# Lake Lemon Conservancy District

**LAKE LEMON CONSERVANCY DISTRICT**
Board of Directors Meeting
Benton Township Senior Citizens Building
May 21, 2014
6:00 p.m.

**AGENDA**

| | | |
|---|---|---|
| I. | Call Meeting to Order / Chairman's Remarks | (JS) |
| II. | Approval of April 16, 2014 Board Meeting Minutes | (JS) |
| III. | Treasurer's Report<br>A. April Financial Highlights<br>B. Report of Claims Approval for April<br>C. 2015 Budget Time Line<br>D. Appointment of 2015 Budget Committee | (LE) |
| IV. | Manager's Report<br>A. Status of Partnership with CBU on Bathymetric/Sediment Study<br>B. Professional Services Agreement: Image Matters, LLC<br>1. Jeff Ehman, PHD<br>C. Professional Services Agreement: ReMetrix, LLC<br>1. Doug Henderson<br>D. Indiana University Water Testing Results for 2013<br>1. Melissa Clark, School of Public and Environmental Affairs<br>E. Debris Removal / Shoreline Erosion Control: Update<br>F. Award Bid/Contract for DNR Grant Vegetation Grant<br>G. Canada Goose: Update<br>H. Board Member Email Addresses | (BM)<br><br><br><br><br><br><br><br><br>(JVT)<br>(JVT) |
| V. | Public Comment | (JS) |
| VI. | New Business / Correspondence for Future Agenda<br>A. Next LLCD Board Meeting: June 21, 2014; 10:00 AM; Annual Picnic, Riddle Point Park Shelter House | (JS) |
| VII. | Adjournment | (JS) |

**7599 North Tunnel Road, Unionville, IN 47468**
**Phone 812/334-0233 • Fax 812/335-0038**

# May 21st 2014

| | | |
|---|---|---|
| Ron Thrasher | 4206 Channel Rd | #7 |
| Scott Adamson | 4184 Walker Ln. | #7 |
| Jeff Wimmenauer | 4385 Watson Ln. | #7 |
| Randy & Maranel Rhoden | 7667 N. John Young Rd | #1 |
| Jeff Ehman | 403 E. 6th Bloomington | |
| Spencer & Jill Leiter | | |
| Melissa Clark (I.U. SPEA) | | |
| Tom Duff | | #7 |
| Ann Wroblewski | | 7 |
| Vince Britt | | 7 |
| Mike Blackwell | | 7 |

**Lake Lemon Conservancy District**
**Board of Directors Meeting Minutes**
Benton Township Senior Center Building
May 21, 2014

**The May 21st, 2014 Board of Directors Meeting of the Lake Lemon Conservancy District was held at the Benton Township Senior Center Building and was called to order by Vice-Chairman Pam Dugan at 6:00 P.M.**

**BOARD MEMBERS PRESENT: Pam Dugan, Lance Eberle, Sue Miller, Kim Mayer, Dennis Friesel, and Tina Thrasher. ALSO PRESENT: Bob Madden, Manager; James Van Tassel, Board Recorder; and LLCD Freeholders (see attached sign-in sheet). ABSENT: John Schell, Director.**

I. **Opening Comments (Dugan)**

a. Dugan chaired the Board Meeting in Schell's absence.

II. **Approval of April 16, 2014 Board Meeting Minutes (Dugan)**

**EBERLE MOTIONED TO APPROVE THE APRIL 16, 2014 BOARD MEETING MINUTES. MILLER SECONDED THE MOTION. ALL "AYE'S". THE MOTION CARRIED.**

III. **Treasurer's Report (Eberle)**

a. April Financial Highlights

i. See Attached

ii. Notable expenses

1. Lake Buoys
2. Patrol Boat Repair
3. Paid off Dredging Loan

**DUGAN MOTIONED TO APPROVE THE APRIL 2014 TREASURER'S REPORT. THRASHER SECONDED THE MOTION. ALL "AYE'S". THE MOTION CARRIED.**

b. Report of Claims Approval for April 2014

**THRASHER MOTIONED TO APPROVE THE ALLOWNACE OF VOUCHERS FOR APRIL 2014. DUGAN SECONDED THE MOTION. ALL "AYE'S". THE MOTION CARRIED.**

c. 2015 Budget Timeline

i. The Proposed 2015 LLCD Budget will be introduced at the June 21st Board Meeting.

ii. The 2015 Budget Timeline will be available at lakelemon.org.

d. Appointment of 2015 Budget Committee

i. Eberle recommended the Budget Committee consist of the Chairman, John Schell; Vice-Chairman, Pam Dugan; Treasurer, Lance Eberle; Manager, Bob Madden.

**MILLER MOTIONED TO APPOINT SCHELL, DUGAN, EBERLE, AND MADDEN TO THE 2015 BUDGET COMMITTEE. THRASHER SECONDED THE MOTION. ALL "AYE'S". THE MOTION CARRIED.**

## IV. Manager's Report (Madden)

a. Status of Partnership with CBU on Bathymetric/Sediment Study

i. The LLCD was not awarded a grant from DNR-LARE for the Bathymetric Study.

ii. The CBU has not said no to our request to cost share the bathymetric study. The CBU wants more time to review the proposal. If the CBU agrees to share the cost, they will reimburse the LLCD after the fact.

b. Indiana University Water Testing Results for 2013

i. Melissa Clark, School of Public and Environmental Affairs

ii. See attached report

c. Debris Removal / Shoreline Erosion Control: Update

i. The North shoreline collected a lot of large debris due to prevailing winds during a flood stage.

ii. The barge has finished cleaning the North Shore and the large deposit of debris at the East end of the Long Causeway.

iii. Several private rip rap jobs will be done prior to the commencement of sediment removal on the East shoreline of Reed Point.

d. Award Bid / Contract for DNR Grant Vegetation Grant

i. The LLCD was awarded $5,000.00 from DNR-LARE for treatment of Eurasian Water Milfoil.

ii. Aquatic Control was the only bid received.

iii. Aquatic Control bided the same costs as in the annual contract.

**THRASHER MOTIONED TO AWARD THE BID FOR THE 2014 DNR-LARE VEGETATION GRANT TO AQUATIC CONTROL. MILLER SECONDED THE MOTION. ALL "AYE'S". THE MOTION CARRIED.**

e. Board Member Email Addresses (Van Tassel)

   i. Once the new email system is up, notice will be sent out on Lake Lemon email changes.

f. Professional Services Agreement: Image Maters, LLC

   i. Jeff Ehman, PHD

      1. Ehman reviewed his agreement and scope of services (see attached)

      2. Thrasher asked if Ehman will calculate change in sediment volume.

         a. Ehman will provide calculations in sediment and water volume change, along with appropriate maps showing this flux.

**MILLER MOTIONED TO APPROVE THE PROFESSIONAL SERVICES AGREEMENT WITH IMAGE MATTERS, LLC. THRASHER SECONDED THE MOTION. ALL AYE'S. THE MOTION CARRIED.**

g. Professional services Agreement: ReMetrix, LLC

   i. Doug Henderson

      1. ReMetrix will be using the same methodology during their study to create the most accurate comparison from the study in 2003.

      2. 51 sediment points have been added in areas of interest.

**THRASHER MOTIONED TO APPROVE TO THE PROFESSIONAL SERVICES AGREEMENT WITH REMETRIX, LLC. MILLER SECONDED THE MOTION. ALL "AYE'S". THE MOTION CARRIED.**

## V. Public Comment

a. Ron Thrasher (VII) asked how the debris at the East end of the long causeway compared to years past. Thrasher also asked if the barge building will occur later this year?

   i. Madden replied the debris at the causeway was less than years past, but still significant. Two loads were removed versus four last year. However, the prevailing winds during the April flood pushed large amounts of debris to the North Shore away from the causeway.

ii. Angela Parker, LLCD Attorney, is working with LLCD staff in compiling bid specifications and requirements for the excavator, barge, and motor(s). These three items will be bided out separately, with the first purchase being the excavator.

**VI. New Business / Correspondence for Future Agenda (Dugan)**

a. Next LLCD Board Meeting: June 21, 2014 at 10:00 AM at the Riddle Point Park Shelter House. The annual picnic will follow the meeting.

**VII. Adjournment (Dugan)**

**THRASHER MOTIONED TO ADJOURN THE MAY 21, 2014 BOARD OF DIRECTORS MEETING. MAYER SECONDED THE MOTION. ALL "AYE'S". THE MOTION CARRIED. MEETING ADJOURNED AT 7:05 PM.**

**RESPECTFULLY SUBMITTED BY:**

**JAMES VAN TASSEL**

**BOARD RECORDER**

**Lake Lemon Conservancy District**
**Budget Summary Report**

**16-Apr-14**

| Profit and Loss Summary | January Actuals | February Actuals | March Actuals | April Actuals | YTD Actuals | Notes |
|---|---|---|---|---|---|---|
| Revenue | **$6,219** | **$12,502** | **$13,968** | **$25,012** | **$57,701** | |
| **Income Breakdown** | | | | | | |
| Watercraft Permits | | | $4,550 | $17,423 | **$21,973** | |
| Launch Fees | | | $1,628 | $5,495 | **$7,123** | |
| Marina & Club Fees | $0 | $0 | $2,000 | | **$2,000** | |
| Sublease & Access Fees | $5,550 | $12,450 | $4,210 | $1,580 | **$23,790** | |
| Property Tax - Brown County | | | | | **$0** | |
| Property Tax - Monroe County | | | | | **$0** | |
| Interest | $169 | $52 | $181 | $214 | **$616** | |
| Grants & Donations | $0 | $0 | $10 | $25 | **$35** | |
| Fish Tournaments | $500 | $0 | $75 | $25 | **$600** | |
| Park/Lake Reservations | $0 | $0 | $500 | $250 | **$750** | |
| Dredging/Rip-Rap Income | 0 | | $0 | | **$0** | |
| Other Income | | | $814 | | **$814** | |
| **Expenses & Margin:** | | | | | | |
| SG&A expenses | **$29,488** | **$12,772** | **$22,924** | **$25,330** | **$90,513** | |
| Salaries & Benefits | $10,793 | $9,807 | $10,256 | $15,941 | **$46,798** | *Assistant Dredger, Gate* |
| Supplies | $976 | $466 | $2,178 | $3,962 | **$7,582** | *Buoys* |
| Professional Services | $853 | $450 | $840 | $2,263 | **$4,406** | *Mowing* |
| Communication/Travel | $236 | $286 | $306 | $236 | **$1,062** | |
| Printing/Advertising | $245 | $24 | $11 | $253 | **$533** | |
| Insurance | $14,914 | $1,166 | $7,985 | $228 | **$24,293** | |
| Utility Services | $450 | $573 | $456 | $567 | **$2,047** | |
| Repair & Maintenance | $240 | $0 | $891 | $1,223 | **$2,355** | *Boat* |
| Other Services | $0 | $0 | $0 | | **$0** | |
| Machinery & Equipment | $0 | $0 | $0 | | **$0** | |
| Other Capital Outlays | $781 | $0 | $0 | $657 | **$1,438** | |
| Pretax operating profit (loss) | **($23,269)** | **($269)** | **($8,956)** | **($318)** | **($32,813)** | |
| Operating margin | *-374.2%* | *-2.2%* | *-64.1%* | *-1.3%* | *-56.9%* | |

| Balance Sheet Summary | January | February Actuals | March Actuals | April Actuals | | |
|---|---|---|---|---|---|---|
| Checking/Savings | **$128,355** | **$128,355** | **$119,359** | **$63,503** | | |
| General Fund CDs | **$216,009** | **$216,009** | **$216,009** | **$216,009** | | |
| Cumulative Maintenance Fund CDs | **$71,797** | **$71,797** | **$71,797** | **$71,797** | | |
| **Other Balance Sheet Items:** | | | | | | |
| Fixed Assets | **$494,943** | **$494,943** | **$494,943** | **$492,027** | | |
| Accounts payable | **$1,921** | **$2,191** | **$2,151** | **$3,597** | | |
| Long-term liabilities | **$58,023** | **$58,023** | **$58,023** | **$0** | | |
| Equity | **$851,159** | **$850,890** | **$841,934** | **$843,355** | | |

# LAKE LEMON CONSERVANCY

Financial Statements

For the Period Ending

January 1, 2014 thru April 30, 2014

**(UNAUDITED)**

**Watkins Accounting**
**113 E. 19th Street**
**Bloomington, IN 47408**

LAKE LEMON CONSERVANCY

I have prepared the financial statements for LAKE LEMON CONSERVANCY as of April 30, 2014on the basis used in the preparation of its federal income tax returns. The tax returns are prepared on the accrual basis when appropriate.

The following are the company's significant accounting policies under this basis:

Income Tax. No provision or liability for income taxes has been included in the financial statements.

Provision for Doubtful Accounts. No provision for doubtful accounts is made. The company follows the practice of charging off all accounts deemed uncollectible directly to expense.

Property and Equipment. Property and equipment, as well as liabilities pertaining thereto, are recorded at cost as determined for income tax purposes.

Shirley Watkins, CPA
May 13, 2014

# LAKE LEMON CONSERVANCY
## Balance Sheet
### As of April 30, 2014

| | Apr 30, 14 |
|---|---|
| ASSETS | |
| Current Assets | |
| Checking/Savings | |
| 1000 · Peoples State Bank | 61,933.35 |
| 1010 · Petty Cash | 100.00 |
| 1020 · Change Fund | 200.00 |
| 1030 · CD's General Fund | 216,008.85 |
| 1040 · CD's Cumulative Maint Fund | 71,796.67 |
| 1050 · Savings Account | 1,269.18 |
| Total Checking/Savings | 351,308.05 |
| Total Current Assets | 351,308.05 |
| Fixed Assets | |
| 1510 · Trucks | 132,761.25 |
| 1520 · Other Asset | 35,350.00 |
| 1550 · Boats | 209,750.00 |
| 1680 · Other Fixed Assets | 114,166.00 |
| Total Fixed Assets | 492,027.25 |
| TOTAL ASSETS | 843,335.30 |
| LIABILITIES & EQUITY | |
| Liabilities | |
| Current Liabilities | |
| Other Current Liabilities | |
| 2010 · FICA & Federal Taxes Payable | 3,051.88 |
| 2020 · State & Co. Withholding Payable | 544.75 |
| Total Other Current Liabilities | 3,596.63 |
| Total Current Liabilities | 3,596.63 |
| Long Term Liabilities | |
| 2800 · Long Term Notes-Net of Current | 67,702.88 |
| Total Long Term Liabilities | 67,702.88 |
| Total Liabilities | 71,299.51 |
| Equity | |
| 3000 · Opening Balance Equity | 101,373.66 |
| 3040 · General Fund | 566,784.83 |
| 3050 · Encumbered Fund | 55.00 |
| 3060 · Cumulative Maintenance Fund | 38,441.47 |
| 3200 · Retained Earnings | 165,896.75 |
| Net Income | -100,515.92 |
| Total Equity | 772,035.79 |
| TOTAL LIABILITIES & EQUITY | 843,335.30 |

# LAKE LEMON CONSERVANCY
## Profit & Loss YTD Comparison
### April 2014

| | Apr 14 | Jan - Apr 14 |
|---|---|---|
| **Income** | | |
| 4000 · Watercraft Permits | 17,423.00 | 21,973.00 |
| 4010 · Launch Fees | 5,495.00 | 7,123.00 |
| 4020 · Marina & Club Fees | 0.00 | 2,000.00 |
| 4030 · Sublease & Access Fees | 1,580.00 | 23,790.00 |
| 4060 · Interest | 213.56 | 615.96 |
| 4070 · Grants & Donations | 25.00 | 35.00 |
| 4080 · Fishing Tournament | 25.00 | 600.00 |
| 4090 · Park Reservations | 250.00 | 750.00 |
| 4120 · Other Income | 0.00 | 813.75 |
| **Total Income** | 25,011.56 | 57,700.71 |
| **Expense** | | |
| 6000 · Manager | 4,582.58 | 18,330.32 |
| 6010 · FICA | 922.34 | 2,499.63 |
| 6020 · State Unemployment Tax | 202.23 | 219.80 |
| 6030 · Retirement | 650.72 | 2,575.39 |
| 6040 · Health Insurance | 2,102.28 | 7,567.58 |
| 6050 · Life Insurance | 0.00 | 1,263.00 |
| 6070 · Gate Attendant | 577.75 | 577.75 |
| 6110 · Lake Biologist | 2,480.00 | 6,587.51 |
| 6112 · Dredger (Other) | 3,024.00 | 5,778.00 |
| 6114 · Assistant Dredger (Other) | 1,400.00 | 1,400.00 |
| 6120 · Season & Launch Permits | 0.00 | 1,246.83 |
| 6140 · Receipt/Tickets Books | 0.00 | 347.05 |
| 6150 · Checks | 53.36 | 53.36 |
| 6160 · Printer, Copier & Computer Supp | 212.54 | 263.50 |
| 6170 · Miscellaneous-Other | 67.70 | 223.89 |
| 6180 · Postage | 4.86 | 215.03 |
| 6190 · General Business Supplies | 19.47 | 220.45 |
| 6200 · Regular Gas | 150.00 | 304.92 |
| 6210 · Diesel | 0.00 | 207.80 |
| 6240 · Building & Grounds | 782.76 | 970.60 |
| 6250 · Boat/Weed Harvester/Truck | 545.64 | 1,031.28 |
| 6251 · Dredging Supplies | 344.33 | 715.85 |
| 6290 · Signs & Nautical Markers | 1,781.00 | 1,781.00 |
| 6300 · Accounting Services | 450.00 | 1,800.00 |
| 6310 · Grass | 1,812.50 | 1,812.50 |
| 6320 · Attorney | 0.00 | 645.00 |
| 6350 · Other Prof/Secretarial Service | 0.00 | 148.00 |
| 6370 · Phone, LDT, Pager, E-Mail | 235.63 | 942.40 |
| 6380 · Travel | 0.00 | 70.00 |
| 6410 · Subscriptions | 0.00 | 50.00 |
| 6430 · Ads | 40.95 | 76.24 |
| 6440 · Other | 212.07 | 457.07 |
| 6450 · Insurance | 228.00 | 24,292.75 |
| 6460 · Electric | 341.95 | 1,611.80 |
| 6470 · Water | 42.14 | 168.56 |
| 6480 · Trash | 83.38 | 166.27 |
| 6500 · Pump Holding Tank | 100.00 | 100.00 |
| 6510 · Building & Grounds Expense | 968.75 | 1,153.75 |
| 6520 · Boat | 0.00 | 946.25 |
| 6530 · Truck | 254.50 | 254.50 |
| 6670 · Debt Service (Dreding Equip.) | 656.87 | 1,438.12 |
| **Total Expense** | 25,330.30 | 90,513.75 |
| **Net Income** | **-318.74** | **-32,813.04** |

# LAKE LEMON CONSERVANCY
## Profit & Loss Budget vs. Actual
### January through April 2014

| | Jan - Apr 14 | Budget | $ Over Budget | % of Budget |
|---|---|---|---|---|
| **Income** | | | | |
| 4000 · Watercraft Permits | 21,973.00 | 102,000.00 | -80,027.00 | 21.5% |
| 4010 · Launch Fees | 7,123.00 | 16,000.00 | -8,877.00 | 44.5% |
| 4020 · Marina & Club Fees | 2,000.00 | 8,000.00 | -6,000.00 | 25.0% |
| 4030 · Sublease & Access Fees | 23,790.00 | 26,000.00 | -2,210.00 | 91.5% |
| 4040 · Property Tax - Brown Co. | 0.00 | 65,000.00 | -65,000.00 | 0.0% |
| 4050 · Property Tax -Monroe Co. | 0.00 | 185,000.00 | -185,000.00 | 0.0% |
| 4060 · Interest | 615.96 | 2,500.00 | -1,884.04 | 24.6% |
| 4070 · Grants & Donations | 35.00 | 6,000.00 | -5,965.00 | 0.6% |
| 4080 · Fishing Tournament | 600.00 | 800.00 | -200.00 | 75.0% |
| 4090 · Park Reservations | 750.00 | 4,500.00 | -3,750.00 | 16.7% |
| 4100 · Park Admisioin Fees | 0.00 | 27,000.00 | -27,000.00 | 0.0% |
| 4110 · Concessions | 0.00 | 0.00 | 0.00 | 0.0% |
| 4120 · Other Income | 813.75 | 0.00 | 813.75 | 100.0% |
| 4130 · Dredging/Rip-Rap Income | 0.00 | 20,000.00 | -20,000.00 | 0.0% |
| **Total Income** | 57,700.71 | 462,800.00 | -405,099.29 | 12.5% |
| **Expense** | | | | |
| 6000 · Manager | 18,330.32 | 54,991.00 | -36,660.68 | 33.3% |
| 6010 · FICA | 2,499.63 | 11,681.00 | -9,181.37 | 21.4% |
| 6020 · State Unemployment Tax | 219.80 | 314.00 | -94.20 | 70.0% |
| 6030 · Retirement | 2,575.39 | 7,809.00 | -5,233.61 | 33.0% |
| 6040 · Health Insurance | 7,567.58 | 21,000.00 | -13,432.42 | 36.0% |
| 6050 · Life Insurance | 1,263.00 | 1,263.00 | 0.00 | 100.0% |
| 6070 · Gate Attendant | 577.75 | 15,000.00 | -14,422.25 | 3.9% |
| 6080 · Seasonal Labor | 0.00 | 0.00 | 0.00 | 0.0% |
| 6090 · Park Maintenance Technician | 0.00 | 0.00 | 0.00 | 0.0% |
| 6100 · Lake Patrol | 0.00 | 4,800.00 | -4,800.00 | 0.0% |
| 6110 · Lake Biologist | 6,587.51 | 21,700.00 | -15,112.49 | 30.4% |
| 6111 · Dredger | 0.00 | 21,600.00 | -21,600.00 | 0.0% |
| 6112 · Dredger (Other) | 5,778.00 | 13,500.00 | -7,722.00 | 42.8% |
| 6113 · Assistant Dredger | 0.00 | 10,500.00 | -10,500.00 | 0.0% |
| 6114 · Assistant Dredger (Other) | 1,400.00 | 5,250.00 | -3,850.00 | 26.7% |
| 6115 · Dredger (Private) | 0.00 | 3,600.00 | -3,600.00 | 0.0% |
| 6116 · Assistant Dredger (Private) | 0.00 | 1,750.00 | -1,750.00 | 0.0% |
| 6120 · Season & Launch Permits | 1,246.83 | 1,200.00 | 46.83 | 103.9% |
| 6130 · Daily Permits | 0.00 | 300.00 | -300.00 | 0.0% |
| 6140 · Receipt/Tickets Books | 347.05 | 400.00 | -52.95 | 86.8% |
| 6150 · Checks | 53.36 | 200.00 | -146.64 | 26.7% |
| 6160 · Printer, Copier & Computer Supp | 263.50 | 500.00 | -236.50 | 52.7% |
| 6170 · Miscellaneous-Other | 223.89 | 1,300.00 | -1,076.11 | 17.2% |
| 6180 · Postage | 215.03 | 1,300.00 | -1,084.97 | 16.5% |
| 6190 · General Business Supplies | 220.45 | 500.00 | -279.55 | 44.1% |
| 6200 · Regular Gas | 304.92 | 5,000.00 | -4,695.08 | 6.1% |
| 6210 · Diesel | 207.80 | 14,000.00 | -13,792.20 | 1.5% |
| 6240 · Building & Grounds | 970.60 | 3,500.00 | -2,529.40 | 27.7% |
| 6250 · Boat/Weed Harvester/Truck | 1,031.28 | 2,000.00 | -968.72 | 51.6% |

