Roaring Brook Lake Questions and Answers, 2015 CSLAP

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

A1. Conditions in Roaring Brook Lake were less favorable in 2015. Water clarity was lower than usual in 2015, and shoreline blue green algae blooms were reported at several times and locations. This may have been consistent with higher phosphorus readings, although overall (open water) algae levels were close to normal.

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

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

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

A3. Roaring Brook Lake had similar to slightly higher water clarity, and similar to slightly lower algae and nutrient readings, than the typical nearby lake. Plant coverage was higher than usual but lower than in nearby lakes in 2015.

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

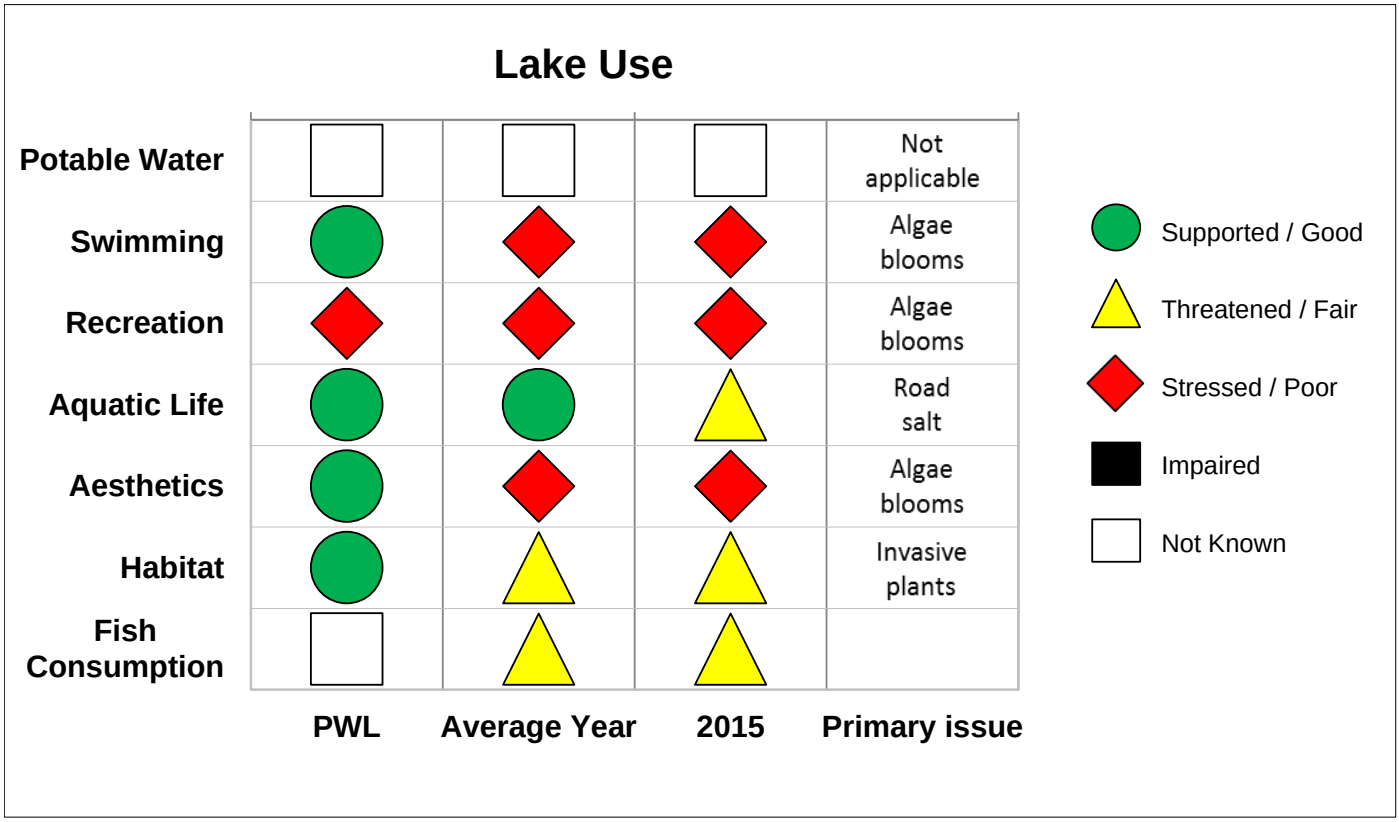
A4. Lake conditions have degraded slightly since 2012- water clarity has decreased as algae levels have increased. This has been coincident with higher total nitrogen, ammonia, conductivity, and water temperatures over the same period, although this dataset is too small to determine if this is part of a long-term trend or normal variability.

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

A5. Roaring Brook Lake is susceptible to shoreline blue green algae blooms, although the trigger point for these blooms is not yet understood. Any nutrient sources along the shoreline or in the watershed (eroding shorelines, sediment,…) should be identified and reduced working with local agencies.

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.



CSLAP 2015 Lake Water Quality Summary:
Roaring Brook Lake

General Lake Information

Location	Town of Putnam Valley
County	Putnam
Basin	Lower Hudson River
Size	46.6 hectares (115.1 acres)
Lake Origins	Augmented by Dam
Watershed Area	466.4 hectares (1,152 acres)
Retention Time	0.3 years
Mean Depth	2.0 meters
Sounding Depth	4.3 meters
Public Access?	private beach
Major Tributaries	Roaring Brook
Lake Tributary To…	Roaring Brook to Peekskill Hollow Creek to Annsville Creek to Hudson River
WQ Classification	B (contact recreation = swimming)
Lake Outlet Latitude	41.433
Lake Outlet Longitude	-73.806
Sampling Years	2009-2013, 2015
2015 Samplers	Ina Cholst, Sam Lee, and Anton Ioukhnovets
Main Contact	Anton Ioukhnovets

Lake Map

Background

Roaring Brook Lake is a 115 acre, class B lake found in the town of Putnam Valley in Putnam County in the southern Hudson River basin. The lake was first sampled as part of CSLAP in 2009.

It is one of 15 CSLAP lakes among the more than 265 lakes and ponds found in Putnam County, and one of 67 CSLAP lakes among the more than 3680 lakes and ponds in the Lower Hudson River drainage basin.

Lake Uses

Roaring Brook 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 angling, aquatic life, and aesthetics. The lake is used by lake residents for swimming, passive boating and other recreation via shoreline properties; the lake does not have public access.

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

General statewide fishing regulations are applicable in Roaring Brook Lake.

Fish species identified in the lake include black crappie, golden shiner, largemouth bass, pumpkinseed sunfish, white catfish, white perch, white sucker and yellow perch.

Historical Water Quality Data

CSLAP sampling was conducted on Roaring Brook Lake from 2009 to 2013, and in 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 Roaring Brook Lake can also be found on the NYSDEC web page at http://www.dec.ny.gov/lands/77848.html.

Roaring Brook Lake was sampled as part of the DEC Lake Classification and Inventory (LCI) survey in 2003. These results indicated lower lake productivity in the LCI survey than exhibited in the CSLAP dataset—water clarity readings were higher, due to lower phosphorus and chlorophyll *a* readings.

There are no NYSDEC RIBS monitoring or stream biomonitoring sites near Roaring Brook Lake.

Lake Association and Management History

Roaring Brook Lake is served by the Roaring Brook Property Owners Association. Most of the management of the lake is conducted by the Roaring Brook Lake Preservation Committee. The lake has no public access, and does not support power boats. The invasive weeds in the lake have been the subject of much discussion, including proposals to stock grass carp, conduct hand harvesting, and an evaluation of other plant management actions.

The Roaring Brook Property Owners Association maintains a website at http://rblpoa.com/.

Summary of 2015 CSLAP Sampling Results

Evaluation of 2015 Annual and Monthly Results Relative to 2006-2013

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 – Roaring Brook Lake" section in Appendix C.

Evaluation of Eutrophication Indicators

Water clarity readings were higher than normal in both 2012 and 2013, but lower than normal in 2014. This was consistent with lower than normal phosphorus readings in the first two years, and higher TP levels in 2015. Water clarity has decreased since 2012, coincident with increasing algae levels over the same period.

Lake productivity increases slightly after mid-summer, as demonstrated by decreasing water clarity and increasing nutrient and algae levels. These patterns were not apparent (or at least not clear) in 2015, although phosphorus levels did decrease slightly during the summer.

The lake can be characterized as *mesotrophic*, or moderately productive, based on total phosphorus, chlorophyll *a*, and water clarity readings. The trophic state index (TSI) evaluation suggests that water clarity readings are slightly lower than expected given the nutrient and algae levels in the lake. This may be indicative of other (non algal) factors affecting water transparency. 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, although the lake is not classified for use for potable water. Roaring Brook Lake is not thermally stratified, at least on a consistent basis, so deepwater samples have not been collected in the lake (and deepwater intakes to avoid surface algae-enriched waters are not possible). Potable water conditions, at least as measurable through CSLAP, are summarized in the Lake Scorecard and Lake Condition Summary Table.

Evaluation of Limnological Indicators

Conductivity and ammonia readings were higher than normal, and these readings have increased slightly since 2012. pH and color readings were lower than usual in 2015, but neither of these readings has exhibited any long-term changes. It is likely that most of the small changes in the limnological indicators has been within the normal range of variability for Roaring Brook Lake.

Chloride levels in the 2015 samples, collected for the first time through CSLAP and cited in Appendix A, ranged from 50 to 104 mg/l. These values fall within the "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 range of values found in most NYS lakes. These readings suggest a moderate to high 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

Macrophyte surveys conducted through the LCI showed a small number of aquatic plants, and at least three exotic plant species (*Cabomba caroliniana,* fanwort; *Myriophyllum spicatum,* Eurasian watermilfoil, and *Phragmites* sp.) were found in the lake. The modified floristic quality indices (FQI) data indicate that the quality of the aquatic plant community is "poor," although it is likely that a detailed aquatic plant survey would identify additional plant species. The fish community in the lake is comprised of a mix of coolwater (at least two species) and warmwater (at least five species) fish, suggesting warmwater fisheries.

