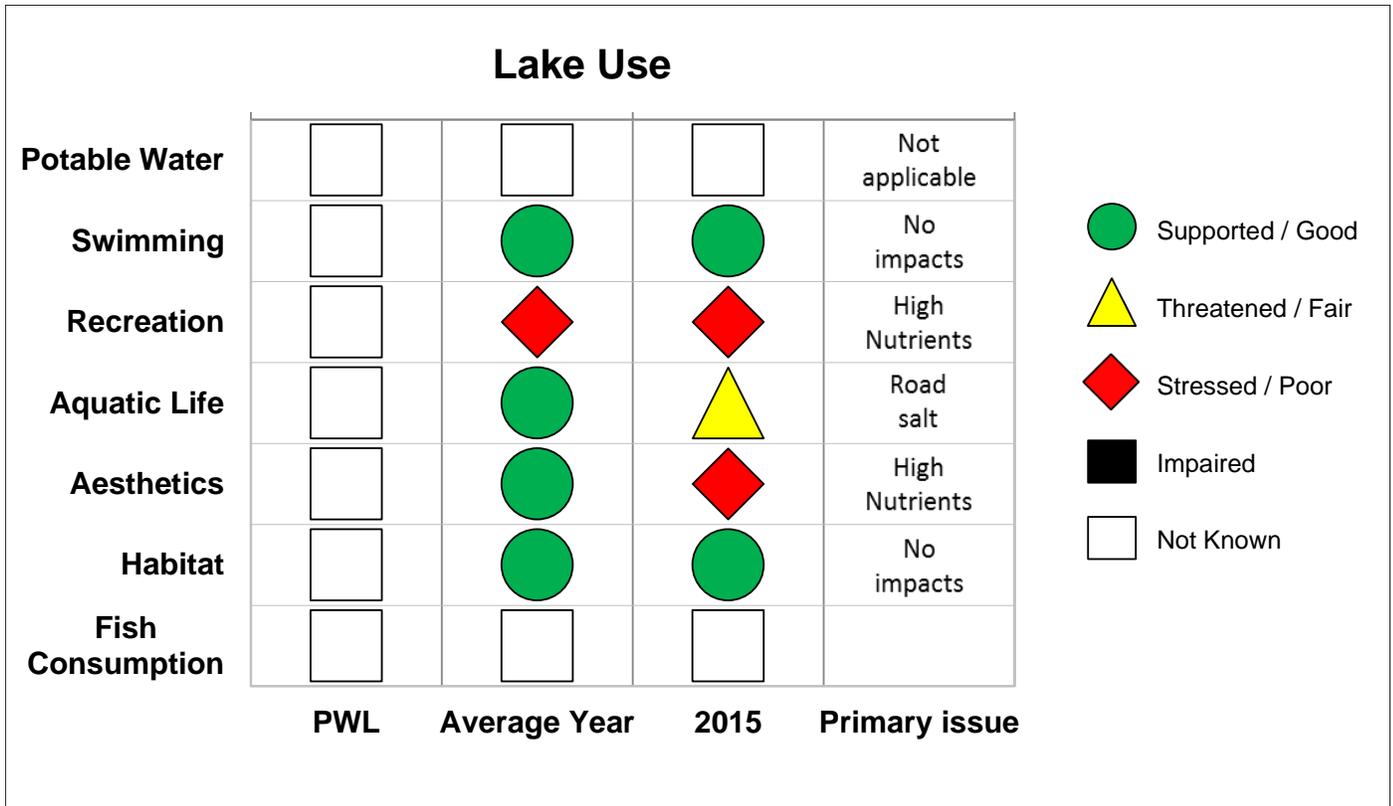
A4. Phosphorus levels had decreased significantly over the last decade, though not in 2015. This resulted in a slight increase in water clarity readings and slightly improved water quality assessments (but not algae levels) over the same period. Water temperatures have increased slightly during the last 10 years.

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

A5. Yankee Lake does not appear to be susceptible to open water or shoreline blue green algae blooms. Lake residents should continue any residential or nearshore nutrient management actions that could have contributed to the recent (previous?) decrease in phosphorus readings, although this may also reflect normal variability.

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 improve lake health by reducing nutrient and sediment loading to the lake. Visiting boats should be inspected to reduce the risk of new invasive species, since nearby lakes harbor several invasive plants not presently found in the lake.



CSLAP 2015 Lake Water Quality Summary: Yankee Lake

General Lake Information

Location	Town of Mamakating
County	Sullivan
Basin	Delaware River
Size	165.8 hectares (409.5 acres)
Lake Origins	Augmented by 22ft by 1600ft earth dam (1844)
Watershed Area	700 hectares (1,729 acres)
Retention Time	1.1 years
Mean Depth	1.8 meters
Sounding Depth	3.8 meters
Public Access?	lake association launch
Major Tributaries	Wolf Lake
Lake Tributary To...	Pine Kill to Basher Kill to Delaware River
WQ Classification	B (contact recreation = swimming)
Lake Outlet Latitude	41.579
Lake Outlet Longitude	-74.561
Sampling Years	2006-2011, 2013-2015
2015 Samplers	Georgia Rampe
Main Contact	Georgia Rampe

Lake Map



Background

Yankee Lake is a 410 acre lake found in the town of Mamakating in Sullivan County in southwestern Catskill Mountain portion of New York State. It has been sampled as part of CSLAP since 2006.

It is one of nine CSLAP lakes among the more than 720 lakes and ponds found in Sullivan County, and one of 15 CSLAP lakes among the nearly 1000 lakes and ponds in the Delaware River drainage basin.

Lake Uses

Yankee 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, aquatic life, and aesthetics. The lake access is controlled by the lake association via a private beach used by lake residents and invited guests for boating and swimming. There is no public access to the lake.

Yankee Lake has not been stocked through any state fisheries stocking programs. It is not known if any private stocking has occurred.

General statewide fishing regulations may be applicable in Yankee Lake.

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

Historical Water Quality Data

CSLAP sampling was conducted on Yankee Lake from 2006 to 2011, and 2013 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 reports for Yankee Lake can also be found on the NYSDEC web page at <http://www.dec.ny.gov/lands/77835.html>.

Yankee Lake was sampled as part of the 2005 Lake Classification and Inventory (LCI) survey conducted by the NYSDEC Division of Water. Water quality conditions were comparable in 2005 to those reported through CSLAP in the period from 2006 to 2011, suggesting that both sets of readings are representative of normal conditions at the lake. These data also indicated that the lake is not thermally stratified, and that dissolved oxygen levels are fairly high to within one meter of the lake bottom.

It is not known if local monitoring has been conducted as a fisheries management tool, or to evaluate swimming conditions in the lake.

Lake Association and Management History

Yankee Lake is served by the Yankee Lake Preservation Association, which was formed in the late 1990s when combined with the Yankee Lake Preservation Alliance. The lake association is involved in a variety of lake management and social activities, including:

- education activities regarding septic, nutrient control, lakescaping, and invasive species
- dam maintenance
- fish stocking (perch, crappie, bass) and fish tournaments
- establishment of dock rules

The lake association maintains a web site at <http://www.yankee-lake.org/>.

Summary of 2015 CSLAP Sampling Results

Evaluation of 2015 Annual Results Relative to 2006-2014

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 – Yankee Lake” section in Appendix C.

Evaluation of Eutrophication Indicators

Phosphorus readings had decreased significantly from the mid-2000s to 2014, but were substantially higher than usual in 2015. The “raw” data indicated even higher values and suggested a potential bottle contamination (at the manufacturers end), although the higher phosphorus readings were consistent with higher TN and conductivity (see below). Algae (chlorophyll *a*) and water clarity reading were close to normal in 2015, although water clarity readings have increased slightly over the last decade in response to a slight drop in algae levels.

Lake productivity does not exhibit any clear seasonal trends. Water clarity increases slightly during late summer into the fall, despite the lack of clear change in algae or nutrient levels at this time. In 2015, no clear seasonal trends were apparent.

The lake can be characterized as *mesotrophic*, or moderately unproductive, based on water clarity, total phosphorus and chlorophyll *a* readings (all typical of *mesotrophic* lakes). The trophic state indices (TSI) evaluation suggests that each of these trophic indicators is “internally consistent”—each of these indicators is in the expected range given the readings of the other indicators. This consistency was not apparent in 2015 due to the higher than expected phosphorus readings although (as noted above) it is not known if these readings were representative of normal conditions in the lake. Overall trophic conditions are summarized on the Lake Scorecard and Lake Condition Summary Table.

Evaluation of Potable Water Indicators

Algae levels are not high enough to render the lake susceptible to taste and odor compounds or elevated DBP (disinfection by product) compounds that could affect the potability of the water, and the lake is not used for drinking water. The lake is not thermally stratified, so deepwater intakes cannot be used to support “unofficial” potable water use (by dropping below the depth at which algae may grow). Potable water conditions, at least as measurable through CSLAP, are summarized in the Lake Scorecard and Lake Condition Summary Table.

Evaluation of Limnological Indicators

pH and conductivity was slightly higher than usual in 2015, and both indicators have increased slightly (but not in a statistically significant manner). NO_x and ammonia readings have decreased slightly in the last few years, and NO_x was lower than normal in 2015. As noted above, total nitrogen levels were also slightly higher than usual, perhaps consistent with the slight rise in conductivity and much larger rise in phosphorus readings.

