

## Friends Lake Questions and Answers, 2014 CSLAP

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

A1. Friends Lake has favorable water quality conditions, with relatively high water clarity and low algae levels. No shoreline blooms or invasive plants have been found, although banded mystery snail has been found at the lake.

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

A2. The HABs testing includes information about the types of algae found in the water samples. These results showed low levels of total and blue green algae in 2014, and the algae community includes a mix of algae species.

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

A3. Friends Lake has similar water clarity, and lower algae and nutrient levels, than most lakes in the area, and shoreline blooms were not reported in the lake. No invasive plants were reported at the lake.

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

A4. None of the measured water quality indicators has exhibited any long term trends, although water clarity and phosphorus levels (decreasing) and algae levels (increasing) did change slightly from 2001 to about 2010. Water clarity has stayed below readings from the last 1990s; it is not known if the present or previous readings are more typical of normal conditions in the lake.

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

A5. Friends Lake may not be susceptible to shoreline algae blooms, based on lake water chemistry. However, lake residents should be on the lookout, and should avoid exposure to, these blooms.

**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 should be continued to maintain water quality by reducing nutrient and sediment loading to the lake. Any potential impacts to water clarity should also be evaluated, given the drop in clarity since the early 2000s. 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.

<b>Lake Use</b>				
	PWL	Average Year	2014	Primary issue
<b>Potable Water</b>				Bottom Pollutants
<b>Swimming</b>				No impacts
<b>Boating / Fishing</b>				No impacts
<b>Aquatic Life</b>				No impacts
<b>Aesthetics</b>				
<b>Fish Consumption</b>				Not applicable

	Supported
	Threatened
	Stressed
	Impaired
	Not Known

## CSLAP 2014 Lake Water Quality Summary: Friends Lake

### General Lake Information

<b>Location</b>	Town of Chester
<b>County</b>	Warren
<b>Basin</b>	Upper Hudson River
<b>Size</b>	183.9 hectares (454.2 acres)
<b>Lake Origins</b>	Natural
<b>Watershed Area</b>	1,440 hectares (3,556.8 acres)
<b>Retention Time</b>	0.9 years
<b>Mean Depth</b>	4.2 meters
<b>Sounding Depth</b>	8.9 meters
<b>Public Access?</b>	private
<b>Major Tributaries</b>	no named tribs
<b>Lake Tributary To...</b>	unnamed outlet to Chester Creek to Schroon River to Hudson River
<b>WQ Classification</b>	AAspec (potable water)
<b>Lake Outlet Latitude</b>	43.639
<b>Lake Outlet Longitude</b>	-73.840
<b>Sampling Years</b>	1991-1995, 2001-2010, 2012-2014
<b>2014 Samplers</b>	Larry Estill, John Daly, Lou Fortin
<b>Main Contact</b>	Larry Estill

### Lake Map



## Background

Friends Lake is a 454 acre, class AA<sub>special</sub> lake found in the Town of Chester in Warren County, in the southeastern Adirondack region of New York State. It was first sampled as part of CSLAP in 1991.

It is one of 12 CSLAP lakes among the more than 120 lakes found in Warren County, and one of 31 CSLAP lakes among the more than 470 lakes and ponds in the Upper Hudson River drainage basin.

## Lake Uses

Friends Lake is a Class AA<sub>special</sub> lake; this means that the best intended use for the lake is for potable water—drinking, contact recreation—swimming and bathing, non-contact recreation—angling and boating, aquatic life and aesthetics. The lake is used by lake residents and invited guests for a variety of recreational purposes—the lake has no public access.

It is not known by the report authors if private stocking occurs in Friends Lake; the lake is not stocked by the state. Fish species in the lake include brown bullhead, largemouth bass, northern pike, pumpkinseed sunfish, redbreast sunfish, rock bass, smallmouth bass, and yellow perch.

General statewide fishing regulations are applicable in Friends Lake.

## Historical Water Quality Data

CSLAP sampling was conducted on Friends Lake from 1991 to 1995, 2001 to 2010, and 2012 to 2014. 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 for Friends Lake can also be found on the NYSDEC web page at <http://www.dec.ny.gov/lands/77831.html>.

Friends Lake was sampled by the Conservation Department (the predecessor to the NYSDEC) on August 8th, 1932 as part of the Biological Survey of the Upper Hudson River basin. The temperature and oxygen surveys from this study show slight dissolved oxygen reduction near the lake bottom (close to 24 feet), but still sufficient oxygen to support all fish species. This is probably still the case at present, at least based on the nutrient readings in the bottom samples (which are similar to those measured at the lake surface, suggesting oxygenated conditions near the lake bottom). Most of the parameters sampled in CSLAP were not analyzed as part of this survey. The results from this survey suggest that the lake may have been slightly more turbid (lower water transparency readings), but pH readings were probably comparable. The field notes from this survey indicate the following:

*“Excellent oxygen relationships exist everywhere... There are relatively few weeds except in the outlet”*

Friends Lake was also sampled by the NYSDEC as part of the state ambient lake monitoring program in 1977 and 1982. These data show water quality sampling results generally within the same range as found through CSLAP. The lake was thermally stratified, with dissolved oxygen levels exceeding the state water quality standard (= 5 ppb) even near the lake bottom. pH readings were comparable to those measured in the contemporary monitoring programs.

Friends Lake was sampled by the DEC as part of the lake biomonitoring study conducted in 2008. The results from the chemical monitoring program were nearly identical to those measured through CSLAP. The thermal profiles showed oxygen deficits (and lower water temperatures) below the thermocline, in the bottom meter of lake water. The bottom sediments showed no toxicity. The biological samples from the shoreline and sediment core are being analyzed with the other study samples collected from 2008 to 2012, and it is anticipated that these analyses will be completed in 2013 and 2014. The report from the sediment grab sample stated:

*“The sediment sample was collected near the middle of the lake, in 7 meters of water. The sample was characterized as a light brown, gelatinous material containing organic material. The total solids were only 10 percent, while the organic carbon was 12.5 percent, which is high.*

*No pesticides or PCBs were detected. Only three PAH compounds were detected and all at low concentrations. The total PAH was just over 100 ppb. Only one metal was found at concentrations above the TEC and that was lead. Overall, the sediments would represent non-impacted sites and indicate very good water quality and a healthy substrate for biota.”*

None of the tributaries to the lake are named nor have they been sampled through the NYSDEC RIBS monitoring program. The lake has also not been sampled by the NYSDEC fisheries staff.

## **Lake Association and Management History**

Friends Lake is represented by the Friends Lake Property Owners Association. It is not known if the lake association maintains a website.

## **Summary of 2014 CSLAP Sampling Results**

### **Evaluation of 2014 Annual Results Relative to 1991-2013**

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 – Friends Lake” section in Appendix C.

### **Evaluation of Eutrophication Indicators**

Phosphorus readings were slightly lower than normal in 2014, but the differences from the typical year were small, and each of the other trophic indicators (chlorophyll *a* and Secchi disk transparency) was close to normal in 2014. Water clarity readings decreased from 2001 to 2010, corresponding to a slight rise in algae levels over the same period. However, phosphorus readings decreased over much of this timeframe, and each of these indicators has been fairly stable over the last five years. It is not known if the clarity from the late 1990s or the present readings are more representative of normal conditions in the lake.

None of these trophic indicators typically changes much during the summer, although phosphorus readings often increase slightly during the sampling season. In 2014, water clarity decreased slightly from May through August, but then increased substantially in September.

Water clarity, chlorophyll *a* (both typical of *mesotrophic* lakes) and total phosphorus readings (typical of *oligotrophic* lakes). The trophic state indices (TSI) evaluation suggests that phosphorus readings are usually slightly lower than expected given the algae and water clarity readings in the lake. This was also apparent in 2013 and 2014. While this suggests that the lake may be susceptible to small changes (increases) in phosphorus loading to the lake, actual measured increases in phosphorus from 2003 to 2007 did not correspond to changes in other measured water quality 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. Deepwater ammonia, iron, manganese, arsenic, and phosphorus readings are low and similar to those measured at the lake surface, although deepwater ammonia levels were slightly higher than normal in 2014. This suggests that deepwater potable intakes should not be compromised. Potable water conditions, at least as measurable through CSLAP, are summarized in the Lake Scorecard and Lake Condition Summary Table.

### **Evaluation of Limnological Indicators**

Each of the other limnological indicators (NO<sub>x</sub>, ammonia, total nitrogen, pH, conductivity, color and calcium) was close to normal in 2014, and none of these readings has exhibited a long-term trend. It is likely that the small changes in these limnological indicators from year to year represent normal variability. Overall limnological conditions are summarized in the Lake Scorecard and Lake Condition Summary Table.

### **Evaluation of Biological Condition**

The fluoroprobe screening samples analyzed by SUNY ESF in the last few years showed very low overall algae levels and low levels of blue green algae. The algae community is comprised of a mix of algae, particularly diatoms and other algae. No shoreline blooms have been reported or sampled.

The macrophyte data collected through CSLAP show very high plant diversity, and the presence of at least one protected plant species (waterthread pondweed, or *Potamogeton diversifolius*). No exotic plants were found in the lake. These data suggest that the quality of the aquatic plant community is “excellent.”

Zooplankton have not been monitored through CSLAP in Friends Lake. Zebra mussels are not found in the lake. The lake biomonitoring study found a large number of macroinvertebrate species, but a relatively high percentage of tolerant species. The high COTE (*Coleoptera*, *Odonate*, *Tricoptera*, and *Ephemeroptera*, a measure of sensitive macroinvertebrates, and therefore one measure of community health) rating indicates that water quality conditions in the lake are favorable, and the macroinvertebrate community is not dominated by a single taxa, suggesting high diversity. Additional evaluation of the macroinvertebrate data will be needed to create lake metrics that can better characterize lake conditions. Banded mystery snail, an exotic species, has been reported in the lake.

The fisheries information in the lake indicates that Friends Lake has a mixed warmwater/coolwater fish species composition, with at least four coolwater and six warmwater fish species found in the lake.

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

### **Evaluation of Lake Perception**

Water quality assessments, aquatic plant coverage, and recreational assessments were less favorable than normal in 2014, despite water quality conditions that were close to normal in 2014. Recreational assessments were less favorable than normal in the last three years, but lake perception has not changed in a consistent pattern since first evaluated in the early 1990s. Aquatic plant coverage increased from May through July in 2014, but was stable during the rest of the summer. Despite these recent changes, these assessments are generally highly favorable. Overall lake perception is summarized on the Lake Scorecard and Lake Condition Summary Table.

### **Evaluation of Local Climate Change**

Air temperatures were slightly higher than normal in 2014, but neither air nor water temperature has exhibited significant long-term change. It is not known if this is an indication of the lack of local climate change or if these changes cannot be well evaluated through CSLAP.

### **Evaluation of Algal Toxins**

Algal toxin levels can vary significantly within blooms and from shoreline to lake, and the absence of toxins in a sample does not indicate safe swimming conditions. Phycocyanin readings have been well below the levels indicating susceptibility for harmful algal blooms (HABs); this was confirmed by the fluoroprobe screening samples from the last several years. An analysis of algae samples indicated low to non-detectable levels of algal toxins, and thus well below the levels needed to support safe swimming. Occasional small spikes in toxin readings do not appear to be accurate.