# LAKE LEMON CONSERVANCY
## Profit & Loss Budget vs. Actual
### January through April 2014

| | Jan - Apr 14 | Budget | $ Over Budget | % of Budget |
|---|---|---|---|---|
| 6251 · Dredging Supplies | 715.85 | 9,000.00 | -8,284.15 | 8.0% |
| 6252 · Rip Rap/Erosion Control | 0.00 | 8,000.00 | -8,000.00 | 0.0% |
| 6270 · Boat Equipment | 0.00 | 300.00 | -300.00 | 0.0% |
| 6290 · Signs & Nautical Markers | 1,781.00 | 2,500.00 | -719.00 | 71.2% |
| 6300 · Accounting Services | 1,800.00 | 5,400.00 | -3,600.00 | 33.3% |
| 6310 · Grass | 1,812.50 | 10,875.00 | -9,062.50 | 16.7% |
| 6320 · Attorney | 645.00 | 6,000.00 | -5,355.00 | 10.8% |
| 6330 · Consulting Engineer | 0.00 | 15,000.00 | -15,000.00 | 0.0% |
| 6350 · Other Prof/Secretarial Service | 148.00 | 500.00 | -352.00 | 29.6% |
| 6370 · Phone, LDT, Pager, E-Mail | 942.40 | 2,900.00 | -1,957.60 | 32.5% |
| 6380 · Travel | 70.00 | | | |
| 6410 · Subscriptions | 50.00 | 300.00 | -250.00 | 16.7% |
| 6430 · Ads | 76.24 | 300.00 | -223.76 | 25.4% |
| 6440 · Other | 457.07 | 1,300.00 | -842.93 | 35.2% |
| 6450 · Insurance | 24,292.75 | 48,000.00 | -23,707.25 | 50.6% |
| 6460 · Electric | 1,611.80 | 4,500.00 | -2,888.20 | 35.8% |
| 6470 · Water | 168.56 | 600.00 | -431.44 | 28.1% |
| 6480 · Trash | 166.27 | 1,100.00 | -933.73 | 15.1% |
| 6490 · Port-O-Lets | 0.00 | 2,200.00 | -2,200.00 | 0.0% |
| 6500 · Pump Holding Tank | 100.00 | 500.00 | -400.00 | 20.0% |
| 6510 · Building & Grounds Expense | 1,153.75 | 4,000.00 | -2,846.25 | 28.8% |
| 6520 · Boat | 946.25 | 1,500.00 | -553.75 | 63.1% |
| 6530 · Truck | 254.50 | 1,000.00 | -745.50 | 25.5% |
| 6541 · Dredging Equipment Maintenance | 0.00 | 7,000.00 | -7,000.00 | 0.0% |
| 6542 · Equipment Rental | 0.00 | 2,000.00 | -2,000.00 | 0.0% |
| 6560 · Water Testing | 0.00 | 4,300.00 | -4,300.00 | 0.0% |
| 6570 · Lake Weed Treatment | 0.00 | 50,000.00 | -50,000.00 | 0.0% |
| 6590 · Contigency Funds 10% | 0.00 | 5,000.00 | -5,000.00 | 0.0% |
| 6600 · 6% MarinaPermit Sales | 0.00 | 2,300.00 | -2,300.00 | 0.0% |
| 6610 · Cumulative Maintenance Fund | 0.00 | 5,000.00 | -5,000.00 | 0.0% |
| 6620 · Dam/Spillway Inspection | 0.00 | 4,650.00 | -4,650.00 | 0.0% |
| 6630 · Spillway Repairs | 0.00 | 10,000.00 | -10,000.00 | 0.0% |
| 6661 · Disposal Site Preparation | 0.00 | 5,000.00 | -5,000.00 | 0.0% |
| 6662 · Debt Service-Dreding Loan | 67,702.88 | 46,000.00 | 21,702.88 | 147.2% |
| 6670 · Debt Service (Dreding Equip.) | 1,438.12 | | | |
| 6680 · Other Services and Charges | 0.00 | 3,000.00 | -3,000.00 | 0.0% |
| 6681 · Fireworks | 0.00 | 7,000.00 | -7,000.00 | 0.0% |
| Total Expense | 158,216.63 | 501,983.00 | -343,766.37 | 31.5% |
| **Net Income** | **-100,515.92** | **-39,183.00** | **-61,332.92** | **256.5%** |

# Lake Lemon Conservancy District

**Date: April 30, 2014** **ALLOWANCE OF VOUCHERS** **Lance Eberle**
**Treasurer**

**(Report of Claims)**

(IC 5-11-10-2 permits the governing body to sign the Accounts Payable Voucher Register in lieu of signing each claim the governing body is allowing.) We have examined the vouchers listed on the foregoing accounts payable voucher register and payroll journal, consisting of 6 pages, and except for vouchers not allowed as shown on the Register such vouchers are allowed in the total of $78,014.32

Dated this 21st day of May 2014

**Signature of Governing Board**

**JOHN SCHELL, CHAIRMAN**

**PAM DUGAN, VICE-CHAIR**

**LANCE EBERLE, TREASURER**

**SUE MILLER, Sub-Area II**

**KIM MAYER, Sub-Area III**

**DENNIS FRIESEL, Sub-Area V**

**TINA THRASHER, Sub-Area VII**

**7599 North Tunnel Road, Unionville, IN 47468**
**Phone 812/334-0233 • Fax 812/335-0038**

# LAKE LEMON CONSERVANCY
## Check Detail
### April 2014

| Type | Num | Date | Name | Item | Account | Paid Amount | Original Amount |
|---|---|---|---|---|---|---|---|
| **Check** | **2955** | **4/7/2014** | **STAPLES CREDIT ...** | | **1000 · Peoples Sta...** | | **-462.25** |
| | | | | | 6160 · Printer, Copi... | -212.54 | 212.54 |
| | | | | | 6190 · General Busi... | -19.47 | 19.47 |
| | | | | | 6240 · Building & G... | -18.17 | 18.17 |
| | | | | | 6440 · Other | -212.07 | 212.07 |
| TOTAL | | | | | | -462.25 | 462.25 |
| **Check** | **2956** | **4/7/2014** | **YOUNG TRUCKIN...** | | **1000 · Peoples Sta...** | | **-531.93** |
| | | | | | 6240 · Building & G... | -271.18 | 271.18 |
| | | | | | 6510 · Building & G... | -260.75 | 260.75 |
| TOTAL | | | | | | -531.93 | 531.93 |
| **Check** | **2957** | **4/7/2014** | **HOOSIER TIMES, I...** | | **1000 · Peoples Sta...** | | **-17.78** |
| | | | | | 6430 · Ads | -17.78 | 17.78 |
| TOTAL | | | | | | -17.78 | 17.78 |
| **Check** | **2958** | **4/7/2014** | **REPUBLIC SERVI...** | | **1000 · Peoples Sta...** | | **-83.38** |
| | | | | | 6480 · Trash | -83.38 | 83.38 |
| TOTAL | | | | | | -83.38 | 83.38 |
| **Check** | **2959** | **4/7/2014** | **BLOOMINGTON H...** | | **1000 · Peoples Sta...** | | **-18.96** |
| | | | | | 6240 · Building & G... | -18.96 | 18.96 |
| TOTAL | | | | | | -18.96 | 18.96 |
| **Check** | **2960** | **4/7/2014** | **NAPA AUTO PARTS** | | **1000 · Peoples Sta...** | | **-350.50** |
| | | | | | 6250 · Boat/Weed ... | -6.17 | 6.17 |
| | | | | | 6251 · Dredging Su... | -344.33 | 344.33 |
| TOTAL | | | | | | -350.50 | 350.50 |
| **Check** | **2961** | **4/7/2014** | **B & B WATER CORP** | | **1000 · Peoples Sta...** | | **-42.14** |
| | | | | | 6470 · Water | -42.14 | 42.14 |
| TOTAL | | | | | | -42.14 | 42.14 |

# LAKE LEMON CONSERVANCY
## Check Detail
### April 2014

| Type | Num | Date | Name | Item | Account | Paid Amount | Original Amount |
|---|---|---|---|---|---|---|---|
| **Check** | **2962** | **4/7/2014** | **BROWN CO DEM...** | | **1000 · Peoples Sta...** | | **-23.17** |
| | | | | | 6430 · Ads | -23.17 | 23.17 |
| TOTAL | | | | | | -23.17 | 23.17 |
| **Check** | **2963** | **4/7/2014** | **RECREATION SUP...** | | **1000 · Peoples Sta...** | | **-233.45** |
| | | | | | 6240 · Building & G... | -233.45 | 233.45 |
| TOTAL | | | | | | -233.45 | 233.45 |
| **Check** | **2971** | **4/16/2014** | **FIRST INSURANC...** | | **1000 · Peoples Sta...** | | **-228.00** |
| | | | | | 6450 · Insurance | -228.00 | 228.00 |
| TOTAL | | | | | | -228.00 | 228.00 |
| **Check** | **2972** | **4/16/2014** | **WATKINS ACCOU...** | | **1000 · Peoples Sta...** | | **-450.00** |
| | | | | | 6300 · Accounting ... | -450.00 | 450.00 |
| TOTAL | | | | | | -450.00 | 450.00 |
| **Check** | **2973** | **4/16/2014** | **COMCAST CABLE** | | **1000 · Peoples Sta...** | | **-202.78** |
| | | | | | 6370 · Phone, LDT,... | -202.78 | 202.78 |
| TOTAL | | | | | | -202.78 | 202.78 |
| **Check** | **2974** | **4/16/2014** | **TODD'S SEPTIC S...** | | **1000 · Peoples Sta...** | | **-100.00** |
| | | | | | 6500 · Pump Holdin... | -100.00 | 100.00 |
| TOTAL | | | | | | -100.00 | 100.00 |
| **Check** | **2975** | **4/16/2014** | **VISA** | | **1000 · Peoples Sta...** | | **-896.97** |
| | | | | | 6200 · Regular Gas | -150.00 | 150.00 |
| | | | | | 6250 · Boat/Weed ... | -539.47 | 539.47 |
| | | | | | 6510 · Building & G... | -28.00 | 28.00 |
| | | | | | 6530 · Truck | -179.50 | 179.50 |
| TOTAL | | | | | | -896.97 | 896.97 |
| **Check** | **2976** | **4/16/2014** | **VERIZON WIRELE...** | | **1000 · Peoples Sta...** | | **-32.85** |
| | | | | | 6370 · Phone, LDT,... | -32.85 | 32.85 |

# LAKE LEMON CONSERVANCY
## Check Detail
### April 2014

| Type | Num | Date | Name | Item | Account | Paid Amount | Original Amount |
|---|---|---|---|---|---|---|---|
| TOTAL | | | | | | -32.85 | 32.85 |
| **Check** | **2977** | **4/21/2014** | **INDIANA DEPT OF...** | | **1000 · Peoples Sta...** | | **-202.23** |
| | | | | | 6020 · State Unem... | -202.23 | 202.23 |
| TOTAL | | | | | | -202.23 | 202.23 |
| **Check** | **2978** | **4/21/2014** | **ANTHEM BLUE CR...** | | **1000 · Peoples Sta...** | | **-2,102.28** |
| | | | | | 6040 · Health Insur... | -2,102.28 | 2,102.28 |
| TOTAL | | | | | | -2,102.28 | 2,102.28 |
| **Check** | **2979** | **4/21/2014** | **SCI REMC** | | **1000 · Peoples Sta...** | | **-341.95** |
| | | | | | 6460 · Electric | -341.95 | 341.95 |
| TOTAL | | | | | | -341.95 | 341.95 |
| **Check** | **2980** | **4/30/2014** | **PAUL YOUNG PLU...** | | **1000 · Peoples Sta...** | | **-511.00** |
| | | | | | 6240 · Building & G... | -91.00 | 91.00 |
| | | | | | 6510 · Building & G... | -420.00 | 420.00 |
| TOTAL | | | | | | -511.00 | 511.00 |
| **Check** | **2981** | **4/30/2014** | **PEOPLES STATE ...** | | **1000 · Peoples Sta...** | | **-57,641.00** |
| | | | | | 6670 · Debt Service... | -656.87 | 656.87 |
| | | | | | 2800 · Long Term N... | -56,984.13 | 56,984.13 |
| TOTAL | | | | | | -57,641.00 | 57,641.00 |
| **Check** | **2982** | **4/30/2014** | **N. ANDERSON EX...** | | **1000 · Peoples Sta...** | | **-1,812.50** |
| | | | | | 6310 · Grass | -1,812.50 | 1,812.50 |
| TOTAL | | | | | | -1,812.50 | 1,812.50 |
| **Check** | **2983** | **4/30/2014** | **MAXWELL ELECT...** | | **1000 · Peoples Sta...** | | **-210.00** |
| | | | | | 6240 · Building & G... | -150.00 | 150.00 |
| | | | | | 6510 · Building & G... | -60.00 | 60.00 |
| TOTAL | | | | | | -210.00 | 210.00 |

# LAKE LEMON CONSERVANCY
## Check Detail
### April 2014

| Type | Num | Date | Name | Item | Account | Paid Amount | Original Amount |
|---|---|---|---|---|---|---|---|
| **Check** | **2984** | **4/30/2014** | **ROLYAN BUOYS** | | **1000 · Peoples Sta...** | | **-1,781.00** |
| | | | | | 6290 · Signs & Nau... | -1,781.00 | 1,781.00 |
| TOTAL | | | | | | -1,781.00 | 1,781.00 |
| **Check** | **3031** | **4/7/2014** | **BOB MADDEN** | | **1000 · Peoples Sta...** | | **-72.56** |
| | | | | | 6170 · Miscellaneou... | -67.70 | 67.70 |
| | | | | | 6180 · Postage | -4.86 | 4.86 |
| TOTAL | | | | | | -72.56 | 72.56 |
| **Check** | **3032** | **4/9/2014** | **CHRIS EAKINS** | | **1000 · Peoples Sta...** | | **-75.00** |
| | | | | | 6530 · Truck | -75.00 | 75.00 |
| TOTAL | | | | | | -75.00 | 75.00 |
| **Check** | **3033** | **4/10/2014** | **TONYA'S TOUCH I...** | | **1000 · Peoples Sta...** | | **-200.00** |
| | | | | | 6510 · Building & G... | -200.00 | 200.00 |
| TOTAL | | | | | | -200.00 | 200.00 |

$68,623.68

# LAKE LEMON CONSERVANCY
## Payroll Summary
### April 2014

| | Allender, Clinton L | | | Creek, Conner A | | | Hopkins, Joseph S | | | MADDEN, ROBERT E | | | Ng... |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Ho... | Rate | Apr 14 | Ho... | Rate | Apr 14 | Ho... | Rate | Apr 14 | Ho... | Rate | Apr 14 | Hours |
| **Employee Wages, Taxes and Adjustments** | | | | | | | | | | | | | |
| **Gross Pay** | | | | | | | | | | | | | |
| **Salary** | | | 0.00 | | | 0.00 | | | 0.00 | | | 4,582.58 | |
| **HOURLY PAY-6110** | | | 0.00 | | | 0.00 | | | 0.00 | | | 0.00 | |
| **Reg. Pay-6070** | | | 0.00 | 29.5 | 9.50 | 280.25 | 19.5 | 10.00 | 195.00 | | | 0.00 | 10.25 |
| **Reg.Pay-6111** | | | 0.00 | | | 0.00 | | | 0.00 | | | 0.00 | |
| **Reg.Pay-6112** | | | 0.00 | | | 0.00 | | | 0.00 | | | 0.00 | |
| **Reg.Pay-6114** | 80 | 17.50 | 1,400.00 | | | 0.00 | | | 0.00 | | | 0.00 | |
| **Reg.Pay 6113** | | 17.50 | 0.00 | | | 0.00 | | | 0.00 | | | 0.00 | |
| **Total Gross Pay** | 80 | | 1,400.00 | 29.5 | | 280.25 | 19.5 | | 195.00 | | | 4,582.58 | 10.25 |
| **Deductions from Gross Pay** | | | | | | | | | | | | | |
| **Insurance** | | | 0.00 | | | 0.00 | | | 0.00 | | | 0.00 | |
| **Total Deductions from Gross Pay** | | | 0.00 | | | 0.00 | | | 0.00 | | | 0.00 | |
| **Adjusted Gross Pay** | 80 | | 1,400.00 | 29.5 | | 280.25 | 19.5 | | 195.00 | | | 4,582.58 | 10.25 |
| **Taxes Withheld** | | | | | | | | | | | | | |
| **Federal Withholding** | | | -144.00 | | | -9.00 | | | 0.00 | | | -506.00 | |
| **Medicare Employee** | | | -20.30 | | | -4.06 | | | -2.83 | | | -66.45 | |
| **Social Security Employee** | | | -86.80 | | | -17.38 | | | -12.09 | | | -284.12 | |
| **IN - Withholding** | | | -47.60 | | | -9.53 | | | -6.63 | | | -155.80 | |
| **Hamilton Co** | | | 0.00 | | | 0.00 | | | 0.00 | | | 0.00 | |
| **Law. Co.** | | | -24.50 | | | 0.00 | | | 0.00 | | | 0.00 | |
| **Monroe Co.** | | | 0.00 | | | -2.95 | | | -2.04 | | | -47.66 | |
| **Total Taxes Withheld** | | | -323.20 | | | -42.92 | | | -23.59 | | | -1,060.03 | |
| **Net Pay** | **80** | | **1,076.80** | **29.5** | | **237.33** | **19.5** | | **171.41** | | | **3,522.55** | **10.25** |
| **Employer Taxes and Contributions** | | | | | | | | | | | | | |
| **Federal Unemployment** | | | 8.40 | | | 1.68 | | | 1.17 | | | 0.00 | |
| **Medicare Company** | | | 20.30 | | | 4.06 | | | 2.83 | | | 66.45 | |
| **Social Security Company** | | | 86.80 | | | 17.38 | | | 12.09 | | | 284.12 | |
| **IN - Unemployment Company** | | | 17.30 | | | 3.46 | | | 2.41 | | | 0.00 | |
| **Total Employer Taxes and Contributions** | | | **132.80** | | | **26.58** | | | **18.50** | | | **350.57** | |

# LAKE LEMON CONSERVANCY
## Payroll Summary
### April 2014

| | Nguyen, Christopher X | | VanTassel, James P | | | WARTHAN, LEVI R | | | TOTAL | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Rate | Apr 14 | Ho... | Rate | Apr 14 | Ho... | Rate | Apr 14 | Hours | Rate | Apr 14 |
| **Employee Wages, Taxes and Adjustments** | | | | | | | | | | | |
| **Gross Pay** | | | | | | | | | | | |
| **Salary** | | 0.00 | | | 0.00 | | | 0.00 | | | 4,582.58 |
| **HOURLY PAY-6110** | | 0.00 | 160 | 15.50 | 2,480.00 | | | 0.00 | 160.00 | | 2,480.00 |
| **Reg. Pay-6070** | 10.00 | 102.50 | | | 0.00 | | | 0.00 | 59.25 | | 577.75 |
| **Reg.Pay-6111** | | 0.00 | | | 0.00 | | 35.00 | 0.00 | | | 0.00 |
| **Reg.Pay-6112** | | 0.00 | | | 0.00 | 84 | 36.00 | 3,024.00 | 84.00 | | 3,024.00 |
| **Reg.Pay-6114** | | 0.00 | | | 0.00 | | | 0.00 | 80.00 | | 1,400.00 |
| **Reg.Pay 6113** | | 0.00 | | 17.00 | 0.00 | | | 0.00 | | | 0.00 |
| **Total Gross Pay** | | 102.50 | 160 | | 2,480.00 | 84 | | 3,024.00 | 383.25 | | 12,064.33 |
| **Deductions from Gross Pay** | | | | | | | | | | | |
| **Insurance** | | 0.00 | | | 0.00 | | | 0.00 | | | 0.00 |
| **Total Deductions from Gross Pay** | | 0.00 | | | 0.00 | | | 0.00 | | | 0.00 |
| **Adjusted Gross Pay** | | 102.50 | 160 | | 2,480.00 | 84 | | 3,024.00 | 383.25 | | 12,064.33 |
| **Taxes Withheld** | | | | | | | | | | | |
| **Federal Withholding** | | 0.00 | | | -208.00 | | | -339.00 | | | -1,206.00 |
| **Medicare Employee** | | -1.49 | | | -35.96 | | | -43.85 | | | -174.94 |
| **Social Security Employee** | | -6.36 | | | -153.76 | | | -187.49 | | | -748.00 |
| **IN - Withholding** | | -3.49 | | | -84.32 | | | -102.82 | | | -410.19 |
| **Hamilton Co** | | 0.00 | | | -24.80 | | | 0.00 | | | -24.80 |
| **Law. Co.** | | 0.00 | | | 0.00 | | | 0.00 | | | -24.50 |
| **Monroe Co.** | | -1.07 | | | 0.00 | | | -31.54 | | | -85.26 |
| **Total Taxes Withheld** | | -12.41 | | | -506.84 | | | -704.70 | | | -2,673.69 |
| **Net Pay** | | **90.09** | **160** | | **1,973.16** | **84** | | **2,319.30** | **383.25** | | **9,390.64** |
| **Employer Taxes and Contributions** | | | | | | | | | | | |
| **Federal Unemployment** | | 0.62 | | | 14.88 | | | 18.15 | | | 44.90 |
| **Medicare Company** | | 1.49 | | | 35.96 | | | 43.85 | | | 174.94 |
| **Social Security Company** | | 6.36 | | | 153.76 | | | 187.49 | | | 748.00 |
| **IN - Unemployment Company** | | 1.27 | | | 30.65 | | | 37.38 | | | 92.47 |
| **Total Employer Taxes and Contributions** | | **9.74** | | | **235.25** | | | **286.87** | | | **1,060.31** |

# Lake Lemon Conservancy District

**TENTATIVE**
**LLCD BUDGET PLANNER/KEY DATES FOR 2015 BUDGET**

| | |
|---|---|
| May 21, 2014 | Budget Time-Line Calendar – Selection of Board Budget Committee |
| May 22 – June 16, 2014 | Prepare 2015 Budget |
| June 21, 2014 | First Public Discussion on 2015 Budget (10:00 A.M., Riddle Point Park Shelter House) |
| July 19, 2014 | Second Public Discussion on 2015 Budget (10:00 A.M., Riddle Point Park Shelter House) |
| August 23, 2014 | Third Public Discussion on 2015 Budget (10:00 A.M., Riddle Point Park Shelter House) |
| September 3, 2014 | First Budget Publication Herald Times / Brown County Democrat |
| September 10, 2014 | Second Budget Publication (7 days after 1st publication) Herald Times / Brown County Democrat |
| September 17, 2014 | Public Hearing on 2015 Budget (Minimum 10 days after 1st publication) (6:00 P.M., Benton Township Senior Citizens Building) |
| October 15, 2014 (But no later than November 1, 2014) | Board Adoption of 2015 Budget (Minimum 15 days after Monroe County Council Review) (6:00 P.M., Benton Township Senior Citizens Building) |

**7599 North Tunnel Road, Unionville, IN 47468**
**Phone 812/334-0233 • Fax 812/335-0038**

# Lake Lemon Conservancy District

## PROFESSIONAL SERVICES AGREEMENT

This Agreement is entered into by and between Lake Lemon Conservancy District (hereinafter "LLCD") and Image Matters, LLC. (hereinafter "Image"):

In consideration of the mutual promises herein, the parties agree as follows:

1. Services to be performed: Image will timely furnish the quality control, analysis, and deliverables associated with the sediment depth and bathymetry assessment of Lake Lemon:

   See Scope of Services: Attachment "A" incorporated herein

   Total Amount of Material, Labor, and Reimbursable Items: $8,441.68

   All work shall be completed by Image on or by October 1, 2014. Any alteration or deviation from specifications attached as Exhibit A will require a modified, written agreement, signed by the Parties.

2. Payment: LLCD will pay in full all invoices for work satisfactorily performed by Image within thirty (30) days of the date of invoice ("Due Date").

3. LLCD's Obligation: LLCD will provide Image access to the property that is the subject of this Agreement at all reasonable times necessary to Image's work.

4. Relationship of the Parties: Image is an independent contractor in the performance of each and every part of this Agreement and solely and personally liable for the costs of all labor, equipment, tools, and expenses in connection therewith and for any and all damages that may occur because of Image's performance under this Agreement, whether for personal injuries or damages of any other kind. Nothing in this Agreement shall be construed in any way to constitute Image as the agent or representative of the LLCD.

5. Tax Liability: Image shall exonerate, indemnify, and hold harmless the LLCD from and against, and shall assume full responsibility for, payment of self-employment taxes, all federal, state and local taxes, or contributions imposed or required under unemployment insurance, workmen's compensation, social security, and income tax laws with respect to the services under this Agreement.

**7599 North Tunnel Road, Unionville, IN 47468**
**Phone 812/334-0233 • Fax 812/335-0038**

6. Remedies: A party shall be entitled to seek and obtain all relief, whether in law or in equity, for breach of the Agreement by the other party, including damages and reasonable attorney fees.

7. Addresses: Payments and other notices shall be provided to Image Matters, LLC at 403 E. 6th St., Suite 100 Bloomington, IN 47408. Invoices and other notices shall be provided to LLCD, Attention: Robert Madden, at 7599 N. Tunnel Road, Unionville, IN 47468.

8. Severability: In the event any provision of this Agreement conflicts with applicable law, such conflict shall not affect other provisions of this Agreement.

9. Choice of Law and Venue: The terms and provisions of this Agreement shall be construed in accordance with Indiana law. The parties waive trial by jury for any dispute arising out of this Agreement. The parties hereby stipulate that Monroe County, Indiana shall be the sole and exclusive venue for any dispute arising from this Agreement.