Chloride levels in the 2015 samples, collected for the first time through CSLAP and cited in Appendix A, were approximately 48 mg/l. These values fall within the (low end of the) range of “major” road salt runoff levels cited by the New Hampshire DES. These readings are well below the state potable water quality standard of 250 mg/l but above the typical range of values found

in most NYS lakes. These readings suggest a 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

Very limited macrophyte survey data was collected through the Lake Classification and Inventory (LCI) of the lake by DEC in 2005. Through that survey, four native aquatic plant species were identified, with no protected or invasive plant species observed. The macrophyte dataset is too small to calculate even a modified floristic quality index (FQI) to evaluate the quality of the aquatic plant community.

The fish community is comprised of at least eight warmwater fish species, and at least three coolwater fish species. This suggests that the lake can most likely be characterized as a coolwater fishery.

Zooplankton and macroinvertebrates have not been evaluated through CSLAP in Yankee Lake. The fluoroprobe algae screening results analyzed by SUNY ESF in the last several years found very low overall algae levels and very low blue green algae levels; this was mostly consistent with the other water quality data. The algae samples were comprised primarily of green algae, although small amounts of other algae (including blue green algae) were also found in the lake. No shoreline blooms were reported or sampled in the last few years.

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

Evaluation of Lake Perception

Water quality assessments and recreational conditions were close to normal in 2015, consistent with water clarity and algae levels that were close to normal. However, water quality assessments have improved slightly in recent years. Aquatic plant coverage was slightly more extensive than usual, and plant coverage has increased slightly over the last decade. It is not known if the higher plant growth is associated with native or invasive plants.

Recreational assessments typically degrade slightly during the summer, consistent with a slight seasonal degradation in water quality assessments, and a slight seasonal increase in the coverage of aquatic plants. No clear seasonal trends in lake perception were apparent in 2015. Overall lake perception is summarized on the Lake Scorecard and Lake Condition Summary Table.

Evaluation of Local Climate Change

Water temperature readings have increased slightly over the last decade, but it not known if this is an indication of local climate change or if these changes can 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 readings have been below the thresholds for harmful algal blooms (HABs) in open water samples, due to

low total and blue green algae levels. An analysis of algae samples indicates microcystin levels well below the levels needed to support safe swimming in open water and in blooms, although lake residents are not advised to swim or recreate within blooms.

Lake Condition Summary

Category	Indicator	Min	Annual Avg	Max	2015 Avg	Classification	2015 Change?	Long-term Change?
Eutrophication Indicators	Water Clarity	0.67	2.86	4.90	3.05	Mesotrophic	Within Normal Range	No Change
	Chlorophyll <i>a</i>	0.50	3.52	7.48	3.47	Mesotrophic	Within Normal Range	No Change
	Total Phosphorus	0.009	0.018	0.049	0.028	Mesotrophic	Higher than Normal	No Change
Potable Water Indicators	Hypolimnetic Ammonia							Not known
	Hypolimnetic Arsenic							Not known
	Hypolimnetic Iron							Not known
	Hypolimnetic Manganese							Not known
Limnological Indicators	Hypolimnetic Phosphorus							Not known
	Nitrate + Nitrite	0.00	0.02	0.10	0.01	Low NOx	Lower Than Normal	No Change
	Ammonia	0.00	0.03	0.41	0.04	Low Ammonia	Within Normal Range	No Change
	Total Nitrogen	0.16	0.37	0.77	0.49	Low Total Nitrogen	Higher than Normal	No Change
	pH	6.05	7.41	8.86	7.54	Circumneutral	Within Normal Range	No Change
	Specific Conductance	65	128	180	166	Intermediate Hardness	Higher than Normal	No Change
	True Color	6	18	62	15	Intermediate Color	Within Normal Range	No Change
	Calcium	4.6	6.0	13.1	6.1	Not Susceptible to Zebra Mussels	Within Normal Range	No Change
Lake Perception	WQ Assessment	1	1.7	3	2.0	Not Quite Crystal Clear	Within Normal Range	No Change
	Aquatic Plant Coverage	1	2.0	3	3.0	Subsurface Plant Growth	Less Favorable than Normal	No Change
	Recreational Assessment	1	1.3	4	1.0	Could Not Be Nicer	Within Normal Range	No Change
Biological Condition	Phytoplankton					Open water-low blue green algae biomass	Not known	Not known
	Macrophytes					Very limited survey information through the LCI	Not known	Not known
	Zooplankton					Not measured through CSLAP	Not known	Not known
	Macroinvertebrates					Not measured through CSLAP	Not known	Not known
	Fish					Coolwater fishery?	Not known	Not known
	Invasive Species					None observed	Not known	Not known
Local Climate Change	Air Temperature	13	23.4	30	25.2		Higher Than Normal	No Change
	Water Temperature	15	22.6	32	24.6		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	0	7	30	5	No readings indicate high risk of BGA	Not known	Not known
	Open Water FP Chl.a	1	1	3	1	No readings indicate high algae levels	Not known	Not known
	Open Water FP BG Chl.a	0	0	1	0	No readings indicate high BGA levels	Not known	Not known
	Open Water Microcystis	<DL	<DL	1.8	<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	80.0	80.0	80.0		Some readings indicate high risk of BGA	Not known	Not known
	Screening FP Chl.a					No shoreline blooms sampled for FP	Not known	Not known
	Screening FP BG Chl.a					No shoreline blooms sampled for FP	Not known	Not known
	Shoreline Microcystis	<DL	<DL	0.0		Low to undetectable shoreline microcystins	Not known	Not known
	Shoreline Anatoxin a					No shoreline bloom anatoxin data	Not known	Not known

Evaluation of Lake Condition Impacts to Lake Uses

Yankee Lake is presently among the lakes listed on the Delaware River drainage basin Priority Waterbody List (PWL) as *unassessed*.

Potable Water (Drinking Water)

The CSLAP dataset at Yankee 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 low algae levels do not indicate any threats to any "unofficial" potable water use.

Public Bathing

The CSLAP dataset at Yankee Lake, including water chemistry data, physical measurements, and volunteer samplers' perception data, suggests that public bathing, if conducted at a public swimming beach, might be supported, although low water clarity at times might *threaten* this use. Additional information about bacterial levels is needed to evaluate the safety of the water for swimming.

Recreation

The CSLAP dataset on Yankee Lake, including water chemistry data, physical measurements, and volunteer samplers' perception data, suggest that recreation may be *stressed* by algae associated with periodic high nutrient levels (including those measured in 2015).

Aquatic Life

The CSLAP dataset on Yankee Lake, including water chemistry data, physical measurements, and volunteer samplers' perception data, suggest that aquatic life may be *threatened* by road salt runoff, although no actual impacts have been measured. Additional data are needed to evaluate the food and habitat conditions for aquatic organisms in the lake.

Aesthetics and Habitat

The CSLAP dataset on Yankee Lake, including water chemistry data, physical measurements, and volunteer samplers' perception data, suggest that aesthetics may at times be *poor* due to excessive nutrients (and associated algae). Habitat may be good.

Fish Consumption

There are no fish consumption advisories posted for Yankee Lake.

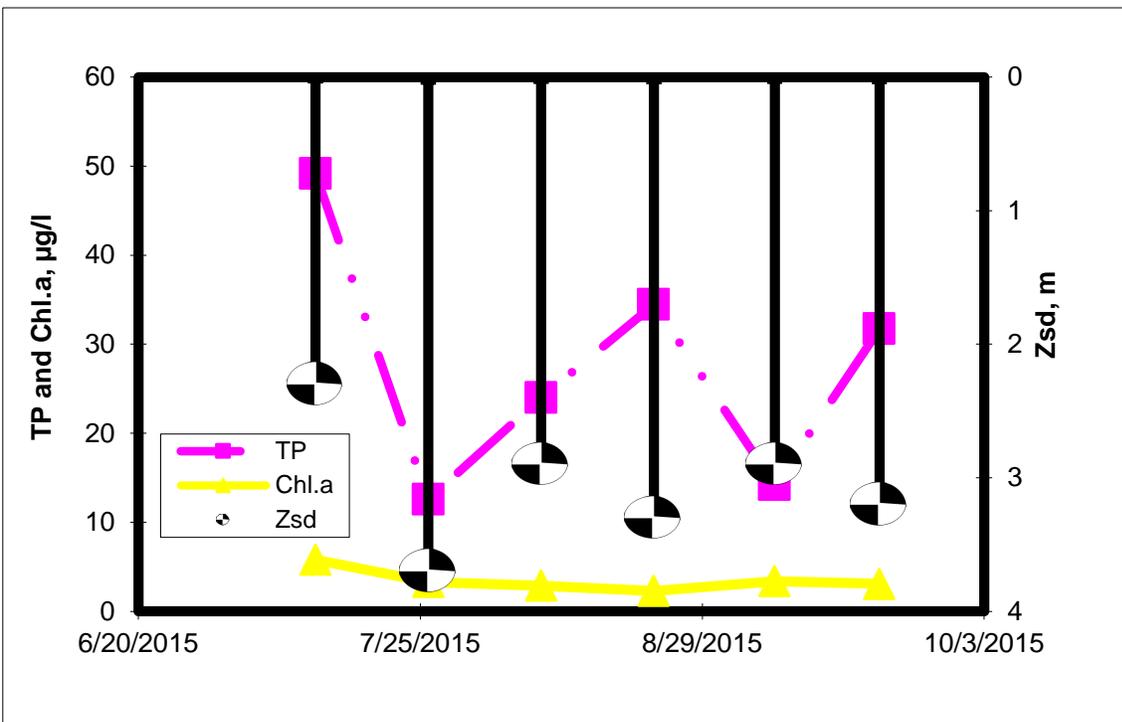
Additional Comments and Recommendations

Aquatic plant survey data will help to determine if the lake is threatened (or presently impacted) by invasive species, such as Eurasian watermilfoil, common to other lakes in the area. Additional water quality monitoring data will help to determine if any designated lake uses are impacted by water quality or biological conditions in the lake. Lake residents should report and avoid exposure to any surface scums or heavily discolored water.

