2017 Annual Report
Part B

Illinois Volunteer Lake Monitoring Program

By

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Lakes Program

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Acknowledgements

First and foremost, thanks to this year's 262 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**
Apple Canyon Jo Daviess Co.	Gary Hannon Kim Rees Bill Ware Erin Winter Fern Tribbey Steve Tribbey John Diehl
Arcadia Williamson Co.	Keith Gardner Bill Nielsen
Barrington Lake Co.	Val Dyokas Tom McGonigle Ann Kinberry D. Faith Dan Brockman Jim Brockman Debora Fein Norm Fein Lewis Yee Siri Blake Tom Blake Horm Firis Joe Salemi Len Zolna Pat Flynn Wayne Davis
Bass Lee Co.	Jerry Corcoran
Beaver Grundy Co.	Barb Arnold Jim Arnold
Big Bear Lake Co.	Gabriel Rodriguez
Bird's Pond Sangamon Co.	Harry Hendrickson Phil Voth
Black Oak Lee Co.	Jerry Corcoran
Bloomington Mclean Co.	Tony Alwood Jill A Mayes
Bluff Lake Co.	John Krutsch Marjorie Krutsch
Butler Lake Co.	Dan Colwell Mary Colwell
Camelot Peoria Co.	Joe Rush Dennis Woods Hammon Woods
Campton Kane Co.	Dave Hansen Kylie McDougall
Campus Jackson Co.	Marjorie Brooks Eduardo Picardo Mart Brooks
Candlewick Boone Co.	Chuck Hart
Carbondale Jackson Co.	Bill Daily Rob Ittner Will Lusk
Catatoga Macoupin Co.	Marie Dawson Walter L Dawson
Catherine Lake Co.	John Massman Berit Massman Isak Massman
Cedar Jackson Co.	John Wallace Eric Stead Lee Pilkington Rob Ittner Will Lusk
Charles DuPage Co.	Darlene Garay
Charleston SCR Coles Co.	Trevor Stewart Alan Alford

Charlotte Kane Co.	Mike Howell Nancy Howell Tom Howell
Chautauqua Jackson Co.	Michael T Madigan Nancy L Spear
Chicago Botanic Garden Cook Co.	Bob Kirschner Peter Nagle
Countryside Lake Co.	Eric Butler Ethan Butler
Cross Lake Co.	Gregory Goldbogen Pam Goldbogen Mikkel Denkenberger
Crystal Champaign Co.	Kara Dudek Caitlin Lill Andy Rousseau Emily Mamer Thomas Delgado
Crystal McHenry Co.	Jeremy Husnik Kelly Burdick Bob Bruzzino
Dawson Mclean Co.	Roger Hagar Allan (Jim) Zoerb Clark Ranney Ken Callahan Terry Fitton Wayne Lockwood
Deboer Woods Will Co.	David Casillas Dennis Dempsey Connie Dempsey
Deep Lake Co.	Ron Riesbeck
Devils Kitchen Williamson Co.	Don Johnson
Druce Lake Co.	Matt DeLacluyse Mary DeLacluyse Cara DeLacluyse
Duck Lake Co.	Carol Bettis Lee Bettis
Dunlap Madison Co.	David Whited
Dunns Lake Co.	Alana Bartolia Gerard Urbanozo Steven Schwen Cameron Crombie
Diamond Lake Co.	Greg Denny
East Loon Lake Co.	Dave Tatak Tom Keefe
Echo Lake Co.	Anne McMorris Hannah McMorris Jeff McMorris
Evergreen Mclean Co.	Tony Alwood Jill A Mayes
Forest Lake Co.	Larry Steker Joe Wachter
Fourth Lake Co.	Donald Wilson Jacob Nast
Fyre Mercer Co.	Ted Kloppenborg
Gages Lake Co.	Matt Brueck
Galena Jo Daviess Co.	Steve Birkbeck Madelynn Wilharm
Gamlin St. Clair Co.	Scott Framsted
Golfview DuPage Co.	Donald Schultz Linda Salerno Marti Schultz Peter Salerno
Goose McHenry Co.	Ross K Nelson Tamara Mueller Mike Nelson John Sullivan
Grass Lake Co.	Alana Bartolai Gerard Urbanozo Steven Schwen Cameron Crombie
Hastings Lake Co.	Donald Wilson

Herrin New Williamson Co.	David A. Johnson Stephen K Phillips
Highland Lake Co.	Mike Kalstrup John Kalstrup
Honey Lake Co.	Wyatt Byrd Conrad Pannkuk Brian Thomson Austin Messer Matt Hellbush
Independence Grove Lake Co.	April Vaos Aden Hoerter
Jacksonville Morgan Co.	David Byus Jordan Byus
Jaycee Jefferson Co.	Anderson Barker Chris Barker Jordan Allen
Killarney McHenry Co.	Neil O'Brien Dennis Oleksy Jeff Joy
Kinkaid Jackson Co.	Scott Wilmouth
LaFox Pond Kane Co.	J. Brian Towey
Lake of Egypt Williamson Co.	JoAnn Malacarne Leroy Pfaltzgraff Lori Pfaltzgraff Sandra Anspaugh Tom Anspaugh
Lancelot Peoria Co.	Joe Rush Dennis Woods Hammon Woods
Linden Lake Co.	Chelsea Delaney Mitchell Schieble Alex Jones Kyle Morrison
Little Silver Lake Co.	James Sheehan

