

CSLAP 2010 Lake Water Quality Summary: Shadow Lake

General Lake Information

Location	Town of Yorktown
County	Westchester
Basin	Lower Hudson River
Size	2.6 hectares (6.4 acres)
Lake Origins	Natural
Watershed Area	60 hectares (148.2 acres)
Retention Time	0.09 years
Mean Depth	1.3 meters
Sounding Depth	2.7 meters
Public Access?	no
Major Tributaries	no named tribs
Lake Tributary To...	unnamed outlet to Varnay Lake
WQ Classification	B (contact recreation = swimming)
Lake Outlet Latitude	41.208
Lake Outlet Longitude	-73.821
Sampling Years	2008-2010
2010 Samplers	Mike Rubbo, Laura Hellmich, Erin Smithies
Main Contact	Mike Rubbo

Lake Map



Background

Shadow Lake is a 6 acre, class B lake found in the Town of Yorktown in Westchester County, in the New York City region of New York State. It was first sampled as part of CSLAP in 2008. Figure 6 shows the location of Shadow Lake.

It is one of 15 CSLAP lakes among the more than 90 lakes found in Westchester County, and one of 41 CSLAP lakes among the more than 360 lakes and ponds in the Lower Hudson River drainage basin.

Lake Uses

Shadow Lake is a Class B lake; this means that the best intended use for the lake is for contact recreation—swimming and bathing, non-contact recreation—boating and fishing, aquatic life, and aesthetics. The lake is used for aesthetic enjoyment by visitors to the Teatown Lake Preserve.

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

General statewide fishing regulations are applicable in Shadow Lake.

Historical Water Quality Data

CSLAP sampling was conducted on Shadow Lake from 2008 to 2009. Some of the CSLAP reports for Shadow Lake are found on the NYSFOLA website at www.nysfola.org, under NYS Lake Association Lake List.

Shadow Lake has not been sampled through any previous NYSDEC monitoring program. It is not known if the lake has been sampled privately through the Teatown Preserve.

There are no NYSDEC RIBS monitoring sites near Shadow Lake, and there are no named tributaries to the lake.

Lake Association and Management History

Shadow Lake is represented through CSLAP by the Teatown Lake Reservation. The Preserve (managing the Reservation) is involved in a number of activities related to the protection of the lake, including:

- Environmental education programs
 - Vernal pool ecology (amphibians)
 - Fish populations in Shadow Lake
 - Habitat management- Invasive plants, recreational uses, and lakeside trail restoration
- Teatown conservation
- Regional conservation

More information can be found at <http://www.teatown.org/>.

Summary of 2010 CSLAP Sampling Results

Evaluation of Eutrophication Indicators

Secchi disk transparency readings were higher than normal in 2010, but chlorophyll *a* and total phosphorus readings were close to normal. It is premature to evaluate if any of these trophic indicators has exhibited any long-term trends. Shadow Lake can be characterized as *eutrophic*, based on water clarity, total phosphorus and chlorophyll *a* readings (all typical of *eutrophic* lakes). The trophic state indices (TSI) evaluation suggests that water clarity readings are higher than expected given the chlorophyll *a* and total phosphorus readings in the lake. This may be due to patchy algae growth and occasional intense algal blooms. Phycocyanin readings were below the levels indicating susceptibility for harmful algal blooms (HABs) in 2009; these readings were not collected in 2010. Overall trophic conditions are summarized on the Lake Scorecard and Lake Condition Summary Table.

Evaluation of Potable Water Indicators

Algae levels are 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 used for this purpose. 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 limnological indicators measured through CSLAP were close to normal. It is not yet known if the readings for these indicators were within the normal range for the lake, or if they have exhibited any long-term trends. Overall limnological conditions are summarized in the Lake Scorecard and Lake Condition Summary Table.

Evaluation of Biological Condition

Information about the composition of the fish community is not available, but it is likely that Shadow Lake supports a warmwater fishery.

Phytoplankton, macrophyte, zooplankton, and macroinvertebrate surveys have not been conducted through CSLAP at Shadow Lake.

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

Evaluation of Lake Perception

Water quality assessments were more favorable than normal in 2010, consistent with higher water clarity readings. Aquatic plant coverage and recreational assessments of Shadow Lake in 2010 were close to normal, but additional data will be needed to determine if any long-

term changes have occurred in these measures of lake perception. Overall lake perception is summarized on the Lake Scorecard and Lake Condition Summary Table.