SO AGREED ON THE DATE STATED BELOW:

Image Matters, LLC

Dated: _____ By: _____
Its: _____

LAKE LEMON CONSERVANCY DISTRICT

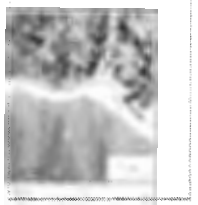
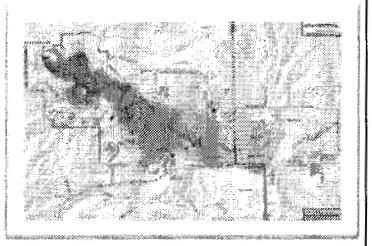
Dated: _____ By: _____
Its: Chairman, Board of Directors

**Attachment A: Scope of Services**

**Proposal to:**
**Lake Lemon Conservancy District**

**Proposed by:**
**Image Matters LLC**
**403 E. Sixth Street, Suite 100**
**Bloomington, IN 47408**

| **Bathymetry and Sediment Depth Data: Product Review and Secondary Product Generation** | | | | | |
|---|---|---|---|---|---|
| **Task** | **Format of Deliverable** | **Staff** | **(hrs)** | **Unit Price ($/hr)** | **Estimated Cost** |
| **Task 1: Review of 2014 Remetrix Survey**<br>• Review of Remetrix data products and report, as done in 2003<br>• Briefing on findings | Report in PDF | Jeff Ehman | 8 | $162.06 | $1,296.48 |
| **Task 2: Sediment Volume Calculations for proposed sediment removal areas**<br>• 2014 sediment volume<br>• 2003 sediment volume<br>• sediment volume change from 2003 to 2014 | Tabular data in Excel and PDF | Nathan Eaton | 20 | $78.08 | $1,561.60 |
| **Task 3: Updated Sediment Removal Map**<br>• Most recent publically available aerial imagery<br>• Revised, colorized bathymetric data from 2014 survey<br>• Updated data table showing 2014 sediment volumes<br>• 12''x18'' and 24''x36'' printable formats | Maps in PDF<br>  | Nathan Eaton | 10 | $78.08 | $780.80 |

| | | | | | |
|---|---|---|---|---|---|
| **Task 4: New Project Map for each of ~60 Sediment Removal Area 60 (8.5"x11" PDF)**<br>• Establish map template based on LLCD input<br>• Show Sediment Removal Area boundary<br>• Incorporate most current imagery, bathymetric data, and sediment volumes | Maps in PDF  | Nathan Eaton | 14 | $78.08 | $1,093.12 |
| **Task 5: Updated Fishing Map**<br>• Revised, colorized bathymetric data from 2014 survey<br>• Revised bathymetric contour lines<br>• Any additional changes requested by LLCD | Map in PDF  | Nathan Eaton | 6 | $78.08 | $468.48 |
| **Task 6: On-call and Meeting Support**<br>• As needed support with LLCD Board, LLCD Subcommittee / Work Group Meetings, LLCD Staff, and/or ReMetrix LLC | Phone or in person | Jeff Ehman | 12 | $162.06 | $1,944.72 |
| **Task 7: Project Management**<br>• Detailed review all deliverables from Tasks 2 – 5 prior to submission<br>• Track and report on project status<br>• Communicate with LLCD as necessary | Monthly Status Reports | Jeff Ehman | 8 | $162.06 | $1,296.48 |
| **DELIVERY ORDER GRAND TOTAL:** | | | | | **$8,441.68** |

I hereby certify that the above estimate is just and, to the best of my knowledge, represents fair charges for the goods and services to be provided.

Jeffrey L. Ehman
Project Manager

Jeffrey L Ehman

13 May, 2014

Lake Lemon Conservancy District

## PROFESSIONAL SERVICES AGREEMENT

This Agreement is entered into by and between Lake Lemon Conservancy District (hereinafter "LLCD") and ReMetrix, LLC. (hereinafter "ReMetrix"):

In consideration of the mutual promises herein, the parties agree as follows:

1. Services to be performed: ReMetrix will timely furnish the materials and perform labor necessary for the sediment depths and bathymetry assessment of Lake Lemon:

   See Scope of Services: Attachment "A" incorporated herein

   Total Amount of Material, Labor, and Reimbursable Items: $22,100.00

   All work shall be completed by ReMetrix on or by August 31, 2014. Any alteration or deviation from specifications attached as Exhibit A will require a modified, written agreement, signed by the Parties.

2. Payment: LLCD will pay in full all invoices for work satisfactorily performed by ReMetrix within thirty (30) days of the date of invoice ("Due Date").

3. LLCD's Obligation: LLCD will provide Remetrix access to the property that is the subject of this Agreement at all reasonable times necessary to ReMetrix's work.

4. Relationship of the Parties: ReMetrix is an independent contractor in the performance of each and every part of this Agreement and solely and personally liable for the costs of all labor, equipment, tools, and expenses in connection therewith and for any and all damages that may occur because of ReMetrix's performance under this Agreement, whether for personal injuries or damages of any other kind. Nothing in this Agreement shall be construed in any way to constitute ReMetrix as the agent or representative of the LLCD. Remetrix shall maintain appropriate commercial general liability insurance in a minimum amount of Two Million Dollars ($2,000,000.00) per occurrence. The LLCD and City of Bloomington Utilities (CBU) shall be included as additional named-insureds on the policy. ReMetrix shall provide proof of insurance.

**7599 North Tunnel Road, Unionville, IN 47468**
**Phone 812/334-0233 • Fax 812/335-0038**

5. Liability: The LLCD and ReMetrix acknowledge and agree that the services to be performed by ReMetrix under this Agreement are to be performed by ReMetrix at its own risk and that it assumes all responsibility for any damages or injuries that may result from its negligent performance of services under this Agreement. ReMetrix agrees to indemnify and hold harmless the LLCD and CBU from any and all liability for any injuries (including death), damages, loss or claims based upon, arising out of, or in any manner connected with its negligent performance of services provided under this Agreement, which includes but is not limited to claims for workers' compensation coverage. It is further agreed that ReMetrix shall bear all costs of obtaining and maintaining for the term of this Agreement all required licensing, permits, liability insurance and Workers' Compensation insurance, as required by law.

6. Tax Liability: ReMetrix shall exonerate, indemnify, and hold harmless the LLCD from and against, and shall assume full responsibility for, payment of self-employment taxes, all federal, state and local taxes, or contributions imposed or required under unemployment insurance, workmen's compensation, social security, and income tax laws with respect to the services under this Agreement.

7. Remedies: A party shall be entitled to seek and obtain all relief, whether in law or in equity, for breach of the Agreement by the other party, including damages and reasonable attorney fees.

8. Addresses: Payments and other notices shall be provided to ReMetrix, LLC at 11550 N. Meridian, Suite 600 Carmel, IN 46032. Invoices and other notices shall be provided to LLCD, Attention: Robert Madden, at 7599 N. Tunnel Road, Unionville, IN 47468.

9. Severability: In the event any provision of this Agreement conflicts with applicable law, such conflict shall not affect other provisions of this Agreement.

10. Choice of Law and Venue: The terms and provisions of this Agreement shall be construed in accordance with Indiana law. The parties waive trial by jury for any dispute arising out of this Agreement. The parties hereby stipulate that Monroe County, Indiana shall be the sole and exclusive venue for any dispute arising from this Agreement.

SO AGREED ON THE DATE STATED BELOW:

ReMetrix, LLC

Dated: _____ By: _____
Its: _____

LAKE LEMON CONSERVANCY DISTRICT

Dated: _____ By: _____
Its: Chairman, Board of Directors

Attachment "A"

ReMetrix

# Proposal for Soft-Sediment Depths, Bathymetry, and Volumetric Updates of Lake Lemon, IN

*April 30, 2014*

*Project overview*

This proposal contains a flexible mapping plan that can be adapted to meet the specific project goals of the Lake Lemon Conservancy District (LLCD). For example, the distribution of the proposed 420 soft-sediment depth sampling points and the 62-km of hydroacoustic transects can be adjusted to maximize collection in areas of greatest interest. ReMetrix is very willing to work with LLCD to optimize the final sampling strategy.

ReMetrix would like to note at the outset that we performed a very similar project to this at Lake Lemon in 2003. Our familiarity with the lake will help make this project a success.

Stated goals of the project (from 3/12/14 email from Jeff Ehman, PhD):

1. Collect water depth (bathymetry) and sediment depth data in lake areas with depth < 6 feet.
2. Update existing contour database and produce revised bathymetry for entire lake. (Original soundings may be used if available.)
3. Generate sediment depth mapping for key areas (TBD, but primarily the back end of the lake and coves with low gradient to deeper water)
4. Evaluate change in water volume for entire lake
5. Evaluate change in both water depth and sediment depth for key areas. The focus is on the relatively shallow areas of the lake.

*Plan for soft-sediment depth sampling*

ReMetrix met with Bob Madden and James Van Tassel of LLCD, and Jeff Ehman of Image Matters LLC, on April 22, 2014 to discuss options for sampling strategies.

In 2003 ReMetrix sampled 369 soft-sediment depth points at Lake Lemon using a sediment probe method. Approximately 38% (140) of the sediment sampling points in 2003 were located within the eastern-most 'back-end' lobe of the lake (Figure 1). ReMetrix initially proposed shifting approximately 85 points in the 2003 sampling plan from the western portion of the lake to the eastern lobe of the lake.

During our meeting the group instead decided the best plan of action is to: (a) keep the 2003 sampling locations intact so as to be able to best determine the changes in sedimentation from 2003 to 2014, and (b) add 51 new points in key areas of current interest. Figure 2 below shows the 2003 soft-sediment sampling points in blue, and the 51 newly proposed sampling points in green.

The proposed new sampling locations have not been surveyed in advance, so some of the new locations may need to be adjusted to nearby locations based on lake conditions at the sites. Similarly, some of the eastern-lobe sites sampled in 2003 are no longer accessible

due to being above the water line. These situations are anticipated to affect a very small percentage of the overall total sites. If a site is unable to be sampled, we will sample the nearest adjacent location or an alternate location as directed by LLCD. Lake Biologist James Van Tassel will be present during much of the sampling process and so we will follow his guidance for adjusting any inaccessible sampling locations.

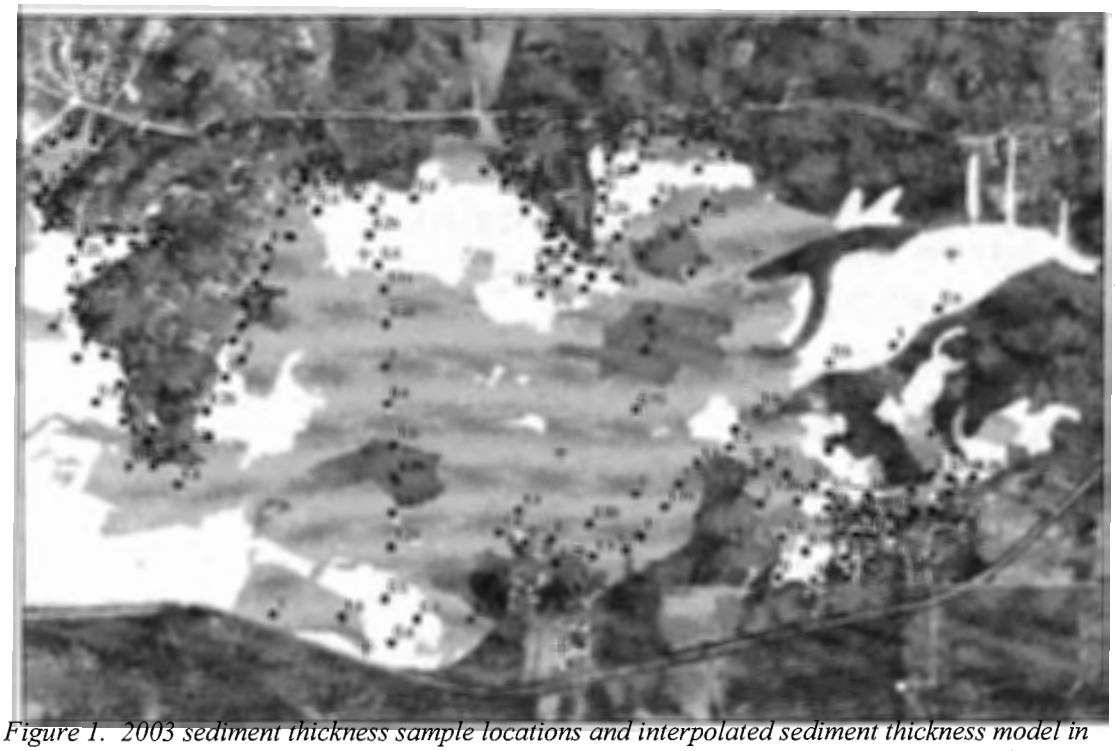


*Figure 1. 2003 sediment thickness sample locations and interpolated sediment thickness model in the eastern 'back-end' lobe of the lake. 140 sample points were collected in this portion of the lake in 2003. ReMetrix proposes increasing to 225 sample points in this same area for 2014.*

*Figure 2. Proposed 420 soft-sediment thickness sampling locations for 2014. The locations in blue are the 2003 soft-sediment sampling locations (369), and the locations in green are the locations that will be added in 2014 (51).*

*Soft-sediment sampling methodology*

Data will be collected using a sediment probe, GPS, and customized GIS data logger. Soft-sediment depths will be recorded at quarter-foot depth increments (every 3-inches), and rounded to the nearest 3-inch marking in instances where the sediment level measures in between two depth increments on the sediment probe.

The depth of the top of the sediment layer will be determined by the first sign of resistance to the probe as it is lowered into the water. The depth of the bottom of the sediment layer will be measured at the point where consistent arm-strength force cannot push the sediment probe any further into the sediment. No mechanical means will be used to push the sediment probe further into the sediment.

ReMetrix will only measure soft-sediment depths to a maximum of six feet of thickness. If the probe is still able to be pushed beyond six feet of sediment thickness, ReMetrix will record the location as exceeding six feet in the data logger. During the subsequent step of estimating sediment volume for that cove, only the sediment volume above the six-foot sediment depth level will be estimated. Similarly, ReMetrix will only conduct probing in a maximum of eight feet of water depth, although for this project that is not expected to be a limitation.

While probing is a common methodology for efficiently measuring soft-sediment depths, a few caveats exist with this methodology. Periodically soft-sediment is deposited in a 'layer-cake' fashion, meaning unconsolidated sediment layers are interspersed with denser, strongly consolidated layers (typically clay) in an alternating arrangement. Thus it is possible that more soft-sediment exists below the initial consolidated layer encountered by the probe.

Additionally, sometimes the consolidated layer is not uniform and contiguous across a geographic area, and thus pockets of soft-sediment with widely varying total depths can occur within a relatively small area. If ReMetrix encounters an area such as this, we will make a note of the area and do our best within the scope of the project to estimate the extent, depth, and volume of the top-most unconsolidated layer. In our experience this situation is fairly infrequent, but it does occasionally occur.

Another situation that can occur in unusual instances is that the probe's progress through the soft-sediment is halted by a large rock, buried object, or pocket of cobbles. It is usually impossible to determine from the water surface what has halted the progress of the probe, so the person performing the probing can only reasonably conclude that the probe has reached the consolidated bottom of the soft-sediment layer and will record the sediment depth as such. These situations, again uncommon, can affect the estimates of total sediment volume within a particular cove, and thus the customer should be aware of this caveat of the probing method.

From a maintenance dredging standpoint, the above caveats may not be an issue if the goal is to only dredge the top-most soft layer of sediment for recreational access. However the customer should be aware of these potential situations and evaluate their potential implications in relation to their specific project goals. If layer-cake sediment properties are indeed a concern, then alternate sediment sampling technologies, such as sediment coring, should be evaluated as a potential solution.

Areas where the soft-sediment protrudes above the water surface (e.g., sand bars) will also be measured with the probe unless they are already consolidated to a degree where probing is resistant to arm-strength force. Such areas will be recorded with special notation in the data logger and also noted on the final project maps. The thickness and extent of sediment protruding above the water surface will be estimated as best as possible using basic field measurement tools and observations.

The proposed sampling technique is the same method that was used in 2003, which will enable 'apples-to-apples' comparisons between the current soft-sediment depths, thicknesses, and volumes with those determined in 2003.

*Plan for hydroacoustic sampling*

In 2003 ReMetrix collected approximately 62 km of transects at the lake (Figure 3). Areas of the lake less than 6-feet of water depth in 2003 are shown in Figure 4.

The price proposed for this 2014 project is based on repeating the same 62km of transects. At the April 22 meeting, a decision was made to repeat the collection of the 2003 hydroacoustic transects so as to best be able to compare lake water volume statistics from 2003 to 2014.

*Figure 3. Hydroacoustic data transects collected by ReMetrix in 2003. Transects within the lake total approximately 62km. Spacing averages approximately 100 meters between transects.*

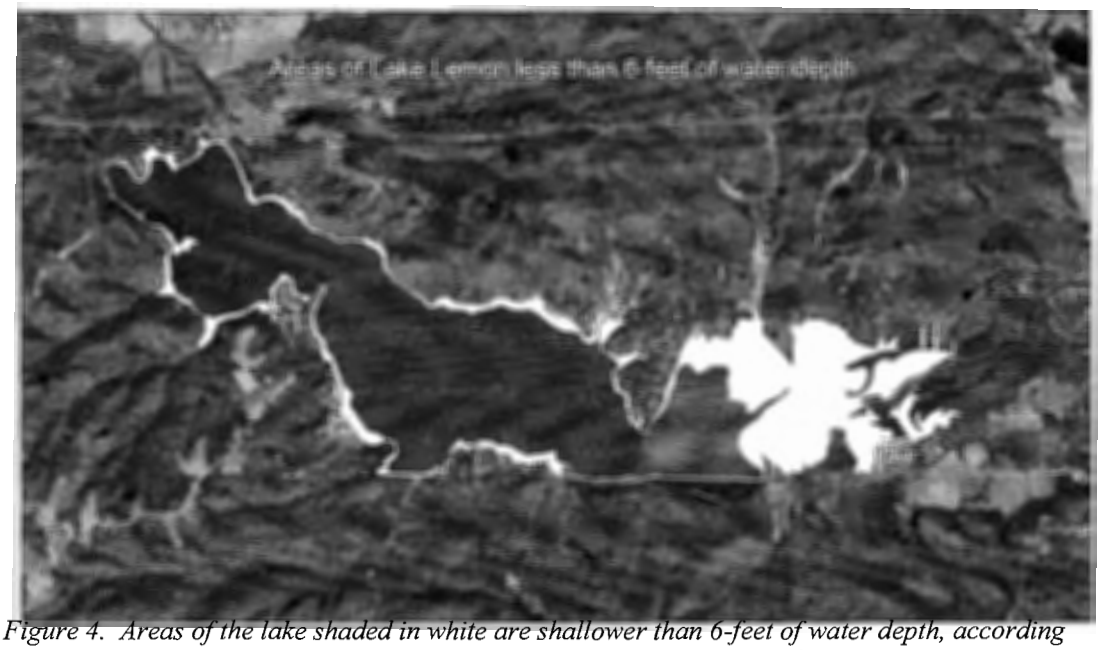


*Figure 4. Areas of the lake shaded in white are shallower than 6-feet of water depth, according to the 2003 bathymetric map. The area shaded in white is 440 acres (30% of the lake).*

*Other sampling factors*

ReMetrix will take digital photos of data collection results at a minimum of 10-percent of the sediment sample sites for quality assurance.

The ReMetrix hydroacoustic system does not collect data in water depths shallower than about 2.5-feet due to the physics of the hydroacoustic beam emitted by the system. If collecting water depth measurements in areas shallower than approximately 2.5-feet of depth is necessary in some portions of the lake, ReMetrix will elect to use the sediment probe to measure water depth to the sediment surface for incorporation into the bathymetric model. We do not anticipate that this will be a widespread occurrence during the project but may occur periodically.

ReMetrix recommends collecting hydroacoustic data as early as possible in the year to avoid any significant plant biomass from aquatic plant beds. ReMetrix is able to filter out the plant biomass from hydroacoustic data, however lake-bottom data with minimal aquatic vegetation is always cleaner than lake-bottom data with significant aquatic vegetation.

As stated in the 'other information and disclaimers' section below, collecting hydroacoustic data at the highest possible lake water level is advantageous. The lake level during the ReMetrix data collection activities in 2003 was 629.7 feet of elevation, as measured at the gauge located near the LLCD office. We have since learned that specific gauge is no longer present, but we can obtain the lake level reading this year at the spillway. ReMetrix can adjust for any variation in water elevation from the 2003 level, so the lake does not need to be at exactly the same elevation as the initial collection.

*Sampling equipment*

ReMetrix will use a sub-meter Trimble AgGPS 162, a BioSonics DT-X scientific hydroacoustic system, a sediment probe with 3-inch depth increments, and a Carolina skiff with 4-stroke engine for this project. A ganoe may also be used for extreme shallow-water navigation.

*Data analysis*

ReMetrix uses various commercial and proprietary software to perform data processing and analyses, but the final maps and data layers are created in Esri® ArcGIS.

Following the completion of field sampling, the sediment thickness data points will be imported into ArcGIS for mapping and analysis. Thickness of locations between data points will be interpolated using geostatistical techniques. A final 3D GIS-based soft-sediment thickness model will be created at 1-foot thickness increments for the extents of the areas sampled.

For the hydroacoustic data analysis, ReMetrix will first post-process the hydroacoustic data for water depth values. Depths of locations between data points will be interpolated using geostatistical techniques. A final 3D GIS-based surface model will be created for the extent of the area sampled (whole-lake or sub-6-foot zones) and contouring algorithms will be used to create depth contours at 1-foot depth intervals. A segmented water-volume table will also be created that provides the volume of each contour interval.

All of the final data outputs and volumetric tables will be assembled into a set of final project maps similar to those provided in the 2003 project, with some updated elements and formatting.

The following geographic coordinate system was used for the 2003 data files, and will be used again for the 2014 data files. ReMetrix can provide data in an alternate coordinate system if desired.

Projection: State Plane Indiana West
Datum: NAD83
Spheroid: GRS1980
Units: feet

*Project deliverables*

Esri ArcGIS data layers:

1) Soft-sediment depth points
2) Hydroacoustic water depth points
3) Grid for bathymetric depth model within the zone collected
4) Grid for soft-sediment depth within the zones collected
5) Lake shoreline polygon

The following maps will be provided in 11x17 and jpg formats:

6) Bathymetry (at 1-foot depth resolution)

7) Soft-sediment thickness (at 1-foot depth resolution)
8) Hydroacoustic transects

*Note: some maps may be split into east and west sections to show greater detail (as was done in 2003). Please inform us if that is not desired.*

The following volumetric estimates will be provided:

9) Whole-lake water volume for each 1-foot bathymetric depth interval.
10) Whole-lake soft-sediment volume for each 1-foot depth interval (based on the extent of the final sampling layout).

The following historic volumetric comparison tables will be provided:

11) Whole-lake water volume change from 2003-2014.
12) Whole-lake soft-sediment volume change from 2003-2014.

Other deliverables:

13) A project summary report (one electronic PDF copy and five bound printed copies).
14) Digital photos from a minimum of 10-percent of the sediment sampling sites.

*Note: An amended project deliverable list will be provided for approval if any adjustments are made to the project plan that affect the list of deliverables. Changes to the list of deliverables may require a project pricing adjustment.*

*Project Budget*

The total price for the above described field data collection, data analyses, and deliverables is **$22,100**.

*Budget adjustment options:*

a) Additional blocks of 100 soft-sediment thickness sampling points: $2,150 per block of 100.

*Qualifications*

- ReMetrix performed soft-sediment thickness, soft-sediment type, and bathymetric mapping at Lake Lemon in 2003.
- ReMetrix has performed mapping projects in over 250 lakes ranging in size from 20 to 40,000 acres.
- ReMetrix remains the national leader in aquatic habitat mapping, having mapped over 2.5 million acres of inland aquatic resources…more than any other company.
- ReMetrix has led and performed many of the largest and most complex inland aquatic mapping projects in the world.
- ReMetrix has a licensed professional surveyor as a principal in its business.
- ReMetrix methods have been validated by third party experts.

- ReMetrix is an Esri® Business Partner.

Thank you for considering ReMetrix for this project. Please contact us with any further questions.

Sincerely,

Douglas Henderson
Commercial Manager
ReMetrix LLC
(317) 580-8035
doug@remetrix.com

## Other Relevant Information and Project Disclaimers

Ideally, the data collection for this project should be performed during maximum annual water levels at the lake (or as close to maximum water levels as realistically possible).

Depending on field conditions, hydroacoustic data are sometimes unable to be collected in waters shallower than 2.5-feet. ReMetrix may periodically navigate into waters shallower than 2.5-feet to collect hydroacoustic data when conditions allow, but the client should recognize that most or all hydroacoustic data for this project may end up being collected in waters 2.5-feet and deeper. ReMetrix will use a physical sampling device to sample water depths in waters 2.5-feet and shallower.

Proposed sampling strategies and grids may have to be modified in the field during collection if certain areas prove too difficult to navigate safely or pose a risk to damaging ReMetrix equipment. Should ReMetrix encounter such situations we will make every reasonable effort to carry out the sampling program with as few deviations as possible from the original plan.

The client is responsible for providing any information relevant to accessing the lake, including any restrictions on hours we may work at the lake (e.g., sunrise to sunset, etc.). The client is also responsible for providing any safety-relevant information regarding the lake (such as known navigational hazards, etc.). Any dates, including weekend dates, which may not be appropriate for data collection (e.g., fishing tournament dates, public festivals at the lake, lake management activities, etc.) should be communicated to ReMetrix as soon as the dates are known so that we are able to schedule around them. The client is responsible for costs incurred should ReMetrix arrive at the lake to perform field data collection and encounter a previously planned public activity on or around the lake that impedes our ability to appropriately perform the contracted work.

Unless a previously created digital shoreline file and/or digital aerial imagery is provided by the client in advance of the project, ReMetrix intends to use publicly available orthophoto-quality aerial imagery to delineate the lake shoreline and as a background layer for final maps. No budget for purchasing existing or acquiring new aerial/satellite imagery has been included in the project budget. Instead ReMetrix will use imagery available at no cost. ReMetrix will make every reasonable effort to locate and use the most-recent and/or high-quality imagery it can find as of the start date of the project. Imagery updates made available to the public after the start date of the project are not guaranteed to be incorporated. In most instances, no-cost public imagery of sufficient quality is available for projects such as this. If ReMetrix is unable to find adequate public imagery for use, we will contact the client and discuss the options before proceeding with the project.

Additions or changes to the finalized, contracted scope-of-work may incur additional costs.

