2008 SUMMARY REPORT
of
Third Lake

Lake County, Illinois

Prepared by the

LAKE COUNTY HEALTH DEPARTMENT
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LAKES MANAGEMENT UNIT

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LAKE FACTS

Lake Name:	Third Lake
Historical Name:	Chittenden Lake
Nearest Municipality:	Village of Third Lake
Location:	T45N, R10E, Sections 13 and 24
Elevation:	766.2 feet mean sea level
Major Tributaries:	Mill Creek
Watershed:	Des Plaines River
Sub-watershed:	Mill Creek
Receiving Waterbody:	Grandwood Park Lake
Surface Area:	155.5 acres
Shoreline Length:	2.0 miles
Maximum Depth:	65.4 feet
Average Depth:	20.5 feet
Lake Volume:	3123.0 acre-feet
Lake Type:	Glacial
Watershed Area:	8,552.7 acres
Major Watershed Land Uses:	Single Family and Agricultural
Bottom Ownership:	Private, Public (Village of Third Lake, Lake County Forest Preserve)
Management Entities:	Village of Third Lake
Current and Historical Uses:	Swimming, fishing, and boating.
Description of Access:	Boat access locations are private, open to the public (with a fee), walk in access thorough LCFPD property.

Third Lake was chosen to be one of seven "sentinel" lakes in the county that the Lakes Management Unit (LMU) will monitor annually for five years, beginning with the 2005 season. This report summarizes the water quality sampling results and aquatic plant surveys conducted in 2008 on Third Lake. Similar reports have been written on data collected in 1993, 1998, 1999, 2000, 2005, 2006, and 2007 and are available from the LMU at (847) 377-8030 or on the web at (http://www.lakecountyil.gov/Health/want/LakeReports.htm). 2009 will be the final year of the annual "sentinel" lake monitoring. A comprehensive summary report detailing all five years will be completed and available for review in 2010.

SUMMARY OF WATER QUALITY

Water samples were collected from April through early November at the deepest point in the lake (Figure 1; Appendix A). Third Lake was sampled at three feet below the surface and three feet above the bottom (Table 1) and the samples were analyzed for various water quality parameters (Appendix C). In addition, Third Lake has participated in the Volunteer Lake Monitoring Program (VLMP) since 2001.

Third Lake was thermally stratified from May through September 2008. The lake was strongly stratified from 12 feet (July) to 22 feet (May). The thermocline (the transition region between the epilimnion and the hypolimnion) remained strong until November, when turnover was taking place and water temperatures throughout the water column grew closer together. Technical problems with the compressors during the season resulted in inadequate air flow to the aerators. This was also a problem in 2007. As a result the dissolved oxygen (DO) concentrations in the epilimnion were lower than expected (Appendix B). Anoxic conditions (DO < 1 mg/L) existed from May through November in the hypolimnion. The anoxic boundary was at its shallowest in July at approximately 14 feet (26.1% of the lake volume) and deepest in May at approximately 56 feet (13.5% of the lake volume). Repairs to the compressors will be made prior to the 2009 season to ensure higher DO concentrations throughout the water column.

Secchi disk depth (water clarity) averaged 4.83 feet during 2008, which was above the Lake County median of 3.12 feet (Appendix D). This was decrease from 2005 (7.83 feet), 2006 (9.44 feet), and 2007 (7.85 feet). The VLMP Secchi depth over the past seven years has averaged from 4.75 feet to 9.09 feet (Figure 2). The 2008 average was the lowest the VLMP has recorded. This could be due to the large amounts of rain that fell during the months of June and July. Water clarity is related to the amount of total suspended solids (TSS) in the water column. Decreases in the Secchi depth correspond with increases in the average TSS (Figure 3). The 2008 average epilimnetic TSS of 5.4 mg/L was an increase from the averages in 2007 (4.2 mg/L), 2006 (3.5 mg/L), and 2005 (3.6 mg/L). The 2008 average epilimnetic TSS was lower than the Lake County median of 8.2 mg/L. The increase in TSS and decrease in Secchi depth averages were caused by the rain during 2008. The Lake County Stormwater Management Commission (SMC) rain gauge in Gages Lake recorded 27.8 inches of rain from April through October which likely brought in a large pulse of nutrient rich water from the large watershed. The water level fluctuated throughout the season. The water level dropped 5.3 inches from April to May and then increase 6.6 inches to June. It then decreased 8.0 inches to July and by another 4.1 inches from to August. The water level increased again in September by 3.8 inches only to drop another 4.6 inches in November. The overall seasonal change in the lake level was a drop of 11.5 inches.

A 2008 average epilimnetic total phosphorus (TP) concentration of 0.028 mg/L was down from the 2007 average of 0.35 mg/L but up from the 2006 average of 0.22 mg/L and the 2005 average of 0.019 mg/L. It was also below the county median of 0.065 mg/L. The 2008 seasonal hypolimnetic average of 0.451 mg/L was above the county median of 0.181 mg/l. This was an increase from the 2007 average of 0.399 mg/L and a significant increase from the 2006 hypolimnetic average TP of 0.175 mg/L, but below the 2005 average of 0.526 mg/L. Much of this fluctuation may have been due to environmental affects, such as rain events or water temperature. These influence the thermal stratification and turnover of the lake, and therefore vary between years. Phosphorus can be released from sediment through biological or mechanical processes, or from plant or algae as they die. In addition, more of the lake volume was anoxic than previous years due to the aerator not functioning properly, thus potentially more bottom surface area exposed to anoxic conditions. This explains why the TP concentrations were higher in the hypolimnion. Third Lake had a TN:TP ratio of 68:1 in 2008, 60:1 in 2007, and 96:1 in 2006 and 2005. This indicates the lake was phosphorus limited, which means any addition of phosphorus could result in increases in plant and algae biomass. Most lakes in Lake County are phosphorus limited. The trophic state of Third Lake based on phosphorus concentration during 2008 was eutrophic with a TSIp score of 52.4, while in 2005 and 2006 the trophic state was mesotrophic with TSIp scores of 46.6 and 48.8. Third Lake ranked 30th out of 163 lakes in Lake County based on average TP concentrations (Table 2). The Village of Third Lake adopted an ordinance banning the use of phosphorous containing fertilizers. This should help eliminate a source of phosphorous to Third Lake.

The Illinois Environmental Protection Agency (IEPA) has assessment indices to classify Illinois lakes for their ability to support aquatic life and recreational uses. The guidelines consider several aspects such as water clarity, phosphorus concentrations (TSIp), and aquatic plant coverage. According to this index, Third Lake provided *Full* support of aquatic life and *Partial* support of recreational activities based on moderate macrophyte impairment. The lake provided *Partial* overall use.

Third Lake continues to have high concentrations of nitrate-nitrogen from April through June. The 2008 average was 0.979 mg/L. This was a slight decrease from the 2007 average concentration was 0.991 mg/L, which was an increase from the 2006 average of 0.980 mg/L and the 2005 average of 0.820 mg/L. Beginning in 2006, due to the purchase of a new analyzer, the lab began measuring nitrogen as nitrate + nitrite (instead of just nitrate). This change in analyzing should be of little significance since nitrite is quickly converted to nitrate under oxic conditions. The majority of the nitrate-nitrogen may be entering the lake from the Avon-Fremont Drainage ditch during spring and early summer runoff.

Conductivity is a measurement of water's ability to conduct electricity and is positively correlated with chloride (Cl^-) concentration. The Lake County median conductivity for near surface samples was 0.8195 milliSiemens/cm (mS/cm). During 2008, the average epilimnetic conductivity reading for Third Lake was 54% higher at 1.2611 mS/cm. This was an increase from 2007 (1.2371 mS/cm) but a decrease from 2006 (1.4910 mS/cm) and 2005 (1.4877 mS/cm).

The hypolimnetic conductivity readings have shown a steady increase over the last four years. The 2008 average Cl^- concentration in Third Lake was above the Lake County median (166 mg/L), with a seasonal average of 259 mg/L. This was also an increase from 2007 (245 mg/L) but a decrease from the 2006 (312 mg/L) and 2005 (318 mg/L) average. Stormwater runoff from impervious surfaces such as roads and parking lots can deliver high concentrations of this Cl^- to nearby lakes and ponds, with road salts being a main source. A study done in Canada reported 10% of aquatic species are harmed by prolonged exposure to Cl^- concentrations greater than 220 mg/L. Additionally, shifts in algal populations were associated with Cl^- concentrations as low as 12 mg/l. Therefore, lakes can be negatively impacted by high Cl^- concentrations and it is important to keep the use of road salts to a minimum within the watershed. Proper application procedures and alternative methods can be used to keep these concentrations under control.

Figure 1. Water quality sampling site on Third Lake, 2008.

Table 1. Water quality data for Third Lake, 2005 – 2008

2008	Epilimnion														
DATE	DEPTH	ALK	TKN	NH_3-N	NO_2+NO_3-N	TP	SRP	Cl^-	TSS	TS	TVS	SECCHI	COND	pH	DO
16-Apr	3	175	1.09	1.165	1.660	0.039	<0.005	296	9.7	802	109	2.63	1.3910	8.02	10.90
14-May	3	184	1.01	<0.1	1.160	0.044	<0.005	297	4.7	821	125	6.92	1.4190	8.39	9.50
11-Jun	3	173	0.88	<0.1	2.070	0.042	<0.005	246	7.5	750	152	2.46	1.2320	8.24	7.98
09-Jul	3	176	1.13	<0.1	0.998	0.023	<0.005	243	4.1	746	158	4.86	1.2300	8.74	8.51
13-Aug	3	164	0.86	<0.1	0.399	0.019	<0.005	248	3.8	727	147	6.07	1.2120	8.60	8.96
10-Sep	3	138	0.78	<0.1	0.087	0.020	<0.005	245	5.2	686	143	4.10	1.1630	8.59	9.43
05-Nov	3	176	1.01	0.148	0.482	0.012	<0.005	235	2.7	732	141	6.76	1.1810	7.53	10.18
	Average	169	0.97	0.657[k]	0.979	0.028	<0.005	259	5.4	752	139	4.83	1.2611	8.30	9.35

2007	Epilimnion														
DATE	DEPTH	ALK	TKN	NH_3-N	NO_2+NO_3-N	TP	SRP	Cl^-	TSS	TS	TVS	SECCHI	COND	pH	DO
17-Apr	3	181	1.22	0.207	2.160	0.044	0.009	339	2.3	976	163	10.66	1.6030	7.85	11.27
16-May	3	194	1.00	0.163	1.870	0.023	<0.005	336	2.5	950	157	11.48	1.6330	7.96	8.97
20-Jun	3	160	1.13	0.100	1.650	0.028	<0.005	235	3.8	775	193	5.41	1.2250	8.11	6.69
18-Jul	3	154	1.14	<0.1	0.799	0.043	<0.005	248	6.0	763	171	7.71	1.2450	8.54	8.61
15-Aug	3	134	1.00	<0.1	0.080	0.041	<0.005	173	5.5	566	122	5.57	0.9280	8.24	8.08
19-Sep	3	175	1.04	<0.1	0.071	0.048	<0.005	160	6.5	587	127	4.92	0.9405	8.30	10.52
24-Oct	3	184	0.99	0.124	0.305	0.015	<0.005	221	3.1	695	116	9.19	1.0850	7.57	7.04
	Average	169	1.07	0.149[k]	0.991	0.035	0.009[k]	245	4.2	759	150	7.85	1.2371	8.08	8.74

2006	Epilimnion														
DATE	DEPTH	ALK	TKN	NH_3-N	NO_2+NO_3-N	TP	SRP	Cl^-	TSS	TS	TVS	SECCHI	COND	pH	DO
12-Apr	3	158	1.47	0.148	2.100	0.021	<0.005	334	4.1	941	140	10.83	1.5840	7.84	11.44
17-May	3	167	1.21	0.155	1.970	0.020	<0.005	318	1.1	911	138	12.63	1.5400	8.04	9.12
21-Jun	3	166	1.03	<0.1	1.280	0.021	<0.005	302	1.3	971	229	11.84	1.5140	8.47	7.71
19-Jul	3	140	1.08	<0.1	0.646	0.012	<0.005	310	4.6	921	191	7.05	1.4820	8.74	9.26
16-Aug	3	112	1.09	<0.1	0.255	0.018	<0.005	325	4.9	936	227	6.10	1.4810	8.73	9.41
20-Sep	3	121	1.04	<0.1	0.222	0.023	<0.005	306	5.6	838	144	6.63	1.4150	8.60	8.93
01-Nov	3	157	1.10	0.287	0.390	0.040	0.015	291	2.6	839	136	10.99	1.4210	7.98	8.96
	Average	146	1.15	0.197[k]	0.980	0.022	0.015[k]	312	3.5	908	172	9.44	1.4910	8.34	9.26

2005	Epilimnion														
DATE	DEPTH	ALK	TKN	NH_3-N	NO_3-N[*]	TP	SRP	Cl^-	TSS	TS	TVS	SECCHI	COND	pH	DO
12-Apr	3	175	1.08	<0.1	1.710	0.015	<0.005	303	3.9	875	150	8.56	1.4680	7.91	10.31
18-May	3	178	1.11	<0.1	1.290	0.021	<0.005	308	2.7	897	158	10.47	1.5090	7.55	9.56
22-Jun	3	168	1.09	<0.1	0.697	0.019	<0.005	319	3.9	918	185	5.28	1.5140	8.00	8.40
20-Jul	3	136	1.04	<0.1	0.123	0.015	<0.005	331	5.5	904	168	5.18	1.5080	8.11	8.58
17-Aug	3	118	0.98	<0.1	<0.05	0.024	<0.005	328	4.3	867	168	5.28	1.4730	8.78	8.51
21-Sep	3	116	0.82	<0.1	<0.05	0.021	<0.005	323	3.1	846	171	8.40	1.4440	8.73	8.14
19-Oct	3	146	0.85	<0.1	0.304	0.018	<0.005	314	2.0	818	122	11.65	1.4980	7.60	8.00
	Average	148	1.00	<0.1	0.820[k]	0.019	<0.005	318	3.6	875	160	7.83	1.4877	8.10	8.79

Table 1. Continued.

