# 2006 SUMMARY REPORT
# of
# Third Lake

## Lake County, Illinois

*Prepared by the*


**LAKE COUNTY HEALTH DEPARTMENT**
**ENVIRONMENTAL HEALTH SERVICES**
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# LAKE FACTS

| | |
|---|---|
| **Lake Name:** | Third Lake |
| **Historical Name:** | Chittenden Lake |
| **Nearest Municipality:** | Village of Third Lake |
| **Location:** | T45N, R10E, Section 13 and 24 |
| **Elevation:** | 766.2 feet |
| **Major Tributaries:** | Mill Creek |
| **Watershed:** | Des Plaines River |
| **Sub-watershed:** | Mill Creek |
| **Receiving Waterbody:** | Grandwood Park Lake |
| **Surface Area:** | 155.5 acres |
| **Shoreline Length:** | 2.0 miles |
| **Maximum Depth:** | 70.0 feet |
| **Average Depth:** | 20.5 feet |
| **Lake Volume:** | 3187.5 acre-feet |
| **Lake Type:** | Glacial |
| **Watershed Area:** | 8,552.7 acres |
| **Major Watershed Land Uses:** | Single Family and Agricultural |
| **Bottom Ownership:** | Private, Public (Village of Third Lake, Lake County Forest Preserve) |
| **Management Entities:** | Village of Third Lake |
| **Current and Historical Uses:** | Swimming, fishing, and  boating. |
| **Description of Access:** | Boat access locations are private, open to the public (with a fee), walk in access trough LCFPD property. |

In 2005, Third Lake was chosen to be one of seven "sentinel" lakes in the county that the Lakes Management Unit (LMU) will monitor annually for five years, beginning with the 2005 season. This report summarizes the water quality sampling results and aquatic plant surveys conducted in 2006 on Third Lake. Similar reports have been written on data collected in 1993, 1998, 1999, 2000, and 2005 and are available from the LMU. The following report does not cover lake history and discussion of the watershed, as other reports have.

## SUMMARY OF WATER QUALITY

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

Third Lake was thermally stratified from May through September 2006. The lake was weakly stratified by May and strongly stratified by June (at approximately the 16 foot depth). The thermocline (the transition region between the epilimnion and the hypolimnion) remained strong until September, when water temperatures throughout the water column grew closer together. Turnover was beginning during the September sampling, although the thermocline was still present at approximately 46 feet.

The dissolved oxygen (DO) concentrations in the epilimnion did not indicate any significant problems (Appendix B). However, anoxic conditions (DO < 1 mg/L) existed from May through September in the hypolimnion. The anoxic boundary was at its shallowest in September at approximately 26 feet (39% of the lake volume) and deepest in May and June at approximately 54 feet (4% of the lake volume). Water quality has improved in the mid-depth (metalimnion) layer of the lake due to the operation of the layered aeration system. DO concentrations that were previously anoxic below a depth of 12 feet have been well above 2 mg/L recently in the mid-depth layer.

Secchi disk depth (water clarity) averaged 9.44 feet during 2006, which was above the Lake County median of 3.27 feet (Appendix D). This was an increase from 2005 (7.83 feet) and 2000 (4.17 feet). The VLMP Secchi depth has remained consistent over the past six years with averages ranging from 6.98 feet to 9.09 feet (Figure 2). Water clarity is related to the amount of total suspended solids (TSS) in the water column. As the Secchi depth has been increasing over the years, the average TSS has decreased (Figure 3). The 2006 average epilimnetic TSS of 3.5 mg/L was similar to the 2005 average (3.6 mg/L) and 56% lower than the 2001 average (7.9 mg/L). The 2006 average epilimnetic TSS was lower than the Lake County median of 7.9 mg/L.

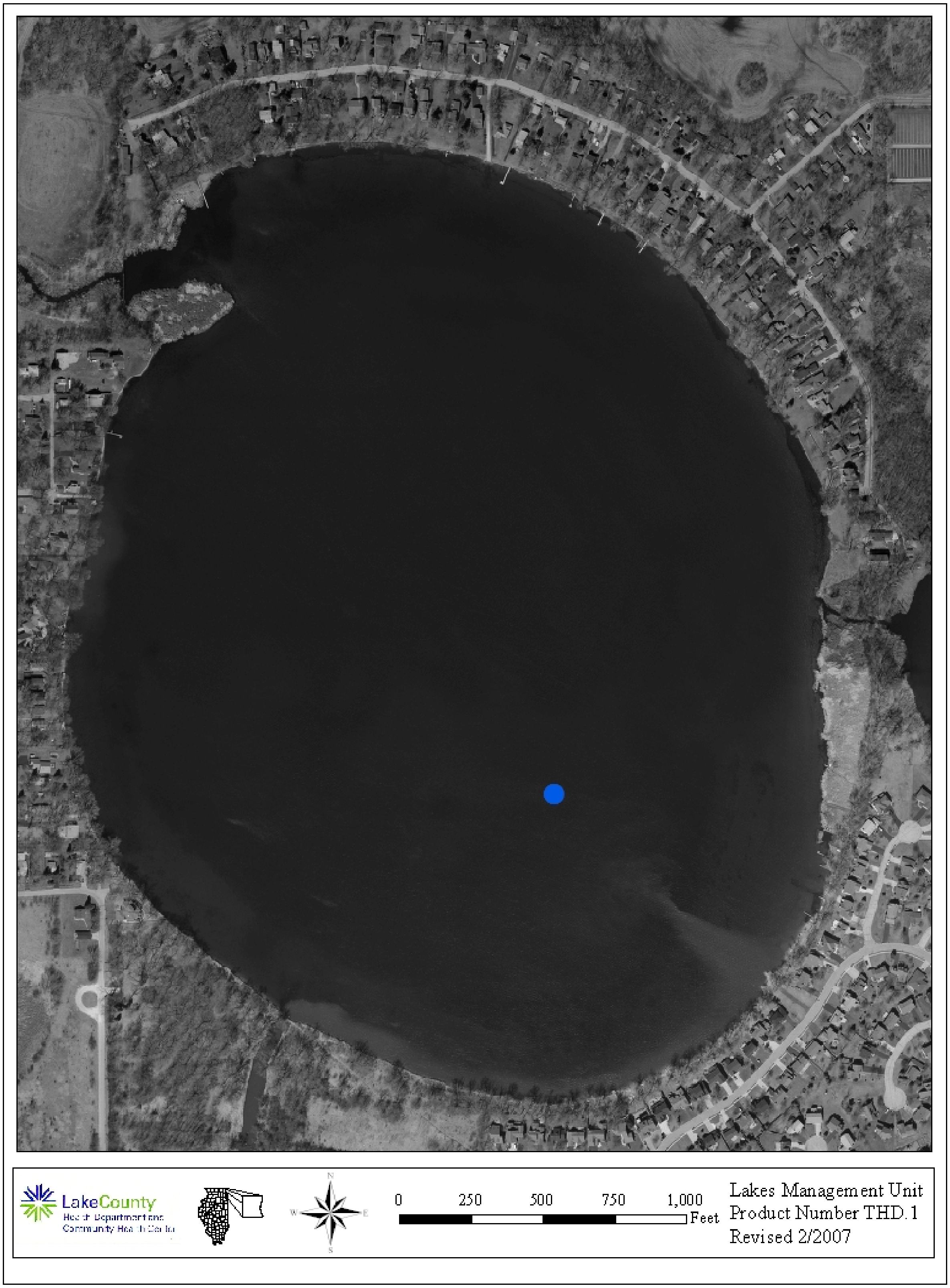
A 2006 average epilimnetic total phosphorus (TP) concentrations of 0.022 mg/L was up from the 2005 average of 0.019 mg/L but lower than the 2000 average of 0.035 mg/L. It was also below the county median of 0.060 mg/L. The 2006 seasonal hypolimnetic average of 0.175 mg/L was above the county median of 0.163 mg/l. This was a significant decrease from the previous monitoring when the hypolimnetic average TP was 0.526 mg/L in 2005 and 0.750 mg/L in 2000. Much of this fluctuation may have been due to environmental affects, such as rain events or water temperature, which influence the thermal stratification and turnover of the lake, and therefore varies between years. Phosphorus can be released from sediment through biological or mechanical processes, or from plant or algae as they die. This explains why the TP concentrations were higher in the hypolimnion. Third Lake had a TN:TP ratio of 96:1 in 2006 and 2005 and 69:1 in 2000. This indicates that the lake was phosphorus limited, which means that any addition of phosphorus could result in increases in plant and algae biomass. Most lakes in Lake County are phosphorus limited. The trophic state of Third Lake based on phosphorus concentration during 2000 was eutrophic with a TSIp score of 55.8, while in 2005 and 2006 the trophic state was mesotrophic with TSIp scores of 46.6 and 48.8. Third Lake ranked 16$^{th}$ out of 162 lakes in Lake County based on average TP concentrations (Table 2).

The Illinois Environmental Protection Agency (IEPA) has assessment indices to classify Illinois lakes for their ability to support aquatic life, swimming, and recreational uses. The guidelines consider several aspects, such as water clarity, phosphorus concentrations (TSIp), and aquatic plant coverage. According to this index, Third Lake provides *Full* support of aquatic life, swimming, and recreational activities as a result of low TP concentrations. The lake provides *Full* overall use.

Third Lake continues to have high concentrations of nitrate-nitrogen from April through June. The April concentration of 2.10 mg/L was fourteen times higher than the county epilimnetic median of 0.150 mg/L. The 2006 average concentration was 0.980 mg/L, which was an increase from the 2005 average of 0.820 mg/L and a decrease from the 2000 average (1.233 mg/L). Beginning in 2006, due to the purchase of a new analyzer, the lab began measuring nitrogen as nitrate + nitrite (instead of just nitrate). This change in analyzing should be of little significance since nitrite is quickly converted to nitrate under oxic conditions. The majority of the nitrate-nitrogen may be entering the lake from the Avon-Fremont Drainage ditch during spring and early summer runoff.

Conductivity is a measurement of water's ability to conduct electricity and is positively correlated with chloride ($Cl^-$) concentration. The Lake County median conductivity for near surface samples was 0.7948 milliSiemens/cm (mS/cm). During 2006, the average epilimnetic conductivity reading for Third Lake was 88% higher at 1.4910 mS/cm and was an increase of only 0.2% from 2005 but an increase of 84% from 2000. The hypolimnetic conductivity reading showed a similar pattern to the epilimnetic conductivity readings. The 2006 average $Cl^-$ concentration in Third Lake was above the Lake County median (171 mg/L), with a seasonal average of 312 mg/L. This was a decrease from the 2005 average of 318 mg/L. Water levels on Third Lake rose by more than 7 inches from April to November, this provided more lake volume and could be a reason for the lower 2006 values. Stormwater runoff from impervious surfaces such as roads and parking lots can deliver high concentrations of this $Cl^-$ to nearby lakes and ponds, with road salts being a main source. A study done in Canada reported 10% of aquatic species are harmed by prolonged exposure to $Cl^-$ concentrations greater than 220 mg/L. Additionally, shifts in algal populations were associated with $Cl^-$ concentrations as low as 12 mg/l. Therefore, lakes can be negatively impacted by high $Cl^-$ concentrations and it is important to keep the use of road salts to a minimum within the watershed.

**Figure 1.  Water quality sampling site on Third Lake, 2006.**



# Table 1. Water quality data for Third Lake, 2000, 2005, and 2006.

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

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

| 2000 | Epilimnion | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DEPTH | ALK | TKN | $NH_3$-N | $NO_3$-$N^*$ | TP | SRP | TDS | $Cl^-$ | TSS | TS | TVS | SECCHI | COND | pH | DO |
| 10-May | 3 | 160 | 0.86 | <0.1 | 2.07 | 0.012 | <0.005 | 696 | NA | 2.2 | 611 | 120 | 7.71 | 0.9971 | 8.60 | 7.97 |
| 14-Jun | 3 | 162 | 1.20 | 0.13 | 2.08 | 0.041 | 0.008 | 542 | NA | 2.4 | 551 | 167 | 5.18 | 0.8091 | 7.97 | 7.15 |
| 11-Jul | 3 | 164 | 1.16 | <0.1 | 1.41 | 0.045 | 0.010 | 474 | NA | 10.0 | 494 | 148 | 2.07 | 0.7187 | 7.93 | 7.47 |
| 16-Aug | 3 | 158 | 1.30 | <0.1 | 0.41 | 0.038 | 0.007 | 450 | NA | 13.0 | 504 | 157 | 2.76 | 0.7417 | 8.73 | 7.98 |
| 13-Sep | 3 | 157 | 1.48 | <0.1 | 0.20 | 0.041 | 0.012 | 498 | NA | 12.0 | 524 | 163 | 3.12 | 0.7935 | 8.70 | 8.13 |
| | **Average** | 160 | 1.20 | $0.130^k$ | 1.233 | 0.035 | $0.009^k$ | 532 | NA | 7.9 | 537 | 151 | 4.17 | 0.8120 | 8.39 | 7.74 |

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

k = Denotes that the actual value is known to be less than the value presented.
NA= Not applicable
* = Prior to 2006 only Nitrate - nitrogen was analyzed