Evaluation of Local Climate Change

Air and water temperatures during the June-September index period were close to normal, but with only three years of data, it is not yet known if these temperatures represent normal conditions in the lake.

Lake Condition Summary

Category	Indicator	Min	08-10 Avg	Max	2010 Avg	Classification	2010 Change?	Long-term Change?
Eutrophication Indicators	Water Clarity	0.90	1.49	2.09	1.70	Eutrophic	Higher Than Normal	Not yet known
	Chlorophyll <i>a</i>	7.72	40.60	356.0	14.27	Eutrophic	Within Normal Range	Not yet known
	Total Phosphorus	0.032	0.058	0.183	0.043	Eutrophic	Within Normal Range	Not yet known
Potable Water Indicators	Hypolimnetic NH4							
	Hypolimnetic As							
	Hypolimnetic Iron							
	Hypolimnetic Mn							
Limnological Indicators	Hypolimnetic TP							
	Nitrate + Nitrite	0.00	0.02	0.16	0.01	Low NOx	Within Normal Range	Not yet known
	Ammonia	0.01	0.04	0.18	0.03	Low Ammonia	Within Normal Range	Not yet known
	Total Nitrogen	0.23	0.60	2.21	0.53	Intermediate Total Nitrogen	Within Normal Range	Not yet known
	pH	6.21	6.90	7.48	7.04	Circumneutral	Within Normal Range	Not yet known
	Specific Conductance	96	253	322	220	Hardwater	Within Normal Range	Not yet known
	True Color	10	31	79	30	Intermediate Color	Within Normal Range	Not yet known
	Calcium	12.6	14.0	16.6	12.7	May be Susceptible to Zebra Mussels	Within Normal Range	Not yet known
Lake Perception	WQ Assessment	2	3.0	4	2.0	Definite Algal Greenness	More Favorable Than Normal	Not yet known
	Plant Coverage	3	3.6	5	3.7	Dense Plant Growth	Within Normal Range	Not yet known
	Rec. Assessment	1	4.0	5	3.7	Substantially Impaired	Within Normal Range	Not yet known
Biological Condition	Phytoplankton					Not measured through CSLAP	Not known	Not known
	Macrophytes					Not measured through CSLAP	Not known	Not known
	Zooplankton					Not measured through CSLAP	Not known	Not known
	Macroinvertebrates					Not measured through CSLAP	Not known	Not known
	Fish					No information available	Not known	Not known
	Invasive Species					None observed	Not known	Not known
Local Climate Change	Air Temperature	12	23.9	31	24.9		Within Normal Range	Not yet known
	Water Temperature	16	23.7	30	22.7		Within Normal Range	Not yet known

Evaluation of Lake Condition Impacts to Lake Uses

Shadow Lake is not presently among the lakes listed on the 2008 Lower Hudson River basin Priority Waterbody List (PWL).

Potable Water (Drinking Water)

The CSLAP dataset at Shadow 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 classified for this use. These data suggest that any use of the lake for potable water may be compromised by excessive algae levels in the lake.

Contact Recreation (Swimming)

The CSLAP dataset at Shadow Lake, including water chemistry data, physical measurements, and volunteer samplers' perception data, suggests that swimming and contact recreation may be *impaired* by excessive algae and poor water clarity, including the risk of harmful algal blooms, although bacterial data are needed to evaluate the safety of the lake for swimming.

Non-Contact Recreation (Boating and Fishing)

The CSLAP dataset on Shadow Lake, including water chemistry data, physical measurements, and volunteer samplers' perception data, suggest that non-contact recreation may be *stressed* by excessive weed growth, despite the apparent lack of invasive exotic plants.

Aquatic Life

The CSLAP dataset on Shadow Lake, including water chemistry data, physical measurements, and volunteer samplers' perception data, suggest that aquatic life may be *threatened* by depressed pH, although additional data are needed to evaluate the food and habitat conditions for aquatic organisms in the lake.

Aesthetics

The CSLAP dataset on Shadow Lake, including water chemistry data, physical measurements, and volunteer samplers' perception data, suggest that aesthetics may be *threatened* by excessive weeds and occasionally due to excessive algae.