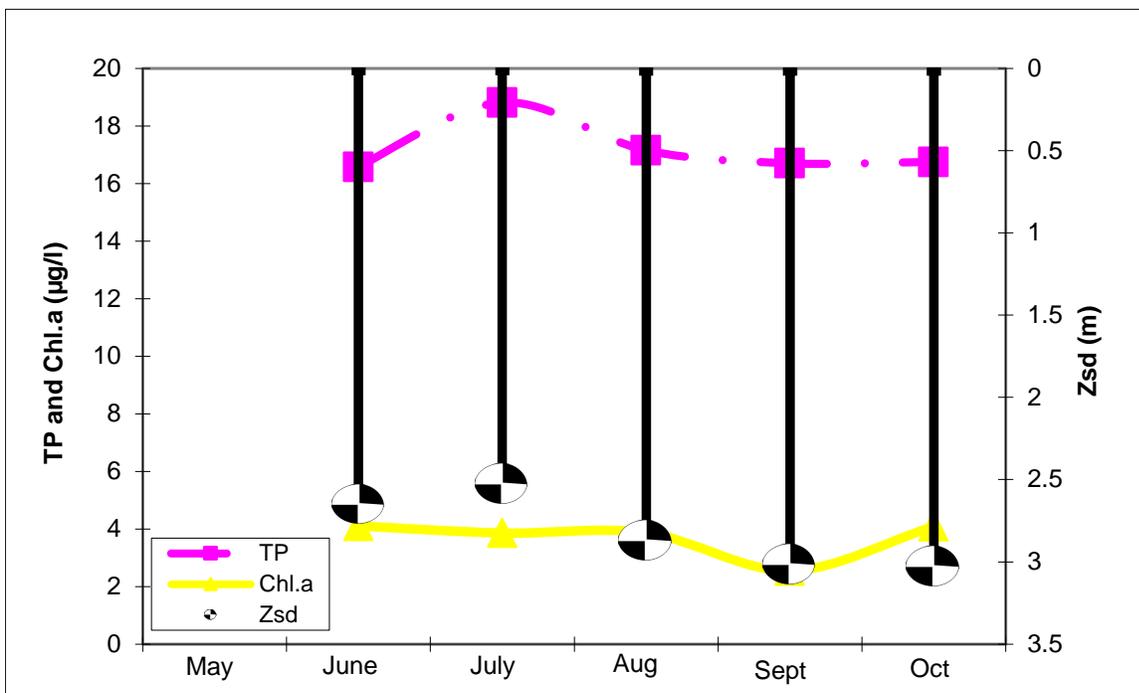
Aquatic Plant IDs-2015

None submitted for identification in 2015.

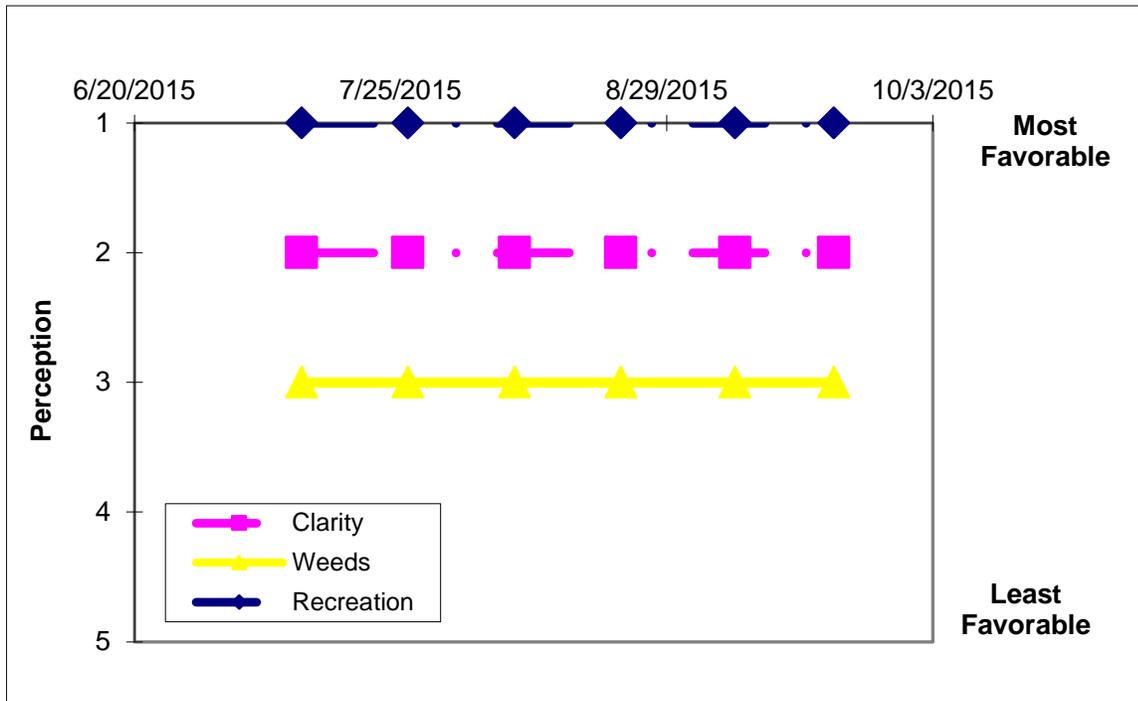
Time Series: Trophic Indicators, 2015



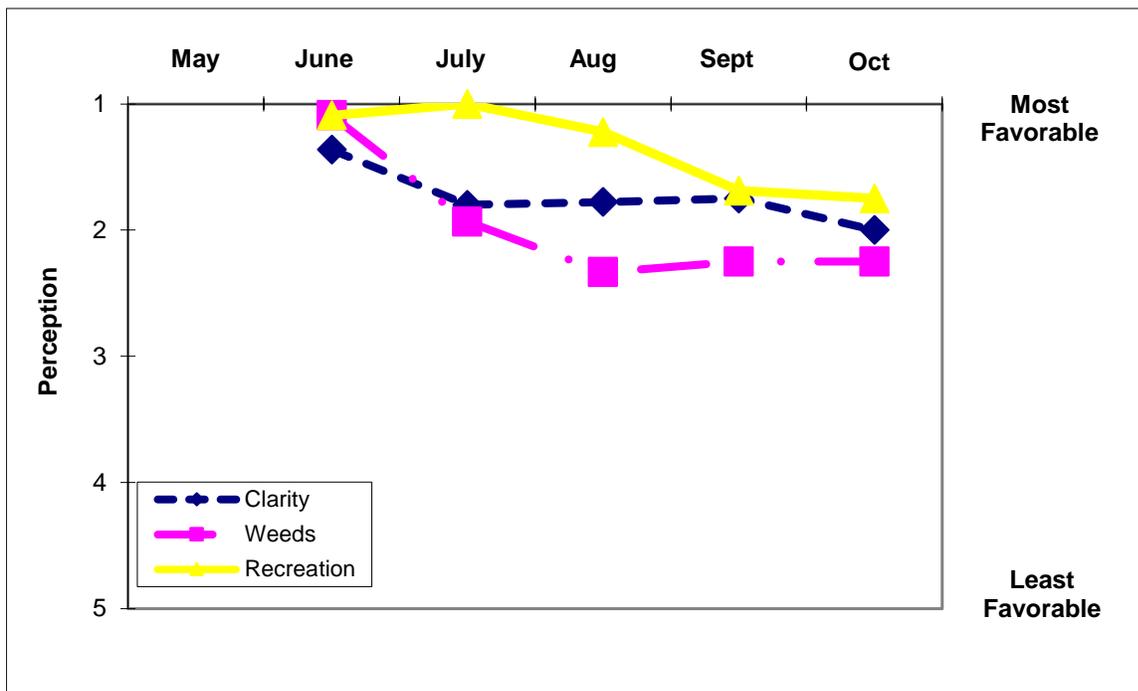
Time Series: Trophic Indicators, Typical Year (2006-2015)



Time Series: Lake Perception Indicators, 2015



Time Series: Lake Perception Indicators, Typical Year (2006-2015)



