2005 SUMMARY REPORT

of

Taylor Lake

Lake County, Illinois

Prepared by the

LAKE COUNTY HEALTH DEPARTMENT
ENVIRONMENTAL HEALTH SERVICES
LAKES MANAGEMENT UNIT

3010 Grand Avenue
Waukegan, Illinois 60085

Adrienne Davis
Michael Adam
Leonard Dane
Shaina Keseley

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EXECUTIVE SUMMARY

Taylor Lake, located in the Lakewood Forest Preserve in Wauconda Township, is a human-made lake formed by the excavation of a wetland. It is currently owned and maintained by the Lake County Forest Preserve District (LCFPD). The lake has a surface area of approximately 6 acres, a maximum depth of 17.0 feet and an estimated mean depth of 8.5 feet. It is located entirely within LCFPD property and is used by the public for fishing and aesthetics. A walking path surrounds the lake and picnickers can enjoy the view from tables nearby.

Taylor Lake was stratified for the entire sampling season with the thermocline forming around 8 to 10 feet. Dissolved oxygen (DO) levels were adequate to support aquatic life (> 5 mg/L) in the epilimnion for most of the summer, and the hypolimnion had anoxic conditions (<1 mg/L) May through September. The average total phosphorus (TP) concentration was 0.118 mg/L, which was nearly double the county median (0.063 mg/L), and an increase from 2003 (0.085 mg/L). The average TKN for Taylor Lake was 1.99 mg/L, which was slightly higher than the county median of 1.22 mg/L. The TN:TP (total nitrogen to total phosphorus) ratio looks at which nutrient is limiting plant and algal growth in a lake. Taylor Lake had a TN:TP ratio of 18:1 which indicated phosphorus was limiting.

TSS increased throughout the season, with a maximum concentration in the epilimnion of 27.1 mg/L in September. The average for the summer was 14.1 mg/L, which was almost double the Lake County median (7.9 mg/L). This was most likely due to the large water loss due to evaporation and solids being concentrated into a smaller volume. High TSS values are typically correlated with poor water clarity and can be detrimental to many aspects of the lake ecosystem, including the plant and fish communities. Water clarity is measured by Secchi disk depth. Taylor Lake had its lowest reading in September (1.97 feet) corresponding to the high TSS value. The average Secchi depth for the season was 3.52 feet, which is just slightly higher than the county median (3.17 feet). Conductivity in Taylor Lake has increased since 2003 but is still well below the county median (0.7748 milliSiemens/cm). The 2005 average conductivity reading in the epilimnion was 0.4894 mS/cm. In 2005, Taylor Lake was hypereutrophic with a Trophic State Index value of 73.0, which placed it 120th out of 162 lakes in the county.

Eleven species of plants were found in Taylor Lake with Coontail being the dominant species (57 % of sites) and Small Pondweed the second most abundant at 28.6 % of the sites. Approximately 67% of the lake was covered with macrophytes. The FQI for Taylor Lake in 2005 was 14.3 and the county median was 13.1.

Nearly 87% of the lake was surrounded by wetland and buffer, which provides habitat for wildlife. However, 88% of the shoreline also had invasive species scattered throughout. The shoreline had only small areas exhibiting moderate erosion, with the largest part on the northwest shoreline that is kept mowed for fishing access.

LAKE FACT SHEET

Lake Name:	Taylor Lake
Historical Name:	None
Nearest Municipality:	Wauconda
Location:	T44N, R10E, Section 30
Elevation:	840.0 feet
Major Tributaries:	None
Watershed:	Fox River
Sub-watershed:	Slocum Lake Drain
Receiving Water body:	Banana Lake
Surface Area:	6.0 acres
Shoreline Length:	0.56 miles
Maximum Depth:	17.0 feet
Average Depth (est.):	8.5 feet
Lake Volume (est.):	51.0 acre-feet
Lake Type:	Human made
Watershed Area:	41.2 acres (estimated)
Major Watershed Land Uses:	Forest Preserve
Bottom Ownership:	Lake County Forest Preserve District
Management Entities:	Lake County Forest Preserve District
Current and Historical Uses:	Fishing from the shore only and aesthetics. No boating.
Description of Access:	Public shoreline access only via Lakewood Forest Preserve.

SUMMARY OF WATER QUALITY

Water samples were collected from May through September in Taylor Lake at the deepest point near the center of the lake (Figure 1). Samples were taken at 3 feet below the surface and approximately 3 feet above the lake bottom (Appendix A). Water levels in Taylor Lake (taken off a stake in the littoral zone) decreased throughout the season as a result of low rainfall. A total loss of 13.9 inches occurred from May to September. In order to accurately monitor water levels it is recommended that a staff gauge be installed.

Taylor Lake was stratified for the entire sampling season in 2005 and 2003. Stratification is when the lake divides into an upper, warm water layer (epilimnion) and a lower, cold-water layer (hypolimnion). The layer between the epilimnion and hypolimnion, where the temperature changes quickly is the thermocline. The thermocline formed around 10 feet in June, July, August, and September and around 8 feet in May. A dissolved oxygen (DO) concentration of 5.0 mg/L is considered adequate to support a sunfish/bass fishery, since many fish suffer from oxygen stress below this amount. Dissolved oxygen (DO) levels were adequate to support aquatic life in the epilimnion for most of the summer, and the hypolimnion had anoxic conditions (<1 mg/L) May through September (Appendix B). Since a bathymetric map with volumetric calculations of Taylor Lake does not exist, an accurate assessment of the DO conditions cannot be made.

Two important nutrients for algal growth, nitrogen and phosphorus, were in high concentrations in Taylor Lake (Table 1). Phosphorus is a nutrient that limits plant and algal growth, therefore any addition of phosphorus to the lake could produce algal blooms (Appendix C). The Forest Preserve has treated the lake with an algaecide in July for the past two years. The epilimnetic average total phosphorus (TP) concentration was 0.118 mg/L, which was nearly double the county median (0.063 mg/L) (Appendix E). This was also an increase from 2003 (0.085 mg/L). Nitrogen is the other nutrient critical for algal growth. Total Kjeldahl nitrogen (TKN) is a measure of organic nitrogen, and is typically bound up in algal and plant cells. The average TKN for Taylor Lake was 1.99 mg/L in the epilimnion, which was slightly higher than the county median of 1.22 mg/L. This was also an increase from the 2003 average of 1.53 mg/L. Taylor Lake had the highest TP and TKN in the hypolimnion of all lakes the LMU has sampled. The average hypolimnetic TP was 1.718 mg/L and the county median was 0.174 mg/L. The median hypolimnetic TKN for the county was 2.27 mg/L and Taylor Lake had an average of 11.53 mg/L. Taylor Lake also had the highest average ammonia nitrate in the hypolimnion (9.716 mg/L). This may be due to high amounts of organic matter due to wetland soils. The TN:TP (total nitrogen to total phosphorus) ratio looks at which nutrient is limiting plant and algal growth in a lake. Ratios < 10:1 indicate nitrogen is limiting. Ratios of >15:1 indicate phosphorus is limiting. Ratios >10:1, <15:1 indicate there is enough of both nutrients for excessive algal growth. Taylor Lake had a TN:TP ratio of 18:1 which indicated phosphorus was limiting.

Total suspended solids (TSS) are composed of nonvolatile suspended solids such as non-organic clay or sediment materials, and volatile suspended solids such as algae and other organic matter. TSS increased throughout the season with a maximum epilimnetic concentration of 27.1 mg/L in September. The average for the summer was 14.1 mg/L, which was almost double the Lake

Figure 1. Water quality sampling site on Taylor Lake, 2005.

Table 1. Summary of water quality data for Taylor Lake, 2005 and 2003.

2005	Epilimnion															
DATE	DEPTH	ALK	TKN	NH3-N	NO3-N	TP	SRP	TDS	Cl^-	TSS	TS	TVS	SECCHI	COND	pH	DO
11-May	3	132	1.89	<0.1	<0.05	0.121	<0.005	NA	76.8	7.0	315	69	3.94	0.5010	8.14	7.57
15-Jun	3	113	1.58	<0.1	<0.05	0.101	0.007	NA	76.0	7.5	286	72	5.64	0.4840	8.61	6.91
13-Jul	3	113	1.60	<0.1	<0.05	0.088	<0.005	NA	79.2	11.0	309	92	3.28	0.4970	8.57	7.96
10-Aug	3	98	2.32	<0.1	<0.05	0.131	0.006	NA	84.5	17.8	303	91	2.78	0.4830	8.98	8.51
14-Sep	3	96	2.57	<0.1	<0.05	0.151	<0.005	NA	84.8	27.1	318	115	1.97	0.4820	8.93	5.41
	Average	110	1.99	<0.1	<0.05	0.118	0.006[k]	NA	80.3	14.1	306	88	3.52	0.4894	8.65	7.27

2003	Epilimnion															
DATE	DEPTH	ALK	TKN	NH_3-N	NO_3-N	TP	SRP	TDS	Cl^-	TSS	TS	TVS	SECCHI	COND	pH	DO
14-May	3	136	1.94	0.365	<0.05	0.117	0.005	266	NA	9.0	301	99	3.00	0.4687	7.90	6.34
11-Jun	3	135	1.73	<0.1	<0.05	0.106	<0.005	276	NA	7.8	289	93	3.33	0.4736	8.23	7.45
16-Jul	3	133	1.43	<0.1	<0.05	0.084	0.006	244	NA	12.0	281	96	2.38	0.4482	8.75	8.60
13-Aug	3	137	1.21	<0.1	<0.05	0.063	0.006	278	NA	5.9	294	76	3.74	0.4850	7.92	6.53
17-Sep	3	131	1.34	<0.1	<0.05	0.057	0.009	272	NA	7.5	277	83	3.36	0.4652	8.36	7.45
	Average	134	1.53	0.365[k]	<0.05	0.085	0.007[k]	267	NA	8.4	288	89	3.16	0.4681	8.23	7.45

Glossary

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

k = Denotes that the actual value is known to be less than the value presented.
NA= Not applicable

Table 1. Continued.

