

Tuxedo Lake Questions and Answers, 2015 CSLAP

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

A1. Water quality conditions in Tuxedo Lake have been less favorable in the last few years. Water clarity has been lower than usual (or at least lower than the late 2000s), due to higher nutrient and (slightly higher) algae levels. This may be consistent with an increase in conductivity. Aquatic plant coverage has also increased in recent years.

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

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

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

A3. Tuxedo Lake had higher water clarity, and lower nutrient levels and algae levels, than the typical lake in the area. Aquatic plant coverage is similar to that found in these other lakes.

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

A4. Water clarity has decreased over the last decade, consistent with an increase in nutrient and algae levels and slightly degraded recreational assessments. The latter may be more associated with slightly more extensive aquatic plant coverage, although plant coverage is still low and recreational assessments are still favorable.

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

A5. The increase in nutrient (phosphorus and nitrogen) and conductivity may have triggered the other lake changes, and may indicate new sources of runoff into the lake. These should be evaluated by the lake association. Additional data will help to determine if these changes represent normal variability over several years, or a longer term trend.

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

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

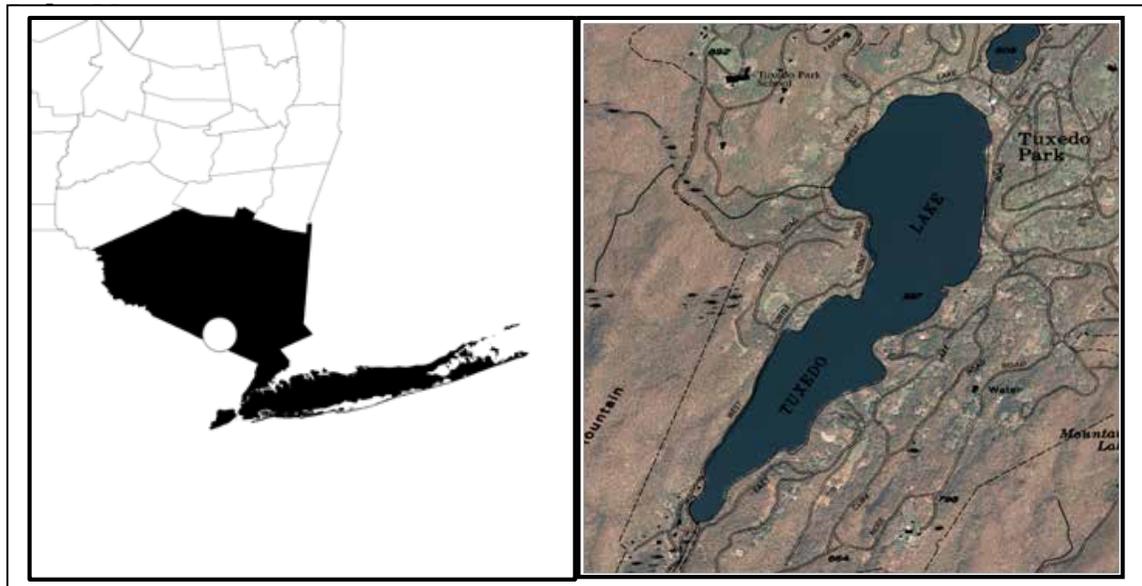
Lake Use				
Potable Water				Algae levels
Swimming				No impacts
Recreation				High nutrients
Aquatic Life				High pH
Aesthetics				Native plants
Habitat				Excessive Weeds
Fish Consumption				
	PWL	Average Year	2015	Primary issue

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

CSLAP 2015 Lake Water Quality Summary: Tuxedo Lake

General Lake Information

Location	Town of Tuxedo
County	Orange
Basin	Raritan/Newark Bay
Size	116.6 hectares (288.0 acres)
Lake Origins	Natural
Watershed Area	1,477 hectares (3,648 acres)
Retention Time	1.2 years
Mean Depth	8.9 meters
Sounding Depth	19 meters
Public Access?	no
Major Tributaries	Summit Brook
Lake Tributary To...	Little We Wah Lake to We Wah Lake to unnamed outlet to Ramapo River
WQ Classification	AA(T) (potable water)
Lake Outlet Latitude	41.207
Lake Outlet Longitude	-74.203
Sampling Years	2008-2012, 2014-2015
2015 Samplers	Susan Heywood, Jean Connolly McGregor, and Susan Goodfellow
Main Contact	Susan Heywood



Background

Tuxedo Lake is a 288 acre, class AA(T) lake found in the Town of Tuxedo in Orange County, just northwest of New York City. The lake was first sampled as part of CSLAP in 2008.

It is one of ten CSLAP lakes among the more than 830 lakes and ponds found in Orange County, and one of four CSLAP lakes among the more than 190 lakes and ponds in the Raritan / Newark Bay drainage basin.

Lake Uses

Tuxedo Lake is a Class AA(T) lake; this means that the best intended use for the lake is for potable water—drinking, contact recreation—swimming and bathing, non-contact recreation—boating and fishing, aquatic life, and aesthetics. The (T) designation indicates that the lake is classified to support coldwater fisheries (trout and salmon) survival. The lake is used by members of the Tuxedo Lake community and invited guests for electric or non-power boating, through residential shoreline access to the lake or the common boat docks and slips at the Boat Club. There is no public access to the lake.

It is not known whether Tuxedo Lake has been stocked through any state fisheries stocking programs, or if any private stocking has occurred.

General statewide fishing regulations are applicable in Tuxedo Lake.

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

Historical Water Quality Data

CSLAP sampling was conducted on Tuxedo Lake from 2008 to 2012, and in 2014 and 2015. The CSLAP reports for each of the past several years can be found on the NYSFOLA website at <http://nysfola.mylaketown.com>. The most recent CSLAP report and scorecard for Tuxedo Lake can also be found on the NYSDEC web page at <http://www.dec.ny.gov/lands/77852.html>.

Tuxedo Lake was sampled by the NYSDEC via the Lake Classification and Inventory (LCI) survey in 2007. Water quality and fisheries studies were conducted in the past through consultants and additional monitoring will be conducted in the near future through a local grant.

Lake Association and Management History

Tuxedo Lake is served by Tuxedo Park and the Park Environmental Advisory Committee. The Committee is involved in a variety of lake management activities, including:

- Proving boating permits from the Village
- Access for boating or fishing via Boat Club
- Working with lake wardens to oversee management of lakes through
 - Patrolling areas to enforce regulations and protect water supplies
 - Regulating materials that can be used for floats
 - Regulating fish stocking
 - Mandating cleaning boats before entering or leaving lake
 - Prohibiting swimming in lake
 - Requiring steam cleaning for boats not stored over winter at lake

- Restricting ice skating to designated areas

The Village maintains a web site for the lake at <http://www.tuxedopark-ny.gov>.

Summary of 2014 CSLAP Sampling Results

Evaluation of 2014 Annual Results Relative to 2008-2012

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 – “Tuxedo Lake” section in Appendix C.

Evaluation of Eutrophication Indicators

Phosphorus readings were substantially higher in 2015 than in previous years, continuing a recent pattern. It is not yet known if this is a long-term trend (or permanent increase), or represents normal variability. Neither water clarity nor algae levels were higher (or lower) than usual in 2015.

Lake productivity does not exhibit any clear seasonal patterns- phosphorus readings decrease from June through September, but algae and water clarity readings vary only slightly during the summer. The same seasonal trends were mostly apparent in 2015, although phosphorus readings increased slightly in the fall, and algae levels dropped slightly during the summer.

The lake can be characterized as *mesotrophic*, or moderately productive, based on chlorophyll *a*, Secchi disk transparency, and total phosphorus (all typical of *mesotrophic* lakes), although phosphorus readings were more typical of *eutrophic* lakes in 2015. The trophic state indices (TSI) evaluation suggests that each of these trophic indicators is usually “internally consistent”—each of these indicators is in the expected range given the readings 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 usually 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, but higher algae levels in 2014 may indicate a higher susceptibility. Deepwater ammonia and phosphorus readings are elevated, but hypolimnetic iron and manganese readings are low, so deepwater intakes may also support potable water use. However, many of these deepwater water quality indicators have not been measured through CSLAP in recent years. 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, conductivity, and ammonia levels were slightly higher than usual in 2015, and each of these (and total nitrogen) have increased slightly in the last few years. It is likely that the changes in each of these indicators was probably within the normal variability for the lake.

Chloride levels in the 2015 samples, collected for the first time through CSLAP and cited in Appendix A, ranged from 30 to 31 mg/l. These values fall within the range of “moderate” to

“major” road salt runoff levels cited by the New Hampshire DES. These readings are well below the state potable water quality standard of 250 mg/l and within the 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

Phytoplankton, macrophyte, zooplankton, and macroinvertebrate surveys have not been conducted through CSLAP at Tuxedo Lake (although an algae sample submitted for identification in 2009 indicated the presence of *Spirogyra*, a green alga). The fluoroprobe screening data collected by SUNY ESF in the last few years indicated generally low algae levels, although there is a higher percentage of blue green algae in some samples. The large localized bloom reported on the north and south shoreline in mid-summer was comprised mostly of cryptophytes, *Scenedesmus* (a green alga), diatoms, and other algae, blue green algae levels were high enough to exceed the DEC bloom criteria. This bloom did not have measurable toxin levels.

An invasive aquatic plant- Eurasian watermilfoil (*Myriophyllum spicatum*) was found for the first time in the lake in 2011, although it is not (yet) likely that this has affected the overall diversity of plants in the lake. Allied Biological conducted aquatic plant surveys of the lake in October of 2011 and September of 2012, finding 13 different plant species mostly at trace to sparse density. A modified floristic quality index (mFQI) for the lake would likely indicate a “fair” quality of the aquatic plant community. The composition of the fish community in Tuxedo Lake is not known.