Zooplankton and macroinvertebrate surveys have not been conducted through CSLAP at Roaring Brook Lake. The fluoroprobe screening data analyzed by SUNY ESF indicates that overall algae and blue green algae levels are low during most of the summer in the open water, and open water algae communities were comprised of a mix of green algae and blue green algae (cyanobacteria). Shoreline blooms in 2015 had extremely high blue green algae levels, particularly in mid-summer.

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 slightly less favorable in 2015 than in the period from 2010 to 2013, consistent with lower water clarity readings in 2015. Plant coverage was slightly higher than in the previous few years, perhaps contributing to the less favorable recreational assessments in 2015. These assessments do not exhibit clear seasonal trends in most years, although water quality and recreational assessments did improve during the summer of 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 steadily increased over the last decade, but is not yet known if this is a reflection of local climate change.

Evaluation of Algal Toxins

Algal toxin levels can vary significantly within blooms and from shoreline to lake, and the absence of toxins in a sample does not indicate safe swimming conditions. Fluoroprobe levels have been below threshold for harmful algal blooms (HABs) in the open water, and open water toxin levels have been low. However, shoreline blooms exhibit high levels of blue green algae, and some of these shoreline samples have exhibited elevated algal toxin levels. Lake residents and visitors are advised to avoid contact with surface scums and heavily discolored water, and to seek medical assistance if needed after exposure to these blooms.

Lake Condition Summary

Category	Indicator	Min	Annual Avg	Max	2015 Avg	Classification	2015 Change?	Long-term Change?
Eutrophication Indicators	Water Clarity	0.95	2.46	3.80	2.26	Mesotrophic	Lower Than Normal	No Change
	Chlorophyll *a*	0.30	3.53	9.50	4.89	Mesotrophic	Higher than Normal	Increasing Significantly
	Total Phosphorus	0.009	0.014	0.028	0.015	Mesotrophic	Within Normal Range	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	0.01	0.02	0.05	0.02	Low NOx	Within Normal Range	No Change
	Ammonia	0.00	0.03	0.12	0.04	Low Ammonia	Higher than Normal	No Change
	Total Nitrogen	0.07	0.36	0.79	0.39	Low Total Nitrogen	Within Normal Range	No Change
	pH	6.80	7.58	8.82	7.44	Alkaline	Lower Than Normal	No Change
	Specific Conductance	173	275	430	376	Hardwater	Higher than Normal	No Change
	True Color	1	22	63	13	Intermediate Color	Lower Than Normal	No Change
	Calcium	8.1	13.5	17.6	16.5	May be Susceptible to Zebra Mussels	Higher than Normal	No Change
Lake Perception	WQ Assessment	1	1.5	3	2.0	Crystal Clear	Less Favorable than Normal	No Change
	Aquatic Plant Coverage	1	1.8	3	1.9	Subsurface Plant Growth	Within Normal Range	No Change
	Recreational Assessment	1	1.4	3	1.6	Could Not Be Nicer	Within Normal Range	No Change
Biological Condition	Phytoplankton					Not measured through CSLAP	Not known	Not known
	Macrophytes					Poor 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					Warmwater fishery	Not known	Not known
	Invasive Species					Eurasian watermilfoil, Fanwort, Phragmites	Not known	Not known
Local Climate Change	Air Temperature	13	25.5	33	28.1		Higher Than Normal	Increasing Significantly
	Water Temperature	12	24.6	31	26.1		Higher Than Normal	Increasing Slightly

Category	Indicator	Min	Annual Avg	Max	2015 Avg	Classification	2015 Change?	Long-term Change?
Harmful Algal Blooms	Open Water Phycocyanin	0	10	46	9	No readings indicate high risk of BGA	Not known	Not known
	Open Water FP Chl.a	0	6	86	2	Few readings indicate high algae levels	Not known	Not known
	Open Water FP BG Chl.a	0	1	19	1	Few readings indicate high BGA levels	Not known	Not known
	Open Water Microcystis	<DL	<DL	1.1	<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					No shoreline blooms sampled for PC	Not known	Not known
	Shoreline FP Chl.a	24	803	3240	735	Most readings indicate high algae levels	Not known	Not known
	Shoreline FP BG Chl.a	17	677	3148	709	Most readings indicate high BGA levels	Not known	Not known
	Shoreline Microcystis	<DL	157.1	825.4	176.6	Very high shoreline bloom MC-LR	Not known	Not known
	Shoreline Anatoxin a	<DL	<DL	<DL	<DL	Shoreline bloom Anatoxin-a consistently not detectable	Not known	Not known

Evaluation of Lake Condition Impacts to Lake Uses

The 2008 NYSDEC Priority Waterbody Listings (PWL) for the Lower Hudson River drainage basin indicate that recreation is *stressed* in Roaring Brook Lake. The PWL listing for Roaring Brook Lake is provided in Appendix B.

Potable Water (Drinking Water)

The CSLAP dataset at Roaring Brook 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 elevated toxin levels in some shoreline blooms suggest that this use may be compromised at some times and locations in the lake.

Public Bathing

The CSLAP dataset at Roaring Brook Lake, including water chemistry data, physical measurements, and volunteer samplers' perception data, suggests that public bathing, if conducted at a public swimming beach, could be *stressed* by shoreline blue green algae blooms. 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 Roaring Brook Lake, including water chemistry data, physical measurements, and volunteer samplers' perception data, suggest that recreation is *stressed* by shoreline blue green algae blooms, and *threatened* by excessive weed growth, particularly fanwort and Eurasian watermilfoil. Additional data may be needed to verify these assessments.

Aquatic Life

The CSLAP dataset on Roaring Brook Lake, including water chemistry data, physical measurements, and volunteer samplers' perception data, suggest that aquatic life may be *threatened* by road salt runoff, shoreline blue green algae blooms, and the presence of fanwort and Eurasian watermilfoil. Additional data are needed to evaluate the food and habitat conditions for aquatic organisms in the lake.

Aesthetics and Habitat

The CSLAP dataset on Roaring Brook Lake, including water chemistry data, physical measurements, and volunteer samplers' perception data, suggest that aesthetics may be *poor* due to shoreline blue green algae blooms, and habitat may be *fair* due to invasive plants.

Fish Consumption

There are no fish consumption advisories posted for Roaring Brook Lake.

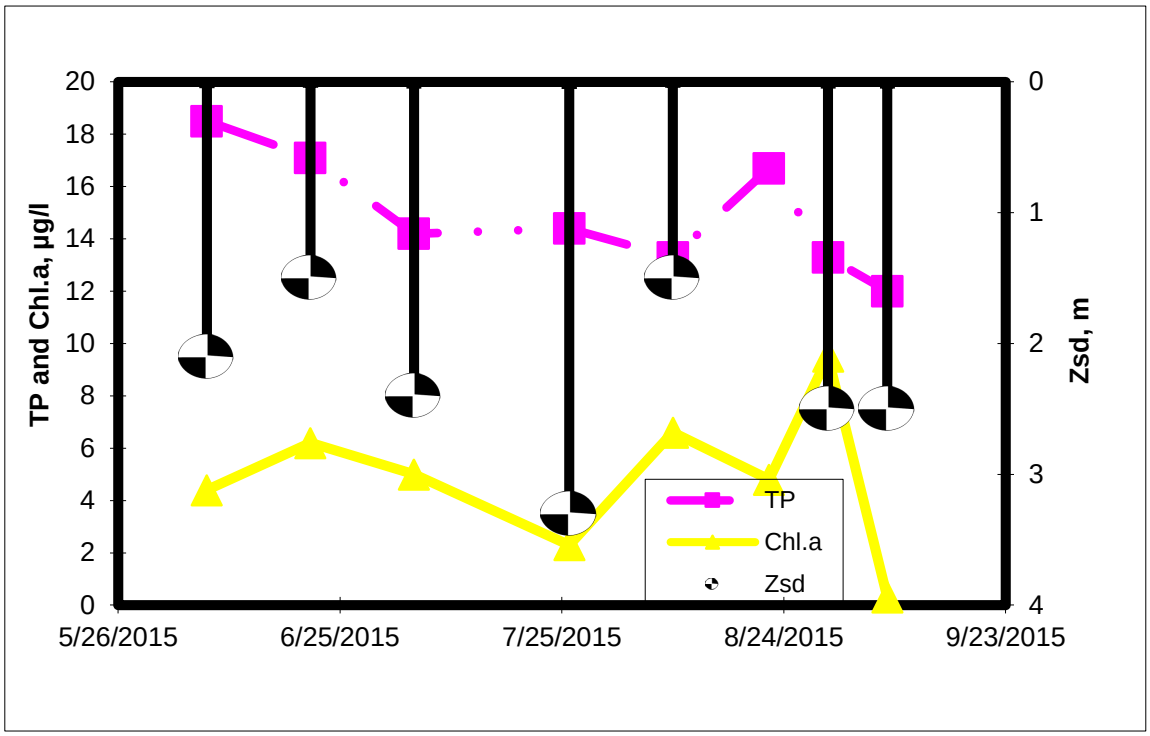
Additional Comments and Recommendations

The impact of invasive plants in the lake should continue to be evaluated. Lake residents are advised to report (and avoid exposure to) shoreline blooms.