2005	Hypolimnion															
DATE	DEPTH	ALK	TKN	NH3-N	NO3-N	TP	SRP	TDS	Cl^-	TSS	TS	TVS	SECCHI	COND	pH	DO
11-May	12	148	2.80	1.630	<0.05	0.170	0.057	NA	82.0	11.0	331	69	NA	0.5630	7.01	0.34
15-Jun	14	210	13.60	11.600	<0.05	1.330	0.381	NA	103.0	72.4	437	102	NA	0.7930	6.53	0.14
13-Jul	14	215	13.00	11.700	<0.05	2.350	0.258	NA	97.8	77.8	456	118	NA	0.8320	6.51	0.35
10-Aug	11	178	7.27	5.250	<0.05	0.942	0.220	NA	85.2	39.0	366	77	NA	0.6810	6.63	0.04
14-Sep	13	255	21.00	18.400	<0.05	3.800	0.793	NA	97.6	116.0	486	115	NA	0.8600	6.52	0.07
	Average	201	11.53	9.716	<0.05	1.718	0.342	NA	93.1	63.2	415	96	NA	0.7458	6.64	0.19

2003	Hypolimnion															
DATE	DEPTH	ALK	TKN	NH_3-N	NO_3-N	TP	SRP	TDS	Cl^-	TSS	TS	TVS	SECCHI	COND	pH	DO
14-May	14	162	4.69	3.670	<0.05	0.278	0.042	274	NA	21.0	302	78	NA	0.5334	7.13	0.20
11-Jun	14	178	8.73	6.970	<0.05	0.918	0.135	280	NA	39.0	329	115	NA	0.5753	6.90	0.12
16-Jul	14	179	8.40	6.190	<0.05	1.170	0.212	270	NA	52.0	327	80	NA	0.6176	6.85	0.06
13-Aug	11	178	7.24	5.940	<0.05	0.847	0.470	278	NA	40.0	338	105	NA	0.6225	6.76	0.22
17-Sep	13	199	10.80	9.260	<0.05	1.510	0.018	272	NA	58.0	337	88	NA	0.7114	6.76	0.13
	Average	179	7.97	6.406	<0.05	0.945	0.175	275	NA	42.0	327	93	NA	0.6120	6.88	0.13

Glossary

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

k = Denotes that the actual value is known to be less than the value presented.
NA= Not applicable

County median (7.9 mg/L). This is most likely due to the large water loss from evaporation due to the dry summer and solids being concentrated into a smaller volume. The elevated concentrations in August and September may also be due to the die off of plant and algae in the lake. Water clarity is a direct result of the amount of TSS in the water column, and is usually the first thing people notice about a lake, as it typifies the overall lake quality. High TSS values are typically correlated with poor water clarity and can be detrimental to many aspects of the lake ecosystem, including the plant and fish communities. Water clarity was measured by Secchi disk depth. Taylor Lake had its lowest reading in September (1.97 feet) corresponding to the high TSS value (Figure 2). The average Secchi depth for the season was 3.52 feet, which was slightly higher than the county median (3.17 feet), and higher than the 2003 average (3.16 feet).

Conductivity readings, which are correlated with chloride concentrations, have been increasing throughout the past few years in the county. It is believed that road salt is probably the reason for the increase because chloride concentrations detect sodium chloride, calcium chloride, potassium chloride, magnesium chloride or ferrocyanide salts, which is what most road salt consists of. Conductivity in Taylor Lake has increased since 2003 but is still well below the county median (0.7748 milliSiemens/cm). The average conductivity reading for the lake in 2005 was 0.4894 mS/cm, just slightly above the 2003 average (0.4681 mg/L). This was most likely due to the small watershed (Figure 3), which consists mostly of public and private open space (Figure 4). The area immediately adjacent to the lake was manicured lawn with small patches of trees and only a small parking lot. Therefore most road salt would be filtered before reaching the lake or the Lake County Forest Preserve District may be minimizing the use of road salt.

The Illinois EPA has a use indices used for assessing lakes for aquatic life, swimming, and recreational use impairment. The aquatic life index is calculated using the mean trophic state index (TSI), percent macrophyte coverage, and the median nonvolatile suspended solid concentration. The TSI index classifies the lake into one of four categories: oligotrophic (nutrient-poor, biologically unproductive), mesotrophic (intermediate nutrient availability and biological productivity), eutrophic (nutrient-rich, highly productive), or hypereutrophic (extremely nutrient-rich, productive). This index can be calculated using TP values obtained at or near the surface. In 2005, Taylor Lake was hypereutrophic with a TSIp value of 73.0, which placed it 120 out of 162 lakes in the county (Table 2). According to this index, Taylor Lake provided full support of aquatic life and partial support for swimming and recreational activity. This was down from 2003 where it had a TSIp score of 64.4, but was also a full degree of support for aquatic organisms.

SUMMARY OF AQUATIC MACROPHYTES

Plant sampling was conducted on Taylor Lake in June. Seven points were sampled based on a computer generated grid system with points 60 meters apart (Figure 5). Nine species of plants were found with Coontail being the dominant species (57 % of sites) and Small Pondweed the second most abundant at 28.60 % of the sites (Table 3). Two other species, *Chara* spp. and Elodea, were also observed in the lake although they were not found at any of the sampling sites (Table 4). Eurasian Watermilfoil and Curlyleaf Pondweed, invasive, exotic species, were also present in the lake, both at 14% of the sites. These plants should be monitored in the lake in order to ensure populations do not overtake the native plant species present. Maximum plant

Figure 2. Total suspended solid (TSS) concentrations vs Secchi depth in Taylor Lake, 2005.

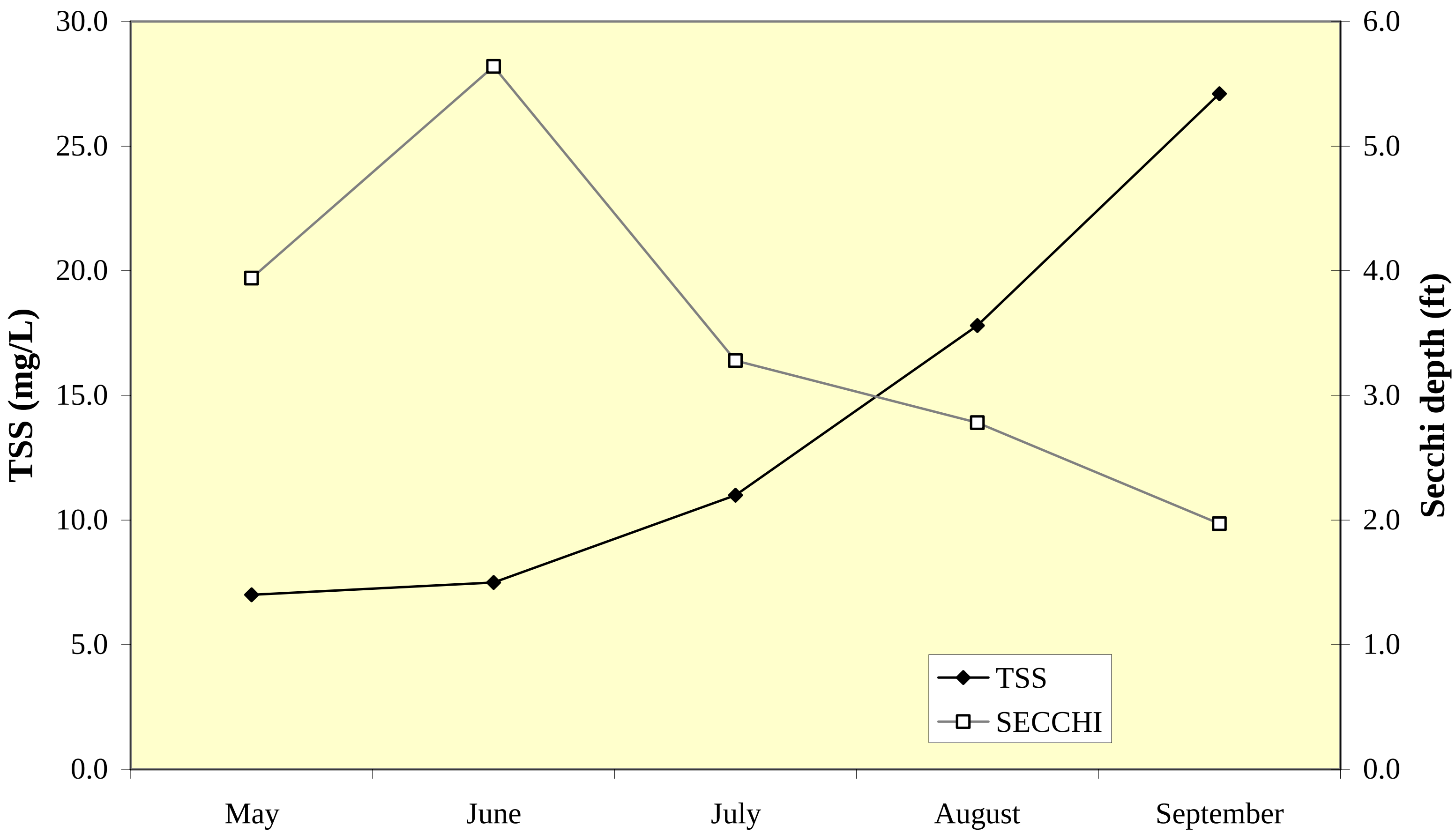

Figure 3. Approximate watershed delineation of Taylor Lake, 2005.

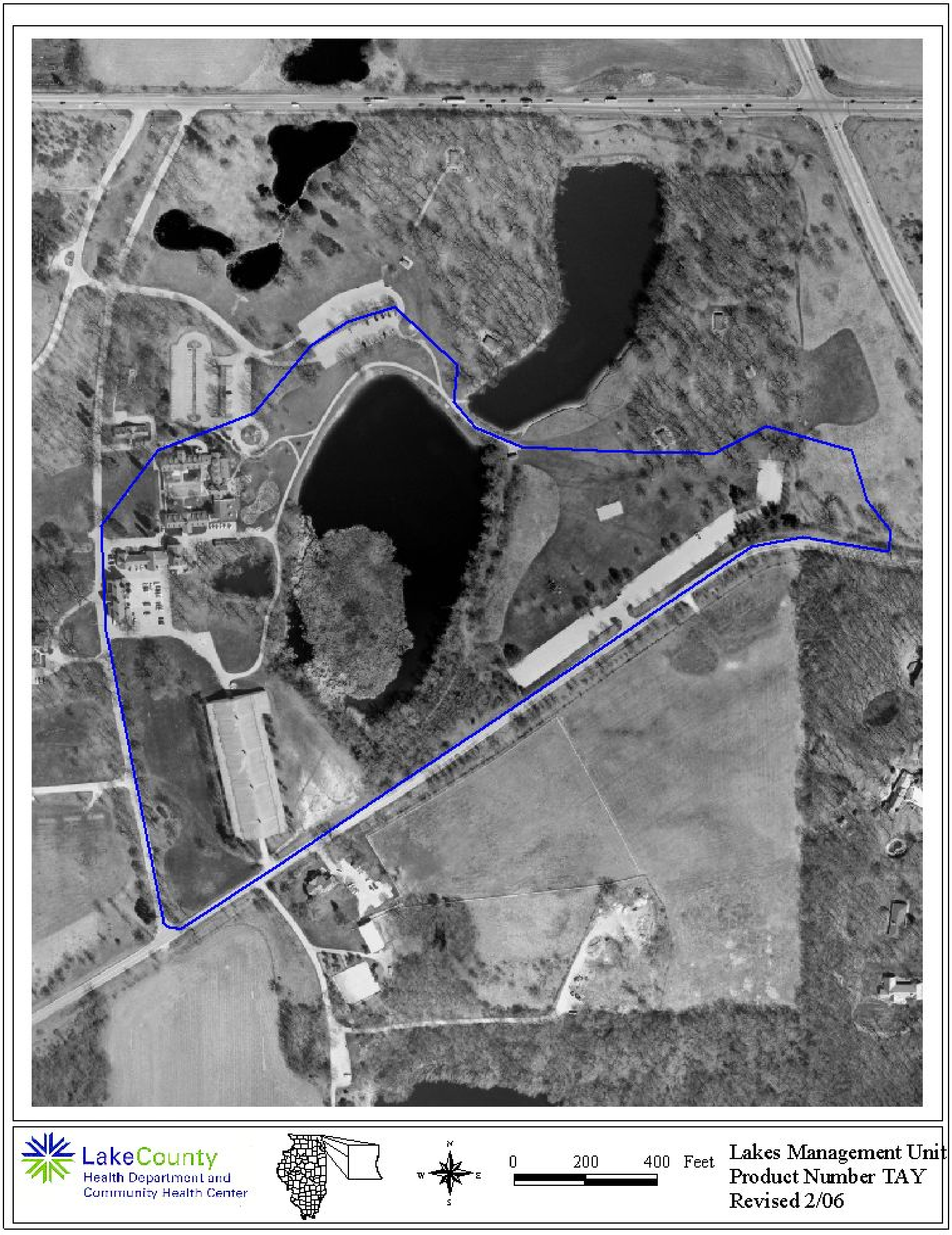

Figure 4. Land use within the Taylor Lake watershed, 2005.