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

Evaluation of Lake Perception

Water quality and recreational assessments were less favorable than usual in 2014 and 2015, although these assessments are still very highly favorable. This was consistent with a slight increase in aquatic plant coverage and lower water clarity (in 2014), although the slightly less favorable recreational assessments were more likely to be associated with “excessive weeds” than “poor water clarity”. The slight degradation in recreational and water quality assessments may be part of a longer trend. Seasonal trends in lake perception are usually not apparent, although slightly more favorable recreational assessments were apparent later in the summer in 2014 (after the copper treatments) and in 2015. Overall lake perception is summarized on the Lake Scorecard and Lake Condition Summary Table.

Evaluation of Local Climate Change

Water temperature readings in the summer index period have increased slightly in recent years, but were close to normal in 2015. This may indicate normal variability from year to year.

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. An analysis of algae samples indicates microcystin levels below the levels needed to protect potable water and

swimming use in all open water samples. Fluoroprobe data indicate some potential susceptibility to shoreline blue green algae blooms, as reported and sampled in 2015. Toxin levels in this sample were not detectable.

Lake Condition Summary

Category	Indicator	Min	Overall Avg	Max	2015 Avg	Classification	2015 Change?	Long-term Change?
Eutrophication Indicators	Water Clarity	1.90	3.52	8.50	3.59	Mesotrophic	Within Normal Range	No Change
	Chlorophyll <i>a</i>	0.10	4.98	13.60	3.65	Mesotrophic	Within Normal Range	No Change
	Total Phosphorus	0.007	0.015	0.032	0.022	Mesotrophic	Higher than Normal	Increasing Significantly
Potable Water Indicators	Hypolimnetic Ammonia	0.02	0.13	0.56	0.08	Close to Surface NH4 Readings	Lower Than Normal	Not known
	Hypolimnetic Arsenic	0.50	0.64	1.00		Low Deepwater Arsenic Levels	Higher than Normal	Not known
	Hypolimnetic Iron	0.01	0.13	0.83		Low Iron Levels	Higher than Normal	Not known
	Hypolimnetic Manganese	0.01	0.12	0.60		Low Manganese Levels	Higher than Normal	Not known
Limnological Indicators	Hypolimnetic Phosphorus	0.012	0.045	0.314	0.042	Close to Surface TP Readings	Within Normal Range	Not known
	Nitrate + Nitrite	0.00	0.02	0.20	0.01	Low NOx	Within Normal Range	No Change
	Ammonia	0.00	0.03	0.20	0.08	Low Ammonia	Higher than Normal	No Change
	Total Nitrogen	0.16	0.33	0.63	0.39	Low Total Nitrogen	Within Normal Range	Increasing Slightly
	pH	5.88	7.47	8.69	7.96	Circumneutral	Higher than Normal	No Change
	Specific Conductance	52	116	179	159	Softwater	Higher than Normal	Increasing Significantly
	True Color	1	14	41	11	Intermediate Color	Within Normal Range	No Change
	Calcium	5.3	8.2	9.4	9.1	Not Susceptible to Zebra Mussels	Within Normal Range	No Change
Lake Perception	WQ Assessment	1	1.6	3	2.1	Not Quite Crystal Clear	Less Favorable than Normal	Highly Degrading
	Aquatic Plant Coverage	1	1.4	2	2.0	Plants Not Visible	Less Favorable than Normal	Slightly Improving
	Recreational Assessment	1	1.3	2	1.5	Could Not Be Nicer	Within Normal Range	Highly Degrading
Biological Condition	Phytoplankton					Open water-low blue green algae biomass; Shoreline-high blue green algae in bloom	Not known	Not known
	Macrophytes					Fair quality of the aquatic plant community	Not known	Not known
	Zooplankton					Not measured through CSLAP	Not known	Not known
	Macroinvertebrates					Not measured through CSLAP	Not known	Not known
	Fish					Information not available	Not known	Not known
	Invasive Species					Eurasian watermilfoil	Not known	Not known
Local Climate Change	Air Temperature	13	27.3	34	27.3		Within Normal Range	No Change
	Water Temperature	15	27.2	35	27.2		Within Normal Range	No Change

Category	Indicator	Min	Overall Avg	Max	2015 Avg	Classification	2015 Change?	Long-term Change?
Harmful Algal Blooms	Open Water Phycocyanin	0	29	153	22	Most readings indicate low risk of BGA	Not known	Not known
	Open Water FP Chl.a	1	4	13	3	Few readings indicate high algae levels	Not known	Not known
	Open Water FP BG Chl.a	0	1	8	0	No readings indicate high BGA levels	Not known	Not known
	Open Water Microcystis	<DL	<DL	0.9	<DL	Low to undetectable open water microcystins	Not known	Not known
	Open Water Anatoxin a	<DL	<DL	0.0	<DL	Open water Anatoxin-a at times detectable	Not known	Not known
	Shoreline Phycocyanin					No shoreline blooms sampled for PC	Not known	Not known
	Shoreline FP Chl.a	342.7	342.7	342.7	342.7	All readings indicate very high algae levels	Not known	Not known
	Shoreline FP BG Chl.a	116.6	116.6	116.6	116.6	All readings indicate very high BGA levels	Not known	Not known
	Shoreline Microcystis	<DL	<DL	0.0	<DL	Low to undetectable shoreline microcystins	Not known	Not known
	Shoreline Anatoxin a	<DL	<DL	<DL	<DL	Shoreline bloom Anatoxin-a consistently not detectable	Not known	Not known

Evaluation of Lake Condition Impacts to Lake Uses

Tuxedo Lake is among the lakes listed on the 2008 Priority Waterbody List (PWL) for the Raritan / Lower Hudson River drainage basin, with water supply listed as *threatened*. The PWL listing for Tuxedo Lake is provided in Appendix B.

Potable Water (Drinking Water)

The CSLAP dataset at Tuxedo Lake, including water chemistry data, physical measurements, and volunteer samplers' perception data, is inadequate to evaluate the use of the lake for potable water. The moderate to low algae levels and deepwater anoxia (based on elevated deepwater phosphorus and ammonia readings) suggest that potable water use should be supported but may be impacted by occasionally elevated algae levels (as occurred in 2014) or shoreline blooms (as occurred in 2015).

Public Bathing

The CSLAP dataset at Tuxedo Lake, including water chemistry data, physical measurements, and volunteer samplers' perception data, suggests that public bathing, if conducted at a public swimming beach, should be fully supported. This use, if allowed, could be *threatened* by periodic shoreline algae blooms. Additional information about bacterial levels is needed to evaluate the safety of the water for swimming.

Recreation (Swimming and Non-Contact Uses)

The CSLAP dataset on Tuxedo Lake, including water chemistry data, physical measurements, and volunteer samplers' perception data, suggest that recreation should be fully supported, although this use may be *stressed* by periodic algae blooms driven by occasionally high nutrient levels.

Aquatic Life

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

Aesthetics and Habitat

The CSLAP dataset on Tuxedo Lake, including water chemistry data, physical measurements, and volunteer samplers' perception data, suggest that aesthetics may be *poor* due to excessive weed growth, and habitat may be (only) *fair* due to invasive plants.

Fish Consumption

There are no fish consumption advisories posted for Tuxedo Lake.

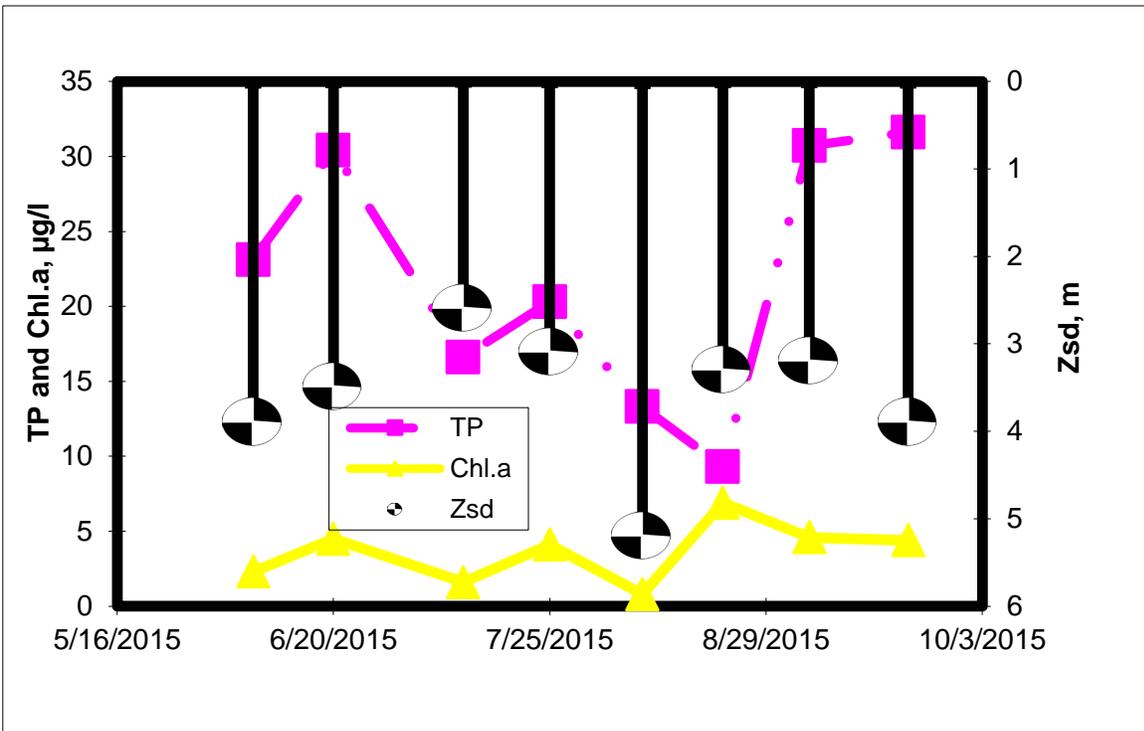
Additional Comments and Recommendations

The lake association is advised to look for any sources of phosphorus and nitrogen that may contribute to higher algae levels (and has resulted in an apparent increase in both nutrients over the last few years). Lake residents and users are advised to report and avoid exposure to any shoreline blooms.

