

2018 Annual Report Part B

Illinois Volunteer Lake Monitoring Program

By
Gregory P. Ratliff

Illinois Environmental Protection Agency
Bureau of Water
Surface Water Section
Lakes Program
P.O. Box 19276
Springfield, Illinois 62794-9276

In cooperation with:

Chicago Metropolitan Agency for Planning
233 S. Wacker Drive, Suite 800
Chicago, Illinois 60606

Greater Egypt Regional Planning and Development Commission
3000 W. DeYoung Street, Suite 800B-3
Marion, Illinois 62959

Lake County Health Department
500 W. Winchester Road, Suite 102
Libertyville, Illinois 60048

December 2018

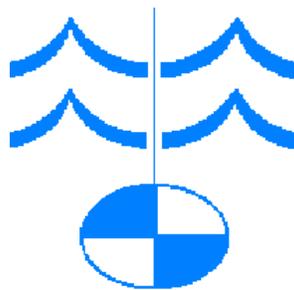


Table of Contents

- Acknowledgements
- Acronyms and Abbreviations
- VLMP Annual Report Part A and Part B
- Results and Discussion
 - Basic Monitoring Program Results
 - Lakes
 - Volunteers
 - Data Returns
 - Transparency Ranking
 - Transparency Variability
 - Percent Macrophyte Coverage
 - Expanded Monitoring Program Results
 - Water Quality Monitoring
 - Phosphorus
 - Nitrogen
 - Suspended Solids
 - Chlorophyll
 - Chloride
 - Alkalinity
 - Trophic State
 - Dissolved Oxygen and Temperature Measurements
- Summary
 - Setting Goals with Volunteer Data
 - Grants Available to Control Nonpoint Source Pollution in Illinois
 - 319 Program
- Glossary

Appendix A: 2018 VLMP Lab Data (separate attachment)

Appendix B: 2018 VLMP Lake Data (separate attachment)

Appendix C: 2018 VLMP Dissolved Oxygen Data (separate attachment)

Acknowledgements

First and foremost, thanks to this year's 255 volunteer lake monitors who made this program and report a possibility. Their dedication to Illinois lakes is greatly appreciated and acknowledged.

| Lake Name County Name | Volunteer Names | Bluff Lake Co. | Alana Bartolai Joyce Gaffney |
|---------------------------------------|---|----------------------------------|--|
| Altamont New Effingham Co. | Jarrett Goers Lloyd Wendling Ryan Spade | Bruce DuPage Co. | Dave Phillips |
| Apple Canyon Jo Daviess Co. | Gary Hannon Kim Rees Bill Ware Fern Tribbey Steve Tribbey Aren Helgerson Kerstin Stople | Butler Lake Co. | Dan Colwell Mary Colwell |
| Arcadia Williamson Co. | Keith Gardner Bill Nielsen | Camelot Peoria Co. | Joe Rush Christopher Mackesy Vincent Johnson |
| Barrington Lake Co. | Valomry Dyokas Tom McGonigle Ann Kirkley Kathy Aron Dan Brockman Louis Yer Len Zolna Pat Flynn Ionn Anderson L. Lee Norm Erih | Campton Kane Co. | Dave Hanson |
| Bass Lee Co. | Jerry Corcoran | Campus Jackson Co. | Marjorie Brooks Louis Helsing |
| Beaver Grundy Co. | Barb Arnold Jim Arnold | Candlewick Boone Co. | Chuck Hart |
| Big Bear Lake Co. | Gabriel Rodriguez | Carbondale Jackson Co. | Kim Cole Bill Daily Rob Ittner Will Lusk Eric Stead Jesse Warden Jimmy Hendrix Lee Pilkington Matt Weaver Skylar Hanson |
| Bird's Pond Sangamon Co. | Harry Hendrickson Phil Voht | Carroll Carroll Co. | Joe Rush |
| Black Oak Lee Co. | Jerry Corcoran | Catatoga Macoupin Co. | Marie Dawson Walter L Dawson |
| Bloomington Mclean Co. | Tony Alwood Jill A Mayes | Catherine Lake Co. | John Massman Berit Massman Bob Mazzeffi Erica Adrian John Vrchota |

| | |
|---|--|
| Cedar Jackson Co. | Eric Stead Lee Pilkington Jesse Warden Matthew Weaver Skylar Hanson |
| Channel Lake Co. | John Massman Bob Mazzeffi Adrian Robinson Adrian Mazzeffi John Vrchota |
| Charles DuPage Co. | Darlene Garay Ken Brennan |
| Charlotte Kane Co. | Mike Howell Reider Hahn |
| Chautauqua Jackson Co. | Michael T Madigan Nancy L Spear |
| Chicago Botanic Garden Cook Co. | Bob Kirschner |
| Countryside Lake Co. | Eric Butler Ethan Butler Evan Butler |
| Crooked Lake Co. | Blair Dawson |
| Cross Lake Co. | Gregory Goldbogen Pam Goldbogen |
| Crystal Champaign Co. | Kara Dudek Andy Rousseau Alex Ivanova Zoe Wu |
| Crystal McHenry Co. | Jeremy Husnik Kelly Burdick Bob Bruzzino |
| Dawson McLean Co. | Allan (Jim) Zoerb Clark Ranney Wayne Lockwood |
| Deboer Woods Will Co. | David Casillas Dennis Dempsey |
| Deep Lake Co. | Ron Riesbeck |

| | |
|---|---|
| Defiance McHenry Co. | Mary Colwell Rachel Berry Erin Slifer Greta Taylor |
| Des Plaines Lake Co. | Paul Klonowski |
| Devils Kitchen Williamson Co. | Don Johnson |
| Diamond Lake Co. | Greg Denny |
| Druce Lake Co. | Matt DeLacluyse Mary DeLacluyse Cara DeLacluyse |
| Duck Lake Co. | Charles Nilson |
| Dunlap Madison Co. | Carolyn Green Doug Carney |
| East Loon Lake Co. | Dave Tatak Karen Tatak Tom Keefe |
| Echo Lake Co. | Anne McMorris Jeff McMorris |
| Evergreen McLean Co. | Tony Alwood Jill A Mayes |
| Forest Lake Co. | Larry Steker Joe Wachter |
| Fourth Lake Co. | Joyce Gaffney Gerard Urbanozo |
| Frontier Sangamon Co. | Loey Fretz Lossaine Mozley Steven Mozley |
| Fyre Mercer Co. | Ted Kloppenborg |
| Gages Lake Co. | Matt Brueck Paul Brueck Zack Brueck |
| Galena Jo Daviess Co. | Steve Birkbeck Madelynn Wilharm |
| Gamlin St. Clair Co. | Scott Framsted |