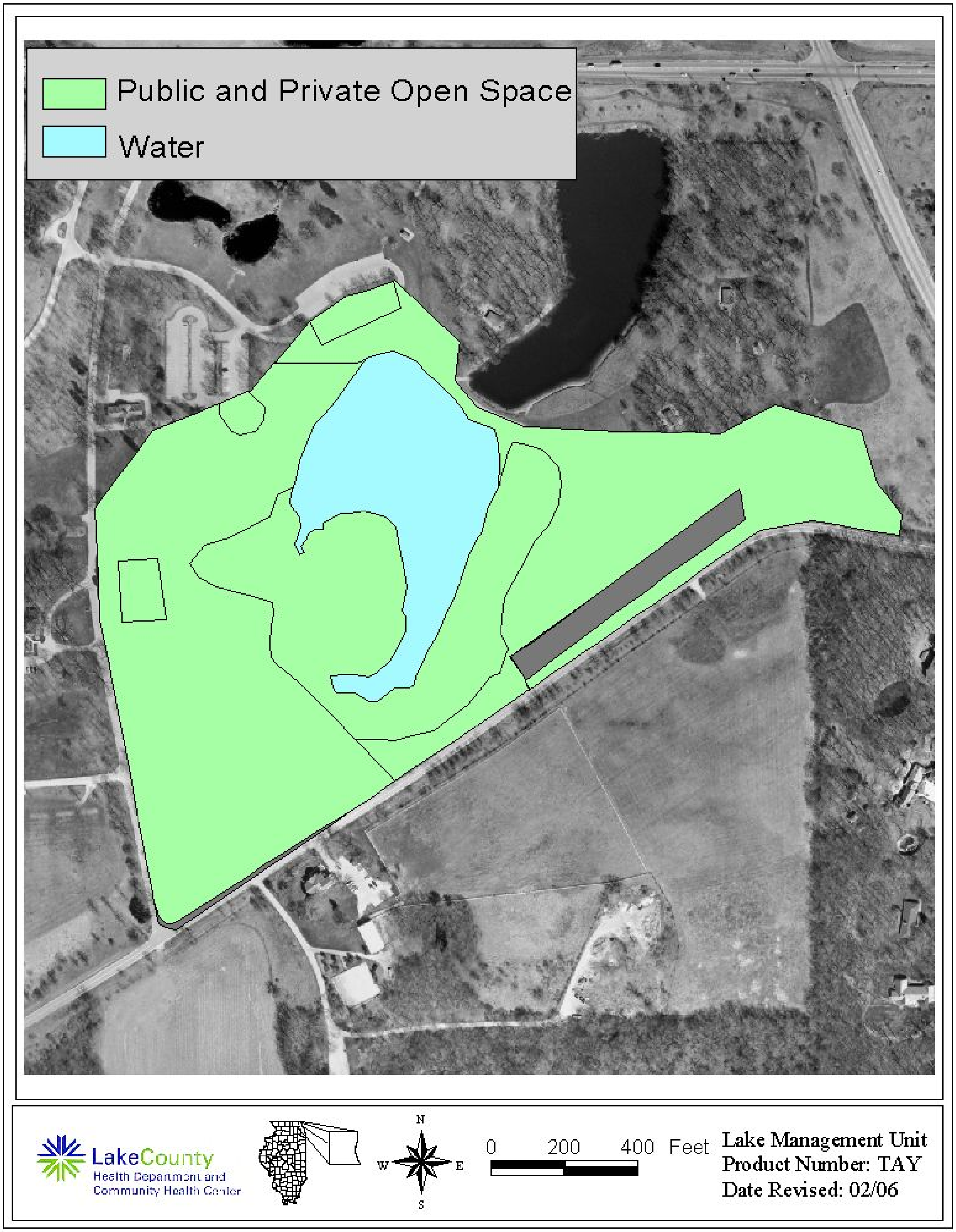

Table 2. Lake County average TSI phosphorous (TSIp) ranking 2000-2005.

RANK	LAKE NAME	TP AVE	TSIp
1	Windward Lake	0.0158	43.9
2	Sterling Lake	0.0162	44.3
3	Lake Minear	0.0165	44.6
4	Pulaski Pond	0.0180	45.8
5	Fourth Lake	0.0182	46.0
6	West Loon Lake	0.0182	46.0
7	Cedar Lake	0.0183	46.1
8	Third Lake	0.0190	46.6
9	Lake Carina	0.0193	46.9
10	Independence Grove	0.0194	46.9
11	Lake Kathyrn	0.0200	47.3
12	Lake of the Hollow	0.0200	47.3
13	Banana Pond	0.0202	47.5
14	Cross Lake	0.0220	48.7
15	Dog Pond	0.0222	48.9
16	Sand Pond	0.0230	49.4
17	Stone Quarry Lake	0.0230	49.4
18	Bangs Lake	0.0233	49.6
19	Cranberry Lake	0.0236	49.7
20	Deep Lake	0.0240	50.0
21	Druce Lake	0.0244	50.2
22	Little Silver Lake	0.0246	50.3
23	Round Lake	0.0254	50.8
24	Lake Leo	0.0256	50.9
25	Timber Lake	0.0270	51.7
26	Dugdale Lake	0.0274	51.9
27	Peterson Pond	0.0274	51.9
28	Lake Miltmore	0.0276	52.0
29	Ames Pit	0.0278	52.1
30	East Loon Lake	0.0280	52.2
31	Lake Zurich	0.0282	52.3
32	Lake Fairfield	0.0296	53.0
33	Gray's Lake	0.0302	53.3
34	Highland Lake	0.0302	53.3
35	Hook Lake	0.0302	53.3
36	Lake Catherine (Site 1)	0.0308	53.6
37	Lambs Farm Lake	0.0312	53.8
38	Old School Lake	0.0312	53.8
39	Sand Lake	0.0316	53.9
40	Waterford Lake	0.0318	54.0
41	Potomac Lake	0.0318	54.0
42	Sullivan Lake	0.0320	54.1

Table 2. Continued.

RANK	LAKE NAME	TP AVE	TSIp
43	Wooster Lake	0.0324	54.3
44	Gages Lake	0.0338	54.9
45	Hendrick Lake	0.0356	55.7
46	Diamond Lake	0.0372	56.3
47	Channel Lake (Site 1)	0.0380	56.6
48	Sun Lake	0.0410	57.7
49	Lake Linden	0.0420	58.0
50	Old Oak Lake	0.0428	58.3
51	Schreiber Lake	0.0434	58.5
52	Nielsen Pond	0.0448	59.0
53	Turner Lake	0.0458	59.3
54	Seven Acre Lake	0.0460	59.4
55	Willow Lake	0.0464	59.5
56	Lucky Lake	0.0476	59.9
57	Davis Lake	0.0476	59.9
58	East Meadow Lake	0.0478	59.9
59	College Trail Lake	0.0496	60.4
60	Countryside Lake	0.0512	60.9
61	Lake Lakeland Estates	0.0524	61.2
62	Butler Lake	0.0528	61.3
63	Lake Christa	0.0530	61.4
64	West Meadow Lake	0.0530	61.4
65	Deer Lake	0.0542	61.7
66	Heron Pond	0.0545	61.8
67	Little Bear Lake	0.0550	61.9
68	Lucy Lake	0.0552	62.0
69	Lake Charles	0.0580	62.7
70	White Lake	0.0588	62.9
71	Lake Naomi	0.0616	63.6
72	Lake Tranquility S1	0.0618	63.6
73	Werhane Lake	0.0630	63.9
74	Liberty Lake	0.0632	63.9
75	Countryside Glen Lake	0.0642	64.2
76	Leisure Lake	0.0648	64.3
77	Hastings Lake	0.0664	64.7
78	St. Mary's Lake	0.0666	64.7
79	Mary Lee Lake	0.0682	65.0
80	Honey Lake	0.0690	65.2
81	Redwing Slough, Site II, Outflow	0.0718	65.8
82	North Tower Lake	0.0718	65.8
83	Lake Fairview	0.0724	65.9
84	Spring Lake	0.0726	65.9
85	ADID 203	0.0730	66.0
86	Bluff Lake	0.0734	66.1

Table 2. Continued.

RANK	LAKE NAME	TP AVE	TSIp
87	Long Lake	0.0761	66.6
88	Harvey Lake	0.0766	66.7
89	Broberg Marsh	0.0782	67.0
90	Echo Lake	0.0792	67.2
91	Sylvan Lake	0.0794	67.2
92	Big Bear Lake	0.0806	67.4
93	Petite Lake	0.0834	67.9
94	Lake Marie (Site 1)	0.0850	68.2
95	North Churchill Lake	0.0872	68.6
96	Grandwood Park, Site II, Outflow	0.0876	68.6
97	South Churchill Lake	0.0896	69.0
98	Rivershire Pond 2	0.0900	69.0
99	McGreal Lake	0.0914	69.3
100	International Mine and Chemical Lake	0.0948	69.8
101	Eagle Lake (Site I)	0.0950	69.8
102	Dunns Lake	0.0952	69.8
103	Lake Barrington	0.0956	69.9
104	Lochanora Lake	0.0960	70.0
105	Owens Lake	0.0978	70.2
106	Woodland Lake	0.0986	70.4
107	Island Lake	0.0990	70.4
108	Duck Lake	0.0996	70.5
109	Tower Lake	0.1000	70.6
110	Crooked Lake	0.1014	70.8
111	Fish Lake	0.1022	70.9
112	Longview Meadow Lake	0.1024	70.9
113	Lake Forest Pond	0.1074	71.6
114	Bittersweet Golf Course #13	0.1096	71.9
115	Fox Lake (Site 1)	0.1098	71.9
116	Bresen Lake	0.1126	72.3
117	Round Lake Marsh North	0.1126	72.3
118	Timber Lake S	0.1128	72.3
119	Deer Lake Meadow Lake	0.1158	72.7
120	**Taylor Lake**	**0.1184**	**73.0**
121	Grand Avenue Marsh	0.1194	73.1
122	Columbus Park Lake	0.1226	73.5
123	Nippersink Lake (Site 1)	0.1240	73.7
124	Grass Lake (Site 1)	0.1288	74.2
125	Lake Holloway	0.1322	74.6
126	Lakewood Marsh	0.1330	74.7
127	Summerhill Estates Lake	0.1384	75.2
128	Redhead Lake	0.1412	75.5

Table 2. Continued.