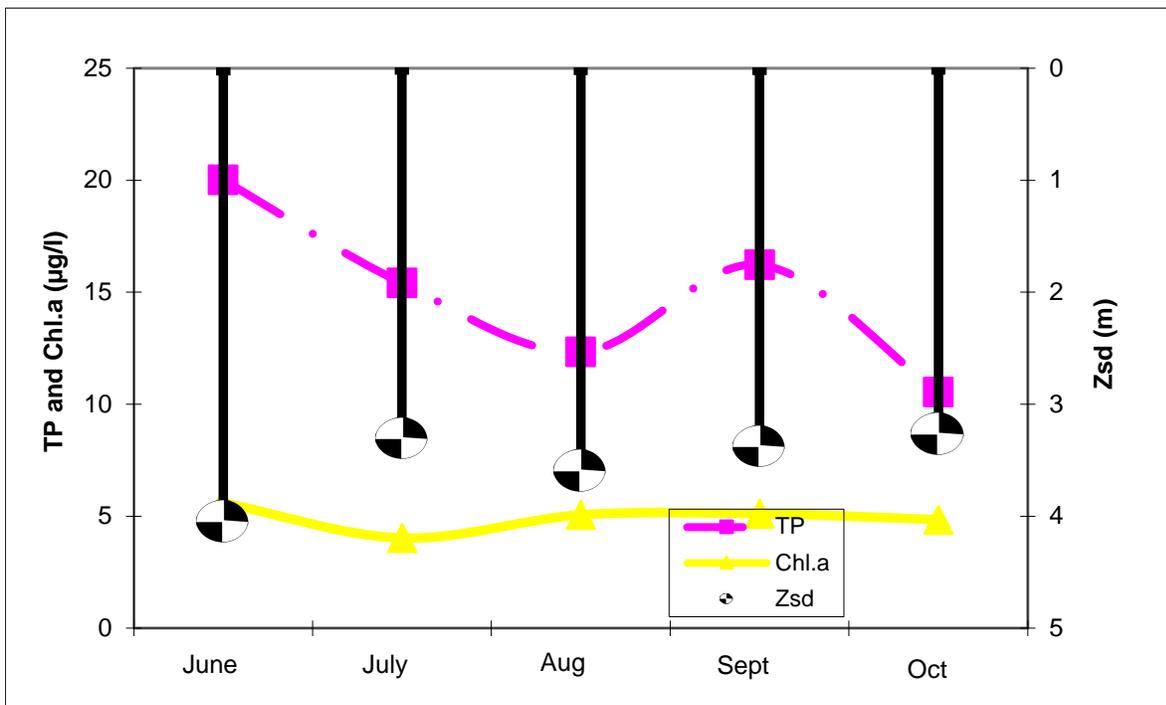
Aquatic Plant IDs-2015

None submitted through CSLAP.

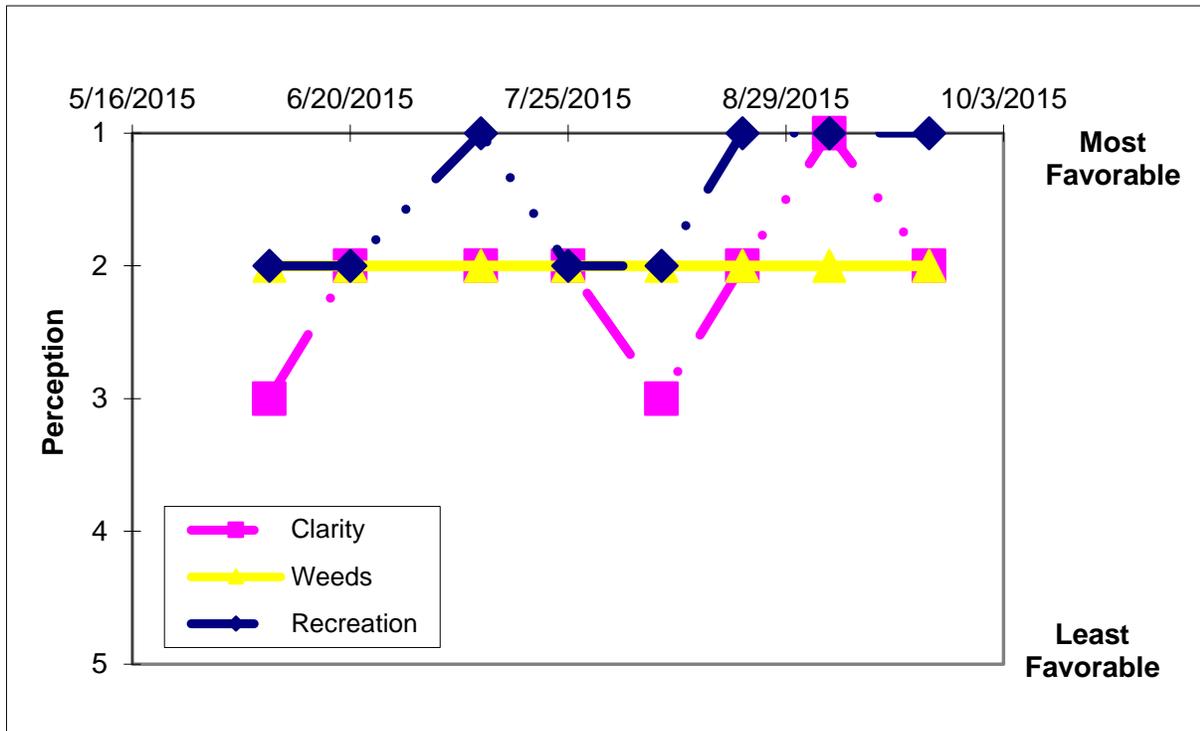
Time Series: Trophic Indicators, 2015



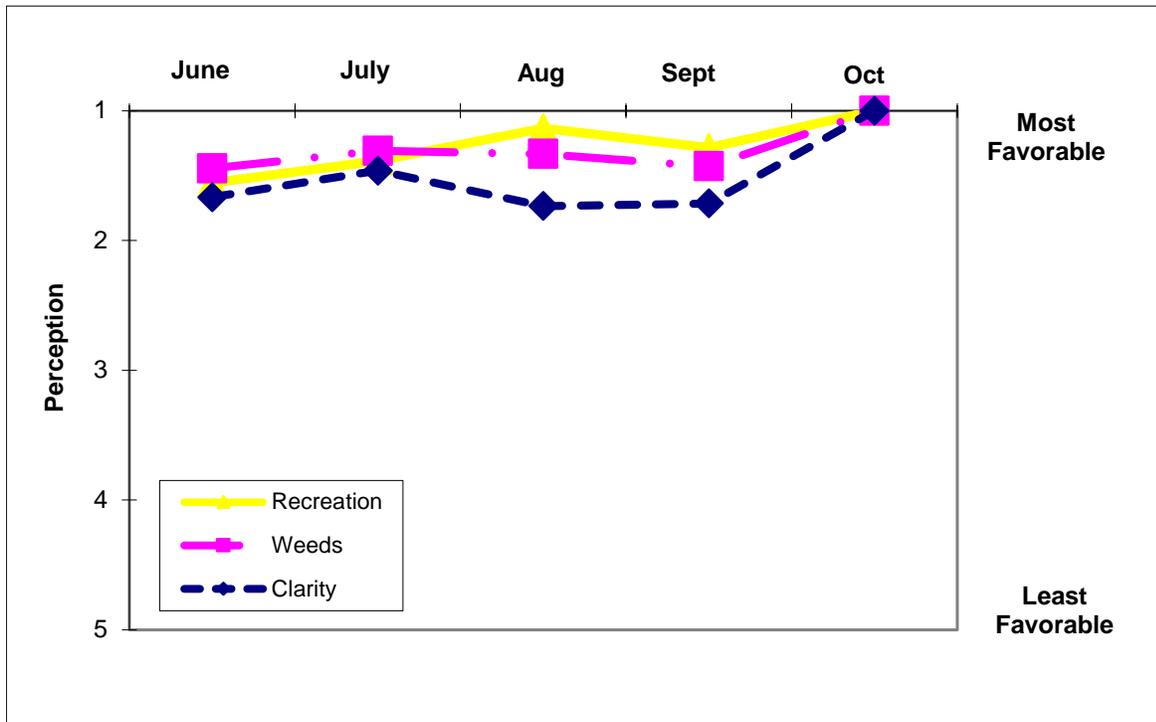
Time Series: Trophic Indicators, Typical Year (2008-2015)



Time Series: Lake Perception Indicators, 2015



Time Series: Lake Perception Indicators, Typical Year (2008-2015)