| | |
|--|---|
| Golfview DuPage Co. | Donald Schultz Linda Salerno Martha Schultz Peter Salerno |
| Goose McHenry Co. | Ross K Nelson Tamara Mueller |
| Grass Lake Co. | Alana Bartolai Joyce Gaffney |
| Grays Lake Co. | Bill Soucie Timothy Bliese |
| Griswold McHenry Co. | Melanie Kandler Adam Garcia |
| Hastings Lake Co. | Donald Wilson |
| Homer Champaign Co. | Adam Kurczewski Dalton Kerans Emily Steffes Emily Williams Peter Goodspeed |
| Honey Lake Co. | Thomas Robbins Wes Garbutt Wyatt Byrd |
| Huntley Lake Co. | Don Wilson Jacob Nast |
| Island Lake Co. | Paul Meindl |
| Jaycee Jefferson Co. | Todd Piper |
| Killarney McHenry Co. | Neil O'Brien Dennis Oleksy |
| Kinkaid Jackson Co. | Scott Wilmouth J.T. Jenkins |
| LaFox Pond Kane Co. | J. Brian Towey |
| Lake of Egypt Williamson Co. | JoAnn Malacarne Leroy Pfaltzgraff Lori Pfaltzgraff Sandra Anspaugh Tom Anspaugh |

| | |
|---|--|
| Lake of the Woods Champaign Co. | Adam Kurczewski Dalton Kerans Emily Steffes Emily Williams Peter Goodspeed |
| Lancelot Peoria Co. | Joe Rush Jeff Hammond Christopher Mackesy Vincent Johnson |
| Leopold Lake Co. | Joe Marencik |
| Linden Lake Co. | John Filippo Nancy Filippo |
| Little Bear Lake Co. | Gabriel Rodriguez |
| Little Silver Lake Co. | James Sheehan |
| Loch Lomond Lake Co. | John Hines Paul Hemmenling Tony Baade Terri Anderson |
| Long Lake Co. | Robert Ringa III Joe Popeck |
| Longmeadow Cook Co. | Barb Schuetz |
| Louise Lake Co. | Anne Kokke April Adler Beth Adler Geoff Ommen Henri Kokke |
| Mattoon Shelby Co. | David Basham Heather McFarland Kory Culp |
| Miller Jefferson Co. | Joan Beckman Eddie Greer Thomas Zielonko Jim Rozycki Jeff Osborn |
| Miltmore Lake Co. | Don Jackson |

| | |
|---------------------------------------|--|
| Minear Lake Co. | Barb Barry Tom Barry Ned Herchenbach David Johnson |
| Murphysboro Jackson Co. | Scott Wilmouth J.T. Jenkins |
| Napa Suwe Lake Co. | Joe Sallak Joyce Sallak |
| New Thompson Jackson Co. | David Crawshaw Sandy Crawshaw |
| NICC Pond Lake Co. | Leonard Dane |
| Nippersink Lake Co. | Alana Bartolai Joyce Gaffney |
| Otter Macoupin Co. | Stan Crawford Otis Foster Joe Hogan Jeff Stanley Tanner Barnes |
| Paradise Coles Co. | David Basham Heather McFarland |
| Paris Twin East Edgar Co. | Greg Whiteman Andy Goodwin |
| Paris Twin West Edgar Co. | Andy Goodwin Greg Whiteman |
| Petersburg Menard Co. | Tom Lawton Barry Bass |
| Petite Lake Co. | Alana Bartolai Joyce Gaffney |
| Pine Lee Co. | Jerry Corcoran |
| Richardson Wildlife Lee Co. | J. Brian Towey |
| River Bend Vermilion Co. | Philip Solter Leellen Solter |
| Round Lake Co. | Ann Hansen Dan Madden Sarah Johnson |

| | |
|------------------------------------|---|
| Ruth Du Page Co. | Stephen Melvin Julie Melvin |
| Sand Lake Co. | Michael Plishka |
| Sangchris Christian Co. | Jacob Sherell Beth Whetsell Greggory Miller Greg Ratliff Jessica Riney Renee Israels |
| Sara Effingham Co. | Janet Kennedy Bob Kennedy |
| Silver McHenry Co. | Bruce Wallace Todd Wallace |
| Spring Lake Co. | Alana Bartolai Joyce Gaffney |
| Spring McDonough Co. | Brian McIlhenny |
| Spring Arbor Jackson Co. | John Roseberry |
| Spring Ledge Lake Co. | Mike Heinrich Tom Heinrich Judy Heinrich |
| Springfield Sangamon Co. | Dan Brill Quentin Jordan |
| St. Mary's Lake Co. | Alana Bartolai Joyce Gaffney |
| Sterling Lake Co. | Paul Klonowski Alana Bartolai |
| Sunset Champaign Co. | Adam Kurczewski Dalton Kerans Emily Steffes Emily Williams Peter Goodspeed |
| Sunset Lee Co. | Jerry Corcoran |
| Sunset Macoupin Co. | Charlie Edwards |

| | | |
|--|---|---|
| Swan Cook Co. | John Kanzia Jack McCracken Jennifer Aguilar Joe Clayton Lyanna Dimas Paige Hines Patti Umbricht | Champaign Co. |
| Third Lake Co. | Patty Morthorst Tom Morthorst Cara DeLacluyse | Valley Lake Co. Marian Kowalski Sherry Johnson |
| Three Oaks North McHenry Co. | Paul McPherson | Virginia Cook Co. Paul Herzog Janet Herzog |
| Three Oaks South McHenry Co. | Paul McPherson | Weslake St. Clair Co. Charles Meirink |
| Thunderbird Putnam Co. | Mark Serio | West Loon Lake Co. Dave Tatak Tom Keefe |
| Timber Lake Co. | Aaron Schroeder Daniel Hanson | Westlake Winnebago Co. Joe Rush |
| Tower Lake Co. | Tom Kubala Zach Rowley Jen Grey Mitch Coulter Quinn Rowley Steve Burgoon | Wonder McHenry Co. Ken Shaleen Tony Musel Dennis Gallo |
| Twin Oaks | Jim Roberts | Woodhaven Lee Co. Jerry Corcoran |
| | | Woods Creek McHenry Co. Adam Brink Zach Hansen Kyle Trusty JR Davis |
| | | Wooster Lake Co. Christopher Larsen |
| | | Zurich Lake Co. Paul Dawidczyk |

This report represents the coordinated efforts of many individuals. The Illinois Environmental Protection Agency's Lakes Program, under the direction of Gregg Good, was responsible for the original design of the Volunteer Lake Monitoring Program (VLMP) and its continued implementation. Two Area-wide Planning Commissions: Chicago Metropolitan Agency for Planning (CMAP) and Greater Egypt Regional Planning and Development Commission (GERPDC), along with Lake County Health Department (LCHD), were responsible for program administration in their regions of the state under the statewide coordination of Greg Ratliff (IEPA).

Additional Program coordination was provided by Teri Holland and Tara Norris (IEPA); Holly Hudson (CMAP); Tyler Carpenter (GERPDC); and Alana Bartolai (LCHD). Training of volunteers was performed by Teri Holland, Greg Ratliff, Holly Hudson, Tyler Carpenter, and Alana Bartolai. Data handling was performed by Teri Holland, Greg Ratliff, Tara Norris, Gregory Miller, Roy Smogor (IEPA), Holly Hudson, Tyler Carpenter and Alana Bartolai. This report was written by Greg Ratliff and reviewed by Teri Holland, Roy Smogor, Gregg Good, Mike Bundren, Tara Norris, and Alana Bartolai. Maps were created by Gregory Miller.