2008	Hypolimnion														
DATE	DEPTH	ALK	TKN	NH_3-N	NO_2+NO_3-N	TP	SRP	Cl^-	TSS	TS	TVS	SECCHI	COND	pH	DO
16-Apr	62	218	2.18	1.070	0.870	0.136	0.076	469	2	1150	134	NA	2.0380	7.69	3.24
14-May	54	223	2.40	1.430	0.646	0.109	0.05	462	4.1	1140	140	NA	2.0130	7.54	1.01
11-Jun	61	233	2.51	1.730	0.490	0.210	0.143	459	3.3	1160	167	NA	1.9970	7.11	0.22
09-Jul	61	244	3.04	2.240	<0.05	0.440	0.348	451	4.5	1150	175	NA	1.9750	7.02	0.20
13-Aug	61	243	2.66	2.410	<0.05	0.549	0.44	444	4.4	1170	193	NA	1.9530	7.00	0.20
10-Sep	61	257	4.08	3.140	<0.05	0.690	0.647	443	5.1	1140	169	NA	1.9730	6.90	0.20
05-Nov	61	265	4.31	3.920	<0.05	1.020	0.853	427	5.1	1120	170	NA	1.9070	6.78	0.23
	Average	240	3.03	2.277	0.669[k]	0.451	0.365	451	4.1	1147	164	NA	1.9794	7.15	0.76

2007	Hypolimnion														
DATE	DEPTH	ALK	TKN	NH_3-N	NO_2+NO_3-N	TP	SRP	Cl^-	TSS	TS	TVS	SECCHI	COND	pH	DO
17-Apr	60	179	1.13	0.287	1.840	0.032	0.013	344	1.4	980	153	NA	1.6270	7.7	10.22
16-May	60	196	1.78	0.960	1.190	0.144	0.125	346	1.2	943	143	NA	1.6420	7.18	2.65
20-Jun	60	211	2.39	1.690	0.487	0.346	0.307	346	3.5	1010	195	NA	1.6540	6.97	0.18
18-Jul	60	221	2.58	2.060	0.059	0.476	0.415	348	5.1	983	164	NA	1.6530	6.98	0.13
15-Aug	61	236	3.24	2.690	<0.05	0.573	0.547	346	3	1020	206	NA	1.6550	6.71	0.12
19-Sep	60	238	3.29	2.760	0.051	0.588	0.503	343	3.9	982	172	NA	1.6580	6.72	0.12
24-Oct	60	239	3.88	2.930	0.052	0.633	0.595	317	10	880	121	NA	1.5240	6.79	0.14
	Average	217	2.61	1.911	0.613[k]	0.399	0.358	341	4.0	971	165	NA	1.6304	7.01	1.94

2006	Hypolimnion														
DATE	DEPTH	ALK	TKN	NH_3-N	NO_2+NO_3-N	TP	SRP	Cl^-	TSS	TS	TVS	SECCHI	COND	pH	DO
12-Apr	55	159	1.29	0.254	1.970	0.032	0.009	340	2.8	956	158	NA	1.5960	7.64	10.47
17-May	57	171	2.08	0.920	1.340	0.134	0.084	337	2.6	924	137	NA	1.5910	6.97	0.36
21-Jun	57	174	1.93	0.972	1.180	0.138	0.106	328	2.3	989	207	NA	1.6010	6.89	0.19
19-Jul	57	181	2.52	1.450	0.548	0.163	0.127	339	2.3	995	206	NA	1.6330	6.73	0.17
16-Aug	57	183	2.27	1.470	0.315	0.138	0.103	342	3.8	976	175	NA	1.6270	6.71	0.15
20-Sep	59	212	3.42	2.680	<0.05	0.580	0.536	345	4.0	973	170	NA	1.6410	6.78	0.16
01-Nov	56	158	1.13	0.302	0.414	0.040	0.014	293	3.1	852	155	NA	1.4240	7.94	8.55
	Average	177	2.09	1.150	0.825[k]	0.175	0.140	332	3.0	952	173	NA	1.5876	7.09	2.86

2005	Hypolimnion														
DATE	DEPTH	ALK	TKN	NH_3-N	NO_3-N[*]	TP	SRP	Cl^-	TSS	TS	TVS	SECCHI	COND	pH	DO
12-Apr	61	175	1.25	0.365	1.630	0.016	0.013	302	2.1	874	148	NA	1.4590	7.36	7.18
18-May	62	189	1.76	0.967	0.991	0.124	0.091	303	1.7	870	135	NA	1.4800	6.79	0.66
22-Jun	59	209	2.89	2.020	<0.05	0.525	0.461	303	2.9	916	192	NA	1.4670	6.61	0.00
20-Jul	60	215	3.10	2.000	0.082	0.471	0.413	303	7.9	897	164	NA	1.4740	6.58	0.04
17-Aug	59	234	4.00	3.140	<0.05	0.762	0.689	301	5.1	913	194	NA	1.4870	6.62	0.01
21-Sep	60	256	5.00	4.030	<0.05	1.140	1.080	300	4.0	875	138	NA	1.4980	5.80	0.06
19-Oct	59	235	3.73	3.080	<0.05	0.641	0.564	299	15.0	863	112	NA	1.5325	6.43	0.15
	Average	216	3.10	2.229	0.901[k]	0.526	0.473	302	5.5	887	155	NA	1.4854	6.60	1.16

Table 1. Continued.

Glossary	
ALK = Alkalinity, mg/L $CaCO_3$	TDS = Total dissolved solids, mg/L
TKN = Total Kjeldahl nitrogen, mg/L	TSS = Total suspended solids, mg/L
NH_3-N = Ammonia nitrogen, mg/L	TS = Total solids, mg/L
NO_2+NO_3-N = Nitrate + Nitrite nitrogen, mg/L	TVS = Total volatile solids, mg/L
NO_3-N = Nitrate + Nitrite nitrogen, mg/L	SECCHI = Secchi disk depth, ft.
TP = Total phosphorus, mg/L	COND = Conductivity, milliSiemens/cm
SRP = Soluble reactive phosphorus, mg/L	DO = Dissolved oxygen, mg/L
Cl^- = Chloride, mg/L	

k = Denotes that the actual value is known to be less than the value presented.

NA= Not applicable

* = Prior to 2006 only Nitrate - nitrogen was analyzed

Figure 2. Yearly Secchi depth averages from VLMP and LCHD records for Third Lake.

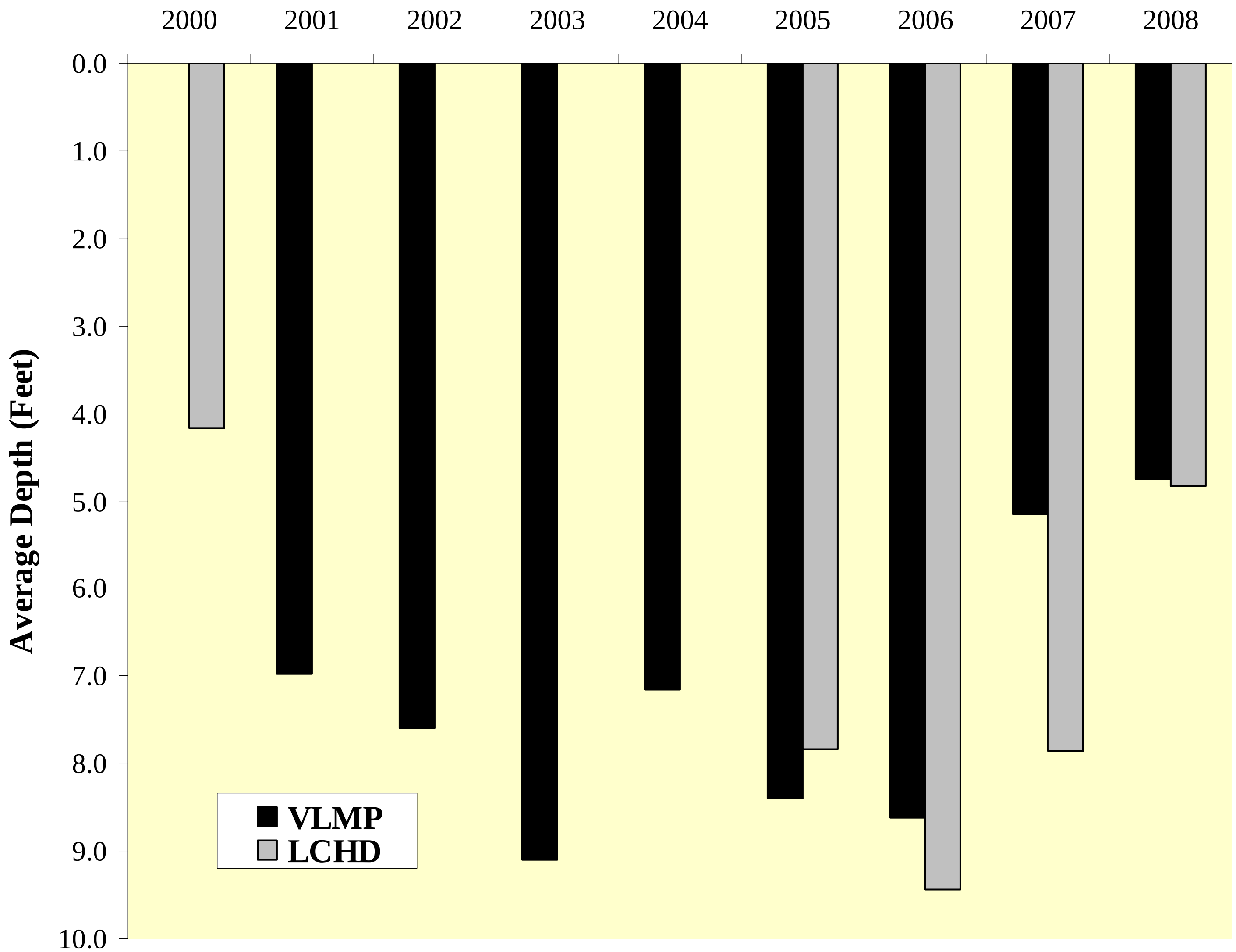

Figure 3. Total suspended solid (TSS) concentrations vs. Secchi depth for Third Lake, 2000 - 2008.

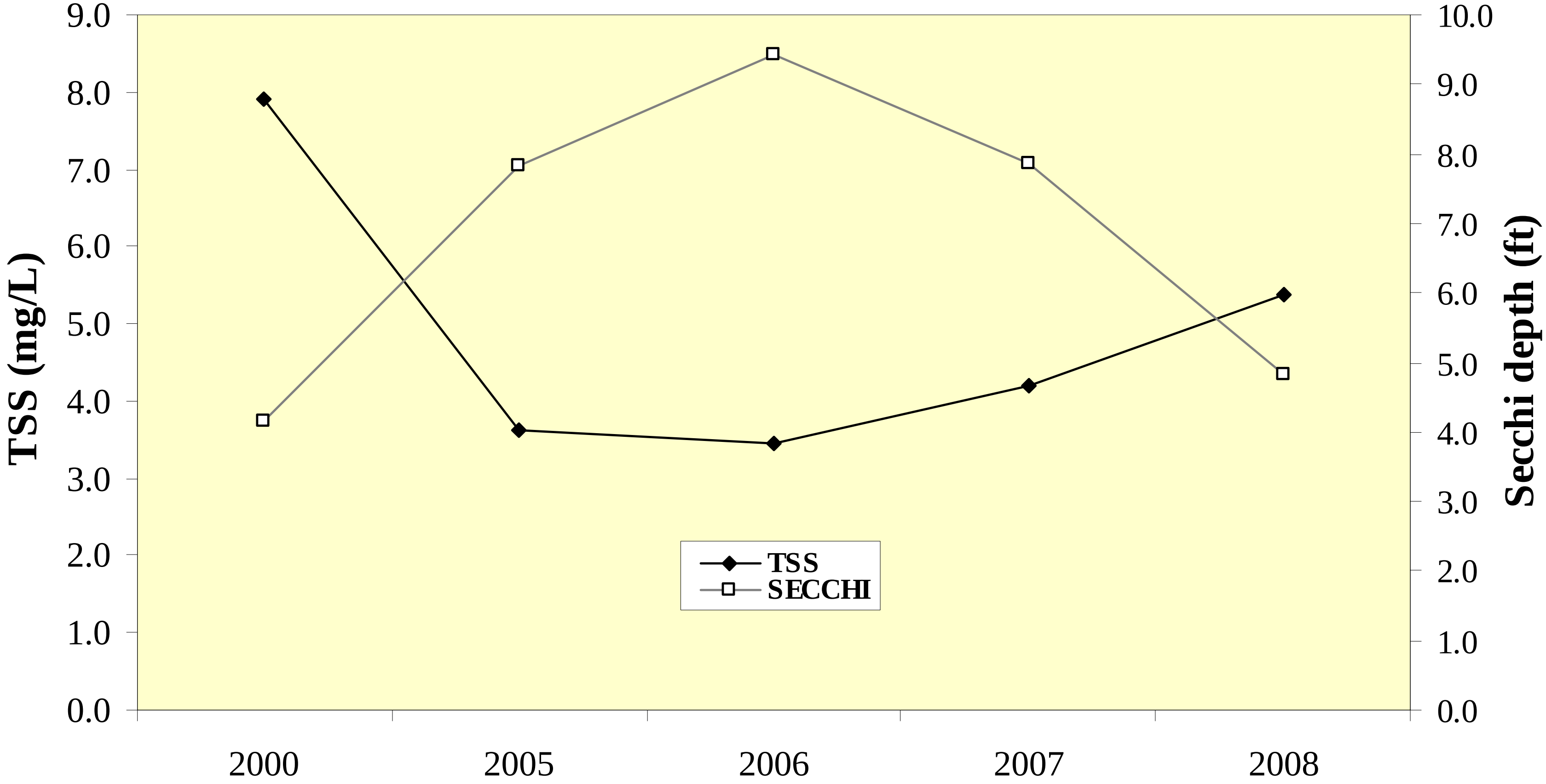

Table 2. Lake County average TSI phosphorous (TSIp) ranking 2000-2008.