# Lake Condition Summary

Category	Indicator	Min	91-14 Avg	Max	2014 Avg	Classification	2014 Change?	Long-term Change?
Eutrophication Indicators	Water Clarity	2.65	4.64	7.00	4.28	Mesotrophic	Within Normal Range	No Change
	Chlorophyll <i>a</i>	0.10	3.14	15.70	3.13	Mesotrophic	Within Normal Range	No Change
	Total Phosphorus	0.001	0.010	0.034	0.007	Oligotrophic	Within Normal Range	No Change
Potable Water Indicators	Hypolimnetic Ammonia	0.00	0.02	0.09	0.03	Close to Surface NH4 Readings	Higher than Normal	Not known
	Hypolimnetic Arsenic	0.34	0.40	0.50		Low Deepwater Arsenic Levels		Not known
	Hypolimnetic Iron	0.03	0.11	0.34		Low Iron Levels		Not known
	Hypolimnetic Manganese	0.02	0.06	0.14		Low Manganese Levels		Not known
Limnological Indicators	Hypolimnetic Phosphorus	0.005	0.012	0.058	0.011	Close to Surface TP Readings	Within Normal Range	Not known
	Nitrate + Nitrite	0.00	0.01	0.07	0.02	Low NOx	Within Normal Range	No Change
	Ammonia	0.00	0.02	0.08	0.02	Low Ammonia	Within Normal Range	No Change
	Total Nitrogen	0.05	0.27	0.56	0.29	Low Total Nitrogen	Within Normal Range	No Change
	pH	6.44	7.50	8.30	7.28	Alkaline	Within Normal Range	No Change
	Specific Conductance	38	60	81	65	Softwater	Within Normal Range	No Change
	True Color	1	11	45	9	Intermediate Color	Within Normal Range	No Change
Lake Perception	Calcium	3.7	7.1	8.3	7.1	Not Susceptible to Zebra Mussels	Within Normal Range	No Change
	WQ Assessment	1	1.2	2	1.9	Crystal Clear	Less Favorable than Normal	No Change
	Aquatic Plant Coverage	1	1.4	3	2.1	Plants Not Visible	Less Favorable than Normal	No Change
Biological Condition	Recreational Assessment	1	1.1	2	1.5	Could Not Be Nicer	Less Favorable than Normal	No Change
	Phytoplankton					Open water-low blue green algae biomass	Not known	Not known
	Macrophytes					Excellent quality of the aquatic plant community	Not known	Not known
	Zooplankton					Not measured through CSLAP	Not known	Not known
	Macroinvertebrates					Preliminary assessment suggests favorable communities	Not known	Not known
	Fish					Coolwater fisheries	Not known	Not known
Local Climate Change	Invasive Species					Banded mystery snail	Not known	Not known
	Air Temperature	6	19.5	31	17.1		Within Normal Range	No Change
	Water Temperature	9	21.3	29	21.4		Within Normal Range	No Change
Harmful Algal Blooms	Open Water Phycocyanin	0	3	16	1	No readings indicate high risk of BGA	Not known	Not known
	Open Water FP Chl.a	1	1	3	1	No readings indicate high algae levels	Not known	Not known
	Open Water FP BG Chl.a	0	0	1	0	No readings indicate high BGA levels	Not known	Not known
	Open Water Microcystis	0.0	0.3	1.4	<0.30	Mostly undetectable open water MC-LR	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					No shoreline blooms sampled for FP	Not known	Not known
	Shoreline FP BG Chl.a					No shoreline blooms sampled for FP	Not known	Not known
	Shoreline Microcystis					No shoreline bloom MC-LR data	Not known	Not known
	Shoreline Anatoxin a					No shoreline bloom anatoxin data	Not known	Not known

## **Evaluation of Lake Condition Impacts to Lake Uses**

Friends Lake is presently among the lakes cited on the Upper Hudson River Basin Priority Waterbody List (PWL), with no known impacts to lake uses. The 2007 PWL listing for the lake is shown in Appendix B.

### **Potable Water (Drinking Water)**

The CSLAP dataset at Friends 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 presence of bacillariophyta, a diatom sometimes associated with filtration, taste, and odor problems, suggests that drinking water may be *threatened* by algae, and deepwater intakes may be *threatened* by deepwater pollutants.

### **Contact Recreation (Swimming)**

The CSLAP dataset at Friends Lake, including water chemistry data, physical measurements, and volunteer samplers' perception data, suggests that swimming and contact recreation should be fully supported, although bacterial data are needed to evaluate the safety of the lake for swimming.

### **Non-Contact Recreation (Boating and Fishing)**

The CSLAP dataset on Friends Lake, including water chemistry data, physical measurements, and volunteer samplers' perception data, suggest that non-contact recreation should be fully supported.

### **Aquatic Life**

The CSLAP dataset on Friends Lake, including water chemistry data, physical measurements, and volunteer samplers' perception data, suggest that aquatic life should be fully supported, although this use may be *threatened* by the presence of banded mystery snail. Additional data are needed to evaluate the food and habitat conditions for aquatic organisms in the lake.

### **Aesthetics**

The CSLAP dataset on Friends Lake, including water chemistry data, physical measurements, and volunteer samplers' perception data, suggest that aesthetics should be fully supported.

### **Fish Consumption**

There is no fish consumption advisories posted for Friends Lake.

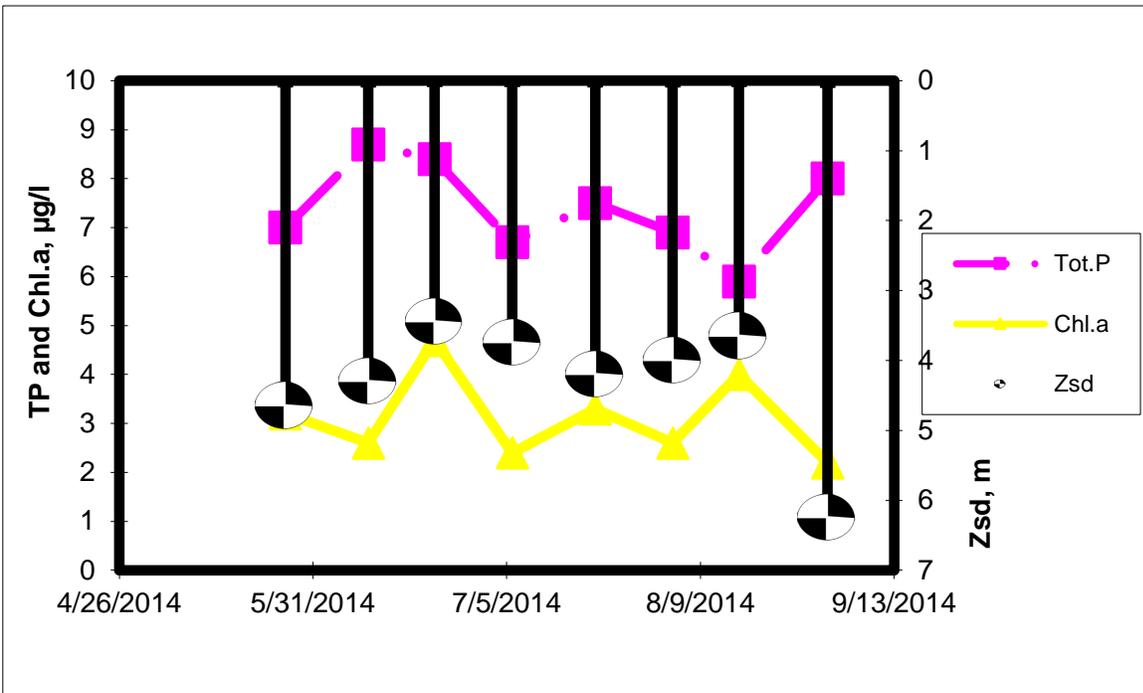
## **Additional Comments and Recommendations**

The continued evaluation of the 2008 biomonitoring survey data will help to better evaluate aquatic life impacts and the biological condition of the lake. Lake residents are advised to stay on the lookout for the introduction of invasive plants or the presence of any shoreline algae blooms, and for any input of nutrients or materials led to the drop in clarity from the 1990s.

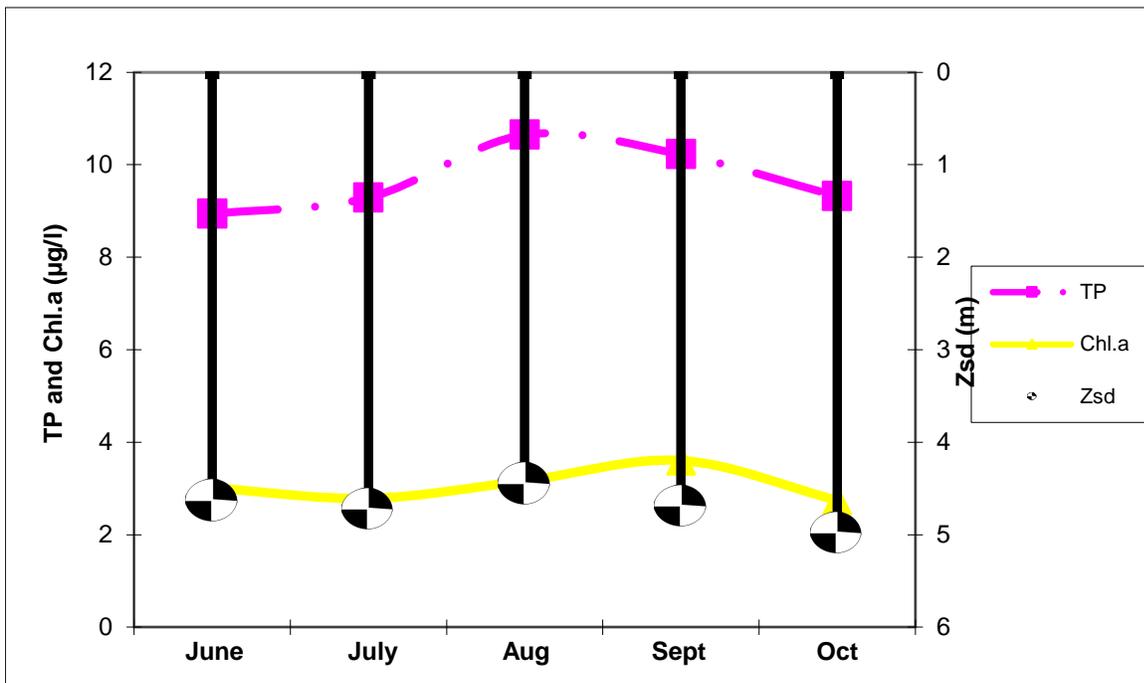
### **Aquatic Plant IDs-2014**

None submitted for identification

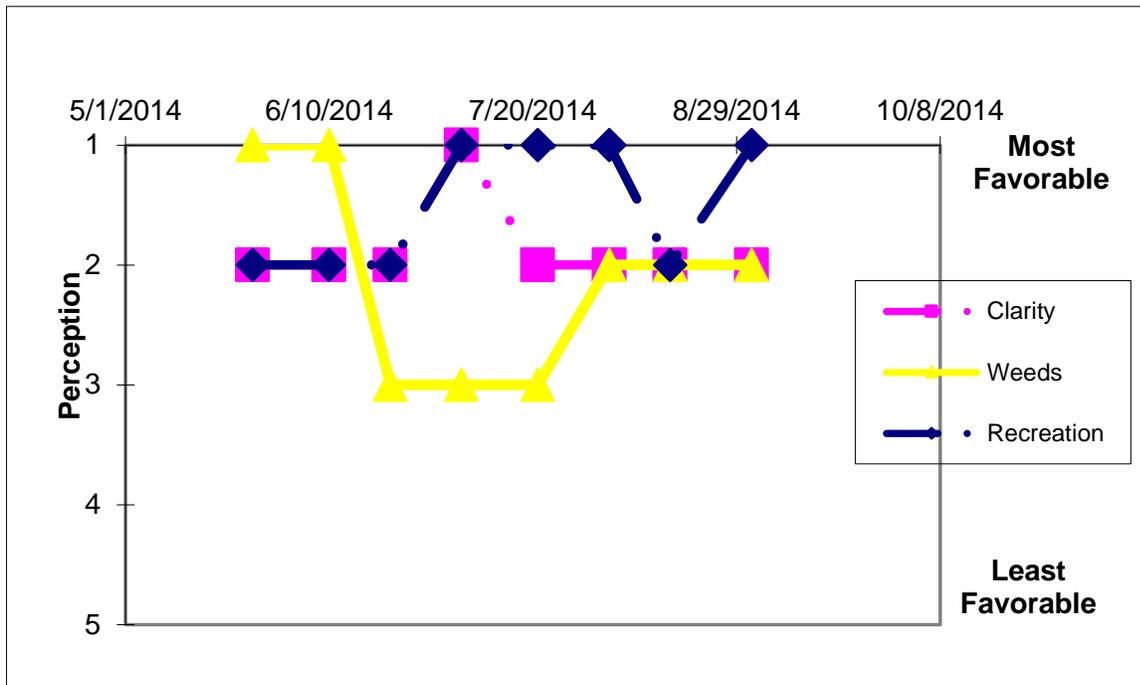
### Time Series: Trophic Indicators, 2014