# Table 1. Continued.

| 2006 | Hypolimnion | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DEPTH | ALK | TKN | $NO_2$+$NO_3$-N | $NO_3$-N | TP | SRP | TDS | $Cl^-$ | TSS | TS | TVS | SECCHI | COND | pH | DO |
| 12-Apr | 55 | 159 | 1.29 | 0.254 | 1.970 | 0.032 | 0.009 | NA | 340 | 2.8 | 956 | 158 | NA | 1.5960 | 7.64 | 10.47 |
| 17-May | 57 | 171 | 2.08 | 0.920 | 1.340 | 0.134 | 0.084 | NA | 337 | 2.6 | 924 | 137 | NA | 1.5910 | 6.97 | 0.36 |
| 21-Jun | 57 | 174 | 1.93 | 0.972 | 1.180 | 0.138 | 0.106 | NA | 328 | 2.3 | 989 | 207 | NA | 1.6010 | 6.89 | 0.19 |
| 19-Jul | 57 | 181 | 2.52 | 1.450 | 0.548 | 0.163 | 0.127 | NA | 339 | 2.3 | 995 | 206 | NA | 1.6330 | 6.73 | 0.17 |
| 16-Aug | 57 | 183 | 2.27 | 1.470 | 0.315 | 0.138 | 0.103 | NA | 342 | 3.8 | 976 | 175 | NA | 1.6270 | 6.71 | 0.15 |
| 20-Sep | 59 | 212 | 3.42 | 2.680 | <0.05 | 0.580 | 0.536 | NA | 345 | 4.0 | 973 | 170 | NA | 1.6410 | 6.78 | 0.16 |
| 01-Nov | 56 | 158 | 1.13 | 0.302 | 0.414 | 0.040 | 0.014 | NA | 293 | 3.1 | 852 | 155 | NA | 1.4240 | 7.94 | 8.55 |
| | **Average** | 177 | 2.09 | 1.546[k] | 0.825[k] | 0.175 | 0.390[k] | NA | 332 | 3.0 | 952 | 173 | NA | 1.5876 | 7.09 | 2.86 |

| 2005 | Hypolimnion | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DEPTH | ALK | TKN | $NH_3$-N | $NO_3$-N[*] | TP | SRP | TDS | $Cl^-$ | TSS | TS | TVS | SECCHI | COND | pH | DO |
| 12-Apr | 61 | 175 | 1.25 | 0.37 | 1.630 | 0.016 | 0.013 | NA | 302 | 2.1 | 874 | 148 | NA | 1.4590 | 7.36 | 7.18 |
| 18-May | 62 | 189 | 1.76 | 0.97 | 0.991 | 0.124 | 0.091 | NA | 303 | 1.7 | 870 | 135 | NA | 1.4800 | 6.79 | 0.66 |
| 22-Jun | 59 | 209 | 2.89 | 2.02 | <0.05 | 0.525 | 0.461 | NA | 303 | 2.9 | 916 | 192 | NA | 1.4670 | 6.61 | 0.00 |
| 20-Jul | 60 | 215 | 3.10 | 2.00 | 0.082 | 0.471 | 0.413 | NA | 303 | 7.9 | 897 | 164 | NA | 1.4740 | 6.58 | 0.04 |
| 17-Aug | 59 | 234 | 4.00 | 3.14 | <0.05 | 0.762 | 0.689 | NA | 301 | 5.1 | 913 | 194 | NA | 1.4870 | 6.62 | 0.01 |
| 21-Sep | 60 | 256 | 5.00 | 4.03 | <0.05 | 1.140 | 1.080 | NA | 300 | 4.0 | 875 | 138 | NA | 1.4980 | 5.80 | 0.06 |
| 19-Oct | 59 | 235 | 3.73 | 3.08 | <0.05 | 0.641 | 0.564 | NA | 299 | 15.0 | 863 | 112 | NA | 1.5325 | 6.43 | 0.15 |
| | **Average** | 216 | 3.10 | 2.23 | 0.901[k] | 0.526 | 0.473 | NA | 302 | 5.5 | 887 | 155 | NA | 1.4854 | 6.60 | 1.16 |

| 2000 | Hypolimnion | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | DEPTH | ALK | TKN | $NH_3$-N | $NO_3$-N[*] | TP | SRP | TDS | $Cl^-$ | TSS | TS | TVS | SECCHI | COND | pH | DO |
| 10-May | 60 | 183 | 1.20 | 1.02 | 1.08 | 0.111 | 0.078 | 588 | NA | 1.9 | 687 | 141 | NA | 1.1380 | 7.77 | 1.56 |
| 14-Jun | 60 | 197 | 2.54 | 1.77 | 0.49 | 0.314 | 0.312 | 726 | NA | 4.2 | 781 | 208 | NA | 1.1630 | 7.29 | 0.00 |
| 11-Jul | 61 | 225 | 4.07 | 3.13 | 0.08 | 0.833 | 0.743 | 684 | NA | 4.3 | 755 | 187 | NA | 1.1690 | 6.90 | 0.00 |
| 16-Aug | 60 | 259 | 5.80 | 5.15 | 0.06 | 1.380 | 1.330 | 677 | NA | 3.6 | 725 | 179 | NA | 1.1780 | 7.08 | 0.00 |
| 13-Sep | 60 | 250 | 5.46 | 4.48 | <0.05 | 1.110 | 0.982 | 704 | NA | 2.8 | 735 | 188 | NA | 1.1860 | 7.04 | 0.00 |
| | **Average** | 223 | 3.81 | 3.11 | 0.43[k] | 0.750 | 0.689 | 676 | NA | 3.4 | 737 | 181 | NA | 1.1668 | 7.22 | 0.31 |

**Glossary**

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

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

NA= Not applicable

* = Prior to 2006 only Nitrate - nitrogen was analyzed

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

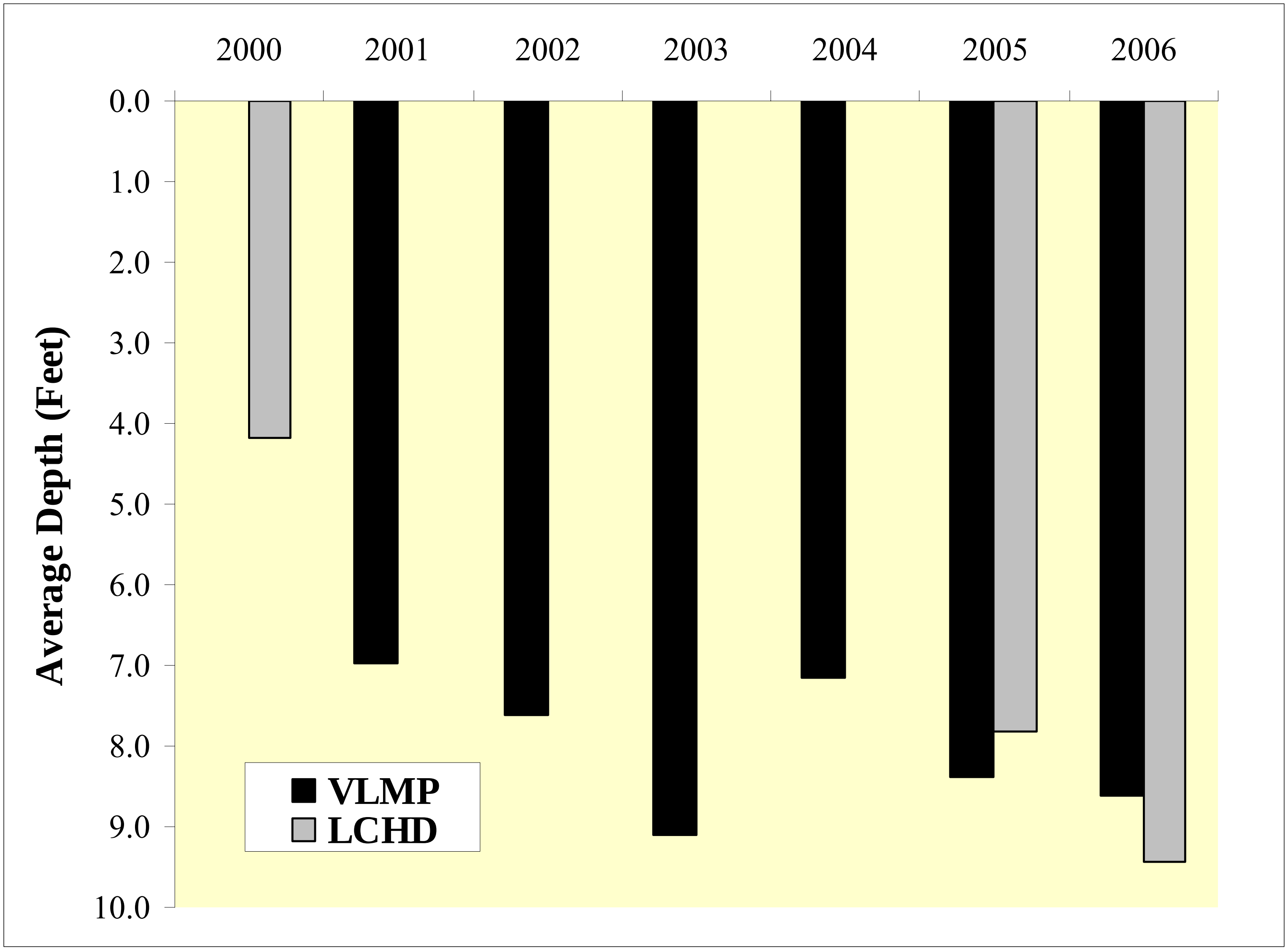
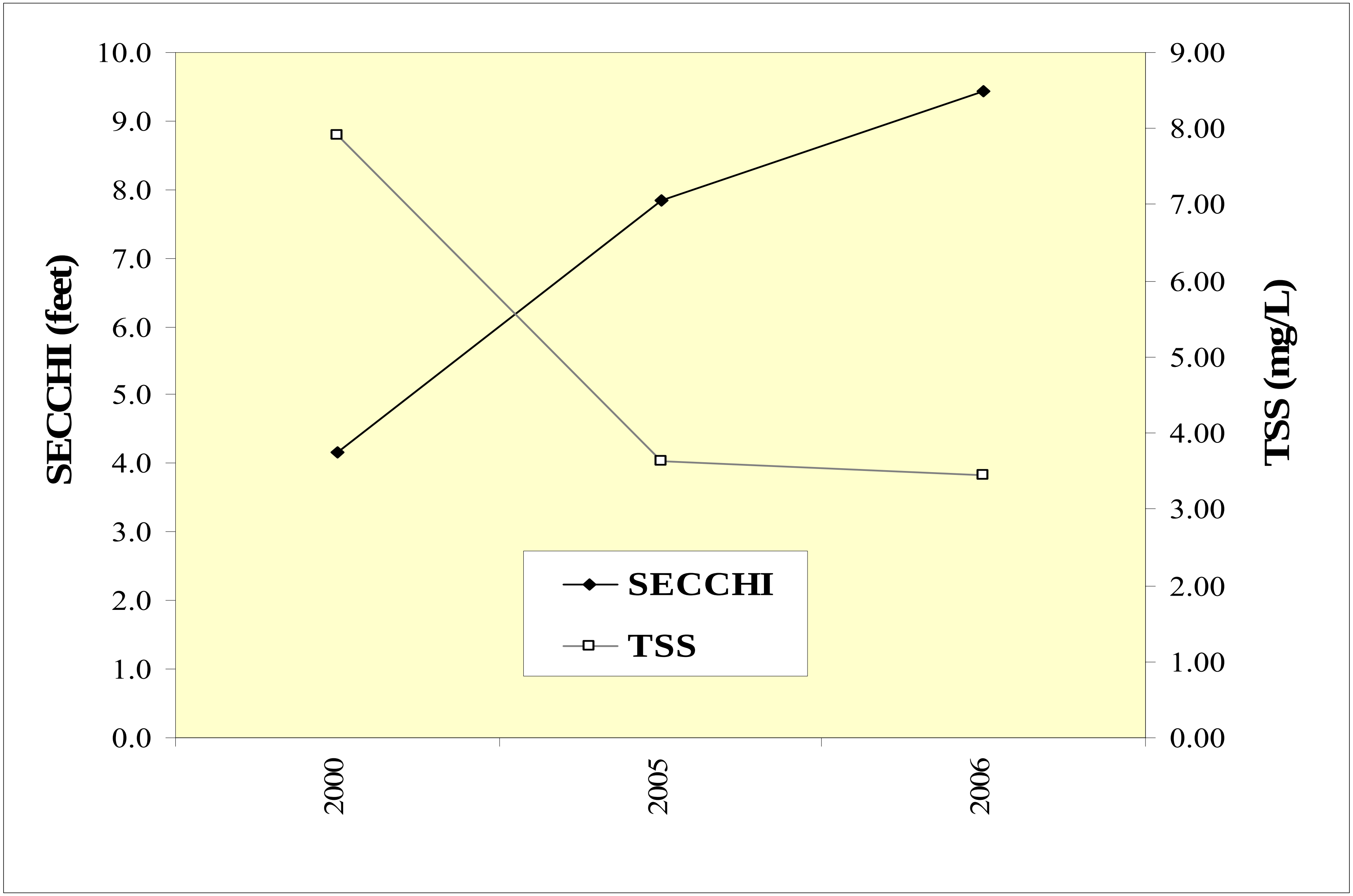