Fish Consumption

There is no fish consumption advisories posted for Shadow Lake.

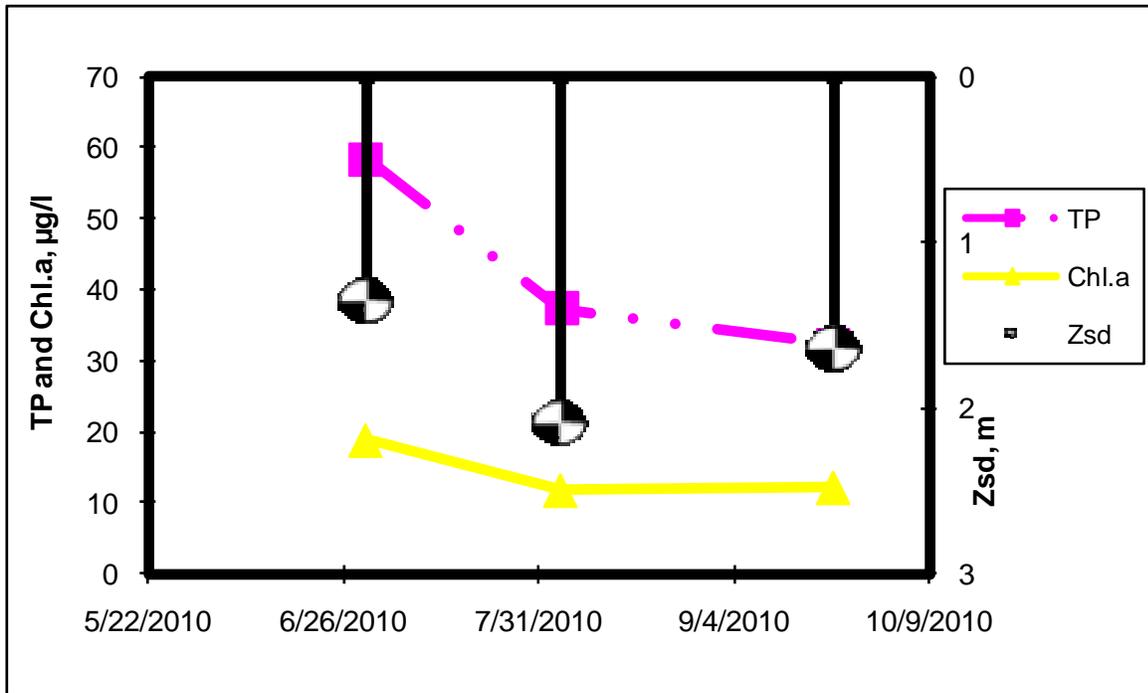
Additional Comments and Recommendations

A full aquatic plant survey of the lake may help to improve the evaluation of biological conditions in the lake, and to determine if any exotic plants are found in the lake.