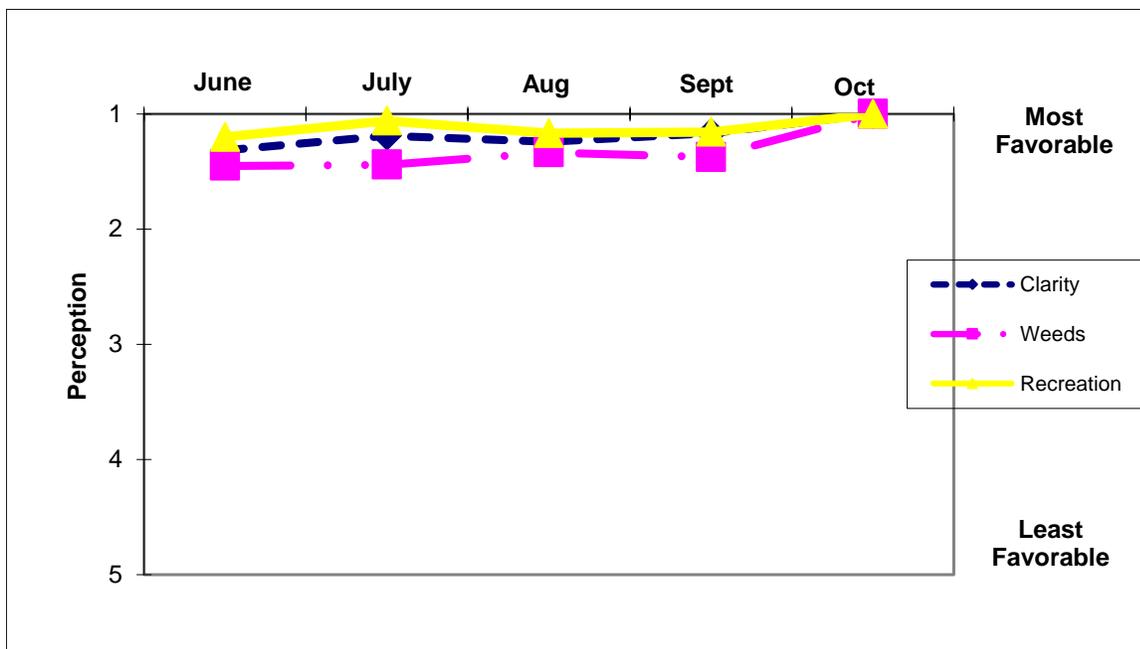
### Time Series: Trophic Indicators, Typical Year (1991-2014)



## Time Series: Lake Perception Indicators, 2014



## Time Series: Lake Perception Indicators, Typical Year (1991-2014)



## Appendix A- CSLAP Water Quality Sampling Results for Friends Lake

LNum	PName	Date	Zbot	Zsd	Zsamp	Tot.P	NO3	NH4	TDN	TN/TP	TColor	pH	Cond25	Ca	Chl.a
82	Friends L	6/30/1991	9.0	4.95	1.5	0.009	0.01				10	7.72	49		4.12
82	Friends L	7/14/1991	9.0	4.65	1.5	0.008					8	7.40	49		4.58
82	Friends L	7/28/1991	9.0	5.38	1.5	0.006	0.01				7	7.67	49		6.85
82	Friends L	8/11/1991	9.0	5.25	1.5	0.008	0.01				13	7.57	49		1.41
82	Friends L	8/25/1991	9.0	4.50	1.5	0.008	0.01				11	7.67	50		2.76
82	Friends L	9/8/1991	9.0	4.50	1.5	0.008	0.01				10	7.16	50		7.22
82	Friends L	9/22/1991	9.0	5.00	1.5	0.010	0.01				14	7.68	50		4.67
82	Friends L	10/4/1991	9.0	5.00	1.5	0.010	0.01				12	7.58	49		5.06
82	Friends L	6/14/1992	9.0	4.25	1.5	0.009	0.01				17	7.71	49		2.49
82	Friends L	6/28/1992	8.5	5.63	1.5	0.011					16	7.42	50		2.39
82	Friends L	7/12/1992	9.0	3.63	1.5	0.008	0.01				15	7.61	51		6.20
82	Friends L	7/26/1992	7.8	3.88	1.5	0.008					9	7.50	50		4.24
82	Friends L	8/10/1992	8.0	4.25	1.5	0.010	0.01				13	7.61	51		4.21
82	Friends L	8/25/1992	8.0	4.25	1.5	0.008					11	7.46	52		5.78
82	Friends L	9/7/1992	7.5	3.50	1.5	0.009	0.01				9	7.45	51		6.12
82	Friends L	9/20/1992	9.0	4.25	1.5	0.007					12	7.54	52		4.15
82	Friends L	6/20/1993	9.0	6.25	1.5	0.017	0.01				6	7.69	48		3.38
82	Friends L	7/4/1993	9.3	6.00	1.5	0.001	0.01				4	6.91	49		0.95
82	Friends L	7/10/1993	9.5	5.00	1.5	0.007	0.01				3	7.46	48		1.48
82	Friends L	7/25/1993	9.3	5.13	1.5	0.008					3	7.36	48		2.19
82	Friends L	8/8/1993	9.3	5.50	1.5	0.009	0.01				5	7.66	49		1.99
82	Friends L	8/22/1993	9.3	3.00	1.5	0.007					4	7.58	50		1.76
82	Friends L	9/4/1993	9.0	4.50	1.5	0.005	0.01				6	7.76	50		2.64
82	Friends L	9/19/1993	9.0	4.00	1.5	0.010					7	7.75	51		2.38
82	Friends L	6/20/1994	9.3	4.75	1.5	0.005	0.01				8	7.56	53		0.77
82	Friends L	7/4/1994	9.3	4.75	1.5						4	7.61	53		5.12
82	Friends L	7/18/1994	9.3	5.13	1.5	0.017	0.01				7	7.61	54		
82	Friends L	8/1/1994	9.0	4.83	1.5	0.008					4	7.42	52		7.26
82	Friends L	8/7/1994	9.3	5.25		0.009	0.01				8	7.80	54		2.33
82	Friends L	8/28/1994	9.3	4.88	1.3	0.008					12	7.15	55		15.70
82	Friends L	9/12/1994	9.5	4.75	1.5	0.009	0.01				9	7.42	55		14.10
82	Friends L	9/26/1994	9.3	5.25	1.5	0.007					8	7.50	54		5.35
82	Friends L	6/26/1995	9.2	6.33	1.5	0.009	0.01				5	7.54	63		0.74
82	Friends L	7/15/1995	9.8	6.25	1.5	0.012					5	7.51	62		1.67
82	Friends L	7/31/1995	9.3	7.00	1.5	0.007	0.01				5	7.48	62		1.04
82	Friends L	8/13/1995	9.5	6.75	1.5	0.008					10	7.34	64		2.30
82	Friends L	8/28/1995	9.5	5.75	1.5	0.006					5	7.33	61		6.37
82	Friends L	9/10/1995	9.5	5.75	1.5	0.007					10	7.60	61		2.88
82	Friends L	9/24/1995	9.5	4.50	1.5	0.011					10	7.45	62		10.20
82	Friends L	7/8/2001	9.0	4.90	1.5	0.011	0.07				7	7.70	70		1.85
82	Friends L	7/22/2001	8.5	5.70	1.5	0.005	0.01				8	6.83	69		0.24
82	Friends L	8/6/2001	8.6	5.65	1.5	0.010	0.01				7	7.45	70		
82	Friends L	8/19/2001	8.8	6.30	1.5	0.005	0.01				6	6.71	70		
82	Friends L	9/3/2001	8.8	5.30	1.5	0.006	0.01				7	7.48	71		1.13
82	Friends L	9/16/2001	8.5	4.40	1.5	0.007	0.01				12	7.73	70		4.01
82	Friends L	9/30/2001	8.8	4.90	1.5	0.008	0.01				13	7.03	70		
82	Friends L	06/23/02	8.6	4.38	1.5	0.006	0.00	0.03	0.31	123.13	12	7.49	72		2.72
82	Friends L	07/07/02	9.0	4.65	1.5	0.005	0.02	0.08	0.36	163.75	18	7.50	72		1.65
82	Friends L	07/21/02	8.6	5.25	1.5	0.002	0.00	0.02	0.36	422.50	7	7.52	72		2.19
82	Friends L	08/04/02	8.7	5.25	1.5	0.006	0.00	0.02	0.36	128.31	10	7.47	73		1.46
82	Friends L	08/18/02	8.5	5.45	1.5	0.008	0.00	0.01			13	7.38	71	3.7	0.27
82	Friends L	09/02/02	8.7	4.55	1.5	0.008	0.01	0.01	0.30	79.58	8	7.41	74		1.50
82	Friends L	09/14/02	8.6	4.25	1.5	0.009	0.00	0.01	0.37	92.49					
82	Friends L	6/23/2003	8.8	5.25	1.5	0.007	0.00	0.01	0.20	61.28	11	7.49	71	7.4	3.17
82	Friends L	7/6/2003	8.5	4.85	1.5	0.017	0.00	0.01	0.26	32.91	7	7.45	72		1.70
82	Friends L	7/20/2003	8.6	5.00	1.5	0.026	0.00	0.00	0.17	14.56	11	7.54	73		2.54
82	Friends L	8/3/2003	8.6	5.25	1.5	0.032	0.00	0.02	0.29	19.94	15	7.32	71		1.45
82	Friends L	8/17/2003	8.8	5.40	1.5	0.034	0.00	0.01	0.32	20.92	7	7.31	69	7.3	1.99
82	Friends L	8/31/2003	8.7	5.00	1.5	0.029	0.00	0.00	0.23	17.25	7	7.01	69		1.22
82	Friends L	9/14/2003	8.6	5.80	1.5	0.013	0.01	0.02	0.22	36.13	10	7.28	72		1.21
82	Friends L	9/27/2003	8.4	6.40	1.5	0.032	0.00	0.01	0.23	15.65	11	6.60	71		1.45
82	Friends L	6/23/2004	8.7	4.80	1.5	0.018	0.01	0.01	0.25	30.68	15	6.44	70		
82	Friends L	7/7/2004	8.8	5.40	1.5	0.008	0.02	0.02			13	6.76	72		0.60
82	Friends L	7/21/2004	8.8	4.70	1.5	0.023	0.04	0.03	0.31	29.77		7.03			0.90
82	Friends L	8/4/2004	8.8	4.60	1.5	0.019	0.01	0.01	0.22	25.56	10	7.35	66		2.90