RANK	LAKE NAME	TP AVE	TSIp
1	Lake Carina	0.0100	37.35
2	Sterling Lake	0.0100	37.35
3	Independence Grove	0.0135	39.24
4	Lake Zurich	0.0130	41.14
5	Sand Pond (IDNR)	0.0165	41.36
6	West Loon Lake	0.0140	42.21
7	Windward Lake	0.0158	43.95
8	Bangs Lake	0.0170	45.00
9	Pulaski Pond	0.0180	45.83
10	Timber Lake	0.0180	45.83
11	Fourth Lake	0.0182	45.99
12	Lake Kathryn	0.0200	47.35
13	Lake of the Hollow	0.0200	47.35
14	Banana Pond	0.0202	47.49
15	Lake Minear	0.0204	47.63
16	Cedar Lake	0.0220	48.72
17	Cross Lake	0.0220	48.72
18	Sun Lake	0.0220	48.72
19	Dog Pond	0.0222	48.85
20	Stone Quarry Lake	0.0230	49.36
21	Deep Lake	0.0234	49.61
22	Druce Lake	0.0244	50.22
23	Little Silver	0.0250	50.57
24	Round Lake	0.0254	50.80
25	Lake Leo	0.0256	50.91
26	Cranberry Lake	0.0270	51.68
27	Dugdale Lake	0.0274	51.89
28	Peterson Pond	0.0274	51.89
29	Lake Miltmore	0.0276	51.99
30	**Third Lake**	**0.0280**	**52.20**
31	Lake Fairfield	0.0296	53.00
32	Gray's Lake	0.0302	53.29
33	Highland Lake	0.0302	53.29
34	Hook Lake	0.0302	53.29
35	Lake Catherine (Site 1)	0.0308	53.57
36	Lambs Farm Lake	0.0312	53.76
37	Old School Lake	0.0312	53.76
38	Sand Lake	0.0316	53.94
39	Sullivan Lake	0.0320	54.13
40	Lake Linden	0.0326	54.39
41	Gages Lake	0.0338	54.92
42	Honey Lake	0.0340	55.00
43	Hendrick Lake	0.0344	55.17
44	Diamond Lake	0.0372	56.30
45	Channel Lake (Site 1)	0.0380	56.60
46	Ames Pit	0.0390	56.98

Table 2. Continued.

RANK	LAKE NAME	TP AVE	TSIp
47	White Lake	0.0408	57.63
48	Potomac Lake	0.0424	58.18
49	Duck Lake	0.0426	58.25
50	Old Oak Lake	0.0428	58.32
51	Deer Lake	0.0434	58.52
52	Schreiber Lake	0.0434	58.52
53	Nielsen Pond	0.0448	58.98
54	Turner Lake	0.0458	59.30
55	Seven Acre Lake	0.0460	59.36
56	Willow Lake	0.0464	59.48
57	Lucky Lake	0.0476	59.85
58	Davis Lake	0.0476	59.85
59	East Meadow Lake	0.0478	59.91
60	East Loon Lake	0.0490	60.27
61	College Trail Lake	0.0496	60.45
62	Lake Lakeland Estates	0.0524	61.24
63	Butler Lake	0.0528	61.35
64	West Meadow Lake	0.0530	61.40
65	Heron Pond	0.0545	61.80
66	Little Bear Lake	0.0550	61.94
67	Lucy Lake	0.0552	61.99
68	Lake Christa	0.0576	62.60
69	Lake Charles	0.0580	62.70
70	Crooked Lake	0.0608	63.38
71	Waterford Lake	0.0610	63.43
72	Lake Naomi	0.0616	63.57
73	Lake Tranquility S1	0.0618	63.62
74	Wooster Lake	0.0620	63.66
75	Countryside Lake	0.0620	63.66
76	Werhane Lake	0.0630	63.89
77	Liberty Lake	0.0632	63.94
78	Countryside Glen Lake	0.0642	64.17
79	Lake Fairview	0.0648	64.30
80	Leisure Lake	0.0648	64.30
81	Tower Lake	0.0662	64.61
82	St. Mary's Lake	0.0666	64.70
83	Mary Lee Lake	0.0682	65.04
84	Hastings Lake	0.0684	65.08
85	Spring Lake	0.0726	65.94
86	ADID 203	0.0730	66.02
87	Bluff Lake	0.0734	66.10
88	Harvey Lake	0.0766	66.71
89	Broberg Marsh	0.0782	67.01
90	Sylvan Lake	0.0794	67.23
91	Big Bear Lake	0.0806	67.45
92	Petite Lake	0.0834	67.94

Table 2. Continued.

RANK	LAKE NAME	TP AVE	TSIp
93	Timber Lake (South)	0.0848	68.18
94	Lake Marie (Site 1)	0.0850	68.21
95	North Churchill Lake	0.0872	68.58
96	Grand Avenue Marsh	0.0874	68.61
97	Grandwood Park, Site II, Outflow	0.0876	68.65
98	North Tower Lake	0.0878	68.68
99	South Churchill Lake	0.0896	68.97
100	Rivershire Pond 2	0.0900	69.04
101	McGreal Lake	0.0914	69.26
102	International Mine and Chemical Lake	0.0948	69.79
103	Eagle Lake (Site I)	0.0950	69.82
104	Valley Lake	0.0950	69.82
105	Dunns Lake	0.0952	69.85
106	Fish Lake	0.0956	69.91
107	Lochanora Lake	0.0960	69.97
108	Owens Lake	0.0978	70.23
109	Woodland Lake	0.0986	70.35
110	Island Lake	0.0990	70.41
111	McDonald Lake 1	0.0996	70.50
112	Longview Meadow Lake	0.1024	70.90
113	Lake Barrington	0.1053	71.31
114	Redwing Slough, Site II, Outflow	0.1072	71.56
115	Lake Forest Pond	0.1074	71.59
116	Bittersweet Golf Course #13	0.1096	71.88
117	Fox Lake (Site 1)	0.1098	71.90
118	Osprey Lake	0.1108	72.04
119	Bresen Lake	0.1126	72.27
120	Round Lake Marsh North	0.1126	72.27
121	Deer Lake Meadow Lake	0.1158	72.67
122	Long Lake	0.1170	72.82
123	Taylor Lake	0.1184	72.99
124	Columbus Park Lake	0.1226	73.49
125	Nippersink Lake (Site 1)	0.1240	73.66
126	Echo Lake	0.1250	73.77
127	Grass Lake (Site 1)	0.1288	74.21
128	Lake Holloway	0.1322	74.58
129	Lakewood Marsh	0.1330	74.67
130	Summerhill Estates Lake	0.1384	75.24
131	Redhead Lake	0.1412	75.53
132	Forest Lake	0.1422	75.63
133	Antioch Lake	0.1448	75.89
134	Slocum Lake	0.1496	76.36
135	Drummond Lake	0.1510	76.50
136	Pond-a-Rudy	0.1514	76.54
137	Lake Matthews	0.1516	76.56
138	Buffalo Creek Reservoir	0.1550	76.88

Table 2. Continued.

RANK	LAKE NAME	TP AVE	TSIp
139	Pistakee Lake (Site 1)	0.1592	77.26
140	Grassy Lake	0.1610	77.42
141	Salem Lake	0.1650	77.78
142	Half Day Pit	0.1690	78.12
143	Lake Eleanor Site II, Outflow	0.1812	79.13
144	Lake Farmington	0.1848	79.41
145	Lake Louise	0.1850	79.43
146	ADID 127	0.1886	79.71
147	Dog Bone Lake	0.1990	80.48
148	Redwing Marsh	0.2072	81.06
149	Stockholm Lake	0.2082	81.13
150	Bishop Lake	0.2156	81.63
151	Hidden Lake	0.2236	82.16
152	Fischer Lake	0.2278	82.43
153	Lake Napa Suwe (Outlet)	0.2304	82.59
154	Patski Pond (outlet)	0.2512	83.84
155	Oak Hills Lake	0.2792	85.36
156	Loch Lomond	0.2954	86.18
157	McDonald Lake 2	0.3254	87.57
158	Fairfield Marsh	0.3264	87.61
159	ADID 182	0.3280	87.69
160	Slough Lake	0.4134	91.02
161	Flint Lake Outlet	0.4996	93.75
162	Rasmussen Lake	0.5025	93.84
163	Albert Lake, Site II, outflow	1.1894	106.26

SUMMARY OF AQUATIC MACROPHYTES

An aquatic plant (macrophyte) survey was conducted in July of 2007. Sampling sites were based on a grid system created by mapping software (ArcMap), with each site located 60 meters apart. On Third Lake, there were 99 sites sampled (Figure 4) and plants were found at a maximum depth of 6.5 feet. Aquatic plants will not photosynthesize at water depths with less than 1% of the available sunlight at the surface. During 2008, the depth of the 1% light level ranged from 8 feet (June) to 15 feet (July and August). There was a total of six aquatic plant species and one macro-algae species found (Table 3). Sago Pondweed was the most dominant species found at 23% of the sampled sites (Table 4a). Eurasian Watermilfoil (EWM) was the second most common species found at 18% of the sampled sites. EWM was found in similar densities in 2007 (16% of the sites in June and 20% of the sites in August). EWM has decreased from 2006 when EWM was the most dominant species both months found at 39% of the sites sampled.

To maintain a healthy sunfish/bass fishery, the Illinois Department of Natural Resources (IDNR) recommends plant coverage be 30% to 40% across the lake bottom. The 2008 survey found approximately 40% of the sites sampled had aquatic plants (Table 4b). It was calculated that approximately 22% of the lake bottom was covered by plants.

Floristic Quality Index (FQI) is a rapid assessment tool designed to evaluate the closeness of the flora of an area to that of undisturbed conditions. It can be used to: 1) identify natural areas, 2) compare the quality of different sites or different locations within a single site, 3) monitor long-term floristic trends, and 4) monitor habitat restoration efforts. A high FQI number indicates that there were large numbers of sensitive, high quality plant species present in the lake. Non-native species were also included in the FQI calculations for Lake County lakes. The average FQI for 2000-2008 Lake County lakes was 13.6 (Table 5). Third Lake had a FQI of 10.2 in 2008 which was a decrease from 2005 (19.6), 2006 (14.1), and 2007(16.8).

Figure 4. Aquatic plant sampling grid that illustrates plant density on Third Lake, July 2008.

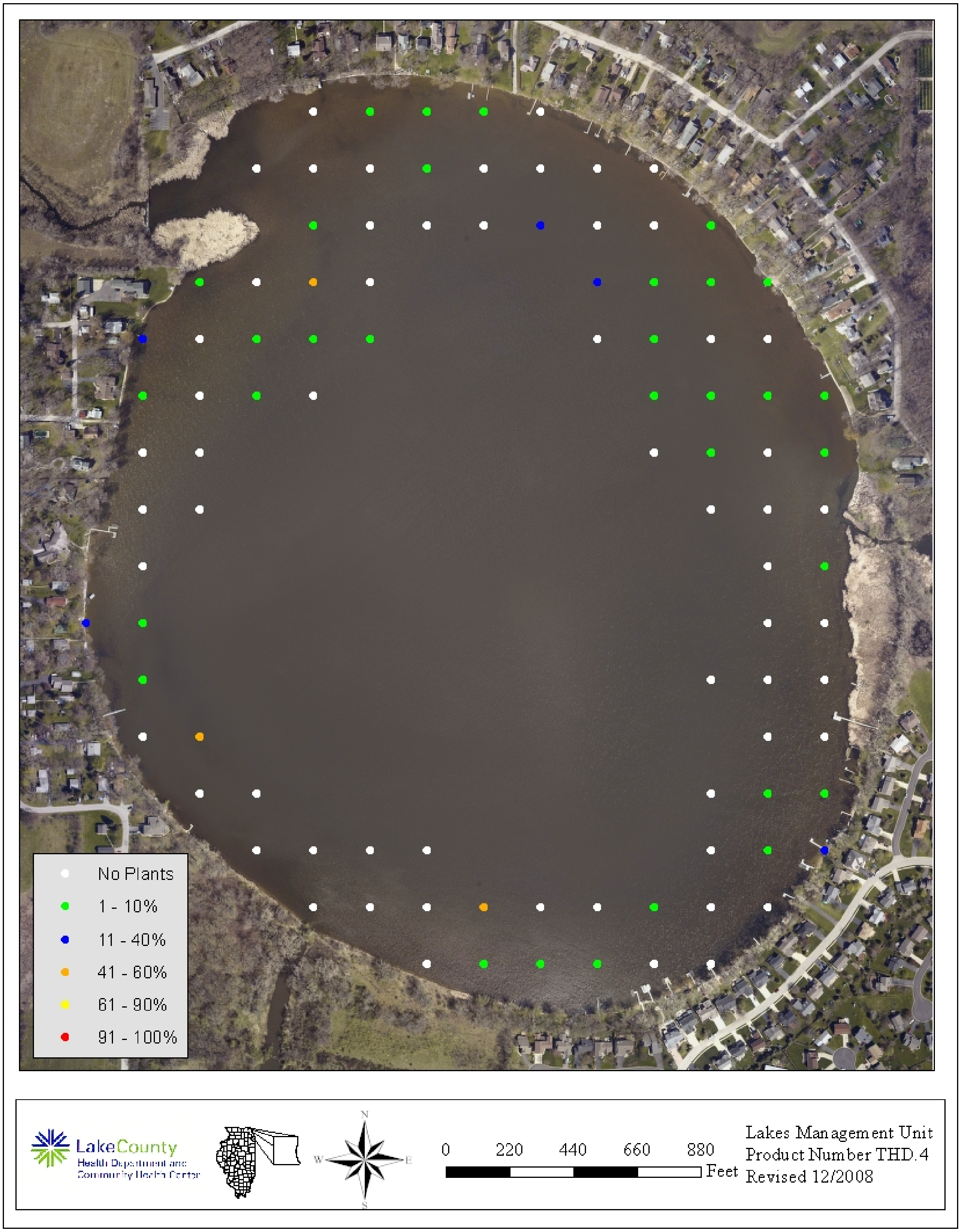

Table 3. Aquatic plant species found in Third Lake in 2008.