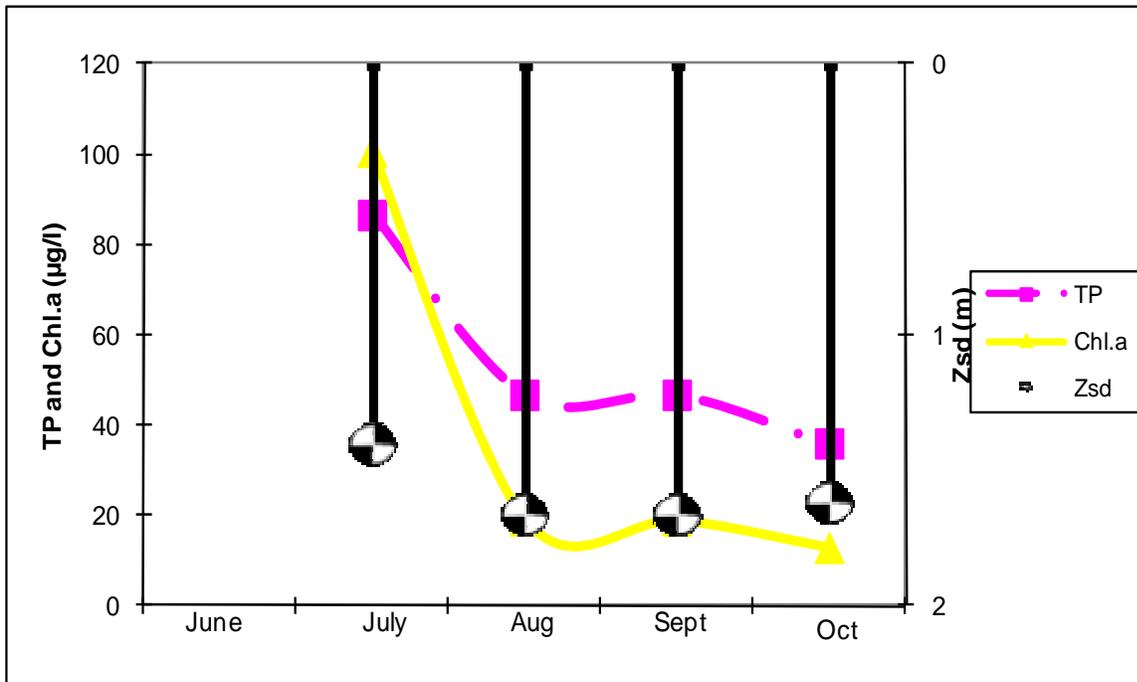
Aquatic Plant IDs-2010

None submitted for identification

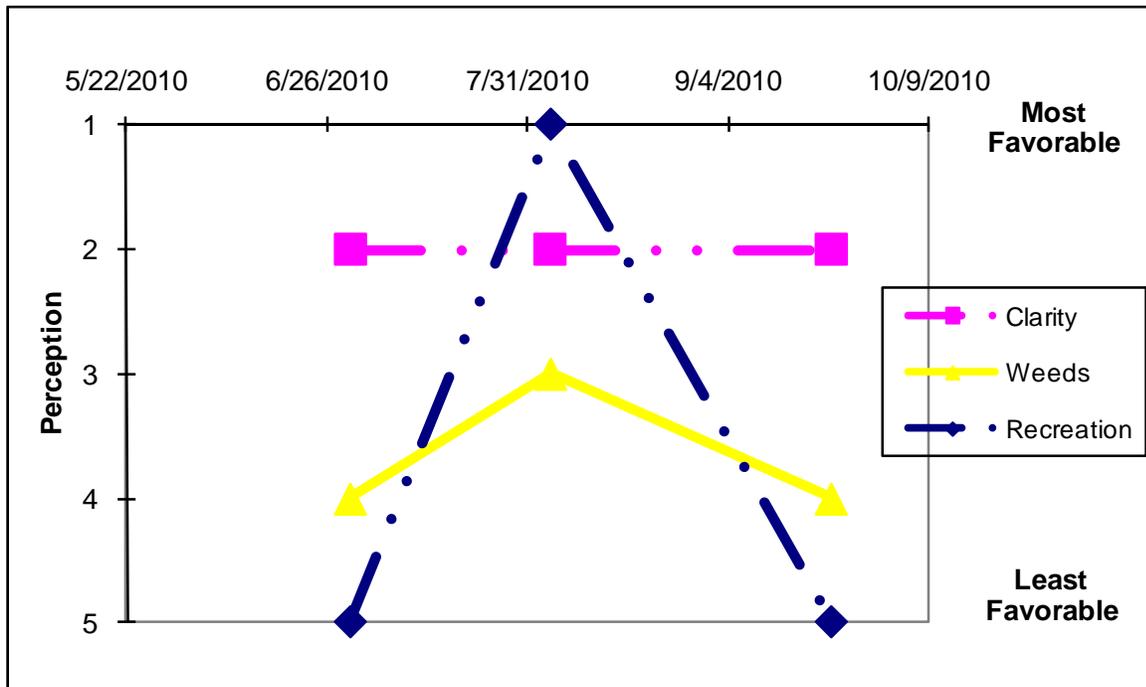
Time Series: Trophic Indicators, 2010



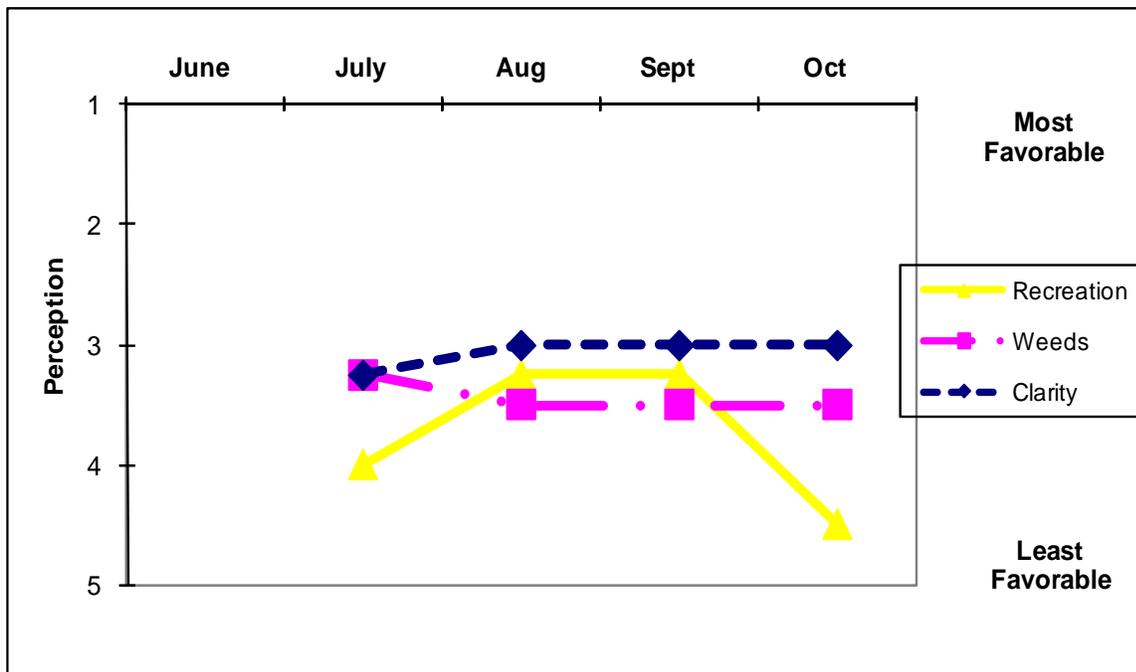
Time Series: Trophic Indicators, Typical Year (2008-2010)



Time Series: Lake Perception Indicators, 2010



Time Series: Lake Perception Indicators, Typical Year (2008-2010)



Appendix A- CSLAP Water Quality Sampling Results for Shadow Lake

LNum	LName	Date	Zbot	Zsd	Zsamp	Tot.P	NO3	NH4	TDN	TN/TP	TColor	pH	Cond25	Ca	Chl.a
214	Shadow L	6/25/2008	2.6	1.48	1.0	0.079	0.01	0.06	0.61	16.96	22	6.67	312	14.1	13.45
214	Shadow L	7/7/2008	2.5	1.43	1.0	0.069	0.02	0.03	0.40	12.69	35	6.87	289		21.76
214	Shadow L	7/22/2008	2.6	0.90	1.0	0.183	0.00	0.01	2.21	26.59	38	7.24	225		356.00
214	Shadow L	8/7/2008	2.5	1.50	1.0	0.058	0.03	0.18	0.62	23.81	23	6.82	234		21.72