LNum	PName	Date	Zbot	Zsd	Zsamp	Tot.P	NO3	NH4	TDN	TN/TP	TColor	pH	Cond25	Ca	Chl.a
82	Friends L	8/18/2004	8.7	4.30	1.5	0.013		0.01	0.30	49.85	11	7.96	81	7.9	0.20
82	Friends L	9/2/2004	8.8	5.20	1.5	0.013	0.02	0.01	0.37	62.11	18	8.11	52		2.30
82	Friends L	9/16/2004	8.6	4.80	1.5	0.011	0.01	0.01	0.23	44.70	4	7.74	58		3.70
82	Friends L	9/29/2004				0.018	0.02	0.01	0.52	64.52	14	7.60	63		
82	Friends L	6/12/2005	8.80	5.10	1.5	0.011			0.17	35.33	7	7.94	73	7.4	1.98
82	Friends L	6/25/2005	8.80	4.60	1.5	0.005	0.01	0.01	0.05	24.80	17	8.29	48		2.73
82	Friends L	7/11/2005	8.80	4.50	1.5	0.006	0.02	0.01			17	7.70	66		2.62
82	Friends L	7/25/2005	8.60	4.10	1.5	0.017	0.03	0.04	0.49	64.61	9	8.05	63		2.79
82	Friends L	8/8/2005	8.60	4.50	1.5	0.017	0.01	0.01	0.06	8.05	8	7.91	58	4.9	2.51
82	Friends L	8/22/2005	8.70	4.30	1.5	0.016	0.01	0.01	0.06	8.34	12	8.28	49		0.63
82	Friends L	9/5/2005	8.80	4.90	1.5	0.008	0.01	0.01	0.09	24.37	9	7.85	38		2.50
82	Friends L	9/19/2005	8.50	6.60	1.5	0.010	0.01	0.01	0.10	20.96	14	8.21	66		1.99
82	Friends L	7/4/2006	9.1	3.90	1.5	0.010	0.00	0.01	0.35	75.04	16	7.75	44	6.2	5.10
82	Friends L	7/10/2006	8.5	4.25	1.5	0.008	0.01	0.05	0.55	158.15		8.18	53		2.25
82	Friends L	7/24/2006	8.8	4.50	1.5	0.016	0.01	0.01	0.56	77.85	25	7.47	55		3.77
82	Friends L	8/7/2006	8.5	4.40	1.5	0.012	0.01	0.01	0.35	64.60	23	7.72	60		1.92
82	Friends L	8/21/2006	8.7	3.80	1.5	0.010	0.01	0.02	0.38	84.88	22	7.58	46	6.9	4.50
82	Friends L	9/4/2006	8.8	3.40	1.5	0.017			0.44	57.08	10	7.74	52		5.32
82	Friends L	9/20/2006	8.7	5.25	1.5	0.019	0.00	0.01	0.45	52.10	30	7.49	60		3.03
82	Friends L	10/9/2006	8.6	5.80	1.5	0.010	0.01	0.02	0.30	63.73	15	6.77	62		2.43
82	Friends L	8/21/2007	8.7	2.65	1.5	0.010	0.00	0.01	0.54	130.1	7	7.85	59	6.8	3.87
82	Friends L	9/10/2007	9.2	3.15	1.5	0.016	0.00	0.01	0.42	33.1	8	7.86	52		6.08
82	Friends L	9/24/2007	9.0	4.80	1.5	0.009	0.01	0.01	0.48	73.3	14	7.92	62		1.70
82	Friends L	10/4/2007	9.0	5.25	1.5	0.011	0.01	0.05	0.52	117.0	8	7.34			0.48
82	Friends L	6/23/2008	8.3	4.18		0.007	0.01	0.03	0.20	59.66	15	7.94	57	7.5	7.71
82	Friends L	7/7/2008	8.1	4.35		0.007	0.00	0.01	0.14	47.59	10	7.71	64		1.77
82	Friends L	7/28/2008	8.7	3.55		0.007	0.02	0.01	0.16	49.18	11	7.20	42		8.38
82	Friends L	8/11/2008	8.9	3.60	1.5	0.009	0.02	0.05	0.16	39.92	10	8.04	56		7.06
82	Friends L	8/25/2008	8.7	3.75	1.5	0.007	0.00	0.01	0.20	61.26	1	6.95	52	7.7	2.34
82	Friends L	9/8/2008	8.5	4.50	1.5	0.001	0.00	0.01	0.20	363.66	11	7.80	64		2.05
82	Friends L	9/22/2008	8.5	3.20	1.5	0.009	0.01	0.02	0.22	53.28	17	7.31	56		0.94
82	Friends L	10/6/2008	8.4	4.40	1.5	0.007	0.02	0.02	0.23	70.78	24	7.80	60		1.06
82	Friends L	06/15/2009	8.4	3.90		0.007	0.01	0.01	0.19		15	6.89	55	7.4	1.38
82	Friends L	06/29/2009	8.1	4.25		0.008	0.01	0.00			13	6.77	57		2.48
82	Friends L	07/13/2009	8.0	5.25	1.0	0.006	0.00	0.01			13	7.02	61		2.69
82	Friends L	07/27/2009	8.0	4.25	1.0	0.007	0.01	0.01			14	6.93	46		2.65
82	Friends L	08/10/2009	8.7	3.70		0.008	0.01	0.01	0.17		45	7.21	50	7.4	4.30
82	Friends L	08/24/2009	8.2	4.25		0.005	0.01	0.02			15	7.82	52		2.30
82	Friends L	09/07/2009	8.8	4.15		0.006		0.03			15	8.02	50		1.80
82	Friends L	09/21/2009	8.5	3.88	1.5	0.007	0.01	0.01			15	7.51	46		2.70
82	Friends L	6/7/2010	9.1	4.15		0.009	0.04	0.03	0.43	100.64	10	7.11	65	8.2	2.80
82	Friends L	6/21/2010	8.1	3.08	1.5	0.010	0.03	0.01	0.23	50.82	8	7.29	79		4.60
82	Friends L	7/6/2010	8.9	3.65		0.007	0.02	0.02	0.17	51.73	8	7.46	68		3.10
82	Friends L	7/19/2010	8.5	4.85		0.007	0.01	0.02	0.20	58.57	9	7.28	67		1.90
82	Friends L	8/2/2010	7.6	3.88	1.5	0.010	0.04	0.03	0.23	48.06	15	7.32	67	8.3	2.40
82	Friends L	8/15/2010	8.2	3.60		0.007	0.01	0.03	0.24	76.52	13	7.26	69		3.50
82	Friends L	8/29/2010	8.3	3.30		0.007	0.05	0.04	0.24	76.69	9	7.65	71		0.10
82	Friends L	9/13/2010	8.6	4.55	1.5	0.009	0.01	0.04	0.24	56.30	9				
82	Friends L	6/15/2012	8.7	4.90		0.010	0.02	0.03	0.27	59.56	14	7.27	64	7.3	3.20
82	Friends L	7/10/2012	7.7	4.60		0.010	0.01	0.01	0.31	67.78	9	8.30	62		3.00
82	Friends L	7/22/2012	8.0	3.90		0.009	0.01	0.03	0.09	23.02	9	7.78	63		2.30
82	Friends L	8/5/2012	5.8	4.00	1.5	0.007	0.01	0.02	0.16	48.53	12	7.96	67		2.10
82	Friends L	8/20/2012	8.4	3.10	1.0	0.010	0.01	0.01	0.36	78.08	8	7.83	65	8.1	2.50
82	Friends L	9/10/2012	8.3	4.20		0.012	0.01	0.04	0.22	40.52	9	7.51	64		1.00
82	Friends L	9/23/2012	8.2	4.60	1.5	0.007	0.01	0.02	0.38	121.97	9	6.78	62		4.10
82	Friends L	10/7/2012	8.3	4.45		0.008	0.01	0.01	0.20	53.54	8	6.86	63		4.70
82	Friends L	5/27/2013		4.85	1.0	0.008	0.05	0.03	0.12	32.44	9	7.80	71	7.7	4.60
82	Friends L	6/9/2013	8.7	4.65	1.0	0.008			0.24	64.64	10	7.56	64		2.90
82	Friends L	6/24/2013	8.5	4.15	1.5	0.006	0.01	0.03	0.33	125.44	13	7.85	63		3.40
82	Friends L	7/7/2013	8.0	4.50	1.5	0.007			0.23	68.53	10	7.59	64		2.00
82	Friends L	7/22/2013	8.3	4.85	1.0	0.014	0.01	0.01	0.10	15.37	14	8.16	66		1.50
82	Friends L	8/4/2013	8.4	3.35	1.5	0.008			0.34	99.00	12	7.75	66		2.80
82	Friends L	8/19/2013	8.2	3.95	1.5	0.009	0.01	0.02	0.27	67.73	15	7.88	66		
82	Friends L	9/2/2013	8.3	4.60	1.5	0.007			0.36	112.53	12	7.90	67		1.30
82	Friends L	5/26/2014	8.9	4.65	1.5	0.007	0.01	0.02	0.23	71.97	18	6.57	64	7.0	3.20
82	Friends L	6/10/2014	8.2	4.30	1.5	0.009			0.33	82.69	7	7.35	65		2.60
82	Friends L	6/22/2014	8.7	3.45	1.5	0.008	0.05	0.03	0.34	88.00	9	7.34	64		4.70
82	Friends L	7/6/2014	8.5	3.75	1.5	0.007			0.34	111.31	11	7.25	66		2.40

LNum	PName	Date	Zbot	Zsd	Zsamp	Tot.P	NO3	NH4	TDN	TN/TP	TColor	pH	Cond25 Fe	Ca Mn	Chl.a As
82	Friends L	7/21/2014	8.0	4.20	1.5	0.008	0.01	0.02	0.18	51.33	8	7.12	66	7.3	3.30
82	Friends L	8/4/2014	8.3	4.00	1.5	0.007			0.28	88.00	2	7.66	64		2.60
82	Friends L	8/16/2014	8.5	3.65	1.5	0.006	0.01	0.02	0.46	170.41	8	7.23	65		4.00
82	Friends L	9/1/2014	8.3	6.25	1.5	0.008			0.22	59.95	7	7.74	65		2.20
82	Friends L	7/25/1993	9.3		7.8	0.011									
82	Friends L	8/22/1993	9.3		7.8	0.015									
82	Friends L	9/19/1993	9.0		7.5	0.010									
82	Friends L	8/1/1994	9.0		7.5	0.011									
82	Friends L	8/28/1994	9.3		7.5	0.008									
82	Friends L	9/26/1994	9.3		7.5	0.007									
82	Friends L	7/4/1994	9.3		7.8	0.012									
82	Friends L	06/23/02	8.6	4.38	7.0	0.007	0.00	0.05	0.27	85.42					
82	Friends L	07/07/02	9.0	4.65	7.0	0.007	0.02	0.09	0.34	110.71					
82	Friends L	07/21/02	8.6	5.25	7.5	0.009	0.00	0.02	0.44	111.13					
82	Friends L	08/04/02	8.7	5.25	7.0	0.007	0.04	0.04	0.30	97.51					
82	Friends L	08/18/02	8.5	5.45	7.0	0.006	0.00	0.01							
82	Friends L	09/02/02	8.7	4.55	7.0			0.01							
82	Friends L	6/23/2003			7.0	0.008	0.00	0.00	0.11	32.22					
82	Friends L	7/6/2003			7.5	0.010	0.00	0.00	0.22	48.04					
82	Friends L	7/20/2003			7.5	0.025	0.00	0.01	0.19	16.49					
82	Friends L	8/3/2003			7.5	0.021	0.00	0.01	0.24	24.71					
82	Friends L	8/17/2003			7.5	0.020	0.00	0.01	0.25	27.45					
82	Friends L	8/31/2003			7.5	0.010	0.00	0.00	0.35	73.99					
82	Friends L	9/14/2003			7.5	0.016	0.00	0.01	0.27	37.00					
82	Friends L	9/27/2003			7.5	0.008	0.01	0.02	0.25	70.97					
82	Friends L	6/23/2004	8.7		7.5	0.007	0.01	0.01	0.75	234.61					
82	Friends L	7/7/2004	8.8		7.5	0.011	0.03	0.01	0.95	191.86					
82	Friends L	7/21/2004	8.8		7.5	0.011	0.01	0.01	0.34	67.48					
82	Friends L	8/4/2004	8.8		7.5		0.01	0.01	0.23						
82	Friends L	8/18/2004	8.7		7.5	0.013	0.03	0.01	0.34	59.85					
82	Friends L	9/2/2004	8.8		7.5	0.013	0.02	0.03	0.26	43.24					
82	Friends L	9/16/2004	8.6		7.5	0.011	0.01	0.02	0.33	65.28					
82	Friends L	9/29/2004				0.013	0.02	0.03	0.65	110.58					
82	Friends L	6/12/2005			7.5	0.006									
82	Friends L	6/25/2005			7.5	0.005									
82	Friends L	7/11/2005			7.5	0.011									
82	Friends L	7/25/2005			7.5	0.014									
82	Friends L	8/8/2005			7.5	0.013									
82	Friends L	8/22/2005			7.5	0.010									
82	Friends L	9/5/2005			7.5	0.011									
82	Friends L	9/19/2005			7.5	0.007									
82	Friends L	7/4/2006	9.1		7.5	0.011									
82	Friends L	7/10/2006	8.5		7.5	0.027									
82	Friends L	7/24/2006	8.8		7.5	0.058									
82	Friends L	8/7/2006	8.5		7.5	0.013									
82	Friends L	8/21/2006	8.7		7.5	0.011									
82	Friends L	9/4/2006	8.8		7.5	0.012									
82	Friends L	9/20/2006	8.7		7.5	0.020									
82	Friends L	10/9/2006	8.6		7.5	0.021									
82	Friends L	8/21/2007	8.7			0.009									
82	Friends L	9/10/2007	9.2			0.028									
82	Friends L	9/24/2007	9.0			0.015									
82	Friends L	10/4/2007	9.0			0.010									
82	Friends L	6/23/2008				0.009									
82	Friends L	7/7/2008				0.011									
82	Friends L	7/28/2008				0.011									
82	Friends L	8/11/2008			7.2	0.011									
82	Friends L	8/25/2008			6.2	0.010									
82	Friends L	9/8/2008			7.5	0.012									
82	Friends L	9/22/2008			7.2	0.008									
82	Friends L	10/6/2008			7.5	0.009									
82	Friends L	06/15/2009			6.9	0.008		0.01							
82	Friends L	06/29/2009			6.7	0.013									
82	Friends L	07/13/2009			6.5	0.011		0.02							
82	Friends L	07/27/2009			6.5	0.007							Fe	Mn	As
82	Friends L	08/10/2009			7.2	0.014		0.01					0.34	0.14	<0.68
82	Friends L	08/24/2009			6.7	0.006									