Acronyms and Abbreviations

| | | | | | |
|--------------------------------|--|--------------|--|--------------------------|-----------------------------------|
| AIS | Aquatic Invasive Species | LCHD | Lake County Health Department | TP | Total Phosphorus |
| CHL-α | Chlorophyll- α | mg/L | Milligrams per Liter | TSI | Trophic State Index |
| CMAP | Chicago Metropolitan Agency for Planning | mL | Milliliter | TSI^{CHL} | TSI for Chlorophyll- α |
| DO | Dissolved Oxygen | NPS | Non-point Source | TSI^{SD} | TSI for Secchi Depth |
| GERPDC | Greater Egypt Regional Planning and Development Commission | NVSS | Non-volatile Suspended Solids | TSI^{TN} | TSI for Total Nitrogen |
| GPS | Global Positioning System | RFLA | Request for Lab Analysis | TSI^{TP} | TSI for Total Phosphorus |
| IEPA | Illinois Environmental Protection Agency | SD | Secchi Depth | TSS | Total Suspended Solids |
| | | TKN | Total Kjeldahl Nitrogen | ug/L | Microgram per Liter |
| | | TN | Total Nitrogen | VLMP | Volunteer Lake Monitoring Program |
| | | TN:TP | Total Nitrogen to Total Phosphorus ratio | VSS | Volatile Suspended Solids |

VLMP Annual Report Part A and Part B

The VLMP Annual Report is comprised of two parts and the appendices. The Annual Report Part A is the companion document for this report and is composed of the Volunteer Lake Monitoring Program’s Background, Methods and Procedures, and Data Evaluation sections. Part A seldom changes. Part B is updated yearly and follows below.

The Annual Report in its entirety can be referenced online at <https://www2.illinois.gov/epa/topics/water-quality/monitoring/vlmp/Pages/data.aspx>.

The components of Part A and Part B are listed below.

Part A

Acknowledgements
 Acronyms and Abbreviations
 Program Objectives
Background
Methods & Procedures
Data Evaluation
 References
 Glossary

Part B

Acknowledgements
 Acronyms and Abbreviations
 Annual Report Part A and Part B
Results and Discussion
Summary
 Glossary Link

Results and Discussion

Basic Monitoring Program Results

Lakes

One hundred twenty-nine lakes were monitored at least once in 2018. These lakes are distributed across the state with a large cluster occurring in Lake County. The lakes enrolled in the program represent several different lake types: backwater, glacial, impoundments (dammed and dug), quarries (coal, sand, gravel and borrow pits) and ponds. Figures 1 and 2 show the distribution and lake types of the 2018 VLMP lakes.

Volunteers

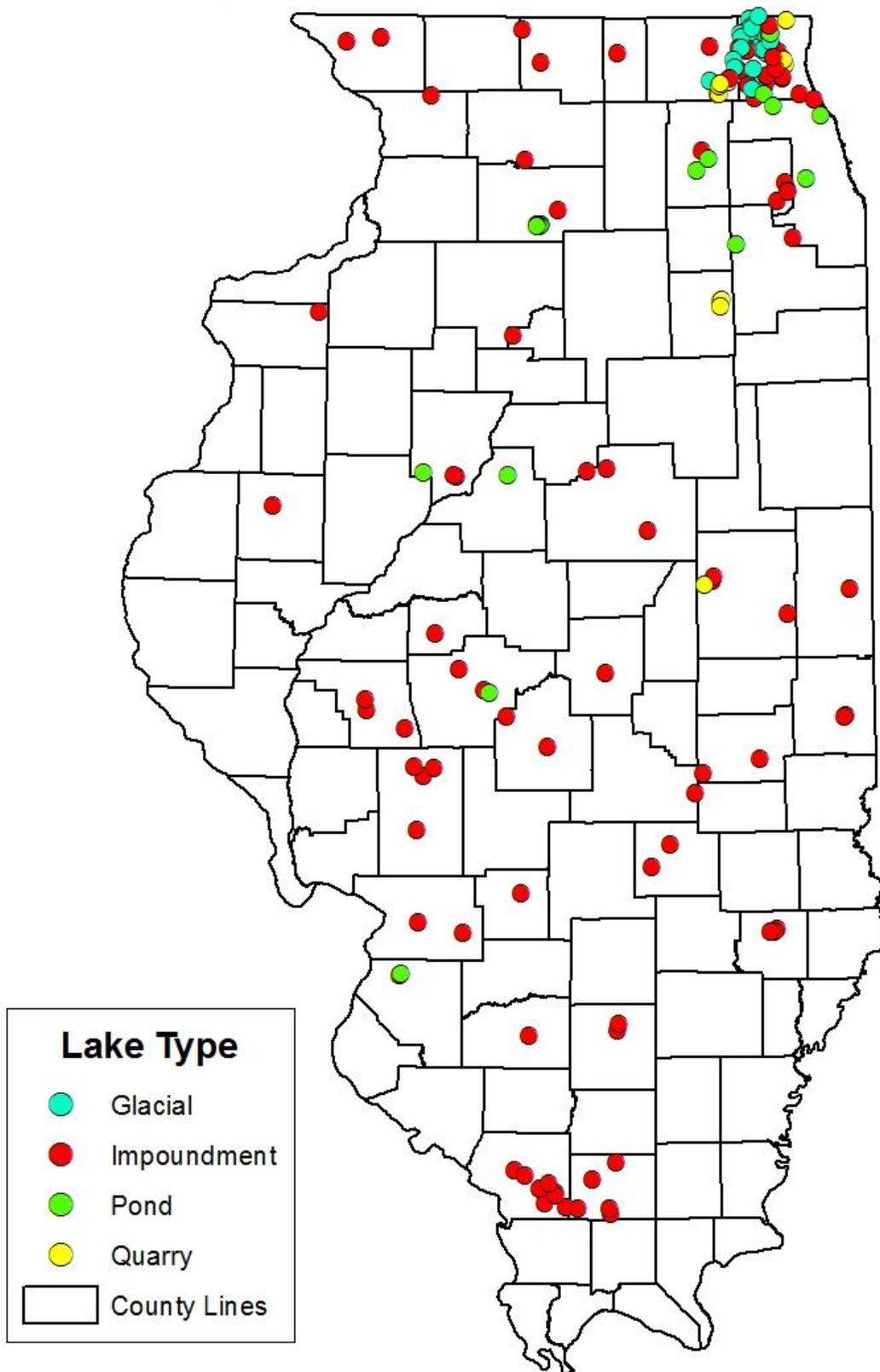
Two hundred fifty-five volunteers participated in lake monitoring during the 2018 season. These monitors donated over 2,823.55 volunteer-hours of their time for 987 monitoring events. Volunteers are primarily lakeshore residents, lake owner/managers, sportspeople, environmental group members, public water supply personnel, or interested citizens.