Appendix A- CSLAP Water Quality Sampling Results for Tuxedo Lake

LNum	PName	Date	Zbot	Zsd	Zsamp	Tot.P	NO3	NH4	TDN	TN/TP	TColor	pH	Cond25	Ca	Chl.a	Cl
222	Tuxedo Lake	7/14/2008				0.012	0.03	0.03	0.19	36.88	10	6.97	116	8.0	2.6	
222	Tuxedo Lake	7/27/2008		4.40	1.5			0.01	0.02	0.32	9	7.31	79		2.9	
222	Tuxedo Lake	8/10/2008		3.95	1.5	0.010	0.01	0.01	0.16	36.15	13	7.28	94		4.8	
222	Tuxedo Lake	8/24/2008	15.0	4.55	1.5	0.008	0.02	0.02	0.22	62.53	1	8.11	86		3.6	
222	Tuxedo Lake	9/7/2008	15+	4.10	1.5	0.008	0.00	0.00	0.21	56.99	8	7.13	107	7.9	4.7	
222	Tuxedo Lake	9/21/2008	15+	4.65	1.5	0.007	0.01	0.02	0.20	62.04	10	8.03	87		3.6	
222	Tuxedo Lake	10/5/2008		3.80	1.5	0.008	0.01	0.00	0.22	59.27	18	7.54	100		3.7	
222	Tuxedo Lake	10/19/2008		3.73	1.5	0.008	0.03	0.01	0.18	51.33	10	7.68	92		4.1	
222	Tuxedo Lake	06/13/2009		4.40	1.5	0.014	0.01	0.01	0.17	26.70	21	6.92	97	8.9	9.24	
222	Tuxedo Lake	06/27/2009	15.0	3.45	1.5	0.016	0.01	0.01	0.25	35.12	20	6.62	97		7.23	
222	Tuxedo Lake	07/11/2009	15.2	3.40	1.5	0.014	0.05	0.02	0.21	34.39	41	7.41	52		2.76	
222	Tuxedo Lake	07/25/2009	15.2	3.33	1.5	0.012	0.03	0.02	0.22	38.85	22	6.89	82		0.10	
222	Tuxedo Lake	08/08/2009	12.5	3.35	1.5	0.014	0.01	0.02	0.49	78.46	30	5.88	93	7.9	3.79	
222	Tuxedo Lake	08/23/2009	15.2	4.15	1.5	0.013	0.11	0.11	0.32	52.60	20	7.06	95		0.20	
222	Tuxedo Lake	09/06/2009	15.2	2.35	1.5	0.017	0.20	0.02	0.27	34.01	35	8.23	86		8.20	
222	Tuxedo Lake	09/20/2009		2.03	1.5	0.018	0.01	0.01			36	7.58	75		6.60	
222	Tuxedo Lake	10/04/2009														
222	Tuxedo Lake	6/20/2010	15.0	4.55	1.5	0.021	0.01	0.02			17	7.29	119	8.8	1.30	
222	Tuxedo Lake	7/4/2010	12.4	4.25	1.5	0.011	0.03	0.02	0.17	33.81	13	8.48	113		1.50	
222	Tuxedo Lake	7/18/2010	12.4	3.75	1.5	0.012	0.02	0.03	0.46	81.74	14	7.79	132		2.40	
222	Tuxedo Lake	8/1/2010	12.5	3.10	1.5	0.012	0.09	0.05	0.41	74.98	19	8.01	124		4.60	
222	Tuxedo Lake	8/14/2010	12.4	3.58	1.5	0.009	0.01	0.01	0.29	71.75	9	7.99	122	9.3	4.90	
222	Tuxedo Lake	8/28/2010	12.5	3.43	1.5	0.012	0.02	0.03	0.62	118.42	8	7.53	124		7.00	
222	Tuxedo Lake	9/11/2010	12.5	4.43	1.5	0.013	0.01	0.02	0.45	76.83	3	8.04	132		7.40	
222	Tuxedo Lake	9/24/2010	12.6	3.95	1.5	0.012	0.02	0.03	0.23	41.78	7	7.07	131		4.10	
222	Tuxedo Lake	10/3/2010														
222	Tuxedo Lake	6/19/2011	16.6	3.20		0.013	0.02	0.03	0.18	31.25	15	6.67	99	7.2	5.30	
222	Tuxedo Lake	7/10/2011	12.5	3.83	1.5	0.015	0.01	0.03	0.28	41.31	10	7.67	119		3.40	
222	Tuxedo Lake	7/24/2011	15.4	4.45	1.5	0.011	0.04	0.03	0.41	82.15	12	7.20	117		3.30	
222	Tuxedo Lake	8/7/2011		2.40	1.5	0.014	0.01	0.02	0.32	49.86	18	6.97	120		8.00	
222	Tuxedo Lake	8/20/2011		3.40	1.5	0.011	0.01	0.01	0.18	36.88	9	7.06	118		5.00	
222	Tuxedo Lake	9/4/2011		3.15	1.5	0.015	0.02	0.07	0.41	59.10	14	7.52	109		6.00	
222	Tuxedo Lake	9/18/2011	12.8	2.20	1.5	0.016	0.01	0.02	0.42	57.44	27	6.73	102			
222	Tuxedo Lake	10/16/2011		2.65	1.5	0.013	0.01	0.02	0.32	52.37	17	6.42	113		4.30	
222	Tuxedo Lake	6/24/2012	12.5	8.50	1.5	0.019	0.11	0.03	0.52	61.51	13	7.78	111	8.5	4.80	
222	Tuxedo Lake	7/8/2012	12.5	1.90	1.5	0.023	0.01	0.02	0.38	36.86	12	8.69	111		9.10	
222	Tuxedo Lake	7/22/2012	12.5	2.85	1.5	0.019	0.01	0.03	0.43	48.45	14	7.42	111		5.20	
222	Tuxedo Lake	8/5/2012	12.5	3.40	1.5	0.014	0.01	0.03	0.28	44.64	13	6.81	112		3.40	
222	Tuxedo Lake	8/18/2012	12.5	4.57	1.5	0.017	0.01	0.02	0.31	39.29	11	8.03	112	9.3	3.90	
222	Tuxedo Lake	9/2/2012	12.5	2.60	1.5	0.017	0.01	0.03	0.31	39.99	10	7.88	112		8.40	
222	Tuxedo Lake	9/15/2012	12.5	2.43	1.5	0.016	0.01	0.03	0.29	39.28	9	7.82	106		6.20	
222	Tuxedo Lake	10/20/2012	12.5	2.90	1.5	0.013	0.01	0.03	0.29	49.94	11	7.74	109		7.30	
222	Tuxedo Lake	6/9/2014	16.0	2.25	1.5	0.020	0.01	0.03	0.28	31.16	11	6.86	120	7.8	7.60	
222	Tuxedo Lake	6/22/2014	15.2	2.70	1.5	0.025			0.47	41.76	12	6.86	128		8.10	
222	Tuxedo Lake	7/7/2014	15.2	2.25	1.5	0.021	0.01	0.03	0.50	53.61	10	7.39	130		9.60	
222	Tuxedo Lake	7/21/2014	13.0	2.90	1.5	0.015			0.41	61.45	8	7.16	127		7.90	
222	Tuxedo Lake	8/4/2014	15.8	2.60	1.5	0.018	0.01	0.03	0.46	55.18	5	7.80	128	5.3	13.60	
222	Tuxedo Lake	8/17/2014	15.9	2.98	1.5	0.012			0.37	67.85	10	7.09	133		5.50	
222	Tuxedo Lake	9/8/2014	16.0	4.03	1.5	0.011	0.01	0.03	0.33	67.64	8	6.97	131		3.40	
222	Tuxedo Lake	9/22/2014	15.9	4.30	1.5	0.014			0.31	49.03	9	7.38	129		4.00	
222	Tuxedo Lake	6/7/2015	15.2	3.90	1.5	0.023	0.01	0.02	0.24	10.17	14	8.24	152	8.8	2.30	
222	Tuxedo Lake	6/20/2015	15.2	3.50	1.5	0.030			0.38	12.63	9	7.28	158		4.50	
222	Tuxedo Lake	7/11/2015	15.5	2.60	1.5	0.017	0.02	0.20	0.63	37.89	11	8.39	154		1.60	29.8
222	Tuxedo Lake	7/25/2015	16.1	3.10	1.5	0.020			0.49	24.33	14	7.25	160		4.10	
222	Tuxedo Lake	7/25/2015														
222	Tuxedo Lake	8/9/2015	17.0	5.20	1.5	0.013	0.01	0.04	0.43	32.26	13	8.65	179	9.4	0.80	
222	Tuxedo Lake	8/22/2015	15.2	3.30	1.5	0.009			0.41	43.66	8	7.46	161		6.90	
222	Tuxedo Lake	9/5/2015	15.5	3.20	1.5	0.031	0.01	0.08	0.25	8.24	10	7.99	144		4.60	31.1
222	Tuxedo Lake	9/21/2015	50.0	3.90	1.5	0.032			0.33	10.38	5	8.43	167		4.40	
LNum	PName	Date	Zbot	Zsd	Zsamp	Tot.P	NO3	NH4				NO2	Fe	Mn	As	
222	Tuxedo Lake	08/08/2009				12.5	0.041	0.10					0.10	0.12		
222	Tuxedo Lake	08/23/2009					0.014									
222	Tuxedo Lake	09/06/2009					0.314	0.56					0.10	0.10		
222	Tuxedo Lake	09/20/2009					0.179						0.83	0.10		
222	Tuxedo Lake	6/20/2010	15.0		15.0	0.052		0.21								
222	Tuxedo Lake	7/18/2010	12.4		12.4	0.026		0.06								
222	Tuxedo Lake	8/1/2010	12.5										0.03	0.23		
222	Tuxedo Lake	8/14/2010	12.4		12.4	0.013		0.04					0.03			
222	Tuxedo Lake	8/28/2010	12.5												0.70	
222	Tuxedo Lake	9/11/2010	12.5		12.5	0.086		0.39					0.38	0.60		
222	Tuxedo Lake	6/19/2011				0.022		0.17					0.01	0.10		
222	Tuxedo Lake	7/24/2011				0.012		0.09					0.01	0.01		

LNum	PName	Date	Zbot	Zsd	Zsamp	Tot.P	NO3	NH4				NO2	Fe	Mn	As
222	Tuxedo Lake	8/20/2011				0.019		0.05							0.50
222	Tuxedo Lake	9/18/2011				0.015		0.03					0.01	0.01	0.50
222	Tuxedo Lake	6/24/2012				0.020		0.06							
222	Tuxedo Lake	7/8/2012											0.03	0.02	
222	Tuxedo Lake	7/22/2012				0.021		0.04							
222	Tuxedo Lake	8/18/2012				0.019		0.02							
222	Tuxedo Lake	9/2/2012											0.03	0.02	0.50
222	Tuxedo Lake	9/15/2012				0.018		0.04							
222	Tuxedo Lake	10/20/2012											0.03	0.02	1.00
222	Tuxedo Lake	6/9/2014			12.0	0.026		0.16							
222	Tuxedo Lake	6/22/2014			13.7	0.018									
222	Tuxedo Lake	7/7/2014			13.7	0.034		0.15							
222	Tuxedo Lake	7/21/2014			12.0	0.024									
222	Tuxedo Lake	8/4/2014			14.0	0.032		0.15							
222	Tuxedo Lake	8/17/2014			13.7	0.059									
222	Tuxedo Lake	9/8/2014			14.0	0.021		0.28							
222	Tuxedo Lake	9/22/2014			14.0	0.018									
222	Tuxedo Lake	6/7/2015													
222	Tuxedo Lake	6/20/2015			13.7	0.050									
222	Tuxedo Lake	7/11/2015			14.0	0.013		0.06							
222	Tuxedo Lake	7/25/2015			14.6	0.071									
222	Tuxedo Lake	8/9/2015			12.0	0.052		0.08							
222	Tuxedo Lake	8/22/2015			12.5	0.050									
222	Tuxedo Lake	9/5/2015			12.6	0.044		0.09							
222	Tuxedo Lake	9/20/2015			13.7	0.018									