RANK	LAKE NAME	TP AVE	TSIp
129	Antioch Lake	0.1448	75.9
130	Forest Lake	0.1470	76.1
131	Valley Lake	0.1470	76.1
132	Slocum Lake	0.1496	76.4
133	Drummond Lake	0.1510	76.5
134	Pond-a-Rudy	0.1514	76.5
135	Lake Matthews	0.1516	76.6
136	Buffalo Creek Reservoir	0.1550	76.9
137	Pistakee Lake (Site 1)	0.1592	77.3
138	Salem Lake	0.1650	77.8
139	Half Day Pit	0.1690	78.1
140	McDonald Lake 1	0.1722	78.4
141	Lake Eleanor Site II, Outflow	0.1812	79.1
142	Lake Farmington	0.1848	79.4
143	ADID 127	0.1886	79.7
144	Lake Louise Inlet	0.1938	80.1
145	Grassy Lake	0.1952	80.2
146	Fischer Lake	0.1978	80.4
147	Dog Bone Lake	0.1990	80.5
148	Redwing Marsh	0.2072	81.1
149	Stockholm Lake	0.2082	81.1
150	Bishop Lake	0.2156	81.6
151	Hidden Lake	0.2236	82.2
152	Lake Napa Suwe (Outlet)	0.2304	82.6
153	Patski Pond (outlet)	0.2512	83.8
154	Slough Lake	0.2634	84.5
155	McDonald Lake 2	0.2706	84.9
156	Oak Hills Lake	0.2792	85.4
157	Loch Lomond	0.2954	86.2
158	Fairfield Marsh	0.3264	87.6
159	ADID 182	0.3280	87.7
160	Flint Lake Outlet	0.4996	93.8
161	Rasmussen Lake	0.5025	93.8
162	Albert Lake, Site II, outflow	1.1894	106.3

Figure 5. Grid used for plant sampling on Taylor Lake, 2005.

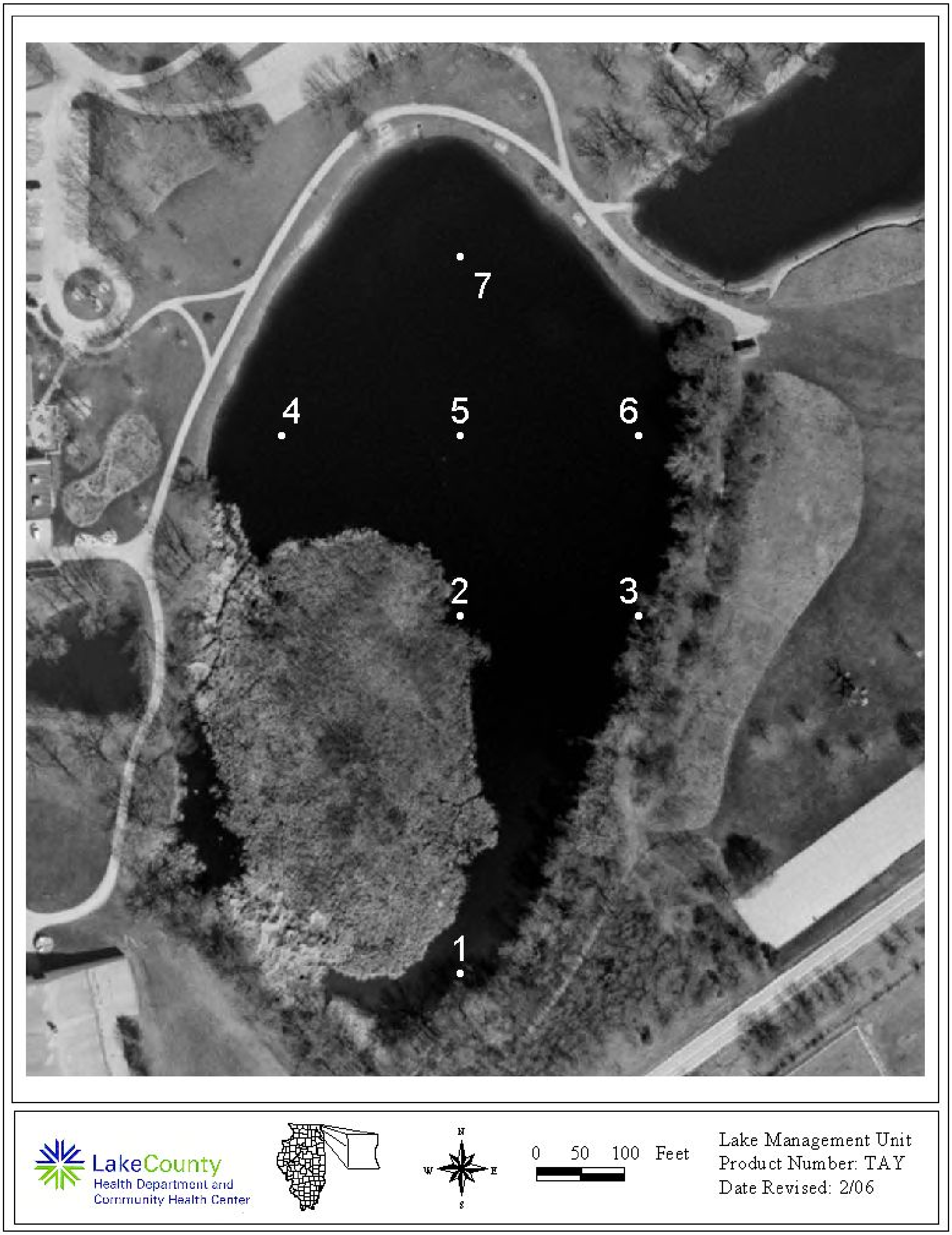

Table 3. Aquatic plant species found at the 7 sampling sites on Taylor Lake, 2005. The maximum depth that plants were found was 4.4 feet.

Plant Density	Coontail	Curlyleaf Pondweed	Duckweed	Eurasian Watermilfoil	Giant Duckweed	Small Pondweed	Smartweed	White Crowfoot	Watermeal
Present	1	0	0	1	1	1	1	0	0
Common	1	0	1	0	0	0	0	1	1
Abundant	1	1	0	0	0	1	0	0	0
Dominant	1	0	0	0	0	0	0	0	0
% Plant Occurrence	57.1	14.3	14.3	14.3	14.3	28.6	14.3	14.3	14.3

Table 3b. Distribution of rake density across all sampling sites.

Rake Density (coverage)	# of Sites	% of Sites
No Plants	3	42.9
>0-10%	1	14.3
10-40%	0	0.0
40-60%	1	14.3
60-90%	1	14.3
>90%	1	14.3
Total Sites with Plants	4	57.1
Total # of Sites	7	100.0

Table 4. Aquatic plant species found in Taylor Lake, 2005.

Coontail	*Ceratophyllum demersum*
Chara (Macro algae)	*Chara* spp.
American Elodea	*Elodea canadensis*
Duckweed	*Lemna minor*
Eurasian Water Milfoil^	*Myriophyllum spicatum*
Smartweed	*Polygonum spp*.
Curlyleaf Pondweed^	*Potamogeton crispus*
Small Pondweed	*Potamogeton pusillus*
Giant Duckweed	*Spirodela polyrhiza*
White Crowfoot	*Ranunculus peltatus*
Watermeal	*Wolffia* spp.

^ Exotic plant

coverage was mapped on Taylor Lake in May (Figure 6). This showed 4 of the 6 acres (67%) of the lake to be topped out in aquatic macrophytes. In order to support a good gamefish population, the Illinois Department of Natural Resources (IDNR) recommends 30-40% plant coverage. There were five species that were found this year that were not present in 2003 which included: *Chara* spp., Elodea, Smartweed, White Crowfoot, and Watermeal. However, there were also five species that were not present this year that were present in 2003 (Slender Naiad, American Pondweed, Leafy Pondweed, Flatstem Pondweed, and Sago Pondweed). These differences are most likely due to time and method of sampling. The five species that were present in 2003 but not in 2005 were all native pondweeds that often are usually seen later in the season. Our sampling method only captures 7 points on the lake therefore some species could have been missed during sampling.

Water clarity and depth are the major limiting factors in determining the maximum depth at which aquatic plants will grow in a lake. When the light level in the water column falls below 1% of the surface light level, plants can no longer photosynthesize. Plants in Taylor Lake were found at a maximum depth of 4.4 feet. The 1% light level was around 7 to 8 feet June through August and about 5 feet in September.

Floristic quality index (FQI; Swink and Wilhelm 1994) is an assessment tool designed to evaluate the closeness that the flora of an area is 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. Each aquatic plant in a lake is assigned a number between 1 and 10 (10 indicating the plant species most sensitive to disturbance). This is done for every floating and submersed plant species found in the lake. These numbers are averaged and multiplied by the square root of the number of species present to calculate an FQI. A high FQI number indicates that there are a large number of sensitive, high quality plant species or a good diversity of plants present in the lake. Non-native species were counted in the FQI calculations for Lake County Lakes. The FQI in 2005 for Taylor Lake was 14.3 (Table 5) and the county median was 13.1. In 2003 it had a value of 15.8, both years were slightly above the average plant diversity for Lake County.

SUMMARY OF SHORELINE CONDITION

In 2003 the shoreline was assessed at the water/land interface. Approximately 58% of the shoreline was developed, with the shoreline type being either lawn or buffer. The remainder of the shoreline was classified as wetland. Wetland is one of the most desirable shoreline types, providing wildlife habitat and, typically, protecting the shore from excessive erosion. About 84% of the shoreline was classified as wetland or buffer. As a result, no erosion was documented in these locations. In 2005 the Lakes Management (LMU) reevaluated the shoreline for erosion or improvements in the shoreline since the previous evaluation. A few areas on the lake were found to be exhibiting moderate erosion this year. The biggest area was on the northwest shoreline, where lawn is mowed to provide easy access for shoreline fishing.

Invasive plant species, including, Buckthorn, Common Reed and Purple Loosestrife were scattered along approximately 88% of the shoreline in 2003. These plants can exclude native plants from the areas they inhabit. Buckthorn provides very poor shoreline stabilization and may

Figure 6. Approximate plant coverage on Taylor Lake, 2005.