ReMetrix participation extending beyond the scope of the contracted project is not included in the project budget. Examples of participation beyond the project scope include but are not limited to: requests to create new, currently non-existent features or layers to the project data set; significantly editing or redesigning features that were part of the original scope of work; importing and manipulating additional data layers not designated above; creating specialty graphics or PowerPoint slides from the project (aside from the deliverables included above), travel to meetings for presentations, routine technical help with data products, etc. Requests for activities such as those listed above or similar are welcome but must be arranged for in a separate agreement.

*CAD digital data formats available for deliverables:*
If requested, ReMetrix can provide data to the client in the following AutoCAD formats: DGN-V8, DWG-R14, DWG-R2000, DWG-R2004, DWG-R2005, DWG-R2006, DWG-R2007, DXF-R14, DXF-R2000, DXF-R2004. DXF-R2005, DXF-R2006, DXF-R2007. Please inquire if additional options are sought.

*Data ownership:*
ReMetrix grants the client a non-exclusive, royalty-free license to use all final data products and reports developed by ReMetrix as part of this project. The license shall have a perpetual term and the client may not transfer it. ReMetrix shall retain all digital and print copyrights, patent rights, data rights and other intellectual property rights to the project data and deliverables.

## Other Relevant Information and Project Disclaimers (continued)

*General disclaimer:*
ReMetrix data for this project are intended for general aquatic management activities. Their purposes are to provide estimates of water depth contours and/or volumes, soft-sediment depth contours and/or volumes, and general surficial soft-sediment types. These data are not intended for any other function. The data products provide estimations and do not represent a survey or an engineering report. These data are not to be used for navigation. Some of the project data are modeled using statistical techniques. Some information portrayed herein, such as shorelines, may have been derived from third-party data sources; the data provider is in no way responsible for the validity of third-party data or its use by others. The user assumes all risks associated with altering the data or using the data outside of their intended purpose.

**Lake Lemon Monitoring Program**
**2013 Executive Summary**

The Lake Lemon Conservancy District (LLCD) has entered into a lease agreement with the City of Bloomington Utilities Service Board (USB) to maintain Lake Lemon in such condition necessary to protect the lake's water quality consistent with its potential use as a drinking water source. LLCD also agreed to maintain the lake in such condition to meet all state and federal requirements for recreational waters and to maintain the quality of the water in the lake at least at its present level. The LLCD has contracted with Indiana University's School of Public & Environmental Affairs (SPEA) to evaluate the condition of Lake Lemon since 1997.

**SAMPLING SEASON AND LOCATIONS:**

Four lake locations and three stream locations were sampled during the 2013 sampling season (Table 1).

**Table 1.** Seven site locations for the 2013 sampling season.

| Location | Spring 5/8/2013 | Summer 7/31/13 | Storm event 5/31/13 | Parameters |
|---|---|---|---|---|
| Riddle Point | ✓ | ✓ | | Lake Full set |
| Reed Point | ✓ | ✓ | | Lake Full set |
| Beanblossom Creek | ✓ | ✓ | ✓ | Stream Full set |
| Chitwood 1 | ✓ | ✓ | | Bacteria only |
| Chitwood 2 | ✓ | ✓ | | Bacteria only |
| Bear Creek | ✓ | ✓ | ✓ | Bacteria + TSS |
| N. Shore Marina | ✓ | ✓ | ✓ | Bacteria + TSS |

**WATER QUALITY RESULTS:**

The water characteristics of Lake Lemon are highly variable due, in large part, to runoff from the very large watershed that can replace the entire lake volume in a relatively short time. This fast flushing rate causes difficulties in monitoring because the water conditions at any particular time depend on several immeasurable variables, including: time since the last major storm and the intensity and duration of that storm (Figure 1). While these variables affect other Indiana lakes and reservoirs, they have a much greater influence at Lake Lemon because of its very large watershed compared to its lake volume. Due the active dredging and updated hydraulic flushing rate will need to be recalculated once this in-lake treatment is completed.

Lake Lemon suffers from seasonally high levels of phosphorus, suspended sediments, and relatively low Secchi disk transparency throughout the year; however, the overall trend for Lake Lemon has not changed in the last 15 years (Figures 2-4). Current and past water conditions unquestionably place the lake into the 'eutrophic' or over-productive trophic category. Eutrophic lakes produce more algae and rooted plants than the bacteria and microbes can decompose annually. As a result, decaying organic matter accumulates on the sediments where it contributes to low dissolved oxygen levels and decreased lake volume.

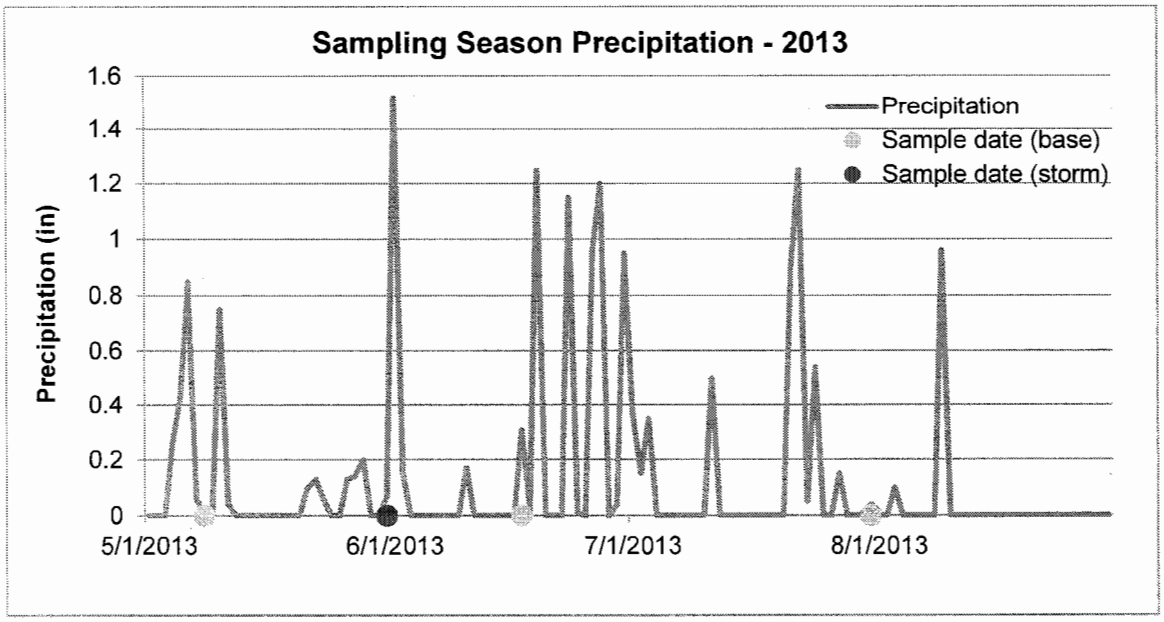



**Figure 1.** Precipitation for the 2013 sampling season. While three samples (orange) represent base flow conditions, they are fall in between small rain events. The storm sample (red) fell within the largest rain event.

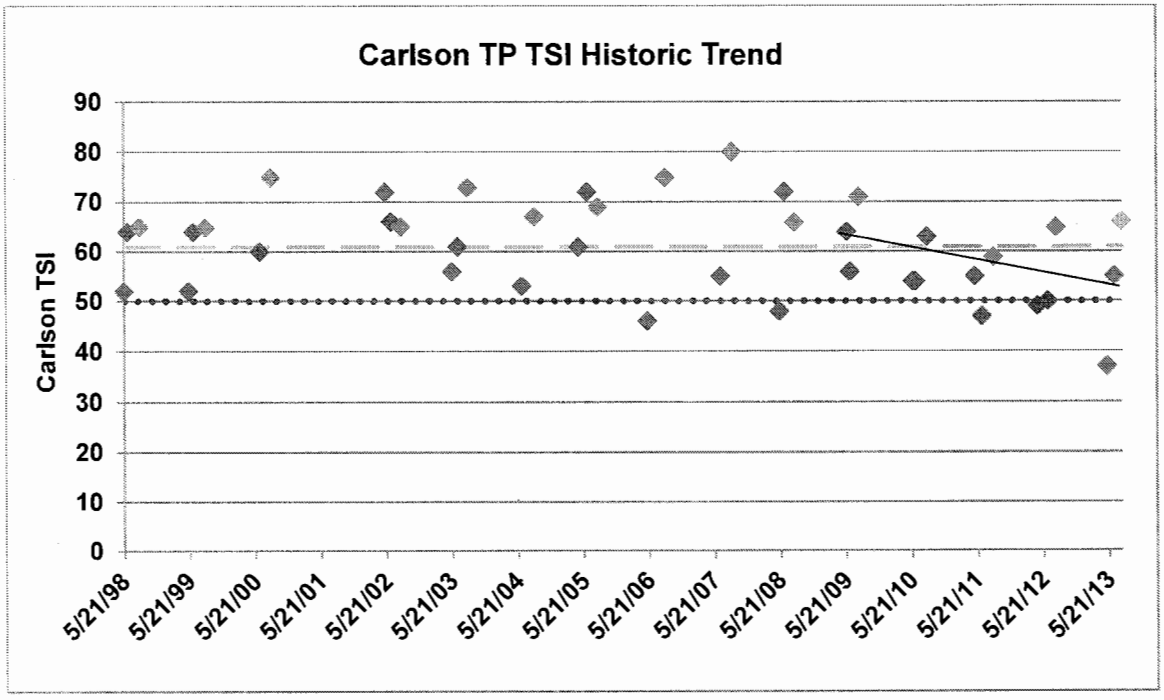



**Figure 2.** The 15 year historic trend for Carlson total phosphorus Trophic State Index (TSI) scores. All August samples, shown in orange, score above the mean for eutrophic status. The purple dotted line illustrates eutrophic status for the Carlson TSI. The green dashed line illustrates the 15-year mean. The black line shows a decreasing trend for the last 5 years.

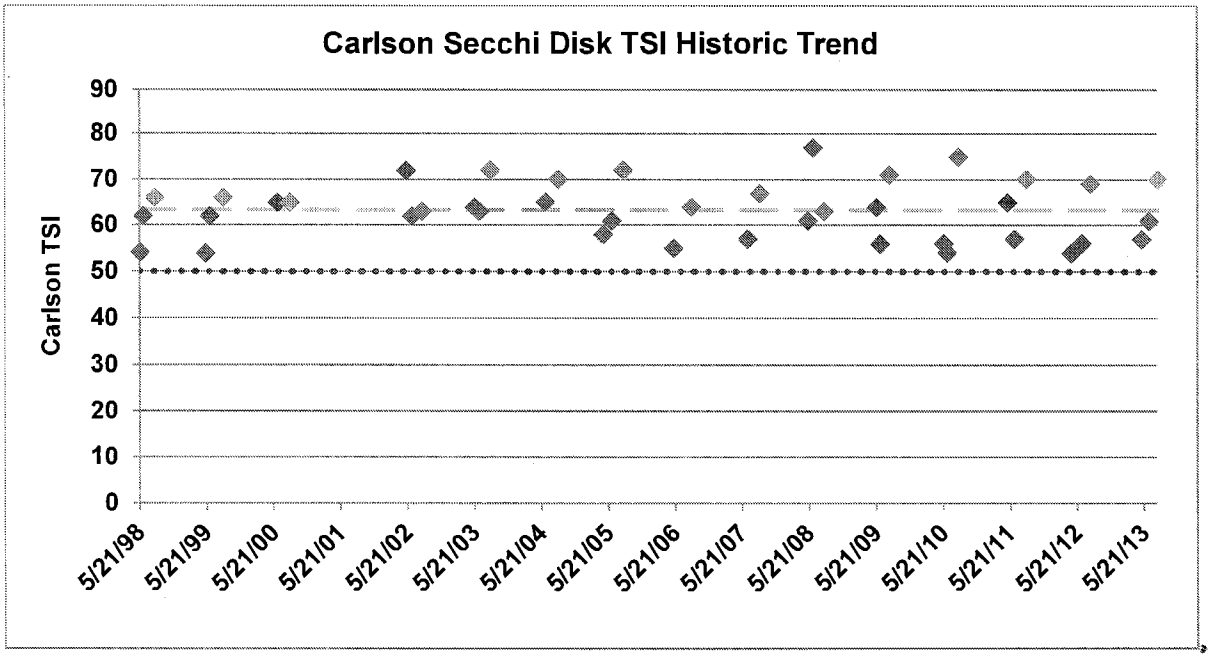



**Figure 3.** The 15-year historic trend for Carlson Secchi disk TSI scores. All but three late summer (August) samples, shown in orange, scored above the mean for eutrophic status. The green dashed line illustrates the 15-year mean. The purple dotted line illustrates eutrophic status for the Carlson TSI.

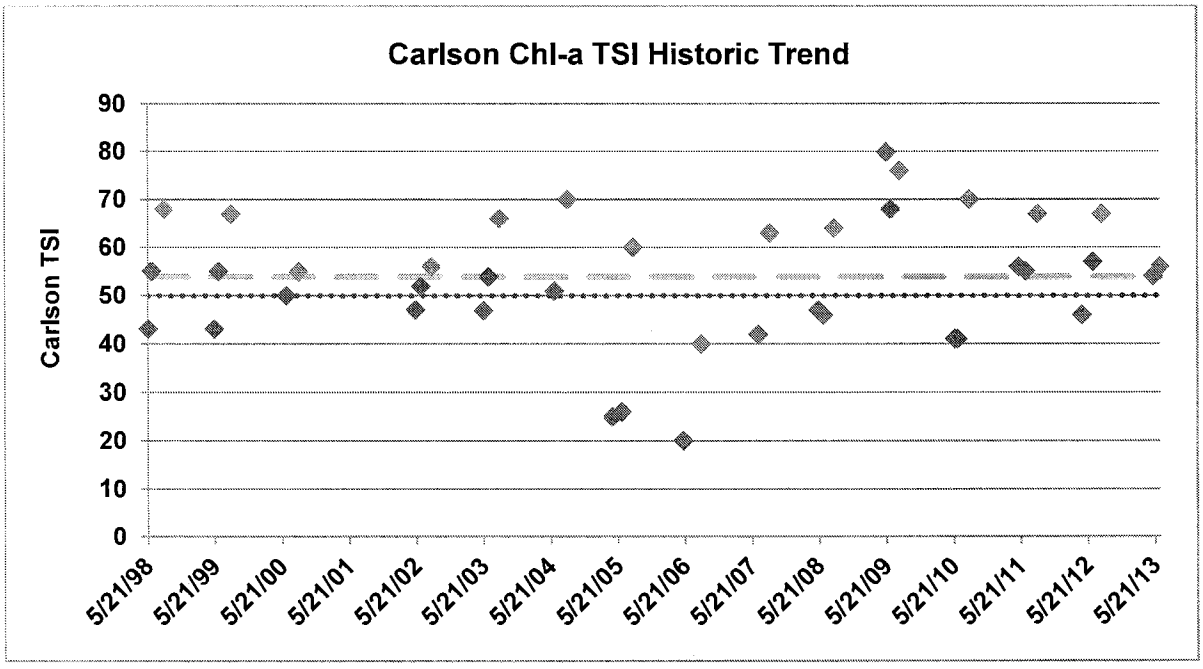



**Figure 4.** The 15-year historic trend for Carlson chlorophyll-*a* TSI scores. Most August samples, shown in orange, score above the mean for eutrophic status. The 15-year mean is just above the Carlson TSI eutrophic status score of 50 (purple dotted line).

Like many lakes with many septic tanks and livestock within the catchment, bacteria are of particular water quality interest. Fecal coliform bacteria are measured because it is in indicator of possible contamination and a risk of waterborne disease. Because soils become saturated during and after wet weather events often causing increased bacteria to enter the lake, tributary samples were also monitored for bacteria concentrations following a rain event. The 2013 fecal coliform bacteria samples fell within the normal range for Lake Lemon with some elevated values all three tributaries (Table 2). All spring samples exceeded the state recreation standard for full body contact (200 #/100mls), which is likely due to the recent rain events.

**Table 2.** Fecal coliform and *Escherichia coli* (*E. coli*) bacteria results from the 2013 sampling season. TNTC = Too numerous to count. State standards for full body contact for Fecal coliform and E. coli are 200 and 235 per 100 mls of water sample, respectively.

| | Fecal Coliform Bacteria (#/100mls) | | | *E. coli* (#/100mls) |
|---|---|---|---|---|
| | **5/8/13** | **5/31/13 (storm event)** | **7/31/13** | **7/31/13** |
| **Riddle Point** | 250 | -- | 8 | 0 |
| **Reed Point** | 790 | -- | 0 | 0 |
| **Chitwood #1** | 1,584 | -- | 72 | 28 |
| **Chitwood #2** | 2,760 | -- | 56 | 8 |
| **Beanblossom Creek** | 50,800 | 53,096 | 64 | 0 |
| **Bear Creek** | 34,060 | 17,240 | 16 | 4 |
| **N. Shore Marina Creek** | 7,920 | TNTC | 48 | 16 |

Sedimentation and its consequences are likely the most pervasive and historic problems of Lake Lemon. Since the LLCD has initiated a dredging program controlling the watershed sources of sediment delivery, are the most needed lake management activities currently at the lake.

While Lake Lemon continues to face watershed and lake challenges ranging from eutrophic water conditions that usually peak towards the end of the summer season to watershed land uses, there has been no significant change over the last 15 years. Key eutrophy parameters (total phosphorus, chlorophyll-*a*, Secchi disk transparency) have produced similar yearly results.

# LAKE LEMON MONITORING PROGRAM
# 2013 RESULTS

**Prepared for:**

**Lake Lemon Conservancy District**

**Prepared by:**

**Melissa A.L. Clark& Sarah Powers**
**School of Public & Environmental Affairs**
**Indiana University**
**Bloomington, Indiana 47405**

**May 2014**

**Acknowledgments**

We'd like to thank the following SPEA students for their help in collecting and analyzing the data used in this report: Dan Warner, Tim Clark, Alex Kian, Chris Hall, Jon Kruse, Maggie Messerschmidt, and Megan Swartz. We'd also like to thank Bob Madden and James Van Tassel of the Lake Lemon Conservancy District for their help in facilitating our sampling efforts.

## CONTENTS

## 1.0 INTRODUCTION

The Lake Lemon Conservancy District (LLCD) has entered into a lease agreement with the City of Bloomington Utilities Service Board (USB) to maintain Lake Lemon in such condition necessary to protect the lake's water quality consistent with its potential use as a drinking water source. LLCD also agreed to maintain the lake in such condition to meet all state and federal requirements for recreational waters and to maintain the quality of the water in the lake at least at its present level.

The LLCD has contracted with Indiana University's School of Public & Environmental Affairs (SPEA) to evaluate the condition of Lake Lemon since 1997. This report is the result of SPEA's 2013 monitoring efforts.

## 2.0 METHODS

The water sampling and analytical methods used for Lake Lemon were consistent with those used in IDEM's Indiana Clean Lakes Program and IDNR's Lake and River Enhancement Program. We collected water samples for various parameters on 5/8/13, 6/17/13, and 7/31/13 from over the point of maximum depth off Cemetery Island near Riddle Point and in the channel off Reed Point in the eastern end of Lake Lemon (Figure 1).


**Figure 1. Sampling locations for the Lake Lemon Water Monitoring Program, 2013.**

We collected water samples from one meter below the surface (***epilimnion***) and from one meter above the bottom (***hypolimnion***) at each lake site that was thermally stratified, except the Chitwood site where we only sampled the epilimnion due to the very shallow channel. These samples were preserved as needed, placed in coolers and transported to our laboratory for analysis. Chlorophyll was determined only for the epilimnetic sample. Other parameters such as Secchi disk transparency, light transmission, and oxygen saturation are single measurements. In addition, dissolved

oxygen and temperature were measured at one-meter intervals from the surface to the bottom. A tow to collect zooplankton was made from the 1% light level to the water surface. An integrated sampler was used to collect phytoplankton within the first two meters of the water column.

Because Lake Lemon's condition is heavily influenced by runoff from its watershed, it was also important to monitor the main inlet to the lake - Beanblossom Creek. Therefore, we sampled Beanblossom Creek on 5/8/13 and 7/31/13 during base flow conditions and 5/31/13 to capture a high flow event, at one location at mid-depth near its discharge point to the lake.

The following parameters were measured for both the lake and stream samples:

- pH
- alkalinity
- conductivity
- dissolved oxygen
- temperature
- total phosphorus
- soluble reactive phosphorus
- nitrate+nitrite
- ammonia
- total organic nitrogen
- total suspended solids
- fecal coliform bacteria

In addition to the water sampling stations described above, we also monitored several other locations for fecal coliform bacteria. At the Chitwood addition, we collected water samples from just inside the entrance (Chitwood #1) and ¾ of the way down the main channel (Chitwood #2), Bear Creek and the North side Marina drainage inlet to Lake Lemon (Figure 1 and 2).


**Figure 2. Zoomed in eastern section of Lake Lemon for the two Chitwood sampling locations.**

All sampling techniques and laboratory analytical methods were performed in accordance with procedures in *Standard Methods for the Examination of Water and* Wastewater, 21th Edition (APHA, 2005). Phytoplankton counts were made using a nannoplankton chamber (PhycoTech, Inc.) and a phase contrast light microscope and zooplankton counted using a standard Sedgewick-Rafter counting cell. Fifteen fields per cell were counted for phytoplankton and the entire slide was counted for zooplankton. Plankton identifications were made according to: Wehr and Sheath (2003), Prescott (1982), Ward and Whipple (1959) and Whitford and Schumacher (1984).

The comprehensive evaluation of lakes and streams require collecting data on a number of different, and sometimes hard-to-understand, water quality parameters. Some of the more important parameters that we analyze include:

**Temperature.** Temperature can determine the form, solubility, and toxicity of a broad range of aqueous compounds. Likewise, life associated with the aquatic environment in any location has its species composition and activity regulated by water temperature. Since essentially all aquatic organisms are 'cold-blooded' the temperature of the water regulates their metabolism and ability to survive and reproduce effectively (EPA, 1976). The Indiana Administrative Code (327 IAC 2-1-6) sets maximum temperature limits to protect aquatic life for Indiana streams. For example, temperatures during the month of May should not exceed 80 $^{o}$F (23.7 $^{o}$C) by more than 3 $^{o}$F (1.7 $^{o}$C). June temperatures should not exceed 90 $^{o}$F (32.2 $^{o}$C).

**Dissolved Oxygen (D.O).** D.O. is the dissolved gaseous form of oxygen. It is essential for respiration of fish and other aquatic organisms. Fish need at least 3-5 mg/L of D.O. Cold-water fish such as trout generally require higher concentrations of D.O. than warm water fish such as bass or Bluegill. The IAC sets minimum D.O. concentrations at 6 mg/L for cold-water fish. D.O. enters water by diffusion from the atmosphere and as a byproduct of photosynthesis by algae and plants. Excessive algae growth can over-saturate (greater than 100% saturation) the water with D.O. Conversely, dissolved oxygen is consumed by respiration of aquatic organisms, such as fish, and during bacterial decomposition of plant and animal matter.

**Conductivity.** Conductivity is a measure of the ability of an aqueous solution to carry an electric current. This ability depends on the presence of ions: on their total concentration, mobility, and valence (APHA, 1998). During low discharge, conductivity is higher than during storm water runoff because the water moves more slowly across or through ion containing soils and substrates during base flow. Carbonates and other charged particles (ions) dissolve into the slow-moving water, thereby increasing conductivity measurements.

**pH.** The pH of water is a measure of the concentration of acidic ions (specifically $H^{+}$) present in the water. The pH also determines the form, solubility, and toxicity of a wide range of other aqueous compounds. The IAC establishes a range of 6-9 pH units for the protection of aquatic life.

**Alkalinity.** Alkalinity is a measure of the acid-neutralizing (or buffering) capacity of water. Certain substances, if present in water, like carbonates, bicarbonates, and sulfates can cause the water to resist changes in pH. A lower alkalinity indicates a lower buffering capacity or a decreased ability to resist changes in pH. During base flow conditions, alkalinity is usually high because the water picks up carbonates from the bedrock. Alkalinity measurements are usually lower during storm flow conditions because buffering compounds are diluted by rainwater and the runoff water moves across carbonate-containing bedrock materials so quickly that little carbonate is dissolved to add additional buffering capacity.

**Nitrogen.** Nitrogen is an essential plant nutrient found in fertilizers, human and animal wastes, yard waste, and the air. About 80% of the air we breathe is nitrogen gas. Nitrogen gas diffuses into water where it can be "fixed", or converted, by Blue-green algae to ammonia for their use. Nitrogen can also enter lakes and streams as inorganic nitrogen and ammonia. Because of this, there is an abundant supply of available nitrogen to aquatic systems. The three common forms of nitrogen are:

***Nitrate ($NO_3^-$)*** – Nitrate is an oxidized form of dissolved nitrogen that is converted to ammonia by algae. It is found in streams and runoff when dissolved oxygen is present, usually in the surface waters. Ammonia applied to farmland is rapidly oxidized or converted to nitrate and usually enters surface and groundwater as nitrate. The Ohio EPA (1999) found that the median nitrate-nitrogen concentration in wadeable streams that support modified warmwater habitat (MWH) was 1.6 mg/L. Modified warmwater habitat was defined as: aquatic life use assigned to streams that have irretrievable, extensive, man-induced modification that preclude attainment of the warmwater habitat use (WWH) designation; such streams are characterized by species that are tolerant of poor chemical quality (fluctuating dissolved oxygen) and habitat conditions (siltation, habitat amplification) that often occur in modified streams (Ohio EPA, 1999). Nitrate concentrations exceeding 10 mg/L in drinking water are considered hazardous to human health (Indiana Administrative Code IAC 2-1-6).