Data Returns

This year 51 lakes were monitored ten or more times throughout the season (Table 1). Of the remaining lakes in the Program, 26 lakes had seven to nine data returns, 28 had four to six data returns, and 24 had three or less data returns.

| Waterbody/County | Waterbody/County | Waterbody/County |
|---------------------------|--------------------------|-------------------------|
| Apple Canyon/Jo Daviess | Echo/Lake | Murphysboro/Jackson |
| Arcadia/Williamson | Evergreen/McLean | Napa Suwe/Lake |
| Barrington/Lake | Forest/Lake | Pine/Lee |
| Bass/Lee | Galena/Jo Daviess | Richardson Wildlife/Lee |
| Black Oak/Lee | Hastings/Lake | River Bend/Vermilion |
| Bloomington/McLean | Huntley/Lake | Round/Lake |
| Carbondale/Jackson | Island/Lake | Sangchris/Christian |
| Catatoga/Macoupin | Killarney/McHenry | Silver/McHenry |
| Catherine/Lake | Kinkaid/Jackson | Spring/McDonough |
| Charles/Du Page | La Fox Pond/Kane | Spring Arbor/Jackson |
| Chautauqua/Jackson | Lake of Egypt/Williamson | Springfield/Sangamon |
| Countryside/Lake | Leopold/Lake | Sunset/Lee |
| Crystal/Champaign | Linden/Lake | Swan/Cook |
| Dawson/McHenry | Little Silver/Lake | Third/Lake |
| Deboer Woods/Will | Loch Lomond/Lake | Valley/Lake |
| Deep/Lake | Long/Lake | Virginia/Cook |
| Devils Kitchen/Williamson | Miller/Jefferson | Woodhaven/Lee |

Figure 1: 2018 VLMP Lakes



trend. Trends based on lake average Secchi disk transparency should be interpreted with caution. A lake's average transparency for a year can be affected by numerous factors, such as:

1. Variations in meteorological conditions and precipitation patterns;
2. Water depths;
3. Variations in the timing and frequency of monitoring;
4. Variations in monitoring techniques and perceptions by different volunteers;
5. Exact location of sampling sites;
6. Growth of aquatic plants that can inhibit the depth to which the Secchi disk can physically be lowered;
7. Variations in lake management (e.g., aquatic plant treatments, drawdowns etc.);
8. Spills, construction, or other temporary human impacts; and
9. Human error in not adhering to monitoring guidelines.

A technical analysis of lake trends should always consider these types of potential sampling errors and variability. Factors such as the minimum and maximum transparencies for each year, seasonal patterns in transparency, effects of a storm event or management practice on transparency, and many other factors also should be examined when interpreting Secchi transparency trends. Hence, it is apparent that the most reliable data trends are those derived from consistent and frequent monitoring throughout the season and over a period of years.

Percent Macrophyte Coverage

Volunteers made an estimate of the percent coverage of macrophytes (aquatic plants) visible on the lake surface. The amount of macrophyte growth in a lake has a large impact on both the life cycles of aquatic animals and public use. In many of Illinois lakes, macrophyte growth is limited by the turbidity of the water. Lakes with little or no macrophytes may require aquatic plant species restoration projects to support local fish populations. Other lakes may need to introduce best management practices (BMPs) that reduce plant growth and restore boating and swimming opportunities to the public.

Appendix B: 2018 VLMP Lake Data includes the percent macrophyte coverage data as well as all other monitoring data associated with collection of transparency data. These data are also accessible online as soon as they are entered by the volunteer or coordinator.

Expanded Monitoring Program Results

Water Quality Monitoring

Volunteers at 73 lakes collected water quality samples. Four lakes were sampled under the Tier 3 program where water samples were collected for analysis at multiple lake stations (including a sample near the lake bottom). Sixty-nine lakes were sampled under the Tier 2 program where water samples were collected at a single lake site, usually the deepest site (surface sample only). The water quality and chlorophyll data are provided in Appendix A: 2018 VLMP Lab Data.

Total Phosphorus (TP): The median values ranged from 0.009 mg/L to 0.987 mg/L. The single highest value overall was found at Long Lake in Lake County, 2.41 mg/L total phosphorus. Forty-two lakes had median values of TP over the 0.05 mg/L water quality standard (WQS). Nine of thirty-one lakes with median TP under 0.05 mg/L WQS had one or more sampling events with levels over the WQS. There were 22 lakes where all TP values were below the WQS (Table 2). TSI^{TP} values were also calculated (Table 3).

Table 2: 2018 lakes with all total phosphorus results below the Illinois water quality standard (0.05 mg/L)

| Lake/County | Lake/County | Lake/County | Lake/County |
|-----------------|---------------------------|--------------------------|--------------------|
| Barrington/Lake | Devils Kitchen/Williamson | Lake of Egypt/Williamson | Sunset/Champaign |
| Carroll/Carroll | Diamond/Lake | Leopold/lake | Thunderbird/Putnam |
| Catherine/Lake | Druce/Lake | Miltmore/Lake | Virginia/Cook |
| Charlotte/Kane | Fyre/Mercer | Petersburg/Menard | Wooster/Lake |
| Crystal/McHenry | Killarney/McHenry | Silver/McHenry | |
| Deep/Lake | Kinkaid/Jackson | Spring Arbor/Jackson | |

Chlorophyll-a: Chlorophyll-a values provide an estimate for the amount of algae present in a lake. Samples for chlorophyll-a were collected at seventeen lakes (four Tier 3, ten Tier 2, and 3 Tier 1). LCHD collected the chlorophyll samples for the Tier 1 lakes and 2 of the Tier 2 lakes. Median chlorophyll-a concentrations ranged from 40.2 µg/L at Gages in Lake County to 72.7 µg/L at Bruce in DuPage County. Lake TSI^{CHL} values were also calculated (Table 3).

Non-volatile Suspended Solids (NVSS): NVSS is an indicator for sediment turbidity present in a lake. NVSS median values were calculated by subtracting the volatile suspended solids (VSS) from the total suspended solids (TSS). (TSS – VSS = NVSS). Fifty-nine of the seventy-three lakes sampled showed no significant amounts of NVSS (less than 3 mg/L); thirteen were 12 mg/L or less; and the last one was under 20 mg/L.

Nitrogen: Nitrogen is an essential nutrient for plants and animals. Lakes were analyzed for three sources of nitrogen: ammonia, nitrites + nitrates (inorganic nitrogen), and Total Kjeldahl Nitrogen (TKN, organic nitrogen + ammonia). Total nitrogen is the sum of TKN and inorganic nitrogen.