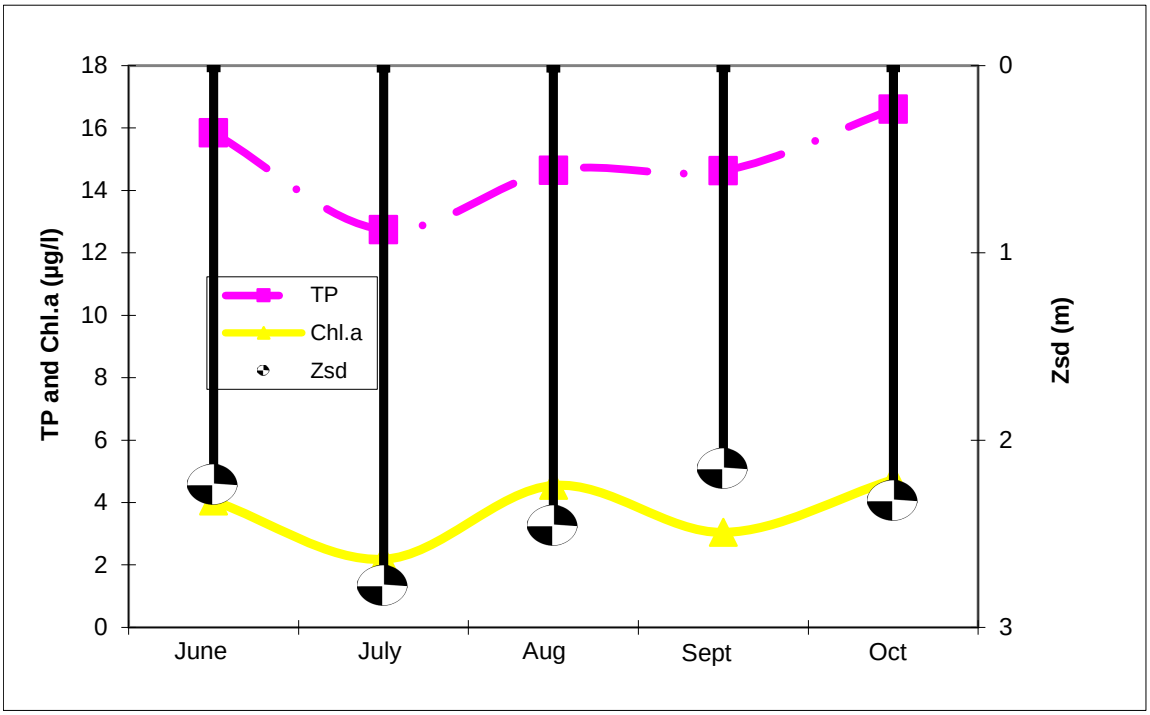
Aquatic Plant IDs-2015

None submitted for identification in 2015.

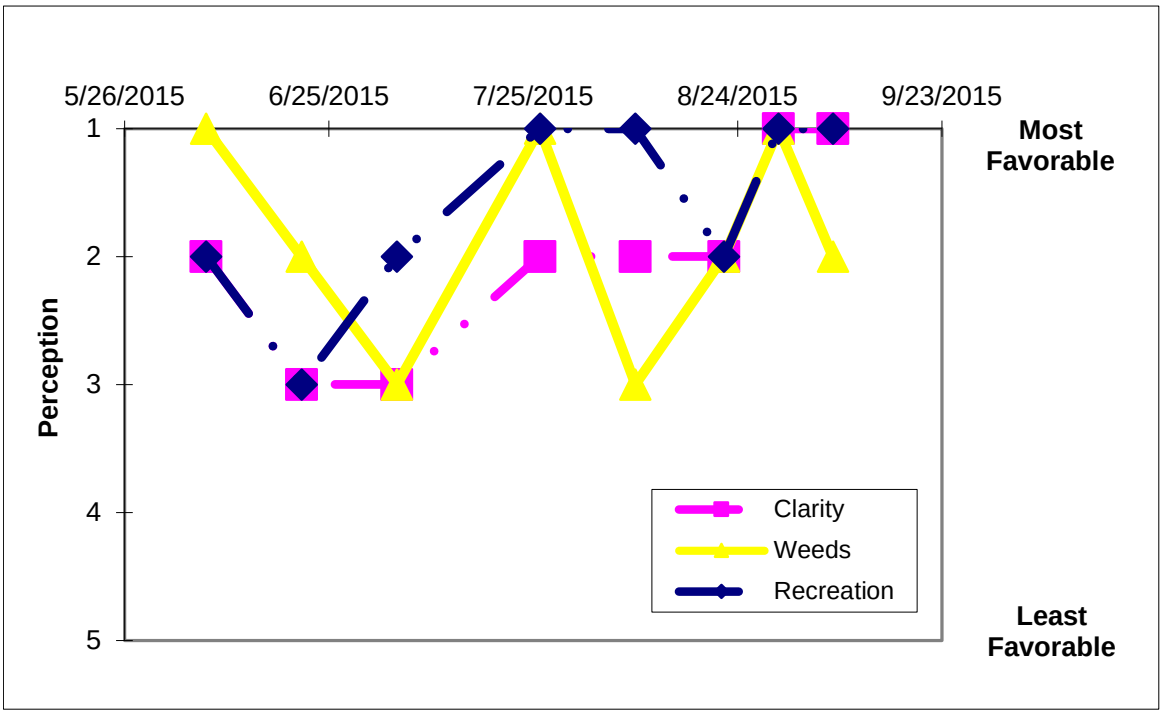
Time Series: Trophic Indicators, 2015



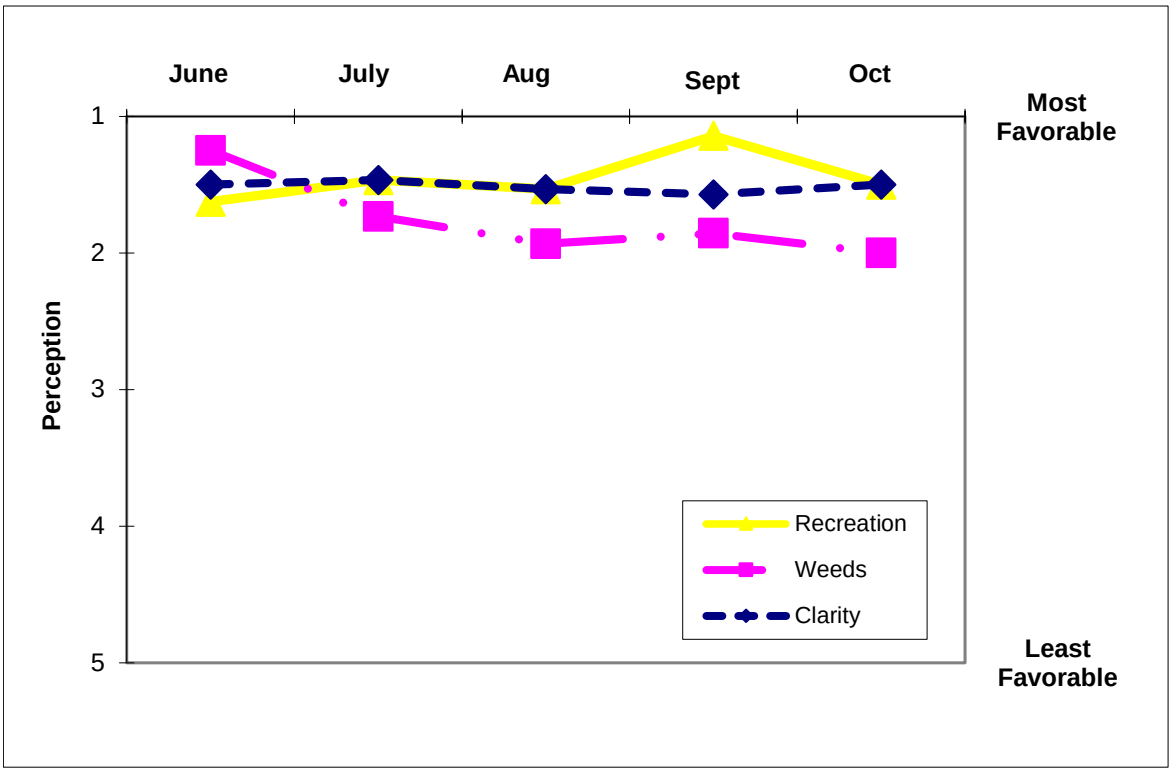
Time Series: Trophic Indicators, Typical Year (2009-2015)



Time Series: Lake Perception Indicators, 2015



Time Series: Lake Perception Indicators, Typical Year (2009-2015)