***Ammonia ($NH_4^+$)*** – Ammonia is a form of dissolved nitrogen that is the preferred form for algae use. It is the reduced form of nitrogen and is found in water where dissolved oxygen is lacking. Important sources of ammonia include fertilizers and animal manure. In addition, bacteria produce ammonia as a by-product as they decompose dead plant and animal matter. Both temperature and pH govern the toxicity of ammonia for aquatic life.

***Organic Nitrogen (Org N)*** – Organic nitrogen includes nitrogen found in plant and animal materials. It may be in dissolved or particulate form. In the analytical procedures, total Kjeldahl nitrogen (TKN) was analyzed. Organic nitrogen is TKN minus ammonia.

**Phosphorus.** Phosphorus is an essential plant nutrient, and the one that most often controls aquatic plant (algae and macrophyte) growth in freshwater. It is found in

fertilizers, human and animal wastes, and yard waste. There are few natural sources of phosphorus to streams other than what is attached to soil particles, and there is no atmospheric (vapor) form of phosphorus. For this reason, phosphorus is often a ***limiting nutrient*** in aquatic systems. This means that the relative scarcity of phosphorus may limit the ultimate growth and production of algae and rooted aquatic plants. Therefore, management efforts often focus on reducing phosphorus inputs to receiving waterways because: (a) it can be managed and (b) reducing phosphorus can reduce algae production. Two common forms of phosphorus are:

> ***Soluble reactive phosphorus (SRP)*** – SRP is dissolved phosphorus readily usable by algae. SRP is often found in very low concentrations in phosphorus-limited systems where the phosphorus is tied up in the algae themselves. Because phosphorus is cycled so rapidly through biota, SRP concentrations as low as 0.005 mg/L are enough to maintain eutrophic or highly productive conditions in lake systems (Correll, 1998). Sources of SRP include fertilizers, animal wastes, and septic systems.
>
> ***Total phosphorus (TP)*** – TP includes dissolved and particulate phosphorus. TP concentrations greater than 0.03 mg/L (or 30μg/L) can cause algal blooms in lakes and reservoirs. The Ohio EPA (1999) found that the median TP in wadeable streams that support MWH for fish was 0.28 mg/L.

**Total Suspended Solids (TSS).** A TSS measurement quantifies all particles suspended and dissolved in stream water. Closely related to turbidity, this parameter quantifies sediment particles and other solid compounds typically found in stream water. In general, the concentration of suspended solids is greater during high flow events due to increased overland flow. The increased overland flow erodes and carries more soil and other particulates to the stream. Although the State of Indiana sets no standard for TSS, total dissolved solids should not exceed 750 mg/L. In general, TSS concentrations >80 mg/L have been found to be deleterious to aquatic life (Waters, 1995).

***E. coli* and *Fecal Coliform* Bacteria -** is used as an indicator organism to identify the potential for the presence of pathogenic organisms in a water sample. Pathogenic organisms can present a threat to human health by causing a variety of serious diseases, including infectious hepatitis, typhoid, gastroenteritis, and other gastrointestinal illnesses. *Fecal coliforms* can come from the feces of any warm-blooded animal. Wildlife, livestock, and/or domestic animal defecation, manure fertilizers, previously contaminated sediments, and failing or improperly sited septic systems are common sources of the bacteria. The IAC sets the maximum standard at 200 colonies/100 ml in any one sample within a 30-day period or a geometric mean of 125 colonies per 100 ml for five samples collected in any 30-day period. In general, fecal coliform bacteria have a life expectancy of less than 24 hours.

**Secchi Disk Transparency**. This refers to the depth to which the black & white Secchi disk can be seen in the lake water. Water clarity, as determined by a Secchi disk, is affected by two primary factors: algae and suspended particulate matter. Particulates

(for example, soil or dead leaves) may be introduced into the water by either runoff from the land or from sediments already on the bottom of the lake. Many processes may introduce sediments from runoff; examples include erosion from construction sites, agricultural lands, and riverbanks. Bottom sediments may be resuspended by bottom feeding fish such as carp, or in shallow lakes, by motorboats or strong winds.

**Light Transmission**. Similar to the Secchi disk transparency, this measurement uses a light meter (photocell) to determine the rate at which light transmission is diminished in the upper portion of the lake's water column. Another important light transmission measurement is determination of the 1% light level. The 1% light level is the water depth to which one percent of the surface light penetrates. This is considered the lower limit of algal growth in lakes and is referred to as the *photic zone*.

**Plankton**. Plankton are important members of the aquatic food web. The plankton include the algae (microscopic plants) and the zooplankton (tiny shrimp-like animals that eat algae). The zooplankton net is towed up through the lake's water column from the one percent light level to the surface utilizing a 80-micron mesh on the net and bucket. Beginning in 2010, phytoplankton were sampled using a 2-meter integrated sampler and in the lab whole water samples of phytoplankton were concentrated using Utermoehl settling chambers. Either 25-ml or 50-ml of sample is concentrated to insure sufficient cell density. Settled concentrate is transferred into a 2-mL micro-centrifuge tube for storage. Counts are made using a nanoplankton chamber (PhycoTech, Inc.) and a phase contrast light microscope. Historically in our analysis of Lake Lemon algae are reported as *natural units*, which records one colonial filament of multiple cells as one natural unit and one cell of a singular alga also as one natural unit. According to the literature, (Ward and Whipple, 1959; Prescott, 1982; Whitford and Schumacher, 1984; Wehr and Sheath, 2003; and St. Amand, 2010) in order to provide a more accurate representation of lake algal community composition, in 2011, we have also included counts of only individual cells. For example, the previous method would count a single filamentous green algae (ie: *Ulothrix*) with 20 cells or 10 cells as one unit, whereas the new method would default to a count of 20 or 15 individual cells (Figure 3). Ten to thirty (based on variability of cells per *natural unit*) representative specimens were selected at random and a mean number of cells per natural unit was calculated. Final counts of each genera appear lower however, because they are reported as # of cells per milliliter as opposed to natural units per L. In this report we report only cell counts in replacement of *natural unit*s. Of the many different algal species present in the water, we are particularly interested in the blue-green algae. Blue-green algae are those that most often form nuisance blooms and their dominance in lakes may indicate poor water conditions.

**Chlorophyll-*a***. The plant pigments of algae consist of the chlorophylls (green color) and carotenoids (yellow color). Chlorophyll-*a* is by far the most dominant chlorophyll pigment and occurs in great abundance. Thus, chlorophyll-*a* is often used as a direct estimate of algal biomass.

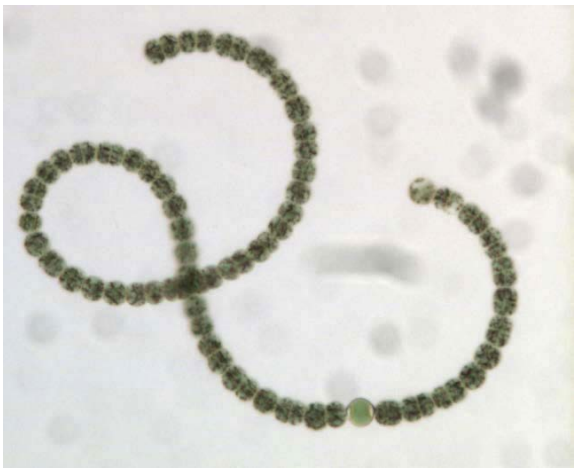


**Figure 3. Phytoplankton can be counted with two techniques: natural unit per liter (N.U./L) and cells per milliliter (cells/ml). Colonial species, like this blue-green algae can be enumerated using both methods. This *Anabaena* is counted as one (1) N.U./L, whereas it would be also counted as 74 cells/ml.**

## 3.0 RESULTS

### 3.1 Water Quality

*Temperature* – Temperature profiles for May, June and July indicated slight thermal stratification at Riddle Point, while Reed Point primarily illustrates no stratification (Figures 4 and 5). In most Indiana lakes, thermal stratification is weakest in the spring and gets stronger as summer progresses. The May temperatures at Riddle Point indicate thermal stratification, with the warmer surface 19.7°C surface temperature and 13.4°C bottom temperature. By June, the Riddle Point temperature profile was more strongly stratified with the hypolimnion starting at 3m deep. The whole water column continued to warm with the July surface temperature reaching 25.2°C and the hypolimnion reaching 23.8°C and the hypolimnion extending to the depth of 5m respectively. Reed Point basically was isothermal throughout the whole summer, with a slight temperature decrease at the 1m depth in July, which is likely due to calm water conditions reducing the mixing of this shallow sampling site. Reed Point is shallow enough that turbulence from winds and boating activity usually keeps it well mixed.

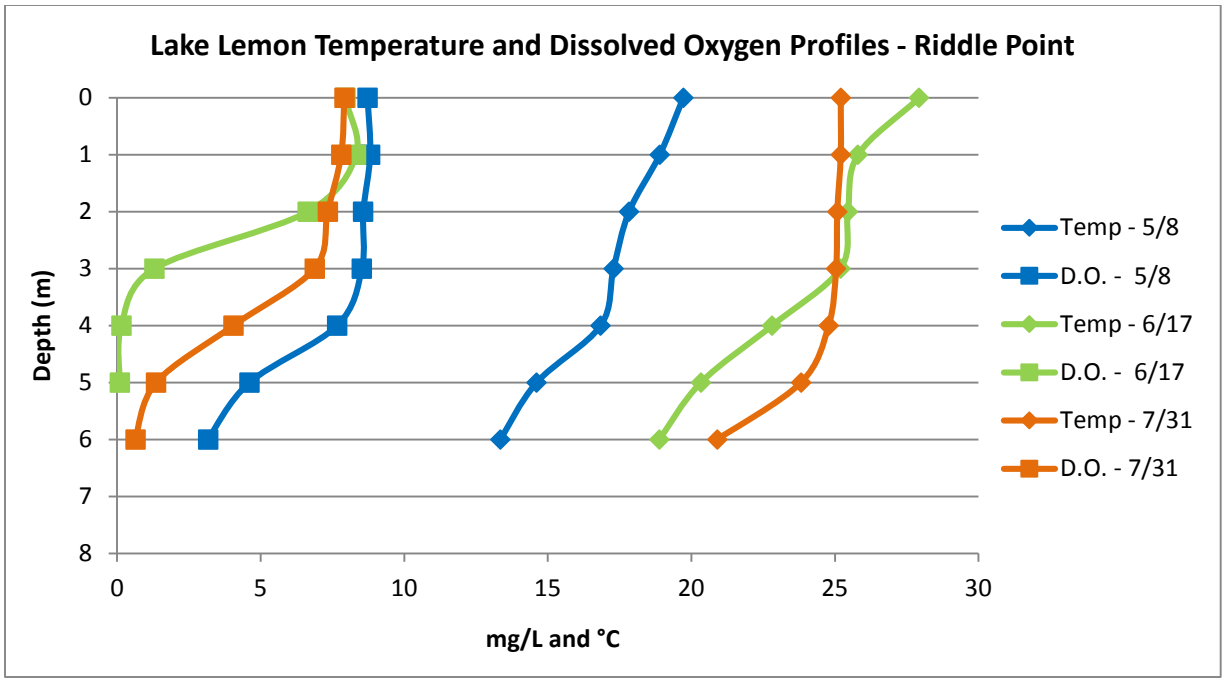



**Figure 4. Temperature and dissolved oxygen profiles for Lake Lemon at Riddle Point on 5/8/13, 6/17/13, and 7/31/13.**

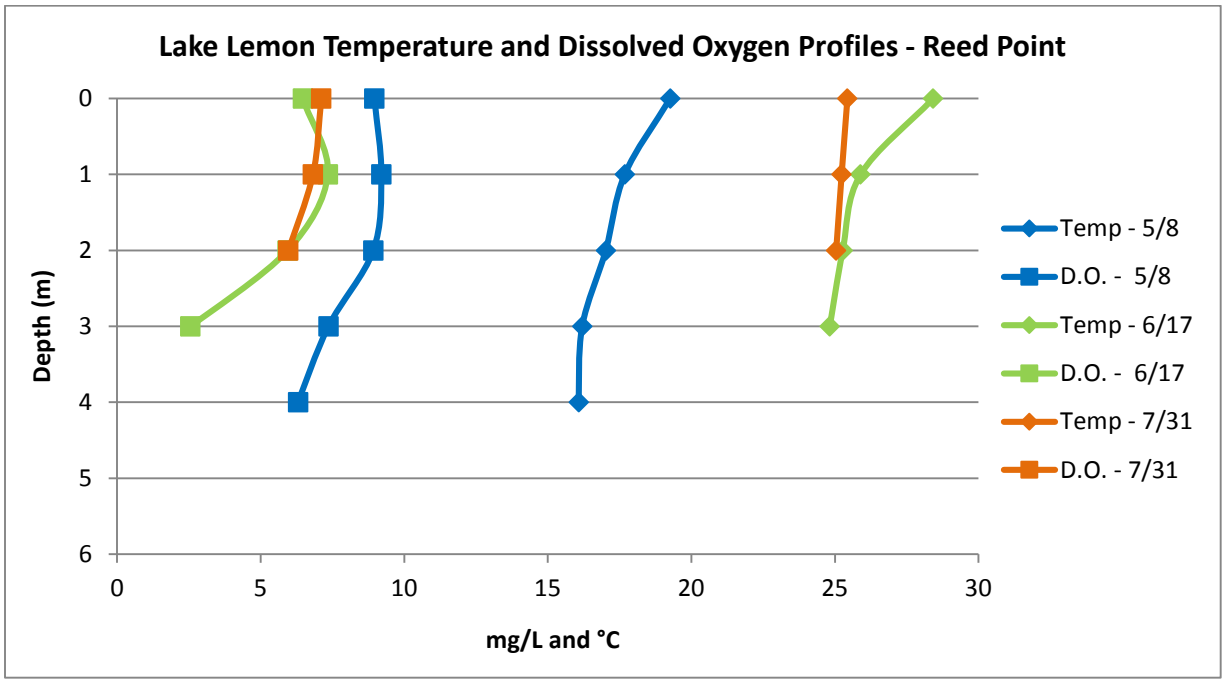



**Figure 5. Temperature and dissolved oxygen profiles for Lake Lemon at Reed Point on 5/8/13, 6/17/13, and 7/31/13.**

*Dissolved Oxygen* – Dissolved oxygen (D.O.) profiles generally follow the temperature profiles. Typically, early spring profiles are characterized by an orthograde oxygen profile, where the oxygen concentrations remain uniform throughout the water column because of recent spring turnover. While neither site illustrated this orthograde temperature profile, the May profile results a fully oxic water column. Riddle Point was characterized by a clinograde oxygen profile by June, where oxygen levels decrease below the thermocline and continue to decrease rapidly. The upper 4 meters of water remained oxygenated during both June and July sampling at Riddle Point (Figures 4). The July dissolved oxygen concentrations averaged 7.5 mg/L in the epilimnion. Anoxic conditions develop below 4 meters depth, which are likely due to significant organic matter on the lake bottom, creating a biochemical oxygen demand (BOD) that results in decomposition processes consuming all the available oxygen. Because stratification does not allow surface water to mix into this deeper water, oxygen is not replenished. The shallow depth of Reed Point and lake turbulence keep this portion of the lake well-mixed and oxygenated (Figure 5). The decreased dissolved oxygen at 3m at Reed is likely the consequence of a very calm night, which allowed that shallow area to slightly thermally stratify and permitted the bottom meter to near anoxia due to decomposition.

*Phosphorus* – Water quality data for Lake Lemon are presented in Tables 1- 3. Phosphorus and nitrogen are the primary plant nutrients in lakes. Typically, mean total phosphorus (TP) concentrations increase throughout the summer within Lake Lemon due to watershed inputs (Figure 6). Soluble phosphorus (SRP) concentrations are lower than total phosphorus because algae rapidly take up and use soluble phosphorus. Mean SRP concentrations were below the method detection (0.01 mg/L) limit in all samples with exception of the July Reed Point sample (0.145 mg/L). All spring and summer TP concentrations were greater than the level indicative of eutrophication (0.030 mg/L), except the June Riddle Point epilimnetic sample.

*Nitrogen* – Typically we only detect low concentrations of nitrate-nitrogen throughout the sampling season. The 2012 spring sampling event captured spring runoff following spring fertilizer application, which resulted in elevated nitrate concentrations during April and June. Nitrate concentrations decreased to the minimum detection level (0.013 mg/L) in June and July at Riddle and Reed Points (Figure 7). Nitrate, an oxidized form of inorganic nitrogen, is highly soluble in water and is carried into the lake from fertilized agricultural fields, livestock, and other sources by watershed runoff. Ammonia, a reduced form of inorganic nitrogen, is the primary by-product of bacterial decomposition of organic matter and is also found in animal wastes. Riddle Point ammonia concentrations initially decreased following the May sample but then increased throughout the summer in the hypolimnion to 0.187 mg/L (Figure 8). The increased ammonia concentrations are due to thermal stratification and anoxic conditions within the hypolimnion coupled with significant decomposition of organic matter, which generates ammonia as a by-product. The Reed Point ammonia concentrations typically remain lower throughout the summer. Sufficient mixing within the shallower waters of Reed Point usually keeps the water column oxygenated preventing the concentration of the chemically-reduced ammonia. Very calm water and wind conditions can allow short-term and temporary thermal stratification within the bottom 2 meters. During these periods

ammonia concentrations can increase due to the reduced environment, then mixing throughout when turbulence returns.

**Table 1. Water Quality Characteristics of Lake Lemon – Riddle Point and Reed Point, 5/8/2013.**

| Parameter | Riddle | | Reed |
|---|---|---|---|
| | Epilimnion | Hypolimnion | Epilimnion |
| **Secchi (m)** | 1.2 | -- | 1 |
| **Light trans @ 3' (%)** | 13.3 | -- | 7.8 |
| **1% Light Level (ft)** | 11.5 | -- | 8 |
| **% Water Column Oxic** | 100 | -- | 100 |
| **pH** | 7.7 | 6.7 | 7.4 |
| **Conductivity (uS/cm))** | 0.179 | 0.192 | 0.192 |
| **Alkalinity (mg/L)** | 53 | 56 | 59 |
| **Total Suspended Solids (mg/L)** | 5.5 | 19.2 | 8.3 |
| **Nitrate (mg/L)** | 0.083 | 0.085 | 0.104 |
| **Ammonia (mg/L)** | 0.047 | 0.167 | 0.0285 |
| **Total Organic Nitrogen (mg/L)** | 0.416 | 0.435 | 0.702 |
| **Soluble Reactive Phosphorus (mg/L)** | 0.010* | 0.010* | 0.010* |
| **Total Phosphorus (mg/L)** | 0.030 | 0.035 | 0.044 |
| **Chlorophyll-*a* (ug/L)** | 1.925 | -- | 3.08 |
| **Plankton (Cells/ml)** | 1,272 | -- | 505 |
| **Plankton (#/L)** | 217,440 | -- | 91,272 |
| **Blue-green dominance NU (%)** | 47 | -- | 37.6 |
| **Blue-green dominance – cells/ml (%)** | 88.9 | -- | 86.5 |

* Method Detection Limit

**Table 2. Water Quality Characteristics of Lake Lemon – Riddle Point and Reed Point, 6/17/13.**

| Parameter | Riddle | | Reed |
|---|---|---|---|
| | Epilimnion | Hypolimnion | Epilimnion |
| **Secchi (m)** | 0.8 | -- | 0.75 |
| **Light trans @ 3' (%)** | 0.1564 | -- | 0.06 |
| **1% Light Level (ft)** | 3.5 | -- | 7 |
| **% Water Column Oxic** | 62.5 | -- | 100 |
| **pH** | 6.55 | 6.7 | 6.9 |
| **Conductivity (uS/cm)** | 0.199 | 0.217 | 0.201 |
| **Alkalinity (mg/L)** | 65.75 | 68.5 | 68 |
| **Total Suspended Solids (mg/L)** | 7.1 | 17 | 10.1 |
| **Nitrate (mg/L)** | 0.013* | 0.013* | 0.013* |
| **Ammonia (mg/L)** | 0.018* | 0.039 | 0.018* |
| **Total Organic Nitrogen (mg/L)** | 0.561 | 0.279 | 0.479 |
| **Soluble Reactive Phosphorus (mg/L)** | 0.011 | 0.010* | 0.145 |
| **Total Phosphorus (mg/L)** | 0.010* | 0.040 | 0.016 |
| **Chlorophyll-*a* (ug/L)** | 13.14 | -- | 15.14 |
| **Plankton (Cells/ml)** | 39,309 | -- | 643 |
| **Plankton (#/L)** | 5,804,272 | -- | 109,272 |
| **Blue-green dominance NU (%)** | 46.5 | -- | 46.7 |
| **Blue-green dominance – cells/ml (%)** | 81.7 | -- | 88.6 |

* Method Detection Limit

**Table 3. Water Quality Characteristics of Lake Lemon – Riddle Point and Reed Point, 7/31/13.**

| Parameter | Riddle | | Reed |
|---|---|---|---|
| | Epilimnion | Hypolimnion | Epilimnion |
| **Secchi (m)** | 0.5 | -- | 0.4 |
| **Light trans @ 3' (%)** | 3.36 | -- | 2.03 |
| **1% Light Level (ft)** | 6 | -- | 5 |
| **% Water Column Oxic** | 83 | -- | |
| **pH** | 8.1 | 7.1 | 8.1 |
| **Conductivity (uS/cm))** | 0.208 | 0.274 | 0.211 |
| **Alkalinity (mg/L)** | 71 | 83.5 | 74.5 |
| **Total Suspended Solids (mg/L)** | 9 | 14 | 12 |
| **Nitrate (mg/L)** | 0.013* | 0.013* | 0.013* |
| **Ammonia (mg/L)** | 0.018* | 0.186 | 0.018* |
| **Total Organic Nitrogen (mg/L)** | 0.939 | 1.048 | 1.134 |
| **Soluble Reactive Phosphorus (mg/L)** | 0.010* | 0.010* | 0.010* |
| **Total Phosphorus (mg/L)** | 0.038 | 0.080 | 0.051 |
| **Chlorophyll-*a* (ug/L)** | 35.46 | -- | 27.55 |
| **Plankton (Cells/ml)** | 4,445 | -- | 4,281 |
| **Plankton (#/L)** | 505,268 | -- | 950,038 |
| **Blue-green dominance NU (%)** | 88.3 | -- | 96.9 |
| **Blue-green dominance – cells/ml (%)** | 92.7 | -- | 83.2 |