Total Nitrogen to Total Phosphorus (TN/TP) ratio is a tool that is commonly used to indicate which of the two nutrients (nitrogen or phosphorus) are limiting algal growth. A TN:TP ratio <10:1 indicates that nitrogen is the limiting nutrient and a ratio >20:1 indicates that phosphorus is the limiting nutrient. When the TN:TP ratios were calculated for the 2018 lakes, 10 lakes were determined to be nitrogen limited, 35 are considered transitional (both may be limiting growth), and 28 are phosphorus limited. While many people assume that phosphorus is always the limiting nutrient responsible for algal growth, results here suggest the need to consider both nutrients when creating a management plan. Additionally, plotting the change of ratios over the course of the growing season for a particular lake may be useful for spotting seasonal trends, but is not within the scope of this report.

Chloride: None of the 39 lakes sampled for chloride had any values over the Agency’s water quality standard (WQS) for surface water (500 mg/L). The median chloride values ranged from 6.0 mg/L at River

Bend in Vermilion County to 392 mg/L at Bruce in DuPage County. Chloride sampling was generally limited to the general Chicago metropolitan area, with a few exceptions.

Alkalinity: For 2018, all but one lake analyzed for alkalinity appears to be well buffered (not sensitive to acid rain). Well buffered lakes have alkalinity concentrations greater than 25 mg/L. Median Alkalinity values across the state ranged from 23 mg/L at Devils Kitchen in Williamson County to 257 mg/L at Longmeadow in Cook County. Devils Kitchen values fall within the category of low sensitivity to acid rain.

Using the USGS Hardness Scale; water from 18 lakes can be considered “Very Hard,” water from 35 lakes are considered “Hard,” water from 16 lakes are considered “Moderately Hard,” and water from 4 lakes are considered “Soft.” All six lakes with soft water were found in Southern Illinois: Devils Kitchen and Lake of Egypt in Williamson County; Cedar, Spring Arbor, and Kinkaid in Jackson County; and Miller in Jefferson County. When using water from reservoirs with very hard or hard water, softeners may be required. Having a good soft water source is an economic boon for any municipality.

Table 3: Lake Ranking by Transparency (with Trophic State Indices)

| Tier | Lake Code | Waterbody | County | Rank | Median SD (in) | TSI ^{TP} | TSI ^{CHL} | TSI ^{SD} | Trophic State |
|------|-----------|------------------|------------|------|----------------|-------------------|--------------------|-------------------|---------------|
| 2 | VTD | Deep | Lake | 1 | 279 | 41.1 | | 31.8 | Mesotrophic |
| 1 | WTJ | Three Oaks North | McHenry | 2 | 211 | | | 35.8 | Oligotrophic |
| 1 | WTG | Three Oaks South | McHenry | 3 | 198 | | | 36.7 | Oligotrophic |
| 2 | SGB | Virginia | Cook | 4 | 184 | 35.5 | | 37.8 | Oligotrophic |
| 1 | RDW | Beaver | Grundy | 5 | 180 | | | 38.1 | Oligotrophic |
| 1 | WGZJ | Sterling | Lake | 6 | 177 | | | 38.4 | Oligotrophic |
| 2 | RTW | Silver | McHenry | 7 | 156 | 39.4 | | 40.2 | Oligotrophic |
| 2 | VTZH | Crystal | McHenry | 8 | 137 | 40.0 | | 42.0 | Mesotrophic |
| 1 | RGI | Gages | Lake | 9 | 134 | | 40.2 | 42.4 | Mesotrophic |
| 1 | RTZB | West Loon | Lake | 9 | 134 | | | 42.4 | Mesotrophic |
| 2 | REZN | Sunset | Champaign | 11 | 126 | 43.2 | | 43.3 | Mesotrophic |
| 2 | RGV | Druce | Lake | 12 | 124 | 42.2 | 43.1 | 43.5 | Mesotrophic |
| 1 | RGM | Sand | Lake | 13 | 119 | | 43.5 | 44.1 | Mesotrophic |
| 2 | VTZ | Charlotte | Kane | 14 | 113 | 54.7 | | 44.8 | Eutrophic |
| 1 | UTV | Cross | Lake | 15 | 108 | | | 45.5 | Mesotrophic |
| 1 | RTS | Zurich | Lake | 16 | 104 | | | 46.0 | Mesotrophic |
| 1 | RTB | Defiance | McHenry | 17 | 102 | | | 46.3 | Mesotrophic |
| 2 | RNJ | Devils Kitchen | Williamson | 18 | 96 | 38.7 | | 47.2 | Oligotrophic |
| 1 | STC | Little Silver | Lake | 19 | 93 | | | 47.6 | Mesotrophic |
| 2 | RTZV | Killarney | McHenry | 20 | 90 | 46.5 | | 48.1 | Mesotrophic |
| 1 | RTI | Channel | Lake | 21 | 87 | | | 48.6 | Mesotrophic |
| 2 | VGI | Leopold | Lake | 22 | 84 | 57.0 | | 49.1 | Eutrophic |

Table 3: Lake Ranking by Transparency (with Trophic State Indices)