Appendix A- CSLAP Water Quality Sampling Results for Roaring Brook Lake

LNum	PName	Date	Zbot	Zsd	Zsamp	Tot.P	NO3	NH4	TDN	TN/TP	TColor	pH	Cond25	Ca	Chl.a	Cl
225	Roaring Brook L	07/11/2009	4.8	1.25	1.5	0.018	0.05	0.01	0.28	34.43	40	7.27	204	14.6	4.37	
225	Roaring Brook L	07/25/2009	5.0	2.90	1.5	0.011	0.05	0.05	0.42	87.18	36	7.58	217		1.88	
225	Roaring Brook L	08/08/2009	5.2	2.90	1.5	0.014	0.05	0.02	0.29	46.26	31	7.87	224		2.30	
225	Roaring Brook L	08/24/2009	5.1	2.65	1.5	0.012	0.02	0.02	0.30	55.85	30	8.82	188		1.30	
225	Roaring Brook L	09/05/2009	5.1	2.10	1.5	0.012	0.01	0.01	0.19	36.22	32	7.16	241	14.3	2.20	
225	Roaring Brook L	09/20/2009	5.1	1.25	1.5	0.013	0.01	0.10	0.34	59.59	63	7.18	203		4.70	
225	Roaring Brook L	10/04/2009	5.3	1.60	1.5	0.021	0.01	0.05	0.34	36.10	35	7.51	243		4.66	
225	Roaring Brook L	10/25/2009	4.8	3.05	1.5	0.013	0.03	0.06	0.35	61.11		7.76	173		4.80	
225	Roaring Brook L	6/19/2010	5.2	2.50	1.5	0.028	0.01	0.02			14	7.13	290	12.9	0.70	
225	Roaring Brook L	7/3/2010	4.9	3.45	1.5	0.011	0.03	0.00	0.19	37.71	10	8.07	307		1.30	
225	Roaring Brook L	7/17/2010	4.8	3.00	1.5	0.011	0.01	0.02	0.41	82.55	12	8.35	328		1.00	
225	Roaring Brook L	7/31/2010	4.9	2.30	1.5	0.011	0.02	0.03	0.34	66.00	32	7.61	310		2.10	
225	Roaring Brook L	8/14/2010	4.8	1.55	1.5	0.017	0.05	0.04	0.27	34.26	17	7.95	326	8.1	6.70	
225	Roaring Brook L	8/28/2010	4.9	2.20	1.5	0.017	0.03	0.05	0.75	95.55	22	7.33	313		3.30	
225	Roaring Brook L	9/11/2010	4.8	3.25	1.5	0.015	0.01	0.04	0.39	56.59	1	7.38	316		2.50	
225	Roaring Brook L	9/24/2010	4.9	2.30	1.5	0.012	0.02	0.02	0.28	49.37	12	7.41	323		1.20	
225	Roaring Brook L	5/30/2011	5.0	2.05	1.5	0.021	0.02	0.02	0.27	28.87	24	8.25	277	12.7	4.20	
225	Roaring Brook L	6/13/2011	5.3	2.95	1.5	0.010	0.01	0.03	0.07	14.67	19	6.8	289		3.70	
225	Roaring Brook L	7/2/2011	5.0	3.15	1.5	0.025	0.04	0.01	0.21	18.53	15	7.89	277		0.90	
225	Roaring Brook L	7/18/2011	4.9	2.80	1.5	0.013	0.02	0.02	0.29	50.53	22	7.42	310		1.60	
225	Roaring Brook L	8/1/2011	4.8	2.00	1.5	0.013	0.05	0.02	0.37	64.95	16	7.56	291	17.6	2.90	
225	Roaring Brook L	8/17/2011	6.1	2.40	1.5	0.015	0.01	0.01	0.25	36.81	15	7.09	302		2.70	
225	Roaring Brook L	8/31/2011	4.7	0.95	1.5	0.020	0.04	0.01	0.46	52.35	42	7.42	262		4.50	
225	Roaring Brook L	9/19/2011	5.0	1.80	1.5	0.020	0.04	0.12	0.60	65.02	48	7.42	260		5.00	
225	Roaring Brook L	6/5/2012	5.3	1.80	1.5	0.021	0.02	0.02	0.79	84.69	27	7.42	226	10.4	7.20	
225	Roaring Brook L	6/18/2012	5.3	2.50	1.5	0.009	0.01	0.03	0.32	74.52	28	7.3	230		2.60	
225	Roaring Brook L	7/2/2012	5.2	2.85	1.5	0.010	0.01	0.01	0.26	57.78	26	8.01	184		0.70	
225	Roaring Brook L	7/16/2012	5.3	2.95	1.5	0.011	0.02	0.02	0.47	90.53	17	7.97	215		1.90	
225	Roaring Brook L	7/30/2012	5.4	2.45	1.5	0.013	0.01	0.02	0.41	71.54	16	7.27	227	11.8	3.50	
225	Roaring Brook L	7/30/2012			bloom											
225	Roaring Brook L	8/13/2012	5.3	3.80	1.5	0.012	0.01	0.02	0.34	64.28	17	7.01	220		3.70	
225	Roaring Brook L	8/27/2012	5.0	3.40	1.5	0.022	0.01	0.03	0.45	45.64	20	7.47	216		4.70	
225	Roaring Brook L	9/11/2012	5.2	1.90	1.5	0.018	0.01	0.08	0.44	52.78	19	7.35	218		5.40	
225	Roaring Brook L	6/17/2013	5.3	2.15		0.014	0.03	0.03	0.38	60.90	26	7.6	245		4.30	
225	Roaring Brook L	6/30/2013	5.2	2.40	1.5	0.010			0.28	62.80	30	7.42	195		3.30	
225	Roaring Brook L	7/9/2013	5.1	2.55	1.5	0.009	0.01	0.02	0.23	59.17	19	7.69	256		1.80	
225	Roaring Brook L	7/16/2013	5.7	2.75	1.5	0.011			0.32	64.05	18	7.38	253		2.20	
225	Roaring Brook L	7/24/2013	5.0	3.60	1.5	0.010	0.01	0.01	0.17	40.29	17	8.4	252			
225	Roaring Brook L	8/2/2013	5.0	2.50	1.5	0.009			0.43	103.92	23	7.99	253		2.50	
225	Roaring Brook L	8/15/2013	5.1	2.90	1.5	0.015		0.02	0.33	48.76	27	7.63	254		5.10	
225	Roaring Brook L	8/21/2013	5.0	3.15	1.5	0.012			0.46	81.74	17	8.35	253		7.60	
225	Roaring Brook L	6/7/2015	5.3	2.10	1.5	0.019	0.03	0.06	0.37	20.16	15	7.48	392	16.2	4.40	
225	Roaring Brook L	6/21/2015	5.1	1.50	1.5	0.017			0.48	27.89	7	7.54	338		6.20	
225	Roaring Brook L	7/5/2015	5.2	2.40	1.5	0.014	0.03	0.03	0.37	26.13	12	7	375		5.00	104.3
225	Roaring Brook L	7/26/2015	5.0	3.30	1.5	0.014			0.27	18.40	11	7.09	362		2.30	
225	Roaring Brook L	8/9/2015	4.8	1.50	1.5	0.013	0.03	0.03	0.47	35.04	18	7.66	349	16.8	6.60	
225	Roaring Brook L	8/22/2015				0.017			0.39	23.53	15	7.5	409		4.80	
225	Roaring Brook L	8/30/2015	5.0	2.50	1.5	0.013	0.01	0.05	0.51	37.97	10	7.71	430		9.50	50.0
225	Roaring Brook L	6/7/2015			bloom											
225	Roaring Brook L	6/25/2015			bloom											
225	Roaring Brook L	6/25/2015			bloom											
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225	Roaring Brook L	8/15/2015			bloom											
225	Roaring Brook L	8/16/2015			bloom											
225	Roaring Brook L	9/7/2015	4.9	2.50	1.5	0.012			0.28	23.25	15	7.56	355		0.30	