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	35.6	37.8
2	Deep Lake	33.9	35.4
3	Round Lake Marsh North	29.1	29.9
4	East Loon Lake	28.4	29.9
5	Cranberry Lake	28.3	28.3
6	Sullivan Lake	28.2	29.7
7	Deer Lake	27.9	30.2
8	Little Silver Lake	27.9	30.0
9	Schreiber Lake	26.8	27.6
10	Redwing Slough	26.0	26.9
11	West Loon Lake	26.0	27.6
12	Timber Lake (North)	25.5	27.1
13	Cross Lake	25.2	27.8
14	Wooster Lake	25.2	26.9
15	Butler Lake	25.0	26.6
16	Lake Zurich	24.0	26.0
17	Lake of the Hollow	23.8	26.2
18	Lakewood Marsh	23.8	24.7
19	Round Lake	23.5	25.9
20	Fourth Lake	23.0	24.8
21	Druce Lake	22.8	25.2
22	Sun Lake	22.7	24.5
23	Countryside Glen Lake	21.9	22.8
24	Sterling Lake	21.8	24.1
25	Bangs Lake	21.2	23.7
26	ADID 203	20.5	20.5
27	Broberg Marsh	20.5	21.4
28	Davis Lake	20.5	21.4
29	McGreal Lake	20.2	22.1
30	Lake Kathryn	19.6	20.7
31	Third Lake	19.6	21.7
32	Owens Lake	19.3	20.2
33	Redhead Lake	19.3	21.2
34	Lake Minear	18.8	20.6
35	Turner Lake	18.6	21.2
36	Salem Lake	18.5	20.2
37	Lake Miltmore	18.4	20.3
38	Fish Lake	18.1	20.0
39	McDonald Lake 1	17.7	18.7
40	Potomac Lake	17.3	18.5
41	Hendrick Lake	17.2	19.0

Table 5. Continued

Rank	Lake Name	FQI (w/A)	FQI (native)
42	Duck Lake	17.1	19.1
43	Summerhill Estates Lake	17.1	18.0
44	Ames Pit	17.0	18.0
45	Seven Acre Lake	17.0	15.5
46	Grand Avenue Marsh	16.9	18.7
47	Gray's Lake	16.9	19.8
48	White Lake	16.9	18.7
49	Bresen Lake	16.6	17.8
50	Waterford Lake	16.6	17.8
51	Diamond Lake	16.3	17.4
52	Lake Barrington	16.3	17.4
53	Lake Napa Suwe	16.3	17.4
54	Windward Lake	16.3	17.6
55	Fischer Lake	16.0	18.1
56	Dog Bone Lake	15.7	15.7
57	Independence Grove	15.5	16.7
58	Long Lake	15.5	17.3
59	Tower Lake	15.2	17.6
60	Heron Pond	15.1	15.1
61	Lake Linden	15.1	16.5
62	Lake Tranquility (S1)	15.0	17.0
63	North Churchill Lake	15.0	15.0
64	Dog Training Pond	14.7	15.9
65	Island Lake	14.7	16.6
66	Highland Lake	14.5	16.7
67	Lake Fairview	14.3	16.3
68	**Taylor Lake**	**14.3**	**16.3**
69	Dugdale Lake	14.0	15.1
70	Eagle Lake (S1)	14.0	15.1
71	Longview Meadow Lake	13.9	13.9
72	Bishop Lake	13.4	15.0
73	Hook Lake	13.4	15.5
74	Timber Lake (South)	13.4	15.5
75	Buffalo Creek Reservoir	13.1	14.3
76	Mary Lee Lake	13.1	15.1
77	Old School Lake	13.1	15.1
78	Dunn's Lake	12.7	13.9
79	Old Oak Lake	12.7	14.7
80	Echo Lake	12.5	14.8
81	Sand Lake	12.5	14.8
82	Stone Quarry Lake	12.5	12.5

Table 5. Continued

Rank	Lake Name	FQI (w/A)	FQI (native)
83	Honey Lake	12.1	14.3
84	Lake Leo	12.1	14.3
85	Lambs Farm Lake	12.1	14.3
86	Pond-A-Rudy	12.1	12.1
87	Stockholm Lake	12.1	13.5
88	Lake Matthews	12.0	12.0
89	McDonald Lake 2	12.0	12.0
90	Flint Lake	11.8	13.0
91	Harvey Lake	11.8	13.0
92	Rivershire Pond 2	11.5	13.3
93	Antioch Lake	11.3	13.4
94	Lake Charles	11.3	13.4
95	Lake Naomi	11.2	12.5
96	Pulaski Pond	11.2	12.5
97	Lake Christa	11.0	12.7
98	Redwing Marsh	11.0	11.0
99	West Meadow Lake	11.0	11.0
100	Nielsen Pond	10.7	12.0
101	Lake Holloway	10.6	10.6
102	Lake Carina	10.2	12.5
103	College Trail Lake	10.0	10.0
104	Lake Lakeland Estates	10.0	11.5
105	Crooked Lake	9.8	12.0
106	Hastings Lake	9.8	12.0
107	Werhane Lake	9.8	12.0
108	Big Bear Lake	9.5	11.0
109	Little Bear Lake	9.5	11.0
110	Loch Lomond	9.4	12.1
111	Sand Pond (IDNR)	9.4	12.1
112	Columbus Park Lake	9.2	9.2
113	Sylvan Lake	9.2	9.2
114	Grandwood Park Lake	9.0	11.0
115	Lake Fairfield	9.0	10.4
116	East Meadow Lake	8.5	8.5
117	Lake Farmington	8.5	9.8
118	Lucy Lake	8.5	9.8
119	South Churchill Lake	8.5	8.5
120	Bittersweet Golf Course #13	8.1	8.1
121	Woodland Lake	8.1	9.9
122	Albert Lake	7.5	8.7
123	Banana Pond	7.5	9.2
124	Fairfield Marsh	7.5	8.7
125	Lake Eleanor	7.5	8.7

Table 5. Continued

Rank	Lake Name	FQI (w/A)	FQI (native)
127	Patski Pond	7.1	7.1
128	Rasmussen Lake	7.1	7.1
129	Lucky Lake	7.0	7.0
130	Lake Forest Pond	6.9	8.5
131	Leisure Lake	6.4	9.0
132	Peterson Pond	6.0	8.5
133	Countryside Lake	5.8	7.1
134	Gages Lake	5.8	10.0
135	Grassy Lake	5.8	7.1
136	Slocum Lake	5.8	7.1
137	Deer Lake Meadow Lake	5.2	6.4
138	ADID 127	5.0	5.0
139	Drummond Lake	5.0	7.1
140	IMC	5.0	7.1
141	Liberty Lake	5.0	5.0
142	Oak Hills Lake	5.0	5.0
143	Slough Lake	5.0	5.0
144	North Tower Lake	4.9	7.0
145	Forest Lake	3.5	5.0
146	Half Day Pit	2.9	5.0
147	Lochanora Lake	2.5	5.0
148	Hidden Lake	0.0	0.0
149	St. Mary's Lake	0.0	0.0
150	Valley Lake	0.0	0.0
151	Willow Lake	0.0	0.0
	Mean	**14.0**	**15.4**
	Median	**13.1**	**14.8**

lead to increasing erosion problems in the future. Common Reed and Purple Loosestrife inhabit wet areas and can easily outcompete native plants. Purple Loosestrife was not found in large populations, but scattered along the shoreline. Their removal now, when their numbers are small, would be easier than trying to control them once the population expands. Steps to eliminate these plants should be carried out as soon as possible in order to prevent further spread of these species and to preserve the quality its surrounding shoreline.

SUMMARY OF WILDLIFE AND HABITAT

Wildlife observations were made each month during the season. Wetland and woodland areas around the lake are abundant and provide good habitat for many species. Some species of birds observed were: Blue Jay, Great White Egret, Great Blue Heron, Oriole, Cedar Waxwing, Warbling Vireo, Wood Duck, Canada Geese, Gold Finch, Indigo Bunting, Rock Dove, and Barn Swallow. American Toads and Bullfrogs were also observed around the lake.

Fish were sampled in 2003 and 2000 by the IDNR. Channel Catfish are stocked annually and Largemouth Bass were partially stocked in 2002 after a winter kill. Other fish found in Taylor Lake were Bluegill, Pumpkinseed Sunfish, Green Sunfish, Black Crappie, Black Bullhead, and Golden Shiner. In 1992 the Lake County Forest Preserve District stocked 64 triploid Grass Carp for aquatic plant control. Since the fish kill, the IDNR believes there is an overabundance of small fish for an almost predator-free lake. Recommendations from the 2003 IDNR survey include the continuation of the annual Channel Catfish stocking, reducing aquatic plant growth, and Canada Goose management.

LAKE MANAGEMENT RECOMMENDATIONS

Taylor Lake has good water quality and nearly 84% of the lake was surrounded by wetland plants and buffer, which provide habitat for wildlife. However, 88% of the shoreline also had invasive species scattered throughout. Although 67% of the lake is covered in aquatic vegetation, diversity is good with only a small amount of exotic species present. This large amount of vegetation may be causing problems within the fishery and should be controlled. There are some recommendation that could help control invasive species and the abundance of plants in the lake. There are also many grant opportunities available to do improvements around or in the lake (Appendix F).

Creating a Bathymetric Map

A bathymetric (depth contour) map is an essential tool in effective lake management since it provides information on the morphometric features of the lake, such as depth, surface area, volume, etc. The knowledge of this morphometric information would be necessary if lake management practices, such as aquatic herbicide use or fish stocking, were part of the overall lake management plan. Taylor Lake does not have a current bathymetric map with volume calculations (Appendix D1).

Eliminate or Control Exotic Species

Purple Loosestrife, Buckthorn, and Common Reed were observed around Taylor Lake in 2003, all of which are exotic, invasive species. Their removal now, when their numbers are small, would be easier than trying to control them once the population expands. Steps to eliminate these plants should be carried out as soon as possible in order to prevent further spread of these species and to preserve the quality of the surrounding shoreline (Appendix D2).

Lakes with High Canada Geese Populations

Canada Geese were noted in large numbers in the area around Taylor Lake. Since the geese are a source of phosphorus through their feces, Taylor Lake would benefit from a goose management program. Techniques may not completely eliminate geese from using the lake, but they can lessen their numbers. The mowed grass offers the geese easy access to Taylor Lake, but taller native plants in a buffer strip around the shoreline can discourage them. The LCFPD could leave a few trails through the buffer strip for anglers to access the shoreline (Appendix D3).

Aquatic Plant Management

One key to a healthy lake is a healthy aquatic plant community. To support a healthy fishery, coverage of approximately 30% to 40% of the lake bottom is considered adequate by the IDNR, and Taylor Lake has almost 67% coverage. Therefore, a management plan may need to be implemented in order to control the abundance of plants. LCFPD may want to try an aquatic herbicide such as 2,4-D, to control Coontail. However, the use of aquatic herbicides may have a negative response from the public since this is a very popular location. If this method were followed, all of the lake would not need to be treated, only enough to bring densities down to 30-40% surface area coverage. This could be applied in either liquid form or slow release pellet form (SRP). Application of herbicides will not eliminate the Coontail problem and treatments may have to be made each year possibly multiple times in a year (Appendix D4).

Eurasian Watermilfoil (EWM) was found in only 8% of the sites in 2003, but it has been noted to be the dominant plant in previous years. The EWM should be monitored closely in order to intervene if necessary to reduce the plant's density. In case EWM density does increase, one method of reduction would be to introduce the milfoil weevil (*Euhrychiopsis lecontei*) in the lake. When present in large enough numbers, these weevils can cause significant damage to milfoil beds. Best results are achieved in lakes that have EWM infestations in shallow areas where it is undisturbed by recreational and management actives, which applies to Taylor Lake.

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 (ArcGIS 3.2) overlaid a grid pattern onto a 2004 aerial photo of Lake County and placed points 60 meters apart. 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.