LNum	PName	Date	Zbot	Zsd	Zsamp	Tot.P	NO3	NH4	TDN	TN/TP			Fe	Mn	As
82	Friends L	09/07/2009			7.3	0.005		0.01					0.10	0.10	
82	Friends L	09/21/2009			7.0	0.008									
82	Friends L	6/7/2010	9.1		7.5	0.012		0.05					0.03		
82	Friends L	7/6/2010	8.9		17.5	0.013		0.01					0.11	0.12	
82	Friends L	8/2/2010	7.6		6.0	0.011							0.03		<0.68
82	Friends L	8/29/2010	8.3		6.8	0.011		0.03					0.29		<0.68
82	Friends L	6/15/2012			7.5	0.012		0.03							
82	Friends L	7/10/2012			7.5								0.03	0.02	
82	Friends L	7/22/2012			6.5	0.014		0.03							
82	Friends L	8/5/2012			4.8								0.03	0.02	
82	Friends L	8/20/2012				0.015		0.01							
82	Friends L	9/10/2012			7.0								0.12	0.02	0.50
82	Friends L	9/23/2012			6.7	0.009		0.02							
82	Friends L	10/7/2012			6.5								0.07	0.02	0.50
82	Friends L	5/27/2013			8.0	0.008		0.02							
82	Friends L	6/9/2013			7.6										
82	Friends L	6/24/2013			7.5	0.006		0.03							
82	Friends L	7/7/2013			6.5										
82	Friends L	7/22/2013			7.0	0.005		0.06							
82	Friends L	8/4/2013			7.0										
82	Friends L	8/19/2013			7.0	0.011		0.02							
82	Friends L	9/2/2013			7.0										
82	Friends L	5/26/2014			7.5	0.013		0.03							
82	Friends L	6/10/2014			7.2	0.010									
82	Friends L	6/22/2014			7.7										
82	Friends L	7/6/2014			7.5	0.009									
82	Friends L	7/21/2014			6.5	0.017		0.03							
82	Friends L	8/4/2014			6.8	0.010									
82	Friends L	8/16/2014			7.0	0.008		0.02							
82	Friends L	9/1/2014			7.2	0.008									

LNum	PName	Date	Site	TAir	TH20	QA	QB	QC	QD	QE	QF	QG	AQ-PC	AQ-Chla	MC-LR	Ana-a	Cylin	FP-Chl	FP-BG	HAB form	Shore HAB	
82	Friends L	6/30/1991	epi	25	22																	
82	Friends L	7/14/1991	epi	25	22																	
82	Friends L	7/28/1991	epi	24	24																	
82	Friends L	8/11/1991	epi	27	23																	
82	Friends L	8/25/1991	epi	23	24																	
82	Friends L	9/8/1991	epi	22	23																	
82	Friends L	9/22/1991	epi	14	17																	
82	Friends L	10/4/1991	epi	20	15																	
82	Friends L	6/14/1992	epi	25	18	2	2	1	0													
82	Friends L	6/28/1992	epi	24	18	2	2	1														
82	Friends L	7/12/1992	epi	23	19	2	2	2														
82	Friends L	7/26/1992	epi	20	18	2	3	2														
82	Friends L	8/10/1992	epi	18	18	2	3	2	0													
82	Friends L	8/25/1992	epi	30	20	2	3	2	0													
82	Friends L	9/7/1992	epi	19	18	2	2	2														
82	Friends L	9/20/1992	epi	19	17	2	3	2														
82	Friends L	6/20/1993	epi	14	17	2	2	2	0													
82	Friends L	7/4/1993	epi	23	18	2	2	1														
82	Friends L	7/10/1993	epi	30	27	2	2	1														
82	Friends L	7/25/1993	epi	22	18	2	2	1														
82	Friends L	8/8/1993	epi	17	18	2	3	2														
82	Friends L	8/22/1993	epi	16	19	2	3	2														
82	Friends L	9/4/1993	epi	19	20	2	3	2														
82	Friends L	9/19/1993	epi	6	9	2	3	2														
82	Friends L	6/20/1994	epi	23	21		2	2	6													
82	Friends L	7/4/1994	epi	15	19		2	1														
82	Friends L	7/18/1994	epi	18	20		1	1	6													
82	Friends L	8/1/1994	epi	19	20		1	1	5													
82	Friends L	8/7/1994	epi	17	19		1	1														
82	Friends L	8/28/1994	epi	14	21		2	1	6													

LNum	PName	Date	Site	TAir	TH20	QA	QB	QC	QD	QF	QG	AQ-PC	AQ-Chla	MC-LR	Ana-a	Cylin	FP-Chl	FP-BG	HAB form	Shore HAB
82	Friends L	9/12/1994	epi	14	18		1	1												
82	Friends L	9/26/1994	epi	18	19		1	1	5											
82	Friends L	6/26/1995	epi	30	29	1	1	1	6											
82	Friends L	7/15/1995	epi	24	26	1	1	1	6											
82	Friends L	7/31/1995	epi	31	27	1	1	1												
82	Friends L	8/13/1995	epi	28	26	2	1	1	6											
82	Friends L	8/28/1995	epi	11	22	1	1	1	6											
82	Friends L	9/10/1995	epi	16	21	1	1	1	6											
82	Friends L	9/24/1995	epi	13	17	1	1	1												
82	Friends L	7/8/2001	epi	19	21	1	3	1	0											
82	Friends L	7/22/2001	epi	22	24	1	1	1	0											
82	Friends L	8/6/2001	epi	21	25	1	1	1	0											
82	Friends L	8/19/2001	epi	17	23	1	1	1												
82	Friends L	9/3/2001	epi	11	21	1	1	1												
82	Friends L	9/16/2001	epi	13	19	1	1	1	6											
82	Friends L	9/30/2001	epi	9	17	1	1	1												
82	Friends L	06/23/02	epi	22	21	1	1	1												
82	Friends L	07/07/02	epi	24	24	1	1	1	8											
82	Friends L	07/21/02	epi	21	23	1	1	1	8											
82	Friends L	08/04/02	epi	18	24	1	1	1	8											
82	Friends L	08/18/02	epi	22	25	1	1	1	8											
82	Friends L	09/02/02	epi	13	23	1	1	1	8											
82	Friends L	09/14/02	epi	23	21	1	1	1	8											
82	Friends L	6/23/2003	epi	26	22	2	1	1	8											
82	Friends L	7/6/2003	epi	23	24	1	1	1	8											
82	Friends L	7/20/2003	epi	18	22	1	1	1	8											
82	Friends L	8/3/2003	epi	21	23	1	1	1	8											
82	Friends L	8/17/2003	epi	17	25	1	1	1	8											
82	Friends L	8/31/2003	epi	14	22	1	1	1	8											
82	Friends L	9/14/2003	epi	21	21	1	1	1	8											
82	Friends L	9/27/2003	epi	18	19	1	1	1	8											
82	Friends L	6/23/2004	epi	21	21	1	1	1	0											
82	Friends L	7/7/2004	epi	19	23	1	1	1	0											
82	Friends L	7/21/2004	epi	21	23	1	1	1	0											
82	Friends L	8/4/2004	epi	21	24	1	1	1	0											
82	Friends L	8/18/2004	epi	17	21	1	1	1	0											
82	Friends L	9/2/2004	epi	16	21	1	1	1	0											
82	Friends L	9/16/2004	epi	23	20	1	1	1	0											
82	Friends L	6/12/2005	epi	24	23	1	1	1	8											
82	Friends L	6/25/2005	epi	21	23	1	1	1	8											
82	Friends L	7/11/2005	epi	23	23	1	1	1	8											
82	Friends L	7/25/2005	epi	21	25	1	1	1	8											
82	Friends L	8/8/2005	epi	18	26	1	1	1	8											
82	Friends L	8/22/2005	epi	18	23	1	1	1	8											
82	Friends L	9/5/2005	epi	13	22	1	1	1	8											
82	Friends L	9/19/2005	epi	14	21	1	1	1	8											
82	Friends L	7/4/2006	epi	23	23	1	1	1	8											
82	Friends L	7/10/2006	epi	25	25	1	1	1	0											
82	Friends L	7/24/2006	epi	18	24	1	1	1	0											
82	Friends L	8/7/2006	epi	23	26	1	1	1	0											
82	Friends L	8/21/2006	epi	19	23	1	1	1	5											
82	Friends L	9/4/2006	epi	18	19	1	1	1	0											
82	Friends L	9/20/2006	epi	15	19	1	1	1	0											
82	Friends L	10/9/2006	epi	14	14	1	1	1	0											
82	Friends L	8/21/2007	epi	16	21	1	1	1	5											
82	Friends L	9/10/2007	epi	17	22	1	1	1	5											
82	Friends L	9/24/2007	epi	25	19	1	1	1	0											
82	Friends L	10/4/2007	epi	14	20	1	1	1	8											
82	Friends L	6/23/2008	epi	23	22	1	3	1	8											
82	Friends L	7/7/2008	epi	27	23	1	1	1	8											
82	Friends L	7/28/2008	epi	27	26	1	1	1	8											