LNum	LName	Date	Type	TAir	TH2O	QA	QB	QC	QD	QF	QG	AQ-PC	AQ-Chla	MC-LR	Ana-a	Cyl	FP-Chl	FP-BG	HAB form	Shore HAB
225	Roaring Brook L	07/11/2009	epi	24	24	2	3	2	1											
225	Roaring Brook L	07/25/2009	epi	25	24	1	2	1	0											
225	Roaring Brook L	08/08/2009	epi	23	24	3	3	3	12											
225	Roaring Brook L	08/24/2009	epi	24	26	1	2	2	0											
225	Roaring Brook L	09/05/2009	epi	25	23	1	2	2	0			19.49								
225	Roaring Brook L	09/20/2009	epi	16	19	3	2	1	0			23.23								
225	Roaring Brook L	10/04/2009	epi	20	17	1	1	1	0			45.87								
225	Roaring Brook L	10/25/2009	epi	13	12	2	3	2	0											
225	Roaring Brook L	6/19/2010	epi	26	23	2	2	2	0	0	0									
225	Roaring Brook L	7/3/2010	epi	26	25	2	2	1	0	0	0									
225	Roaring Brook L	7/17/2010	epi	31	28	1	1	1	0	0	0									
225	Roaring Brook L	7/31/2010	epi	23	25	2	2	3	2	0	0									
225	Roaring Brook L	8/14/2010	epi	25	26	1	2	1	0	0	0									
225	Roaring Brook L	8/28/2010	epi	24	23	1	2	1	0	0	0									
225	Roaring Brook L	9/11/2010	epi	23	22	1	2	1	0	0	0									
225	Roaring Brook L	9/24/2010	epi	26	21	2	2	1	0	0	0									
225	Roaring Brook L	5/30/2011	epi	24	24	1	1	1	0	0	0									
225	Roaring Brook L	6/13/2011	epi	21	23	1	2	1	0	0	0	10.70	3.30							
225	Roaring Brook L	7/2/2011	epi	27	26	1	2	1	0	0	0	4.80	1.70							
225	Roaring Brook L	7/18/2011	epi	28	28	1	2	1	0	0	0	10.60	1.60	<0.30	<0.900	<0.1				
225	Roaring Brook L	8/1/2011	epi	29	28	2	2	1	0	0	0	10.80	3.40							
225	Roaring Brook L	8/17/2011	epi	27	25	2	3	3	0	0	0	15.60	2.90							
225	Roaring Brook L	8/31/2011	epi	27	24	2	1	1	0	0	0	21.70	7.50							
225	Roaring Brook L	9/19/2011	epi	20	20	1	1	1	0	0	0	12.90	8.40							
225	Roaring Brook L	6/5/2012	epi	17	20	1	1	1	0	0	0	5.40	1.10	<0.30	<0.417		1.59	0.67	I	
225	Roaring Brook L	6/18/2012	epi	25	23	1	1	1	0	0	0	1.90	0.50	<0.30	<0.413		85.81	19.07	I	
225	Roaring Brook L	7/2/2012	epi	29	28	1	2	1	0	0	0	0.70	0.30	<0.30	<0.423		0.28	0.00	I	
225	Roaring Brook L	7/16/2012	epi	29	27	1	1	1	0	0	0	6.90	0.40	<0.30	<0.328		1.30	0.60	I	
225	Roaring Brook L	7/30/2012	epi	27	26	1	1	1	0	0	0	5.20	0.60	<0.30	<0.292		2.78	1.14	I	
225	Roaring Brook L	7/30/2012	bloom											0.94	<0.292		1344	421		
225	Roaring Brook L	8/13/2012	epi	29	27	2	2	2	0	0	0	8.20	0.50	0.38	<0.552		3.01	2.03	I	
225	Roaring Brook L	8/27/2012	epi	27	26	1	2	1	0	0	0	5.70	0.50	<0.30	<0.642		1.77	0.80	I	
225	Roaring Brook L	9/11/2012	epi	17	22	2	2	1	0	0	0	8.30	0.70	0.38	<3.299		2.75	1.58	I	
225	Roaring Brook L	6/17/2013	epi	28	21	1	1	1	0	5	0	3.10	4.10	<0.30	<0.440		2.80	0.00	I	I
225	Roaring Brook L	6/30/2013	epi	26	27	1	1	1	0	0	0	6.00	1.80	<0.30	<0.650		2.00	0.80	I	I
225	Roaring Brook L	7/9/2013	epi	31	31	1	2	1	0	0	0	4.20	1.10	0.52	<0.510		1.50	0.70	I	I
225	Roaring Brook L	7/16/2013	epi	31	30	2	2	1	8	0	0	3.90	1.60	<0.30	<0.910		1.20	0.20	I	G
225	Roaring Brook L	7/24/2013	epi	25	28	1	2	2	8	0	0	4.80	1.20	<0.30	<0.400		1.60	1.20	I	I
225	Roaring Brook L	8/2/2013	epi	26	26	1	2	1	0	0	0	6.00	1.00	1.05	<0.390		1.40	0.70	I	I
225	Roaring Brook L	8/15/2013	epi	25	25	1	1	1	0	0	0	4.10	3.10	<0.30	<0.510		2.70	0.00	I	I
225	Roaring Brook L	8/21/2013	epi	29	25	1	1	1	0	0	0	5.40	4.60	<0.30	<0.570		3.50	0.00	I	I
225	Roaring Brook L	6/7/2015	epi	24	25	2	1	2	268	4	45	7.80	0.90	<0.77	<0.126	<1.739	2.58	0.54	F	BF
225	Roaring Brook L	6/21/2015	epi	30	27	3	2	3	2	4	4	16.90	0.60	<0.59	<0.004	<0.001	4.28	1.99	FH	H
225	Roaring Brook L	7/5/2015	epi	29	26	3	3	2	12	46	0	10.10	0.40	<0.88	<0.010	<0.000	2.24	0.94	F	I
225	Roaring Brook L	7/26/2015	epi	32	26	2	1	1	0	0	0	13.60	0.30	<0.30	<0.002	<0.014	1.68	0.96	I	I
225	Roaring Brook L	8/9/2015	epi	28	27	2	3	1	0	7	0	6.70	0.50	<0.44	<0.002	<0.014	2.47	0.76	I	I
225	Roaring Brook L	8/22/2015	epi	21	25	2	2	2	15	15	17	0.05	0.30	<0.28	<0.008	<0.021	1.70	0.51	F	
225	Roaring Brook L	8/30/2015	epi	28	25	1	1	1	0	0	0			<0.49	<0.003	<0.014	2.08	0.38	I	I
225	Roaring Brook L	6/7/2015	bloom											<1.32	<0.252	<3.477	94.66	88.34		b
225	Roaring Brook L	6/25/2015	bloom											528.53	<0.008	<0.001	3240	3148		bd
225	Roaring Brook L	6/25/2015	bloom											825.41	<0.015	<0.001	560	560		abc
225	Roaring Brook L	7/6/2015	bloom											<1.25	<0.020	<0.001	24.27	16.66		h
225	Roaring Brook L	7/6/2015	bloom											<1.25	<0.020	<0.001	1336	1336		d
225	Roaring Brook L	7/6/2015	bloom											57.33	<0.020	<0.001	455.0	455.0		d
225	Roaring Brook L	8/15/2015	bloom											<0.88	<0.024	<0.061	44.78	16.57		ac
225	Roaring Brook L	8/16/2015	bloom											<0.88	<0.005	<0.027	124.4	52.14		ac
225	Roaring Brook L	9/7/2015	epi	33	28	1	2	1	0	5	0			<0.74	<0.010	<0.075	2.67	0.32	I	I

Legend Information

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

Appendix B: Priority Waterbody Listing for Roaring Brook Lake

Roaring Brook Lake (1301-0037) Need Verific

Waterbody Location Information Revised: 07/11/2008

Water Index No:	H- 55-18-P183a			**Drain Basin:**	Lower Hudson River
Hydro Unit Code:	02030101/020	**Str Class:**	B		Lower Hudson River
Waterbody Type:	Lake			**Reg/County:**	3/Putnam Co. (40)
Waterbody Size:	114.9 Acres			**Quad Map:**	OSCAWANA LAKE (P-25-2)
Seg Description:	entire lake				

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

Use(s) Impacted	Severity	Problem Documentation
Recreation	Stressed	Possible

Type of Pollutant(s)
Known: - - -
Suspected: ALGAL/WEED GROWTH (aquatic vegetation), NUTRIENTS
Possible: - - -

Source(s) of Pollutant(s)
Known: - - -
Suspected: ON-SITE/SEPTIC SYST, Urban/Storm Runoff
Possible: - - -

Resolution/Management Information

Issue Resolvability: 1 (Needs Verification/Study (see STATUS))
Verification Status: 1 (Waterbody Nominated, Problem Not Verified)
Lead Agency/Office: DOW/BWAM **Resolution Potential:** Medium
TMDL/303d Status: n/a

Further Details

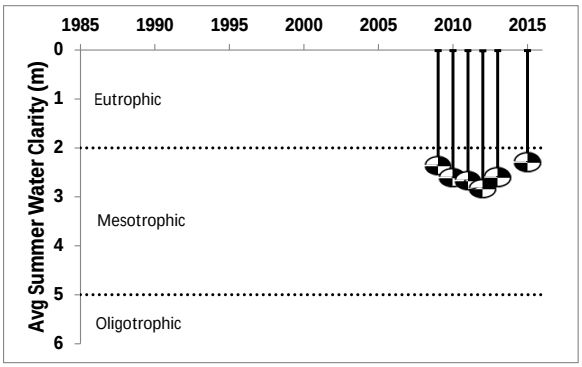
Overview
Recreational uses in Roaring Brook Lake may experience minor impacts/threats due to excessive aquatic vegetation and/or algal growth. This assessment is based on previously reported concerns and conditions in the lake need to be verified.

Previous Assessment
Concerns that recreational uses and aesthetics in Walton Lake may be restricted by excessive aquatic vegetation were previously reported. A 1985 lake study by a consultant indicated suspected sources of nutrients feeding the lake include inadequate and/or failing on-site septic systems serving residences along the lake and lawn chemical/fertilizer usage. Urban runoff and the impact of proposed residential developments was also raised. (Putnam County WQCC, 1996)

Appendix C- Long Term Trends: Roaring Brook Lake

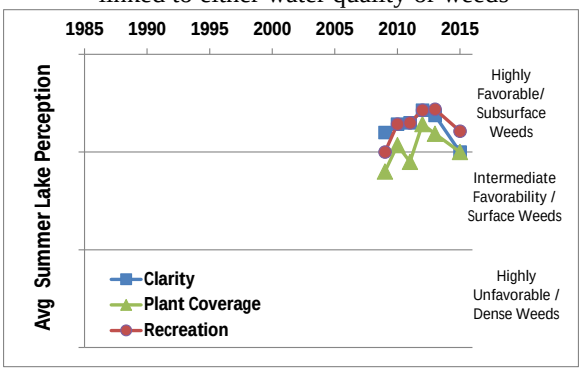
Long Term Trends: Water Clarity

- ↑ 2009-2013, but ↓ last 2 years
- Most readings typical of *mesotrophic* lakes



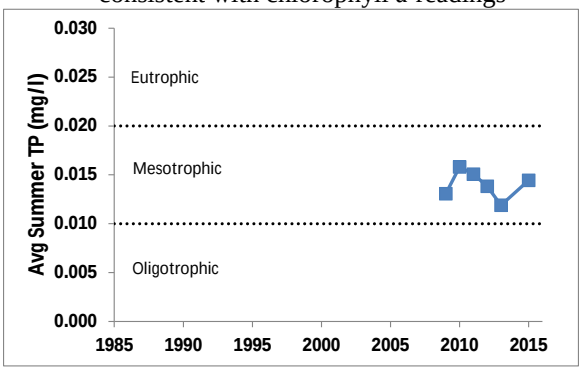
Long Term Trends: Lake Perception

- Assessments improved 2009 - 2014
- Recreational impacts not apparent or closely linked to either water quality or weeds