Plankton Sampling

Plankton was sampled at the same location as water quality samples. Using the Hydrolab DataSonde® 4a 1% light level depth (depth where the water light is 1% of the surface irradiance)

was determined. A plankton net/tow, with 80μm mesh, was then lowered to the pre-determined 1% light level depth and retrieved vertically. On the way up the water column, plankton are collected within a small cup on the bottom of the tow. The collected sample was then emptied into a pre-labeled brown plastic bottle. The net was rinsed with deionized water into the bottle in order to ensure all the plankton were collected. The sample was then transferred to a graduated cylinder to measure the amount of milliliters (mL) that the sample was. The sample was then returned to the bottle and preserved with Lugol's iodine solution (5 drops/mL). The sample bottle was then closed and stored in a cooler until returning to the lab, where it was transferred to the refrigerator until enumeration. Enumeration was performed within three months, but ideally within one month, under a microscope. Sample bottle was inverted several times to ensure proper homogenization. An automated pipette was used to retrieve 1 mL of sample, which was then placed on a Sedgewick Rafter slide. This is a microscope slide on which a rectangular chamber has been constructed, measuring 50 mm x 20 mm in area and with a depth of 1 mm. The slide was then placed under the microscope and counted at a 20X magnification. Twenty fields of view were randomly counted with all species within each field counted. Through calculations, it was determined how many of each species were in 1 mL of lake water.

Shoreline Assessment

In previous years a complete assessment of the shoreline was done. However, this year we did a visual estimate to determine changes in the shoreline. The degree of shoreline erosion was categorically defined as none, slight, moderate, or severe. Below are brief descriptions of each category.

> None – Includes man-made erosion control such as beach, rip-rap and sea wall.
>
> Slight – Minimal or no observable erosion; generally considered stable; no erosion control practices will be recommended with the possible exception of small problem areas noted within an area otherwise designated as "slight".
>
> Moderate – Recession is characterized by past or recently eroded banks; area may exhibit some exposed roots, fallen vegetation or minor slumping of soil material; erosion control practices may be recommended although the section is not deemed to warrant immediate remedial action.
>
> Severe – Recession is characterized by eroding of exposed soil on nearly vertical banks, exposed roots, fallen vegetation or extensive slumping of bank material, undercutting, washouts or fence posts exhibiting realignment; erosion control practices are recommended and immediate remedial action may be warranted.

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 nitrogen	Brucine method Standard Methods (SM) 14th ed 419D 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
Total dissolved solids	SM 18th ed, Method #2540C
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 TAYLOR LAKE IN 2005

Date MMDDYY	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
5/11/2005	0.25		18.33	8.26	88.0	0.501	8.20	NA	Surface		
5/11/2005	1		18.48	7.62	81.4	0.501	8.17	NA	Surface	NA	
5/11/2005	2		18.53	7.57	81.0	0.501	8.15	NA	NA	NA	NA
5/11/2005	3		18.52	7.57	81.0	0.501	8.14	NA	NA	NA	NA
5/11/2005	4		18.52	7.57	81.0	0.501	8.13	NA	NA	NA	NA
5/11/2005	6		12.58	9.68	91.1	0.511	8.16	NA	NA	NA	NA
5/11/2005	8		10.60	5.90	53.0	0.511	7.41	NA	NA	NA	NA
5/11/2005	10		9.83	0.63	5.5	0.513	7.22	NA	NA	NA	NA
5/11/2005	12		9.52	0.34	3.0	0.519	7.16	NA	NA	NA	NA
5/11/2005	14		8.24	0.18	1.5	0.679	6.81	NA	NA	NA	NA

Date MMDDYY	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 1.04
6/15/2005	0.25	0.525	23.94	6.89	81.9	0.484	8.44	3179.8	Surface		
6/15/2005	1	1.031	23.96	6.94	82.4	0.484	8.59	976.0	Surface		
6/15/2005	2	2.119	23.94	6.92	82.3	0.484	8.61	329.4	0.369	100%	2.94
6/15/2005	3	2.913	23.94	6.91	82.0	0.484	8.61	214.2	1.163	65%	0.54
6/15/2005	4	4.044	23.93	6.89	81.8	0.484	8.61	100.1	2.294	30%	0.67
6/15/2005	6	6.043	23.76	6.17	73.1	0.485	8.45	33.7	4.293	10%	0.54
6/15/2005	8	8.012	18.92	0.22	2.4	0.514	7.22	14.3	6.262	4%	0.44
6/15/2005	10	10.033	13.77	0.23	2.2	0.538	6.96	3.7	8.283	1%	0.67
6/15/2005	12	12.053	10.25	0.19	1.7	0.651	6.60	0.2	10.303	0%	1.44
6/16/2005	14	14.051	8.19	0.14	1.2	0.804	6.52	0.1	12.301	0%	0.35
6/17/2005	16	15.985	7.82	0.11	0.9	0.845	6.54	0.1	14.235	0%	0.00

Date MMDDYY	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	0.53
7/13/2005	0.25	0.274	25.52	8.26	101	0.496	8.49	2016	Surface		
7/13/2005	1	1.026	25.52	8.17	99.9	0.497	8.54	767.2	Surface		
7/13/2005	2	2.011	25.53	8.12	99.3	0.497	8.58	303.4	0.261	100%	3.55
7/13/2005	3	2.976	25.49	7.96	97.3	0.497	8.57	187.4	1.226	62%	0.50
7/13/2005	4	4.022	25.48	7.81	95.5	0.497	8.56	95.0	2.272	31%	0.65
7/13/2005	6	6.11	25.31	6.34	77.1	0.5	8.32	43.6	6.288	14%	0.19
7/13/2005	8	8.038	23.30	0.71	8.4	0.511	7.75	7.0	8.238	2%	0.94
7/13/2005	10	9.988	17.52	0.40	4.2	0.566	7.02	0.5	10.33	0%	1.26
7/13/2005	12	12.080	12.29	0.39	3.7	0.725	6.74	0.1	12.331	0%	0.80
7/14/2005	14	14.081	9.53	0.35	3.1	0.840	6.53	0.1	14.262	0%	0.00
7/15/2005	16	16.012	8.57	0.33	2.8	0.931	6.50	0.1	-1.75	0%	0.00

Date MMDDYY	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	0.52
8/10/2005	0.25	0.455	28.08	12.20	156.2	0.482	9.17	3005.6	Surface		
8/10/2005	1	1.056	28.06	12.35	158.1	0.481	9.21	1225.4	Surface		
8/10/2005	2	2.053	27.71	12.07	153.5	0.481	9.22	561.7	0.303	100%	2.57
8/10/2005	3	3.065	27.36	8.51	107.6	0.483	8.97	86.1	1.315	15%	1.85
8/10/2005	4	4.047	27.16	4.52	57.0	0.487	8.67	66.1	2.297	12%	0.27
8/10/2005	5	4.923	26.72	2.40	30.0	0.490	8.42	32.5	3.173	6%	0.81
8/10/2005	6	5.945	26.00	0.32	4.0	0.497	8.02	23.0	4.195	4%	0.34
8/10/2005	7	7.020	24.21	0.22	2.6	0.513	7.70	14.7	5.27	3%	0.42
8/10/2005	8	7.914	22.20	0.16	1.9	0.538	7.30	8.1	6.164	1%	0.67
8/10/2005	9	8.938	20.05	0.09	0.9	0.577	6.96	4.9	7.188	1%	0.49
8/10/2005	10	9.964	17.35	0.09	0.9	0.638	6.75	4.6	8.214	1%	0.06
8/10/2005	11	10.963	15.71	0.04	0.4	0.683	6.64	4.1	9.213	1%	0.12
8/10/2005	12	11.968	13.44	0.05	0.5	0.774	6.64	3.8	10.218	1%	0.08
8/10/2005	13	12.960	12.16	0.05	0.4	0.832	6.63	3.6	11.21	1%	0.05
8/10/2005	14	14.012	11.44	0.03	0.3	0.846	6.60	3.4	12.262	1%	0.05
	Text								Depth of		

Date MMDDYY	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	0.94
9/14/2005	0.25	0.496	24.37	5.62	67.4	0.482	8.73	3057.2	Surface		
9/14/2005	1	1.021	24.43	5.65	67.7	0.482	8.84	2012.0	Surface		
9/14/2005	2	2.068	24.35	5.59	66.9	0.483	8.91	379.3	0.318	100%	5.25
9/14/2005	3	3.005	24.27	5.41	64.7	0.483	8.93	200.0	1.255	53%	0.68
9/14/2005	4	4.091	24.09	4.59	54.6	0.483	8.88	71.8	2.341	19%	0.94
9/14/2005	5	5.040	23.90	2.70	32.0	0.485	8.72	26.8	3.29	7%	1.04
9/14/2005	6	6.021	23.37	0.21	2.5	0.495	8.12	10.9	4.271	3%	0.92
9/14/2005	7	7.051	22.62	0.12	1.4	0.506	7.78	4.5	5.301	1%	0.86
9/14/2005	8	8.024	21.31	0.10	1.2	0.530	7.40	3.5	6.274	1%	0.26
9/14/2005	9	9.024	20.19	0.08	0.9	0.568	7.05	1.8	7.274	0%	0.66
9/14/2005	10	10.048	18.55	0.08	0.8	0.653	6.80	0.8	8.298	0%	0.79
9/14/2005	11	11.162	16.48	0.07	0.7	0.742	6.66	0.6	9.412	0%	0.26
9/14/2005	12	12.022	15.34	0.07	0.7	0.781	6.58	0.5	10.272	0%	0.21
9/14/2005	13	13.025	13.76	0.07	0.7	0.859	6.52	0.5	11.275	0%	0.00
9/14/2005	14	13.964	12.46	0.05	0.5	0.907	6.50	0.5	12.214	0%	0.00
9/14/2005	15	14.889	11.65	0.05	0.5	0.961	6.37	0.6	13.139	0%	-0.20
9/14/2005	16	15.998	10.75	0.04	0.4	1.022	6.30	0.6	14.248	0%	0.00

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 2000-2005 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 2000-2005 is 0.063 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 2000-2005 was 0.174 mg/L and ranged from a minimum of 0.012 mg/L in West Loon 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 7.9 mg/L, ranging from below the 1 mg/L detection limit (10 lakes) 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 mg/L, ranging from 34 mg/L in Pulaski Pond to 298 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 3.17 feet. From 2000-2005, 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 8.30, 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. LAKE MANAGEMENT OPTIONS

D1. Option for Creating a Bathymetric Map

A bathymetric (depth contour) map is an essential tool for effective lake management since it provides critical information about the physical features of the lake, such as depth, surface area, volume, etc. This information is particularly important when intensive management techniques (i.e., chemical treatments for plant or algae control, dredging, fish stocking, etc.) are part of the lake's overall management plan. Some bathymetric maps for lakes in Lake County do exist, but they are frequently old, outdated and do not accurately represent the current features of the lake. Maps can be created by the Lake County Health Department - Lakes Management Unit (LMU). LMU recently purchased a BioSonics DT-X™ Echosounder. With this equipment the creation of an accurate bathymetric map of almost any size lake in the county is possible. Costs vary, but can range from $2,000-5,000 depending on lake size.

D2. Options to Eliminate or Control Exotic Species

Option 1: Biological Control

Biological control (bio-control) is a means of using natural relationships already in place to limit, stop, or reverse an exotic species' expansion. In most cases, insects that prey upon the exotic plants in its native ecosystem are imported. Since there is a danger of bringing another exotic species into the ecosystem, state and federal agencies require testing before any bio-control species are released or made available for purchase. Control of exotics by a natural mechanism is preferable to chemical treatments, however there are few exotics that can be controlled by biological means. Insects, being part of the same ecological system as the exotic plant (i.e., the beetles and weevils with Purple Loosestrife) are more likely to provide long-term control. Chemical treatments are usually non-selective while bio-control measures target specific plant species. Bio-control can also be expensive and labor intensive.