Chara	*Chara* spp.
Illinois Pondweed	*Potamogeton illinoensis*
Sago Pondweed	*Potamogeton pectinatus*
Eurasian Water Milfoil^	*Myriophyllum spicatum*
Slender Naiad	*Najas flexilis*
Spiny Naiad	*Najas marina*
White Water Lily	*Nymphaea tuberosa*

^ Exotic plant

Table 4a. Aquatic plant species found at the 99 sampling sites on Third Lake in July, 2008. The maximum depth that plants were found was 6.5 feet

July							
Plant Density	Chara	Eurasian Watermilfoil	Illinois Pondweed	Sago Pondweed	Slender Naiad	Spiny Naiad	White Water Lily
Absent	94	81	97	76	94	94	97
Present	4	14	2	19	5	5	1
Common	1	2	0	3	0	0	1
Abundant	0	2	0	1	0	0	0
Dominant	0	0	0	0	0	0	0
% Plant Occurrence	5.1	18.2	2.0	23.2	5.1	5.1	2.0

Table 4b. Distribution of rake density across all sampling sites

July		
Rake Density (Coverage)	# of Sites	%
No plants	59	59.6%
>0 to 10%	32	32.3%
>10 to 40%	5	5.1%
>40 to 60%	3	3.0%
>60 to 90%	0	0.0%
>90%	0	0.0%
Total Sites with Plants	40	40.4%
Total # of Sites	99	100.0%

Table 5. Floristic quality index (FQI) of lakes in Lake County, calculated with exotic species (w/Adventives) and with native species only (native)

RANK	LAKE NAME	FQI (w/A)	FQI (native)
1	Cedar Lake	36.3	38.4
2	East Loon Lake	30.6	32.7
3	Cranberry Lake	30.1	31.6
4	Deep Lake	29.7	31.2
5	Little Silver	29.6	31.6
6	Round Lake Marsh North	29.1	29.9
7	Deer Lake	28.2	29.7
8	Sullivan Lake	28.2	29.7
9	Schreiber Lake	26.8	27.6
10	Bangs Lake	25.7	27.4
11	West Loon Lake	25.7	27.3
12	Cross Lake	25.2	27.8
13	Independence Grove	24.6	27.5
14	Sterling Lake	24.5	26.9
15	Lake Zurich	24.3	27.1
16	Sun Lake	24.3	26.1
17	Lake of the Hollow	23.8	26.2
18	Lakewood Marsh	23.8	24.7
19	Round Lake	23.5	25.9
20	Honey Lake	23.3	25.1
21	Fourth Lake	23.0	24.8
22	Druce Lake	22.8	25.2
23	Countryside Glen Lake	21.9	22.8
24	Butler Lake	21.4	23.1
25	Duck Lake	21.1	22.9
26	Timber Lake (North)	20.8	22.8
27	Broberg Marsh	20.5	21.4
28	Davis Lake	20.5	21.4
29	ADID 203	20.5	20.5
30	McGreal Lake	20.2	22.1
31	Lake Kathryn	19.6	20.7
32	Fish Lake	19.3	21.2
33	Owens Lake	19.3	20.2
34	Redhead Lake	19.3	21.2
35	Turner Lake	18.6	21.2
36	Wooster Lake	18.5	20.2
37	Salem Lake	18.5	20.2
38	Lake Miltmore	18.4	20.3
39	Hendrick Lake	17.7	17.7
40	Summerhill Estates Lake	17.1	18.0
41	Seven Acre Lake	17.0	15.5
42	Gray's Lake	16.9	19.8
43	Lake Barrington	16.7	17.7
44	Bresen Lake	16.6	17.8

Table 5. Continued.

Rank	LAKE NAME	FQI (w/A)	FQI (native)
45	Diamond Lake	16.3	17.4
46	Lake Napa Suwe	16.3	17.4
47	Windward Lake	16.3	17.6
48	Dog Bone Lake	15.7	15.7
49	Redwing Slough	15.6	16.6
50	Osprey Lake	15.5	17.3
51	Lake Fairview	15.2	16.3
52	Heron Pond	15.1	15.1
53	Lake Tranquility (S1)	15.0	17.0
54	North Churchill Lake	15.0	15.0
55	Dog Training Pond	14.7	15.9
56	Island Lake	14.7	16.6
57	Highland Lake	14.5	16.7
58	Grand Avenue Marsh	14.3	16.3
59	Taylor Lake	14.3	16.3
60	Dugdale Lake	14.0	15.1
61	Eagle Lake (S1)	14.0	15.1
62	Longview Meadow Lake	13.9	13.9
63	Ames Pit	13.4	15.5
64	Bishop Lake	13.4	15.0
65	Hook Lake	13.4	15.5
66	Long Lake	13.1	15.1
67	Buffalo Creek Reservoir	13.1	14.3
68	Mary Lee Lake	13.1	15.1
69	McDonald Lake 2	13.1	14.3
70	Old School Lake	13.1	15.1
71	Dunn's Lake	12.7	13.9
72	Old Oak Lake	12.7	14.7
73	Timber Lake (South)	12.7	14.7
74	White Lake	12.7	14.7
75	Hastings Lake	12.5	14.8
76	Sand Lake	12.5	14.8
77	Stone Quarry Lake	12.5	12.5
78	Lake Carina	12.1	14.3
79	Lake Leo	12.1	14.3
80	Lambs Farm Lake	12.1	14.3
81	Pond-A-Rudy	12.1	12.1
82	Stockholm Lake	12.1	13.5
83	Grassy Lake	12	12
84	Lake Matthews	12.0	12.0
85	Flint Lake	11.8	13.0
86	Harvey Lake	11.8	13.0
87	Rivershire Pond 2	11.5	13.3
88	Antioch Lake	11.3	13.4
89	Lake Charles	11.3	13.4
90	Lake Linden	11.3	11.3

Table 5. Continued.

Rank	LAKE NAME	FQI (w/A)	FQI (native)
91	Lake Naomi	11.2	12.5
92	Pulaski Pond	11.2	12.5
93	Lake Minear	11.0	13.9
94	Redwing Marsh	11.0	11.0
95	Tower Lake	11.0	11.0
96	West Meadow Lake	11.0	11.0
97	Nielsen Pond	10.7	12.0
98	Lake Holloway	10.6	10.6
99	**Third Lake**	**10.2**	**12.5**
100	Crooked Lake	10.2	12.5
101	College Trail Lake	10.0	10.0
102	Lake Lakeland Estates	10.0	11.5
103	Valley Lake	9.9	9.9
104	Werhane Lake	9.8	12.0
105	Big Bear Lake	9.5	11.0
106	Little Bear Lake	9.5	11.0
107	Loch Lomond	9.4	12.1
108	Columbus Park Lake	9.2	9.2
109	Sylvan Lake	9.2	9.2
110	Lake Louise	9	10.4
111	Fischer Lake	9.0	11.0
112	Grandwood Park Lake	9.0	11.0
113	Lake Fairfield	9.0	10.4
114	McDonald Lake 1	8.9	10.0
115	Countryside Lake	8.7	10.6
116	East Meadow Lake	8.5	8.5
117	Lake Christa	8.5	9.8
118	Lake Farmington	8.5	9.8
119	Lucy Lake	8.5	9.8
120	South Churchill Lake	8.5	8.5
121	Bittersweet Golf Course #13	8.1	8.1
122	Woodland Lake	8.1	9.9
123	Albert Lake	7.5	8.7
124	Banana Pond	7.5	9.2
125	Fairfield Marsh	7.5	8.7
126	Lake Eleanor	7.5	8.7
127	Patski Pond	7.1	7.1
128	Rasmussen Lake	7.1	7.1
129	Slough Lake	7.1	7.1
130	Lucky Lake	7.0	7.0
131	Lake Forest Pond	6.9	8.5
132	Leisure Lake	6.4	9.0
133	Peterson Pond	6.0	8.5
134	Gages Lake	5.8	10.0
135	Slocum Lake	5.8	7.1
136	Deer Lake Meadow Lake	5.2	6.4

Table 5. Continued.

Rank	LAKE NAME	FQI (w/A)	FQI (native)
137	ADID 127	5.0	5.0
138	Drummond Lake	5.0	7.1
139	IMC Lake	5.0	7.1
140	Liberty Lake	5.0	5.0
141	Oak Hills Lake	5.0	5.0
142	Forest Lake	3.5	5.0
143	Sand Pond (IDNR)	3.5	5.0
144	Half Day Pit	2.9	5.0
145	Lochanora Lake	2.5	5.0
146	Echo Lake	0.0	0.0
147	Hidden Lake	0.0	0.0
148	North Tower Lake	0.0	0.0
149	Potomac Lake	0.0	0.0
150	St. Mary's Lake	0.0	0.0
151	Waterford Lake	0.0	0.0
152	Willow Lake	0.0	0.0
	Mean	**13.6**	**14.9**
	Median	**12.5**	**14.3**

APPENDIX A. METHODS FOR FIELD DATA COLLECTION AND LABORATORY ANALYSES

Water Sampling and Laboratory Analyses

Two water samples were collected once a month from May through September. Sample locations were at the deepest point in the lake (see sample site map), three feet below the surface, and 3 feet above the bottom. Samples were collected with a horizontal Van Dorn water sampler. Approximately three liters of water were collected for each sample for all lab analyses. After collection, all samples were placed in a cooler with ice until delivered to the Lake County Health Department lab, where they were refrigerated. Analytical methods for the parameters are listed in Table A1. Except nitrate nitrogen, all methods are from the Eighteenth Edition of Standard Methods, (eds. American Public Health Association, American Water Works Association, and Water Pollution Control Federation, 1992). Methodology for nitrate nitrogen was taken from the 14th edition of Standard Methods. Dissolved oxygen, temperature, conductivity and pH were measured at the deep hole with a Hydrolab DataSonde® 4a. Photosynthetic Active Radiation (PAR) was recorded using a LI-COR® 192 Spherical Sensor attached to the Hydrolab DataSonde® 4a. Readings were taken at the surface and then every two feet until reaching the bottom.

Plant Sampling

In order to randomly sample each lake, mapping software (ArcMap 9.3) overlaid a grid pattern onto an aerial photo of Lake County and placed points 60 or 30 meters apart, depending on lake size. Plants were sampled using a garden rake fitted with hardware cloth. The hardware cloth surrounded the rake tines and is tapered two feet up the handle. A rope was tied to the end of the handle for retrieval. At designated sampling sites, the rake was tossed into the water, and using the attached rope, was dragged across the bottom, toward the boat. After pulling the rake into the boat, plant coverage was assessed for overall abundance. Then plants were individually identified and placed in categories based on coverage. Plants that were not found on the rake but were seen in the immediate vicinity of the boat at the time of sampling were also recorded. Plants difficult to identify in the field were placed in plastic bags and identified with plant keys after returning to the office. The depth of each sampling location was measured either by a hand-held depth meter, or by pushing the rake straight down and measuring the depth along the rope or rake handle. One-foot increments were marked along the rope and rake handle to aid in depth estimation.

Wildlife Assessment

Species of wildlife were noted during visits to each lake. When possible, wildlife was identified to species by sight or sound. However, due to time constraints, collection of quantitative information was not possible. Thus, all data should be considered anecdotal.
Some of the species on the list may have only been seen once, or were spotted during their migration through the area.

Table A1. Analytical methods used for water quality parameters.

Parameter	***Method***
Temperature	Hydrolab DataSonde® 4a or YSI 6600 Sonde®
Dissolved oxygen	Hydrolab DataSonde ®4a or YSI 6600 Sonde®
Nitrate and Nitrite nitrogen	USEPA 353.2 rev. 2.0 EPA-600/R-93/100 Detection Limit = 0.05 mg/L
Ammonia nitrogen	SM 18th ed. Electrode method, #4500 NH_3-F Detection Limit = 0.1 mg/L
Total Kjeldahl nitrogen	SM 18th ed, 4500-N_{org} C Semi-Micro Kjeldahl, plus 4500 NH_3-F Detection Limit = 0.5 mg/L
pH	Hydrolab DataSonde® 4a, or YSI 6600 Sonde® Electrometric method
Total solids	SM 18th ed, Method #2540B
Total suspended solids	SM 18th ed, Method #2540D Detection Limit = 0.5 mg/L
Chloride	SM 18th ed, Method #4500C1-D
Total volatile solids	SM 18th ed, Method #2540E, from total solids
Alkalinity	SM 18th ed, Method #2320B, patentiometric titration curve method
Conductivity	Hydrolab DataSonde® 4a or YSI 6600 Sonde®
Total phosphorus	SM 18th ed, Methods #4500-P B 5 and #4500-P E Detection Limit = 0.01 mg/L
Soluble reactive phosphorus	SM 18th ed, Methods #4500-P B 1 and #4500-P E Detection Limit = 0.005 mg/L
Clarity	Secchi disk
Color	Illinois EPA Volunteer Lake Monitoring Color Chart
Photosynthetic Active Radiation (PAR)	Hydrolab DataSonde® 4a or YSI 6600 Sonde®, LI-COR® 192 Spherical Sensor

APPENDIX B. MULTI-PARAMETER DATA FOR THIRD LAKE IN 2008.

Third Lake 2008 Multiparameter data

Date MMDDYY	Time HHMMSS	Text Depth feet	Dep25 feet	Temp øC	DO mg/l	DO% Sat	SpCond mS/cm	pH Units	PAR æE/s/mý	Depth of Light Meter feet	% Light Transmission	Extinction Coefficient
											Average	0.46
41608	113721	0.25	0.39	7.71	10.96	95.1	1.39	7.98	4376	Surface		
41608	113843	1	0.96	7.74	10.93	94.9	1.392	8.05	1139	Surface	100%	
41608	113942	2	2.05	7.69	10.92	94.8	1.391	8.07	640	0.3	56%	1.92
41608	114047	3	2.99	7.75	10.9	94.6	1.391	8.02	1090	1.24	96%	-0.43
41608	114126	4	3.95	7.72	10.86	94.4	1.39	8.04	355	2.2	31%	0.51
41608	114232	6	6	7.71	10.85	94.1	1.391	8.08	108	4.25	9%	0.28
41608	114320	8	8.07	7.69	10.85	94.1	1.391	8.12	26	6.32	2%	0.23
41608	114353	10	10.03	7.62	10.84	94	1.391	8.15	3	8.28	0.3%	0.26
41608	114441	12	12.17	7.63	10.8	93.7	1.391	8.18	0	10.42		
41608	114528	14	13.97	7.61	10.79	93.4	1.392	8.2	0	12.22		
41608	114607	16	15.89	7.61	10.72	92.7	1.39	8.22	0	14.14		
41608	114706	18	18.1	7.46	10.7	92.1	1.394	8.24	0	16.35		
41608	114752	20	20.09	7.37	10.68	91.3	1.394	8.24	0	18.34		
41608	114829	22	22	6.94	10.5	89.9	1.405	8.22	0	20.25		
41608	114915	24	23.74	6.32	10.28	86.4	1.415	8.19	0	21.99		
41608	115149	26	26	6.23	10.2	85.3	1.457	8.19	0	24.25		
41608	115249	28	28.1	6.1	10.13	84.6	1.488	8.12	0	26.35		
41608	115049	30	30.67	5.34	9.95	81.3	1.545	8.15	0	28.92		
41608	115322	32	32.07	5.05	10.27	82.4	1.571	8.11	0	30.32		
41608	115412	34	34.04	4.27	9.85	78	1.644	8.04	0	32.29		
41608	115448	36	36	2.97	9.89	76.2	1.8	7.97	0	34.25		
41608	115535	38	38.08	1.7	9.56	71.7	1.937	7.9	0	36.33		
41608	115617	40	40.07	1.62	9.36	69	1.945	7.88	0	38.32		
41608	115721	42	41.87	1.59	8.73	64.7	1.96	7.84	0	40.12		
41608	115927	44	44.2	1.54	8.05	59.5	1.986	7.79	0	42.45		
41608	120051	46	46.21	1.58	7.28	53.8	1.994	7.78	0	44.46		
41608	120159	48	48.34	1.57	6.97	51.9	1.998	7.77	0	46.59		
41608	120300	50	50.47	1.59	6.35	47	2.001	7.68	0	48.72		
41608	120426	52	52.25	1.67	6.3	46.4	2.022	7.72	0	50.5		
41608	120519	54	53.91	1.69	5.06	37.6	2.023	7.72	0	52.16		
41608	120632	56	55.76	1.7	4.65	34.5	2.026	7.71	0	54.01		
41608	120738	58	58.28	1.72	4.02	30.1	2.024	7.71	0	56.53		
41608	120818	60	59.46	1.75	3.99	29.3	2.03	7.69	0	57.71		
41608	120936	62	62.87	1.79	3.24	23.7	2.038	7.69	0	61.12		
41608	121026	64	64.14	1.86	2.41	17.5	2.045	7.67	0	62.39		