LNum	PName	Date	Type	TAir	TH20	QA	QB	QC	QD	QE	QF	QG	AQ-PC	AQ-Chla	MC-LR	Ana-a	Cyl	FP-Chl	FP-BG	HAB form
222	Tuxedo L	7/14/2008	epi																	
222	Tuxedo L	7/27/2008	epi	24	27	1	1	1	0											
222	Tuxedo L	8/10/2008	epi	28	26	2	1	1	5											
222	Tuxedo L	8/24/2008	epi	24	26	2	1	1	0											
222	Tuxedo L	9/7/2008	epi	25	25	1	1	1	0											
222	Tuxedo L	9/21/2008	epi	27	23	1	1	1	0											
222	Tuxedo L	10/5/2008	epi	19	19	1	1	1	0											
222	Tuxedo L	10/19/2008	epi	13	15	1	1	1	0											
222	Tuxedo L	06/13/2009	epi	22	24	1	1	1	0											
222	Tuxedo L	06/27/2009	epi	26	29	1	1	1	0											
222	Tuxedo L	07/11/2009	epi	28	27	1	1	1	3											
222	Tuxedo L	07/25/2009	epi	31	28	1	1	1	0											
222	Tuxedo L	08/08/2009	epi	25	27	1	1	1	0						0.00					
222	Tuxedo L	08/23/2009	epi	32	31	1	2	1	8											
222	Tuxedo L	09/06/2009	epi	26	27	2	1	2	18				78.38		0.00					
222	Tuxedo L	09/20/2009	epi	26	26	2	2	1					153.2							
222	Tuxedo L	10/04/2009	epi												0.00					
222	Tuxedo L	6/20/2010	epi	30	28	1	1	1	0	0	0									
222	Tuxedo L	7/4/2010	epi	34	30	1	1	1	0	0	0									
222	Tuxedo L	7/18/2010	epi	34	35	1	1	2	0	0	0									
222	Tuxedo L	8/1/2010	epi	27	30	1	1	1	0	0	0	42.00		0.56						
222	Tuxedo L	8/14/2010	epi	26	29	2	1	1	1	0	0	70.00								
222	Tuxedo L	8/28/2010	epi	30	28	2	1	1	0	0	0	56.00								
222	Tuxedo L	9/11/2010	epi	28	25	2	1	1	0	0	0	70.00		0.33						
222	Tuxedo L	9/24/2010	epi	30	25	2	1	2	0	0	0									
222	Tuxedo L	10/3/2010	epi									56.00		0.00						
222	Tuxedo L	6/19/2011	epi	29		1	1	1	0	0	0	6.50	1.30							
222	Tuxedo L	7/10/2011	epi	31	31	1	1	1	0	0	0	8.00	2.30							
222	Tuxedo L	7/24/2011	epi	30	32	1	1	1	0	0	0	17.20	1.80							
222	Tuxedo L	8/7/2011	epi	31	32	2	1	2	0	0	0	18.20	3.70							
222	Tuxedo L	8/7/2011	bloom												0.00					
222	Tuxedo L	8/20/2011	epi	31	31	2	1	1	0	0	0	19.80	3.90							
222	Tuxedo L	9/4/2011	epi	31	29	1	1	1	0	0	0	37.90	4.80							
222	Tuxedo L	9/18/2011	bloom												0.00					
222	Tuxedo L	10/15/2011	bloom												0.00					
222	Tuxedo L	9/18/2011	epi	24	24	2	1	1	0	0	0	110.60	8.10							
222	Tuxedo L	10/16/2011	epi	21	21				5	0	0	27.50	4.30							
222	Tuxedo L	6/24/2012	epi	29	30	2	1	2	0	7		0.80	1.30	<0.30	<0.428		1.75	1.06		l
222	Tuxedo L	7/8/2012	epi	33	32	2	1	2	8	4	4	4.30	1.30	<0.30	<0.423		2.82	1.01		l
222	Tuxedo L	7/22/2012	epi	30	28	2	1	1	8	0	7	2.60	0.80				3.54	0.97		l
222	Tuxedo L	8/5/2012	epi	32	31	1	1	1	0	0	0	4.50	0.50	<0.30	<0.330		2.54	0.83		l
222	Tuxedo L	8/18/2012	epi	29	29	1	2	1	0	0	0	7.80	0.80	0.36	<0.223		3.18	1.89		
222	Tuxedo L	9/2/2012	epi	31	30	2	2	2	0	0	0	22.80	0.60	<0.30	<0.580		4.70	3.42		
222	Tuxedo L	9/15/2012	epi	26	26	2	1	1	0	0	0	7.40	0.40	0.53	<3.205		1.35	0.83		
222	Tuxedo L	10/20/2012	epi	24	26	1	1	1	0	0	0	16.90	1.10	<0.30	<3.205		5.61	0.72		
222	Tuxedo L	6/9/2014	epi	22	25	1	1	1	0	0	0	0.60	3.10	<1.83	<0.17	<0.001	2.19	0.00		i
222	Tuxedo L	6/22/2014	epi	28	27	2	2	2	5	5	5	20.60	0.30	<0.58	<0.44	<0.002	4.16	3.19		h
222	Tuxedo L	7/7/2014	epi	32	28	2	2	2	8	57	57	36.00	0.70	<0.40	<0.48	<0.001	12.55	7.87		h
222	Tuxedo L	7/21/2014	epi	25	26	2	2	2	0	0	0	25.80	0.40	<0.39	<0.24	<0.002	4.99	3.09		i

LNum	PName	Date	Type	TAir	TH20	QA	QB	QC	QD	QF	QG	AQ-PC	AQ-Chla	MC-LR	Ana-a	Cyl	FP-Chl	FP-BG	HAB form
222	Tuxedo L	8/4/2014	epi	27	27	2	2	2	0	0	0	32.20	0.60	<0.33	<0.24	<0.002	6.19	4.04	f
222	Tuxedo L	8/17/2014	epi	22	26	3	2	1	0	45	0	13.90	0.50	<0.42	<0.10	<0.002	3.89	1.10	f
222	Tuxedo L	9/8/2014	epi	25	25	1	1	1	0	7	4	8.20	0.30	<0.64	<0.03	<0.001	2.46	0.93	
222	Tuxedo L	9/22/2014	epi	23	24	2	2	2	0	0	0	4.60	0.40	<0.48	<0.04	<0.001	2.21	0.00	f
222	Tuxedo L	6/7/2015	epi	28	26	3	2	2	0	0	0	5.00	0.90	<0.77	<0.126	<1.739	2.07	0.00	F
222	Tuxedo L	6/20/2015	epi	22	26	2	2	2	5	0	0	16.10	0.80	<0.55	<0.004	<0.024	3.29	0.84	F
222	Tuxedo L	7/11/2015	epi	32	28	2	2	1	0	0	4	6.90	0.50	<1.01	<0.003	<0.011	2.00	0.00	l
222	Tuxedo L	7/25/2015	epi	32	31	2	2	2	8	4	0	5.50	0.90	<0.30	<0.002	<0.014	4.30	0.00	F
222	Tuxedo L	7/25/2015	epi											<0.46	<0.007	<0.037	342.73	116.55	d
222	Tuxedo L	8/9/2015	epi	22	27	3	2	2	0	0	0	0.05	0.60	<1.13	<0.002	<0.014	1.19	0.00	F
222	Tuxedo L	8/22/2015	epi	31	30	2	2	1	0	7	7	110.30	1.70	<0.33	<0.006	<0.024	1.83	0.00	F
222	Tuxedo L	9/5/2015	epi	32	29	1	2	1	8	0	0			<0.26	0.00	<0.086	3.08	1.23	l
222	Tuxedo L	9/21/2015	epi	28	27	2	2	1	8	0	0	9.90	0.20	<0.30	<0.007	<0.035	2.49	0.56	l
222	Tuxedo L	6/9/2014	hypo		11														
222	Tuxedo L	6/22/2014	hypo		19														
222	Tuxedo L	7/7/2014	hypo		14														
222	Tuxedo L	7/21/2014	hypo		7														
222	Tuxedo L	8/4/2014	hypo		14														
222	Tuxedo L	8/17/2014	hypo		16														
222	Tuxedo L	9/8/2014	hypo		16														
222	Tuxedo L	9/22/2014	hypo		13														
222	Tuxedo L	6/20/2015	hypo		12														
222	Tuxedo L	7/11/2015	hypo		13														
222	Tuxedo L	7/25/2015	hypo		14														
222	Tuxedo L	8/9/2015	hypo		18														
222	Tuxedo L	8/22/2015	hypo		20														
222	Tuxedo L	9/5/2015	hypo		14														
222	Tuxedo L	9/20/2015	hypo		15														
222	Tuxedo L	6/9/2014	hypo		11														
222	Tuxedo L	6/22/2014	hypo		19														
222	Tuxedo L	7/7/2014	hypo		14														
222	Tuxedo L	7/21/2014	hypo		7														
222	Tuxedo L	8/4/2014	hypo		14														

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 B- Priority Waterbody Listing for Tuxedo Lake

Tuxedo Lake (1501-0050)

Threat(Poss)

Waterbody Location Information

Revised: 07/14/2008

Water Index No:	NJ-12-15-P1007	Drain Basin:	Hackensack-Ramapo Rivers
Hydro Unit Code:	02030103/080	Str Class:	AA(T)
Waterbody Type:	Lake	Reg/County:	3/Orange Co. (36)
Waterbody Size:	290.9 Acres	Quad Map:	SLOATSBURG (Q-24-1)
Seg Description:	entire lake		

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

Use(s) Impacted	Severity	Problem Documentation
Water Supply	Threatened	Possible

Type of Pollutant(s)

Known: ---
 Suspected: ---
 Possible: OTHER POLLUTANTS

Source(s) of Pollutant(s)

Known: ---
 Suspected: ---
 Possible: OTHER SOURCE (unspecified)

Resolution/Management Information

Issue Resolvability:	3 (Strategy Being Implemented)	
Verification Status:	5 (Management Strategy has been Developed)	
Lead Agency/Office:	ext/WQCC	Resolution Potential: High
TMDL/303d Status:	n/a	

Further Details

Overview

Water supply use of Tuxedo Lake may experience threats from various pollutants attributed to urban/stormwater runoff and other nonpoint sources.