Option 2: Control by Hand

Controlling exotic plants by hand removal is most effective on small areas (< 1 acre) and if done prior to heavy infestation. Some exotics, such as Purple Loosestrife and Reed Canary Grass, can be controlled to some degree by digging, cutting, or mowing if done early and often during the year. Digging may be required to ensure the entire root mass is removed. Spring or summer is the best time to cut or mow, since late summer and fall is when many of the plant seeds disperse. Proper disposal of excavated plants is important since seeds may persist and germinate even after several years. Once exotic plants are removed, the disturbed ground should be planted with native vegetation and closely monitored since regrowth of the removed species is common. Many exotic species, such as Purple Loosestrife, Buckthorn, and Garlic Mustard are proficient at colonizing disturbed sites. This method can be labor intensive but costs are low.

Option 3: Herbicide Treatment

Chemical treatments can be effective at controlling exotic plant species, and works best on individual plants or small areas already infested with the plant.   In some areas where individual spot treatments are prohibitive or impractical (i.e., large expanses of a wetland or woodland), chemical treatments may not be an option because in order to chemically treat the area, a broadcast application would be needed. Because many of the herbicides are not selective, meaning they kill all plants they contact, this may be unacceptable if native plants are found in the proposed treatment area.

Herbicides are commonly used to control nuisance shoreline vegetation by applying it to green foliage or cut stems. They provide a fast and effective way to control or eliminate nuisance vegetation by killing the root of the plant, preventing regrowth. Products are applied by either spraying or wicking (wiping) solution on plant surfaces. Spraying is used when large patches of undesirable vegetation are targeted. Herbicides are sprayed on growing foliage using a hand-held or backpack sprayer. Wicking is used when selected plants are to be removed from a group of plants.   It is best to apply herbicides when plants are actively growing, such as in the late spring/early summer, but before formation of seed heads. Herbicides are often used in conjunction with other methods, such as cutting or mowing, to achieve the best results. Proper use of these products is critical to their success. Always read and follow label directions.

D3. Options for Lakes with High Canada Geese Populations

Option 1: Removal

Since Canada Geese are considered migratory waterfowl, both state and federal laws restrict taking or harassing geese. Under the federal Migratory Bird Treaty Act, it is illegal to kill or capture geese outside a legal hunting season or to harass their nests without a permit. If removal of problematic geese is warranted or if nest and egg destruction becomes an option, permits need to be obtained from the Illinois Department of Natural Resources (217- 782-6384) and the U.S. Fish and Wildlife Service (217-241-6700). Removing a significant portion of a problem goose population can have a positive effect on the overall health of a lake. However, if the habitat conditions still exist, more geese will likely replace any that were removed. Thus, money and time used removing geese may not be well spent unless there is a change in habitat conditions.

Option 2: Dispersal/Repellent Techniques

Several techniques and products are on the market that claim to disperse or deter geese from using an area. These techniques can be divided into two categories: harassment and chemical. With both types of techniques it is important to implement any action early in the season, before geese establish territories and begin nesting. Once established, the dispersal/repellant techniques may be less effective and geese more difficult to coerce into leaving. Harassment techniques include scaring off geese with noisemakers, or chasing them off using dogs or swans. Chemical repellents may also be used with some effectiveness. New products are continually coming out that claim to rid an area of nuisance geese.

With persistence, harassment and/or use of repellants can result reduced or minimal usage of an area by geese. Fewer geese may mean less feces and cleaner yards and parks, which may increase recreational uses along shorelines. However, the effectiveness of harassment techniques is reduced over time since geese will adapt to the devices.

Option 3: Exclusion

Erecting a barrier to exclude geese is another option. In addition to a traditional wood or wire fence, an effective exclusion control is to suspend netting over the area where geese are unwanted. Geese are reluctant to fly or walk into the area. A similar deterrent that is often used is a single string or wire suspended a foot or so above the ground along the length of the shoreline. This technique will not be effective if the geese are using a large area. The single string or wire method may be effective at first, but geese often learn to go around, over, or under the string after a short period of time. Excluding geese from one area will force them to another area on a different part of the same lake or another nearby lake. While this solves one property owner's problem, it creates one for another.

Option 4: Habitat Alteration

One of the best methods to deter geese from using an area is through habitat alteration. Habitats that consist of mowed turfgrass to the edge of the shoreline are ideal for geese. Create a buffer strip (approximately 10-20 feet wide) between the shoreline and any mowed lawn by planting natural shoreline vegetation (i.e., bulrushes, cattails, rushes, grasses, shrubs, and trees, etc.) or allowing the vegetation to establish naturally. Aeration systems that run into the fall and winter prevent the lake from freezing, thus not forcing geese to migrate elsewhere. To alleviate this problem, turn aerators off during fall and early winter. Once the lake freezes over and the geese have left, wait a few weeks before turning the aerators on again if needed.

Altering the habitat in an area can not only make the habitat less desirable for geese, but may be more desirable for many other species of wildlife. A buffer strip has additional benefits by filtering run-off of nutrients, sediments, and pollutants and protecting the shoreline from erosion from wind, wave, or ice action. The more area that has natural vegetation, the less turfgrass needs to be constantly manicured and maintained.

Option 5: Do Not Feed Waterfowl!

There are few "good things", if any, that come from feeding waterfowl. Birds become dependent on handouts, become semi-domesticated, and do not migrate. This causes populations to increase and concentrate, which may create additional problems such as diseases within waterfowl populations. The nutritional value in many of the "foods" (i.e., white bread) given to geese and other waterfowl are quite low. Since geese are physiologically adapted to eat a variety of foods, they can actually be harmed by filling-up on human food. Geese that are accustomed to hand feeding may become aggressive toward other geese or even the people feeding the geese.

D4. Options for Aquatic Plant Management

Option 1: Aquatic Herbicides

Aquatic herbicides are the most common method to control nuisance vegetation/algae. When used properly, they can provide selective and reliable control. Products cannot be licensed for use in aquatic situations unless there is less than a 1 in 1,000,000 chance of any negative effects on human health, wildlife, and the environment. Prior to herbicide application, licensed applicators should evaluate the lake's vegetation and, along with the lake's management plan, choose the appropriate herbicide and treatment areas, and apply the herbicides during appropriate conditions (i.e., low wind speed, DO concentration, temperature).

When used properly, aquatic herbicides can be a powerful tool in management of excessive vegetation. Often, aquatic herbicide treatments can be more cost effective in the long run compared to other management techniques. The fisheries and waterfowl populations of the lake would benefit greatly due to an increase in quality habitat and food supply. Dense stands of plants would be thinned out and improve spawning habitat and food source availability for fish. By implementing a good management plan with aquatic herbicides, usage opportunities of the lake would increase.

The most obvious drawback of using aquatic herbicides is the input of chemicals into the lake. Even though the United States Environmental Protection Agency (USEPA) approved these chemicals for use, human error can make them unsafe and bring about undesired outcomes. If not properly used, aquatic herbicides can remove too much vegetation from the lake. Another problem associated with removing too much vegetation is the loss of sediment stabilization by plants, which can lead to increased turbidity and resuspension of nutrients. After the initial removal, there is a possibility for regrowth of vegetation. Upon regrowth, weedy plants such as Eurasian Watermilfoil and Coontail quickly reestablish, form dense stands, and prevent the growth of desirable species. This causes a decrease in plant biodiversity. Over-removal, and possible regrowth of nuisance vegetation that may follow will drastically impair recreational use of the lake.

Option 2: Mechanical Harvesting

Mechanical harvesting involves the cutting and removal of nuisance aquatic vegetation by large specialized boats with underwater cutting bars. The total removal or over removal (neither of which should never be the plan of any management entity) of plants by mechanical harvesting should never be attempted. To avoid complete or over removal, the management entity should have a harvesting plan that determines where and how much vegetation is to be removed.

Mechanical harvesting can be a selective means to reduce stands of nuisance vegetation in a lake. Typically, plants cut low enough to restore recreational use and limit or prevent regrowth. This practice normally improves habitat for fish and other aquatic organisms. High initial investment, extensive maintenance, and high operational costs have led to decreased use. Mechanical harvesters cannot be used in less than 2-4 feet of water (depending on draft of the harvester) and cannot maneuver well in tight places. The harvested plant material must be disposed of properly to a place that can accommodate large quantities of plants and prevent any from washing back into the lake. Fish, mussels, turtles and other aquatic organisms are commonly caught in the harvester and injured or even removed from the lake in the harvesting process. After the initial removal, there is a possibility for vegetation regrowth. If complete/over removal does occur several problems can result. One problem is the loss of sediment stabilization by plants, which can lead to increased turbidity and resuspension of nutrients. Another problem with mechanical harvesting, even if properly done, is that it can be a nonselective process.

Option 3: Hand Removal

Hand removal of excessive aquatic vegetation is a commonly used management technique. Hand removal is normally used in small ponds/lakes and limited areas for selective vegetation removal. Areas surrounding piers and beaches are commonly targeted areas. Typically tools such as rakes and cutting bars are used to remove vegetation. Hand removal is a quick, inexpensive, and selective way to remove nuisance vegetation. There are few negative attributes to hand removal. One negative implication is labor. Depending on the extent of infestation, removal of a large amount of vegetation can be quite tiresome. Another drawback can be disposal. Finding a site for numerous residents to dispose of large quantities of harvested vegetation can sometimes be problematic.

Option 4: Water Milfoil Weevil

Euhrychiopsis lecontei (*E. lecontei*) is a biological control organism used to control Eurasian Watermilfoil (EWM). *E. lecontei* is a native weevil, which feeds exclusively on milfoil species. It is stocked as a biocontrol and is commonly referred to as the Eurasian Watermilfoil weevil. Currently, the LCHD-Lakes Management Unit has documented weevils in 35 Lake County lakes. Many of these lakes have seen declines in EWM densities in recent years. Weevils are stocked in known quantities to achieve a density of 1-4 weevils per stem. As weevil populations expand, EWM populations may decline. After EWM declines, weevil populations decline and do not feed on any other aquatic plants. Currently only one company, EnviroScience Inc., has a stocking program (called the MiddFoil® process). The program includes evaluation of EWM densities, of current weevil populations (if any), stocking, monitoring, and restocking as needed.

If control with milfoil weevils were successful, the quality of the lake would be improved. Native plants could start to recolonize, and the fishery of the lake would improve due to more balanced predation and higher quality habitat. Waterfowl would benefit due to increased food sources and availability of prey. Use of milfoil weevils does have some drawbacks. Control using the weevil has been inconsistent in many cases. Also, milfoil control using weevils may not work well on plants in deep water. Furthermore, weevils do not work well in areas where plants are continuously disturbed by activities such as powerboats, swimming, harvesting or herbicide use. One of the most prohibitive aspects to weevil use is price. Typically weevils are stocked to achieve a density of 1-4 weevils per stem. This translates to 500-3000 weevils per acre.