**Figure 3. Total suspended solid (TSS) concentrations vs. Secchi depth for Third Lake, 2000 - 2006.**



## Table 2. Lake County average TSI phosphorous (TSIp) ranking 2000-2006.

| RANK | LAKE NAME | TP AVE | TSIp |
|---|---|---|---|
| 1 | Cedar Lake | 0.0154 | 43.61 |
| 2 | Windward Lake | 0.0158 | 43.95 |
| 3 | Sterling Lake | 0.0162 | 44.31 |
| 4 | Lake Minear | 0.0165 | 44.57 |
| 5 | Pulaski Pond | 0.0180 | 45.83 |
| 6 | Timber Lake | 0.0180 | 45.83 |
| 7 | Fourth Lake | 0.0182 | 45.99 |
| 8 | West Loon Lake | 0.0182 | 45.99 |
| 9 | Lake Carina | 0.0193 | 46.86 |
| 10 | Independence Grove | 0.0194 | 46.91 |
| 11 | Lake Kathyrn | 0.0200 | 47.35 |
| 12 | Lake of the Hollow | 0.0200 | 47.35 |
| 13 | Banana Pond | 0.0202 | 47.49 |
| 14 | Bangs Lake | 0.0220 | 48.72 |
| 15 | Cross Lake | 0.0220 | 48.72 |
| **16** | **Third Lake** | **0.0221** | **48.82** |
| 17 | Dog Pond | 0.0222 | 48.85 |
| 18 | Sand Pond | 0.0230 | 49.36 |
| 19 | Stone Quarry Lake | 0.0230 | 49.36 |
| 20 | Cranberry Lake | 0.0240 | 49.98 |
| 21 | Deep Lake | 0.0240 | 49.98 |
| 22 | Druce Lake | 0.0244 | 50.22 |
| 23 | Little Silver Lake | 0.0246 | 50.33 |
| 24 | Round Lake | 0.0254 | 50.80 |
| 25 | Lake Leo | 0.0256 | 50.91 |
| 26 | Dugdale Lake | 0.0274 | 51.89 |
| 27 | Peterson Pond | 0.0274 | 51.89 |
| 28 | Lake Miltmore | 0.0276 | 51.99 |
| 29 | Ames Pit | 0.0278 | 52.10 |
| 30 | East Loon Lake | 0.0280 | 52.20 |
| 31 | Lake Zurich | 0.0282 | 52.30 |
| 32 | Lake Fairfield | 0.0296 | 53.00 |
| 33 | Gray's Lake | 0.0302 | 53.29 |
| 34 | Highland Lake | 0.0302 | 53.29 |
| 35 | Hook Lake | 0.0302 | 53.29 |
| 36 | Lake Catherine (Site 1) | 0.0308 | 53.57 |
| 37 | Lambs Farm Lake | 0.0312 | 53.76 |
| 38 | Old School Lake | 0.0312 | 53.76 |
| 39 | Sand Lake | 0.0316 | 53.94 |
| 40 | Sullivan Lake | 0.0320 | 54.13 |
| 41 | Lake Linden | 0.0326 | 54.39 |
| 42 | Gages Lake | 0.0338 | 54.92 |
| 43 | Hendrick Lake | 0.0344 | 55.17 |

## Table 2. Continued.

| RANK | LAKE NAME | TP AVE | TSIp |
|---|---|---|---|
| 44 | Diamond Lake | 0.0372 | 56.30 |
| 45 | Channel Lake (Site 1) | 0.0380 | 56.60 |
| 46 | White Lake | 0.0408 | 57.63 |
| 47 | Sun Lake | 0.0410 | 57.70 |
| 48 | Potomac Lake | 0.0424 | 58.18 |
| 49 | Duck Lake | 0.0426 | 58.25 |
| 50 | Old Oak Lake | 0.0428 | 58.32 |
| 51 | Wooster Lake | 0.0433 | 58.48 |
| 52 | Deer Lake | 0.0434 | 58.52 |
| 53 | Schreiber Lake | 0.0434 | 58.52 |
| 54 | Nielsen Pond | 0.0448 | 58.98 |
| 55 | Turner Lake | 0.0458 | 59.30 |
| 56 | Seven Acre Lake | 0.0460 | 59.36 |
| 57 | Willow Lake | 0.0464 | 59.48 |
| 58 | Lucky Lake | 0.0476 | 59.85 |
| 59 | Davis Lake | 0.0476 | 59.85 |
| 60 | East Meadow Lake | 0.0478 | 59.91 |
| 61 | College Trail Lake | 0.0496 | 60.45 |
| 62 | Lake Lakeland Estates | 0.0524 | 61.24 |
| 63 | Butler Lake | 0.0528 | 61.35 |
| 64 | West Meadow Lake | 0.0530 | 61.40 |
| 65 | Heron Pond | 0.0545 | 61.80 |
| 66 | Little Bear Lake | 0.0550 | 61.94 |
| 67 | Lucy Lake | 0.0552 | 61.99 |
| 68 | Lake Christa | 0.0576 | 62.60 |
| 69 | Lake Charles | 0.0580 | 62.70 |
| 70 | Crooked Lake | 0.0608 | 63.38 |
| 71 | Waterford Lake | 0.0610 | 63.43 |
| 72 | Lake Naomi | 0.0616 | 63.57 |
| 73 | Lake Tranquility S1 | 0.0618 | 63.62 |
| 74 | Werhane Lake | 0.0630 | 63.89 |
| 75 | Liberty Lake | 0.0632 | 63.94 |
| 76 | Countryside Glen Lake | 0.0642 | 64.17 |
| 77 | Leisure Lake | 0.0648 | 64.30 |
| 78 | St. Mary's Lake | 0.0666 | 64.70 |
| 79 | Long Lake | 0.0680 | 65.00 |
| 80 | Mary Lee Lake | 0.0682 | 65.04 |
| 81 | Hastings Lake | 0.0684 | 65.08 |
| 82 | Honey Lake | 0.0690 | 65.21 |
| 83 | North Tower Lake | 0.0718 | 65.78 |
| 84 | Lake Fairview | 0.0724 | 65.90 |
| 85 | Spring Lake | 0.0726 | 65.94 |
| 86 | ADID 203 | 0.0730 | 66.02 |

# Table 2. Continued.

| RANK | LAKE NAME | TP AVE | TSIp |
|---|---|---|---|
| 87 | Bluff Lake | 0.0734 | 66.10 |
| 88 | Harvey Lake | 0.0766 | 66.71 |
| 89 | Broberg Marsh | 0.0782 | 67.01 |
| 90 | Countryside Lake | 0.0788 | 67.12 |
| 91 | Echo Lake | 0.0792 | 67.19 |
| 92 | Sylvan Lake | 0.0794 | 67.23 |
| 93 | Big Bear Lake | 0.0806 | 67.45 |
| 94 | Petite Lake | 0.0834 | 67.94 |
| 95 | Lake Marie (Site 1) | 0.0850 | 68.21 |
| 96 | North Churchill Lake | 0.0872 | 68.58 |
| 97 | Grandwood Park, Site II, Outflow | 0.0876 | 68.65 |
| 98 | South Churchill Lake | 0.0896 | 68.97 |
| 99 | Rivershire Pond 2 | 0.0900 | 69.04 |
| 100 | McGreal Lake | 0.0914 | 69.26 |
| 101 | International Mine and Chemical Lake | 0.0948 | 69.79 |
| 102 | Eagle Lake (Site I) | 0.0950 | 69.82 |
| 103 | Dunns Lake | 0.0952 | 69.85 |
| 104 | Fish Lake | 0.0956 | 69.91 |
| 105 | Lake Barrington | 0.0956 | 69.91 |
| 106 | Lochanora Lake | 0.0960 | 69.97 |
| 107 | Owens Lake | 0.0978 | 70.23 |
| 108 | Woodland Lake | 0.0986 | 70.35 |
| 109 | Island Lake | 0.0990 | 70.41 |
| 110 | McDonald Lake 1 | 0.0996 | 70.50 |
| 111 | Tower Lake | 0.1000 | 70.56 |
| 112 | Longview Meadow Lake | 0.1024 | 70.90 |
| 113 | Redwing Slough, Site II, Outflow | 0.1072 | 71.56 |
| 114 | Lake Forest Pond | 0.1074 | 71.59 |
| 115 | Bittersweet Golf Course #13 | 0.1096 | 71.88 |
| 116 | Fox Lake (Site 1) | 0.1098 | 71.90 |
| 117 | Bresen Lake | 0.1126 | 72.27 |
| 118 | Round Lake Marsh North | 0.1126 | 72.27 |
| 119 | Timber Lake S | 0.1128 | 72.29 |
| 120 | Deer Lake Meadow Lake | 0.1158 | 72.67 |
| 121 | Taylor Lake | 0.1184 | 72.99 |
| 122 | Grand Avenue Marsh | 0.1194 | 73.11 |
| 123 | Columbus Park Lake | 0.1226 | 73.49 |
| 124 | Nippersink Lake (Site 1) | 0.1240 | 73.66 |
| 125 | Grass Lake (Site 1) | 0.1288 | 74.21 |
| 126 | Lake Holloway | 0.1322 | 74.58 |
| 127 | Lakewood Marsh | 0.1330 | 74.67 |
| 128 | Summerhill Estates Lake | 0.1384 | 75.24 |
| 129 | Redhead Lake | 0.1412 | 75.53 |

# Table 2. Continued.

| RANK | LAKE NAME | TP AVE | TSIp |
|---|---|---|---|
| 130 | Forest Lake | 0.1422 | 75.63 |
| 131 | Antioch Lake | 0.1448 | 75.89 |
| 132 | Valley Lake | 0.1470 | 76.11 |
| 133 | Slocum Lake | 0.1496 | 76.36 |
| 134 | Drummond Lake | 0.1510 | 76.50 |
| 135 | Pond-a-Rudy | 0.1514 | 76.54 |
| 136 | Lake Matthews | 0.1516 | 76.56 |
| 137 | Buffalo Creek Reservoir | 0.1550 | 76.88 |
| 138 | Pistakee Lake (Site 1) | 0.1592 | 77.26 |
| 139 | Salem Lake | 0.1650 | 77.78 |
| 140 | Half Day Pit | 0.1690 | 78.12 |
| 141 | Lake Eleanor Site II, Outflow | 0.1812 | 79.13 |
| 142 | Lake Farmington | 0.1848 | 79.41 |
| 143 | ADID 127 | 0.1886 | 79.71 |
| 144 | Lake Louise Inlet | 0.1938 | 80.10 |
| 145 | Grassy Lake | 0.1952 | 80.20 |
| 146 | Dog Bone Lake | 0.1990 | 80.48 |
| 147 | Redwing Marsh | 0.2072 | 81.06 |
| 148 | Stockholm Lake | 0.2082 | 81.13 |
| 149 | Bishop Lake | 0.2156 | 81.63 |
| 150 | Hidden Lake | 0.2236 | 82.16 |
| 151 | Fischer Lake | 0.2278 | 82.43 |
| 152 | Lake Napa Suwe (Outlet) | 0.2304 | 82.59 |
| 153 | Patski Pond (outlet) | 0.2512 | 83.84 |
| 154 | Oak Hills Lake | 0.2792 | 85.36 |
| 155 | Loch Lomond | 0.2954 | 86.18 |
| 156 | McDonald Lake 2 | 0.3254 | 87.57 |
| 157 | Fairfield Marsh | 0.3264 | 87.61 |
| 158 | ADID 182 | 0.3280 | 87.69 |
| 159 | Slough Lake | 0.4134 | 91.02 |
| 160 | Flint Lake Outlet | 0.4996 | 93.75 |
| 161 | Rasmussen Lake | 0.5025 | 93.84 |
| 162 | Albert Lake, Site II, outflow | 1.1894 | 106.26 |

# SUMMARY OF AQUATIC MACROPHYTES

An aquatic plant (macrophyte) survey was conducted in June and August of 2006. Sampling sites were based on a grid system created by mapping software (ArcMap), with each site located 60 meters apart. On Third Lake, there were 103 sites sampled in June (Figure 4) and 110 sites sampled in August (Figure 5). The maximum depth plants were found was 9.7 feet in June and 11.0 feet in August. Aquatic plants will not photosynthesize at water depths with less than 1% of the available sunlight at the surface. During 2006, the depth of the 1% light level ranged from 10 feet (September) to 20 feet (November). There was a total of nine aquatic plant species and one macro-algae species found between the two sampling events (Table 3). Eurasian Watermilfoil (EWM) was the most dominant species found at 39% of the sampling sites both months (Table 4a, b). *Chara* sp. was the second most common species found in June at 18% of the sampling sites and Spiny Naiad was the second most commons species found in August at 36% of the sampling sights.

To maintain a healthy sunfish/bass fishery, the Illinois Department of Natural Resources (IDNR) recommends plant coverage be 30% to 40% across the lake bottom. The 2006 surveys found approximately 59% and approximately 75% of the sites sampled had aquatic plants (Table 4c). It was calculated that approximately 34% – 46% of the lake bottom was covered by plants. At the present time the aquatic plant density is sufficient and no management is needed.

Floristic Quality Index (FQI) is a rapid assessment tool designed to evaluate the closeness of the flora of an area to that of undisturbed conditions. It can be used to: 1) identify natural areas, 2) compare the quality of different sites or different locations within a single site, 3) monitor long-term floristic trends, and 4) monitor habitat restoration efforts. A high FQI number indicates that there were large numbers of sensitive, high quality plant species present in the lake. Non-native species were also included in the FQI calculations for Lake County lakes. The average FQI for 2000-2006 Lake County lakes was 13.6 (Table 5). Third Lake had a FQI of 14.1 in 2006, which is a decrease from the 2005 (19.6) and 2000 (21.6).