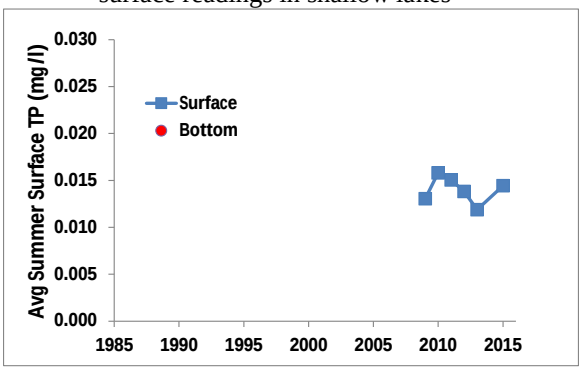
Long Term Trends: Phosphorus

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



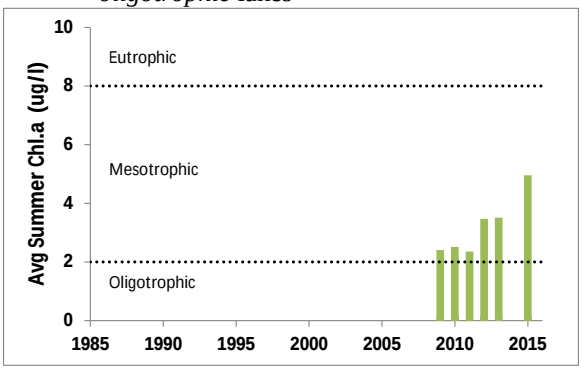
Long Term Trends: Bottom Phosphorus

- Deepwater TP levels not measured
- Deepwater TP readings likely similar to surface readings in shallow lakes



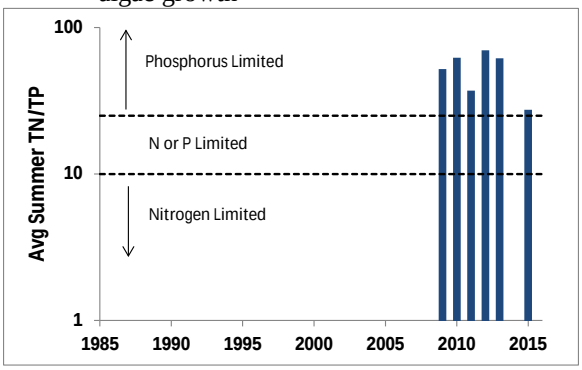
Long Term Trends: Chlorophyll a

- Perhaps increasing; higher in last few years
- Most readings typical of *mesotrophic to oligotrophic* lakes



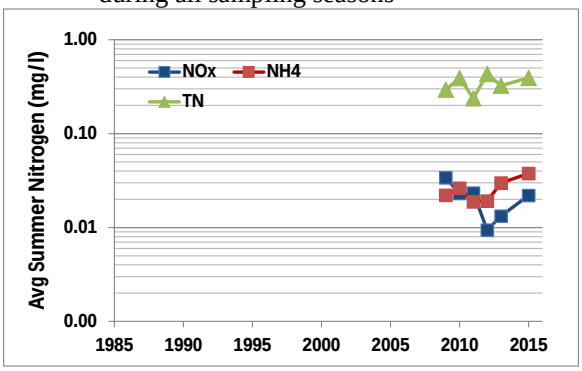
Long Term Trends: N:P Ratio

- No trends apparent, but lower in 2015
- Most readings indicate phosphorus limits algae growth



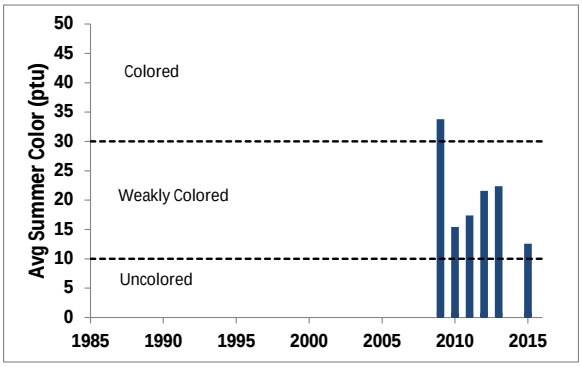
Long Term Trends: Nitrogen

- No NOx trend; ↑ NH4 and TN?
- Low NOx, ammonia and total nitrogen during all sampling seasons



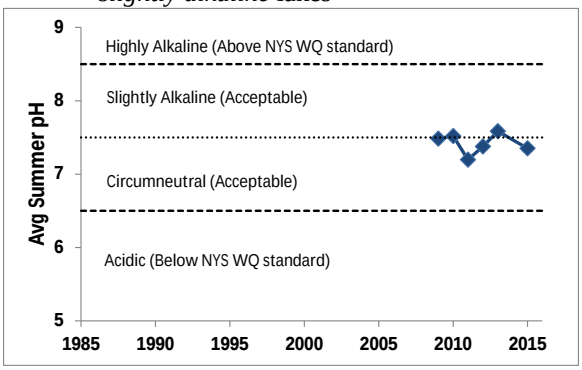
Long Term Trends: Color

- No trends apparent; lower in 2015
- Most readings typical of *weakly colored* lakes



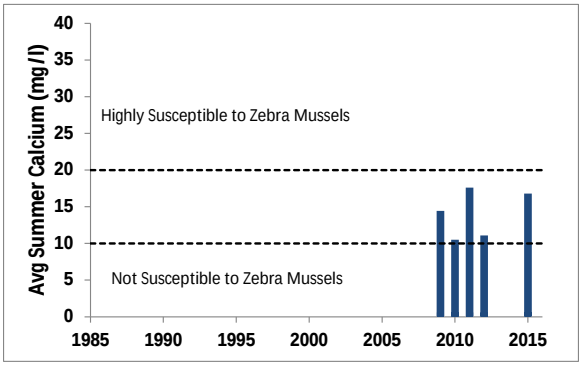
Long Term Trends: pH

- No trends apparent
- Most readings typical of *circumneutral* to *slightly alkaline* lakes



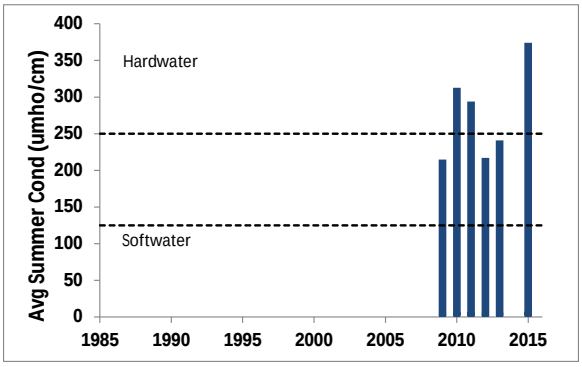
Long Term Trends: Calcium

- No trends apparent
- Data indicates moderate to low susceptibility to zebra mussels



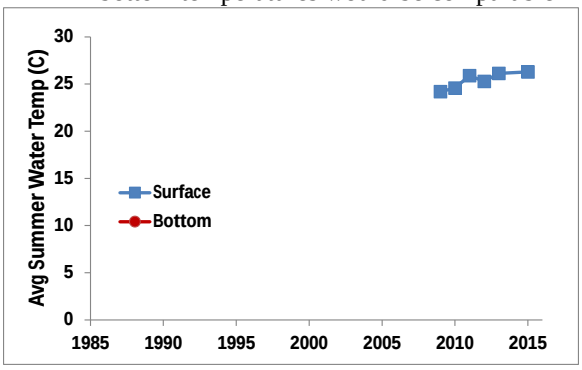
Long Term Trends: Conductivity

- No trends apparent, but higher in 2015
- Most readings typical of intermediate to *hardwater* lakes



Long Term Trends: Water Temperature

- Increasing water temperatures
- Shallow lake depth suggests that surface and bottom temperatures would be comparable



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.