* Method Detection Limit

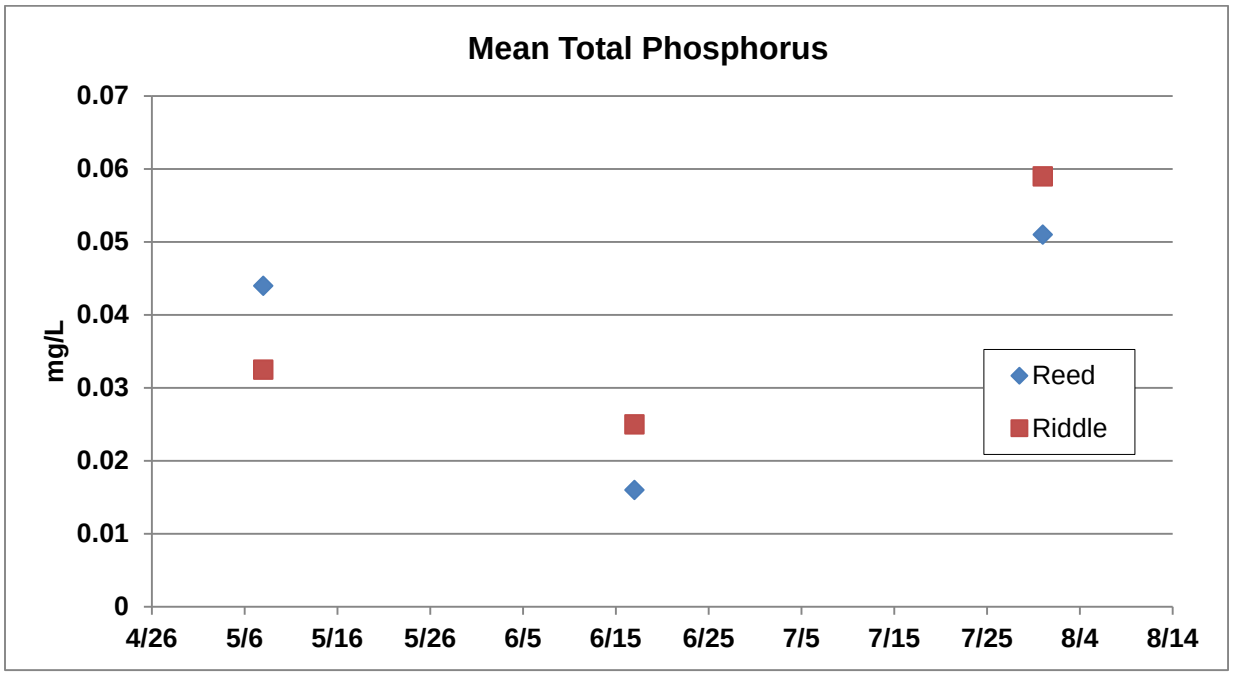



**Figure 6. Mean total phosphorus concentrations at Riddle and Reed Point during summer 2013.**

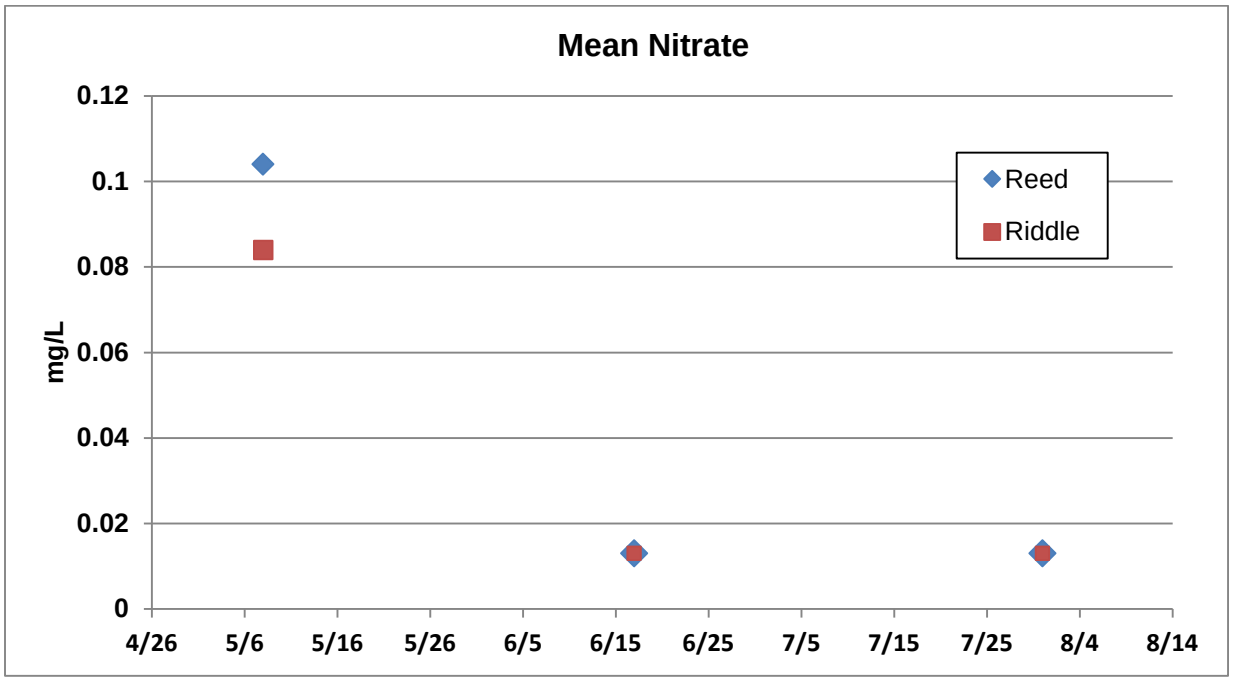



**Figure 7. Mean nitrate concentrations at Riddle and Reed Point during summer 2013.**

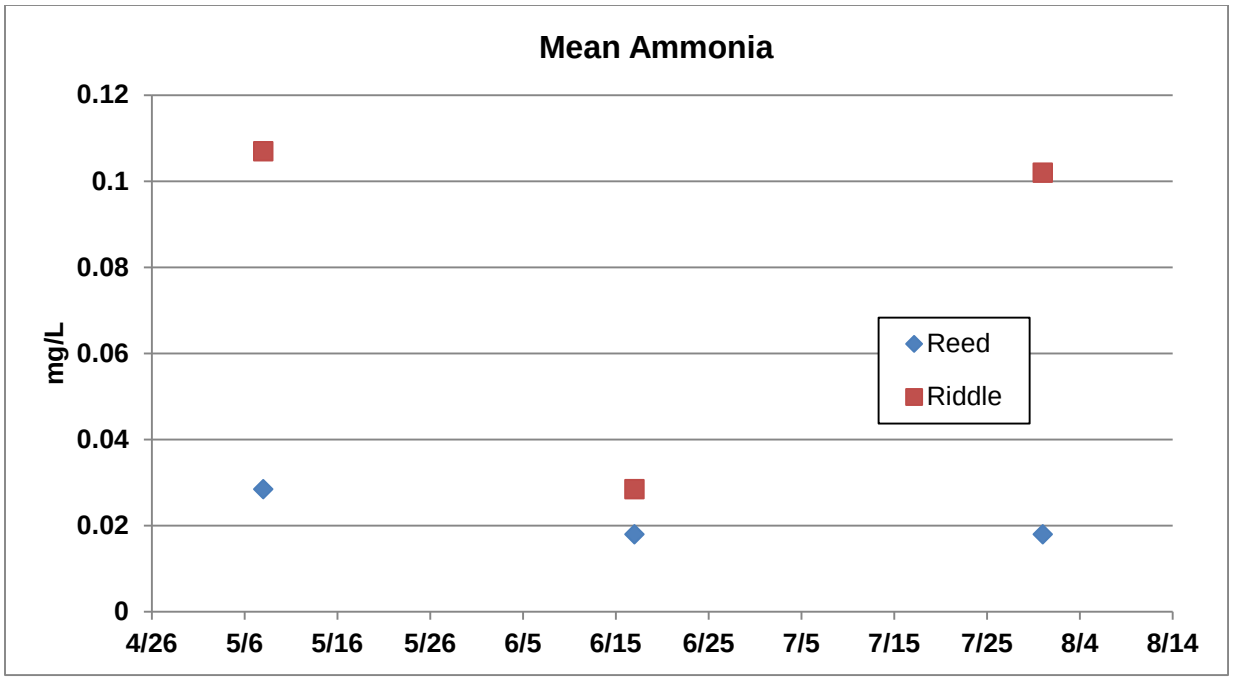



**Figure 8. Mean ammonia concentrations at Riddle and Reed Point during summer 2013.**

*Plankton* – Lake Lemon is characterized by relatively low to average plankton densities. Usually, Lake Lemon is characterized by lower spring densities that increase by July and August. In 2013, Riddle plankton counts increased by mid-June but at a lower rate, which is most likely due to the flushing effect of the multiple storm events that occurred prior to sampling (Table 4). Reed plankton counts were generally lower in densities (Table 5). Typically, the plankton assemblage shifted towards a strongly dominant blue-green algae proportion by August, which is definitely the case with blue-green dominating both late July samples at approximately 90%. Blue-green algae are less desirable in lakes because they: 1) may form extremely dense nuisance blooms; 2) may cause taste and odor problems; and 3) are unpalatable as food for many zooplankton grazers. Blue-green algae usually have an advantage over other plankton tend to dominate reaching nuisance proportions. These competitive advantages include: 1) ability to regulate buoyancy and thus stay up in the light, 2) nitrogen fixation, and 3) more efficient use of nutrients. Dominant blue-green algae populations are typical of temperate lakes with high nutrient availability, especially from a large watershed that is predominately agriculture.

Zooplankton, which are microscopic animals equivalent to cows grazing in the pasture, feed on phytoplankton (Figure 10). Zooplankton densities significantly increased by late July. Typically, rotifer populations (small zooplankton) dominate at both Riddle and Reed Point samples over Cladacera and Copepod populations (large zooplankton).

*Transparency* – The low Secchi disk transparencies in Lake Lemon are a reflection of the relatively high amount of suspended material (sediments, algae, etc.) in the water. Both Riddle and Reed start the season with transparencies just over 1 m and

decrease to half a meter by end of July. Sources of suspended sediments to Lake Lemon include soils washed in from the watershed, resuspended lake sediments, and algal cells produced within the lake. The fine clays and silts of the sediments (Zogorski et al., 1986) can be suspended in the shallow east end of the lake by wind directed along the main west-east axis of the lake. In addition, turbulence from motorboats is capable of resuspending fine clay sediments from a depth exceeding ten feet (Yousef et al., 1978). All of these actions likely contribute to the poor clarity of Lake Lemon and of shallow lakes in general.

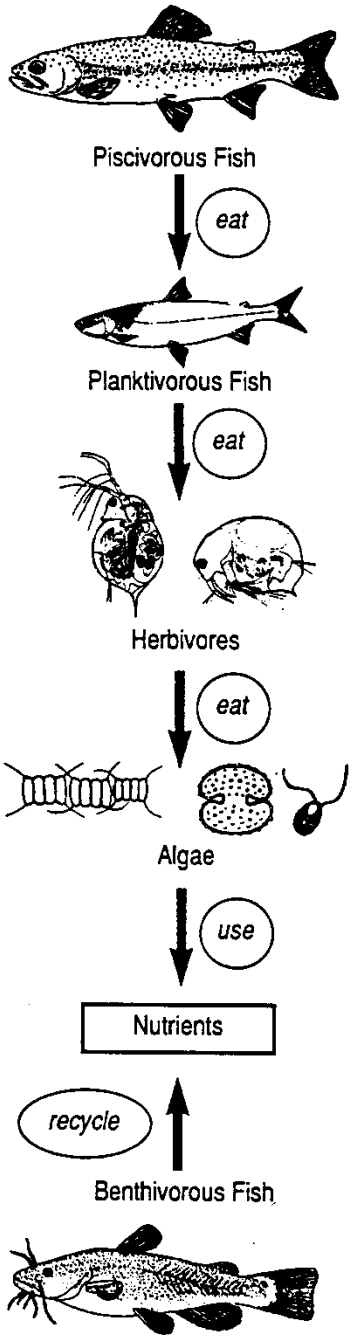



**Figure 10. Generalized aquatic food chain. Tiny shrimp-like animals called zooplankton eat algae. Zooplankton, in turn, are eaten by small plankton-eating fish such as minnows, gizzard shad and young sunfish.**

**Table 4. Phytoplankton and Zooplankton Community for Lake Lemon at Riddle Point, enumerated as # cells/ml for phytoplankton and # Natural Units per liter for zooplankton.**

| | 5/8/13 | | 6/17/13 | | 7/31/13 | |
|---|---|---|---|---|---|---|
| **Phytoplankton (Algae)** | **Total (Cells/ml)** | **%** | **Total (Cells/ml)** | **%** | **Total (Cells/ml)** | **%** |
| **Blue-greens** | 1,131 | 88.92% | 32,124 | 81.72% | 4,121 | 92.71% |
| **Greens** | 68 | 5.35% | 6,558 | 16.68% | 298 | 6.70% |
| **Diatoms** | 27 | 2.12% | 393 | 1.00% | 19 | 0.43% |
| **Other algae** | 46 | 3.62% | 234 | 0.60% | 7 | 0.16% |
| **Total Phytoplankton** | 1,272 | | 39,309 | | 4,445 | |
| | | | | | | |
| **Zooplankton** | **Total (#/L)** | | **Total (#/L)** | | **Total (#/L)** | |
| **Rotifers** | 46 | | 81 | | 199 | |
| **Zooplankton*** | 206 | | 281 | | 48 | |

*Zooplankton counts include Cladocera and Copepods.

**Table 5. Phytoplankton and Zooplankton Community for Lake Lemon at Reed Point, enumerated as # cells/ml for phytoplankton and # Natural Units per liter for zooplankton.**

| | 5/8/13 | | 6/17/13 | | 7/31/13 | |
|---|---|---|---|---|---|---|
| **Phytoplankton (Algae)** | **Total (Cells/ml)** | **%** | **Total (Cells/ml)** | **%** | **Total (Cells/ml)** | **%** |
| **Blue-greens** | 437 | 86.53% | 570 | 89% | 3,563 | 74.17% |
| **Greens** | 49 | 9.70% | 33 | 5% | 719 | 14.97% |
| **Diatoms** | 5 | 0.99% | 28 | 4% | 44 | 0.9% |
| **Other algae** | 14 | 2.77% | 7 | 1% | 478 | 9.95% |
| **Total phytoplankton** | 505 | | 638 | | 4,804 | |
| | | | | | | |
| **Zooplankton** | **Total (#/L)** | | **Total (#/L)** | | **Total (#/L)** | |
| **Rotifers** | 44 | | 1 | | 1 | |
| **Zooplankton*** | 222 | | 4641 | | 0 | |

*Zooplankton counts include Cladocera and Copepods.

*Chlorophyll-a* – Chlorophyll-*a,* which is a measure of the primary pigment in algae, is a direct measure of algal productivity. In the integrated samples from the surface to the 2-meter depth, the chlorophyll-*a* concentrations ranged from 1.925 µg/L in May to 35.46 µg/L in July. Chlorophyll-*a* concentrations >7 µg/L are indicative of eutrophic lake conditions. Overall, we see a seasonal pattern of nutrient increase by late summer, which is characteristic of Lake Lemon. This pattern is mirrored by increases in chlorophyll-*a* concentrations. This suggests that conditions exist for increasing growth of algae (Figure 11 and 12).

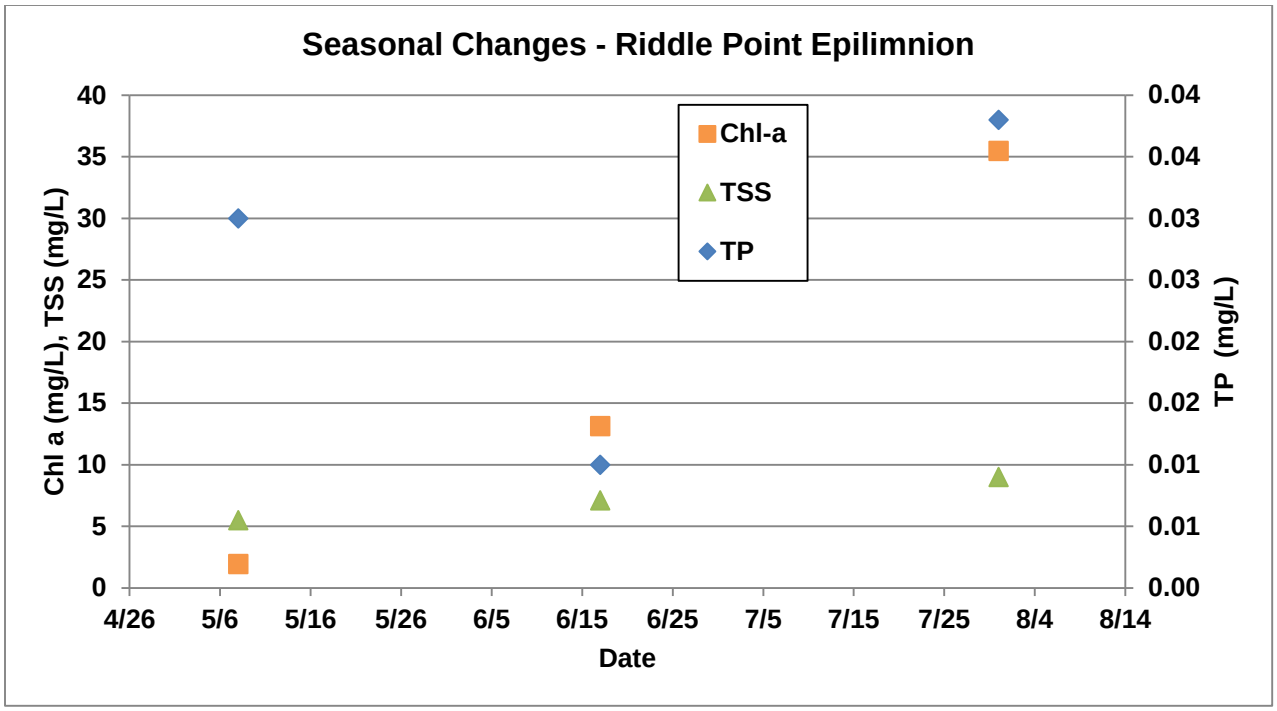



**Figure 11. Seasonal changes in total phosphorus, total suspended solids, and chlorophyll-*a* in the surface waters (epilimnion) at Riddle Point in Lake Lemon in 2013.**

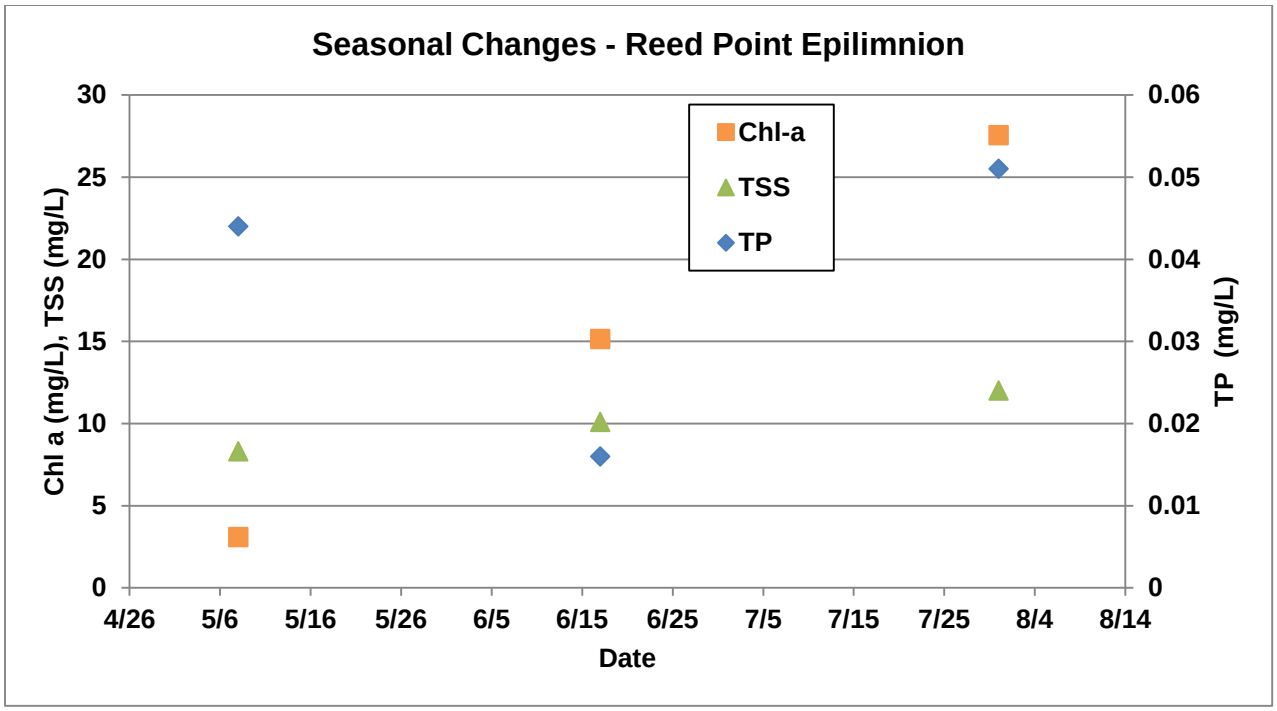



**Figure 12. Seasonal changes in total phosphorus, total suspended solids, and chlorophyll-*a* in the surface waters (epilimnion) at Reed Point in Lake Lemon in 2013.**

## 3.2 Comparison with Other Indiana

Table 6 gives values of water quality parameters determined for 355 Indiana lakes during July-August 1998-2010 by the Indiana Clean Lakes Program. This table can be used to compare values determined for Lake Lemon with other Indiana lakes. Table 6 shows that only chlorophyll-*a* exceeded the median values for these 355 lakes, but fell well below the maximum concentrations.

**Table 6. July-August Water Quality Characteristics of 355 Indiana Lakes Sampled From 1998 thru 2010 by the Indiana Clean Lakes Program compared to Riddle Point of Lake Lemon (7/31/13). Means of epilimnion and hypolimnion samples were used for Lake Lemon.**

| | Secchi Disk (m) | $NO_3$ (mg/L) | $NH_4$ (mg/L) | TKN (mg/L) | TP (mg/L) | SRP (mg/L) | Chl. *a* (μg/L) |
|---|---|---|---|---|---|---|---|
| Median | 1.7 | 0.046 | 0.455 | 1.199 | 0.082 | 0.028 | 4.42 |
| Maximum | 16 | 16.679 | 16.348 | 20.873 | 4.894 | 1.427 | 380.38 |
| **Minimum** | 0.1 | 0.013* | 0.018* | 0.230* | 0.010* | 0.010* | 0.010 |
| **Mean Values for Riddle Pt. (7/31/13)** | **0.5** | **0.013*** | **0.102** | **0.993** | **0.059** | **0.010*** | **35.46** |

* Method Detection Limit

## 3.3 Stream Results

Results from the Beanblossom Creek samples are given in Table 7. Stream values generally fell within the range of lake parameters. Variation among the sample parameters was slight. Historically, most of the parameters increased throughout the summer. Solubility of oxygen in water is influenced by temperature, with less dissolved oxygen dissolving in warmer water. Beanblossom Creek's late July temperature (23.0°C) resulted in a decreased dissolved oxygen concentration (5.9 mg/L). Storm event samples were collected on May 31st (Figure 13). There was no significant increase in any nutrients or other parameters, which is likely due to smaller previous storms flushing the tributaries and since we collected samples towards the beginning of the sampled storm event.

**Table 7. Water Quality Characteristics of Beanblossom Creek, Bear Creek, and the small stream that enters Lake Lemon from the North Shore Marina in 2013. Bear Creek and the North Shore Marina Creek only included TSS and F. coliform bacteria analysis.**

| | Beanblossom Creek | | | Bear Creek | | | North Shore Marina Creek | | |
|---|---|---|---|---|---|---|---|---|---|
| | 5/8 | 5/31 (Storm) | 7/31 | 5/8 | 5/31 (Storm) | 7/31 | 5/8 | 5/31 (Storm) | 7/31 |
| **pH** | 7 | 6.8 | 7.4 | | | | | | |
| **Conductivity (mS/cm)** | 0.203 | 0.220 | 0.311 | | | | | | |
| **Alk (mg/L)** | 64 | 92 | 112 | | | | | | |
| **Temperature (°C)** | 16.4 | 23.6 | 23.0 | | | | | | |
| **D.O. (mg/L)** | 7.7 | 6.4 | 5.9 | | | | | | |
| **TSS (mg/L)** | 4.3 | 9.5 | 7 | 3 | 8 | 6.5 | 2 | 98.8 | 15 |
| **$NO_3^-$ (mg/L)** | 0.169 | 0.103 | 0.053 | | | | | | |
| **$NH_4^+$ (mg/L)** | 0.026 | 0.085 | 0.018* | | | | | | |
| **TKN (mg/L)** | 0.215 | -- | 0.595 | | | | | | |
| **SRP (mg/L)** | 0.010* | 0.010* | 0.010* | | | | | | |
| **Total Phos (mg/L)** | 0.027 | 0.031 | 0.054 | | | | | | |
| **Fecal Coliform (col/100ml)** | 50,800 | 53,096 | 64 | 34,060 | 17,240 | 16 | 7,920 | TNTC** | 48 |

* Method Detection Limit
** TNTC = Too Numerous To Count

In addition to collecting fecal coliform bacteria at Riddle Point and Reed Point, two locations adjacent to the Chitwood neighborhood and three stream locations within 1) Bear Creek, 2) the North Shore Marina tributary, and 3) Beanblossom Creek (Table 8). All spring May samples exceeded the state standard of 200 colonies per 100 ml threshold, which followed multiple rain events that likely saturated soils reducing necessary infiltration for septic leach fields and livestock waste. The storm event concentrations significantly exceeded state standards as well, with the sample from the tributary that enters the lake east of the North Shore Marina too numerous to count.

Total suspended solids (TSS) were sampled at the three stream sites. While the concentrations increased at Beanblossom and Bear Creek in July, the values are significantly below the cautionary value of 80 mg/L, considered harmful to aquatic life (Waters, 1995).