**Figure 4. Aquatic plant sampling grid that illustrates plant density on Third Lake, June 2006.**

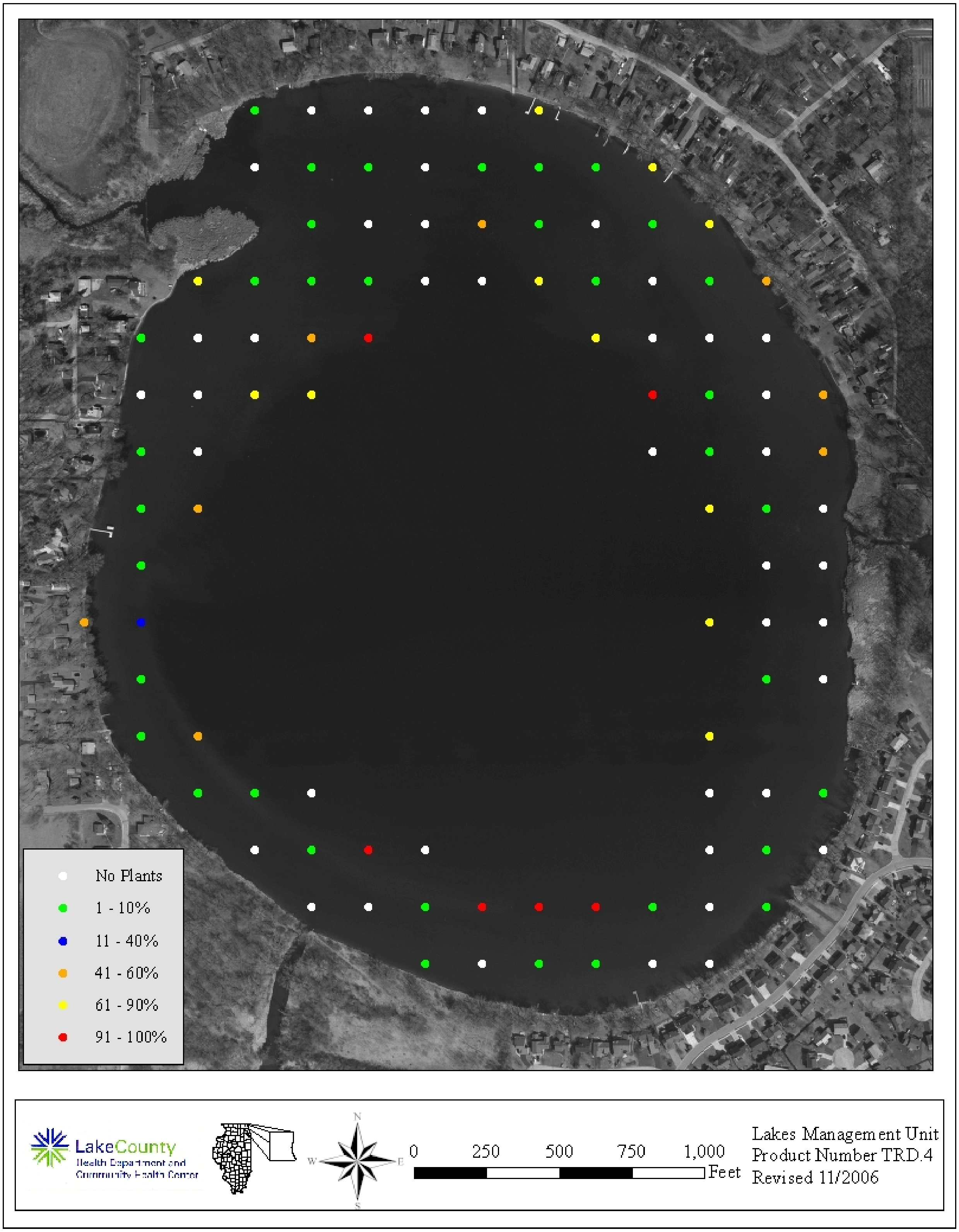


**Figure 5. Aquatic plant sampling grid that illustrates plant density on Third Lake, August 2006.**

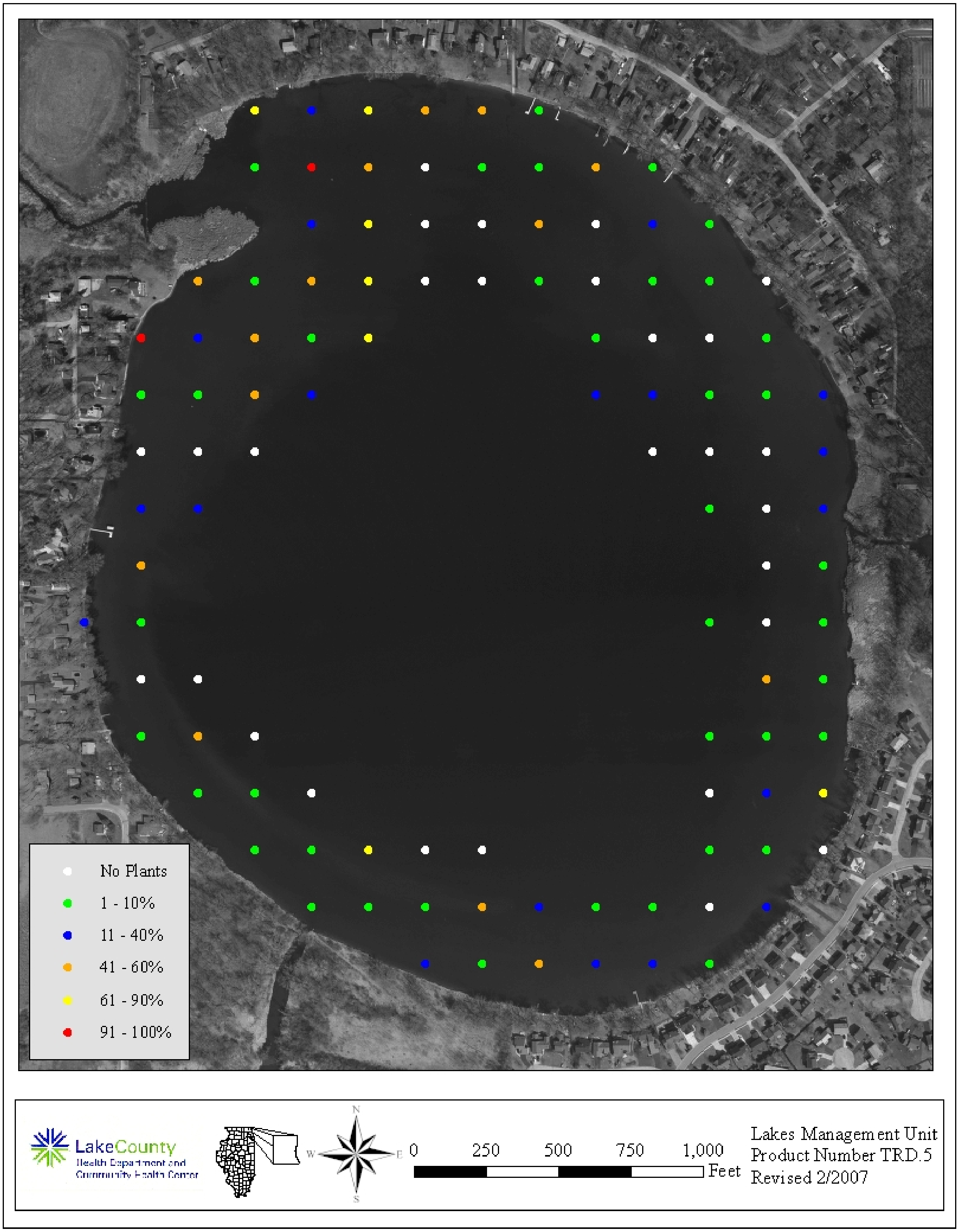


**Table 3. Aquatic plant species found in Third Lake in 2006.**

| | |
|---|---|
| Coontail | *Ceratophyllum demersum* |
| Chara | *Chara* spp. |
| Flatstem Pondweed | *Potamogeton zosteriformis* |
| Illinois Pondweed | *Potamogeton illinoensis* |
| Sago Pondweed | *Potamogeton pectinatus* |
| Eurasian Water Milfoil^ | *Myriophyllum spicatum* |
| Southern Naiad | *Najas guadalupensis* |
| Spiny Naiad | *Najas marina* |
| White Water Lily | *Nymphaea tuberosa* |
| Vallisneria (eel grass) | *Vallisneria americana* |

**^ Exotic plant**

## Table 4a. Aquatic plant species found at the 103 sampling sites on Third Lake in June, 2006. The maximum depth that plants were found was 9.7 feet.

**June**

| Plant Density | Chara | Coontail | Eurasian Watermilfoil | Flatstem Pondweed | Illinois Pondweed | Sago Pondweed | Spiny Naiad | Vallisneria |
|---|---|---|---|---|---|---|---|---|
| Absent | 84 | 100 | 63 | 102 | 101 | 88 | 99 | 102 |
| Present | 11 | 3 | 23 | 1 | 2 | 10 | 3 | 1 |
| Common | 1 | 0 | 1 | 0 | 0 | 4 | 1 | 0 |
| Abundant | 5 | 0 | 4 | 0 | 0 | 1 | 0 | 0 |
| Dominant | 2 | 0 | 12 | 0 | 0 | 0 | 0 | 0 |
| % Plant Occurrence | 18.4 | 2.9 | 38.8 | 1.0 | 1.9 | 14.6 | 3.9 | 1.0 |

## Table 4b. Aquatic plant species found at the 110 sampling sites on Third Lake in August 2006. The maximum depth that plants were found was 11.0 feet.

**August**

| Plant Density | Chara | Coontail | Eurasian Watermilfoil | Flatstem Pondweed | Illinois Pondweed | Sago Pondweed | Southern Naiad | Spiny Naiad | White Water Lily |
|---|---|---|---|---|---|---|---|---|---|
| Absent | 102 | 104 | 67 | 105 | 99 | 72 | 97 | 71 | 108 |
| Present | 6 | 4 | 34 | 3 | 10 | 31 | 11 | 17 | 2 |
| Common | 2 | 1 | 5 | 1 | 1 | 6 | 1 | 8 | 0 |
| Abundant | 0 | 1 | 2 | 1 | 0 | 1 | 0 | 10 | 0 |
| Dominant | 0 | 0 | 2 | 0 | 0 | 0 | 1 | 4 | 0 |
| % Plant Occurrence | 7.3 | 5.5 | 39.1 | 4.5 | 10.0 | 34.5 | 11.8 | 35.5 | 1.8 |

## Table 4c. Distribution of rake density across all sampling sites.

**June**

| Rake Density (Coverage) | # of Sites | % |
|---|---|---|
| No plants | 42 | 40.8% |
| >0 to 10% | 35 | 34.0% |
| >10 to 40% | 1 | 1.0% |
| >40 to 60% | 8 | 7.8% |
| >60 to 90% | 11 | 10.7% |
| >90% | 6 | 5.8% |
| Total Sites with Plants | 61 | 59.2% |
| Total # of Sites | 103 | 100.0% |

**August**

| Rake Density (Coverage) | # of Sites | % |
|---|---|---|
| No plants | 28 | 27.2% |
| >0 to 10% | 40 | 38.8% |
| >10 to 40% | 19 | 18.4% |
| >40 to 60% | 14 | 13.6% |
| >60 to 90% | 7 | 6.8% |
| >90% | 2 | 1.9% |
| Total Sites with Plants | 82 | 79.6% |
| Total # of Sites | 110 | 106.8% |

**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 | 35.7 | 37.9 |
| 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 | Deer Lake | 28.2 | 29.7 |
| 6 | Sullivan Lake | 28.2 | 29.7 |
| 7 | Little Silver Lake | 27.9 | 30.0 |
| 8 | Schreiber Lake | 26.8 | 27.6 |
| 9 | Cranberry Lake | 26.6 | 28.6 |
| 10 | Bangs Lake | 26.4 | 28.0 |
| 11 | West Loon Lake | 26.0 | 27.6 |
| 12 | Cross Lake | 25.2 | 27.8 |
| 13 | Lake Zurich | 24.0 | 26.0 |
| 14 | Lake of the Hollow | 23.8 | 26.2 |
| 15 | Lakewood Marsh | 23.8 | 24.7 |
| 16 | Round Lake | 23.5 | 25.9 |
| 17 | Fourth Lake | 23.0 | 24.8 |
| 18 | Druce Lake | 22.8 | 25.2 |
| 19 | Sun Lake | 22.7 | 24.5 |
| 20 | Countryside Glen Lake | 21.9 | 22.8 |
| 21 | Sterling Lake | 21.8 | 24.1 |
| 22 | Butler Lake | 21.4 | 23.1 |
| 23 | Duck Lake | 21.1 | 22.9 |
| 24 | Timber Lake (North) | 20.8 | 22.8 |
| 25 | Broberg Marsh | 20.5 | 21.4 |
| 26 | Davis Lake | 20.5 | 21.4 |
| 27 | ADID 203 | 20.5 | 20.5 |
| 28 | McGreal Lake | 20.2 | 22.1 |
| 29 | Wooster Lake | 19.8 | 22.3 |
| 30 | Lake Kathryn | 19.6 | 20.7 |
| 31 | Fish Lake | 19.3 | 21.2 |
| 32 | Redhead Lake | 19.3 | 21.2 |
| 33 | Owens Lake | 19.3 | 20.2 |
| 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 | Hendrick Lake | 17.7 | 17.7 |
| 39 | Summerhill Estates Lake | 17.1 | 18.0 |
| 40 | Ames Pit | 17.0 | 18.0 |
| 41 | Seven Acre Lake | 17.0 | 15.5 |
| 42 | Gray's Lake | 16.9 | 19.8 |
| 43 | Grand Avenue Marsh | 16.9 | 18.7 |

## Table 5. Continued.

| Rank | Lake Name | FQI (w/A) | FQI (native) |
|---|---|---|---|
| 44 | Long Lake | 16.9 | 18.7 |
| 45 | Bresen Lake | 16.6 | 17.8 |
| 46 | Windward Lake | 16.3 | 17.6 |
| 47 | Lake Barrington | 16.3 | 17.4 |
| 48 | Diamond Lake | 16.3 | 17.4 |
| 49 | Lake Napa Suwe | 16.3 | 17.4 |
| 50 | Dog Bone Lake | 15.7 | 15.7 |
| 51 | Redwing Slough | 15.6 | 16.6 |
| 52 | Independence Grove | 15.5 | 16.7 |
| 53 | Tower Lake | 15.2 | 17.6 |
| 54 | Heron Pond | 15.1 | 15.1 |
| 55 | Lake Tranquility (S1) | 15.0 | 17.0 |
| 56 | North Churchill Lake | 15.0 | 15.0 |
| 57 | Island Lake | 14.7 | 16.6 |
| 58 | Dog Training Pond | 14.7 | 15.9 |
| 59 | Highland Lake | 14.5 | 16.7 |
| 60 | Lake Fairview | 14.3 | 16.3 |
| 61 | Taylor Lake | 14.3 | 16.3 |
| **62** | **Third Lake** | **14.1** | **16.3** |
| 63 | Dugdale Lake | 14.0 | 15.1 |
| 64 | Eagle Lake (S1) | 14.0 | 15.1 |
| 65 | Longview Meadow Lake | 13.9 | 13.9 |
| 66 | Hook Lake | 13.4 | 15.5 |
| 67 | Timber Lake (South) | 13.4 | 15.5 |
| 68 | Bishop Lake | 13.4 | 15.0 |
| 69 | Mary Lee Lake | 13.1 | 15.1 |
| 70 | Old School Lake | 13.1 | 15.1 |
| 71 | Buffalo Creek Reservoir | 13.1 | 14.3 |
| 72 | McDonald Lake 2 | 13.1 | 14.3 |
| 73 | Old Oak Lake | 12.7 | 14.7 |
| 74 | White Lake | 12.7 | 14.7 |
| 75 | Dunn's Lake | 12.7 | 13.9 |
| 76 | Echo Lake | 12.5 | 14.8 |
| 77 | Hastings Lake | 12.5 | 14.8 |
| 78 | Sand Lake | 12.5 | 14.8 |
| 79 | Countryside Lake | 12.5 | 14.0 |
| 80 | Stone Quarry Lake | 12.5 | 12.5 |
| 81 | Honey Lake | 12.1 | 14.3 |
| 82 | Lake Leo | 12.1 | 14.3 |
| 83 | Lambs Farm Lake | 12.1 | 14.3 |
| 84 | Stockholm Lake | 12.1 | 13.5 |
| 85 | Pond-A-Rudy | 12.1 | 12.1 |
| 86 | Lake Matthews | 12.0 | 12.0 |