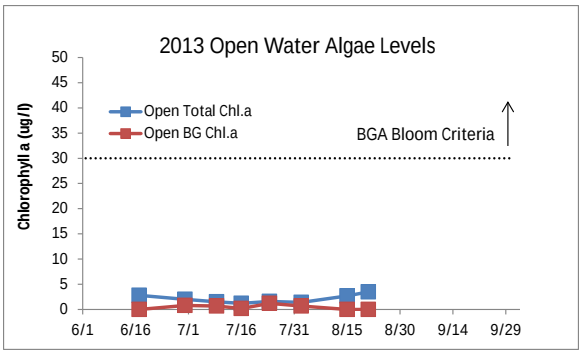


Figure D1:
2013 Open Water Total and BGA Chl.a

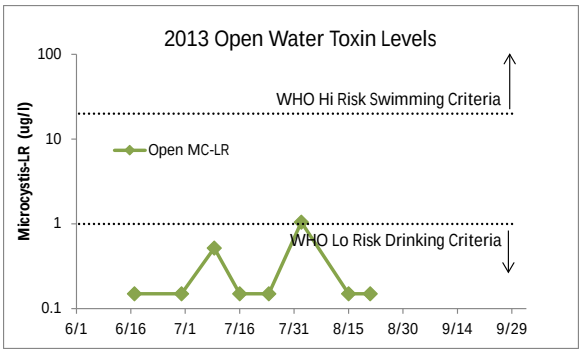


Figure D2:
2013 Open Water Microcystin-LR

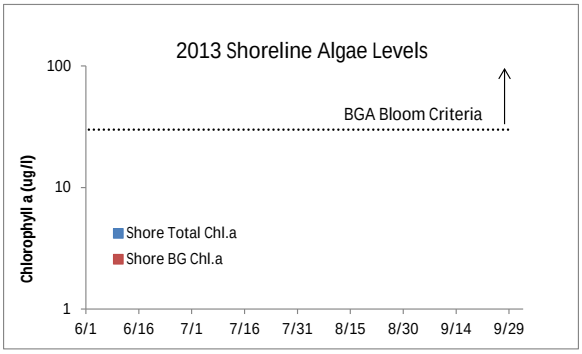


Figure D3:
2013 Shoreline Total and BGA Chl.a

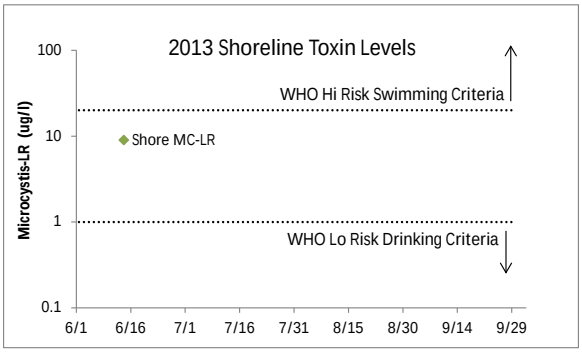


Figure D4:
2013 Shoreline Microcystin-LR

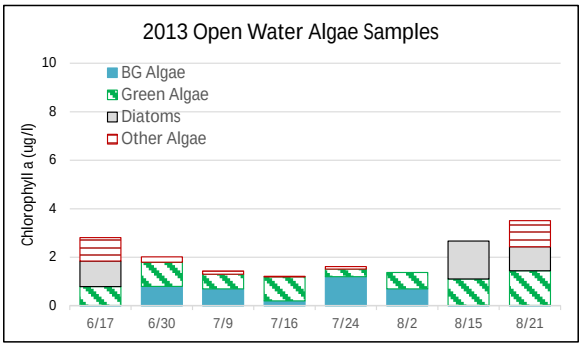


Figure D5:
2013 Open Water Algae Types

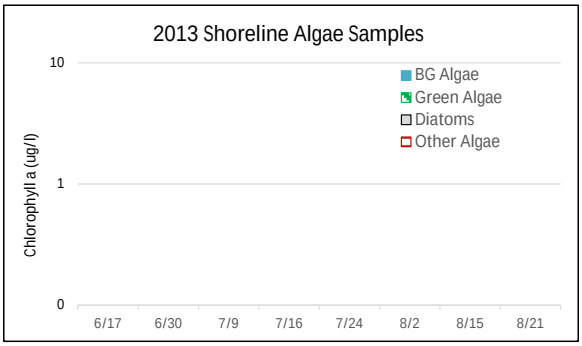


Figure D6:
2013 Shoreline Algae Types

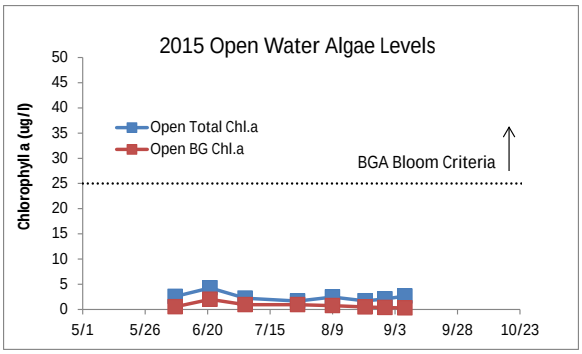


Figure D7:
2015 Open Water Total and BGA Chl.a

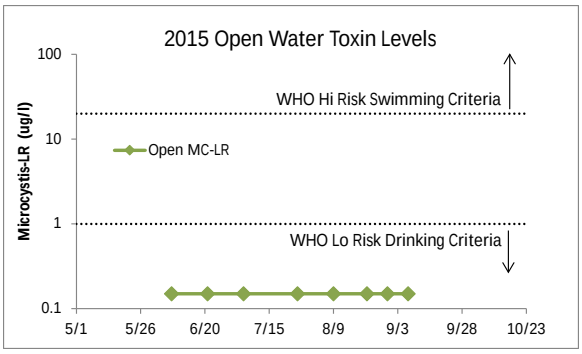


Figure D8:
2015 Open Water Microcystin-LR

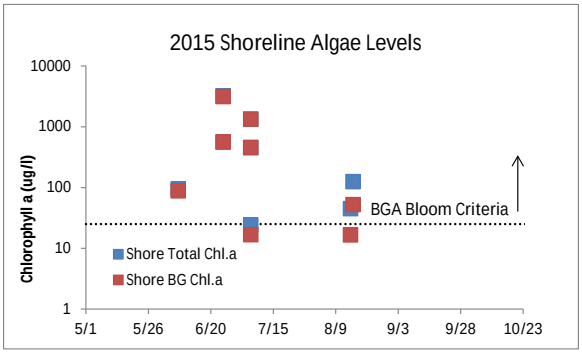


Figure D9:
2015 Shoreline Total and BGA Chl.a

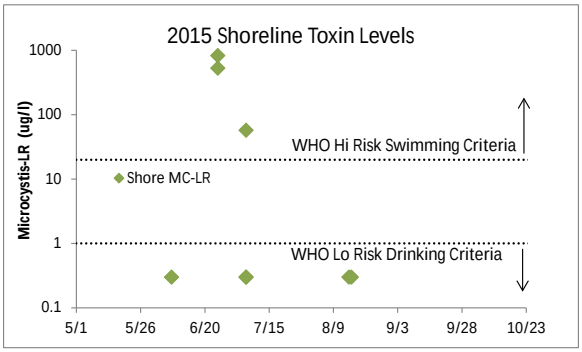


Figure D10:
2015 Shoreline Microcystin-LR

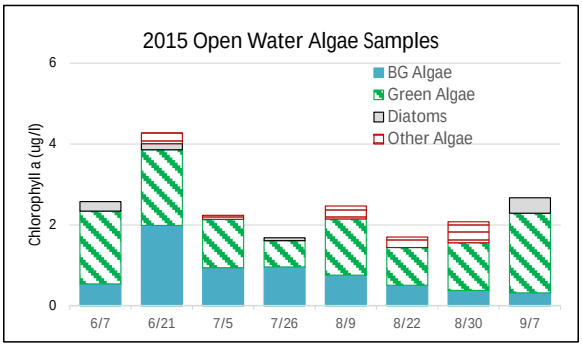


Figure D11:
2015 Open Water Algae Types

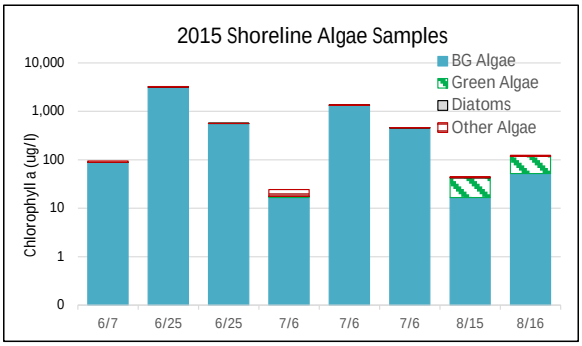


Figure D12:
2015 Shoreline Algae Types

Appendix E:
AIS Species in Putnam County

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

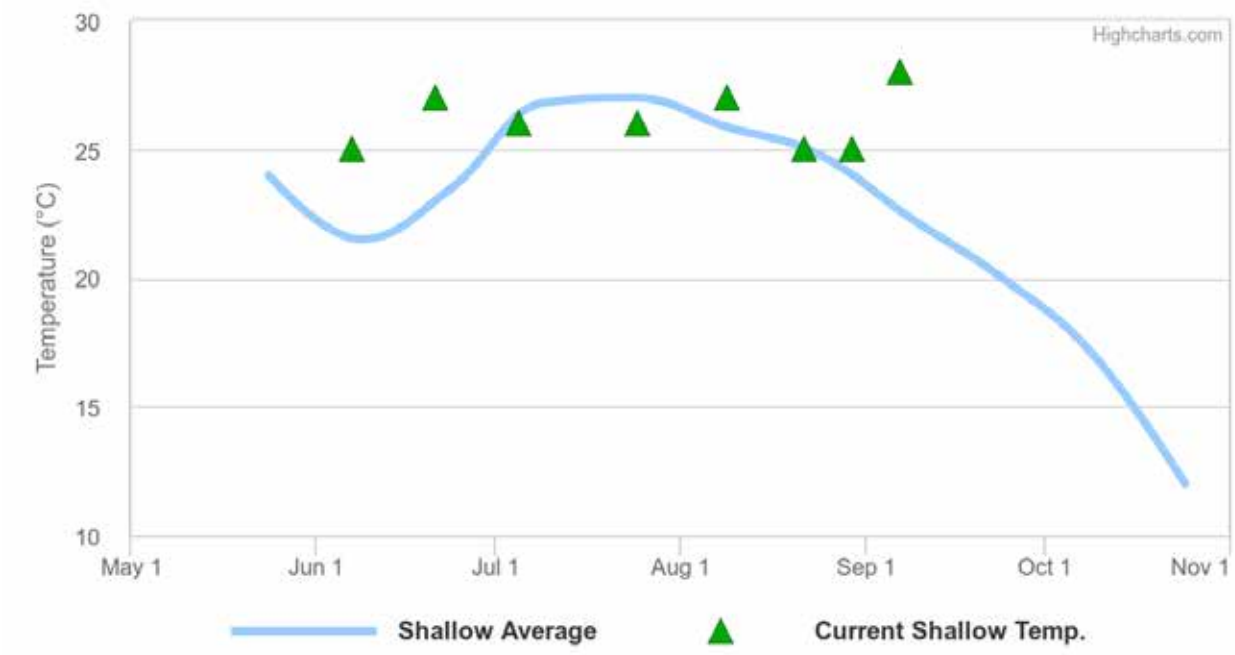
This list is not complete, but instead represents only those species that have been reported and verified within the county. If any additional aquatic invasive species (AIS) are known or suspected in these or other waterbodies in the county, this information should be reported through iMap invasives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