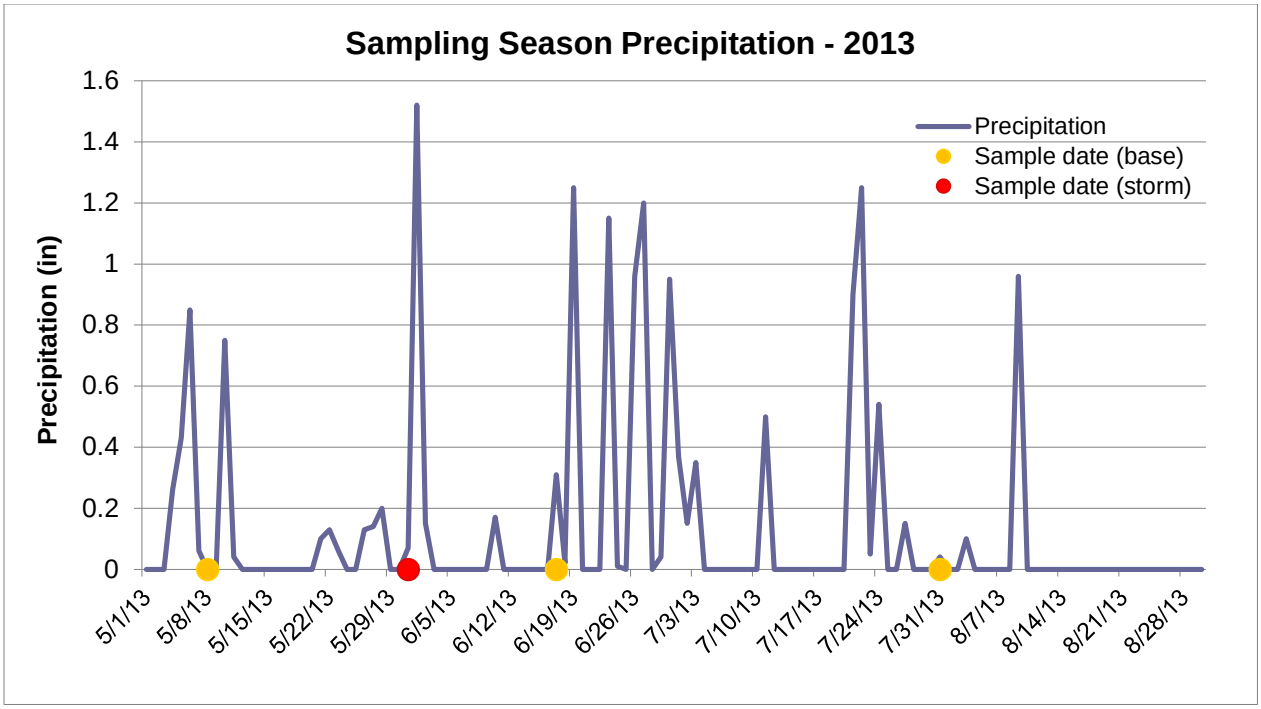



**Figure 13. Precipitation amounts during the 2013 sampling season.**

**Table 8. Fecal coliform bacteria summary for 2013 Lake Lemon samples. The state standard for full body contact and recreation is 200 colonies per 100mls.**

| | Fecal Coliform Bacteria (#/100mls) | | | *E. coli* (#/100mls) |
|---|---|---|---|---|
| | **5/8/13** | **5/31/13 (storm event)** | **7/31/13** | **7/31/13** |
| **Riddle Point** | 250 | -- | 8 | 0 |
| **Reed Point** | 790 | -- | 0 | 0 |
| **Chitwood #1** | 1,584 | -- | 72 | 28 |
| **Chitwood #2** | 2,760 | -- | 56 | 8 |
| **Beanblossom Creek** | 50,800 | 53,096 | 64 | 0 |
| **Bear Creek** | 34,060 | 17,240 | 16 | 4 |
| **N. Shore Marina Creek** | 7,920 | TNTC** | 48 | 16 |

**TNTC = Too numerous To Count

## 3.4 Trophic State

### 3.4.1 Introduction

The most widely used standard for assessing the condition of a lake is by considering its *trophic state*. The trophic state of a lake refers to its overall level of nutrition or biological productivity. Trophic categories include: *oligotrophic, mesotrophic, eutrophic* and *hypereutrophic*, with productivity increasing from oligotrophic to eutrophic (Table 9).

**Table 9. Some characteristics of the different trophic state index classifications. Note, that while those salmonid fisheries, which have higher oxygen requirements, are lost in more eutrophic lakes, there are still many fish species present.**

| Classification | Transparency | Nutrients | Algae | D.O. | Fish |
|---|---|---|---|---|---|
| ***Oligotrophic*** | clear | Low<br>TP < 6 µg/L | few algae | Hypo has D.O. | can support salmonids (trout and salmon) |
| ***Mesotrophic*** | Less clear | Moderate<br>TP 10-30 µg/L | healthy populations of algae | Less D.O. in hypo | lack of salmonids |
| ***Eutrophic*** | transparency <2 meters | High<br>TP > 35 µg/L | abundant algae and weeds | No D.O. in the hypo during the summer | Warm-water fisheries only. Bass may dominate. |
| ***Hypereutrophic*** | transparency <1 meter | extremely high<br>TP > 80 µg/L | thick algal scum<br>Dense weeds | No D.O. in the hypo during the summer | Rough fish dominate; summer fish kills possible |

The changes in a lake from oligotrophy to eutrophy (higher trophic state) is called *eutrophication*. Eutrophication is defined as the excessive addition of inorganic nutrients, organic matter and silt to lakes and reservoirs at rates sufficient to increase biological production and to lead to a decrease in lake volume. By this definition, high phosphorus alone does not make a lake eutrophic. The phosphorus levels must also cause an increase or potential increase in plant production and/or sedimentation.

### 3.4.2 Trophic State Indices

The large amount of water quality data collected during lake water quality assessments can be confusing to evaluate. Because of this, Indiana and many other states use a trophic state index (TSI) to help evaluate water quality data. A TSI condenses water quality data into a single, numerical index. Different index (or eutrophy) points are assigned for various water quality concentrations. The index total, or TSI, is the sum of individual eutrophy points for a lake.

The most widely used and accepted TSI is one developed by Bob Carlson (1977) called the Carlson TSI (Figure14). Carlson analyzed total phosphorus, chlorophyll-*a*, and Secchi disk transparency data for numerous lakes and found statistically significant relationships among the three parameters. He developed mathematical equations for these relationships that form the basis for the Carlson TSI. Using this index, a TSI value can be generated by one of three measurements: Secchi disk transparency, chlorophyll-*a* or total phosphorus. Data for one parameter can also be used to predict a value for another. The TSI values range from 0 to 100. Each major TSI division (10, 20, 30, etc.) represents a doubling in algal biomass.

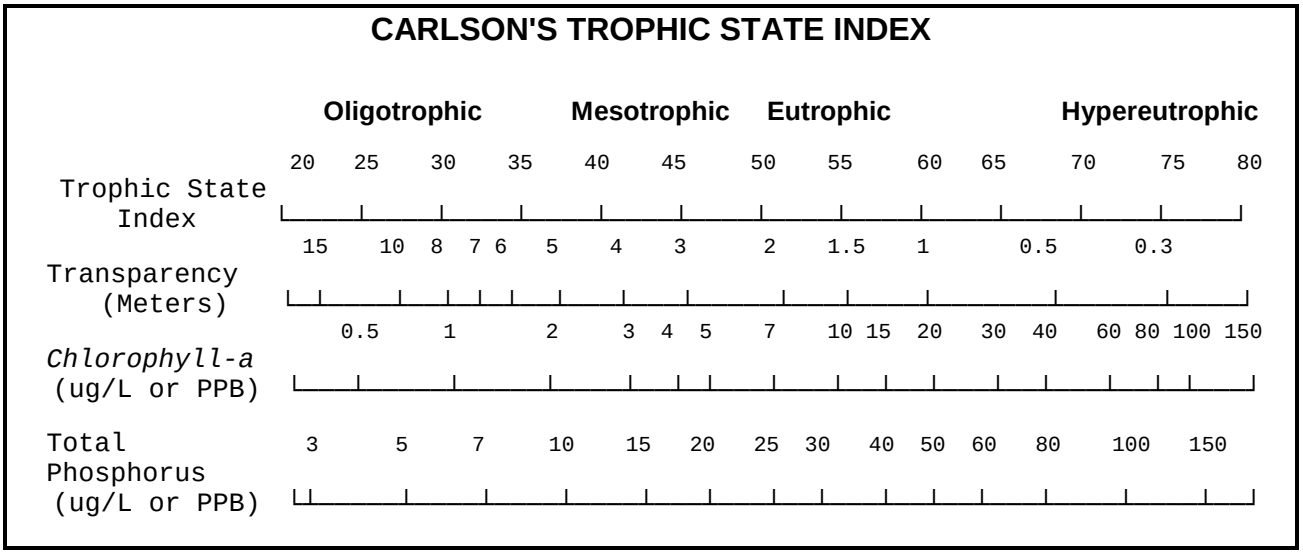



**Figure 14. Carlson's trophic state index.**

### 3.4.3 Trophic State Scores

Using Carlson's TSI for the May, June, and July data, Lake Lemon varied slightly by parameter and month but was mostly characterized by the eutrophic classification (Table 10). The earlier April TSI scores start the growing season with eutrophic conditions. Except the July chlorophyll and the May Secchi disk classifications, all the TSI scores increased throughout the growing season, which is the historic trend for Lake Lemon.

**Table 10. Summary of Trophic State Index Scores Using Mean 2013 Water Quality Data for Riddle/Reed Points.**

| DATE | Carlson's Secchi Disk TSI | Carlson's Total Phosphorus TSI | Carlson's Chlorophyll TSI |
|---|---|---|---|
| **May** | 57/60 | 54/59 | 37/42 |
| | Eutrophic | Eutrophic | Mesotrophic |
| **June** | 61/65 | 56/51 | 55/56 |
| | Eutrophic | Eutrophic | Eutrophic |
| **July** | 70/73 | 63/61 | 66/63 |
| | Hypereutrophic | Eutrophic | Eutrophic |

*How to read:*

**Riddle Pt. TP** = 0.051mg/L = 51ug/L
⇩
Graph on Carlson's TP scale
⇩
Carlson's TSI value

**Carlson's TP TSI**
65 / 68
Eutrophic/Hypereutrophic

**Reed Pt. TP** = 0.334mg/L = 334ug/L
⇩
Graph on Carlson's TP scale
⇩
Carlson's TSI value

## 4.0 TROPHIC STATE TRENDS

Using Riddle Point Carlson TSI scores to look at the historic trend for Lake Lemon shows that the lake is generally characterized as eutrophic conditions. Figures 14-16 illustrate the Carlson TSI historic trends for Secchi disk, total phosphorus, and chlorophyll-*a*. Overall, a pattern is seen within the seasonal variation with the late spring months scoring significantly lower (less eutrophic) while increasing during the late summer months to a eutrophic/hypereutrophic status.

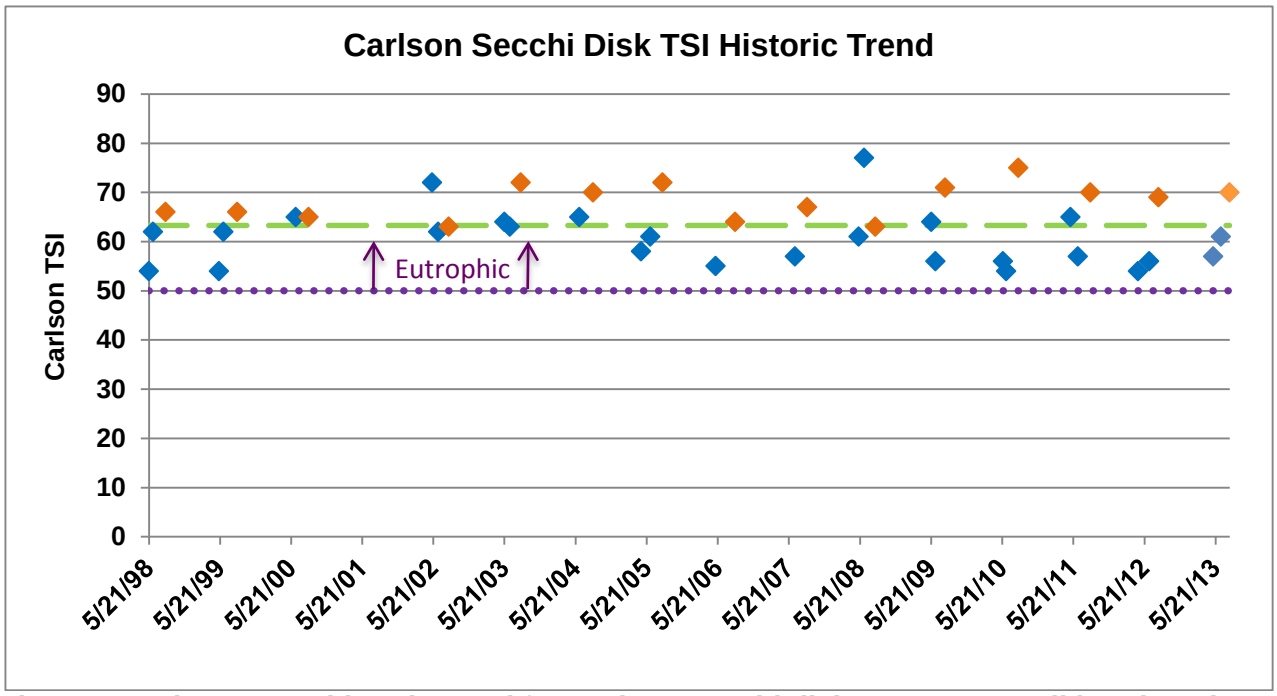



**Figure 14. The 15-year historic trend for Carlson Secchi disk TSI scores. All but three late summer (August) samples, shown in orange, scored above the mean for eutrophic status. The green dashed line illustrates the 15-year mean. The purple dotted line illustrates eutrophic status for the Carlson TSI.**

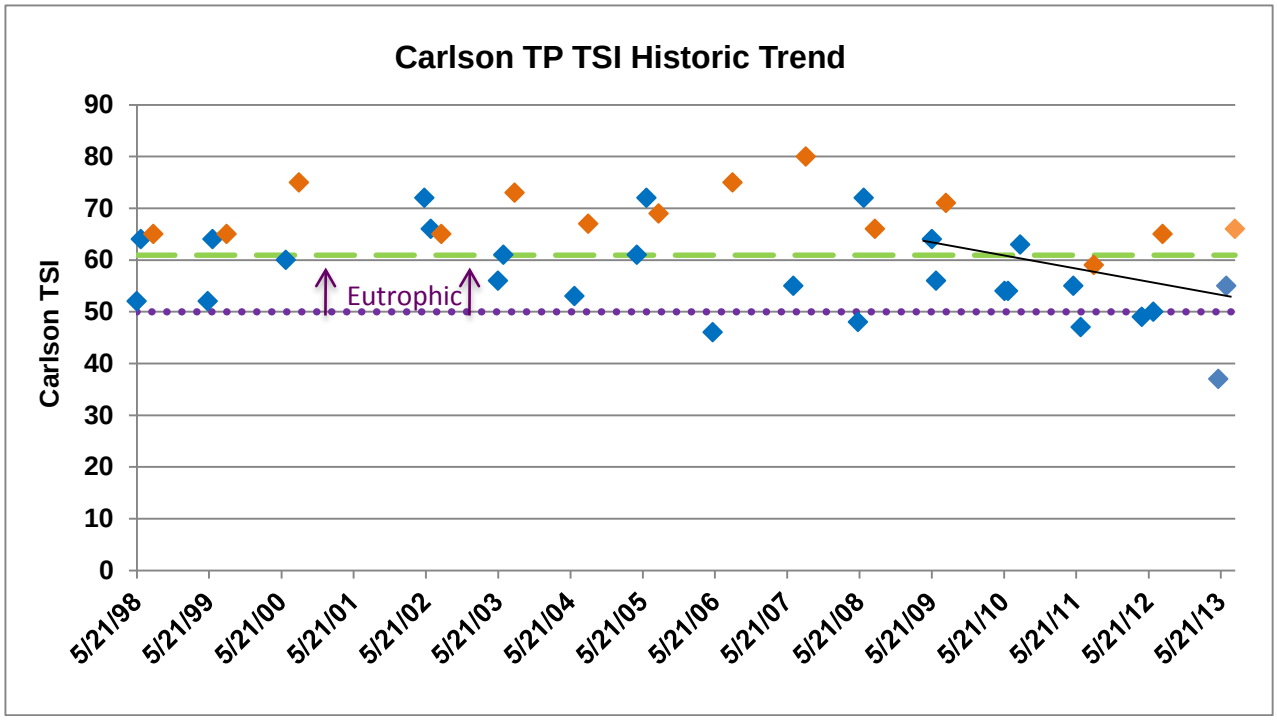



**Figure 15. The 15-year historic trend for Carlson total phosphorus TSI scores. All August samples, shown in orange, score above the mean for eutrophic status. The green dashed line illustrates the 15-year mean. The purple dotted line illustrates eutrophic status for the Carlson TSI. The black line shows a decreasing trend for the last 5 years.**

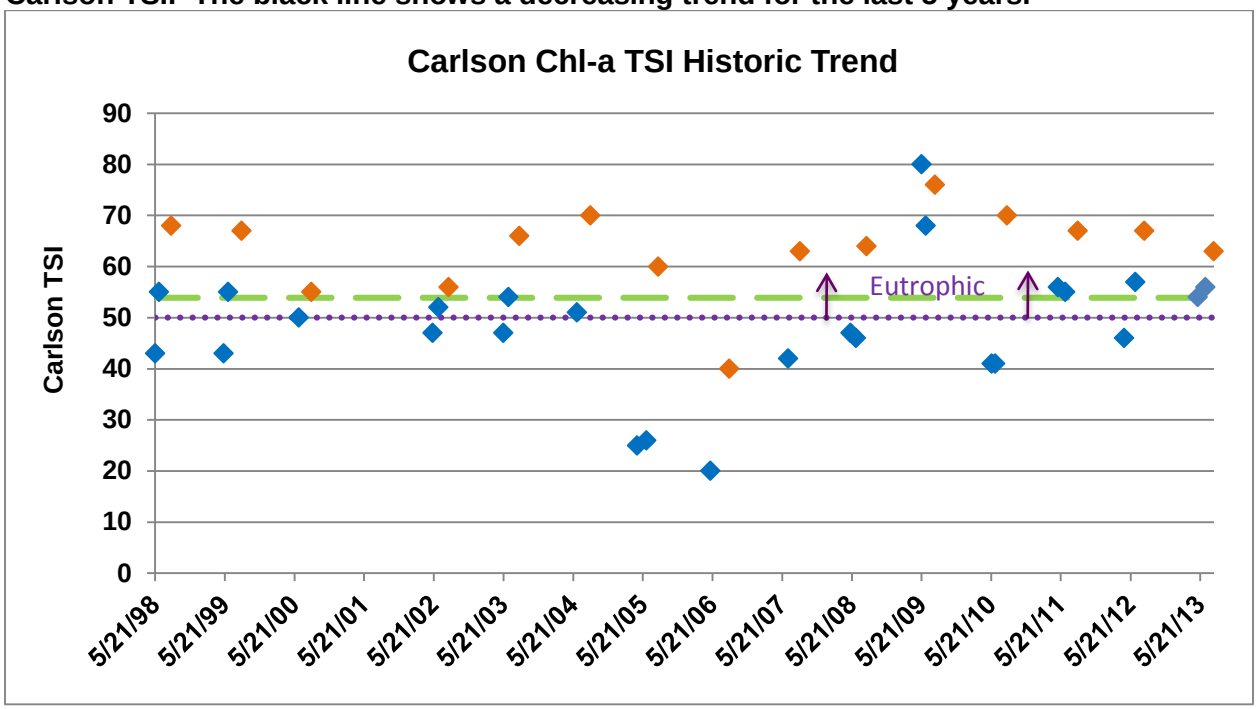



**Figure 16. The 15-year historic trend for Carlson chlorophyll-*a* TSI scores. Most August samples, shown in orange, score above the mean for eutrophic status. The 15-year mean is just above the Carlson TSI eutrophic status score of 50 (purple dotted line).**

## 5.0 WATER QUALITY TRENDS

Compiled Secchi disk transparency data from volunteer monitors and SPEA monitoring studies over the past 20 years are shown in Figure 17. There is no apparent long-term trend in transparency except that late July and August samples are generally lower in transparency. All measures of record would be considered indicative of eutrophic conditions.

Total phosphorus (TP) concentrations are quite variable over the past 20 years at Lake Lemon's Riddle Point sampling site (Figure 18). There is little visible long-term trend. Most of the values were above the eutrophic threshold of 0.030 mg/L. The earlier April and June 2012 samples were below this threshold, but exceed the concentration by late July. The variable concentrations have tightened over the years with the average just about 0.030 mg/L.

Epilimnetic total phosphorus concentrations at Riddle Point are mostly in the eutrophic range but the resulting chlorophyll-*a* concentrations (Figure 19) do not always reach the eutrophic range of greater than 7 μg/L; however, the majority of the August chlorophyll-*a* samples over the 20 years do fall above the eutrophic classification. It is typical that the chlorophyll-*a* concentrations would align with the TP concentrations; however, Lake Lemon watershed inputs of suspended solids contribute and elevate the TP concentrations, which also shade out the photic zone.

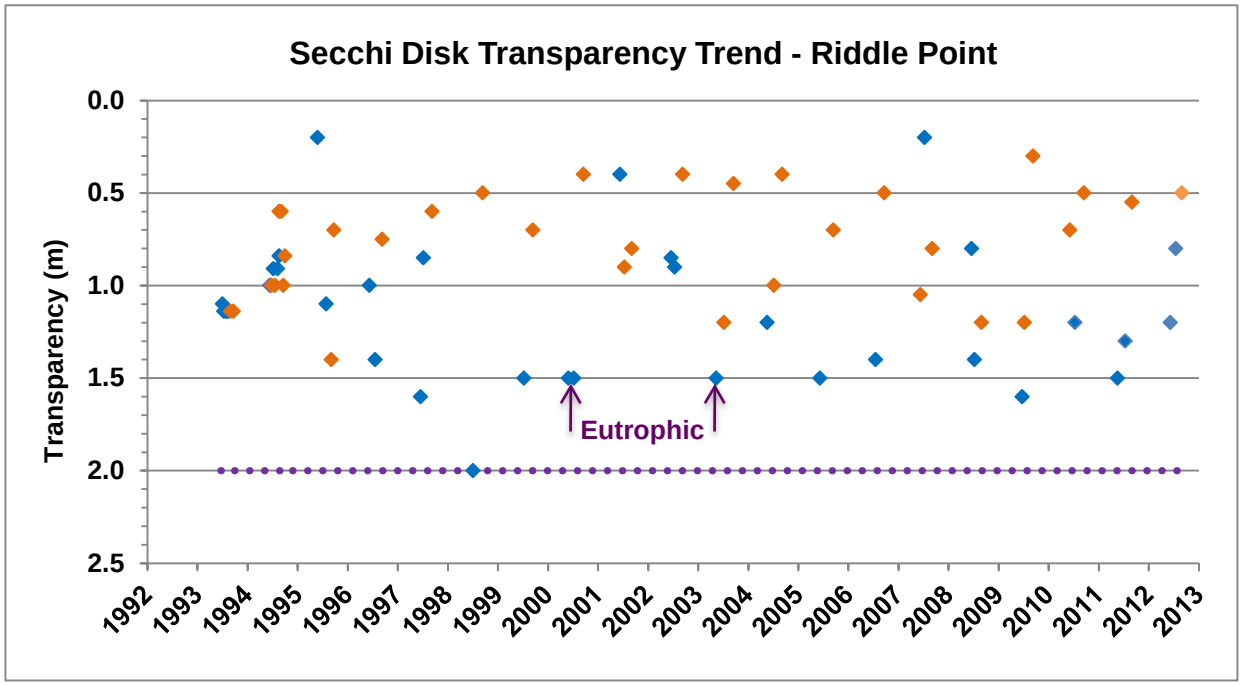



**Figure 17. Historic Secchi disk transparency data for Lake Lemon. All data are less than the general eutrophic indicator of 2 meters (dotted line). Orange markers indicate August or late July samples.**

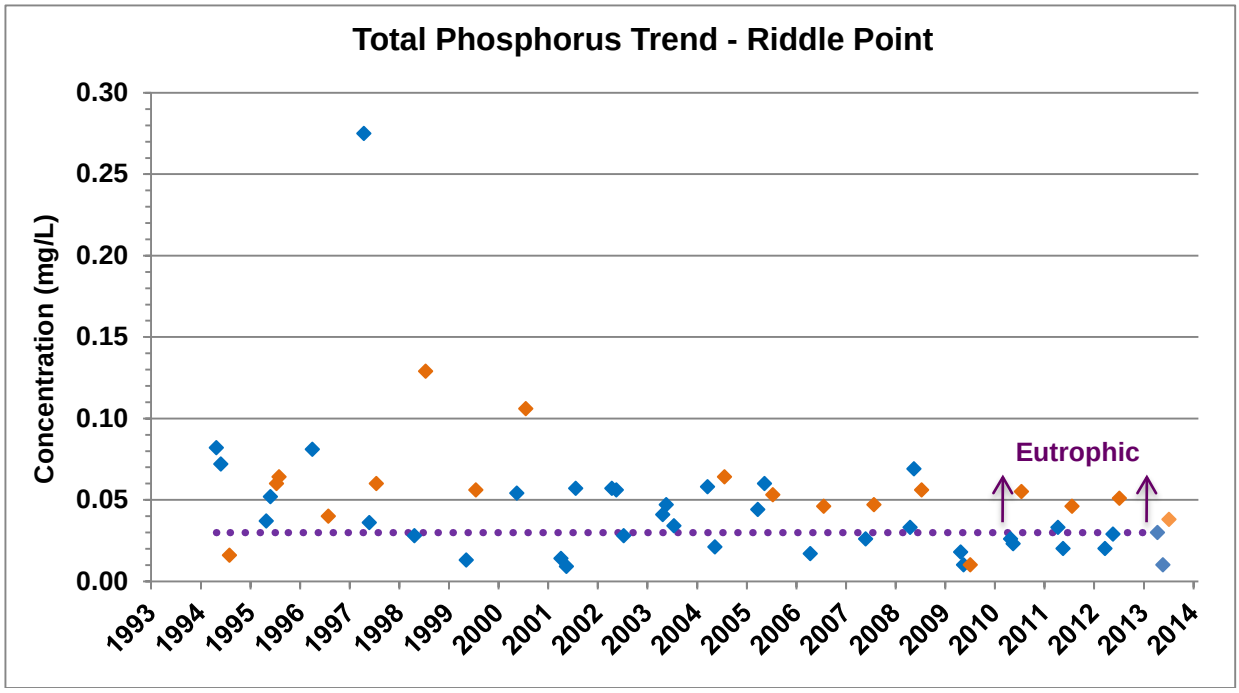



**Figure 18. Historic epilimnetic total phosphorus trend for Lake Lemon. Most concentrations are higher than 0.030 mg/L (dotted line), the level generally considered high enough to support eutrophic conditions. Orange markers indicate August or late July samples.**