## Table 5. Continued.

| Rank | Lake Name | FQI (w/A) | FQI (native) |
|---|---|---|---|
| 87 | Flint Lake | 11.8 | 13.0 |
| 88 | Harvey Lake | 11.8 | 13.0 |
| 89 | Rivershire Pond 2 | 11.5 | 13.3 |
| 90 | Antioch Lake | 11.3 | 13.4 |
| 91 | Lake Charles | 11.3 | 13.4 |
| 92 | Lake Linden | 11.3 | 11.3 |
| 93 | Lake Naomi | 11.2 | 12.5 |
| 94 | Pulaski Pond | 11.2 | 12.5 |
| 95 | Redwing Marsh | 11.0 | 11.0 |
| 96 | West Meadow Lake | 11.0 | 11.0 |
| 97 | Nielsen Pond | 10.7 | 12.0 |
| 98 | Lake Holloway | 10.6 | 10.6 |
| 99 | Lake Carina | 10.2 | 12.5 |
| 100 | Crooked Lake | 10.2 | 12.5 |
| 101 | Lake Lakeland Estates | 10.0 | 11.5 |
| 102 | College Trail Lake | 10.0 | 10.0 |
| 103 | Werhane Lake | 9.8 | 12.0 |
| 104 | Big Bear Lake | 9.5 | 11.0 |
| 105 | Little Bear Lake | 9.5 | 11.0 |
| 106 | Loch Lomond | 9.4 | 12.1 |
| 107 | Sand Pond (IDNR) | 9.4 | 12.1 |
| 108 | Columbus Park Lake | 9.2 | 9.2 |
| 109 | Sylvan Lake | 9.2 | 9.2 |
| 110 | Fischer Lake | 9.0 | 11.0 |
| 111 | Grandwood Park Lake | 9.0 | 11.0 |
| 112 | Lake Fairfield | 9.0 | 10.4 |
| 113 | McDonald Lake 1 | 8.9 | 10.0 |
| 114 | East Meadow Lake | 8.5 | 8.5 |
| 115 | South Churchill Lake | 8.5 | 8.5 |
| 116 | Lake Christa | 8.5 | 9.8 |
| 117 | Lake Farmington | 8.5 | 9.8 |
| 118 | Lucy Lake | 8.5 | 9.8 |
| 119 | Bittersweet Golf Course #13 | 8.1 | 8.1 |
| 120 | Woodland Lake | 8.1 | 9.9 |
| 121 | Albert Lake | 7.5 | 8.7 |
| 122 | Lake Eleanor | 7.5 | 8.7 |
| 123 | Fairfield Marsh | 7.5 | 8.7 |
| 124 | Lake Louise | 7.5 | 8.7 |
| 125 | Banana Pond | 7.5 | 9.2 |
| 126 | Patski Pond | 7.1 | 7.1 |
| 127 | Rasmussen Lake | 7.1 | 7.1 |
| 128 | Slough Lake | 7.1 | 7.1 |
| 129 | Lucky Lake | 7.0 | 7.0 |

## Table 5. Continued.

| Rank | Lake Name | FQI (w/A) | FQI (native) |
|---|---|---|---|
| 130 | Lake Forest Pond | 6.9 | 8.5 |
| 131 | Leisure Lake | 6.4 | 9.0 |
| 132 | Peterson Pond | 6.0 | 8.5 |
| 133 | Grassy Lake | 5.8 | 7.1 |
| 134 | Slocum Lake | 5.8 | 7.1 |
| 135 | Gages Lake | 5.8 | 10.0 |
| 136 | Deer Lake Meadow Lake | 5.2 | 6.4 |
| 137 | ADID 127 | 5.0 | 5.0 |
| 138 | Liberty Lake | 5.0 | 5.0 |
| 139 | Oak Hills Lake | 5.0 | 5.0 |
| 140 | Drummond Lake | 5.0 | 7.1 |
| 141 | IMC Lake | 5.0 | 7.1 |
| 142 | North Tower Lake | 4.9 | 7.0 |
| 143 | Forest Lake | 3.5 | 5.0 |
| 144 | Half Day Pit | 2.9 | 5.0 |
| 145 | Lochanora Lake | 2.5 | 5.0 |
| 146 | Hidden Lake | 0.0 | 0.0 |
| 147 | St. Mary's Lake | 0.0 | 0.0 |
| 148 | Valley Lake | 0.0 | 0.0 |
| 149 | Waterford Lake | 0.0 | 0.0 |
| 150 | Potomac Lake | 0.0 | 0.0 |
| 151 | Willow Lake | 0.0 | 0.0 |
| | ***Mean*** | **13.6** | **14.9** |
| | ***Median*** | **12.5** | **14.3** |

## SUMMARY OF WILDLIFE AND HABITAT

Wildlife observations were made on a monthly basis during water quality activities. With the lake being in a residential setting with the majority of the shoreline as riprap, seawall, or lawn, wildlife habitat is limited. Good habitat was found on the undeveloped sections of the eastern and southwestern shorelines, and along the northwest section of the lake near the spillway. While the manicured lawns on the lake do not provide good habitat, many of the lots had a mature tree canopy at the shoreline, which harbored numerous wildlife species. Improvements to the wildlife habitat on Third Lake could include the placement of artificial nesting structures (i.e., bird and bat boxes), leaving deadfalls, creating buffer strips along shorelines, and implementing boating restrictions. Most of the birds observed were those common in residential settings (Table 6).

**Table 6. Wildlife species observed on Third Lake, April – October 2006.**

| | |
|---|---|
| *Birds* | |
| Canada Goose | *Branta canadensis* |
| Mallard | *Anas platyrhnchos* |
| Ring-billed Gull | *Larus delawarensis* |
| Great Blue Heron | *Ardea herodias* |
| Belted Kingfisher | *Megaceryle alcyon* |
| Common Flicker | *Colaptes auritus* |
| Great Crested Flycatcher | *Myiarchus crinitus* |
| Tree Swallow | *Iridoprocne bicolor* |
| Black-capped Chickadee | *Poecile atricapillus* |
| Wood Thrush | *Hylocichla mustelina* |
| Yellow-throated Vireo | *Vireo flavifrons* |
| Common Yellowthroat | *Geothlypis trichas* |
| Red-winged Blackbird | *Agelaius phoeniceus* |
| Starling | *Sturnus vulgaris* |
| House Sparrow | *Passer domesticus* |
| Northern Cardinal | *Cardinalis cardinalis* |
| *Amphibians* | |
| American toad | *Bufo americanus* |

# APPENDIX A. METHODS FOR FIELD DATA COLLECTION AND LABORATORY ANALYSES

## Water Sampling and Laboratory Analyses

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

## Plant Sampling

In order to randomly sample each lake, mapping software (ArcMap 9.1) overlaid a grid pattern onto a 2006 aerial photo of Lake County and placed points 60 or 30 meters apart, depending on lake size. Plants were sampled using a garden rake fitted with hardware cloth. The hardware cloth surrounded the rake tines and is tapered two feet up the handle. A rope was tied to the end of the handle for retrieval. At designated sampling sites, the rake was tossed into the water, and using the attached rope, was dragged across the bottom, toward the boat. After pulling the rake into the boat, plant coverage was assessed for overall abundance. Then plants were individually identified and placed in categories based on coverage. Plants that were not found on the rake but were seen in the immediate vicinity of the boat at the time of sampling were also recorded. Plants difficult to identify in the field were placed in plastic bags and identified with plant keys after returning to the office. The depth of each sampling location was measured either by a hand-held depth meter, or by pushing the rake straight down and measuring the depth along the rope or rake handle. One-foot increments were marked along the rope and rake handle to aid in depth estimation.

## Wildlife Assessment

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

**Table A1. Analytical methods used for water quality parameters.**

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

# APPENDIX B. MULTI-PARAMETER DATA FOR THIRD LAKE IN 2006

Third Lake 2006 Multiparameter data

| Date MMDDYY | Time HHMMSS | Text Depth feet | Dep25 feet | Temp øC | DO mg/l | DO% Sat | SpCond mS/cm | pH Units | PAR æE/s/mý | Depth of Light Meter feet | % Light Transmission | Extinction Coefficient |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | Average | 0.52 |
| 41206 | 80930 | 0.25 | 0.27 | 9.64 | 11.50 | 105.5 | NA | 7.85 | 193 | Surface | | |
| 41206 | 81026 | 1 | 1.08 | 9.56 | 11.42 | 104.5 | 1.5820 | 7.83 | 135 | Surface | 100% | |
| 41206 | 81130 | 2 | 1.96 | 9.56 | 11.40 | 104.3 | 1.5830 | 7.83 | 41 | 0.21 | 30% | 5.67 |
| 41206 | 81224 | 3 | 3.08 | 9.54 | 11.44 | 104.6 | 1.5830 | 7.84 | 39 | 1.33 | 29% | 0.04 |
| 41206 | 81310 | 4 | 4.11 | 9.53 | 11.43 | 104.5 | 1.5810 | 7.85 | 21 | 2.36 | 16% | 0.26 |
| 41206 | 81432 | 6 | 6.07 | 9.55 | 11.40 | 104.3 | 1.5820 | 7.85 | 15 | 4.32 | 11% | 0.08 |
| 41206 | 81602 | 8 | 7.96 | 9.53 | 11.44 | 104.6 | 1.5840 | 7.84 | 12 | 6.21 | 9% | 0.04 |
| 41206 | 81647 | 10 | 9.87 | 9.54 | 11.36 | 103.9 | 1.5820 | 7.84 | 8 | 8.12 | 6% | 0.05 |
| 41206 | 81757 | 12 | 12.04 | 9.53 | 11.43 | 104.5 | 1.5840 | 7.83 | 6 | 10.29 | 4% | 0.03 |
| 41206 | 81848 | 14 | 14.05 | 9.52 | 11.38 | 104.0 | 1.5860 | 7.83 | 4 | 12.3 | 3% | 0.03 |
| 41206 | 81952 | 16 | 16.01 | 9.53 | 11.18 | 102.2 | 1.5860 | 7.83 | 3 | 14.26 | 2% | 0.02 |
| 41206 | 82033 | 18 | 17.98 | 9.53 | 11.31 | 103.4 | 1.5770 | 7.83 | 1 | 16.23 | 0.7% | 0.07 |
| 41206 | 82132 | 20 | 19.72 | 9.50 | 11.35 | 103.7 | 1.5860 | 7.83 | 1 | 17.97 | 0.7% | 0.00 |
| 41206 | 82235 | 22 | 21.55 | 9.50 | 11.28 | 103.1 | 1.5860 | 7.83 | 1 | 19.8 | 0.7% | 0.00 |
| 41206 | 82345 | 24 | 24.14 | 9.48 | 11.38 | 103.9 | 1.5850 | 7.84 | 0 | 22.39 | | |
| 41206 | 82422 | 26 | 26.19 | 9.29 | 11.29 | 102.7 | 1.5820 | 7.83 | 0 | 24.44 | | |
| 41206 | 82524 | 28 | 28.22 | 8.97 | 11.31 | 102.0 | 1.5850 | 7.82 | 0 | 26.47 | | |
| 41206 | 82556 | 30 | 29.99 | 7.95 | 11.23 | 98.8 | 1.5870 | 7.76 | 0 | 28.24 | | |
| 41206 | 82732 | 32 | 32.08 | 7.83 | 11.35 | 99.6 | 1.5870 | 7.75 | 0 | 30.33 | | |
| 41206 | 82836 | 34 | 34.13 | 7.80 | 11.18 | 98.1 | 1.5790 | 7.74 | 0 | 32.38 | | |
| 41206 | 82906 | 36 | 36.10 | 7.01 | 11.32 | 97.4 | 1.5810 | 7.71 | 0 | 34.35 | | |
| 41206 | 82952 | 38 | 38.06 | 6.90 | 11.13 | 95.5 | 1.5840 | 7.70 | 0 | 36.31 | | |
| 41206 | 83040 | 40 | 39.87 | 6.78 | 11.23 | 96.1 | 1.5810 | 7.69 | 0 | 38.12 | | |
| 41206 | 83205 | 42 | 41.96 | 6.53 | 11.02 | 93.6 | 1.5850 | 7.66 | 0 | 40.21 | | |
| 41206 | 83239 | 44 | 43.89 | 6.49 | 10.83 | 91.9 | 1.5830 | 7.65 | 0 | 42.14 | | |
| 41206 | 83310 | 46 | 46.05 | 6.44 | 10.72 | 90.9 | 1.5820 | 7.64 | 0 | 44.3 | | |
| 41206 | 83414 | 48 | 47.90 | 6.43 | 10.65 | 90.3 | 1.5860 | 7.64 | 0 | 46.15 | | |
| 41206 | 83515 | 50 | 49.90 | 6.42 | 10.47 | 88.7 | 1.5840 | 7.63 | 0 | 48.15 | | |
| 41206 | 83603 | 52 | 51.72 | 6.40 | 10.61 | 89.9 | 1.5840 | 7.64 | 0 | 49.97 | | |
| 41206 | 83705 | 54 | 53.96 | 6.41 | 10.50 | 89.0 | 1.5850 | 7.64 | 0 | 52.21 | | |
| 41206 | 83746 | 56 | 55.95 | 6.41 | 10.43 | 88.3 | 1.5820 | 7.64 | 0 | 54.2 | | |
| 41206 | 83841 | 58 | 57.84 | 6.33 | 9.88 | 83.5 | 1.5850 | 7.57 | 0 | 56.09 | | |