Appendix A- CSLAP Water Quality Sampling Results for Yankee Lake

LNum	LName	Date	Zbot	Zsd	Zsamp	Tot.P	NO3	NH4	TDN	TN/TP	TColor	pH	Cond25	Ca	Chl.a	Cl
206	Yankee L	6/13/2006	6.6	2.60	1.5	0.021	0.03	0.01			11	6.8	99.8	7.0	4.63	
206	Yankee L	6/27/2006		2.60	1.5	0.020			0.40	19.8	28	6.6	110		7.57	
206	Yankee L	7/10/2006		2.55	1.5	0.024	0.01	0.01	0.36	14.9	23	7.7	118.7		5.1	
206	Yankee L	7/25/2006		1.75	1.5	0.016	0.01	0.02	0.47	29.6	27	7.8	107.1		6.06	
206	Yankee L	8/8/2006		2.40	1.5	0.022	0.01	0.01	0.44	19.9	15	7.2	143.3	5.1	4.97	
206	Yankee L	8/22/2006		2.45	1.5	0.013	0.01	0.02	0.47	35.8	19	7.8	109.3		4.45	
206	Yankee L	9/5/2006		2.68	1.5	0.015	0.00	0.01	0.40	26.9	12	6.8	92.58		1.67	
206	Yankee L	9/22/2006	6.7	2.88	1.5	0.012	0.02	0.03	0.39	32.6	14	7.6	103.8		4.05	
206	Yankee L	7/2/2007		2.30	1.5	0.015	0.01	0.02	0.41	59.94	15	7.01	116	5.2	2.64	
206	Yankee L	7/17/2007		2.58	1.5	0.023	0.01	0.01	0.55	53.29	17	7.27	97		3.53	
206	Yankee L	8/2/2007		3.60	1.5	0.042	0.01	0.01	0.57	30.44	12	8.12	131		5.20	
206	Yankee L	8/27/2007		3.33	1.5	0.014	0.03	0.01	0.62	100.66	13	7.60	85	4.9	3.52	
206	Yankee L	9/9/2007		2.94	1.5	0.015	0.02	0.01	0.49	75.05	31	8.43	126		0.69	
206	Yankee L	9/26/2007		3.45	1.5	0.013	0.00	0.01	0.55	96.32	10	8.32	107		1.88	
206	Yankee L	10/7/2007		3.83	1.5	0.021	0.01	0.02	0.65	68.67	11	7.52	126		2.40	
206	Yankee L	6/28/2008		2.30	1.5	0.017	0.00	0.02	0.37	48.82	10	7.62	153	13.1	5.43	
206	Yankee L	7/21/2008		2.25	1.5	0.016			0.20	27.92						
206	Yankee L	7/28/2008		2.55	1.5	0.020	0.02	0.01	0.16	17.01	11	6.70	131		2.92	
206	Yankee L	8/11/2008		3.10		0.013	0.02	0.04	0.26	45.75	12	6.64	125		4.00	
206	Yankee L	8/26/2008		3.63	1.5	0.014	0.00	0.03	0.29	44.06	10	6.52	127		4.19	
206	Yankee L	9/16/2008		2.48	1.5	0.028	0.01	0.06	0.28	22.08	14	7.69	142	5.5	3.44	
206	Yankee L	10/1/2008		2.70	1.5	0.014	0.02	0.02	0.23	34.80	7	7.21	129		4.19	
206	Yankee L	10/13/2008		2.65		0.013	0.02	0.00	0.28	47.02	7	7.59	141		6.04	
206	Yankee L	06/29/2009		2.50	1.5	0.016	0.00	0.00	0.20	28.31	19	8.02	139	6.1	4.21	
206	Yankee L	07/20/2009		3.13	1.5	0.016	0.01	0.07	0.29	40.50	26	6.29	156		4.31	
206	Yankee L	08/03/2009		2.45	1.5	0.026	0.01	0.05	0.29	24.11	23	7.71	65		6.04	
206	Yankee L	08/18/2009		2.85	1.5	0.015	0.04	0.01	0.31	45.16	30	6.50	103		3.40	
206	Yankee L	08/30/2009		2.00	1.5	0.018	0.02	0.18	0.36	45.63	40	6.90	112	5.2	5.00	
206	Yankee L	09/13/2009		2.75	1.5	0.015	0.01	0.01	0.32	46.46	29	7.60	92		3.90	
206	Yankee L	09/28/2009		2.88	1.5	0.013	0.01	0.03	0.25	41.70	24	7.71	130		4.11	
206	Yankee L	6/20/2010		2.65	1.5	0.014	0.01	0.41			13	6.97	133	4.9	0.70	
206	Yankee L	7/4/2010		2.95	1.5	0.015	0.02	0.02	0.28	42.63	12	7.22	180		0.60	
206	Yankee L	7/18/2010		2.88	1.5	0.016	0.10	0.04	0.35	48.13	17	7.58	134		0.70	
206	Yankee L	8/2/2010		3.25	1.5	0.012	0.02	0.03	0.29	52.80	12	7.24	135		0.60	
206	Yankee L	8/2/2010			bloom											
206	Yankee L	8/17/2010		2.75	1.5	0.018	0.02	0.01	0.48	59.75	7	6.72	139	5.7	1.10	
206	Yankee L	9/5/2010	4.2	2.80	1.5	0.016	0.01	0.01	0.25	36.05	13	7.32	137		0.90	
206	Yankee L	9/19/2010	4.6	4.08	1.5	0.029	0.03	0.03	0.32	24.44	12	7.00	135		0.60	
206	Yankee L	6/5/2011		2.75	1.5	0.026	0.04	0.02	0.29	24.28	34	7.46	127	5.6	7.00	
206	Yankee L	6/19/2011		2.35	1.5	0.016	0.01	0.03	0.20	27.82	62	6.05	160		4.40	
206	Yankee L	7/5/2011		2.70	1.5	0.019	0.01	0.02	0.38	45.06	17	7.54	120		4.40	
206	Yankee L	7/17/2011		0.67	1.5	0.013	0.01	0.02	0.32	53.91	19	7.70	117		5.50	
206	Yankee L	8/1/2011		2.10	10.0	0.014	0.02	0.03	0.49	75.61	27	8.86	136	4.6	6.20	
206	Yankee L	8/16/2011		2.15	10.0	0.012	0.06	0.05	0.43	77.00	18	7.65	119		3.60	
206	Yankee L	9/11/2011		2.20	1.5	0.017	0.01	0.03	0.39	49.60	34	7.39	92		1.70	
206	Yankee L	6/24/2013		3.28	1.5	0.014	0.01	0.03	0.36	57.39	18	8.79	124		3.30	
206	Yankee L	7/9/2013		3.00	1.5	0.017			0.29	38.78	21	8.49	110		3.40	
206	Yankee L	7/22/2013	5.0	2.38	1.5	0.016	0.01	0.01	0.21	29.66	25	8.22	112		1.80	
206	Yankee L	8/5/2013	3.0	2.55	1.5	0.017			0.47	60.31	21	7.35	115		2.70	
206	Yankee L	9/2/2013	3.4	3.15	1.5	0.016	0.01	0.01	0.40	55.61	16	7.77	129		2.30	
206	Yankee L	9/15/2013		3.10	1.5	0.017			0.37	48.17	23	8.82	126		3.00	
206	Yankee L	9/29/2013	5.5	4.45	1.5	0.015	0.01	0.02	0.35	50.46	13	6.80	106		2.10	
206	Yankee L	6/1/2014	5.5	2.65	1.5	0.015	0.04	0.03	0.29	42.82	20	7.06	125	5.4	3.50	
206	Yankee L	6/15/2014	3.6	2.30	1.5	0.014			0.30	49.21	15	6.87	138		4.10	

LNum	LName	Date	Zbot	Zsd	Zsamp	Tot.P	NO3	NH4	TDN	TN/TP	TColor	pH	Cond25	Ca	Chl.a	Cl
206	Yankee L	6/29/2014	5.4	3.20	1.5	0.011	0.02	0.01	0.31	62.23	16	8.26	138		0.50	
206	Yankee L	7/14/2014	4.1	4.90	2.0	0.012			0.36	64.57	12	7.46	143		4.00	
206	Yankee L	7/29/2014	3.7	3.13	1.5	0.012	0.01	0.03	0.32	60.88	6	7.45	133	5.5	4.40	
206	Yankee L	8/10/2014	3.3	3.00		0.009			0.36	86.11	12	6.91	140		3.80	
206	Yankee L	8/24/2014	5.4	4.23	1.5	0.011	0.01	0.01	0.32	64.60	10	7.10	140		3.80	
206	Yankee L	9/7/2014	4.7	3.70	1.5	0.012			0.29	53.97	12	6.20	139		2.90	
206	Yankee L	7/12/2015	3.3	2.30	1.5	0.049	0.00	0.04	0.65	9.07	18	7.42	146	6.5	5.80	
206	Yankee L	7/26/2015	4.1	3.70	1.5	0.013			0.47	25.65	17	7.75	162		3.30	
206	Yankee L	8/9/2015	3.3	2.90	1.5	0.024	0.01	0.04	0.47	13.36	18	7.24	170		2.90	48.3
206	Yankee L	8/23/2015	4.1	3.30	1.5	0.034			0.77	15.30	15	7.70	172		2.30	
206	Yankee L	9/7/2015	3.1	2.90	1.5	0.014	0.01	0.04	0.28	13.51	10	7.89	167	5.7	3.40	
206	Yankee L	9/20/2015	3.2	3.20	1.5	0.032			0.32	6.85	10	7.25	178		3.10	