Option 5: Reestablishing Native Aquatic Vegetation

Revegetation should only be done when existing nuisance vegetation, such as Eurasian Watermilfoil, are under control using one of the above management options. If the lake has poor clarity due to excessive algal growth or turbidity, these problems must be addressed before a revegetation plan is undertaken. At maximum, planting depth light levels must be greater than 1-5% of the surface light levels for plant growth and photosynthesis.

There are two methods by which reestablishment can be accomplished. The first is use of existing plant populations to revegetate other areas within the lake. The second method of reestablishment is to import native plants from an outside source. A variety of plants can be ordered from nurseries that specialize in native aquatic plants. By revegetating newly opened areas that were once infested with nuisance species, the lake will benefit in several ways. There are few negative impacts to revegetating a lake. One possible drawback is the possibility of new vegetation expanding to nuisance levels and needing control. However, this is an unlikely outcome. Another drawback could be the high costs of extensive revegetation with imported plants.

APPENDIX E. WATER QUALITY STATISTICS FOR ALL LAKE COUNTY LAKES

2000 - 2005 Water Quality Parameters, Statistics Summary

	ALK (oxic) <=3ft 2000-2005	
Average	**167.0**	
Median	**162.0**	
Minimum	**64.9**	**IMC**
Maximum	**330.0**	**Flint Lake**
STD	**42.2**	
n =	**803**	

	ALK (anoxic) 2000-2005	
Average	**205**	
Median	**194**	
Minimum	**103**	**Heron Pond**
Maximum	**470**	**Lake Marie**
STD	**53**	
n =	**265**	

	Cond (oxic) <=3ft 2000-2005	
Average	**0.8536**	
Median	**0.7748**	
Minimum	**0.2305**	**White Lake**
Maximum	**6.8920**	**IMC**
STD	**0.5203**	
n =	**808**	

	Cond (anoxic) 2000-2005	
Average	**0.9606**	
Median	**0.8210**	
Minimum	**0.3031**	**White Lake**
Maximum	**7.4080**	**IMC**
STD	**0.7611**	
n =	**265**	

	NO3-N (oxic) <=3ft 2000-2005	
Average	**0.480**	
Median	**0.116**	
Minimum	**<0.05**	***ND**
Maximum	**9.670**	**South Churchill Lake**
STD	**1.019**	
n =	**808**	

*ND = Many lakes had non-detects (69%)
Only compare lakes with detectable concentrations to the statistics above

	NH3-N (anoxic) 2000-2005	
Average	**2.296**	
Median	**1.560**	
Minimum	**<0.1**	***ND**
Maximum	**18.400**	**Taylor Lake**
STD	**2.483**	
n =	**265**	

*ND = 21% Non-detects from 32 different lakes

	pH (oxic) <=3ft 2000-2005	
Average	**8.31**	
Median	**8.30**	
Minimum	**7.06**	**Deer Lake**
Maximum	**10.28**	**Round Lake Marsh North**
STD	**0.46**	
n =	**807**	

	pH (anoxic) 2000-2005	
Average	**7.11**	
Median	**7.13**	
Minimum	**5.80**	**Third Lake**
Maximum	**8.48**	**Heron Pond**
STD	**0.41**	
n =	**265**	

	All Secchi 2000-2005	
Average	**4.39**	
Median	**3.17**	
Minimum	**0.33**	**Fairfield Marsh, Patski Pond**
Maximum	**29.23**	**Bangs Lake**
STD	**3.65**	
n =	**740**	

81 of 161 lakes had anoxic conditions
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

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2000 - 2005 Water Quality Parameters, Statistics Summary continued

	TKN (oxic) <=3ft 2000-2005	
Average	**1.457**	
Median	**1.220**	
Minimum	**<0.5**	***ND**
Maximum	**10.300**	**Fairfield Marsh**
STD	**0.831**	
n =	**808**	

*ND = 5% Non-detects from 19 different lakes

	TKN (anoxic) 2000-2005	
Average	**3.067**	
Median	**2.270**	
Minimum	**<0.5**	***ND**
Maximum	**21.000**	**Taylor Lake**
STD	**2.467**	
n =	**265**	

*ND = 5% Non-detects from 7 different lakes

	TP (oxic) <=3ft 2000-2005	
Average	**0.098**	
Median	**0.063**	
Minimum	**<0.01**	**From 5 Lakes**
Maximum	**3.880**	**Albert Lake**
STD	**0.168**	
n =	**795**	

*ND = 0.1% Non-detects from 5 different lakes
(Bangs, Cedar, Carina, Minear,& Stone Quarry)

	TP (anoxic) 2000-2005	
Average	**0.320**	
Median	**0.174**	
Minimum	**0.012**	**West Loon Lake**
Maximum	**3.800**	**Taylor Lake**
STD	**0.412**	
n =	**265**	

	TSS (all) <=3ft 2000-2005	
Average	**15.3**	
Median	**7.9**	
Minimum	**<0.1**	***ND**
Maximum	**165.0**	**Fairfield Marsh**
STD	**20.3**	
n =	**815**	

*ND = 2% Non-detects from 10 different lakes

	TVS (oxic) <=3ft 2000-2005	
Average	**136.0**	
Median	**132.0**	
Minimum	**34.0**	**Pulaski Pond**
Maximum	**298.0**	**Fairfield Marsh**
STD	**40.4**	
n =	**758**	

No 2002 IEPA Chain Lakes

	TDS (oxic) <=3ft 2000-2004	
Average	**470**	
Median	**454**	
Minimum	**150**	**Lake Kathryn, White**
Maximum	**1340**	**IMC**
STD	**169**	
n =	**745**	

No 2002 IEPA Chain Lakes, Data from 00-04.

	CL (anoxic) 2004-2005	
Average	**277**	
Median	**102**	
Minimum	**53**	**Banana Pond**
Maximum	**2390**	**IMC**
STD	**489**	
n =	**66**	

	CL (oxic) <=3ft 2004-2005	
Average	**243.8**	
Median	**183.0**	
Minimum	**51.7**	**Heron Pond**
Maximum	**2760.0**	**IMC**
STD	**339.4**	
n =	**197**	

LakeCounty
Health Department and
Community Health Center

APPENDIX F. GRANT PROGRAM OPPORTUNITES

Table F1. A list of potential grant opportunities

Grant Program Name	Funding Source	Funding Focus			Cost Share	Typical Award
		Water Quality	Flooding	Habitat		
Challenge Grant Program	USFWS			X	>50%	<$10,000
Chicago Wilderness Small Grants Program	CW			X	None	$15,000
Conservation 2000 (C2000)	IDNR			X	None	$10,000 to $500,000
Conservation Reserve Program	NRCS			X	Land	Variable
Five Star Challenge Grant	NFWF			X	None	$5,000 to $20,000
Flood Mitigation Assistance Program	IEMA		X		25%	$200,000
Habitat Restoration Program for the Fox Watershed	LCSWCD			X	25%	<$1,000K
Illinois Clean Lakes Program (ICLP)	IEPA	X			>50%	$5,000 to $30,000
Illinois Clean Energy Community Foundation	ICECF			X	None	Variable
Lakes Education Assistance Grant Program (LEAP)	IEPA	X			None	$500
Northeast Illinois Wetland Conservation Account	USFWS	X		X	>50%	$600 to $200,000
Partners for Fish and Wildlife Program	USFWS			X	>50%	$3,000
Section 206: Aquatic Ecosystem Restoration	USACE			X	35%	<$1,000,000
Section 319: Non-Point Source Management Program	IEPA	X		X	>40%	Variable
STAG Grants	LCSMC	X			None	Variable
Stream Cleanup And Lakeshore Enhancement (SCALE)	IEPA	X			None	$2,000
Streambank Stabilization and Restoration Program (SSRP)	LCSWCD	X		X	25%	Variable
Unincorporated Lake County Drainage Fund	LCPBD		X		>50%	$5,000 to $10,000
Wildlife Habitat Incentives Program	NRCS			X	Land	Variable
Watershed Management Board	LCSMC	X	X	X	>50%	$5K to $10K
Wetland Reserve Program	NRCS			X	Land	Variable

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
LCPBD = Lake County Planning, Building, and Development Department
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 F2. Grant Contacts

Chicago Wilderness (CW)
Elizabeth McCance, Director of Conservation Programs
Phone: (312) 580-2138
E-mail: emccance@chicagowilderness.org
http://www.chicagowilderness.org/

Illinois Clean Energy Community Foundation (ICECF)
2 N. LaSalle Street
Suite 950
Chicago, IL 60602
Phone: (312) 372-5191
Fax: (312) 372-5190
http://www.illinoiscleanenergy.org/

Illinois Department of Natural Resources (IDNR)
One Natural Resources Way
Springfield, IL 62702-1271
Phone: (217) 782-9740
http://dnr.state.il.us/orep/C2000

Illinois Emergency Management Agency (IEMA)
110 East Adams Street
Springfield, Illinois 62701
Phone: (217) 785-0229
http://www.state.il.us/iema/index.htm

Illinois Environmental Protection Agency (IEPA)
Bureau of Water - Surface Water Section
1021 North Grand Avenue East
P.O. Box 19276
Springfield, Illinois 62794-9276
Telephone: (217) 782-3362
Fax: (217) 785-1225
http://www.epa.state.il.us/water/financial-assistance/non-point.html

Lake County Planning, Building, and Development Department (LCPBD)

18 N. County Street
Waukegan, IL 60085
Phone: (847) 377-2875
Fax: (847) 782-3016

Lake County Soil and Water Conservation District (LCSWCD)

100 N. Atkinson Road
Suite 102A
Grayslake, IL 60030
Phone: (847)-223-1056
Fax: (847)-223-1127
http://www.lakeswcd.org/

Lake County Stormwater Management Commission (LCSMC)

333-B Peterson Road
Libertyville, IL 60048
Phone: (847) 918-5260
Fax: (847) 918-9826
http://www.co.lake.il.us/smc

National Fish and Wildlife Foundation (NFWF)

Attn: Five Star Restoration Program
1120 Connecticut Avenue N.W., Suite 900
Washington, DC 20036
Phone: (202) 857-0166
Fax: (202) 857-0162
http://nfwf.org/programs/5star-rfp.htm

Natural Resources Conservation Service (NRCS)

Wildlife Habitat Incentives Program Coordinator
USDA Natural Resources Conservation Service
1902 Fox Drive
Champaign, IL 61820
Phone: (217) 398-5267
http://www.nrcs.usda.gov/programs/whip/

United States Army Corps of Engineers (USACE)
111 N. Canal Street
Chicago, Illinois 60606-7206
Telephone: (312)-846-5333
Fax: (312)-353-2169
http://www.lrc.usace.army.mil/

United States Fish and Wildlife Service (USFWS)
Chicago Field Office
1250 South Grove Avenue, Suite 103
Barrington, IL 60010
Phone: (847)-381-2253
Fax: (847)-381-2285

Other Related Contacts

Catalog of Federal Funding Sources for Watershed Protection Web Site
http://cfpub.epa.gov/fedfund/

Fox River Ecosystem Partnership (FREP)
http://foxriverecosystem.org/

North American Wetlands Conservation Act Grants Program
http://birdhabitat.fws.gov/NAWCA/grants.htm

North American Wetland Conservation Act Programs
http://birdhabitat.fws.gov/NAWCA/grants.htm

U.S. Fish and Wildlife Foundation
http://www.nfwf.org/