Third Lake 2006 Multiparameter data

| Date MMDDYY | Time HHMMSS | Text Depth feet | Dep25 feet | Temp øC | DO mg/l | DO% Sat | SpCond mS/cm | pH Units | PAR æE/s/mý | Depth of Light Meter feet | % Light Transmission | Extinction Coefficient |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | Average | 0.32 |
| 51706 | 81453 | 0.25 | 0.49 | 14.19 | 9.12 | 92.8 | 1.54 | 8 | 3150 | Surface | | |
| 51706 | 81622 | 1 | 1.01 | 14.17 | 9.16 | 93.1 | 1.542 | 8.03 | 3730 | Surface | 100% | |
| 51706 | 81727 | 2 | 2.02 | 14.16 | 9.21 | 93.7 | 1.54 | 8.03 | 1081 | 0.27 | 29% | 4.59 |
| 51706 | 81827 | 3 | 2.98 | 14.14 | 9.12 | 92.7 | 1.54 | 8.04 | 767 | 1.23 | 21% | 0.28 |
| 51706 | 81930 | 4 | 3.98 | 14.12 | 9.05 | 92 | 1.546 | 8.04 | 501 | 2.23 | 13% | 0.19 |
| 51706 | 82027 | 6 | 6.02 | 14.02 | 9.25 | 93.8 | 1.537 | 8.04 | 468 | 4.27 | 13% | 0.02 |
| 51706 | 82142 | 8 | 8.02 | 13.89 | 9.16 | 92.6 | 1.531 | 8.03 | 339 | 6.27 | 9% | 0.05 |
| 51706 | 82305 | 10 | 10.04 | 13.66 | 9.18 | 92.5 | 1.534 | 8.02 | 154 | 8.29 | 4% | 0.10 |
| 51706 | 82411 | 12 | 12.02 | 13.31 | 8.86 | 88.4 | 1.545 | 7.99 | 104 | 10.27 | 3% | 0.04 |
| 51706 | 82453 | 14 | 14.04 | 13.07 | 8.72 | 86.5 | 1.546 | 7.97 | 58 | 12.29 | 2% | 0.05 |
| 51706 | 82551 | 16 | 15.99 | 12.96 | 8.58 | 84.9 | 1.542 | 7.94 | 39 | 14.24 | 1.0% | 0.03 |
| 51706 | 82658 | 18 | 18.01 | 12.8 | 8.42 | 83 | 1.532 | 7.88 | 27 | 16.26 | 0.7% | 0.02 |
| 51706 | 82749 | 20 | 20.01 | 12.62 | 8.12 | 79.8 | 1.544 | 7.89 | 17 | 18.26 | 0.5% | 0.03 |
| 51706 | 82849 | 22 | 21.99 | 12.44 | 8.15 | 79.8 | 1.546 | 7.88 | 11 | 20.24 | 0.3% | 0.02 |
| 51706 | 83010 | 24 | 24.06 | 12.14 | 7.8 | 75.8 | 1.549 | 7.82 | 6 | 22.31 | 0.2% | 0.03 |
| 51706 | 83059 | 26 | 26 | 11.59 | 7.43 | 71.3 | 1.566 | 7.76 | 5 | 24.25 | 0.1% | 0.01 |
| 51706 | 83207 | 28 | 28.06 | 11.17 | 7.11 | 67.6 | 1.57 | 7.72 | 3 | 26.31 | 0.1% | 0.02 |
| 51706 | 83320 | 30 | 29.99 | 10.11 | 7.01 | 65.1 | 1.58 | 7.61 | 1 | 28.24 | 0.0% | 0.04 |
| 51706 | 83422 | 32 | 32 | 7.74 | 7.42 | 65 | 1.583 | 7.47 | 1 | 30.25 | 0.0% | 0.00 |
| 51706 | 83513 | 34 | 34 | 7.23 | 7.92 | 68.5 | 1.579 | 7.47 | 0 | 32.25 | | |
| 51706 | 83603 | 36 | 35.99 | 7.02 | 7.57 | 65.2 | 1.58 | 7.42 | 1 | 34.24 | | |
| 51706 | 83708 | 38 | 38.04 | 6.86 | 7.1 | 60.9 | 1.581 | 7.37 | 1 | 36.29 | | |
| 51706 | 83809 | 40 | 39.95 | 6.74 | 6.78 | 58 | 1.582 | 7.34 | 1 | 38.2 | | |
| 51706 | 83855 | 42 | 42.01 | 6.67 | 6.1 | 52 | 1.582 | 7.28 | 0 | 40.26 | | |
| 51706 | 84144 | 44 | 44.01 | 6.63 | 5.63 | 48 | 1.582 | 7.22 | 1 | 42.26 | | |
| 51706 | 84233 | 46 | 45.99 | 6.61 | 5.41 | 46.1 | 1.582 | 7.21 | 0 | 44.24 | | |
| 51706 | 84319 | 48 | 48.06 | 6.57 | 5.02 | 42.7 | 1.584 | 7.17 | 0 | 46.31 | | |
| 51706 | 84408 | 50 | 50.02 | 6.51 | 4.02 | 34.2 | 1.581 | 7.13 | 1 | 48.27 | | |
| 51706 | 84458 | 52 | 52.02 | 6.47 | 3.33 | 28.3 | 1.588 | 7.09 | 1 | 50.27 | | |
| 51706 | 84625 | 54 | 54 | 6.34 | 0.89 | 7.5 | 1.587 | 6.99 | 0 | 52.25 | | |
| 51706 | 84724 | 56 | 56 | 6.31 | 0.39 | 3.3 | 1.591 | 6.97 | 0 | 54.25 | | |
| 51706 | 84839 | 58 | 57.98 | 6.29 | 0.32 | 2.7 | 1.59 | 6.97 | 0 | 56.23 | | |
| 51706 | 84922 | 60 | 59.66 | 6.3 | 0.48 | 4.1 | 1.587 | 6.97 | 1 | 57.91 | | |

Third Lake 2006 Multiparameter data

| Date MMDDYY | Time HHMMSS | Text Depth feet | Dep25 feet | Temp øC | DO mg/l | DO% Sat | SpCond mS/cm | pH Units | PAR æE/s/mý | Depth of Light Meter feet | % Light Transmission | Extinction Coefficient |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | Average | 0.62 |
| 62106 | 81941 | 0.25 | 0.22 | 23.07 | 7.94 | 96.1 | 1.514 | 8.45 | 193 | Surface | | |
| 62106 | 82020 | 1 | 1.05 | 23.06 | 7.85 | 95 | 1.514 | 8.46 | 169 | Surface | 100% | |
| 62106 | 82106 | 2 | 1.96 | 23.07 | 7.87 | 95.2 | 1.514 | 8.47 | 36 | 0.21 | 21% | 7.36 |
| 62106 | 82140 | 3 | 3.02 | 23.08 | 7.71 | 93.3 | 1.514 | 8.47 | 27 | 1.27 | 16% | 0.23 |
| 62106 | 82222 | 4 | 3.99 | 23.08 | 7.68 | 92.9 | 1.513 | 8.48 | 20 | 2.24 | 12% | 0.13 |
| 62106 | 82301 | 6 | 6.04 | 23.08 | 7.82 | 94.7 | 1.514 | 8.48 | 17 | 4.29 | 10% | 0.04 |
| 62106 | 82344 | 8 | 8.02 | 23.08 | 7.82 | 94.7 | 1.514 | 8.48 | 11 | 6.27 | 7% | 0.07 |
| 62106 | 82418 | 10 | 9.99 | 23.08 | 7.84 | 94.8 | 1.514 | 8.49 | 8 | 8.24 | 5% | 0.04 |
| 62106 | 82451 | 12 | 12.01 | 23.01 | 7.7 | 93.1 | 1.515 | 8.48 | 6 | 10.26 | 4% | 0.03 |
| 62106 | 82527 | 14 | 14.03 | 22.91 | 7.6 | 91.7 | 1.515 | 8.48 | 4 | 12.28 | 2% | 0.03 |
| 62106 | 82710 | 16 | 15.99 | 16.77 | 6.19 | 66.1 | 1.538 | 7.94 | 4 | 14.24 | 2% | 0.00 |
| 62106 | 82822 | 18 | 18.01 | 12.18 | 5.46 | 52.8 | 1.567 | 7.64 | 2 | 16.26 | 1.2% | 0.04 |
| 62106 | 82911 | 20 | 20.06 | 11.24 | 5.69 | 53.9 | 1.576 | 7.56 | 1 | 18.31 | 0.6% | 0.04 |
| 62106 | 83007 | 22 | 21.97 | 10.65 | 5.71 | 53.3 | 1.579 | 7.51 | 1 | 20.22 | 0.6% | 0.00 |
| 62106 | 83059 | 24 | 24.02 | 10.49 | 5.75 | 53.5 | 1.58 | 7.49 | 1 | 22.27 | 0.6% | 0.00 |
| 62106 | 83203 | 26 | 26 | 10.46 | 5.72 | 53.1 | 1.582 | 7.47 | 0 | 24.25 | | |
| 62106 | 83254 | 28 | 28.04 | 10.24 | 5.62 | 51.9 | 1.581 | 7.44 | 0 | 26.29 | | |
| 62106 | 83344 | 30 | 30.03 | 10.22 | 5.54 | 51.1 | 1.582 | 7.43 | 0 | 28.28 | | |
| 62106 | 83447 | 32 | 32 | 10.19 | 5.49 | 50.7 | 1.578 | 7.41 | 0 | 30.25 | | |
| 62106 | 83531 | 34 | 34.01 | 10.07 | 5.41 | 49.8 | 1.584 | 7.39 | 0 | 32.26 | | |
| 62106 | 83630 | 36 | 36.02 | 9.87 | 5.29 | 48.5 | 1.583 | 7.36 | 0 | 34.27 | | |
| 62106 | 83702 | 38 | 38.06 | 9.82 | 5.21 | 47.6 | 1.584 | 7.35 | 0 | 36.31 | | |
| 62106 | 83812 | 40 | 40.01 | 9.66 | 5.1 | 46.5 | 1.585 | 7.32 | 0 | 38.26 | | |
| 62106 | 83907 | 42 | 42.02 | 9.38 | 4.7 | 42.6 | 1.586 | 7.27 | 0 | 40.27 | | |
| 62106 | 83954 | 44 | 43.99 | 8.67 | 4.21 | 37.5 | 1.59 | 7.21 | 0 | 42.24 | | |
| 62106 | 84048 | 46 | 46.03 | 7.95 | 3.87 | 33.8 | 1.59 | 7.14 | 0 | 44.28 | | |
| 62106 | 84141 | 48 | 48.01 | 7.37 | 3.46 | 29.9 | 1.595 | 7.09 | 0 | 46.26 | | |
| 62106 | 84237 | 50 | 50.04 | 7.01 | 2.69 | 23 | 1.6 | 7.02 | 0 | 48.29 | | |
| 62106 | 84337 | 52 | 52.04 | 6.7 | 1.48 | 12.6 | 1.599 | 6.96 | 0 | 50.29 | | |
| 62106 | 84425 | 54 | 53.98 | 6.5 | 0.38 | 3.2 | 1.6 | 6.91 | 0 | 52.23 | | |
| 62106 | 84504 | 56 | 56.02 | 6.44 | 0.2 | 1.7 | 1.601 | 6.89 | 0 | 54.27 | | |
| 62106 | 84602 | 58 | 58 | 6.3 | 0.18 | 1.5 | 1.604 | 6.85 | 0 | 56.25 | | |
| 62106 | 84708 | 60 | 59.57 | 6.24 | 0.12 | 1 | 1.582 | 6.55 | 0 | 57.82 | | |