LNum	LName	Date	Type	TAir	TH2O	QA	QB	QC	QD	QF	QG	AQ-PC	AQ-Chla	MC-LR	Ana-a	Cylin	FP-Chl	FP-BG	HAB form	Shore HAB
206	Yankee L	6/13/2006	epi	28	18	2	1	1	2											
206	Yankee L	6/27/2006	epi	26	23	2	1	2	2											
206	Yankee L	7/10/2006	epi	26	25	2	1	1	2											
206	Yankee L	7/25/2006	epi	27	26	2	1	1	2											
206	Yankee L	8/8/2006	epi	29	26	2	1	1	2											
206	Yankee L	8/22/2006	epi	25	24	2	1	1	2											
206	Yankee L	9/5/2006	epi	18	16	2	1	2	2											
206	Yankee L	9/22/2006	epi	17	16	2	1	2	2											
206	Yankee L	7/2/2007	epi	23	21	1	3	1	5											
206	Yankee L	7/17/2007	epi	30	25	2	1	1	0											
206	Yankee L	8/2/2007	epi	30	27	3	3	2	16											
206	Yankee L	8/13/2007	epi			2	3	1	8											
206	Yankee L	8/27/2007	epi	22	23	1	2	1	0											
206	Yankee L	9/9/2007	epi	27	25	1	3	2	2											
206	Yankee L	9/26/2007	epi	23	20	1	2	1	8											
206	Yankee L	10/7/2007	epi	22	21	1	1	1	8											
206	Yankee L	6/28/2008	epi	29	23	2	1	1	0											
206	Yankee L	7/21/2008	epi	26	27	2	3	1	0											
206	Yankee L	7/28/2008	epi	25	25	2	2	1	0											
206	Yankee L	8/11/2008	epi	21	23	2	3	1	0											
206	Yankee L	8/26/2008	epi	22	23	2	3	1	0											
206	Yankee L	9/16/2008	epi	17	20	1	2	1	0											
206	Yankee L	10/1/2008	epi	17	18	2	3	2	5											
206	Yankee L	10/13/2008	epi	21	15	3	3	3	5											
206	Yankee L	06/29/2009	epi	25	23	1	1	1	0											
206	Yankee L	07/20/2009	epi	20	22	2	1	1	0											
206	Yankee L	08/03/2009	epi	22	23	2	2	2	18											
206	Yankee L	08/18/2009	epi	29	32	2	2	2	0											
206	Yankee L	08/30/2009	epi	23	23	2	3	2	15											
206	Yankee L	09/13/2009	epi	23	20	2	2	2	5											
206	Yankee L	09/28/2009	epi	19	17	2	3	4	5											
206	Yankee L	6/20/2010	epi	25	24	1	2	1	0											
206	Yankee L	7/4/2010	epi	26	24	2	3	1	0	0	0									
206	Yankee L	7/18/2010	epi	27	26	2	3	1	0	4										
206	Yankee L	8/2/2010	epi	24	24	2	2	1	5	4		14.00		0.00						
206	Yankee L	8/2/2010	bloom									80.00		0.02						
206	Yankee L	8/17/2010	epi	24	24	2	2	2	5	0	0									
206	Yankee L	9/5/2010	epi	16	20	2	3	1	5	0	4	30.00		0.00						
206	Yankee L	9/19/2010	epi	22	18	2	3	1	5	0	0									
206	Yankee L	6/5/2011	epi	18	19	2	1	1	5	0	0		18.30							
206	Yankee L	6/19/2011	epi	26	22	1	1	1	0	0	0	10.20		2.90						
206	Yankee L	7/5/2011	epi	24	23	1	1	1	0	0	0	9.00	3.40							

LNum	LName	Date	Type	TAir	TH2O	QA	QB	QC	QD	QF	QG	AQ-PC	AQ-Chla	MC-LR	Ana-a	Cylin	FP-Chl	FP-BG	HAB form	Shore HAB
206	Yankee L	7/17/2011	epi	22	25	2	2	1	0	0	0	11.90	3.00	0.15					I	
206	Yankee L	8/1/2011	epi	28	27	1	2	1	0	0	0	12.10	4.50							
206	Yankee L	8/16/2011	epi	23	25	1	2	1	0	0	0	20.50	4.90	0.15						
206	Yankee L	9/11/2011	epi	20	21	3	3	3	15	0	0	15.80	6.70							
206	Yankee L	6/24/2013	epi	25	25	1	1	1	0	0	0	4.50	2.70	<0.30	<0.410		1.70	0.00	I	
206	Yankee L	7/9/2013	epi	25	27	2	2	1	3	4	4	3.80	2.10	<0.30	<0.510		2.90	0.30	H	
206	Yankee L	7/22/2013	epi	27	28	2	2	1	0	4	4	2.80	2.90	<0.30	<0.370		2.64	0.00		
206	Yankee L	8/5/2013	epi	15	22	2	2	1	0	7	7			1.84	<0.400					
206	Yankee L	9/2/2013	epi	22	24	2	2	2	5	4	4	6.80	2.20	<0.30	<0.570		2.70	0.80	H	
206	Yankee L	9/15/2013	epi	18	19	2	3	1	0	0	0	3.50	1.60	<0.30	<0.100		0.80	0.00		
206	Yankee L	9/29/2013	epi	22	17	1	2	1	0	0	0	2.30	1.50	<0.30	<10.600		0.70	0.00	I	
206	Yankee L	6/1/2014	epi	28	20	1	1	1	0	0	0	0.05	1.60	<0.53	<0.40	<0.001	1.41	0.00	i	i
206	Yankee L	6/15/2014	epi	24	20	1	1	1	0	0	0	0.40	1.50	<0.61	<0.08	<0.002	1.88	0.66	i	i
206	Yankee L	6/29/2014	epi	27	27	1	1	1	0	0	0	1.80	0.40	<1.60	<0.48	<0.002	0.82	0.00	i	i
206	Yankee L	7/14/2014	epi	24	25	1	2	1	0	0	0	4.80	0.40	<0.31	<0.24	<0.002	1.12	0.03	i	i
206	Yankee L	7/29/2014	epi	20	24	1	1	1	0	0	0	4.30	0.30	<0.28	<0.05	<0.001	0.72	0.00	i	i
206	Yankee L	8/10/2014	epi	28	26	1	2	1	0	0	0	1.10	0.40	<0.26	<0.10	<0.002	1.64	0.13	i	i
206	Yankee L	8/24/2014	epi	28	22	1	3	1	0	0	0	5.40	0.40	<0.64	<0.03	<0.001	1.02	0.00	i	i
206	Yankee L	9/7/2014	epi	23	24	1	1	1	0	0	0	2.90	0.30	<0.40	<0.48	<0.001	1.47	0.35	i	i
206	Yankee L	7/12/2015	epi	27	25	2	3	1	0	0	0	3.30	0.70	<0.76	<0.003	<0.011	1.88	0.00	I	I
206	Yankee L	7/26/2015	epi	27	25	2	3	1	0	0	0	6.60	0.40	<0.23	<0.002	<0.014	1.08	0.00	I	I
206	Yankee L	8/9/2015	epi	26		2	3	1	0	0	0	6.40	0.70	<1.13	<0.002	<0.014	0.87	0.00	I	I
206	Yankee L	8/23/2015	epi	24	26	2	3	1	0	0	0	7.60	0.20	<0.28	<0.003	<0.010	0.79	0.00	I	I
206	Yankee L	9/7/2015	epi	27	26	2	3	1	0	0	0			<0.74	<0.010	<0.075	1.64	0.34	I	I
206	Yankee L	9/20/2015	epi	20	21	2	3	1	0	0	0	0.50	0.30	<0.39	<0.009	<0.022	0.83	0.00	I	I

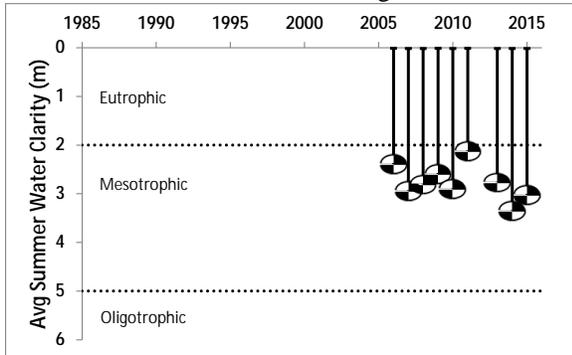
Legend Information

<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	Cylindrospermopsin (ug/l)	0.1 ug/l	none
FP-Chl, FP-BG	Fluoroprobe total chlorophyll, fluoroprobe blue-green chlorophyll (ug/l)	0.1 ug/l	none
Lake Assessment			
QA	water quality assessment; 1 = crystal clear, 2 = not quite crystal clear, 3 = definite algae greenness, 4 = high algae levels, 5 = severely high algae levels		
QB	aquatic plant assessment; 1 = no plants visible, 2 = plants below surface, 3 = plants at surface, 4 = plants dense at surface, 5 = surface plant coverage		
QC	recreational assessment; 1 = could not be nicer, 2 = excellent, 3 = slightly impaired, 4 = substantially impaired, 5 = lake not usable		
QD	reasons for recreational assessment; 1 = poor water clarity, 2 = excessive weeds, 3 = too much algae, 4 = lake looks bad, 5 = poor weather, 6 = litter/surface debris, 7 = too many lake users, 8 = other		
QF, QG	Health and safety issues today (QF) and past week (QG); 0 = none, 1 = taste/odor, 2 = GI illness humans/animals, 3 = swimmers itch, 4 = algae blooms, 5 = dead fish, 6 = unusual animals, 7 = other		
HAB form, Shore HAB	HAB evaluation; A = spilled paint, B = pea soup, C = streaks, D = green dots, E = bubbling scum, F = green/brown tint, G = duckweed, H = other, I = no bloom		