NYSDOH Source Water Assessment

The NYSDOH Source Water Assessment Program (SWAP) compiles, organizes, and evaluates information regarding possible and actual threats to the quality of public water supply (PWS) sources. The information contained in SWAP assessment reports assists in the oversight and protection of public water systems. It is important to note that SWAP reports estimate the potential for untreated drinking water sources to be impacted by contamination. These reports do not address the safety or quality of treated finished potable tap water. This water supply reservoir provides water to Tuxedo Park Village. This assessment found a moderate susceptibility to contamination for this source of drinking water. Land cover and its associated activities within the assessment area does not increase the potential for contamination. Non-sanitary wastewater discharges may contribute to contamination, but there are no noteworthy contamination threats associated with other discrete contaminant sources. (NYSDOH, Source Water Assessment Program, 2005)

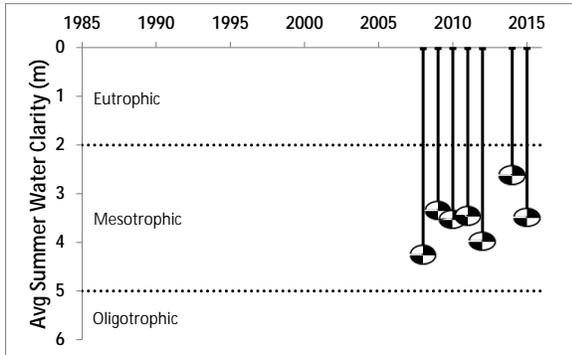
Drinking Water Protection

The designation of this waterbody as a threatened water is reflective of a need to protect its particular resource value, rather than specifically identified threats. Although there are no specific water quality impacts, the segment is considered a highly valued water resource due to its [drinking water supply classification as a AA(T) water. The inclusion of this waterbody on the DEC/DOW Priority Waterbodies List as a Threatened water is a reflection of the particular resource value reflected in this designation and the need to provide additional protection, rather than any specifically identified threats.

Appendix C- Long Term Trends: Tuxedo Lake

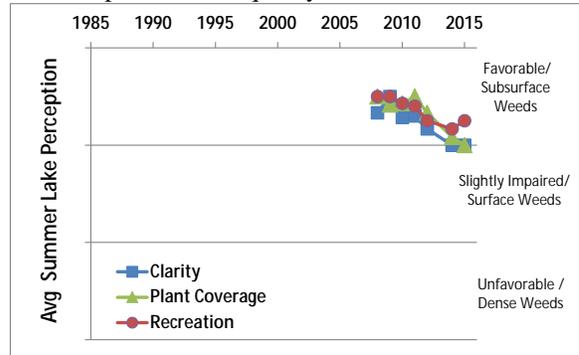
Long Term Trends: Water Clarity

- Decreasing since mid-2000s
- Most readings typical of *mesotrophic* lakes



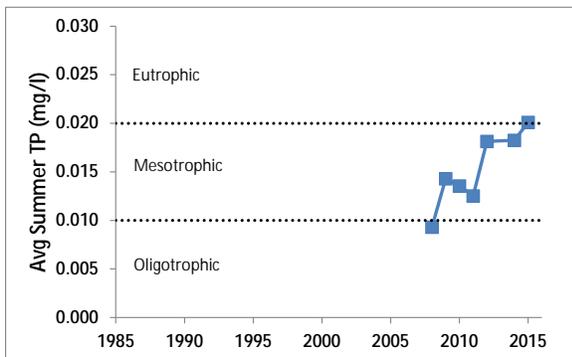
Long Term Trends: Lake Perception

- Rec and WQ assessment degrading, plants ↑
- Recreational perception may be connected in part to water quality and weeds



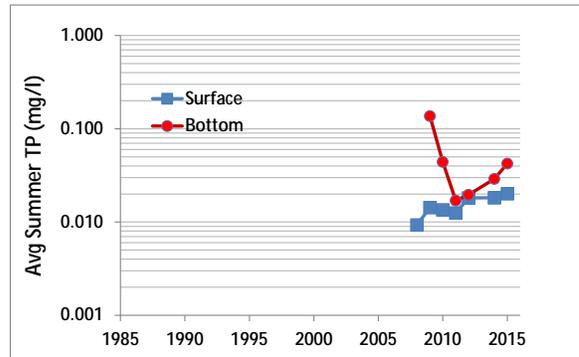
Long Term Trends: Phosphorus

- Increase since 2008
- Most readings typical of *mesotrophic* lakes



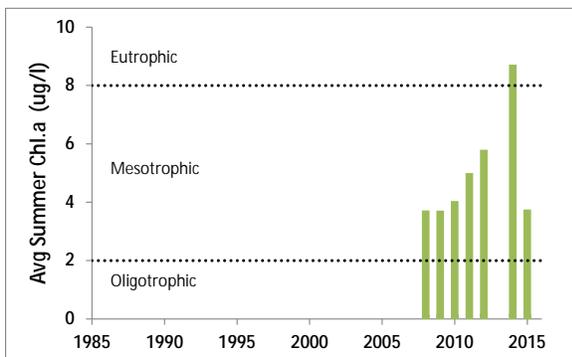
Long Term Trends: Bottom Phosphorus

- Usually close to surface P; some high values
- At least occasional differences suggest strong thermal stratification



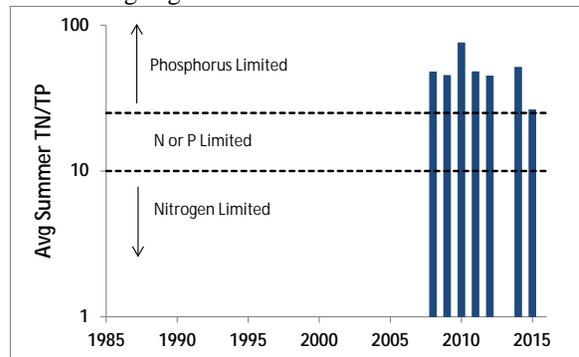
Long Term Trends: Chlorophyll a

- ↑ roughly parallels TP rise (but lower in '15)
- Most readings typical of *mesotrophic* lakes



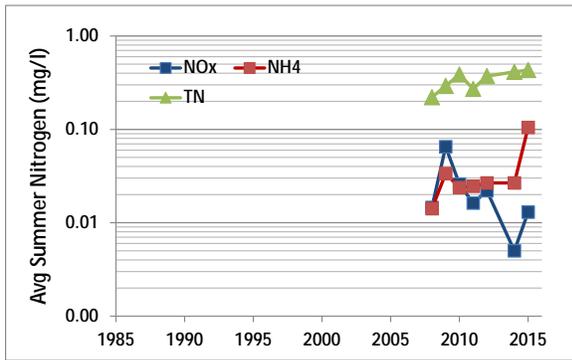
Long Term Trends: N:P Ratio

- Slight decrease
- Most readings indicate phosphorus limits algae growth



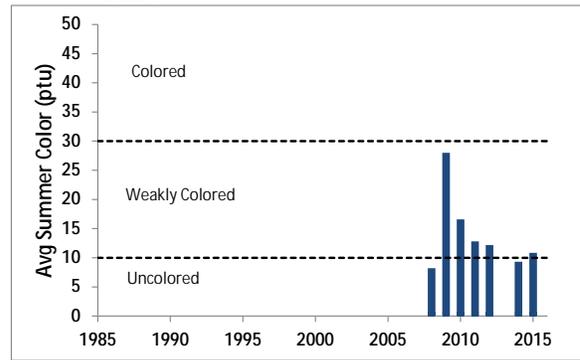
Long Term Trends: Nitrogen

- Increasing TN and NH₄, decreasing NO_x
- Low nitrate, ammonia and total nitrogen



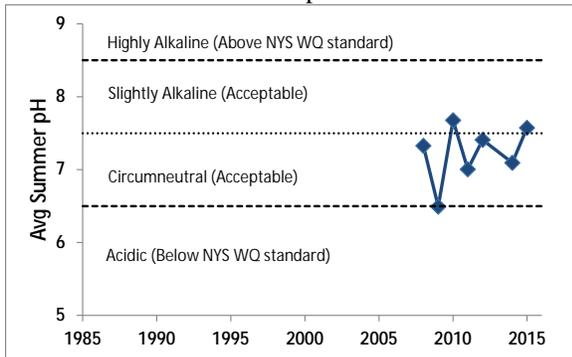
Long Term Trends: Color

- Recent ↓ in color likely normal change
- Most readings typical of *weakly colored* lakes



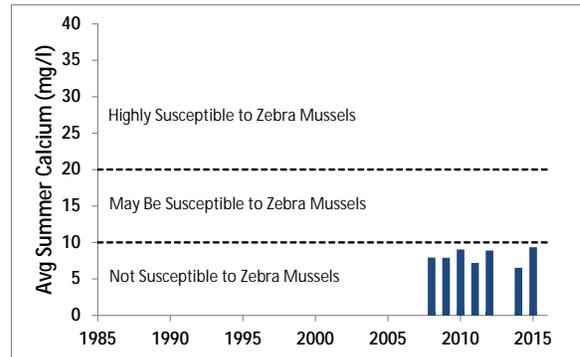
Long Term Trends: pH

- Slight increase since late 2000s
- Most readings typical of *circumneutral* lakes, but occasional low pH



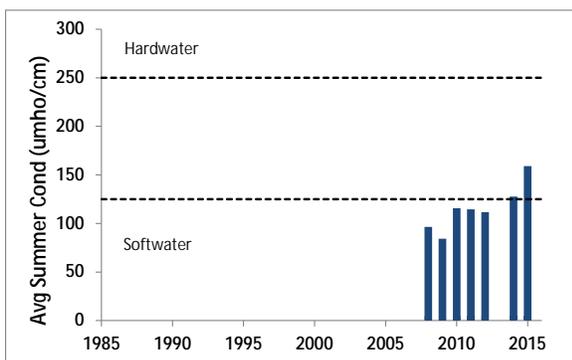
Long Term Trends: Calcium

- No long term trend
- Most readings indicate low susceptibility to zebra mussels



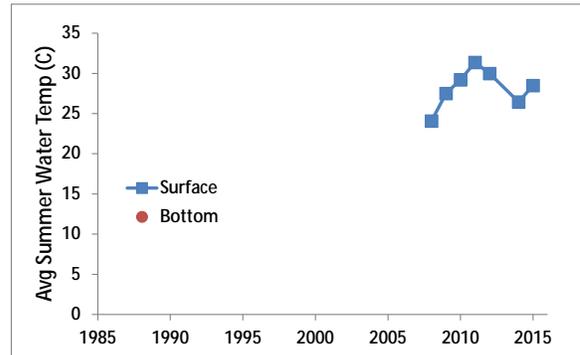
Long Term Trends: Conductivity

- Increasing conductivity since late 2000s
- Most readings typical of *softwater* lakes



Long Term Trends: Water Temperature

- Water temperature appears to be increasing
- No deepwater temperature readings available



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.