| Tier | Lake Code | Waterbody | County | Rank | Median SD (in) | TSI ^{TP} | TSI ^{CHL} | TSI ^{SD} | Trophic State |
|------|-----------|---------------|------------|------|----------------|-------------------|--------------------|-------------------|----------------|
| 2 | RGW | Third | Lake | 23 | 82 | 49.0 | 43.1 | 49.4 | Mesotrophic |
| 1 | RNU | Jaycee | Jefferson | 24 | 81 | | | 49.6 | Mesotrophic |
| 2 | RTD | Catherine | Lake | 25 | 76 | 57.3 | | 50.5 | Eutrophic |
| 1 | RTZQ | Timber | Lake | 26 | 75 | | | 50.7 | Eutrophic |
| 1 | RGP | Minear | Lake | 27 | 74 | | | 50.9 | Eutrophic |
| 2 | RMQ | Carroll | Carroll | 28 | 73 | 54.1 | | 51.1 | Eutrophic |
| 2 | RGZD | Miltmore | Lake | 29 | 69 | 46.6 | 46.0 | 52.0 | Mesotrophic |
| 2 | RTZU | Honey | Lake | 30 | 66 | 58.4 | | 52.6 | Eutrophic |
| 2 | RLH | Fyre | Mercer | 31 | 64 | 43.2 | | 53.0 | Mesotrophic |
| 2 | VDE | Catatoga | Macoupin | 32 | 63 | 57.3 | | 53.2 | Eutrophic |
| 2 | REL | Petersburg | Menard | 32 | 63 | 45.0 | | 53.2 | Mesotrophic |
| 1 | RGY | Huntley | Lake | 34 | 62 | | | 53.5 | Eutrophic |
| 2 | RTZT | Barrington | Lake | 35 | 60 | 42.3 | | 53.9 | Mesotrophic |
| 3 | RNC | Kinkaid | Jackson | 36 | 58 | 49.4 | 55.2 | 54.5 | Eutrophic |
| 1 | RNE | Cedar | Jackson | 37 | 56 | | | 54.9 | Eutrophic |
| 2 | RAL | Lake of Egypt | Williamson | 38 | 54 | 48.0 | | 55.4 | Mesotrophic |
| 1 | UGF | St. Mary's | Lake | | 54 | | | 55.4 | Out of Season |
| 1 | WTO | NICC Pond | Lake | 39 | 53 | | | 55.7 | Eutrophic |
| 2 | SDQ | Thunderbird | Putnam | 40 | 52 | 53.2 | | 56.0 | Eutrophic |
| 2 | RPJ | Bass | Lee | 41 | 50 | 71.4 | | 56.6 | Hypereutrophic |
| 1 | WGZV | Little Bear | Lake | 42 | 48 | | | 57.1 | Eutrophic |
| 2 | WBE | River Bend | Vermilion | 42 | 48 | 75.1 | | 57.1 | Hypereutrophic |
| 2 | RTZF | Tower | Lake | 42 | 48 | 59.4 | | 57.1 | Eutrophic |
| 1 | RGC | Linden | Lake | 42 | 48 | | | 57.3 | Eutrophic |
| 2 | RGZB | Hastings | Lake | 46 | 46 | 61.4 | | 57.8 | Eutrophic |
| 1 | UDH | Sunset | Macoupin | 46 | 46 | | | 57.8 | Eutrophic |
| 1 | RTH | Round | Lake | 46 | 46 | | | 57.9 | Eutrophic |
| 1 | RGK | Grays | Lake | 49 | 45 | | 47.0 | 58.1 | Mesotrophic |
| 2 | RPM | Woodhaven | Lee | 49 | 45 | 64.9 | | 58.1 | Eutrophic |
| 2 | RMJ | Apple Canyon | Jo Daviess | 49 | 45 | 64.1 | | 58.2 | Eutrophic |
| 1 | RGZC | Fourth | Lake | | 45 | | | 58.2 | Out of Season |
| 2 | RNZG | Spring Arbor | Jackson | 49 | 45 | 48.0 | | 58.2 | Mesotrophic |
| 3 | RTJ | Long | Lake | 53 | 43 | 62.7 | 51.6 | 58.7 | Eutrophic |
| 1 | RPZB | Pine | Lee | 53 | 43 | | | 58.9 | Eutrophic |
| 2 | REE | Dawson | McLean | 55 | 41 | 57.7 | | 59.6 | Eutrophic |
| 2 | RTZR | Echo | Lake | 56 | 40 | 60.8 | | 59.8 | Eutrophic |
| 2 | RPV | Candlewick | Boone | 57 | 39 | 63.8 | | 60.1 | Eutrophic |
| | RTY | Griswold | McHenry | | 38 | | | 60.5 | Out of Season |

Table 3: Lake Ranking by Transparency (with Trophic State Indices)

| Tier | Lake Code | Waterbody | County | Rank | Median SD (in) | TSI ^{TP} | TSI ^{CHL} | TSI ^{SD} | Trophic State |
|------|-----------|---------------------|------------|------|----------------|-------------------|--------------------|-------------------|----------------|
| 1 | STM | La Fox Pond | Kane | 58 | 38 | | | 60.5 | Eutrophic |
| 2 | RPZK | Westlake | Winnebago | 59 | 38 | 82.7 | | 60.7 | Hypereutrophic |
| 2 | SDP | Lancelot | Peoria | 60 | 37 | 73.3 | | 60.9 | Hypereutrophic |
| 1 | RPL | Sunset | Lee | 60 | 37 | | | 60.9 | Eutrophic |
| 1 | RTM | East Loon | Lake | 60 | 37 | | | 61.1 | Eutrophic |
| 2 | RAZP | Arcadia | Williamson | 63 | 36 | 64.2 | | 61.3 | Eutrophic |
| 2 | RMM | Galena | Jo Daviess | 63 | 36 | 67.0 | 64.7 | 61.3 | Eutrophic |
| 2 | RGJ | Butler | Lake | 63 | 36 | 66.8 | | 61.5 | Eutrophic |
| 2 | RGZG | Forest | Lake | 66 | 35 | 65.5 | | 61.7 | Eutrophic |
| 1 | VTJ | Bluff | Lake | 67 | 35 | | | 61.9 | Eutrophic |
| 2 | UDB | Camelot | Peoria | 68 | 34 | 76.4 | | 62.1 | Hypereutrophic |
| 1 | RTZS | Goose | McHenry | 68 | 34 | | | 62.1 | Eutrophic |
| 2 | VGZF | Deboer Woods | Will | 70 | 33 | 73.2 | 54.9 | 62.5 | Eutrophic |
| 1 | RGZA | Crooked | Lake | 71 | 32 | | | 63.0 | Eutrophic |
| 1 | RJZK | Gamlin | St Clair | 71 | 32 | | | 63.0 | Eutrophic |
| 2 | RTZZ | Woods Creek | McHenry | 71 | 32 | 62.2 | | 63.0 | Eutrophic |
| 1 | RPK | Black Oak | Lee | 71 | 32 | | | 63.2 | Eutrophic |
| 2 | RBO | Homer | Champaign | 71 | 32 | 60.6 | | 63.2 | Eutrophic |
| 3 | RCE | Sara | Effingham | 71 | 32 | 58.7 | 65.3 | 63.2 | Eutrophic |
| 2 | RNZO | New Thompson | Jackson | 77 | 31 | 58.6 | | 63.4 | Eutrophic |
| 1 | RJJ | Weslake | St Clair | 77 | 31 | | | 63.4 | Eutrophic |
| 1 | RGQ | Countryside | Lake | 77 | 31 | | | 63.7 | Eutrophic |
| 1 | WGZU | Big Bear | Lake | 80 | 30 | | | 63.9 | Eutrophic |
| 2 | RGR | Charles | Du Page | 80 | 30 | 68.2 | 63.8 | 63.9 | Eutrophic |
| 2 | RDF | Otter | Macoupin | 80 | 30 | 56.2 | | 63.9 | Eutrophic |
| 2 | RBU | Crystal | Champaign | 80 | 30 | 64.9 | | 64.2 | Eutrophic |
| 2 | RNZH | Campus | Jackson | 84 | 29 | 63.9 | | 64.4 | Eutrophic |
| 2 | UGV | Spring Ledge | Lake | 84 | 29 | 65.2 | | 64.4 | Eutrophic |
| 2 | RHZK | Longmeadow | Cook | 86 | 28 | 65.2 | | 64.9 | Eutrophic |
| 1 | SDA | Evergreen | McLean | 87 | 26 | | | 66.0 | Eutrophic |
| 1 | RPZI | Richardson Wildlife | Lee | 87 | 26 | | | 66.0 | Eutrophic |
| 1 | RJD | Dunlap | Madison | 89 | 25 | | | 66.5 | Eutrophic |
| 1 | RDO | Bloomington | McLean | 90 | 24 | | | 67.1 | Eutrophic |
| 1 | RTZI | Island | Lake | 90 | 24 | | | 67.1 | Eutrophic |
| 2 | RNZI | Miller | Jefferson | 90 | 24 | 62.8 | | 67.1 | Eutrophic |
| 1 | RND | Murphysboro | Jackson | 90 | 24 | | | 67.1 | Eutrophic |
| 2 | WGZY | Swan | Cook | 90 | 24 | 103.6 | 68.8 | 67.1 | Eutrophic |