Appendix C- Long Term Trends: Yankee Lake

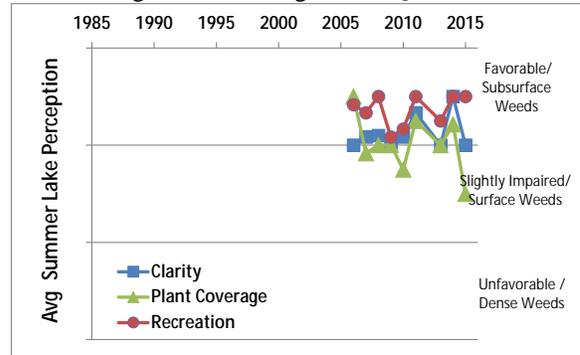
Long Term Trends: Water Clarity

- Slight increase, particularly 11-14
- Most readings typical of *mesotrophic* lakes, similar to TP and algae levels



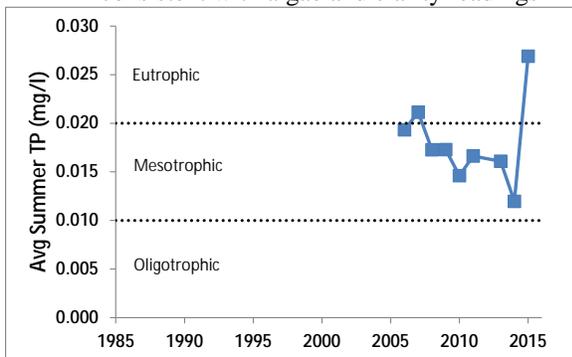
Long Term Trends: Lake Perception

- Improved WQ; increasing weeds
- Small changes in recreational perception not aligned with changes in WQ or weeds



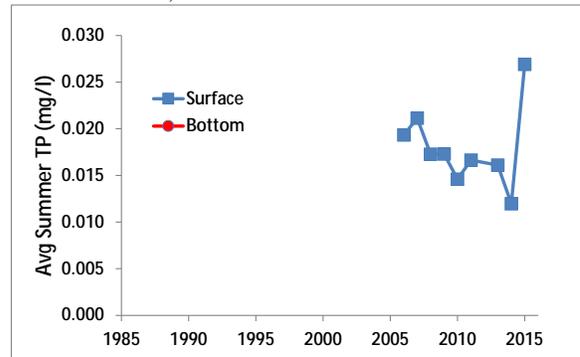
Long Term Trends: Phosphorus

- Steady ↓ since mid-2000s; higher 2015?
- Most readings typical of *mesotrophic* lakes, consistent with algae and clarity readings



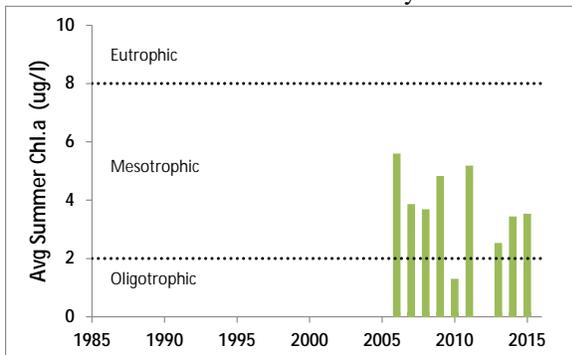
Long Term Trends: Bottom Phosphorus

- No thermal stratification
- Likely similar surface and deepwater TP levels, as in most shallow lakes



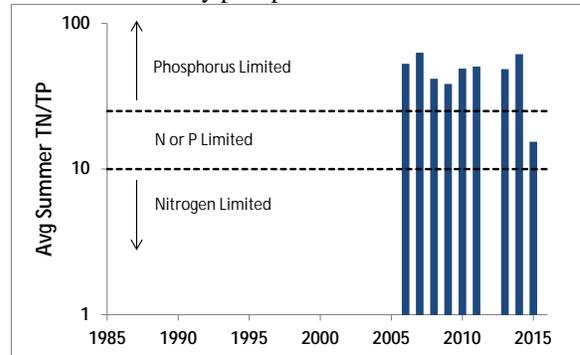
Long Term Trends: Chlorophyll a

- Slight but inconsistent decrease 2006-15
- Most readings typical of *mesotrophic* lakes, consistent with TP and clarity levels



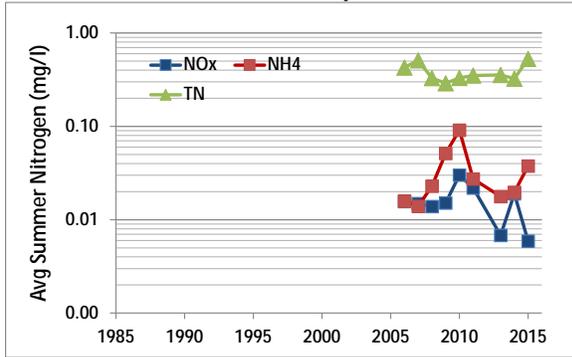
Long Term Trends: N:P Ratio

- No long term trend but lower in 2015
- Most readings indicate algae growth likely limited by phosphorus



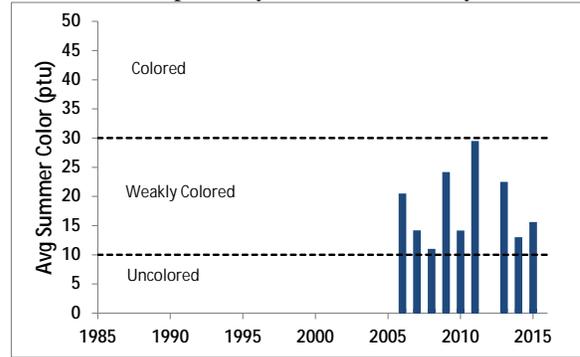
Long Term Trends: Nitrogen

- ↓ NOx and ↑ NH4 last few years
- Low nitrate, ammonia and total nitrogen; NOx and ammonia vary with each other



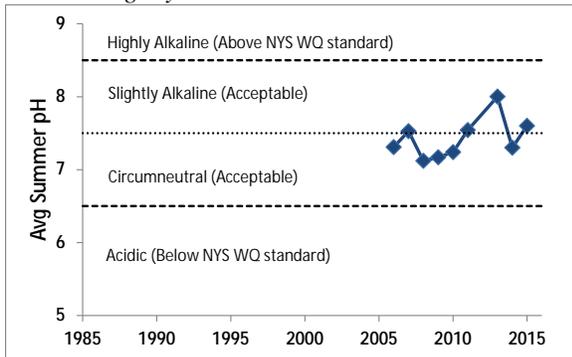
Long Term Trends: Color

- No long term trend
- Most readings typical of *moderately colored* lakes; probably no effect on clarity



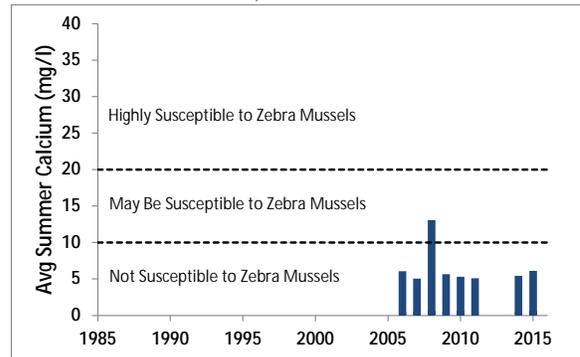
Long Term Trends: pH

- No clear long term trend, but slight ↑
- Most readings typical of *circumneutral* to *slightly alkaline* lakes



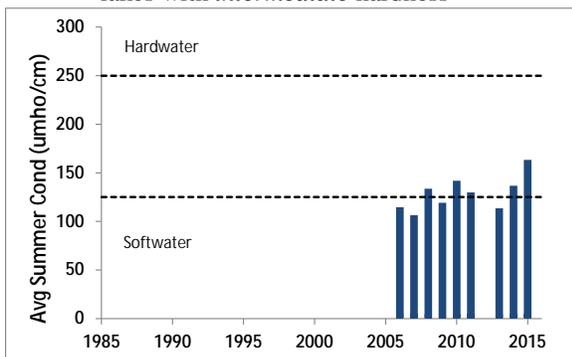
Long Term Trends: Calcium

- No long term trend; usually low & stable
- Most readings indicate low susceptibility to zebra mussels, which are not found in lake



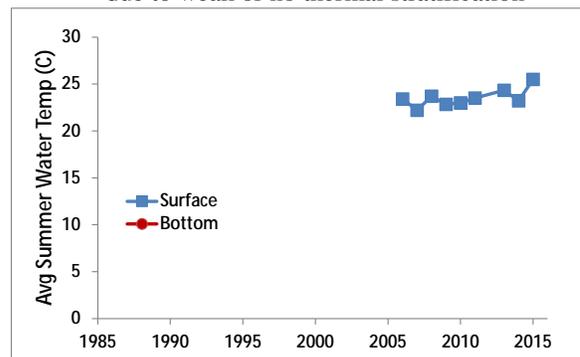
Long Term Trends: Conductivity

- Slight ↑ since mid-2000s
- Most readings typical of *softwater* lakes to lakes with *intermediate* hardness



Long Term Trends: Water Temperature

- No deepwater T; slight rise in surface T?
- Surface and bottom readings likely similar due to weak or no 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