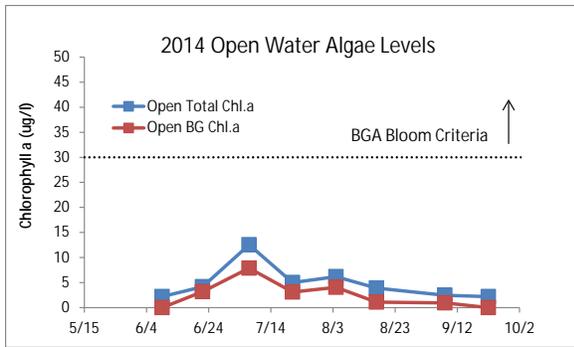


Figure D1:
2014 Open Water Total and BGA Chl.a

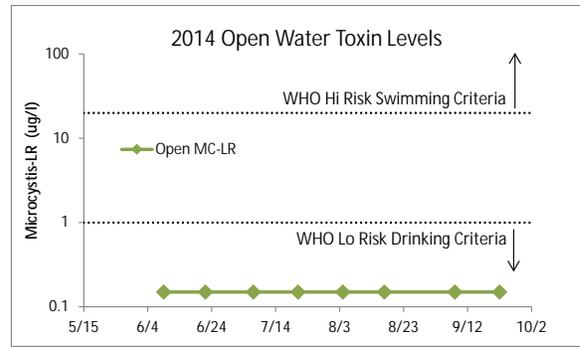


Figure D2:
2014 Open Water Microcystin-LR

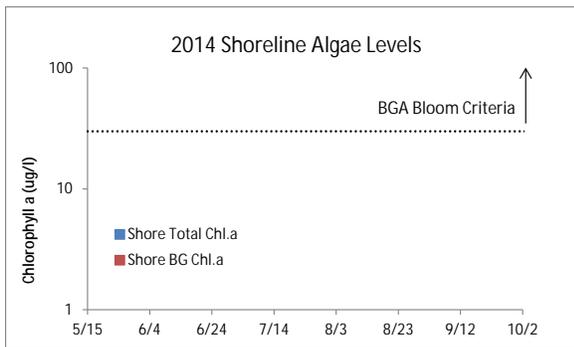


Figure D3:
2014 Shoreline Total and BGA Chl.a

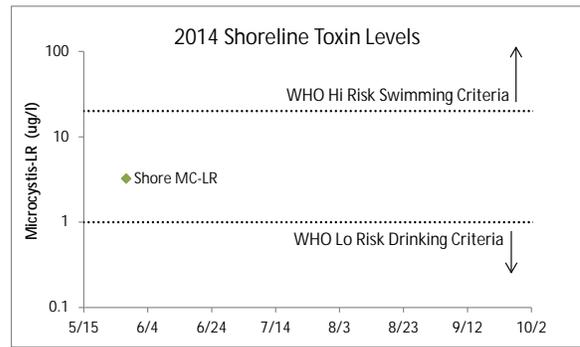


Figure D4:
2014 Shoreline Microcystin-LR

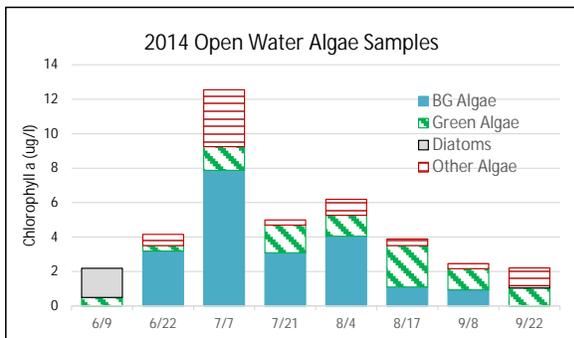


Figure D5:
2014 Open Water Algae Types

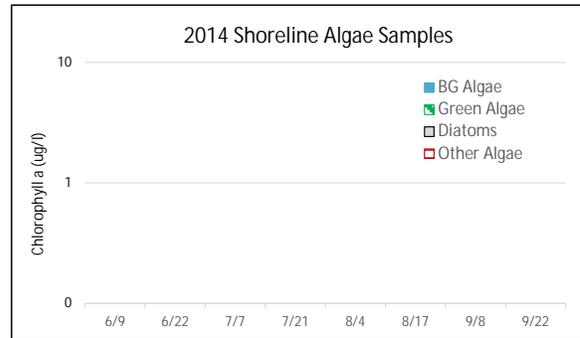


Figure D6:
2014 Shoreline Algae Types

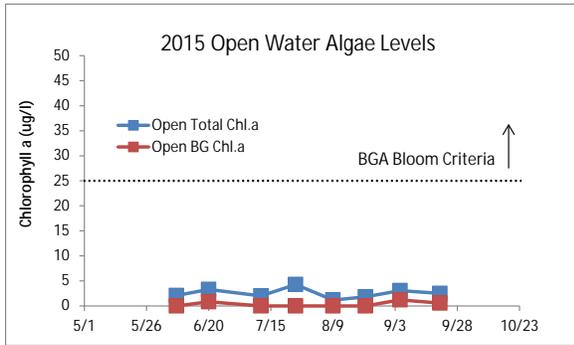


Figure D7:
2015 Open Water Total and BGA Chl.a

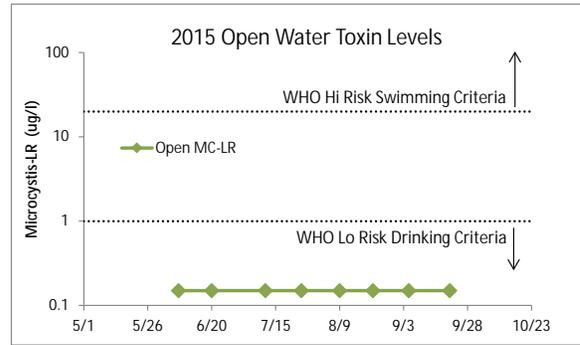


Figure D8:
2015 Open Water Microcystin-LR

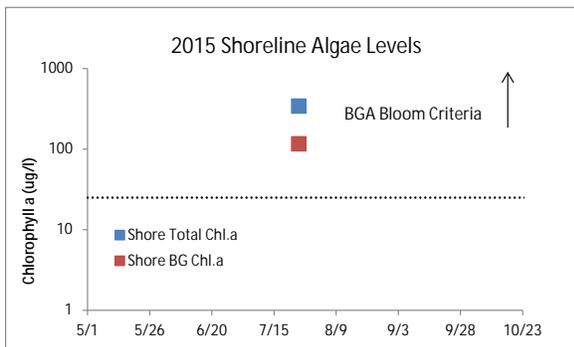


Figure D9:
2015 Shoreline Total and BGA Chl.a

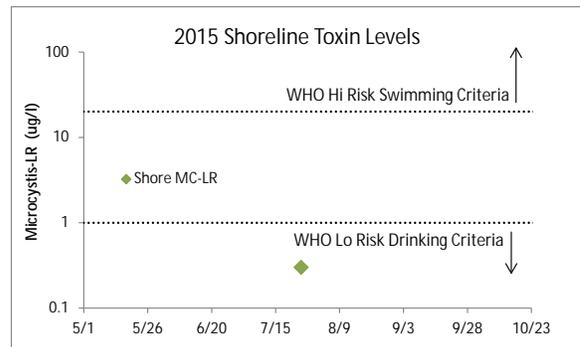


Figure D10:
2015 Shoreline Microcystin-LR

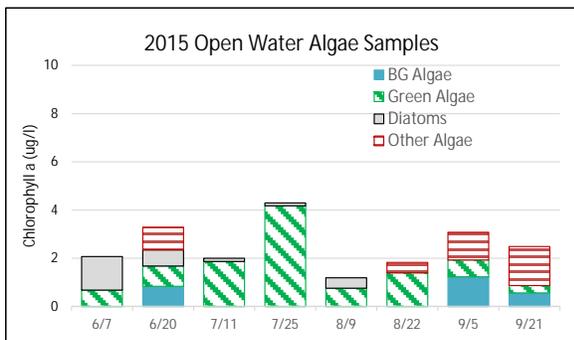


Figure D11:
2015 Open Water Algae Types

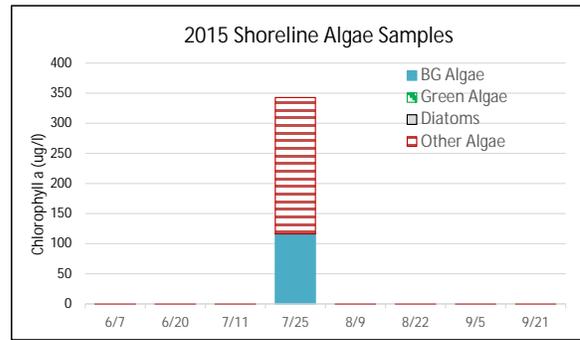


Figure D12:
2015 Shoreline Algae Types

Appendix E: AIS Species in Orange County

The table below shows the invasive aquatic plants and animals that have been documented in Orange 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 - Orange County			
Waterbody	Kingdom	Common name	Scientific name
Beaver Dam Lake	Plant	Eurasian watermilfoil	<i>Myriophyllum spicatum</i>
Beaver Dam Lake	Plant	Curly leafed pondweed	<i>Potamogeton crispus</i>
Beaver Dam Lake	Plant	Water chestnut	<i>Trapa natans</i>
Big Pond	Plant	Waterwheel plant	<i>Aldrovanda vesiculosa</i>
Brooks Lake	Plant	Eurasian watermilfoil	<i>Myriophyllum spicatum</i>
Brooks Lake	Plant	Brittle naiad	<i>Najas minor</i>
Brooks Lake	Plant	Curly leafed pondweed	<i>Potamogeton crispus</i>
Browns Pond	Plant	Eurasian watermilfoil	<i>Myriophyllum spicatum</i>
Browns Pond	Plant	Curly leafed pondweed	<i>Potamogeton crispus</i>
Chaddwick Lake	Plant	Eurasian watermilfoil	<i>Myriophyllum spicatum</i>
Chaddwick Lake	Plant	Curly leafed pondweed	<i>Potamogeton crispus</i>
Chaddwick Lake	Plant	Water chestnut	<i>Trapa natans</i>
Creamery Pond	Plant	Hydrilla	<i>Hydrilla verticillata</i>
Creamery Pond	Plant	Curly leafed pondweed	<i>Potamogeton crispus</i>
Glenmere Lake	Plant	Eurasian watermilfoil	<i>Myriophyllum spicatum</i>
Greenwood Lake	Plant	Eurasian watermilfoil	<i>Myriophyllum spicatum</i>
Guymard Lake	Plant	Brazilian elodea	<i>Egeria densa</i>
Hudson River	Animal	Zebra mussel	<i>Dreissena polymorpha</i>
Hudson River	Plant	Water chestnut	<i>Trapa natans</i>
Lake Kanawauke	Plant	Fanwort	<i>Cabomba caroliniana</i>
Lake Kanawauke	Plant	Variable watermilfoil	<i>Myriophyllum heterophyllum</i>
Lake Kanawauke	Plant	Eurasian watermilfoil	<i>Myriophyllum spicatum</i>
Lake Nawahunta	Plant	Variable watermilfoil	<i>Myriophyllum heterophyllum</i>
Lake Sapphire	Plant	Brazilian elodea	<i>Egeria densa</i>
Lake Sapphire	Plant	Eurasian watermilfoil	<i>Myriophyllum spicatum</i>

Waterbody	Kingdom	Common name	Scientific name
Lake Sapphire	Plant	Curly leafed pondweed	<i>Potamogeton crispus</i>
Lake Skannatati	Plant	Fanwort	<i>Cabomba caroliniana</i>
Lake Skannatati	Plant	Variable watermilfoil	<i>Myriophyllum heterophyllum</i>
Lake Stahahe	Plant	Brazilian elodea	<i>Egeria densa</i>
Lake Stahahe	Plant	Variable watermilfoil	<i>Myriophyllum heterophyllum</i>
Lake Stahahe	Plant	Eurasian watermilfoil	<i>Myriophyllum spicatum</i>