214	Shadow L	8/19/2008	2.7	1.53	1.0	0.056	0.02	0.04	0.50	19.78	25	6.87	283	13.8	24.46
214	Shadow L	9/17/2008	2.6	0.95		0.057	0.01	0.03	0.51	19.40	19	7.24	177		48.64
214	Shadow L	10/2/2008	2.8	1.50		0.038	0.03	0.04	0.39	22.68	36	6.52	290		7.72
214	Shadow L	07/01/2009	2.3	1.65	3.0	0.059	0.00	0.02	0.38	14.19	40	7.18	299	12.6	8.15
214	Shadow L	07/30/2009	2.7	1.65		0.035	0.01	0.04	0.51	32.11	10	7.28	263		14.95
214	Shadow L	08/25/2009	2.5	1.55	1.5	0.035	0.01	0.03	0.71	44.50	79	6.49	183		17.30
214	Shadow L	09/08/2009	2.3	1.45	1.5	0.037	0.16	0.03	0.23	13.80	25	7.01	322		14.20
214	Shadow L	10/06/2009	2.4	1.75		0.034	0.01	0.02	0.35	22.85	17	6.21	261	16.6	17.80
214	Shadow L	6/30/2010	2.7	1.35	1.5	0.058			0.59	22.38	27	7.48	96	12.7	18.80
214	Shadow L	8/4/2010	2.4	2.09	1.5	0.037	0.02	0.04	0.56	32.82	46	6.80	242		11.80
214	Shadow L	9/22/2010	2.7	1.65	1.5	0.032	0.01	0.02	0.44	29.90	16	6.85	321		12.20