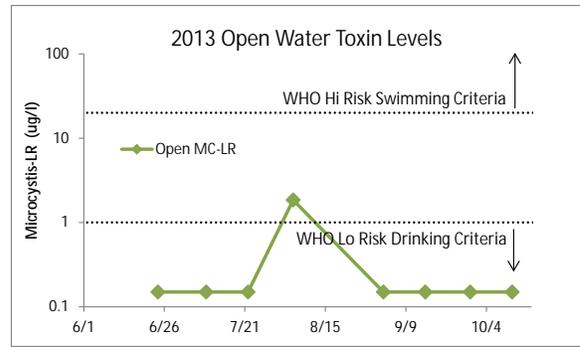


Figure D2:
2013 Open Water Microcystin-LR

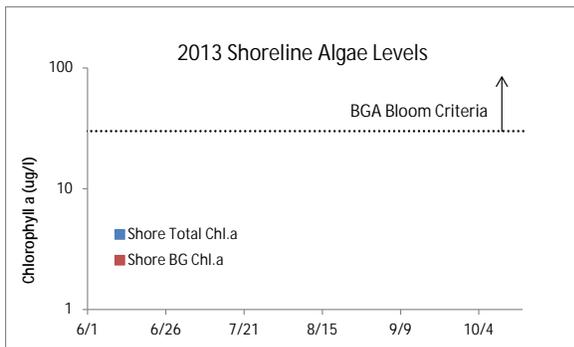


Figure D3:
2013 Shoreline Total and BGA Chl.a

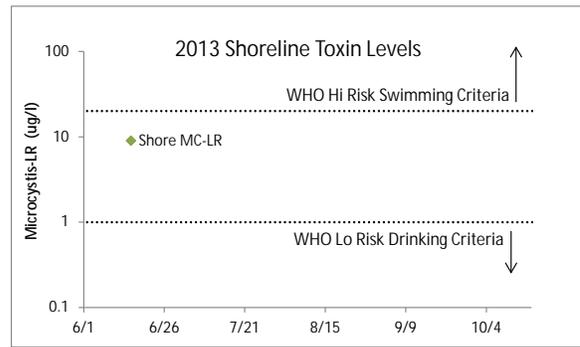


Figure D4:
2013 Shoreline Microcystin-LR

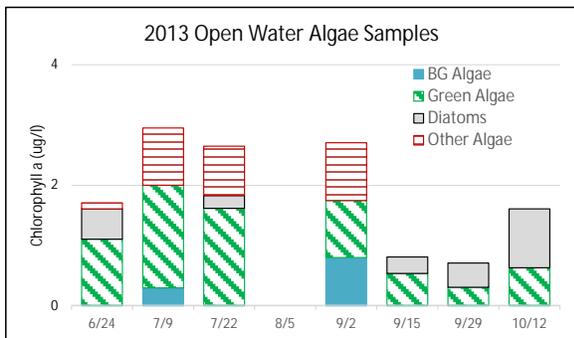


Figure D5:
2013 Open Water Algae Types

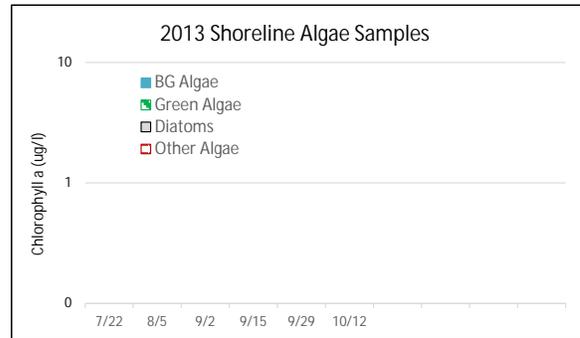


Figure D6:
2013 Shoreline Algae Types

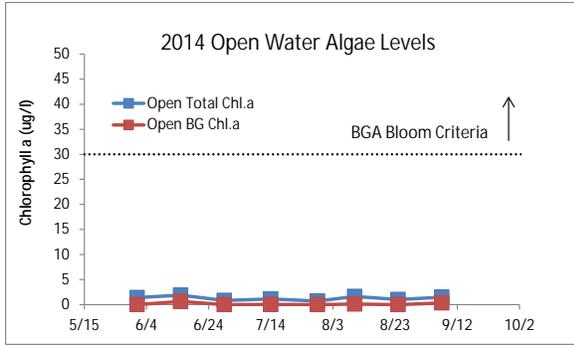


Figure D7:
2014 Open Water Total and BGA Chl.a

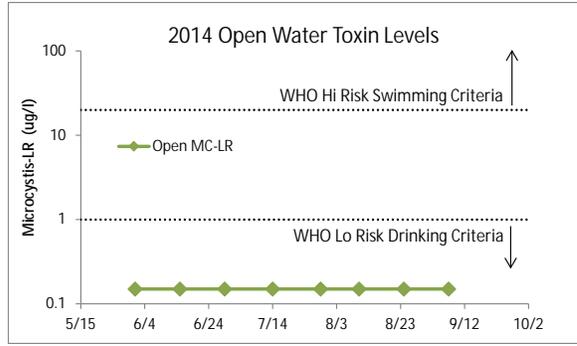


Figure D8:
2014 Open Water Microcystin-LR



Figure D9:
2014 Shoreline Total and BGA Chl.a

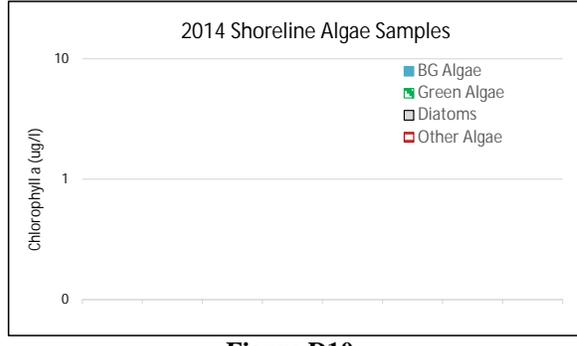


Figure D10:
2014 Shoreline Microcystin-LR

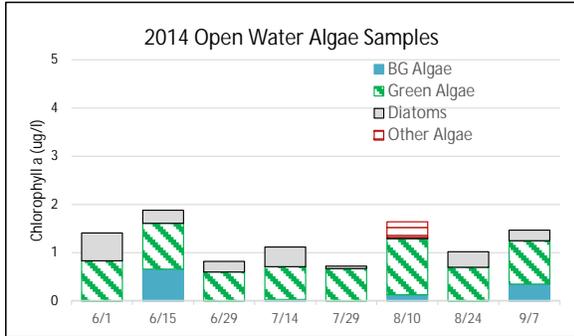


Figure D11:
2014 Open Water Algae Types

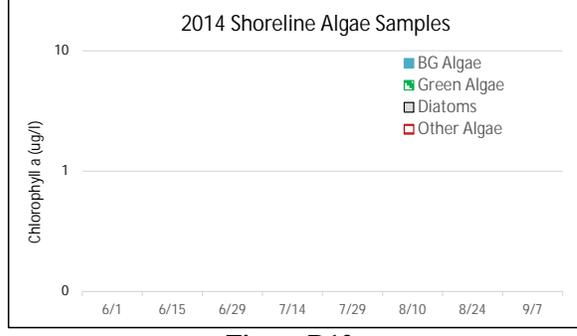


Figure D12:
2014 Shoreline Algae Types

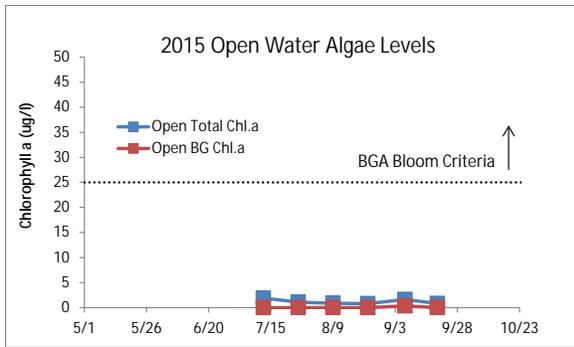


Figure D13:
2015 Open Water Total and BGA Chl.a

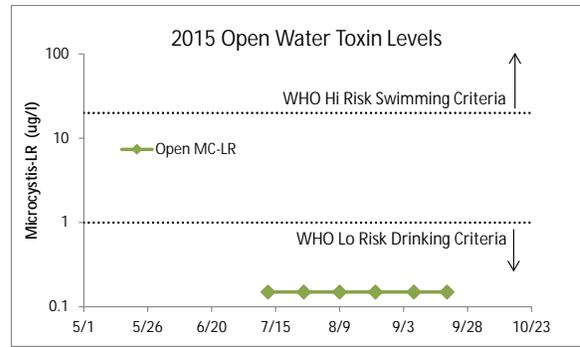


Figure D14:
2015 Open Water Microcystin-LR

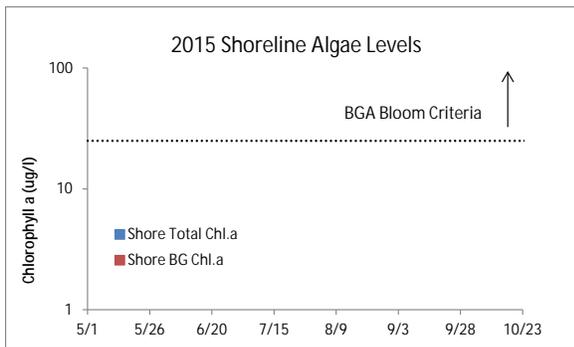


Figure D15:
2015 Shoreline Total and BGA Chl.a

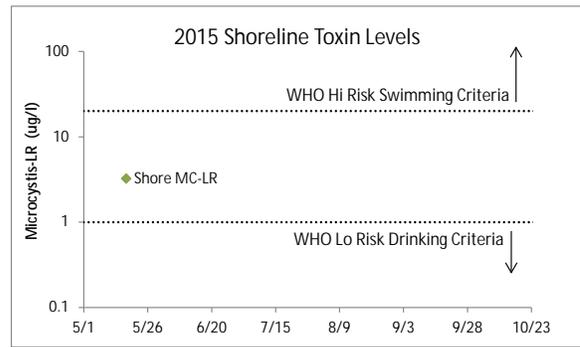


Figure D16:
2015 Shoreline Microcystin-LR

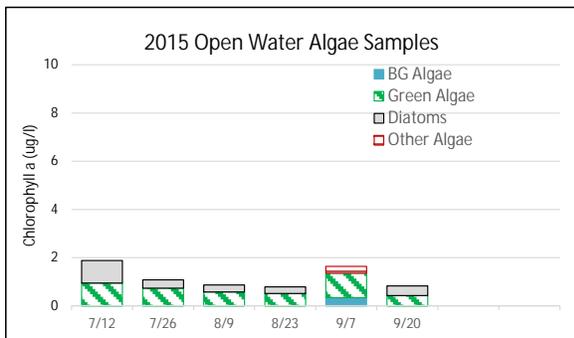


Figure D17:
2015 Open Water Algae Types

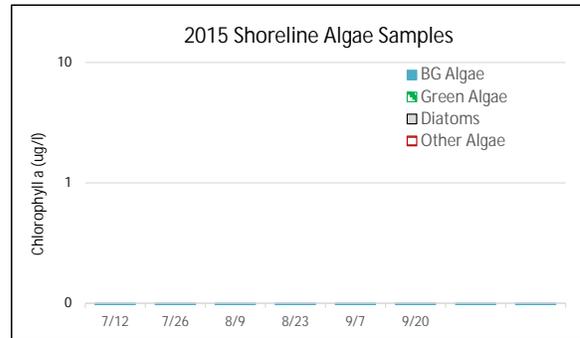


Figure D18:
2015 Shoreline Algae Types

Appendix E: AIS Species in Sullivan County

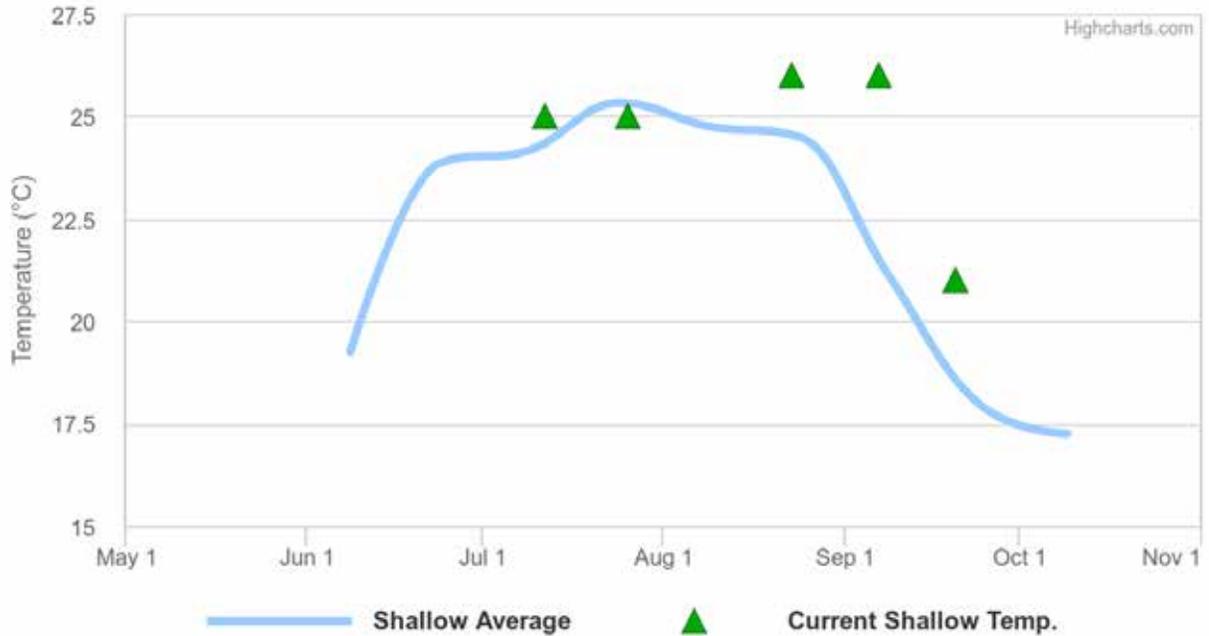
The table below shows the invasive aquatic plants and animals that have been documented in Sullivan County, as cited in either the iMapInvasives database (<http://www.imapinvasives.org/>) or in the NYSDEC Division of Water database. These databases may include some, but not all, non-native plants or 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 - Sullivan County			