Table 3: Lake Ranking by Transparency (with Trophic State Indices)

| Tier | Lake Code | Waterbody | County | Rank | Median SD (in) | TSI ^{TP} | TSI ^{CHL} | TSI ^{SD} | Trophic State |
|------|-----------|-------------------------|-----------|------|----------------|-------------------|--------------------|-------------------|----------------|
| 2 | REG | Lake of the Woods | Champaign | 95 | 23 | 64.1 | | 67.7 | Eutrophic |
| 2 | SEB | Bird's Pond | Sangamon | 95 | 23 | 71.7 | | 68.1 | Hypereutrophic |
| 1 | SNA | Chautauqua | Jackson | 95 | 23 | | | 68.1 | Eutrophic |
| 1 | RTZG | Duck | Lake | 98 | 22 | | | 68.4 | Eutrophic |
| 1 | VTW | Petite | Lake | 99 | 21 | | | 69.1 | Eutrophic |
| 3 | REB | Sangchris | Christian | 99 | 21 | 63.5 | 67.0 | 69.1 | Eutrophic |
| 2 | RGZM | Valley | Lake | 99 | 21 | 68.9 | | 69.4 | Eutrophic |
| 1 | RBX | Paris Twin West | Edgar | 102 | 20 | | | 69.8 | Eutrophic |
| 2 | RGB | Diamond | Lake | 102 | 20 | 56.5 | | 70.1 | Eutrophic |
| 1 | RTQ | Grass | Lake | 102 | 20 | | | 70.1 | Hypereutrophic |
| 1 | RTUA | Nippersink | Lake | 102 | 20 | | | 70.1 | Hypereutrophic |
| 2 | RCF | Mattoon | Shelby | 106 | 19 | 73.7 | | 70.5 | Hypereutrophic |
| 1 | RBL | Paris Twin East | Edgar | 106 | 19 | | | 70.9 | Hypereutrophic |
| 2 | RCJ | Altamont New | Effingham | 108 | 18 | 75.0 | | 71.3 | Hypereutrophic |
| 1 | STJ | Campton | Kane | | 18 | | | 71.3 | Out of Season |
| 1 | REZO | Frontier | Sangamon | 108 | 18 | | | 71.7 | Hypereutrophic |
| 2 | RTZC | Wonder | McHenry | 110 | 17 | 73.5 | | 72.5 | Hypereutrophic |
| 1 | RGZT | Spring | Lake | 111 | 16 | | | 73.0 | Hypereutrophic |
| 2 | REF | Springfield | Sangamon | 111 | 16 | 88.8 | | 73.4 | Hypereutrophic |
| 1 | STO | Napa Suwe | Lake | 113 | 15 | | | 73.9 | Hypereutrophic |
| 2 | REZL | Twin Oaks | Champaign | 114 | 14 | 79.5 | | 74.9 | Hypereutrophic |
| 2 | RDR | Spring | McDonough | 114 | 14 | 84.5 | | 75.4 | Hypereutrophic |
| 1 | VGZD | Des Plaines | Lake | 116 | 13 | | | 76.5 | Hypereutrophic |
| 2 | RNI | Carbondale | Jackson | 117 | 12 | 72.7 | | 77.1 | Hypereutrophic |
| 2 | RGU | Loch Lomond | Lake | 117 | 12 | 65.1 | | 77.1 | Eutrophic |
| 2 | RCG | Paradise | Coles | 117 | 12 | 85.8 | | 77.1 | Hypereutrophic |
| 2 | VGZE | Ruth | Du Page | 117 | 12 | 74.4 | 67.5 | 77.1 | Hypereutrophic |
| 2 | VTZJ | Louise | Lake | 121 | 6 | 85.1 | | 87.1 | Hypereutrophic |
| 2 | RGA | Bruce | Du Page | | | 64.6 | 72.7 | VoB | Eutrophic |
| 2 | RHJA | Chicago Botanic Gardens | Cook | | | 53.4 | 46.1 | NS | Eutrophic |
| 2 | RGZW | Golfview | Du Page | | | 65.5 | | NS | Eutrophic |
| 2 | RTZH | Wooster | Lake | | | 55.8 | | NS | Eutrophic |

NS - Secchi data was not submitted by volunteer by mail or online portal.

VoB - the Secchi depth readings were either visible on the bottom or hidden by plants.

Trophic Status

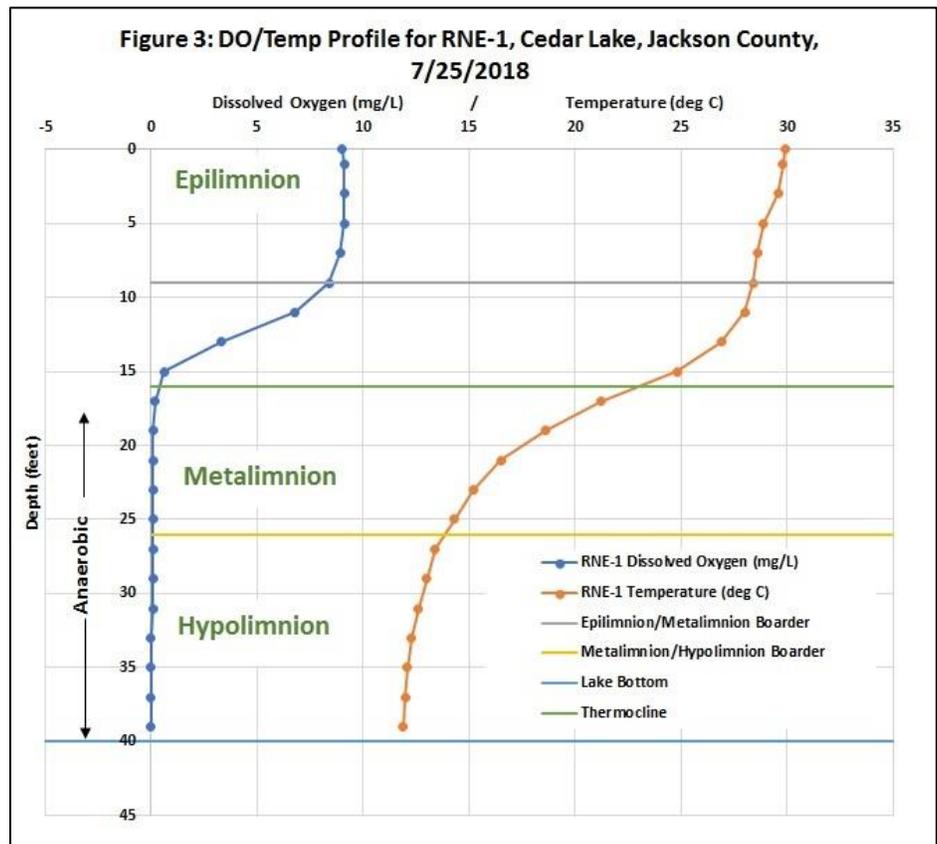
The trophic status was determined for 125 lakes by calculating a TSI for Secchi transparency depth (TSI^{SD}), Total phosphorus (TSI^{TP}), and chlorophyll-a (TSI^{CHL}) where data were available (Table 3). When the TSI values did not agree, the trophic status of a lake was determined by looking at the TSIs in priority order: TSI^{TP}, TSI^{CHL} and TSI^{SD}. For 2018, twenty-three lakes were determined to be hypereutrophic, seventy-three were eutrophic, twenty-two were mesotrophic, and seven were oligotrophic.