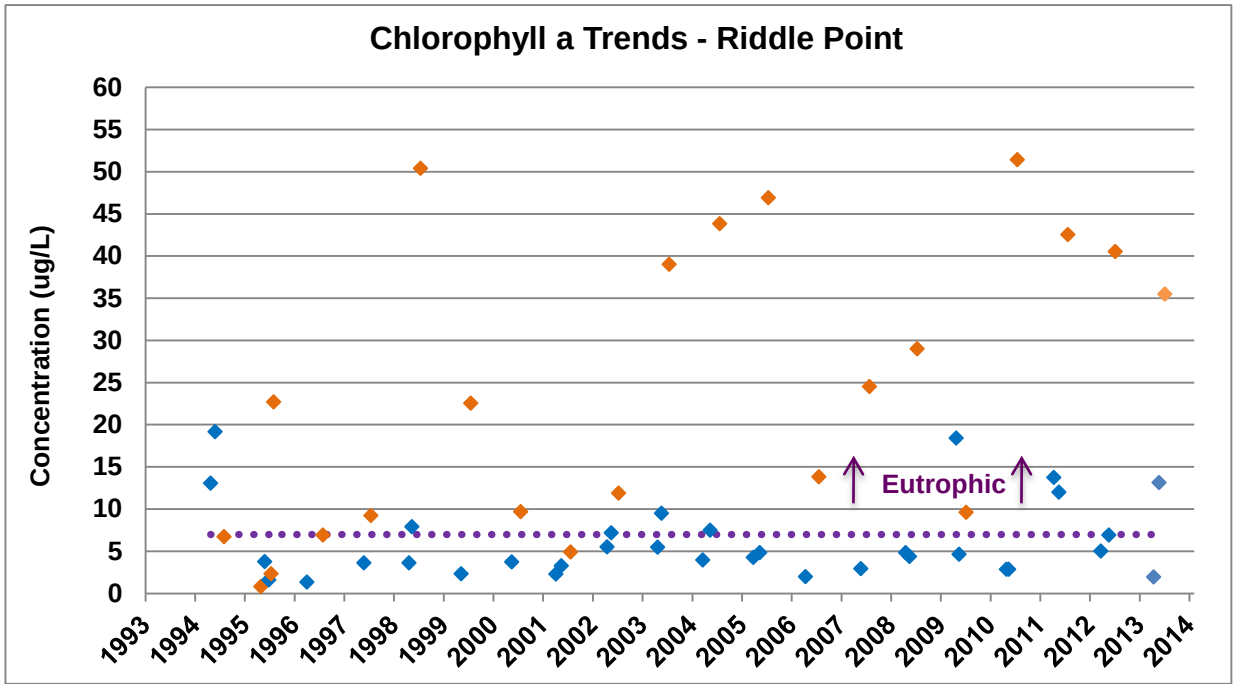



**Figure 19. Historic chlorophyll-*a* data for Lake Lemon. The dotted line illustrates concentrations indicative of eutrophic conditions. Orange markers indicate August or late July samples.**

## 6.0 CONCLUSIONS

The water characteristics of Lake Lemon are highly variable due, in large part, to runoff from the very large watershed that can replace the entire lake volume in a relatively short time (Figure 20). This causes difficulties in monitoring because the water conditions at any particular time depend on several immeasurable variables, including: time since the last major storm and the intensity and duration of that storm. All base flow samples fell within rain events so there was likely significant flushing of algal cells (Figure 13). While these variables affect other Indiana lakes and reservoirs, they have a much greater influence at Lake Lemon because of its very large watershed and short residence time. The watershed drainage area to lake area ratio is very large at 31:1 for Lake Lemon. While the flushing rate will need to be recalculated once the dredging work is complete, previously Lake Lemon had a hydraulic flushing rate of 5/yr, meaning the whole lake volume replaces itself 5 times per year. This makes this reservoir very responsive to watershed inputs.

Lake Lemon suffers from seasonally high levels of phosphorus, and suspended sediments and relatively low Secchi disk transparency throughout the year; however, the overall trend for Lake Lemon has not changed in over 19 years (Figures 17-19). Current water conditions unquestionably place the lake into the 'eutrophic' or over-productive trophic category. Eutrophic lakes produce more algae and rooted plants than the bacteria and microbes can decompose annually. As a result, decaying organic matter accumulates on the sediments where it contributes to low dissolved oxygen levels and decreased lake volume.

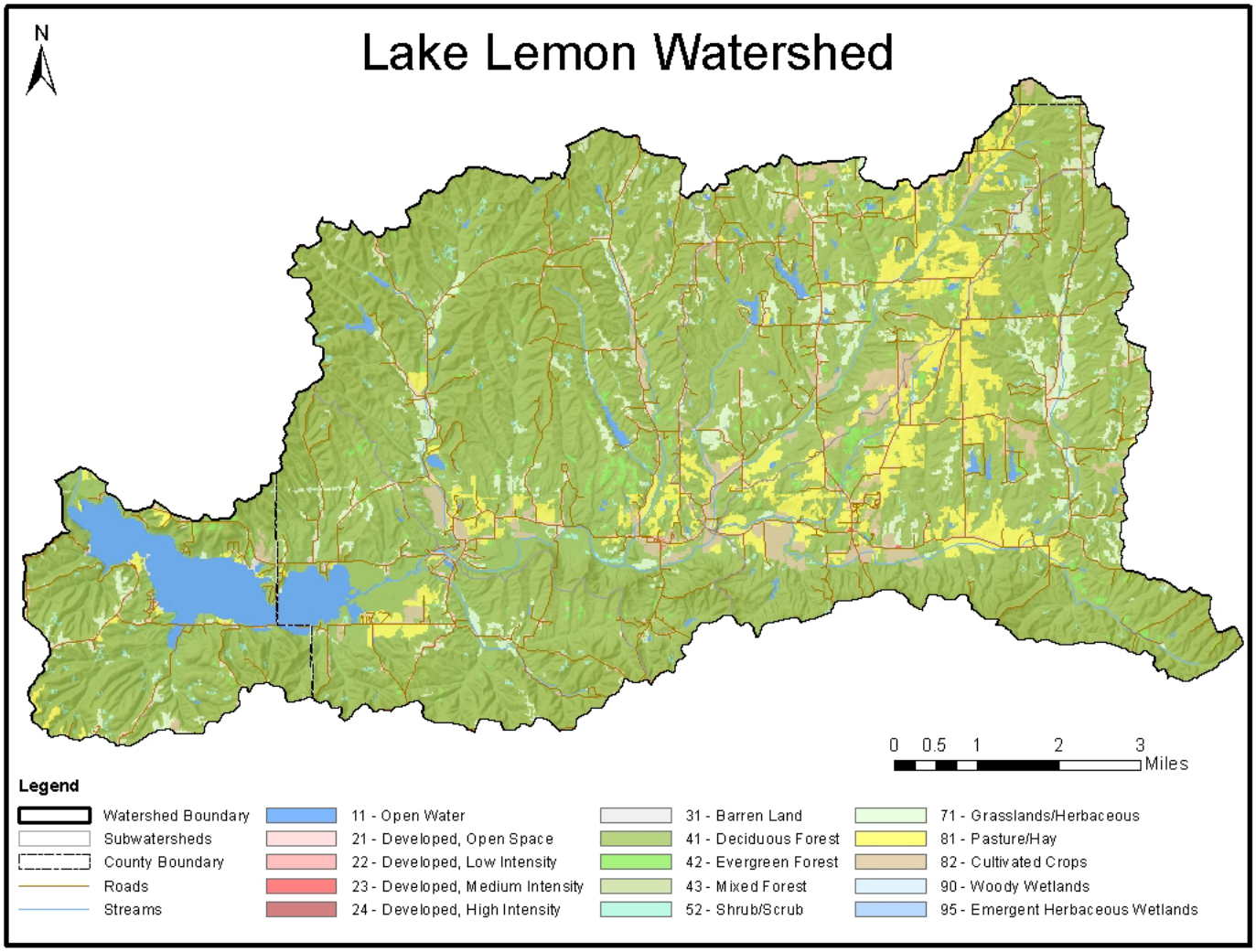



**Figure 20. Lake Lemon watershed.**

The delivery of eroded watershed soils to the lake has created bars and shallow water depths in the eastern end of the lake. In addition to posing navigation problems, sediment accumulations provide more potential habitat for rooted aquatic plants. The abundant shallow water and freshly deposited sediments in Lake Lemon provide ideal conditions for the growth of rooted plants. These rooted aquatic plants then provide additional hydraulic resistance encouraging sedimentation, which exacerbates the siltation in the eastern end of the lake. While the overabundance of macrophytes has decreased over the years by active harvesting and recent dredging, watershed sedimentation continues to deliver excessive suspended solids.

Sedimentation and its consequences are likely the most pervasive and historic problems of Lake Lemon. Since the LLCD has initiated a dredging program, controlling the watershed sources of sediment delivery, are the most needed lake management activities currently at the lake. While nutrient mitigation is not the primary objective of the current sediment dredging, removing those nutrient rich lake sediments will impact the nutrient release and resuspension, consequently reducing nutrients in the lake.

However, since most lake sediments were dredged from the epiliminetic sediments, the nutrient release is chemically limited but fully susceptible to boat wave action. It is well documented that a 50 horse power recreational boat motor can resuspend silt sized lake sediment particles in 10 feet of water. While there are a many idle speed areas within the lake, a large portion of the lake area that is 10 feet deep and shallower permits high speed motor boating (Figure 21). This certainly contributes to the high sediment resuspension in addition to watershed inputs.

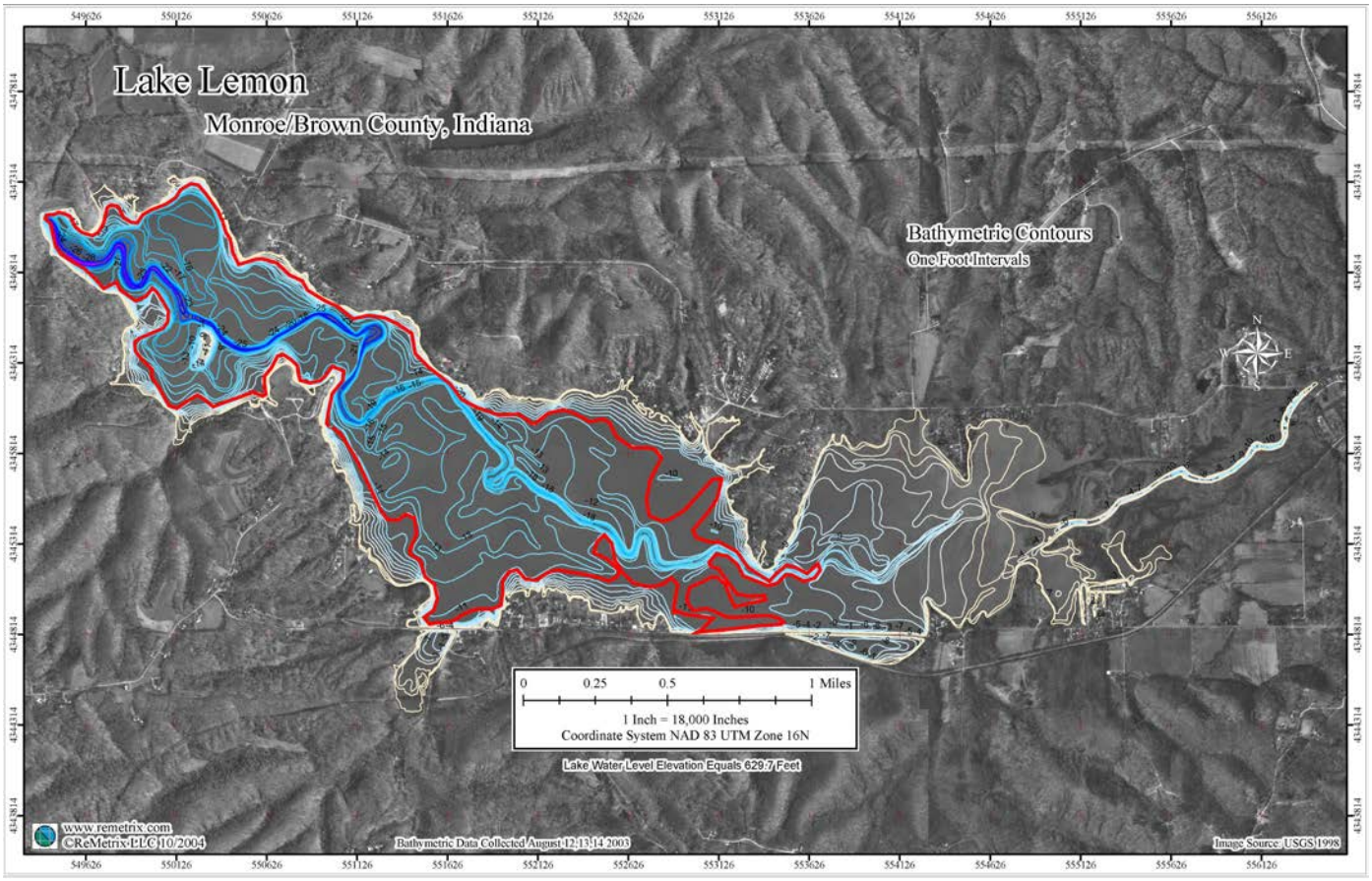



**Figure 21. Lake Lemon 2004 Bathymetry. The red line follows the 10 foot depth contour.**

While Lake Lemon continues to face watershed and lake challenges ranging from eutrophic water conditions that usually peak towards the end of the summer season to watershed land uses, there has been no significant change over the last 15 years. Key eutrophy parameters (total phosphorus, chlorophyll-*a*, Secchi disk transparency) have produced similar yearly results. Additional time is needed to discover if the multiple benefits of dredging significantly contribute to nutrient reduction.

## 7.0 **REFERENCES**


APHA et al. 2005. Standard Methods for the Examination of Water and Wastewater, 21th edition. American Public Health Association, Washington, D.C.

Carlson, R.E. 1977. A trophic state index for lakes. Limnology and Oceanography, 22(2): 361-369.

Correll, David L. 1998. The role of phosphorus in the eutrophication of receiving waters: a review. J. Environ. Qual., 27(2):261-266.

IDEM. 1976. Indiana Lake Classification System and Management Plan. Stream Pollution Control Board, Indianapolis, Indiana.

IDEM. 1986. Indiana Lake Classification System and Management Plan. Department of Environmental Management, Indianapolis, Indiana.

Jones, W.W. and seven others. 1997. Lake Monroe Diagnostic and Feasibility Study. School of Public and Environmental Affairs, Indiana University, Bloomington, IN, 324pp.

Ohio EPA. 1999. Association between nutrients, habitat, and the aquatic biota in Ohio rivers and streams. Ohio EPA Technical Bulletin MAS/1999-1-1, Columbus.

Prescott, G.W. 1982. Algae of the Western Great Lakes Area. Otto Koeltz Science Publishers, West Germany.

St. Amand, Ann. 2010. Aquatic Microorganism Image Library (CD). PhycoTech, Inc., St. Joseph, MI

U.S. Department of Commerce. 2009. National Oceanic and Atmospheric Administration, National Weather Service.

Walker, R.D. 1978. Task force on Agricultural Nonpoint Sources of Pollution Subcommittee on soil Erosion and Sedimentation. Illinois Institute for Enbironmental Qaulity, 72pp.

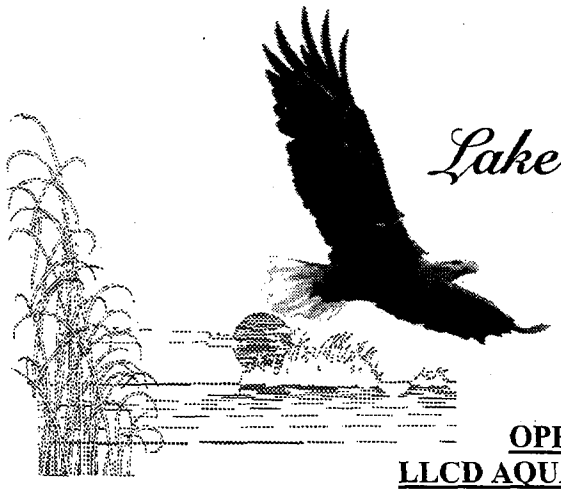
Ward, H.B. and G.C. Whipple. 1959. Freshwater Biology, Second Edition. W.T. Edmondson, editor. John Wiley & Sons, Inc., New York.

Wehr, J.D. and R.G. Sheath. 2003. Freshwater ALgae of North America, Ecology and Classification. Academic Press, San Diego.

Whitford, L.A. and G.J. Schumacher. 1984. A Manual of Fresh-Water Algae. Sparks Press, Raleigh, N.C.

Yousef, Y.A. et. al. 1978. Mixing effects due to boating activities in shallow lakes. Draft Report to OWRT, U.S. Dep. Inter. Tech. Rep. ESEI 78-10, Washington, D.C.

Zogorski, J.S., W.W. Jones and others. 1986. Lake Lemon Diagnostic/Feasibility Study. ESAC-86-02. School of Public and Environmental Affairs, Indiana University, Bloomington, Indiana.



# Lake Lemon Conservancy District

## OPERATING AGREEMENT
## LLCD AQUATIC VEGETATION CONTROL

THIS AGREEMENT is entered into this 21st day of May, 2014, by and between the Lake Lemon Conservancy District ("LLCD") and Aquatic Control, Inc. ("Independent Contractor"). In consideration of the covenants and promises herein provided, and other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the parties agree:

1. Description of Services. The LLCD maintains Lake Lemon, which is owned by the City of Bloomington ("CBU") and leased to the LLCD, which lake requires continual upkeep and maintenance (hereinafter "Project"). The LLCD hereby retains Independent Contractor and Independent Contractor agrees to provide operating services, specifically including the treatment of Eurasian Water Milfoil in Lake Lemon during the 2014 season on a schedule and as more specifically set forth on the Estimate for Services, attached hereto and by reference made a part hereof and marked as Exhibit "A."

2. Term. The Term shall be from May 22, 2014 to December 31, 2014.

3. Termination and Extension. Either party may terminate this Agreement by giving a five (5) day notice to the other party. This Agreement may be extended for additional one (1) year periods for a cumulative total of three (3) years upon the giving of written notice by LLCD at least sixty (60) days prior to the termination of the Agreement or any extensions thereof and so long as Independent Contractor maintains the same cost for services from year to year.

4. Payment for Services. For the entire contract term, LLCD shall pay Independent Contractor an estimated amount of Ten Thousand Dollars ($10,000.00), which payments will be made as satisfactory services are provided to LLCD and invoiced to the LLCD on a monthly basis for the duration of the Project. The charges invoiced by Independent Contractor shall be in accordance with the Custom Vegetation Management Program, as provided in Exhibit A for the actual acreage treated by Independent Contractor.

5. Reimbursement for Materials. If materials, in addition to those customarily provided by the Independent Contractor in conjunction with its work are required, LLCD shall reimburse Independent Contractor for such materials, so long as LLCD has approved such purchases in advance and provided its tax exemption number for such purchases.

**7599 North Tunnel Road, Unionville, IN 47468**
**Phone 812/334-0233 • Fax 812/335-0038**

6. Relationship of the Parties. Independent Contractor is an independent contractor in the performance of each and every part of this Agreement and solely and personally liable for the costs of all labor, equipment, tools, and expenses in connection therewith and for any and all damages that may occur because of Independent Contractor's performance under this Agreement, whether for personal injuries or damages of any other kind. Nothing in this Agreement shall be construed in any way to constitute Independent Contractor as the agent or representative of the LLCD. Nothing in this Agreement shall prohibit Independent Contractor from engaging in work for anyone other than the LLCD.

7. Insurance. Independent Contractor shall maintain appropriate commercial general liability insurance in a minimum amount of Two Million Dollars ($2,000,000.00) per occurrence. The LLCD and CBU shall be included as additional named-insureds on the policy and Independent Contractor shall provide proof of insurance to LLCD.

8. Liability. The LLCD and Independent Contractor acknowledge and agree that the services to be performed by Independent Contractor under this Agreement are to be performed by it at its own risk and that Independent Contractor assumes all responsibility for any damages or injuries that may result from Independent Contractor's performance of services under this Agreement. Independent Contractor agrees to indemnify and hold harmless the LLCD and CBU from any and all liability for any injuries (including death), damages, loss or claims, including attorney fees, based upon, arising out of, or in any manner connected with Independent Contractor's services provided under this Agreement, which includes but is not limited to claims for workers' compensation coverage. It is further agreed that Independent Contractor shall bear all costs of obtaining and maintaining for the term of this Agreement all required licensing, liability insurance and Workers' Compensation insurance.

9. Tax Liability. Independent Contractor shall exonerate, indemnify, and hold harmless the LLCD from and against, and shall assume full responsibility for, payment of self-employment taxes, all federal, state and local taxes, or contributions imposed or required under unemployment insurance, workmen's compensation, social security, and income tax laws with respect to Independent Contractor's services under this Agreement.

10. Remedies. A party shall be entitled to seek and obtain all relief, whether in law or in equity, for breach of the Agreement by the other party, including damages and reasonable attorney fees.

11. Assignment. The Independent Contractor's obligations under this Agreement may not be assigned or transferred without the prior written consent of the LLCD.

12. Venue and Applicable Law. This Agreement shall be governed by and construed under the laws of the State of Indiana, and the Monroe Circuit Court, Bloomington, Indiana, 47404, shall have exclusive jurisdiction over disputes arising hereunder.

13. Entire Agreement. This Agreement constitutes the entire contract between the parties. There is no statement, promise, agreement or obligation in existence which may conflict with the terms of this Agreement, or may modify, enlarge, or invalidate this Agreement or any provisions of it. This Agreement may not be amended, supplemented, or modified except by a written document signed by the LLCD and Independent Contractor.

14. Non-Waiver. The failure of any party to insist upon performance of any of the provisions of this Agreement or to pursue its rights hereunder shall not be construed as a waiver of any such provisions or the relinquishment of any such rights.

The foregoing Agreement is hereby executed on the terms stated above.

**Lake Lemon Conservancy District:**

By: _____
By: John Schell
Its: Chairman, Board of Directors

**Independent Contractor:**

_____
Aquatic Control, Inc.
By: Nathan W. Long
Its: Vice President

Prepared by:
Angela F. Parker, Attorney-at-Law
ANDREWS, HARRELL, MANN, CARMIN & PARKER, P.C.
400 West 7th Street, Ste. 104, P. O. Box 2639
Bloomington, IN 47402-2639

267285/11820

Exhibit "A"

VEGETATION MANAGEMENT

LAKE SURVEYS

FISH MANAGEMENT

AQUATIC CONTROL

PROFESSIONAL CONSULTANTS

FOUNTAINS

AERATION SYSTEMS

Phone 812-497-2410 Fax 812-497-2460

**Proposal No.:** 169772
**Created :** 05/09/2014
**Company ID :** 1026
**Contact ID :** 1026

Mr. Bob Madden
Lake Lemon Conservancy District
7599 North Tunnel Road
Unionville, IN 47468

| | |
|---|---|
| Park Office | 812-334-0233 |
| Fax | 812-335-0038 |
| Home | 812-337-0350 |

Invoices will be mailed to:
Lake Lemon Conservancy District
7599 North Tunnel Road
Unionville, IN 47468

We hereby submit specifications and costs for a **LARE Funded Eurasian Watermilfoil Maintenance Treatment**.

**Program Specifications:**

Aquatic Control will provide state certified aquatic applicators, EPA registered aquatic herbicides, and equipment needed to complete treatment for control of Eurasian watermilfoil in Lake Lemon. Price for treating milfoil is $535/acre 3.0 ft or 4.0 ft avg depth. Pricing for 2,4-D is $250/acre for 3 ft avg deotph and $275/acre for 4 ft avg depth. Treatment areas will be determined following a spring Invasive Species Survey. Treatment will have minimal impacts on native submersed plant species and filamentous algae.

**Options and/or special terms included in this contract /proposal are as follows:**

Price listed below is for treatment of 18.69 acres with Renovate 3 herbicide.

| | |
|---|---|
| **PROGRAM COST: $10,000.00** ( $10,000.00 plus $0.00 sales tax ) | **Nontaxable** ☐ **Tax Rate** 0.000% |

**Payment Options: (Please check choice)**

☐ Net 30

**Precautions for water use following treatments:**

Signs will be posted prior to treatment.

**Terms:**

**This contract is for the complete program as described in the above specifications and options sections,with material cost prorated over the entire contract period. The monthly payment is not a per month charge for treatment, therefore, deletion of, or addition of, a portion of the service time does not automatically reduce or increase the contract fee. Payment will be according to the payment option chosen above, with net 30 day terms on monthly billing. Overdue accounts are subject to suspension services.**

*Authorized Signature:* Nathan W. Long

***Acceptance of Proposal***

The above prices, specifications and conditions are satisfactory and are hereby accepted. You are authorized to do the work as specified. Payment will be made as stated above.

Date _____ Signature _____

**Please sign, date, and return white copy to**
**Aquatic Control, Inc., P.O. Box 100, Seymour, IN 47274**