Aquatic Invasive Species - Putnam County			
Waterbody	**Kingdom**	**Common name**	**Scientific name**
Canopus Lake	Plant	Variable watermilfoil	*Myriophyllum heterophyllum*
Canopus Lake	Plant	Eurasian watermilfoil	*Myriophyllum spicatum*
Canopus Lake	Plant	Curly leafed pondweed	*Potamogeton crispus*
Croton Falls Reservoir	Plant	Eurasian watermilfoil	*Myriophyllum spicatum*
Duck Pond	Plant	Eurasian watermilfoil	*Myriophyllum spicatum*
Hudson River	Plant	Water chestnut	*Trapa natans*
Ice Pond	Plant	Brittle naiad	*Najas minor*
Kirk Lake	Plant	Eurasian watermilfoil	*Myriophyllum spicatum*
Lake Carmel	Plant	Eurasian watermilfoil	*Myriophyllum spicatum*
Lake Celeste	Plant	Curly leafed pondweed	*Potamogeton crispus*
Lake Mahopac	Animal	Zebra mussel	*Dreissena polymorpha*
Lake Mahopac	Plant	Eurasian watermilfoil	*Myriophyllum spicatum*
Lake Nimham	Plant	Brittle naiad	*Najas minor*
Lake Peekskill	Plant	Curly leafed pondweed	*Potamogeton crispus*
Lake Tibet	Plant	Eurasian watermilfoil	*Myriophyllum spicatum*
Lake Valhalla	Plant	Curly leafed pondweed	*Potamogeton crispus*
Loretta Lake	Plant	Eurasian watermilfoil	*Myriophyllum spicatum*
Lost Lake	Plant	Curly leafed pondweed	*Potamogeton crispus*
Oscawana Lake	Plant	Eurasian watermilfoil	*Myriophyllum spicatum*
Oscawana Lake	Plant	Water chestnut	*Trapa natans*
Palmer Lake	Plant	Eurasian watermilfoil	*Myriophyllum spicatum*
Palmer Lake	Plant	Brittle naiad	*Najas minor*
Peach Lake	Plant	Eurasian watermilfoil	*Myriophyllum spicatum*
Pelton Pond	Plant	Variable watermilfoil	*Myriophyllum heterophyllum*

Waterbody	Kingdom	Common name	Scientific name
Putnam Lake	Plant	Curly leafed pondweed	*Potamogeton crispus*
Putnam Lake	Plant	Water chestnut	*Trapa natans*
Roaring Brook Lake	Plant	Fanwort	*Cabomba caroliniana*
Roaring Brook Lake	Plant	Eurasian watermilfoil	*Myriophyllum spicatum*
Roaring Brook Lake	Plant	Curly leafed pondweed	*Potamogeton crispus*
Seven Hills Lake	Plant	Eurasian watermilfoil	*Myriophyllum spicatum*
Seven Hills Lake	Plant	Curly leafed pondweed	*Potamogeton crispus*
White Lake	Plant	Eurasian watermilfoil	*Myriophyllum spicatum*
White Lake	Plant	Curly leafed pondweed	*Potamogeton crispus*
White Pond	Plant	Eurasian watermilfoil	*Myriophyllum spicatum*
White Pond	Plant	Curly leafed pondweed	*Potamogeton crispus*
Wonder Lake	Plant	Water chestnut	*Trapa natans*

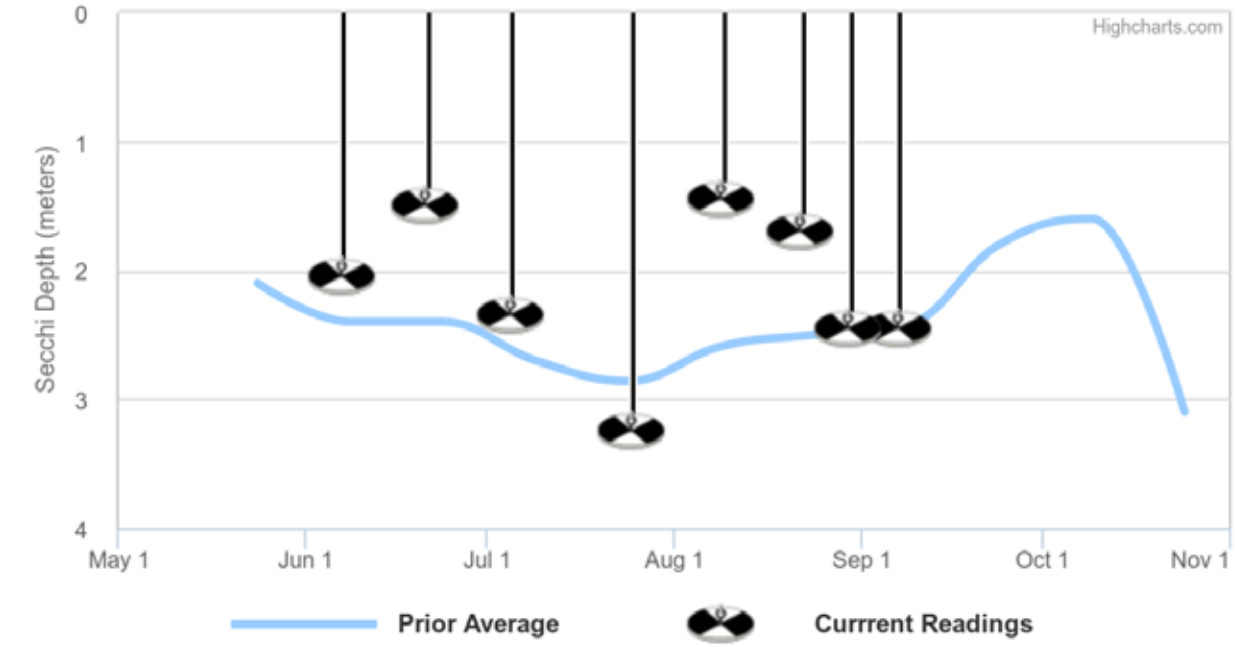
Appendix F: Current Year vs. Prior Averages for Roaring Brook Lake

Current Year Water Temperatures vs. Prior Average

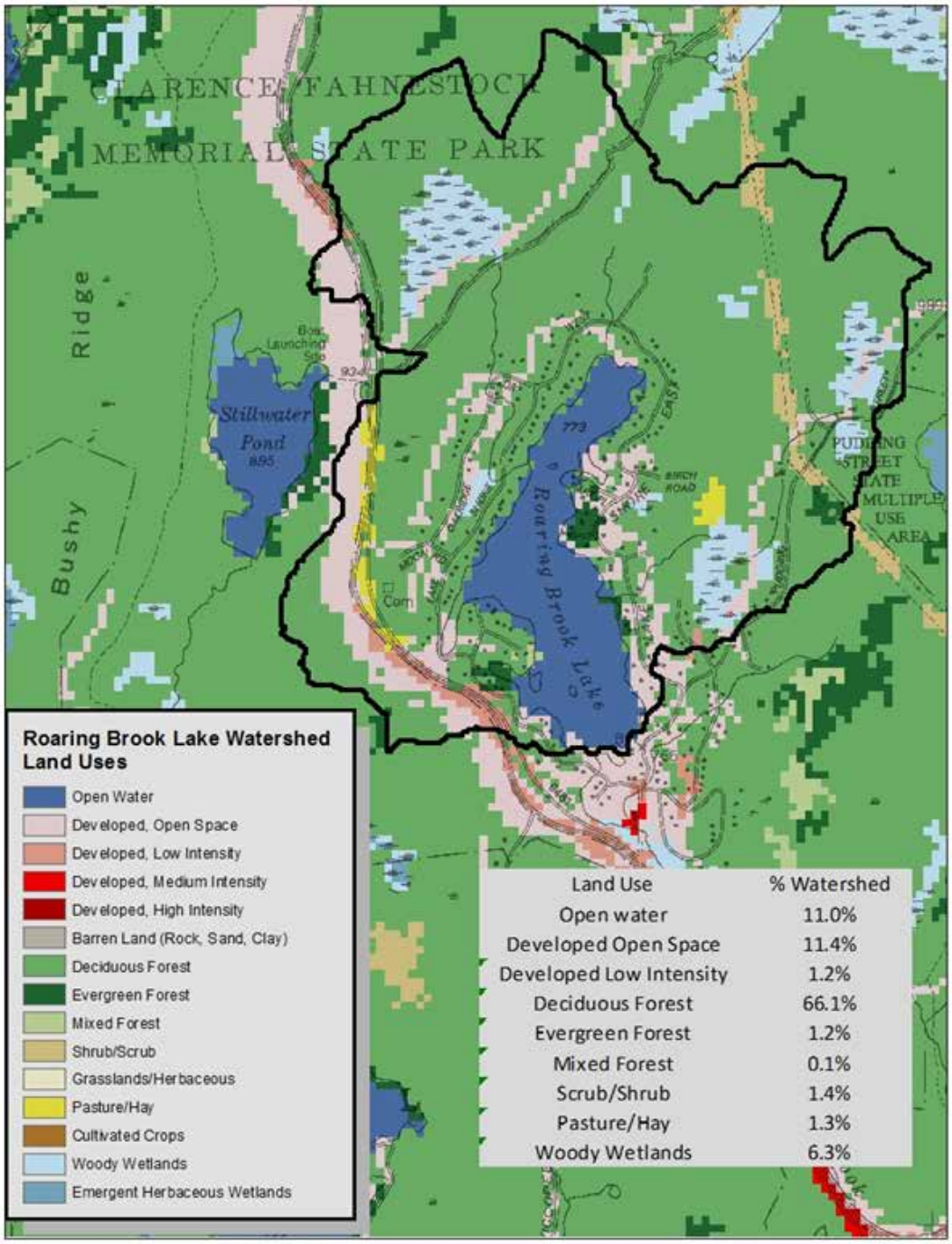


This year's shallow water sample temperatures are about the same as the average of readings collected from 2009 to 2013.

Current Year Secchi Readings vs. Prior Average



This year's session Secchi readings are tending to be lower than normal when compared to the average of readings collected from 2009 to 2013

Appendix G: Watershed and Land Use Map for Roaring Brook 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.