LNum	PName	Date	Site	TAir	TH20	QA	QB	QC	QD	QF	QG	AQ-PC	AQ-Chla	MC-LR	Ana-a	Cylin	FP-Chl	FP-BG	HAB form	Shore HAB
82	Friends L	8/11/2008	epi	18	23	1	1	1	58											
82	Friends L	8/25/2008	epi	25	23	1	1	1	8											
82	Friends L	9/8/2008	epi	19	22	1	1	1	8											
82	Friends L	9/22/2008	epi	15	18	1	1	1	8											
82	Friends L	10/6/2008	epi	14	16	1	1	1	5											
82	Friends L	06/15/2009	epi	14	20	1	1	1	6											
82	Friends L	06/29/2009	epi	17	23	1	1	1	0											
82	Friends L	07/13/2009	epi		21	1	1	1	0											
82	Friends L	07/27/2009	epi	20	23	1	1	1	0											
82	Friends L	08/10/2009	epi	23	22	1	1	1	0											
82	Friends L	08/24/2009	epi	18	24	1	1	1	0					0.00						
82	Friends L	09/07/2009	epi	13	21	1	1	1	0			14.28								
82	Friends L	09/21/2009	epi	20	18	1	1	1	0			15.75		0.00						
82	Friends L	6/7/2010	epi	13		1	1	1	0	0	0									
82	Friends L	6/21/2010	epi	19		1	1	1	0	0	0									
82	Friends L	7/6/2010	epi	28		1	2	1	0	0	0									
82	Friends L	7/19/2010	epi	21		1	1	1	0	0	0									
82	Friends L	8/2/2010	epi	24		1	1	1	0	0	0									
82	Friends L	8/15/2010	epi	19		1	1	1	0	0	0	8.00		0.00						
82	Friends L	8/29/2010	epi	26	24	1	1	1	0	0	0									
82	Friends L	9/13/2010	epi	15	19	1	1	1	0	0	0									
82	Friends L	6/15/2012	epi	19	21	1	1	1	0	0	0	2.20	0.40	<0.30	<0.413					i
82	Friends L	7/10/2012	epi	19	23	1	2	1	6	0	0			<0.30	<0.423					
82	Friends L	7/22/2012	epi	25	24	1	1	1	0	0	0			<0.30	<0.585					i
82	Friends L	8/5/2012	epi	26	25	1	1	1	0	0	0			<0.30	<0.330					i
82	Friends L	8/20/2012	epi	26	23	1	1	1	0	0	0			0.32	<0.552					
82	Friends L	9/10/2012	epi	16	20	1	3	1	5	0	0			<0.30	<0.580					i
82	Friends L	9/23/2012	epi	8	17	1	2	1	0	0	0			<0.30	<3.205					
82	Friends L	10/7/2012	epi	11	15	1	1	1	0	0	0			<0.30	<3.205					
82	Friends L	5/27/2013	epi	8	13	1	1	1	5	0	0	3.00	1.40	<0.30	<0.630		0.70	0.00		i
82	Friends L	6/9/2013	epi	18	18	1	1	1	0	0	0			<0.30	<0.420					
82	Friends L	6/24/2013	epi	23	22	1	2	1	0	0	0			<0.30	<0.410					i
82	Friends L	7/7/2013	epi	30	26	1	1	1	0	0	0	1.60	1.00	0.46	<0.510		1.00	0.00		i
82	Friends L	7/22/2013	epi	19	27	1	1	1	0	0	0	0.80	1.80	<0.30	<0.370		1.30	0.00		i
82	Friends L	8/4/2013	epi	25	24	2	2	2	0	0	0	1.90	1.80	0.82	<0.390		2.90	0.50		i
82	Friends L	8/19/2013	epi	16	21	1	1	1	0	0	0	1.40	1.80	<0.30	<0.510		0.80	0.00		i
82	Friends L	9/2/2013	epi	21	24	1	2	2	0	0	0	3.10	1.30	1.39	<1.100		0.70	0.00		i
82	Friends L	5/26/2014	epi	11	17	2	1	2	0	0	0	0.10	0.60	<1.83	<0.40	<0.001	0.50	0.00		i
82	Friends L	6/10/2014	epi	18	21	2	1	2	56	0	0	0.10	1.00	<1.83	<0.17	<0.001	0.80	0.00		i
82	Friends L	6/22/2014	epi	22	20	2	3	2	0	0	0	1.50	0.60	<0.58	<0.44	<0.002	1.90	0.00		i
82	Friends L	7/6/2014	epi	17	24	1	3	1	0	0	0	0.50	0.50	<0.62	<0.03	<0.002	1.50	0.00		i
82	Friends L	7/21/2014	epi	14	23	2	3	1	0	0	0	2.50	0.40	<0.39	<0.03	<0.001	1.10	0.00		i
82	Friends L	8/4/2014	epi	18	24	2	2	1	0	0	0	2.20	0.30	<0.33	<0.01	<0.002	1.00	0.00		i
82	Friends L	8/16/2014	epi	14	20	2	2	2	0	0	0	2.30	0.30	<0.42	<0.10	<0.002	0.90	0.00		i
82	Friends L	9/1/2014	epi	23	22	2	2	1	0	0	0	0.40	0.10	<0.25	<0.14	<0.002	0.70	0.00		i
82	Friends L	7/25/1993	hypo	22	8															
82	Friends L	8/22/1993	hypo	16	15															
82	Friends L	9/19/1993	hypo	6	12															
82	Friends L	8/1/1994	hypo		15															
82	Friends L	8/28/1994	hypo		19															
82	Friends L	9/26/1994	hypo		18															
82	Friends L	7/4/1994	hypo		19															
82	Friends L	06/23/02	hypo	22	21	1	1	1												
82	Friends L	07/07/02	hypo	24	24	1	1	1	8											
82	Friends L	07/21/02	hypo	21	23	1	1	1	8											
82	Friends L	08/04/02	hypo	18	24	1	1	1	8											
82	Friends L	08/18/02	hypo	22		1	1	1	8											
82	Friends L	09/02/02	hypo	13	23	1	1	1	8											
82	Friends L	06/29/2009	hypo		18															
82	Friends L	07/13/2009	hypo		18															
82	Friends L	07/27/2009	hypo		22															

LNum	PName	Date	Site	TAir	TH20															
82	Friends L	08/10/2009	hypo		20															
82	Friends L	08/24/2009	hypo		18															
82	Friends L	09/07/2009	hypo		20															
82	Friends L	6/7/2010	hypo		14															
82	Friends L	7/6/2010	hypo		17															
82	Friends L	8/2/2010	hypo		18															
82	Friends L	8/29/2010	hypo		22															
82	Friends L	6/15/2012	hypo		15															
82	Friends L	7/10/2012	hypo		20															
82	Friends L	7/22/2012	hypo		22															
82	Friends L	8/5/2012	hypo		24															
82	Friends L	8/20/2012	hypo		23															
82	Friends L	9/10/2012	hypo		19															
82	Friends L	9/23/2012	hypo		17															
82	Friends L	10/7/2012	hypo		15															
82	Friends L	5/27/2013	hypo		13															
82	Friends L	6/9/2013	hypo		13															
82	Friends L	6/24/2013	hypo		18															
82	Friends L	7/7/2013	hypo		19															
82	Friends L	7/22/2013	hypo		16															
82	Friends L	8/4/2013	hypo		18															
82	Friends L	8/19/2013	hypo		20															
82	Friends L	9/2/2013	hypo		21															
82	Friends L	5/26/2014	hypo		11															
82	Friends L	6/10/2014	hypo		13															
82	Friends L	6/22/2014	hypo		15															
82	Friends L	7/6/2014	hypo		15															
82	Friends L	7/21/2014	hypo		19															
82	Friends L	8/4/2014	hypo		21															
82	Friends L	8/16/2014	hypo		20															
82	Friends L	9/1/2014	hypo		21															

## Legend Information

<i>Indicator</i>	<i>Description</i>	<i>Detection Limit</i>	<i>Standard (S) / Criteria (C)</i>
<b>General Information</b>			
<b>Lnum</b>	lake number (unique to CSLAP)		
<b>Lname</b>	name of lake (as it appears in the Gazetteer of NYS Lakes)		
<b>Date</b>	sampling date		
<b>Field Parameters</b>			
<b>Zbot</b>	lake depth at sampling point, meters (m)		
<b>Zsd</b>	Secchi disk transparency or clarity	0.1m	1.2m ( C)
<b>Zsamp</b>	water sample depth (m) (epi = epilimnion or surface; bot = bottom)	0.1m	none
<b>Tair</b>	air temperature ( C)	-10C	none
<b>TH20</b>	water temperature ( C)	-10C	none
<b>Laboratory Parameters</b>			
<b>Tot.P</b>	total phosphorus (mg/l)	0.003 mg/l	0.020 mg/l ( C)
<b>NOx</b>	nitrate + nitrite (mg/l)	0.01 mg/l	10 mg/l NO3 (S), 2 mg/l NO2 (S)
<b>NH4</b>	total ammonia (mg/l)	0.01 mg/l	2 mg/l NH4 (S)
<b>TN</b>	total nitrogen (mg/l)	0.01 mg/l	none
<b>TN/TP</b>	nitrogen to phosphorus (molar) ratio, = (TKN + NOx)*2.2/TP		none
<b>TCOLOR</b>	true (filtered) color (ptu, platinum color units)	1 ptu	none
<b>pH</b>	powers of hydrogen (S.U., standard pH units)	0.1 S.U.	6.5, 8.5 S.U. (S)
<b>Cond25</b>	specific conductance, corrected to 25C (umho/cm)	1 umho/cm	none
<b>Ca</b>	calcium (mg/l)	1 mg/l	none
<b>Chl.a</b>	chlorophyll a (ug/l)	0.01 ug/l	none
<b>Fe</b>	iron (mg/l)	0.1 mg/l	1.0 mg/l (S)
<b>Mn</b>	manganese (mg/l)	0.01 mg/l	0.3 mg/l (S)
<b>As</b>	arsenic (ug/l)	1 ug/l	10 ug/l (S)
<b>AQ-PC</b>	Phycocyanin (aquafior) (unitless)	1 unit	none
<b>AQ-Chl</b>	Chlorophyll a (aquafior) (ug/l)	1 ug/l	none
<b>MC-LR</b>	Microcystis-LR (ug/l)	0.01 ug/l	1 ug/l potable (C) 20 ug/l swimming (C)
<b>Ana</b>	Anatoxin-a (ug/l)	variable	none
<b>Cyl</b>	Cylindrospermopsin (ug/l)	0.1 ug/l	none
<b>FP-Chl, FP-BG</b>	Fluoroprobe total chlorophyll, fluoroprobe blue-green chlorophyll (ug/l)	0.1 ug/l	none
<b>Lake Assessment</b>			
<b>QA</b>	water quality assessment; 1 = crystal clear, 2 = not quite crystal clear, 3 = definite algae greenness, 4 = high algae levels, 5 = severely high algae levels		
<b>QB</b>	aquatic plant assessment; 1 = no plants visible, 2 = plants below surface, 3 = plants at surface, 4 = plants dense at surface, 5 = surface plant coverage		
<b>QC</b>	recreational assessment; 1 = could not be nicer, 2 = excellent, 3 = slightly impaired, 4 = substantially impaired, 5 = lake not usable		
<b>QD</b>	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		
<b>QF, QG</b>	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		
<b>HAB form, Shore HAB</b>	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 Friends Lake

**Friends Lake (1104-0205)**

**NoKnownImpct**

**Waterbody Location Information**

Revised: 12/11/2006

<b>Water Index No:</b>	H-391-33-8-P365	<b>Drain Basin:</b>	Upper Hudson River
<b>Hydro Unit Code:</b>	02020001/110	<b>Str Class:</b>	AAspcl
<b>Waterbody Type:</b>	Lake	<b>Reg/County:</b>	5/Warren Co. (57)
<b>Waterbody Size:</b>	454.4 Acres	<b>Quad Map:</b>	CHESTERTOWN (G-25-2)
<b>Seg Description:</b>	entire lake		