Third Lake 2006 Multiparameter data

| Date MMDDYY | Time HHMMSS | Text Depth feet | Dep25 feet | Temp øC | DO mg/l | DO% Sat | SpCond mS/cm | pH Units | PAR æE/s/mý | Depth of Light Meter feet | % Light Transmission | Extinction Coefficient |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | Average | 0.28 |
| 71906 | 93750 | 0.25 | 0.33 | 27.35 | 9.21 | 119.7 | 1.4840 | 8.73 | 3631 | Surface | | |
| 71906 | 93911 | 1 | 1.03 | 27.36 | 9.24 | 120.2 | 1.4820 | 8.74 | 3599 | Surface | 100% | |
| 71906 | 94042 | 2 | 1.98 | 27.36 | 9.22 | 119.8 | 1.4810 | 8.74 | 1511 | 0.23 | 42% | 3.77 |
| 71906 | 94150 | 3 | 3.07 | 27.31 | 9.26 | 120.3 | 1.4820 | 8.74 | 1281 | 1.32 | 36% | 0.13 |
| 71906 | 94318 | 4 | 3.97 | 27.27 | 9.18 | 119.2 | 1.4810 | 8.75 | 571 | 2.22 | 16% | 0.36 |
| 71906 | 94422 | 6 | 6.00 | 27.19 | 9.40 | 121.9 | 1.4800 | 8.75 | 640 | 4.25 | 18% | -0.03 |
| 71906 | 94616 | 8 | 7.98 | 26.99 | 8.81 | 113.8 | 1.4820 | 8.71 | 294 | 6.23 | 8% | 0.12 |
| 71906 | 94734 | 10 | 10.06 | 26.64 | 8.44 | 108.3 | 1.4840 | 8.67 | 168 | 8.31 | 5% | 0.07 |
| 71906 | 94828 | 12 | 12.06 | 26.46 | 8.27 | 105.8 | 1.4850 | 8.64 | 102 | 10.31 | 3% | 0.05 |
| 71906 | 94951 | 14 | 14.06 | 24.44 | 6.90 | 85.1 | 1.5040 | 8.43 | 53 | 12.31 | 1.5% | 0.05 |
| 71906 | 95056 | 16 | 16.03 | 18.70 | 3.82 | 41.9 | 1.5300 | 7.74 | 33 | 14.28 | 0.9% | 0.03 |
| 71906 | 95253 | 18 | 17.96 | 14.20 | 3.94 | 39.6 | 1.5660 | 7.43 | 19 | 16.21 | 0.5% | 0.03 |
| 71906 | 95407 | 20 | 20.02 | 12.99 | 3.90 | 38.1 | 1.5660 | 7.36 | 11 | 18.27 | 0.3% | 0.03 |
| 71906 | 95519 | 22 | 21.96 | 12.77 | 4.03 | 39.2 | 1.5660 | 7.31 | 7 | 20.21 | 0.2% | 0.02 |
| 71906 | 95638 | 24 | 24.01 | 12.70 | 3.98 | 38.6 | 1.5700 | 7.29 | 4 | 22.26 | 0.1% | 0.03 |
| 71906 | 95822 | 26 | 26.00 | 12.63 | 3.95 | 38.3 | 1.5700 | 7.25 | 3 | 24.25 | 0.1% | 0.01 |
| 71906 | 95934 | 28 | 28.07 | 12.55 | 3.88 | 37.5 | 1.5700 | 7.22 | 1 | 26.32 | 0.0% | 0.04 |
| 71906 | 100042 | 30 | 29.99 | 12.46 | 3.80 | 36.7 | 1.5720 | 7.2 | 1 | 28.24 | 0.0% | 0.00 |
| 71906 | 100208 | 32 | 31.97 | 12.42 | 3.78 | 36.5 | 1.5730 | 7.17 | 1 | 30.22 | 0.0% | 0.00 |
| 71906 | 100251 | 34 | 33.99 | 12.37 | 3.69 | 35.6 | 1.5710 | 7.15 | 0 | 32.24 | | |
| 71906 | 100350 | 36 | 36.03 | 12.29 | 3.57 | 34.3 | 1.5720 | 7.14 | 0 | 34.28 | | |
| 71906 | 100451 | 38 | 38.05 | 12.24 | 3.55 | 34.1 | 1.5730 | 7.13 | 0 | 36.3 | | |
| 71906 | 100553 | 40 | 40.02 | 12.17 | 3.41 | 32.7 | 1.5730 | 7.11 | 0 | 38.27 | | |
| 71906 | 100714 | 42 | 42.06 | 11.88 | 2.94 | 28.0 | 1.5740 | 7.09 | 0 | 40.31 | | |
| 71906 | 100814 | 44 | 44.02 | 11.49 | 2.36 | 22.3 | 1.5760 | 7.06 | 0 | 42.27 | | |
| 71906 | 100920 | 46 | 46.00 | 10.03 | 1.13 | 10.4 | 1.5800 | 7.01 | 0 | 44.25 | | |
| 71906 | 101041 | 48 | 48.01 | 8.99 | 0.96 | 8.6 | 1.5950 | 6.98 | 0 | 46.26 | | |
| 71906 | 101222 | 50 | 50.12 | 7.27 | 0.29 | 2.5 | 1.6000 | 6.92 | 0 | 48.37 | | |
| 71906 | 101346 | 52 | 51.95 | 6.77 | 0.19 | 1.6 | 1.6020 | 6.90 | 0 | 50.2 | | |
| 71906 | 101523 | 54 | 53.97 | 6.48 | 0.15 | 1.3 | 1.6010 | 6.88 | 0 | 52.22 | | |
| 71906 | 101611 | 56 | 56.08 | 6.29 | 0.16 | 1.3 | 1.6080 | 6.83 | 0 | 54.33 | | |
| 71906 | 101730 | 58 | 58.03 | 6.21 | 0.18 | 1.5 | 1.6330 | 6.73 | 0 | 56.28 | | |
| 71906 | 101819 | 60 | 59.99 | 6.11 | 0.16 | 1.3 | 1.6260 | 6.67 | 0 | 58.24 | | |

Third Lake 2006 Multiparameter data

| Date MMDDYY | Time HHMMSS | Text Depth feet | Dep25 feet | Temp øC | DO mg/l | DO% Sat | SpCond mS/cm | pH Units | PAR æE/s/mý | Depth of Light Meter feet | % Light Transmission | Extinction Coefficient |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | Average | 0.28 |
| 81606 | 81722 | 0.25 | 0.26 | 24.84 | 9.60 | 118.8 | 1.4780 | 8.69 | 3194 | Surface | | |
| 81606 | 81906 | 1 | 1.01 | 24.87 | 9.41 | 116.5 | 1.4810 | 8.71 | 3235 | Surface | 100% | |
| 81606 | 82020 | 2 | 1.99 | 24.86 | 9.35 | 115.7 | 1.4800 | 8.72 | 1071 | 0.24 | 33% | 4.61 |
| 81606 | 82133 | 3 | 3.01 | 24.86 | 9.41 | 116.5 | 1.4810 | 8.73 | 950 | 1.26 | 29% | 0.10 |
| 81606 | 82239 | 4 | 4.01 | 24.86 | 9.42 | 116.6 | 1.4810 | 8.74 | 443 | 2.26 | 14% | 0.34 |
| 81606 | 82413 | 6 | 6.02 | 24.86 | 9.27 | 114.8 | 1.4820 | 8.74 | 288 | 4.27 | 9% | 0.10 |
| 81606 | 82539 | 8 | 8.01 | 24.85 | 9.25 | 114.5 | 1.4820 | 8.74 | 161 | 6.26 | 5% | 0.09 |
| 81606 | 82659 | 10 | 10.01 | 24.66 | 8.95 | 110.4 | 1.4840 | 8.71 | 102 | 8.26 | 3% | 0.06 |
| 81606 | 82832 | 12 | 12 | 24.36 | 8.74 | 107.2 | 1.4880 | 8.65 | 62 | 10.25 | 2% | 0.05 |
| 81606 | 82940 | 14 | 14.04 | 23.74 | 7.93 | 96.2 | 1.4940 | 8.52 | 35 | 12.29 | 1.1% | 0.05 |
| 81606 | 83134 | 16 | 16.02 | 20.52 | 2.65 | 30.2 | 1.5410 | 7.70 | 21 | 14.27 | 0.6% | 0.04 |
| 81606 | 83234 | 18 | 18.02 | 16.07 | 1.25 | 13.0 | 1.5760 | 7.42 | 13 | 16.27 | 0.4% | 0.03 |
| 81606 | 83354 | 20 | 19.97 | 14.75 | 1.45 | 14.7 | 1.5810 | 7.32 | 8 | 18.22 | 0.2% | 0.03 |
| 81606 | 83509 | 22 | 22.03 | 14.60 | 1.47 | 14.8 | 1.5810 | 7.28 | 4 | 20.28 | 0.1% | 0.03 |
| 81606 | 83709 | 24 | 23.98 | 14.52 | 1.43 | 14.4 | 1.5810 | 7.23 | 4 | 22.23 | 0.1% | 0.00 |
| 81606 | 83853 | 26 | 25.99 | 14.42 | 1.36 | 13.7 | 1.5840 | 7.19 | 3 | 24.24 | 0.1% | 0.01 |
| 81606 | 83951 | 28 | 28.01 | 14.31 | 1.31 | 13.1 | 1.5820 | 7.16 | 1 | 26.26 | 0.0% | 0.04 |
| 81606 | 84102 | 30 | 30.02 | 14.27 | 1.30 | 13.0 | 1.5850 | 7.13 | 1 | 28.27 | 0.0% | 0.00 |
| 81606 | 84227 | 32 | 32.02 | 14.18 | 1.30 | 13.0 | 1.5830 | 7.10 | 1 | 30.27 | 0.0% | 0.00 |
| 81606 | 84348 | 34 | 34.03 | 14.17 | 1.29 | 12.9 | 1.5870 | 7.08 | 1 | 32.28 | 0.0% | 0.00 |
| 81606 | 84525 | 36 | 35.96 | 14.10 | 1.22 | 12.2 | 1.5840 | 7.06 | 1 | 34.21 | 0.0% | 0.00 |
| 81606 | 84626 | 38 | 38.03 | 13.96 | 1.01 | 10.1 | 1.5860 | 7.04 | 1 | 36.28 | 0.0% | 0.00 |
| 81606 | 84843 | 40 | 40.01 | 13.83 | 0.88 | 8.7 | 1.5830 | 7.02 | 0 | 38.26 | | |
| 81606 | 84940 | 42 | 42.03 | 13.64 | 0.63 | 6.3 | 1.5860 | 7.01 | 0 | 40.28 | | |
| 81606 | 85055 | 44 | 44.01 | 13.44 | 0.26 | 2.5 | 1.5850 | 6.98 | 0 | 42.26 | | |
| 81606 | 85142 | 46 | 46.01 | 11.88 | 0.16 | 1.5 | 1.5850 | 6.96 | 0 | 44.26 | | |
| 81606 | 85251 | 48 | 48.01 | 9.17 | 0.15 | 1.3 | 1.6110 | 6.89 | 0 | 46.26 | | |
| 81606 | 85409 | 50 | 49.99 | 8.18 | 0.16 | 1.4 | 1.6180 | 6.86 | 0 | 48.24 | | |
| 81606 | 85507 | 52 | 52.02 | 7.43 | 0.15 | 1.3 | 1.6160 | 6.83 | 0 | 50.27 | | |
| 81606 | 85621 | 54 | 53.99 | 6.97 | 0.17 | 1.4 | 1.6190 | 6.80 | 0 | 52.24 | | |
| 81606 | 85702 | 56 | 55.99 | 6.56 | 0.15 | 1.2 | 1.6270 | 6.71 | 0 | 54.24 | | |
| 81606 | 85851 | 58 | 58.01 | 6.33 | 0.15 | 1.3 | 1.6360 | 6.64 | 0 | 56.26 | | |
| 81606 | 90013 | 60 | 59.98 | 6.14 | 0.17 | 1.4 | 1.6510 | 6.52 | 0 | 58.23 | | |

Third Lake 2006 Multiparameter data

| Date MMDDYY | Time HHMMSS | Text Depth feet | Dep25 feet | Temp øC | DO mg/l | DO% Sat | SpCond mS/cm | pH Units | PAR æE/s/mý | Depth of Light Meter feet | % Light Transmission | Extinction Coefficient |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | Average | 0.54 |
| 92006 | 81247 | 0.25 | 0.24 | 17.61 | 9.24 | 99.9 | 1.4160 | 8.55 | 3162 | Surface | | |
| 92006 | 81407 | 1 | 0.97 | 17.65 | 9.05 | 97.9 | 1.4140 | 8.58 | 3214 | Surface | 100% | |
| 92006 | 81527 | 2 | 1.96 | 17.67 | 9.04 | 97.8 | 1.4150 | 8.58 | 867 | 0.21 | 27% | 6.24 |
| 92006 | 81645 | 3 | 3.00 | 17.67 | 8.93 | 96.6 | 1.4150 | 8.6 | 367 | 1.25 | 11% | 0.69 |
| 92006 | 81755 | 4 | 4.01 | 17.67 | 8.84 | 95.6 | 1.4170 | 8.59 | 307 | 2.26 | 10% | 0.08 |
| 92006 | 81901 | 6 | 6.00 | 17.66 | 8.87 | 96.0 | 1.4160 | 8.61 | 162 | 4.25 | 5% | 0.15 |
| 92006 | 82020 | 8 | 8.00 | 17.67 | 8.85 | 95.8 | 1.4170 | 8.6 | 73 | 6.25 | 2% | 0.13 |
| 92006 | 82145 | 10 | 9.99 | 17.64 | 8.42 | 91.1 | 1.4220 | 8.55 | 39 | 8.24 | 1.2% | 0.08 |
| 92006 | 82256 | 12 | 12.01 | 17.62 | 8.41 | 90.9 | 1.4210 | 8.55 | 20 | 10.26 | 0.6% | 0.07 |
| 92006 | 82516 | 14 | 14.01 | 17.56 | 8.39 | 90.6 | 1.4210 | 8.55 | 11 | 12.26 | 0.3% | 0.05 |
| 92006 | 82707 | 16 | 15.99 | 17.49 | 8.43 | 90.9 | 1.4240 | 8.55 | 6 | 14.24 | 0.2% | 0.04 |
| 92006 | 82808 | 18 | 18.04 | 17.23 | 8.16 | 87.5 | 1.4220 | 8.55 | 3 | 16.29 | 0.1% | 0.04 |
| 92006 | 82909 | 20 | 19.99 | 17.1 | 7.42 | 79.4 | 1.4360 | 8.39 | 2 | 18.24 | 0.1% | 0.02 |
| 92006 | 83010 | 22 | 22.02 | 16.84 | 4.08 | 43.4 | 1.4940 | 7.79 | 1 | 20.27 | 0.0% | 0.03 |
| 92006 | 83140 | 24 | 24.03 | 16.25 | 2.92 | 30.6 | 1.5300 | 7.54 | 1 | 22.28 | 0.0% | 0.00 |
| 92006 | 83240 | 26 | 25.99 | 16.19 | 0.72 | 7.6 | 1.5600 | 7.4 | 1 | 24.24 | 0.0% | 0.00 |
| 92006 | 83352 | 28 | 28.02 | 16.14 | 0.21 | 2.2 | 1.5650 | 7.33 | 0 | 26.27 | | |
| 92006 | 83538 | 30 | 30.06 | 16.06 | 0.27 | 2.8 | 1.5660 | 7.29 | 0 | 28.31 | | |
| 92006 | 83622 | 32 | 32.05 | 16.03 | 0.20 | 2.1 | 1.5670 | 7.26 | 0 | 30.3 | | |
| 92006 | 83708 | 34 | 34.04 | 15.97 | 0.29 | 3.1 | 1.5670 | 7.25 | 0 | 32.29 | | |
| 92006 | 83840 | 36 | 36.04 | 15.87 | 0.40 | 4.2 | 1.5670 | 7.23 | 0 | 34.29 | | |
| 92006 | 83948 | 38 | 37.99 | 15.83 | 0.50 | 5.3 | 1.5690 | 7.22 | 0 | 36.24 | | |
| 92006 | 84129 | 40 | 40.05 | 15.82 | 0.51 | 5.3 | 1.5680 | 7.21 | 0 | 38.3 | | |
| 92006 | 84306 | 42 | 42.01 | 15.6 | 0.21 | 2.2 | 1.5750 | 7.18 | 0 | 40.26 | | |
| 92006 | 84427 | 44 | 44.04 | 15.31 | 0.15 | 1.5 | 1.5790 | 7.17 | 0 | 42.29 | | |
| 92006 | 84512 | 46 | 46.04 | 13.94 | 0.16 | 1.6 | 1.5830 | 7.14 | 0 | 44.29 | | |
| 92006 | 84628 | 48 | 48.00 | 10.98 | 0.17 | 1.6 | 1.6140 | 7.12 | 0 | 46.25 | | |
| 92006 | 84728 | 50 | 50.07 | 9.36 | 0.17 | 1.5 | 1.6190 | 7.08 | 0 | 48.32 | | |
| 92006 | 84821 | 52 | 52.04 | 8.24 | 0.17 | 1.5 | 1.6240 | 7.03 | 0 | 50.29 | | |
| 92006 | 84914 | 54 | 54.03 | 7.45 | 0.15 | 1.3 | 1.6270 | 6.98 | 0 | 52.28 | | |
| 92006 | 85048 | 56 | 56.00 | 6.8 | 0.17 | 1.4 | 1.6380 | 6.86 | 0 | 54.25 | | |
| 92006 | 85205 | 58 | 58.03 | 6.6 | 0.16 | 1.3 | 1.6410 | 6.78 | 0 | 56.28 | | |
| 92006 | 85303 | 60 | 60.05 | 6.47 | 0.16 | 1.3 | 1.6470 | 6.75 | 0 | 58.3 | | |
| 92006 | 85343 | 62 | 62.06 | 6.45 | 0.15 | 1.3 | 1.5280 | 6.7 | 0 | 60.31 | | |