Date MMDDYY	Time HHMMSS	Depth feet	Dep25 feet	Temp øC	DO mg/l	DO% Sat	SpCond mS/cm	pH Units	PAR æE/s/mý	Depth of Light Meter feet	% Light Transmission Average	Extinction Coefficient 0.46
51408	93903	0.25	0.33	14.47	9.52	97.2	1.418	8.33	1530	Surface	100%	
51408	94003	1	1.02	14.47	9.54	97.3	1.418	8.35	1015	Surface	66%	
51408	94052	2	1.96	14.48	9.52	97.2	1.418	8.37	215	0.21	14%	7.39
51408	94134	3	2.98	14.48	9.5	96.9	1.419	8.39	313	1.23	20%	-0.31
51408	94211	4	3.96	14.48	9.5	96.9	1.418	8.41	237	2.21	15%	0.13
51408	94308	6	5.99	14.48	9.5	96.9	1.418	8.45	146	4.24	10%	0.11
51408	94400	8	8.02	14.48	9.47	96.7	1.418	8.48	75	6.27	5%	0.11
51408	94446	10	10	14.48	9.46	96.5	1.418	8.51	38	8.25	2%	0.08

51408	94535	12	11.99	14.48	9.44	96.3	1.418	8.54	22	10.24	1.4%	0.05
51408	94630	14	14.06	14.38	9.38	95.5	1.419	8.54	11	12.31	0.7%	0.06
51408	94715	16	16.03	14.36	9.35	95.2	1.419	8.56	7	14.28	0.5%	0.03
51408	94805	18	17.96	14.31	9.25	94	1.417	8.57	5	16.21	0.3%	0.02
51408	94856	20	19.99	13.52	8.91	89.1	1.416	8.52	3	18.24	0.2%	0.03
51408	95008	22	22.04	12.16	7.88	76.4	1.424	8.37	2	20.29	0.1%	0.02
51408	95102	24	24.01	10.56	7.1	66.4	1.426	8.23	2	22.26	0.1%	0.00
51408	95152	26	25.98	8.7	6.55	58.6	1.438	8.05	2	24.23	0.1%	0.00
51408	95253	28	28.02	6.56	6.71	56.9	1.521	7.82	2	26.27	0.1%	0.00
51408	95344	30	29.95	5.75	6.77	56.3	1.575	7.86	2	28.2	0.1%	0.00
51408	95434	32	32.01	4.84	7.19	58.4	1.646	7.83	1	30.26	0.1%	0.02
51408	95536	34	33.96	4.62	6.97	56.3	1.684	7.81	0	32.21		
51408	95621	36	35.97	4.24	6.72	53.8	1.725	7.78	0	34.22		
51408	95712	38	38.05	3.59	6.73	52.9	1.806	7.74	0	36.3		
51408	95814	40	40.09	3	6.38	49.4	1.87	7.7	0	38.34		
51408	95916	42	42.01	2.8	5.89	45.4	1.876	7.68	0	40.26		
51408	100012	44	44.08	2.59	5.63	43.2	1.91	7.66	0	42.33		
51408	100112	46	46.04	2.33	5.36	40.8	1.941	7.66	0	44.29		
51408	100216	48	47.93	2.24	4.7	35.7	1.953	7.62	0	46.18		
51408	100317	50	49.91	2.06	3.58	27.1	1.987	7.6	0	48.16		
51408	100516	52	52	2.06	2.26	17.1	1.996	7.56	0	50.25		
51408	100613	54	54.1	2.01	1.01	7.6	2.013	7.54	0	52.35		
51408	100716	56	56.21	2.03	0.75	5.7	2.023	7.55	0	54.46		

Date MMDDYY	Time HHMMSS	Text Depth feet	Dep25 feet	Temp øC	DO mg/l	DO% Sat	SpCond mS/cm	pH Units	PAR æE/s/mý	Depth of Light Meter feet	% Light Transmission Average	Extinction Coefficient 0.23
61108	93758	0.25	0.41	22.99	8.01	96.3	1.2310	8.21	3476	Surface	100%	
61108	93857	1	1.07	23.00	7.99	96.0	1.2310	8.25	1286	Surface	37%	
61108	94003	2	2.15	22.96	7.99	95.9	1.2310	8.23	1038	0.4	30%	0.54
61108	94112	3	2.98	22.96	7.98	95.8	1.2310	8.23	612	1.23	18%	0.43
61108	94210	4	4.07	22.9	7.97	95.7	1.2310	8.23	161	2.32	5%	0.58
61108	94336	6	5.98	22.79	7.99	95.7	1.2330	8.27	106	4.23	3%	0.10
61108	94453	8	7.98	22.65	7.52	89.8	1.2360	8.24	37	6.23	1.1%	0.17
61108	94619	10	10.05	21.8	6.57	77.2	1.1620	7.96	12	8.3	0.3%	0.14
61108	94742	12	12.00	21.44	6.35	74.1	1.1850	7.99	5	10.25	0.1%	0.09
61108	94902	14	13.98	20.85	6.37	73.5	1.2610	8.12	3	12.23	0.1%	0.04
61108	94952	16	16.02	18.74	7.11	78.7	1.4210	8.27	2	14.27	0.1%	0.03
61108	95050	18	17.99	16.12	6.56	68.8	1.4300	8.15	0	16.24		
61108	95301	20	20.08	15.16	5.87	60.2	1.4330	8.04	0	18.33		
61108	95414	22	22.00	13.96	5.20	52.1	1.4340	7.90	0	20.25		
61108	95516	24	24.00	12.43	4.78	46.2	1.4450	7.76	0	22.25		
61108	95621	26	25.99	10.93	4.32	40.4	1.4530	7.57	0	24.24		
61108	95724	28	28.02	8.64	4.28	37.9	1.4950	7.46	0	26.27		
61108	95851	30	30.10	7.25	4.45	38.1	1.5410	7.38	0	28.35		
61108	100000	32	32.04	6.14	4.49	37.4	1.6160	7.36	0	30.29		
61108	100055	34	34.07	5.54	4.09	33.5	1.6690	7.31	0	32.32		
61108	100150	36	36.04	4.86	3.88	31.3	1.7400	7.35	0	34.29		
61108	100254	38	37.98	4.30	3.59	28.5	1.7840	7.26	0	36.23		
61108	100346	40	39.89	3.83	3.27	25.7	1.8330	7.20	0	38.14		
61108	100435	42	41.92	3.41	2.88	22.3	1.8700	7.17	0	40.17		
61108	100534	44	43.98	2.99	2.45	18.8	1.9090	7.14	0	42.23		
61108	100633	46	45.96	2.81	2.02	15.4	1.9270	7.12	0	44.21		
61108	100738	48	48.05	2.65	1.81	13.8	1.9490	7.15	0	46.3		

61108	100831	50	49.96	2.57	1.41	10.7	1.9530	7.13	0	48.21		
61108	100940	52	51.98	2.44	1.16	8.8	1.9670	7.12	0	50.23		
61108	101113	54	53.97	2.44	0.36	2.8	1.9730	7.11	0	52.22		
61108	101324	56	55.95	2.35	0.25	1.9	1.9880	7.09	0	54.2		
61108	101444	58	58.05	2.35	0.22	1.7	1.9910	7.10	0	56.3		
61108		60	60.00	2.34	0.22	1.7	1.9950	7.10	0	58.25		
61108	101629	62	61.93	2.32	0.21	1.6	1.9970	7.12	0	60.18		
61108		64	64.00	2.33	0.21	1.6	1.9950	7.13	0	62.25		

Date MMDDYY	Time HHMMSS	Text Depth feet	Dep25 feet	Temp øC	DO mg/l	DO% Sat	SpCond mS/cm	pH Units	PAR æE/s/mý	Depth of Light Meter feet	% Light Transmission Average	Extinction Coefficient 0.25
70908	91734	0.25	0.54	24.83	8.57	106.9	1.23	8.71	4152	Surface	100%	
70908	91820	1	0.93	24.84	8.55	106.7	1.23	8.72	4010	Surface	97%	
70908	91920	2	2.02	24.83	8.54	106.6	1.23	8.73	1676	0.27	40%	3.23
70908	92009	3	2.97	24.83	8.51	106.2	1.23	8.71	1386	1.22	33%	0.16
70908	92116	4	3.94	24.84	8.5	106.1	1.23	8.75	687	2.19	17%	0.32
70908	92259	6	6	24.81	8.52	106.2	1.23	8.76	467	4.25	11%	0.09
70908	92416	8	7.97	24.79	8.53	106.3	1.23	8.76	296	6.22	7%	0.07
70908	92543	10	10.01	24.75	8.54	106.4	1.23	8.76	159	8.26	4%	0.08
70908	92654	12	12.06	24.73	8.59	106.9	1.23	8.77	85	10.31	2%	0.06
70908	92827	14	14.02	22.55	5.24	62.7	1.262	8.39	51	12.27	1.2%	0.04
70908	93009	16	15.93	20.52	0.64	7.3	1.291	7.87	31	14.18	0.7%	0.04
70908	93230	18	18.1	17.73	0.19	2.1	1.386	7.65	18	16.35	0.4%	0.03
70908	93402	20	20.02	14.25	0.28	2.8	1.443	7.45	11	18.27	0.3%	0.03
70908	93554	22	22	11	0.59	5.5	1.512	7.36	8	20.25	0.2%	0.02
70908	93749	24	24.01	8.37	1.46	12.8	1.635	7.25	5	22.26	0.1%	0.02
70908	93907	26	25.99	7.97	1.56	13.6	1.662	7.23	4	24.24	0.1%	0.01
70908	94201	28	28	7.71	1.58	13.7	1.655	7.22	3	26.25	0.1%	0.01
70908	94305	30	29.96	7.61	1.57	13.6	1.659	7.22	3	28.21	0.1%	0.00
70908	94409	32	31.94	7.36	1.62	13.9	1.665	7.25	2	30.19	0.05%	0.01
70908	94543	34	34.03	7.21	1.56	13.3	1.672	7.21	0	32.28		
70908	94543	36	36	7	1.51	12.9	1.679	7.21	0	34.25		
70908	94913	38	38.01	6.54	1.42	11.9	1.701	7.18	0	36.26		
70908	95040	40	40.05	6.16	1.57	13.1	1.708	7.18	0	38.3		
70908	95453	42	42.16	5.76	1.28	10.6	1.718	7.15	0	40.41		
70908	95616	44	43.68	5.33	0.81	6.7	1.754	7.13	0	41.93		
70908	95828	46	45.58	5.02	0.59	4.8	1.774	7.13	0	43.83		
70908	100027	48	48.16	4.55	0.35	2.8	1.807	7.12	0	46.41		
70908	100140	50	49.91	4.04	0.22	1.8	1.851	7.09	0	48.16		
70908	100240	52	51.7	3.48	0.2	1.6	1.906	7.07	0	49.95		
70908	100420	54	53.52	2.92	0.2	1.5	1.956	7.04	0	51.77		
70908	100517	56	55.91	2.77	0.2	1.5	1.97	7.04	0	54.16		
70908	100612	58	58.04	2.73	0.2	1.5	1.975	7.06	0	56.29		
70908	100704	60	60.01	2.72	0.2	1.5	1.974	7.04	0	58.26		
70908	100804	62	62.12	2.69	0.19	1.5	1.98	7.03	0	60.37		
70908	100856	64	64.22	2.67	0.19	1.5	1.99	7.02	0	62.47		

Date MMDDYY	Time HHMMSS	Text Depth feet	Dep25 feet	Temp øC	DO mg/l	DO% Sat	SpCond mS/cm	pH Units	PAR æE/s/mý	Depth of Light Meter feet	% Light Transmission Average	Extinction Coefficient 0.37
72408	145125	0.25	0.75	26.79	9.02	116.2	1.1860	8.55	4344	Surface	100%	