Dissolved Oxygen and Temperature Measurements

Dissolved oxygen (DO) and temperature (temp) were measured at twenty-nine lakes. Measurements were taken at the same lake sites monitored for Secchi transparency. All four Tier 3 lakes and forty-three Tier 2 lakes provided data sheets which have been compiled into Appendix C: 2018 VLMP Dissolved Oxygen Profiles. Table 4 shows an example of a typical DO/Temp profile sheet collected by the VLMP volunteers.

| Depth (feet) | DO (mg/l) | Temperature (°C) |
|--------------|-----------|------------------|
| 0 | 9.0 | 29.9 |
| 1 | 9.1 | 29.8 |
| 3 | 9.1 | 29.6 |
| 5 | 9.1 | 28.9 |
| 7 | 8.9 | 28.6 |
| 9 | 8.4 | 28.4 |
| 11 | 6.8 | 28.0 |
| 13 | 3.3 | 26.9 |
| 15 | 0.6 | 24.8 |
| 17 | 0.2 | 21.2 |
| 19 | 0.1 | 18.6 |
| 21 | 0.1 | 16.5 |
| 23 | 0.1 | 15.2 |
| 25 | 0.1 | 14.3 |
| 27 | 0.1 | 13.4 |
| 29 | 0.1 | 13.0 |
| 31 | 0.1 | 12.6 |
| 33 | 0.0 | 12.3 |
| 35 | 0.0 | 12.1 |
| 37 | 0.0 | 12.0 |
| 39 | 0.0 | 11.9 |

The DO/Temp data can easily be visualized by creating a depth profile graph (Figure 3). A depth profile graph depicts the changes in DO and temperature through lake depth. These graphs are used to determine if the lake is thermally stratified and the location of a thermocline if the lake is stratified. Anaerobic conditions can also be observed on these plots. When anaerobic conditions are persistent, water chemistry samples might show an increase in phosphorus and ammonia concentrations near the lake bottom.



Best management practices can be implemented to address this issue. For example, an aerator can be used to break up thermal stratification and oxygenate hypolimnetic waters to alleviate effects of anaerobic conditions.

Summary

The two hundred fifty-eight volunteers collectively pooled 2,686 hours of effort to visit one hundred twenty-nine lakes for a total of nine hundred sixty-three monitoring trips. 2018 volunteers were lakeshore residents, lake owner or managers, sportspersons, environmental group members, public water supply personnel, and interested citizens. Though a large cluster of lakes in the program are in Lake County (50 lakes), the rest of the lakes are scattered throughout the state. Lakes represented this year in the Program include glacial lakes, impoundment lakes (dammed and dug), quarry lakes (coal, sand, gravel and borrow pits) and ponds. No backwater lakes participated in the program this year.

Data from the VLMP continues to show heavy loading of nutrients into Illinois lakes. Median total phosphorus values for the seventy-three lakes sampled ranged from 0.009 mg/L to 0.987 mg/L. Forty-two of these lakes had median TP values over the Illinois water quality standards (WQS) in freshwater lakes greater than 20 acres in size (0.05 mg/L). Of the thirty-one lakes with median TP values under the WQS, nine had at least one exceedance of the standard. Thirty percent of the lakes studied did not exceed the Illinois WQS for total phosphorus in fresh water lakes.

The other nutrient of concern in Illinois lakes is total nitrogen (nitrate + nitrite values plus TKN). Unlike total phosphorus, there is no Illinois WQS for total nitrogen. Total nitrogen values had a median range of 0.330 mg/L to 3.79 mg/L this sampling season. The highest total nitrogen value reached 7.65 mg/L.

Setting Goals with Volunteer Data

There are many options for improving the water quality of a lake – from picking up litter to implementing best management practices (BMPs) in the watershed. BMPs have been developed for construction, cropland, and forestry, as well as other similar land-use activities. Managers of lakes and streams can focus their BMPs to control water runoff, erosion, nutrient loading and contaminant loading. There is a long list of BMPs with a set of priorities assigned at low, medium, or high for agriculture, construction, urban runoff, hydrologic modification, resource extraction, groundwater, and wetlands.

The volunteer data helps to identify and justify the use of BMPs. Are the water quality issues in your lake caused by nutrient loading, high suspended solids, aquatic plant growth, or a combination of the three? Are the plant issues caused by invasive species? If so, maybe there is grant money through a local, state or federal program to eradicate that invasive species. In all cases of grant applications, data to confirm your need is valuable.

Illinois EPA publishes a series of fact sheets called “Lake Notes” that provide information on a wide range of lake and watershed related topics. Aquatic Exotics, Aquatic Plant Management Options, Common Lake Water Quality Parameters, Lake Dredging, Shoreline Buffer Strips, and Where to Go for Lake Information are just a few of the subjects covered by the fact sheets. These fact sheets can be found at the following address:

<https://www2.illinois.gov/epa/topics/water-quality/surface-water/Pages/lake-notes.aspx>

Grants Available to Control Nonpoint Source Pollution in Illinois

319 Grants are available to local units of government and other organizations to protect water quality in Illinois. Projects must address water quality issues relating directly to nonpoint source pollution. Funds can be used for the implementation of watershed management plans, including the development of information and/or education programs, and for the installation of best management practices.

IEPA receives these funds through Section 319(h) of the Clean Water Act and administers the program within Illinois. The maximum federal funding available is 60 percent. The program period is two years unless otherwise approved. This is a reimbursement program.

Applications are accepted June 1st through August 1st. If August 1st is a Saturday or Sunday, the deadline becomes the Friday prior to August 1st before 5 p.m. Electronic submittals are not accepted. Please mail applications to the address provided to the right.

Contact Number: (217)782-3362

Links for 319 Grants

- [Section 319 Application](#)
- [Section 319 Application Instructions](#)

**Illinois Environmental Protection Agency
Bureau of Water
Watershed Management Section
Nonpoint Source Unit
1021 North Grand Avenue East
P.O. Box 19276
Springfield, Illinois 62794-9276**

Glossary of Terms

A full glossary of terms can be found in part A of the report at

<https://www2.illinois.gov/epa/Documents/iepa/water-quality/monitoring/vlmp/2015-annual-report-part-a.pdf>