LNum	PName	Date	Zbot	Zsd	Zsamp	TAir	TH2O	QA	QB	QC	QD
214	Shadow L	6/25/2008	2.6	1.48	1.0	26	25	3	3	3	28
214	Shadow L	7/7/2008	2.5	1.43	1.0	27	27	4	3	3	128
214	Shadow L	7/22/2008	2.6	0.90	1.0	30	30	3	3	4	1238
214	Shadow L	8/7/2008	2.5	1.50	1.0	29	25	4	4	3	123
214	Shadow L	8/19/2008	2.7	1.53	1.0	27	26	3	3	4	1238
214	Shadow L	9/17/2008	2.6	0.95		21	21	3	4	4	2
214	Shadow L	10/2/2008	2.8	1.50		12	18	3	3	4	5
214	Shadow L	07/01/2009	2.3	1.65	3.0	23	24	2	3	4	2
214	Shadow L	07/30/2009	2.7	1.65		27	26	4	4	5	23
214	Shadow L	08/25/2009	2.5	1.55	1.5	28	27	3	4	5	1234
214	Shadow L	09/08/2009	2.3	1.45	1.5	21	22	4	5	5	123
214	Shadow L	10/06/2009	2.4	1.75		14	16	3	4	5	2
214	Shadow L	6/30/2010	2.7	1.35	1.5	20	27	2	4	5	2
214	Shadow L	8/4/2010	2.4	2.09	1.5	31	21	2	3	1	0
214	Shadow L	9/22/2010	2.7	1.65	1.5	24	21	2	4	5	2

Legend Information

<i>Indicator</i>	<i>Description</i>	<i>Detection Limit</i>	<i>Standard (S) / Criteria (C)</i>
General Information			
Lnum	lake number (unique to CSLAP)		
Lname	name of lake (as it appears in the Gazetteer of NYS Lakes)		
Date	sampling date		
Field Parameters			
Zbot	lake depth at sampling point, meters (m)		
Zsd	Secchi disk transparency or clarity	0.1m	1.2m (C)
Zsamp	water sample depth (m)	0.1m	none
Tair	air temperature (C)	-10C	none
TH20	water temperature (C)	-10C	none
Laboratory Parameters			
Tot.P	total phosphorus (mg/l)	0.003 mg/l	0.020 mg/l (C)
NOx	nitrate + nitrite (mg/l)	0.01 mg/l	10 mg/l NO3 (S), 2 mg/l NO2 (S)
NH4	total ammonia (mg/l)	0.01 mg/l	2 mg/l NH4 (S)
TN	total nitrogen (mg/l)	0.01 mg/l	none
TN/TP	nitrogen to phosphorus (molar) ratio, = (TKN + NOx)*2.2/TP		none
TCOLOR	true (filtered) color (ptu, platinum color units)	1 ptu	none
pH	powers of hydrogen (S.U., standard pH units)	0.1 S.U.	6.5, 8.5 S.U. (S)
Cond25	specific conductance, corrected to 25C (umho/cm)	1 umho/cm	none
Ca	calcium (mg/l)	1 mg/l	none
Chl.a	chlorophyll a (ug/l)	0.01 ug/l	none
Fe	iron (mg/l)	0.1 mg/l	1.0 mg/l (S)
Mn	manganese (mg/l)	0.01 mg/l	0.3 mg/l (S)
As	arsenic (ug/l)	1 ug/l	10 ug/l (S)
Lake Assessment			
QA	water quality assessment, 5 point scale; 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, 5 point scale; 1 = no plants visible, 2 = plants below surface, 3 = plants at surface, 4 = plants dense at surface, 5 = surface plant coverage		
QC	recreational assessment, 5 point scale; 1 = could not be nicer, 2 = excellent, 3 = slightly impaired, 4 = substantially impaired, 5 = lake not usable		
QD	reasons for recreational assessment, 8 choices; 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		