72408	145215	1	1.00	26.78	9.03	116.3	1.1860	8.57	4263	Surface	98%	
72408	145311	2	2.00	26.78	9.00	115.9	1.1860	8.60	2767	0.25	64%	1.73
72408	145357	4	3.99	26.66	8.95	115.0	1.1860	8.66	1054	2.24	24%	0.43
72408	145442	6	6.10	26.52	8.74	112.1	1.1860	8.68	495	4.35	11%	0.17
72408	145535	8	7.95	25.51	8.34	105.0	1.1860	8.65	292	6.2	7%	0.09
72408	145646	10	10.15	25.11	8.31	103.8	1.1830	8.64	150	8.4	3%	0.08
72408	145746	12	11.87	25.03	7.19	89.7	1.1860	8.56	76	10.12	2%	0.07
72408	145916	14	13.98	23.86	3.39	41.4	1.2050	8.21	38	12.23	0.9%	0.06
72408	150036	16	15.95	21.89	0.55	6.4	1.2430	7.93	26	14.2	0.6%	0.03
72408	150147	18	17.99	17.89	0.20	2.2	1.3440	7.73	15	16.24	0.3%	0.03
72408	150255	20	20.1	13.59	0.20	2.0	1.4590	7.56	10	18.35	0.2%	0.02
72408	150356	22	22.02	10.61	0.21	2.0	1.5840	7.43	7	20.27	0.2%	0.02
72408	150450	24	24.01	8.79	0.44	3.9	1.6180	7.35	5	22.26	0.1%	0.02
72408	150551	26	26.06	8.45	0.51	4.5	1.6370	7.31	4	24.31	0.1%	0.01
72408	150703	28	28.00	8.25	0.54	4.7	1.6340	7.28	3	26.25	0.1%	0.01
72408	150807	30	30.08	8.17	0.53	4.6	1.6320	7.26	0	28.33		
72408	150907	32	31.97	8.01	0.54	4.7	1.6390	7.26	0	30.22		
72408	150958	34	34.00	7.96	0.52	4.5	1.6400	7.25	0	32.25		
72408	151057	36	36.04	7.63	0.51	4.4	1.6500	7.23	0	34.29		
72408	151230	38	38.16	7.44	0.45	3.9	1.6550	7.21	0	36.41		
72408	151335	40	39.78	7.17	0.45	3.8	1.6670	7.20	0	38.03		
72408	151508	42	42.07	7.05	0.40	3.4	1.6700	7.19	0	40.32		
72408	151653	44	44.05	6.95	0.37	3.1	1.6720	7.17	0	42.3		
72408	151817	46	46.02	6.14	0.23	1.9	1.6970	7.16	0	44.27		
72408	151913	48	47.93	5.08	0.20	1.6	1.7630	7.14	0	46.18		
72408	152007	50	50.02	4.13	0.20	1.6	1.8380	7.11	0	48.27		
72408	152141	52	51.81	3.49	0.20	1.6	1.9030	7.09	0	50.06		
72408	152253	54	54.02	3.14	0.20	1.5	1.9320	7.04	0	52.27		
72408	152406	56	56.03	2.91	0.19	1.5	1.9490	7.04	0	54.28		
72408	152512	58	58.00	2.94	0.19	1.5	1.9480	7.02	0	56.25		
72408	152548	60	60.02	2.88	0.19	1.5	1.9560	7.03	0	58.27		
72408	152624	62	61.98	2.84	0.19	1.5	1.9570	7.04	0	60.23		
72408	152658	64	63.95	2.85	0.19	1.5	1.9260	7.02	0	62.2		

Date MMDDYY	Time HHMMSS	Text Depth feet	Dep25 feet	Temp øC	DO mg/l	DO% Sat	SpCond mS/cm	pH Units	PAR æE/s/mý	Depth of Light Meter feet	% Light Transmission Average	Extinction Coefficient 0.06
81308	90418	0.25	0.44	24.52	8.92	111.0	1.212	8.58	4535	Surface	100%	
81308	90550	1	1.04	24.48	8.94	111.2	1.212	8.59	4458	Surface	98%	0.08
81308	90646	2	1.97	24.48	8.94	111.2	1.212	8.59	1798	0.22	40%	0.73
81308	90749	3	3.00	24.42	8.96	111.3	1.212	8.60	1210	1.25	27%	0.17
81308	90838	4	4.02	24.41	9.00	111.8	1.211	8.62	1019	2.27	22%	0.04
81308	90927	6	5.99	24.39	9.02	112.0	1.211	8.62	513	4.24	11%	0.11
81308	91024	8	8.02	24.38	9.01	111.8	1.211	8.62	305	6.27	7%	0.06
81308	91123	10	9.98	24.36	9.00	111.6	1.211	8.62	181	8.23	4%	0.05
81308	91415	12	11.99	24.21	8.70	107.6	1.211	8.61	112	10.24	2%	0.04
81308	91535	14	14.02	23.87	8.62	106.0	1.212	8.59	67	12.27	1.5%	0.04
81308	91721	16	16.05	22.65	5.49	65.9	1.238	8.28	40	14.3	0.9%	0.03
81308	91918	18	18.01	18.41	0.26	2.9	1.35	7.70	24	16.26	0.5%	0.03
81308	92008	20	20.02	12.69	0.26	2.5	1.556	7.52	14	18.27	0.3%	0.03
81308	92117	22	21.97	9.71	0.25	2.3	1.631	7.38	10	20.22	0.2%	0.02
81308	92249	24	24.02	8.83	0.32	2.8	1.639	7.3	7	22.27	0.2%	0.01
81308	92344	26	25.98	8.68	0.31	2.8	1.639	7.28	5	24.23	0.1%	0.01
81308	92529	28	28.00	8.55	0.35	3.1	1.637	7.24	4	26.25	0.1%	0.01

81308	92726	30	29.97	8.43	0.29	2.6	1.639	7.24	4	28.22	0.1%	0.00
81308	93006	32	32.05	8.33	0.23	2.0	1.642	7.20	3	30.3	0.1%	0.01
81308	93128	34	34.02	8.16	0.22	1.9	1.645	7.19	3	32.27	0.1%	0.00
81308	93231	36	36.04	8.09	0.22	1.9	1.647	7.19	2	34.29	0.04%	0.01
81308	93404	38	38.38	7.9	0.21	1.8	1.654	7.18	2	36.63	0.04%	0.00
81308	93501	40	40.09	7.8	0.20	1.7	1.658	7.19	2	38.34	0.04%	0.00
81308	93709	42	42.03	7.69	0.20	1.7	1.655	7.17	1	40.28	0.02%	0.02
81308	93812	44	44.00	7.53	0.19	1.7	1.666	7.16	0	42.25		
81308	94012	46	46.05	7.29	0.20	1.7	1.671	7.15	0	44.3		
81308	94128	48	48.08	6.67	0.20	1.7	1.689	7.14	0	46.33		
81308	94300	50	50.06	5.41	0.20	1.6	1.77	7.11	0	48.31		
81308	94430	52	51.96	4.47	0.20	1.6	1.852	7.08	0	50.21		
81308	94519	54	54.01	4.03	0.20	1.6	1.881	7.08	0	52.26		
81308	94615	56	55.99	3.66	0.19	1.5	1.917	7.03	0	54.24		
81308	94720	58	58.01	3.2	0.20	1.5	1.945	7.00	0	56.26		
81308	94817	60	59.85	3.13	0.20	1.5	1.951	6.99	0	58.1		
81308	94859	62	61.88	3.07	0.20	1.5	1.955	7.00	0	60.13		
81308	94947	64	63.99	3.03	0.19	1.5	1.965	6.94	0	62.24		

Date MMDDYY	Time HHMMSS	Text Depth feet	Dep25 feet	Temp øC	DO mg/l	DO% Sat	SpCond mS/cm	pH Units	PAR æE/s/mý	Depth of Light Meter feet	% Light Transmission Average	Extinction Coefficient 0.09
91008	92107	0.25	0.29	20.46	9.48	107.6	1.1640	8.57	4020	Surface	100%	
91008	92157	1	1.02	20.50	9.45	107.3	1.1640	8.58	4214	Surface	105%	-0.19
91008	92301	2	2.00	20.49	9.46	107.4	1.1640	8.59	1865	0.25	46%	0.65
91008	92401	3	3.01	20.37	9.43	106.8	1.1630	8.59	890	1.26	22%	0.33
91008	92504	4	4.02	20.25	9.29	105.0	1.1630	8.62	880	2.27	22%	0.00
91008	92625	6	6.05	20.23	9.27	104.7	1.1640	8.59	383	4.3	10%	0.13
91008	92801	8	8.00	20.07	9.38	105.6	1.1630	8.58	196	6.25	5%	0.08
91008	92917	10	10.04	19.89	9.19	103.1	1.1630	8.57	104	8.29	3%	0.06
91008	93141	12	11.98	19.74	8.93	99.9	1.1620	8.52	56	10.23	1.4%	0.05
91008	93304	14	13.96	19.65	7.96	88.9	1.1680	8.45	30	12.21	0.7%	0.04
91008	93424	16	16.04	19.45	7.38	82.1	1.1850	8.35	15	14.29	0.4%	0.04
91008	93558	18	18.03	18.76	5.02	55.0	1.2290	8.13	9	16.28	0.2%	0.03
91008	93852	20	20.08	16.58	0.27	2.8	1.4180	7.62	5	18.33	0.1%	0.03
91008	93942	22	22.01	13.53	0.27	2.6	1.6090	7.51	4	20.26	0.1%	0.01
91008	94037	24	24.00	10.19	0.23	2.1	1.6570	7.41	3	22.25	0.1%	0.01
91008	94132	26	26.05	9.08	0.23	2.0	1.6600	7.35	0	24.3		
91008	94316	28	28.01	8.83	0.22	2.0	1.6600	7.27	0	26.26		
91008	94431	30	30.10	8.69	0.21	1.8	1.6610	7.25	0	28.35		
91008	94538	32	31.97	8.61	0.21	1.8	1.6660	7.21	0	30.22		
91008	94645	34	34.04	8.54	0.21	1.8	1.6650	7.20	0	32.29		
91008	94803	36	36.00	8.49	0.21	1.8	1.6670	7.20	0	34.25		
91008	94910	38	37.98	8.35	0.2	1.8	1.6680	7.18	0	36.23		
91008	95023	40	39.97	8.23	0.2	1.8	1.6700	7.15	0	38.22		
91008	95204	42	41.99	8.13	0.2	1.7	1.6730	7.15	0	40.24		
91008	95348	44	44.06	7.94	0.2	1.7	1.6760	7.13	0	42.31		
91008	95449	46	46.04	7.84	0.2	1.7	1.6800	7.06	0	44.29		
91008	95537	48	48.00	7.45	0.2	1.7	1.6910	7.12	0	46.25		
91008	95632	50	49.99	6.69	0.2	1.7	1.7220	7.10	0	48.24		
91008	95759	52	51.99	5.43	0.2	1.6	1.8310	7.05	0	50.24		
91008	95852	54	54.00	4.33	0.2	1.6	1.9300	7.01	0	52.25		
91008	95956	56	56.08	3.95	0.2	1.6	1.9520	6.97	0	54.33		
91008	100047	58	57.97	3.63	0.2	1.5	1.9720	6.94	0	56.22		

91008	100156	60	60.03	3.59	0.2	1.5	1.9710	6.90	0	58.28
91008	100258	62	61.99	3.45	0.2	1.5	1.9740	6.89	0	60.24
91008	100352	64	63.98	3.34	0.2	1.5	1.9780	6.83	0	62.23

Date MMDDYY	Time HHMMSS	Text Depth feet	Dep25 feet	Temp øC	DO mg/l	DO% Sat	SpCond mS/cm	pH Units	PAR æE/s/mý	Depth of Light Meter feet	% Light Transmission Average	Extinction Coefficient 0.14
110508	81723	0.25	0.28	11.44	10.24	96.9	1.1810	6.94	3011	Surface	100%	
110508	81850	1	1.07	11.41	10.21	96.5	1.1810	7.27	3172	Surface	105%	-0.19
110508	81958	2	2.03	11.41	10.20	96.4	1.1810	7.42	565	0.28	19%	1.37
110508	82048	3	3.01	11.41	10.18	96.2	1.1810	7.5	339	1.26	11%	0.23
110508	82136	4	3.99	11.40	10.18	96.2	1.1810	7.58	303	2.24	10%	0.03
110508	82241	6	5.98	11.41	10.16	96.1	1.1810	7.65	132	4.23	4%	0.13
110508	82343	8	8.02	11.35	10.15	95.8	1.1810	7.69	63	6.27	2%	0.09
110508	82438	10	9.97	10.61	9.80	90.9	1.1790	7.67	35	8.22	1.2%	0.06
110508	82535	12	12.02	10.21	9.49	87.3	1.1780	7.66	19	10.27	0.6%	0.05
110508	82617	14	14.03	9.97	9.43	86.2	1.1770	7.66	11	12.28	0.4%	0.04
110508	82716	16	15.97	9.74	9.21	83.8	1.1770	7.63	8	14.22	0.3%	0.02
110508	82801	18	18.01	9.60	9.03	81.8	1.1790	7.6	5	16.26	0.2%	0.03
110508	82915	20	20.03	9.43	8.64	78	1.1780	7.57	4	18.28	0.1%	0.01
110508	83006	22	22.00	9.37	8.51	76.7	1.1790	7.56	3	20.25	0.1%	0.01
110508	83121	24	24.03	9.24	8.35	75	1.1810	7.54	0	22.28		
110508	83209	26	26.01	9.16	8.26	74	1.1790	7.53	0	24.26		
110508	83310	28	28.03	9.09	8.05	72.1	1.1830	7.52	0	26.28		
110508	83405	30	30.01	8.99	7.53	67.3	1.1960	7.49	0	28.26		
110508	83452	32	32.00	8.87	7.23	64.4	1.2230	7.45	0	30.25		
110508	83542	34	34.00	8.77	6.40	56.9	1.2480	7.41	0	32.25		
110508	83637	36	36.05	8.72	5.98	53.1	1.2620	7.38	0	34.3		
110508	83724	38	38.01	8.69	5.68	50.4	1.2660	7.36	0	36.26		
110508	83759	40	40.00	8.63	5.31	47.0	1.2920	7.33	0	38.25		
110508	83850	42	42.01	8.39	3.46	30.4	1.3630	7.27	0	40.26		
110508	83926	44	44.03	7.72	1.40	12.2	1.6280	7.18	0	42.28		
110508	84020	46	46.05	6.89	0.43	3.7	1.6880	7.1	0	44.3		
110508	84054	48	48.06	6.62	0.33	2.8	1.7030	7.06	0	46.31		
110508	84218	50	50.02	6.25	0.27	2.3	1.7390	7.00	0	48.27		
110508	84432	52	52.04	5.72	0.25	2	1.7870	6.92	0	50.29		
110508	84452	54	53.98	5.46	0.25	2	1.8200	6.92	0	52.23		
110508	84627	56	55.93	5.06	0.23	1.9	1.8670	6.85	0	54.18		
110508	84730	58	58.08	4.77	0.23	1.9	1.8920	6.8	0	56.33		
110508	84821	60	60.05	4.56	0.23	1.8	1.914	6.77	0	58.3		
110508	84935	62	61.82	4.5	0.23	1.8	1.917	6.73	0	60.07		
110508	85017	64	63.98	4.44	0.22	1.8	1.919	6.72	0	62.23		

APPENDIX C. INTERPRETING YOUR LAKE'S WATER QUALITY DATA

Lakes possess a unique set of physical and chemical characteristics that will change over time. These in-lake water quality characteristics, or parameters, are used to describe and measure the quality of lakes, and they relate to one another in very distinct ways. As a result, it is virtually impossible to change any one component in or around a lake without affecting several other components, and it is important to understand how these components are linked.

The following pages will discuss the different water quality parameters measured by Lake County Health Department staff, how these parameters relate to each other, and why the measurement of each parameter is important. The median values (the middle number of the data set, where half of the numbers have greater values, and half have lesser values) of data collected from Lake County lakes from 2000-2008 will be used in the following discussion.