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

<b>Use(s) Impacted</b>	<b>Severity</b>	<b>Problem Documentation</b>
NO USE IMPAIRMNT		

**Type of Pollutant(s)**  
 Known: ---  
 Suspected: ---  
 Possible: ---

**Source(s) of Pollutant(s)**  
 Known: ---  
 Suspected: ---  
 Possible: ---

**Resolution/Management Information**

<b>Issue Resolvability:</b> 8 (No Known Use Impairment)	
<b>Verification Status:</b> (Not Applicable for Selected RESOLVABILITY)	
<b>Lead Agency/Office:</b> n/a	<b>Resolution Potential:</b>
<b>TMDL/303d Status:</b> n/a ( )	

**Further Details**

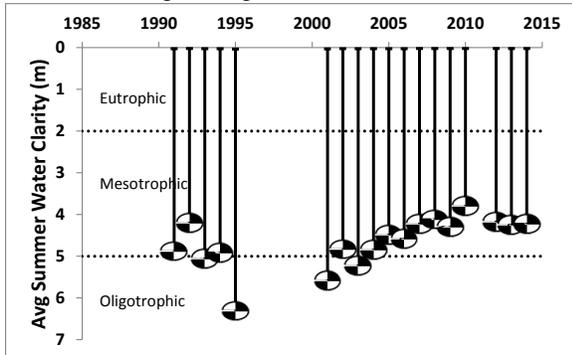
Friends Lake has been sampled as part of the NYSDEC Citizen Statewide Lake Assessment Program (CSLAP) beginning in 1991 and continuing through 2005. An Interpretive Summary report of the findings of this sampling was published in 2006. These data indicate that the lake continues to be best characterized as mesooligotrophic, or moderately unproductive. Phosphorus levels in the lake are generally below criteria that would indicate impacted recreational uses (somewhat elevated levels of phosphorus were noted in 2003 and 2004) and transparency measurements satisfy what is recommended for swimming beaches. (DEC/DOW, BWAM/CSLAP, May 2006)

Public perception of the lake and its uses is also evaluated as part of the CSLAP program. These assessment also indicate recreational suitability of the lake to be highly favorable since the lake was first evaluated and continuing through the most recent assessment. Recreational conditions in the lake have been most often described as "could not be nicer" for most uses. The lake is regularly described as "crystal clear." Native aquatic plants are present in the lake, but none of the major exotic plants often found in other New York lakes were present. (DEC/DOW, BWAM/CSLAP, May 2006)

# Appendix C- Long Term Trends: Friends Lake

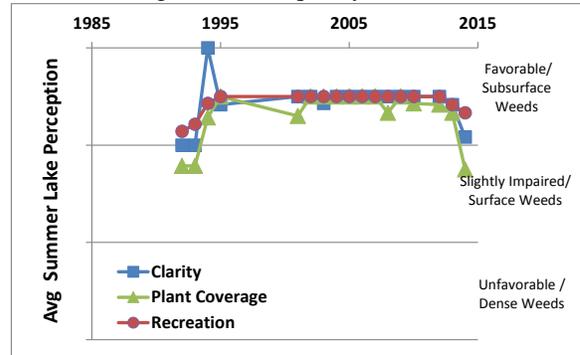
## Long Term Trends: Water Clarity

- Decrease 2001-10, but stable since then
- Most readings typical of *mesotrophic* lakes, in range of algae but lower than TP levels



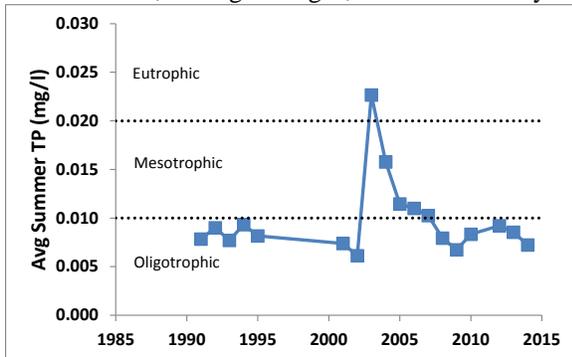
## Long Term Trends: Lake Perception

- Less favorable last few years
- Recreational perception somewhat linked to changes in water quality and weeds



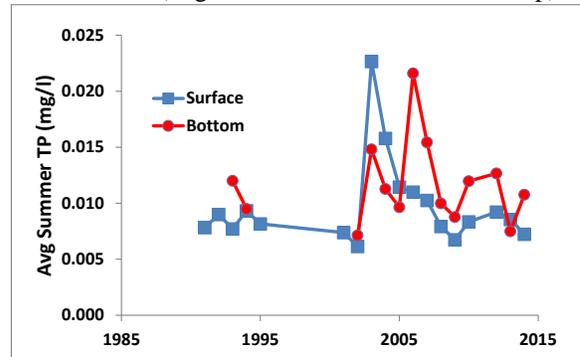
## Long Term Trends: Phosphorus

- Drop in TP 03-09, then stable
- Most readings typical of *mesoligotrophic* lakes, in range of algae, lower than clarity



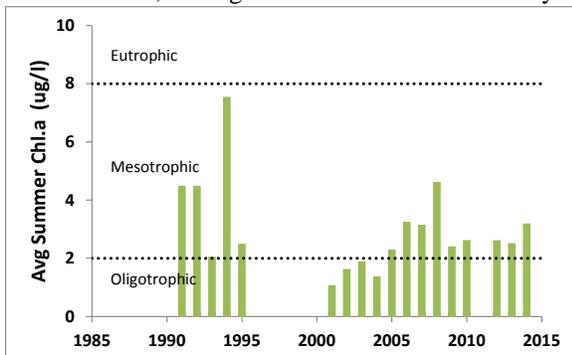
## Long Term Trends: Bottom Phosphorus

- Bottom TP similar to surface TP
- Probably not any significant internal nutrient load (migration of nutrients bottom to top)



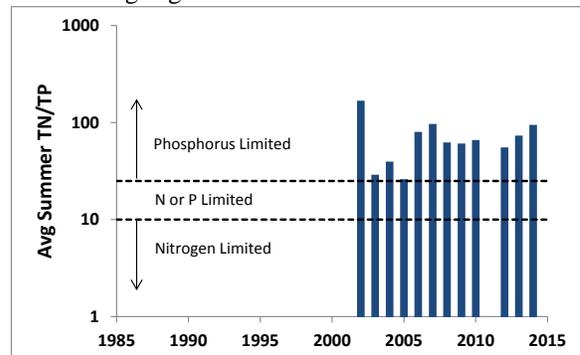
## Long Term Trends: Chlorophyll a

- No trends apparent; lower since mid 1990s
- Most readings typical of *mesoligotrophic* lakes, in range of TP but lower than clarity



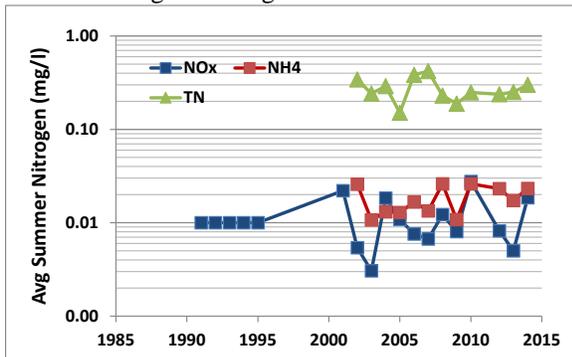
## Long Term Trends: N:P Ratio

- Slightly variable N:P ratios
- Most readings still indicate phosphorus limits algae growth



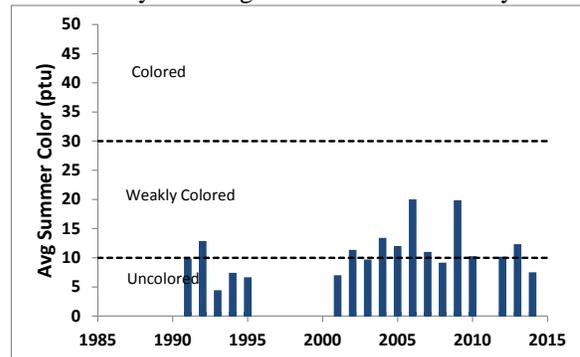
### Long Term Trends: Nitrogen

- No trends apparent
- Generally low NOx, ammonia, and total nitrogen readings



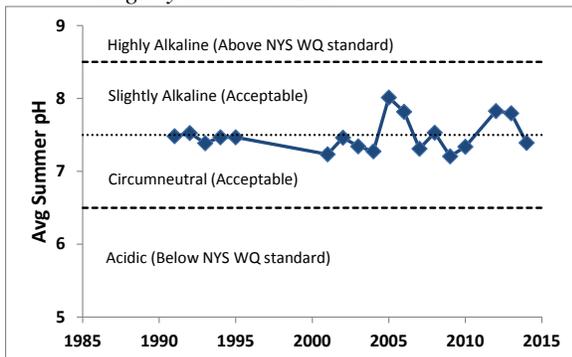
### Long Term Trends: Color

- No trends apparent
- Most readings typical of *uncolored* lakes, but may have slight effect on water clarity



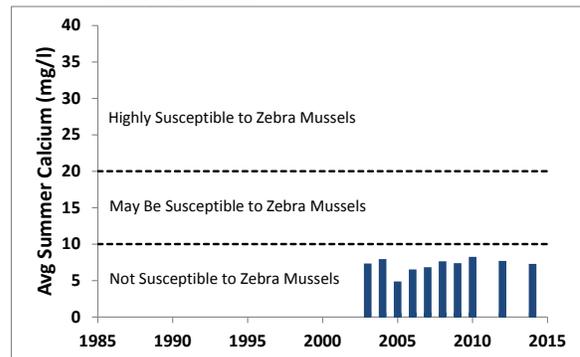
### Long Term Trends: pH

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



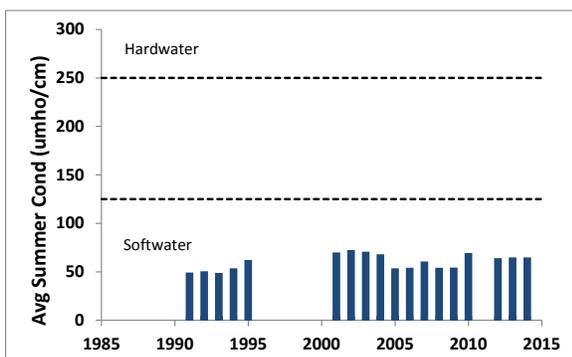
### Long Term Trends: Calcium

- No trends apparent
- Most readings indicate low susceptibility to zebra mussels



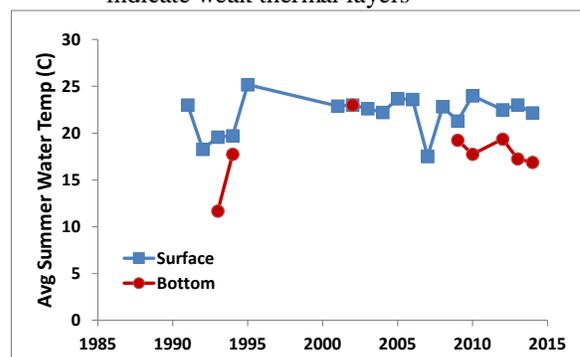
### Long Term Trends: Conductivity

- No trends apparent
- Most readings typical of lakes with *soft water*



### Long Term Trends: Water Temperature

- No trends apparent in surface temperatures
- Similar surface and bottom temperatures indicate weak thermal layers