Lake Stahahe	Plant	Curly leafed pondweed	<i>Potamogeton crispus</i>
Lake Tiorati	Plant	Fanwort	<i>Cabomba caroliniana</i>
Lake Tiorati	Plant	Variable watermilfoil	<i>Myriophyllum heterophyllum</i>
Lake Tiorati	Animal	Red-eared slider turtle	<i>Trachemys scripta elegans</i>
Lake Washington	Plant	Curly leafed pondweed	<i>Potamogeton crispus</i>
Little Long Pond	Plant	Fanwort	<i>Cabomba caroliniana</i>
Little We Wah Lake	Plant	Eurasian watermilfoil	<i>Myriophyllum spicatum</i>
Lower Twin Lake	Plant	Variable watermilfoil	<i>Myriophyllum heterophyllum</i>
Martin Lake	Plant	Fanwort	<i>Cabomba caroliniana</i>
Merriewold Lake	Plant	Eurasian watermilfoil	<i>Myriophyllum spicatum</i>
Merriewold Lake	Plant	Curly leafed pondweed	<i>Potamogeton crispus</i>
Merriewold Lake	Plant	Water chestnut	<i>Trapa natans</i>
Mombasha Lake	Plant	Curly leafed pondweed	<i>Potamogeton crispus</i>
Monroe Ponds	Plant	Eurasian watermilfoil	<i>Myriophyllum spicatum</i>
Monroe Ponds	Plant	Brittle naiad	<i>Najas minor</i>
Monroe Ponds	Plant	Curly leafed pondweed	<i>Potamogeton crispus</i>
Monroe Ponds	Plant	Water chestnut	<i>Trapa natans</i>
Muchattoes Lake	Plant	Water chestnut	<i>Trapa natans</i>
North Laurel Pond	Plant	Eurasian watermilfoil	<i>Myriophyllum spicatum</i>
Orange Lake	Plant	Eurasian watermilfoil	<i>Myriophyllum spicatum</i>
Orange-Rockland Lake	Plant	Curly leafed pondweed	<i>Potamogeton crispus</i>
Orange-Rockland Lake	Plant	Water chestnut	<i>Trapa natans</i>
Queensboro Lake	Plant	Water chestnut	<i>Trapa natans</i>
Ramapo River - Harriman SP	Animal	Asian Clam	<i>Corbicula fluminea</i>
Ridgebury Lake	Animal	Northern snakehead	<i>Channa argus</i>
Round Lake	Plant	Eurasian watermilfoil	<i>Myriophyllum spicatum</i>
Round Lake	Animal	Rusty crayfish	<i>Orconectes rusticus</i>
Round Lake	Plant	Curly leafed pondweed	<i>Potamogeton crispus</i>
Round Lake	Plant	Water chestnut	<i>Trapa natans</i>
Silver Mine Lake	Plant	Variable watermilfoil	<i>Myriophyllum heterophyllum</i>
Silver Mine Lake	Plant	Eurasian watermilfoil	<i>Myriophyllum spicatum</i>
Silver Mine Lake	Animal	Virile crayfish	<i>Orconectes virilis</i>
Silver Mine Lake	Plant	Water chestnut	<i>Trapa natans</i>
Summit Lake	Plant	Variable watermilfoil	<i>Myriophyllum heterophyllum</i>
Summit Lake	Plant	Eurasian watermilfoil	<i>Myriophyllum spicatum</i>
Tamms Pond	Plant	Curly leafed pondweed	<i>Potamogeton crispus</i>

Waterbody	Kingdom	Common name	Scientific name
Tomahawk Lake	Plant	Water chestnut	<i>Trapa natans</i>
Tuxedo Lake	Plant	Eurasian watermilfoil	<i>Myriophyllum spicatum</i>
Upper Lake Cohasset	Plant	Variable watermilfoil	<i>Myriophyllum heterophyllum</i>
Upper Pound Swamp	Plant	Fanwort	<i>Cabomba caroliniana</i>
Upper Pound Swamp	Plant	Variable watermilfoil	<i>Myriophyllum heterophyllum</i>
Walkill River	Plant	Curly leafed pondweed	<i>Potamogeton crispus</i>

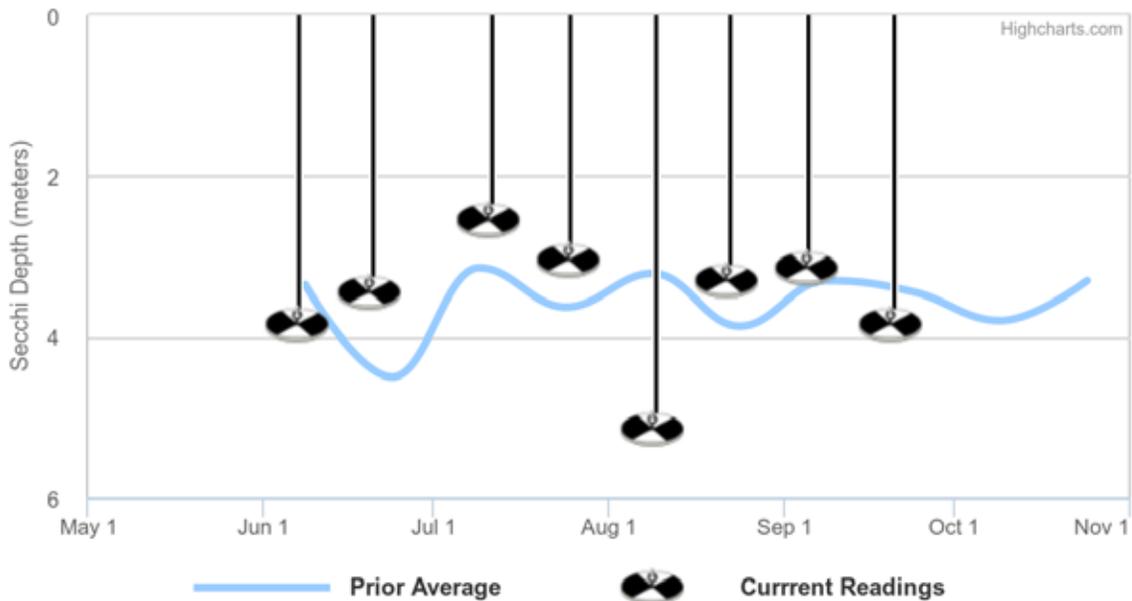
Appendix F: Current Year vs. Prior Averages for Tuxedo Lake

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 2008 to 2014. There are not enough deep 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



This year's session Secchi readings are tending to be higher than normal when compared to the average of readings collected from 2008 to 2014

Appendix G: Watershed and Land Use Map for Tuxedo 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.