Temperature and Dissolved Oxygen:

Water temperature fluctuations will occur in response to changes in air temperatures, and can have dramatic impacts on several parameters in the lake. In the spring and fall, lakes tend to have uniform, well-mixed conditions throughout the water column (surface to the lake bottom). However, during the summer, deeper lakes will separate into distinct water layers. As surface water temperatures increase with increasing air temperatures, a large density difference will form between the heated surface water and colder bottom water. Once this difference is large enough, these two water layers will separate and generally will not mix again until the fall. At this time the lake is thermally stratified. The warm upper water layer is called the ***epilimnion***, while the cold bottom water layer is called the ***hypolimnion***. In some shallow lakes, stratification and destratification can occur several times during the summer. If this occurs the lake is described as polymictic. Thermal stratification also occurs to a lesser extent during the winter, when warmer bottom water becomes separated from ice-forming water at the surface until mixing occurs during spring ice-out.

Monthly temperature profiles were established on each lake by measuring water temperature every foot (lakes $\leq$ 15 feet deep) or every two feet (lakes > 15 feet deep) from the lake surface to the lake bottom. These profiles are important in understanding the distribution of chemical/biological characteristics and because increasing water temperature and the establishment of thermal stratification have a direct impact on dissolved oxygen (DO) concentrations in the water column. If a lake is shallow and easily mixed by wind, the DO concentration is usually consistent throughout the water column. However, shallow lakes are typically dominated by either plants or algae, and increasing water temperatures during the summer speeds up the rates of photosynthesis and decomposition in surface waters. When many of the plants or algae die at the end of the growing season, their decomposition results in heavy oxygen consumption and can lead to an oxygen crash. In deeper, thermally stratified lakes, oxygen production is greatest in the top portion of the lake, where sunlight drives photosynthesis, and oxygen consumption is greatest near the bottom of a lake, where sunken organic matter accumulates and decomposes. The oxygen difference between the top and bottom water layers can be dramatic, with plenty of oxygen near the surface, but practically none near the bottom. The oxygen profiles measured during the water quality study can illustrate if this is occurring. This is important because the absence of oxygen (anoxia) near the lake bottom can have adverse effects in eutrophic lakes resulting in the chemical release of phosphorus from lake sediment and the production of hydrogen sulfide (rotten egg smell) and other gases in the bottom waters. Low oxygen conditions in the upper water of a lake can also be problematic since all aquatic organisms need oxygen to live. Some oxygen may be present in the water, but at too low a concentration to sustain aquatic life. Oxygen is needed by all plants, virtually all algae and for many chemical reactions that are important in lake functioning. Most adult sport-fish such as largemouth bass and bluegill require at least 3 mg/L of DO in the water to survive. However, their offspring require at least 5 mg/L DO as they are more sensitive to DO stress. When DO concentrations drop below 3 mg/L, rough fish such as carp and green sunfish are favored and over time will become the dominant fish species.

External pollution in the form of oxygen-demanding organic matter (i.e., sewage, lawn clippings, soil from shoreline erosion, and agricultural runoff) or nutrients that stimulate the growth of excessive organic matter (i.e., algae and plants) can reduce average DO concentrations in the lake by increasing oxygen consumption. This can have a detrimental impact on the fish community, which may be squeezed into a very small volume of water as a result of high temperatures in the epilimnion and low DO levels in the hypolimnion.

Nutrients:

Phosphorus:

For most Lake County lakes, phosphorus is the nutrient that limits plant and algae growth. This means that any addition of phosphorus to a lake will typically result in algae blooms or high plant densities during the summer. The source of phosphorus to a lake can be external or internal (or both). External sources of phosphorus enter a lake through point (i.e., storm pipes and wastewater discharge) and non-point runoff (i.e., overland water flow). This runoff can pick up large amounts of phosphorus from agricultural fields, septic systems or impervious surfaces before it empties into the lake.

Internal sources of phosphorus originate within the lake and are typically linked to the lake sediment. In lakes with high oxygen levels (oxic), phosphorus can be released from the sediment through plants or sediment resuspension. Plants take up sediment-bound phosphorus through their roots, releasing it in small amounts to the water column throughout their life cycles, and in large amounts once they die and begin to decompose. Sediment resuspension can occur through biological or mechanical means. Bottom-feeding fish, such as common carp and black bullhead can release phosphorus by stirring up bottom sediment during feeding activities and can add phosphorus to a lake through their fecal matter. Sediment resuspension, and subsequent phosphorus release, can also occur via wind/wave action or through the use of artificial aerators, especially in shallow lakes. In lakes that thermally stratify, internal phosphorus release can occur from the sediment through chemical means. Once oxygen is depleted (anoxia) in the hypolimnion, chemical reactions occur in which phosphorus bound to iron complexes in the sediment becomes soluble and is released into the water column. This phosphorus is trapped in the hypolimnion and is unavailable to algae until fall turnover, and can cause algae blooms once it moves into the sunlit surface water at that time. Accordingly, many of the lakes in Lake County are plagued by dense algae blooms and excessive, exotic plant coverage, which negatively affect DO levels, fish communities and water clarity.

Lakes with an average phosphorus concentration greater than 0.05 mg/L are considered nutrient rich. The median near surface total phosphorus (TP) concentration in Lake County lakes from 2000-2008 is 0.065 mg/L and ranged from a non-detectable minimum of <0.010 mg/L on five lakes to a maximum of 3.880 mg/L on Albert Lake. The median anoxic TP concentration in Lake County lakes from 2000-2008 was 0.181 mg/L and ranged from a minimum of 0.012 mg/L in Independence Grove Lake to a maximum of 3.880 mg/L in Taylor Lake.

The analysis of phosphorus also included soluble reactive phosphorus (SRP), a dissolved form of phosphorus that is readily available for plant and algae growth. SRP is not discussed in great detail in most of the water quality reports because SRP concentrations vary throughout the season depending on how plants and algae absorb and release it. It gives an indication of how much phosphorus is available for uptake, but, because it does not take all forms of phosphorus into account, it does not indicate how much phosphorus is truly present in the water column. TP is considered a better indicator of a lake's nutrient status because its concentrations remain more stable than soluble reactive phosphorus. However, elevated SRP levels are a strong indicator of nutrient problems in a lake.

Nitrogen:

Nitrogen is also an important nutrient for plant and algae growth. Sources of nitrogen to a lake vary widely, ranging from fertilizer and animal wastes, to human waste from sewage treatment plants or failing septic systems, to groundwater, air and rainfall. As a result, it is very difficult to control or reduce nitrogen inputs to a lake. Different forms of nitrogen are present in a lake under different oxic conditions. NH_4^+ (ammonium) is released from decomposing organic material under anoxic conditions and accumulates in the hypolimnion of thermally stratified lakes. If NH_4^+ comes into contact with oxygen, it is immediately converted to NO_2 (nitrite) which is then oxidized to NO_3^- (nitrate). Therefore, in a thermally stratified lake, levels of NH_4^+ would only be elevated in the hypolimnion and levels of NO_3^- would only be elevated in the epilimnion. Both NH_4^+ and NO_3^- can be used as a nitrogen source by aquatic plants and algae. Total Kjeldahl nitrogen (TKN) is a measure of organic nitrogen plus ammonium. Adding the concentrations of TKN and nitrate together gives an indication of the amount of total nitrogen present in the water column. If inorganic nitrogen (NO_3^-, NO_2^-, NH_4^+) concentrations exceed 0.3 mg/L in spring, sufficient nitrogen is available to support summer algae blooms. However, low nitrogen levels do not guarantee limited algae growth the way low phosphorus levels do. Nitrogen gas in the air can dissolve in lake water and blue-green algae can "fix" atmospheric nitrogen, converting it into a usable form. Since other types of algae do not have the ability to do this, nuisance blue-green algae blooms are typically associated with lakes that are nitrogen limited (i.e., have low nitrogen levels).

The ratio of TKN plus nitrate nitrogen to total phosphorus (TN:TP) can indicate whether plant/algae growth in a lake is limited by nitrogen or phosphorus. Ratios of less than 10:1

suggest a system limited by nitrogen, while lakes with ratios greater than 20:1 are limited by phosphorus. It is important to know if a lake is limited by nitrogen or phosphorus because any addition of the limiting nutrient to the lake will, likely, result in algae blooms or an increase in plant density.

Solids:

Although several forms of solids (total solids, total suspended solids, total volatile solids, total dissolved solids) were measured each month by the Lakes Management Staff, total suspended solids (TSS) and total volatile solids (TVS) have the most impact on other variables and on the lake as a whole. TSS are particles of algae or sediment suspended in the water column. High TSS concentrations can result from algae blooms, sediment resuspension, and/or the inflow of turbid water, and are typically associated with low water clarity and high phosphorus concentrations in many lakes in Lake County. Low water clarity and high phosphorus concentrations, in turn, exacerbate the high TSS problem by leading to reduced plant density (which stabilize lake sediment) and increased occurrence of algae blooms. The median TSS value in epilimnetic waters in Lake County is 8.2 mg/L, ranging from below the 0.1 mg/L detection limit to 165 mg/L in Fairfield Marsh.

TVS represents the fraction of total solids that are organic in nature, such as algae cells, tiny pieces of plant material, and/or tiny animals (zooplankton) in the water column. High TVS values indicate that a large portion of the suspended solids may be made up of algae cells. This is important in determining possible sources of phosphorus to a lake. If much of the suspended material in the water column is determined to be resuspended sediment that is releasing phosphorus, this problem would be addressed differently than if the suspended material was made up of algae cells that were releasing phosphorus. The median TVS value was 132.8 mg/L, ranging from 34.0 mg/L in Pulaski Pond to 298.0 mg/L in Fairfield Marsh.

Total dissolved solids (TDS) are the amount of dissolved substances, such as salts or minerals, remaining in water after evaporation. These dissolved solids are discussed in further detail in the *Alkalinity* and *Conductivity* sections of this document. TDS concentrations were measured in Lake County lakes prior to 2004, but was discontinued due to the strong correlation of TDS to conductivity and chloride concentrations.

Water Clarity:

Water clarity (transparency) is not a chemical property of lake water, but is often an indicator of a lake's overall water quality. It is affected by a lake's water color, which is a reflection of the amount of total suspended solids and dissolved organic chemicals. Thus, transparency is a measure of particle concentration and is measured with a Secchi disk. Generally, the lower the clarity or Secchi depth, the poorer the water quality. A decrease in Secchi depth during the summer occurs as the result of an increase in suspended solids (algae or sediment) in the water column. Aquatic plants play an important role in the level of water clarity and can, in turn, be negatively affected by low clarity levels. Plants increase clarity by competing with algae for resources and by stabilizing sediments to prevent sediment resuspension. A lake with a healthy plant community will almost always have higher water clarity than a lake without plants. Additionally, if the plants in a lake are removed (through herbicide treatment or the stocking of grass carp), the lake will probably become dominated by algae and Secchi depth will decrease. This makes it very difficult for plants to become re-established due to the lack of available sunlight and the lake will, most likely, remain turbid. Turbidity will be accelerated if the lake is very shallow and/or common carp are present. Shallow lakes are more susceptible to sediment resuspension through wind/wave action and are more likely to experience clarity problems if plants are not present to stabilize bottom sediment.

Common Carp are prolific fish that feed on invertebrates in the sediment. Their feeding activities stir up bottom sediment and can dramatically decrease water clarity in shallow lakes. As mentioned above, lakes with low water clarity are, generally, considered to have poor water quality. This is because the causes and effects of low clarity negatively impact the plant and fish communities, as well as the levels of phosphorus in a lake. The detrimental impacts of low Secchi depth to plants has already been discussed. Fish populations will suffer as water clarity decreases due to a lack of food and decreased ability to successfully hunt for prey. Bluegills are planktivorous fish and feed on invertebrates that inhabit aquatic plants. If low clarity results in the disappearance of plants, this food source will disappear too. Largemouth Bass and Northern Pike are piscivorous fish that feed on other fish and hunt by sight. As the water clarity decreases, these fish species find it more difficult to see and ambush prey and may decline in size as a result. This could eventually lead to an imbalance in the fish community. Phosphorus release from resuspended sediment could increase as water clarity and plant density decrease. This would then result in increased algae blooms, further reducing Secchi depth and aggravating all problems just discussed. The average Secchi depth for Lake County lakes is 3.12 feet. From 2000-2008, Fairfield Marsh and Patski Pond had the lowest Secchi depths (0.33 feet) and Bangs Lake had the highest (29.23 feet). As an example of the difference in Secchi depth based on plant coverage, South Churchill Lake, which had no plant coverage and large numbers of Common Carp in 2003 had an average Secchi depth of 0.73 feet (over four times lower than the county average), while Deep Lake, which had a diverse plant community and few carp had an average 2003 Secchi depth of 12.48 feet (almost four times higher than the county average).

Another measure of clarity is the use of a light meter. The light meter measures the amount of light at the surface of the lake and the amount of light at each depth in the water column. The amount of attenuation and absorption (decreases) of light by the water column are major factors controlling temperature and potential photosynthesis. Light intensity at the lake surface varies seasonally and with cloud cover, and decreases with depth. The deeper into the water column light penetrates, the deeper potential plant growth. The maximum depth at which algae and plants can grow underwater is usually at the depth where the amount of light available is reduced to 0.5%-1% of the amount of light available at the lake surface. This is called the euphotic (sunlit) zone. A general rule of thumb in Lake County is that the 1% light level is about 1 to 3 times the Secchi disk depth.

Alkalinity, Conductivity, Chloride, pH:

Alkalinity:

Alkalinity is the measurement of the amount of acid necessary to neutralize carbonate ($CO_3^{=}$) and bicarbonate (HCO_3^-) ions in the water, and represents the buffering capacity of a body of water. The alkalinity of lake water depends on the types of minerals in the surrounding soils and in the bedrock. It also depends on how often the lake water comes in contact with these minerals. If a lake gets groundwater from aquifers containing limestone minerals such as calcium carbonate ($CaCO_3$) or dolomite ($CaMgCO_3$), alkalinity will be high. The median alkalinity in Lake County lakes (162 mg/L) is considered moderately hard according to the hardness classification scale of Brown, Skougstad and Fishman (1970). Because hard water (alkaline) lakes often have watersheds with fertile soils that add nutrients to the water, they usually produce more fish and aquatic plants than soft water lakes. Since the majority of Lake County lakes have a high alkalinity they are able to buffer the adverse effects of acid rain.