## **Appendix D: Algae Testing Results from SUNY ESF Study**

Most algae are harmless, naturally present, and an important part of the food web. However excessive algae growth can cause health, recreational, and aesthetic problems. Some algae can produce toxins that can be harmful to people and animals. High quantities of these algae are called harmful algal blooms (HABs). CSLAP lakes have been sampled for a variety of HAB indicators since 2008. This was completed on selected lakes as part of a NYS DOH study from 2008-2010. In 2011, enhanced sampling on all CSLAP lakes was initiated through an EPA-funded project that has continued through the current sampling season. This study has evaluated a number of HAB indicators as follows:

- Algae types - blue green, green, diatoms, and "other"
- Algae densities
- Microscopic analysis of bloom samples
- Algal toxin analysis

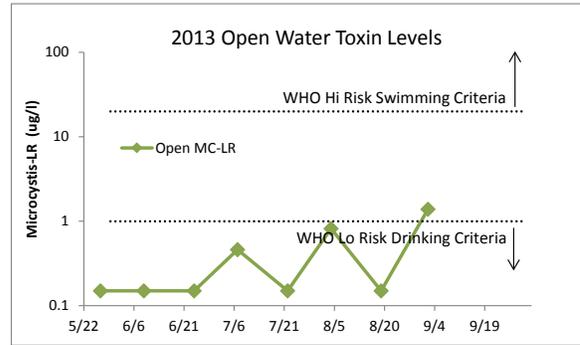
Some of these results are reported in other portions of these reports. This appendix the seasonal change in blue green algae, other algae types, and the primary algal toxin (microcystin-LR, a liver toxin). Analysis was completed on open water samples and, for some lakes, shoreline samples that were collected when visual evidence of blooms were apparent. Results are compared to the DEC criteria of 30 ug/l blue green chlorophyll a and 20 ug/l microcystin-LR (based on the World Health Organization (WHO) threshold for unsafe swimming conditions) and the WHO provisional criteria for long-term protection of treated water supplies (= 1 ug/l microcystin-LR). The data for algae types are drawn from a high end fluorometer used by SUNY ESF. While these results are useful for timely approximation of lake conditions, they are not as accurate as the total chlorophyll results measured as a regular part of CSLAP since 1986 in all open water samples. Therefore these results are used judiciously in the assessment of sampled waterbodies.

Two separate samples are evaluated. A sample is taken at the CSLAP sample point at the deepest point of the lake at every sample session. In addition, shoreline samples can be taken when a bloom is visible. It should be noted that shoreline conditions can vary significantly over time and from one location to another. The shoreline bloom sampling results summarized below are not collected as routinely as open water samples, and therefore represent snapshots in time. It is assumed that sampling results showing high blue green algae and/or toxin levels indicate that algae blooms may be common and/or widespread on these lakes. However, the absence of elevated blue green algae and toxin levels does not assure the lack of shoreline blooms on these lakes. Elevated open water readings may indicate a higher likelihood of shoreline blooms, but in some lakes, these shoreline blooms have not been (well) documented.

The results from these samples are summarized within the CSLAP report for the lake.



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



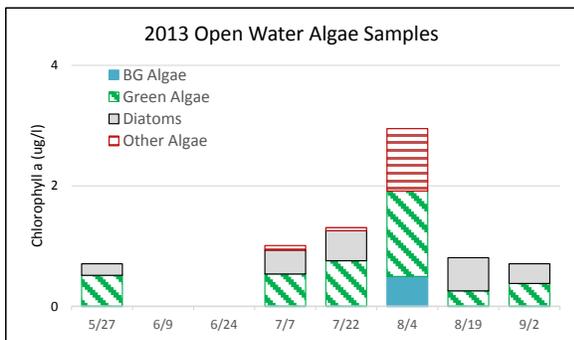
**Figure D2:**  
2013 Open Water Microcystin-LR



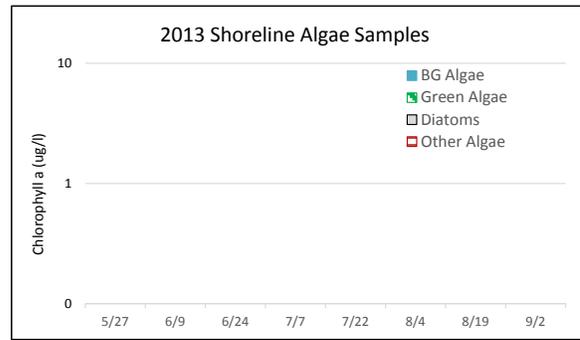
**Figure D3:**  
2013 Shoreline Total and BGA Chl.a



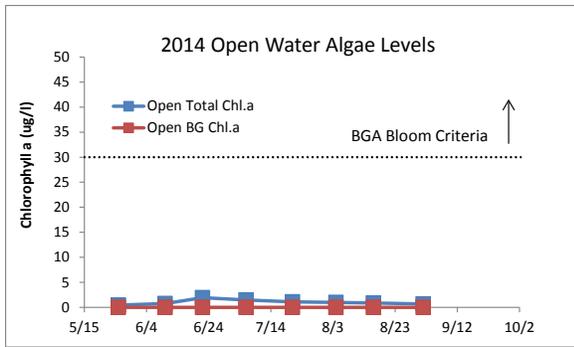
**Figure D4:**  
2013 Shoreline Microcystin-LR



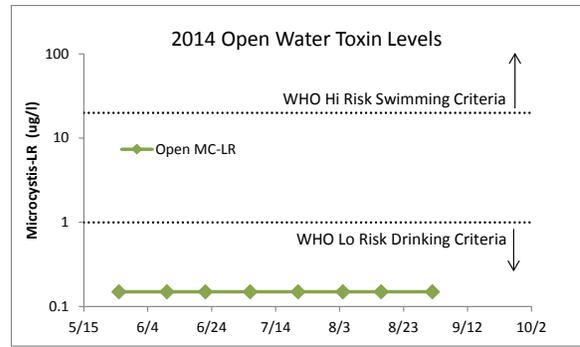
**Figure D5:**  
2013 Open Water Algae Types



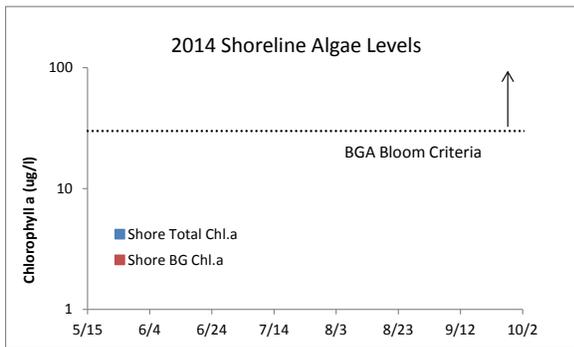
**Figure D6:**  
2013 Shoreline Algae Types



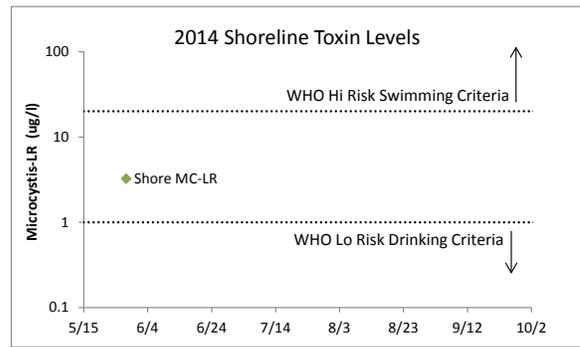
**Figure D7:**  
2014 Open Water Total and BGA Chl.a



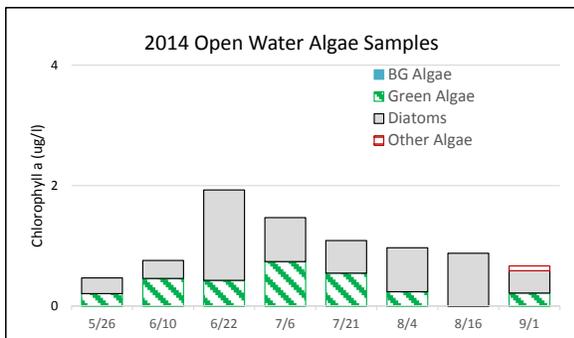
**Figure D8:**  
2014 Open Water Microcystin-LR



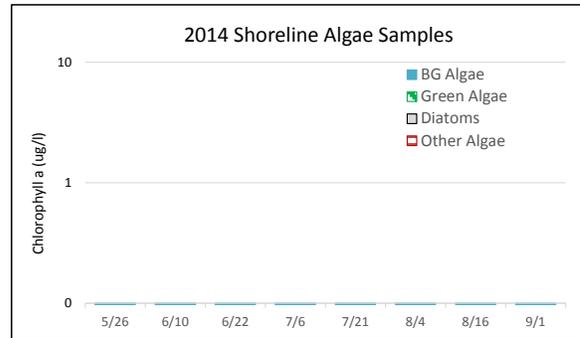
**Figure D9:**  
2014 Shoreline Total and BGA Chl.a



**Figure D10:**  
2014 Shoreline Microcystin-LR



**Figure D11:**  
2014 Open Water Algae Types



**Figure D12:**  
2014 Shoreline Algae Types

## Appendix E: AIS Species in Warren County

The table below shows the invasive aquatic plants and animals that have been documented in Warren 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](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](mailto:dowinfo@dec.ny.gov).

<b>Aquatic Invasive Species – Warren County</b>			
<b>Waterbody</b>	<b>Kingdom</b>	<b>Common name</b>	<b>Scientific name</b>
Brant Lake	Plant	Eurasian watermilfoil	<i>Myriophyllum spicatum</i>
Brant Lake	Plant	Curly leafed pondweed	<i>Potamogeton crispus</i>
Brant Lake	Plant	Curly leafed pondweed	<i>Potamogeton crispus</i>
Crandall Pond	Plant	Eurasian watermilfoil	<i>Myriophyllum spicatum</i>
Daggett Pond	Plant	Eurasian watermilfoil	<i>Myriophyllum spicatum</i>
Friends Lake	Animal	Banded mystery snail	<i>Viviparus georgianus</i>
Glen Lake	Animal	Zebra mussel	<i>Dreissena polymorpha</i>
Glen Lake	Plant	Eurasian watermilfoil	<i>Myriophyllum spicatum</i>
Glen Lake	Plant	Brittle naiad	<i>Najas minor</i>
Glen Lake	Plant	Curly leafed pondweed	<i>Potamogeton crispus</i>
Hovey Pond	Plant	Eurasian watermilfoil	<i>Myriophyllum spicatum</i>
Lake George	Animal	Spiny waterflea	<i>Bythotrephes longimanus</i>
Lake George	Animal	Asian clam	<i>Corbicula fluminea</i>
Lake George	Animal	Zebra mussel	<i>Dreissena polymorpha</i>
Lake George	Plant	Eurasian watermilfoil	<i>Myriophyllum spicatum</i>
Lake George	Plant	Brittle naiad	<i>Najas minor</i>
Lake George	Animal	Virile crayfish	<i>Orconectes virilis</i>
Lake George	Plant	Curly leafed pondweed	<i>Potamogeton crispus</i>
Lake Luzerne	Plant	Eurasian watermilfoil	<i>Myriophyllum spicatum</i>
Lake Luzerne	Plant	Curly leafed pondweed	<i>Potamogeton crispus</i>
Lake Sunnyside	Plant	Eurasian watermilfoil	<i>Myriophyllum spicatum</i>
Loon Lake	Plant	Eurasian watermilfoil	<i>Myriophyllum spicatum</i>
North Pond	Plant	Eurasian watermilfoil	<i>Myriophyllum spicatum</i>
Schroon Lake	Plant	Eurasian watermilfoil	<i>Myriophyllum spicatum</i>

<b>Waterbody</b>	<b>Kingdom</b>	<b>Common name</b>	<b>Scientific name</b>
Schroon Lake	Plant	Curly leafed pondweed	<i>Potamogeton crispus</i>
Trout Lake	Animal	Rusty crayfish	<i>Orconectes rusticus</i>

## Appendix F: Watershed and Land Use Map for Friends 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.