Waterbody	Kingdom	Common name	Scientific name
Beaverman Lake	Plant	European frogbit	<i>Hydrocharis morsus-ranae</i>
Black Lake	Plant	Water chestnut	<i>Trapa natans</i>
Cliff Lake	Plant	Fanwort	<i>Cabomba caroliniana</i>
Kiamesha Lake	Plant	Eurasian watermilfoil	<i>Myriophyllum spicatum</i>
Martin Lake	Plant	Fanwort	<i>Cabomba caroliniana</i>
Morningside Lake	Plant	Water chestnut	<i>Trapa natans</i>
Morningside Lake	Plant	Curly leafed pondweed	<i>Potamogeton crispus</i>
Pleasure Lake	Plant	Eurasian watermilfoil	<i>Myriophyllum spicatum</i>
Pleasure Lake	Plant	Water chestnut	<i>Trapa natans</i>
Rio Reservoir	Animal	Green sunfish	<i>Lepomis cyanellus</i>
Sackett Lake	Plant	Curly leafed pondweed	<i>Potamogeton crispus</i>
Saint Josephs Lake	Plant	Floating primrose willow	<i>Ludwigia peploides ssp. glabrescens</i>
Silver Lake	Plant	Curly leafed pondweed	<i>Potamogeton crispus</i>
Silver Lake	Plant	Water chestnut	<i>Trapa natans</i>
Swan Lake	Plant	Curly leafed pondweed	<i>Potamogeton crispus</i>
Swan Lake	Plant	Water chestnut	<i>Trapa natans</i>
Swinging Bridge Reservoir	Animal	Common carp	<i>Cyprinus carpio</i>
Swinging Bridge Reservoir	Animal	Green sunfish	<i>Lepomis cyanellus</i>
Waneta Lake	Plant	Eurasian watermilfoil	<i>Myriophyllum spicatum</i>
White Lake	Plant	Eurasian watermilfoil	<i>Myriophyllum spicatum</i>

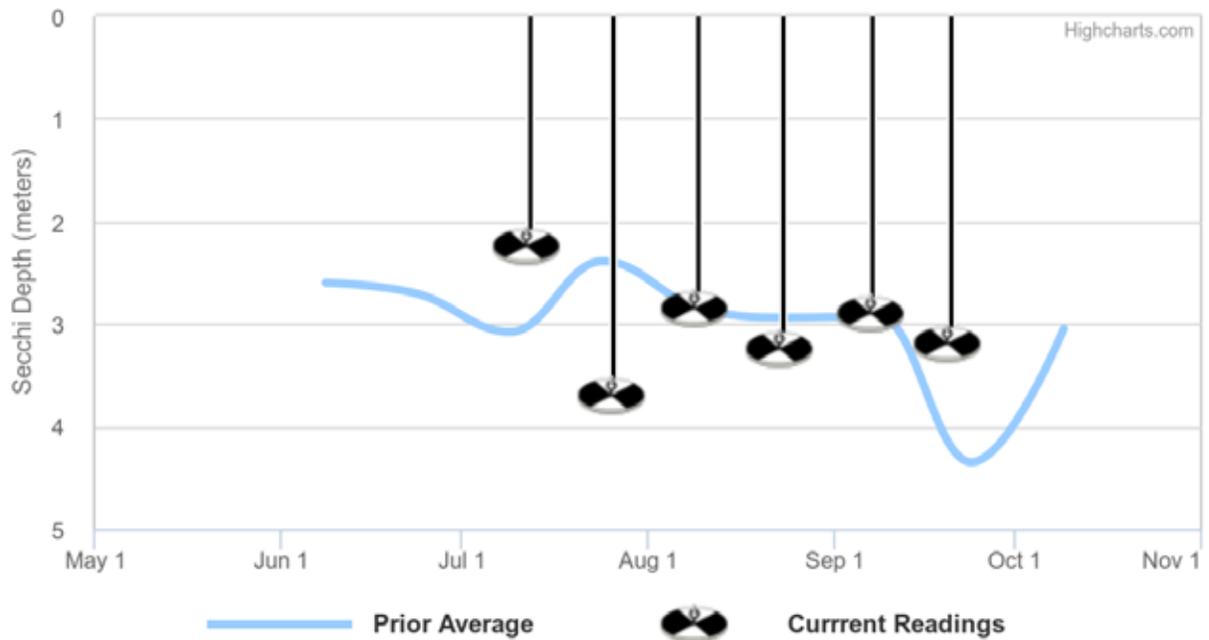
Appendix F: Current Year vs. Prior Averages for Yankee Lake

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 2006 to 2014.

Current Year Secchi Readings vs. Prior Average



This year's session Secchi readings are tending to be higher than normal when compared to the average of readings collected from 2006 to 2014

Appendix G: Watershed and Land Use Map for Yankee 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.