Conductivity and Chloride:

Conductivity is the inverse measure of the resistance of lake water to an electric flow. This means that the higher the conductivity, the more easily an electric current is able to flow through water. Since electric currents travel along ions in water, the more chemical ions or dissolved salts a body of water contains, the higher the conductivity will be. Accordingly, conductivity has been correlated to total dissolved solids and chloride ions. The amount of dissolved solids or conductivity of a lake is dependent on the lake and watershed geology, the size of the watershed flowing into the lake, the land uses within that watershed, and evaporation and bacterial activity. Many Lake County lakes have elevated conductivity levels in May, but not during any other month. This was because chloride, in the form of road salt, was washing into the lakes with spring rains, increasing conductivity. Most road salt is sodium chloride, calcium chloride, potassium chloride, magnesium chloride or ferrocyanide salts. Beginning in 2004, chloride concentrations are one of the parameters measured during the lake studies. Increased chloride concentrations may have a negative impact on aquatic organisms. Conductivity changes occur seasonally and with depth. For example, in stratified lakes the conductivity normally increases in the hypolimnion as bacterial decomposition converts organic materials to bicarbonate and carbonate ions depending on the pH of the water. These newly created ions increase the conductivity and total dissolved solids. Over the long term, conductivity is a good indicator of potential watershed or lake problems if an increasing trend is noted over a period of years. It is also important to know the conductivity of the water when fishery assessments are conducted, as electroshocking requires a high enough conductivity to properly stun the fish, but not too high as to cause injury or death.

pH:

pH is the measurement of hydrogen ion (H^+) activity in water. The pH of pure water is neutral at 7 and is considered acidic at levels below 7 and basic at levels above 7. Low pH levels of 4-5 are toxic to most aquatic life, while high pH levels (9-10) are not only toxic to aquatic life but may also result in the release of phosphorus from lake sediment. The presence of high plant densities can increase pH levels through photosynthesis, and lakes dominated by a large amount of plants or algae can experience large fluctuations in pH levels from day to night, depending on the rates of photosynthesis and respiration. Few, if any pH problems exist in Lake County lakes. Typically, the flooded gravel mines in the county are more acidic than the glacial lakes as they have less biological activity, but do not usually drop below pH levels of 7. The median near surface pH value of Lake County lakes is 8.32, with a minimum of 7.06 in Deer Lake and a maximum of 10.28 in Round Lake Marsh North.

Eutrophication and Trophic State Index:

The word *eutrophication* comes from a Greek word meaning "well nourished." This also describes the process in which a lake becomes enriched with nutrients. Over time, this is a lake's natural aging process, as it slowly fills in with eroded materials from the surrounding watershed and with decaying plants. If no human impacts disturb the watershed or the lake, natural eutrophication can take thousands of years. However, human activities on a lake or in the watershed accelerate this process by resulting in rapid soil erosion and heavy phosphorus inputs. This accelerated aging process on a lake is referred to as cultural eutrophication. The term trophic state refers to the amount of nutrient enrichment within a lake system. *Oligotrophic* lakes are usually deep and clear with low nutrient levels, little plant growth and a limited fishery. *Mesotrophic* lakes are more biologically productive than oligotrophic lakes and have moderate nutrient levels and more plant growth. A lake labeled as *eutrophic* is high in nutrients and can support high plant densities and large fish populations. Water clarity is typically poorer than oligotrophic or mesotrophic lakes and dissolved oxygen problems may be present. A *hypereutrophic* lake has excessive nutrients, resulting in nuisance plant or algae growth. These lakes are often pea-soup green, with poor water clarity. Low dissolved oxygen may also be a problem, with fish kills occurring in shallow, hypereutrophic lakes more often than less enriched lakes. As a result, rough fish (tolerant of low dissolved oxygen levels) dominate the fish community of many hypereutrophic lakes. The categorization of a lake into a certain trophic state should not be viewed as a "good to bad" categorization, as most lake residents rate their lake based on desired usage. For example, a fisherman would consider a plant-dominated, clear lake to be desirable, while a water-skier might prefer a turbid lake devoid of plants. Most lakes in Lake County are eutrophic or hypereutrophic. This is primarily as a result of cultural eutrophication. However, due to the fertile soil in this area, many lakes (especially man-made) may have started out under eutrophic conditions and will never attain even mesotrophic conditions, regardless of any amount of money put into the management options. This is not an excuse to allow a lake to continue to deteriorate, but may serve as a reality check for lake owners attempting to create unrealistic conditions in their lakes.

The Trophic State Index (TSI) is an index which attaches a score to a lake based on its average total phosphorus concentration, its average Secchi depth (water transparency) and/or its average chlorophyll *a* concentration (which represent algae biomass). It is based on the principle that as phosphorus levels increase, chlorophyll *a* concentrations increase and Secchi depth decreases. The higher the TSI score, the more nutrient-rich a lake is, and once a score is obtained, the lake can then be designated as oligotrophic, mesotrophic or eutrophic. Table 1 (below) illustrates the Trophic State Index using phosphorus concentration and Secchi depth.

Table 1. Trophic State Index (TSI).

Trophic State	TSI score	Total Phosphorus (mg/L)	Secchi Depth (feet)
Oligotrophic	<40	≤ 0.012	>13.12
Mesotrophic	≥40<50	>0.012 ≤ 0.024	≥6.56<13.12
Eutrophic	≥50<70	>0.024 ≤ 0.096	≥1.64<6.56
Hypereutrophic	≥70	>0.096	< 1.64

APPENDIX D. WATER QUALITY STATISTICS FOR ALL LAKE COUNTY LAKES.

2000 - 2008 Water Quality Parameters, Statistics Summary

	ALKoxic <=3ft00-2008	
Average	**167**	
Median	**162**	
Minimum	**65**	**IMC**
Maximum	**330**	**Flint Lake**
STD	**42**	
n =	**802**	

	ALKanoxic 2000-2008	
Average	**202**	
Median	**194**	
Minimum	**103**	**Heron Pond**
Maximum	**470**	**Lake Marie**
STD	**50**	
n =	**243**	

	Condoxic <=3ft00-2008	
Average	**0.8934**	
Median	**0.8195**	
Minimum	**0.2542**	**Broberg Marsh**
Maximum	**6.8920**	**IMC**
STD	**0.5250**	
n =	**806**	

	Condanoxic 2000-2008	
Average	**1.0312**	
Median	**0.8695**	
Minimum	**0.3210**	**Lake Kathyrn**
Maximum	**7.4080**	**IMC**
STD	**0.7985**	
n =	**243**	

	NO3-N, Nitrate+Nitrite,oxic <=3ft00-2008	
Average	**0.508**	
Median	**0.156**	
Minimum	**<0.05**	***ND**
Maximum	**9.670**	**South Churchill Lake**
STD	**1.073**	
n =	**807**	

*ND = Many lakes had non-detects (74.1%)
Only compare lakes with detectable concentrations to the statistics above
Beginning in 2006, Nitrate+Nitrite was measured.

	NH3-Nanoxic 2000-2008	
Average	**2.192**	
Median	**1.630**	
Minimum	**<0.1**	***ND**
Maximum	**18.400**	**Taylor Lake**
STD	**2.343**	
n =	**243**	

*ND = 19.8% Non-detects from 28 different lakes

	pHoxic <=3ft00-2008	
Average	**8.32**	
Median	**8.32**	
Minimum	**7.07**	**Bittersweet #13**
Maximum	**10.28**	**Round Lake Marsh North**
STD	**0.44**	
n =	**801**	

	pHanoxic 2000-2008	
Average	**7.28**	
Median	**7.28**	
Minimum	**6.24**	**Banana Pond**
Maximum	**8.48**	**Heron Pond**
STD	**0.42**	
n =	**243**	

	All Secchi 2000-2008	
Average	**4.51**	
Median	**3.12**	
Minimum	**0.33**	**Fairfield Marsh, Patski Pon**
Maximum	**24.77**	**West Loon Lake**
STD	**3.78**	
n =	**749**	

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2000 - 2008 Water Quality Parameters, Statistics Summary (continued)

	TKNoxic <=3ft00-2008	
Average	**1.450**	
Median	**1.200**	
Minimum	**<0.1**	***ND**
Maximum	**10.300**	**Fairfield Marsh**
STD	**0.845**	
n =	**802**	

*ND = 3.9% Non-detects from 15 different lakes

	TKNanoxic 2000-2008	
Average	**2.973**	
Median	**2.330**	
Minimum	**<0.5**	***ND**
Maximum	**21.000**	**Taylor Lake**
STD	**2.324**	
n =	**243**	

*ND = 2.9% Non-detects from 4 different lakes

	TPoxic <=3ft00-2008	
Average	**0.105**	
Median	**0.065**	
Minimum	**<0.01**	***ND**
Maximum	**3.880**	**Albert Lake**
STD	**0.218**	
n =	**808**	

*ND = 2.6% Non-detects from 9 different lakes

	TPanoxic 2000-2008	
Average	**0.316**	
Median	**0.181**	
Minimum	**0.012**	**Independ. Grove**
Maximum	**3.800**	**Taylor Lake**
STD	**0.419**	
n =	**243**	

	TSSall <=3ft00-2008	
Average	**15.5**	
Median	**8.2**	
Minimum	**<0.1**	***ND**
Maximum	**165.0**	**Fairfield Marsh**
STD	**20.3**	
n =	**813**	

*ND = 1.5% Non-detects from 9 different lakes

	TVSoxic <=3ft00-2008	
Average	**132.8**	
Median	**129.0**	
Minimum	**34.0**	**Pulaski Pond**
Maximum	**298.0**	**Fairfield Marsh**
STD	**39.8**	
n =	**757**	

No 2002 IEPA Chain Lakes

	TDSoxic <=3ft00-2004	
Average	**470**	
Median	**454**	
Minimum	**150**	**Lake Kathryn, White**
Maximum	**1340**	**IMC**
STD	**169**	
n =	**745**	

No 2002 IEPA Chain Lakes.

	CLanoxic <=3ft00-2008	
Average	**234**	
Median	**139**	
Minimum	**41**	**Timber Lake (N)**
Maximum	**2390**	**IMC**
STD	**364**	
n =	**125**	

	CLoxic <=3ft00-2008	
Average	**210**	
Median	**166**	
Minimum	**30**	**White Lake**
Maximum	**2760**	**IMC**
STD	**233**	
n =	**470**	

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Anoxic conditions are defined <=1 mg/l D.O.
pH Units are equal to the -Log of [H] ion activity
Conductivity units are in MilliSiemens/cm
Secchi Disk depth units are in feet
All others are in mg/L

Minimums and maximums are based on data from all lakes from 2000-2008 (n=1351).

Average, median and STD are based on data from the most recent water quality sampling year for each lake.

LCHD Lakes Management Unit ~ 12/1/2008

APPENDIX E. GRANT PROGRAM OPPORTUNITES.

Table E1. Potential Grant Opportunities

Grant Program Name	Funding Source	Contact Information	Funding Focus: Water Quality/ Wetland	Funding Focus: Habitat	Funding Focus: Erosion	Funding Focus: Flooding	Cost Share
Challenge Grant Program	USFWS	847-381-2253 or 309-793-5800		X	X		
Chicago Wilderness Small Grants	CW	312-346-8166 ext. 30					None
Partners in Conservation (formerly C2000)	IDNR	http://dnr.state.il.us/orep/c2000/		X			None
Conservation Reserve Program	NRCS	http://www.nrcs.usda.gov/programs/crp/		X			Land
Ecosystems Program	IDNR	http://dnr.state.il.us/orep/c2000/ecosystem/		X			None
Emergency Watershed Protection	NRCS	http://www.nrcs.usda.gov/programs/ewp/			X	X	None
Five Star Challenge	NFWF	http://www.nfwf.org/AM/Template.cfm		X			None
Illinois Flood Mitigation Assistance Program	IEMA	http://www.state.il.us/iema/construction.htm				X	None
Great Lakes Basin Program	GLBP	http://www.glc.org/basin/stateproj.html?st=il	X		X		None
Illinois Clean Energy Community Foundation	ICECF	http://www.illinoiscleanenergy.org/		X			
Illinois Clean Lakes Program	IEPA	http://www.epa.state.il.us/water/financial-assistance/index.html					None
Lake Education Assistance Program (LEAP)	IEPA	http://www.epa.state.il.us/water/conservation-2000/leap/index.html	X				$500

CW = Chicago Wilderness
ICECF = Illinois Clean Energy Community Foundation
IEMA = Illinois Emergency Management Agency
IEPA = Illinois Environmental Protection Agency
IDNR = Illinois Department of Natural Resources
IDOA = Illinois Department of Agriculture
LCSMC = Lake County Stormwater Management Commission
LCSWCD = Lake County Soil and Water Conservation District
NFWF = National Fish and Wildlife Foundation
NRCS = Natural Resources Conservation Service
USACE = United States Army Corps of Engineers
USFWS = United States Fish and Wildlife Service

Table E1. Continued

Grant Program Name	Funding Source	Contact Information	Funding Focus: Water Quality/ Wetland	Habitat	Erosion	Flooding	Cost Share
Northeast Illinois Wetland Conservation Account	USFWF	847-381-2253	X				
Partners for Fish and Wildlife	USFWS	http://ecos.fws.gov/partners/		X			> 50%
River Network's Watershed Assistance Grants Program	River Network	http://www.rivernetwork.org	X	X	X		na
Section 206: Aquatic Ecosystems Restoration	USACE	312-353-6400, 309-794-5590 or 314-331-8404		X			35%
Section 319: Non-Point Source Management Program	IEPA	http://www.epa.state.il.us/water/financial-assistance/non point.html	X	X			>40%
Section 1135: Project Modifications for the Improvement of the Environment	USACE	312-353-6400, 309-794-5590 or 314-331-8404		X			25%
Stream Cleanup And Lakeshore Enhancement (SCALE)	IEPA	http://www.epa.state.il.us/water/watershed/scale.html	X	X			None
Streambank Stabilization & Restoration (SSRP)	IDOA/ LCSWCD	http://www.agr.state.il.us/Environment/conserv/ or call LCSWCD at (847) 223-1056		X	X		25%
Watershed Management Boards	LCSMC	http://www.co.lake.il.us/smc/projects/wmb/default.asp	X		X	X	50%
Wetlands Reserve Program	NRCS	http://www.nrcs.usda.gov/programs/wrp/	X	X			Land
Wildlife Habitat Incentive Program	NRCS	http://www.nrcs.usda.gov/programs/whip/		X			Land

CW = Chicago Wilderness
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