Third Lake 2006 Multiparameter data

| Date MMDDYY | Time HHMMSS | Text Depth feet | Dep25 feet | Temp øC | DO mg/l | DO% Sat | SpCond mS/cm | pH Units | PAR æE/s/mý | Depth of Light Meter feet | % Light Transmission | Extinction Coefficient |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | Average | 0.18 |
| 110106 | 131631 | 0.25 | 0.47 | 8.71 | 9.05 | 79.9 | 1.4210 | 7.99 | 2736 | Surface | | |
| 110106 | 131726 | 1 | 0.93 | 8.72 | 8.99 | 79.4 | 1.4210 | 7.99 | 943 | Surface | 100% | |
| 110106 | 131815 | 2 | 2.00 | 8.73 | 8.99 | 79.3 | 1.4210 | 7.98 | 520 | 0.25 | 55% | 2.38 |
| 110106 | 131900 | 3 | 3.09 | 8.72 | 8.96 | 79.0 | 1.4210 | 7.98 | 263 | 1.34 | 28% | 0.51 |
| 110106 | 131953 | 4 | 4.14 | 8.72 | 8.92 | 78.7 | 1.4230 | 7.98 | 487 | 2.39 | 52% | -0.26 |
| 110106 | 132044 | 6 | 5.96 | 8.73 | 8.88 | 78.3 | 1.4210 | 7.98 | 316 | 4.21 | 34% | 0.10 |
| 110106 | 132137 | 8 | 8.00 | 8.74 | 8.81 | 77.8 | 1.4220 | 7.98 | 256 | 6.25 | 27% | 0.03 |
| 110106 | 132247 | 10 | 9.96 | 8.74 | 8.79 | 77.6 | 1.4210 | 7.98 | 151 | 8.21 | 16% | 0.06 |
| 110106 | 132351 | 12 | 12.04 | 8.74 | 8.81 | 77.7 | 1.4210 | 7.99 | 70 | 10.29 | 7% | 0.07 |
| 110106 | 132504 | 14 | 13.99 | 8.74 | 8.78 | 77.5 | 1.4200 | 7.98 | 54 | 12.24 | 6% | 0.02 |
| 110106 | 132601 | 16 | 15.95 | 8.74 | 8.76 | 77.3 | 1.4210 | 7.98 | 29 | 14.2 | 3% | 0.04 |
| 110106 | 132705 | 18 | 18.07 | 8.74 | 8.83 | 77.9 | 1.4220 | 7.99 | 20 | 16.32 | 2% | 0.02 |
| 110106 | 132743 | 20 | 19.96 | 8.74 | 8.79 | 77.6 | 1.4210 | 7.98 | 13 | 18.21 | 1.4% | 0.02 |
| 110106 | 132826 | 22 | 22.00 | 8.74 | 8.75 | 77.3 | 1.4230 | 7.98 | 8 | 20.25 | 0.8% | 0.02 |
| 110106 | 132936 | 24 | 24.02 | 8.74 | 8.70 | 76.8 | 1.4220 | 7.99 | 5 | 22.27 | 0.5% | 0.02 |
| 110106 | 133041 | 26 | 25.85 | 8.74 | 8.83 | 78.0 | 1.4210 | 7.98 | 3 | 24.1 | 0.3% | 0.02 |
| 110106 | 133147 | 28 | 28.09 | 8.74 | 8.79 | 77.6 | 1.4220 | 7.98 | 2 | 26.34 | 0.2% | 0.02 |
| 110106 | 133238 | 30 | 29.87 | 8.74 | 8.76 | 77.3 | 1.4220 | 7.98 | 1 | 28.12 | 0.1% | 0.02 |
| 110106 | 133402 | 32 | 31.99 | 8.73 | 8.80 | 77.7 | 1.4230 | 7.98 | 1 | 30.24 | 0.1% | 0.00 |
| 110106 | 133510 | 34 | 33.99 | 8.74 | 8.77 | 77.4 | 1.4230 | 7.98 | 0 | 32.24 | | |
| 110106 | 133649 | 36 | 36.08 | 8.71 | 8.74 | 77.1 | 1.4220 | 7.97 | 0 | 34.33 | | |
| 110106 | 133739 | 38 | 38.01 | 8.68 | 8.69 | 76.6 | 1.4230 | 7.97 | 0 | 36.26 | | |
| 110106 | 133842 | 40 | 40.13 | 8.66 | 8.66 | 76.3 | 1.4230 | 7.97 | 0 | 38.38 | | |
| 110106 | 133942 | 42 | 41.97 | 8.64 | 8.66 | 76.3 | 1.4220 | 7.96 | 0 | 40.22 | | |
| 110106 | 134042 | 44 | 44.07 | 8.60 | 8.64 | 76.0 | 1.4240 | 7.95 | 0 | 42.32 | | |
| 110106 | 134155 | 46 | 46.02 | 8.50 | 8.62 | 75.7 | 1.4230 | 7.96 | 0 | 44.27 | | |
| 110106 | 134244 | 48 | 48.07 | 8.39 | 8.57 | 75.0 | 1.4230 | 7.96 | 0 | 46.32 | | |
| 110106 | 134417 | 50 | 50.19 | 8.43 | 8.59 | 75.2 | 1.4230 | 7.95 | 0 | 48.44 | | |
| 110106 | 134532 | 52 | 52.05 | 8.37 | 8.58 | 75.0 | 1.4220 | 7.95 | 0 | 50.3 | | |
| 110106 | 134654 | 54 | 53.97 | 8.37 | 8.62 | 75.4 | 1.4220 | 7.95 | 0 | 52.22 | | |
| 110106 | 134759 | 56 | 56.09 | 8.30 | 8.55 | 74.7 | 1.4240 | 7.94 | 0 | 54.34 | | |
| 110106 | 134901 | 58 | 58.04 | 8.23 | 8.44 | 73.6 | 1.4230 | 7.93 | 0 | 56.29 | | |

# 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. WATER QUALITY STATISTICS FOR ALL LAKE COUNTY LAKES.

# 2000 - 2006 Water Quality Parameters, Statistics Summary

| | ALKoxic <=3ft00-2006 | |
|---|---|---|
| Average | **167.0** | |
| Median | **162.0** | |
| Minimum | **64.9** | **IMC** |
| Maximum | **330.0** | **Flint Lake** |
| STD | **41.8** | |
| n = | **798** | |

| | ALKanoxic 2000-2006 | |
|---|---|---|
| Average | **201** | |
| Median | **192** | |
| Minimum | **103** | **Heron Pond** |
| Maximum | **470** | **Lake Marie** |
| STD | **49** | |
| n = | **246** | |

| | Condoxic <=3ft00-2006 | |
|---|---|---|
| Average | **0.8834** | |
| Median | **0.7948** | |
| Minimum | **0.2542** | **Broberg Marsh** |
| Maximum | **6.8920** | **IMC** |
| STD | **0.5389** | |
| n = | **797** | |

| | Condanoxic 2000-2006 | |
|---|---|---|
| Average | **0.9968** | |
| Median | **0.8285** | |
| Minimum | **0.3031** | **White Lake** |
| Maximum | **7.4080** | **IMC** |
| STD | **0.7821** | |
| n = | **246** | |

| | NO3-N, Nitrate+Nitrite,oxic <=3ft00-2006 | |
|---|---|---|
| Average | **0.518** | |
| Median | **0.150** | |
| Minimum | **<0.05** | ***ND** |
| Maximum | **9.670** | **South Churchill Lake** |
| STD | **1.058** | |
| n = | **803** | |

*ND = Many lakes had non-detects (71.5%)
Only compare lakes with detectable
concentrations to the statistics above
Beginning in 2006, Nitrate+Nitrite was measured.

| | NH3-Nanoxic 2000-2006 | |
|---|---|---|
| Average | **2.112** | |
| Median | **1.375** | |
| Minimum | **<0.1** | ***ND** |
| Maximum | **18.400** | **Taylor Lake** |
| STD | **2.356** | |
| n = | **246** | |

*ND = 18.6% Non-detects from 27 different lakes

| | pHoxic <=3ft00-2006 | |
|---|---|---|
| Average | **8.31** | |
| Median | **8.31** | |
| Minimum | **7.06** | **Deer Lake** |
| Maximum | **10.28** | **Round Lake Marsh North** |
| STD | **0.45** | |
| n = | **792** | |

| | pHanoxic 2000-2006 | |
|---|---|---|
| Average | **7.19** | |
| Median | **7.18** | |
| Minimum | **6.24** | **Banana Pond** |
| Maximum | **8.48** | **Heron Pond** |
| STD | **0.38** | |
| n = | **246** | |

| | All Secchi 2000-2006 | |
|---|---|---|
| Average | **4.48** | |
| Median | **3.27** | |
| Minimum | **0.33** | **Fairfield Marsh, Patski Pond** |
| Maximum | **29.23** | **Bangs Lake** |
| STD | **3.69** | |
| n = | **740** | |

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# 2000 - 2006 Water Quality Parameters, Statistics Summary (continued)

| | TKNoxic <=3ft00-2006 | |
|---|---|---|
| Average | **1.414** | |
| Median | **1.220** | |
| Minimum | **<0.5** | ***ND** |
| Maximum | **10.300** | **Fairfield Marsh** |
| STD | **0.844** | |
| n = | **798** | |

*ND = 3.6% Non-detects from 14 different lakes

| | TKNanoxic 2000-2006 | |
|---|---|---|
| Average | **2.973** | |
| Median | **2.270** | |
| Minimum | **<0.5** | ***ND** |
| Maximum | **21.000** | **Taylor Lake** |
| STD | **2.346** | |
| n = | **246** | |

*ND = 3.2% Non-detects from 5 different lakes

| | TPoxic <=3ft00-2006 | |
|---|---|---|
| Average | **0.098** | |
| Median | **0.060** | |
| Minimum | **<0.01** | ***ND** |
| Maximum | **3.880** | **Albert Lake** |
| STD | **0.171** | |
| n = | **798** | |

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

| | TPanoxic 2000-2006 | |
|---|---|---|
| Average | **0.280** | |
| Median | **0.163** | |
| Minimum | **0.012** | **West Loon Lake** |
| Maximum | **3.800** | **Taylor Lake** |
| STD | **0.369** | |
| n = | **246** | |

| | TSSall <=3ft00-2006 | |
|---|---|---|
| Average | **15.3** | |
| Median | **7.9** | |
| Minimum | **<0.1** | ***ND** |
| Maximum | **165.0** | **Fairfield Marsh** |
| STD | **20.3** | |
| n = | **809** | |

*ND = 1.3% Non-detects from 10 different lakes

| | TVSoxic <=3ft00-2006 | |
|---|---|---|
| Average | **137.7** | |
| Median | **134.0** | |
| Minimum | **34.0** | **Pulaski Pond** |
| Maximum | **298.0** | **Fairfield Marsh** |
| STD | **41.2** | |
| n = | **753** | |

No 2002 IEPA Chain Lakes

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

No 2002 IEPA Chain Lakes.

| | CLanoxic <=3ft00-2006 | |
|---|---|---|
| Average | **263** | |
| Median | **116** | |
| Minimum | **41** | **Timber Lake (N)** |
| Maximum | **2390** | **IMC** |
| STD | **452** | |
| n = | **78** | |

| | CLoxic <=3ft00-2006 | |
|---|---|---|
| Average | **220** | |
| Median | **171** | |
| Minimum | **30** | **White Lake** |
| Maximum | **2760** | **IMC** |
| STD | **275** | |
| n = | **318** | |

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

Minimums and maximums are based on data from all lakes from 1988-2006 (n=3053).

Average, median and STD are based on data from the most recent water quality sampling year for each lake.
LCHD Lakes Management Unit ~ 1/4/2007

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# APPENDIX E.  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/