Loch Lomond Lake Co.	Tony Baade Rob Scharf John Adams John Hines Kerry Anderson Terri Anderson
Long Lake Co.	Robert Ringa III Craig Kimchik Jim Bland Joe Popeck Ron Gurak
Longmeadow Cook Co.	Barb Schuetz
Louise Lake Co.	Geoff Ommen Beth Adler Henri Kokke James Adler
Mattoon Shelby Co.	David Basham Heather McFarland
Mauvaise Terre Morgan Co.	David Byus Jordan Byus Jordan Allen
Miller Jefferson Co.	Joan Beckman Eddie Greer Thomas Zielonko Jim Rosycki
Miltmore Lake Co.	Don Jackson
Minear Lake Co.	Barb Barry Tom Barry Ned Herchenbach David Johnson
Murphysboro Jackson Co.	Scott Wilmouth
Napa Suwe Lake Co.	Joe Sallak
New Thompson Jackson Co.	Pat Bischoff
Nippersink Lake Co.	Alana Bartolia Gerard Urbanozo Steven Schwen Cameron Crombie

Otter Macoupin Co.	Stan Crawford Brian Durbin Otis Foster Joe Hogan Tim Walter Rudy Rodriguez
Paradise Coles Co.	David Basham Heather McFarland
Paris Twin East Edgar Co.	Greg Whiteman Chris Chapman
Paris Twin West Edgar Co.	Chris Chapman Greg Whiteman
Petersburg Menard Co.	Tom Lawton
Pine Lee Co.	Jerry Corcoran
Potomac Lake Co.	Chelsea Delaney Mitchell Schieble
Richardson Wildlife Lee Co.	J. Brian Towey
Sangchris Christian Co.	Jacob Sherell Beth Whetsell Greggory Miller Greg Ratliff Jack Waggoner Justin Mably Terry Doyle Zane Nyhus
Sara Effingham Co.	Janet Kennedy
Silver McHenry Co.	Bruce Wallace Sandy Wallace Rob Wallace
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 Michelle B Nicol
Stephen Will Co.	Ken Rathbun Will Rathbun
Summerset Winnebago Co.	Walter Raduns Dan Van Kirk
St. Mary's Lake Co.	Michael Sweeney
Sunset Lee Co.	Jerry Corcoran
Sunset Macoupin Co.	John Kemp Roger Winterland
Swan Cook Co.	John Kanzia Bethany Maxwell Grace Wischmeyer
Third Lake Co.	Patty Morthorst Tom Morthorst
Thompson Fulton Co.	Pat Bischoff
Three Oaks North McHenry Co.	Paul McPherson
Three Oaks South McHenry Co.	Paul McPherson
Thunderbird Putnam Co.	Mark Serio Bob Hammond
Timber Lake Co.	Dawn Cooper Tony Cooper
Tower Lake Co.	Tom Kubala Mickey Kubala Eric Torstenson Will Knight Zach Rowley
Twin Oaks Champaign Co.	Jim Roberts
Valley Lake Co.	Marian Kowalski John Kowalski
Vermilion Vermilion Co.	Bert C Nicholson Keith Bates Wes Bieritz

Virginia Cook Co.	Paul Herzog Janet Herzog
Waterford Lake Co.	April Nielsen Alex Jones Kyle Morrison
Weslake St. Clair Co.	Charles Meirink
West Loon Lake Co.	Dave Tatak Jim Bland Tom Keefe
Wonder McHenry Co.	Ken Shaleen Tony Musel Dennis Gallo Cindy Giba Jack Giba Geralyn Mohawk
Woodhaven Lee Co.	Jerry Corcoran
Woods Creek McHenry Co.	Zach Hansen Adam Brink Eric Baillargeon Tom Dunn Steven Ferreira Bonnie Libka Robert Libka Chloe Basch Marvin Basch Charles Schumann Nathan Spavonne
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, Greggory 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 Bartolia. Maps were created by Greggory Miller.

Acronyms and Abbreviations

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

Annual Report Part A

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. This document is posted on the VLMP's web pages at http://www.epa.illinois.gov/topics/water-quality/monitoring/vlmp/data/index.

The VLMP Annual Report has been broken up into two volumes as Part A seldom needs to change and allows us to reduce the size of Part B. Part B is comprised of the acknowledgement to volunteers, results and summary portion of the report and allows for much easier manipulation in various media, such as email. These portions change every year, so Part B must be developed starting from a basic outline.

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Part A

- Acknowledgements
- Acronyms and Abbreviations
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- References
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Part B

- Acknowledgements
- Acronyms and Abbreviations
- Annual Report Part A
- **Results and Discussion**
- **Summary**
- Glossary

Results and Discussion

Basic Monitoring Program Results

Lakes

One hundred seventeen lakes were monitored at least once in 2017. These lakes are distributed across the state with a large cluster occurring in Lake County. The type of lakes typically in the program include: backwater, glacial, impoundments (dammed and dug), quarries (coal, sand, gravel and borrow pits) and ponds. Figures 1 and 2 show the distribution of the volunteer lakes, as well as differentiating them by lake type.

Volunteers

Two hundred fifty-eight volunteers participated in lake monitoring during the 2017 season. These monitors donated over 2,642 volunteer-hours of their time for 888 monitoring events. Volunteers are primarily lakeshore residents, lake owner/managers, sportspersons, environmental group members, public water supply personnel, or interested citizens.

Data Returns

This year 45 lakes were monitored ten or more times throughout the season (Table 1). For the rest, 25 lakes had seven to nine data returns, 22 had four to six data returns, and 25 had three or less data returns.

Table 1: VLMP lakes monitored 10 or more times in 2017 (45 lakes).

Lake	County	Lake	County	Lake	County	Lake	County
Barrington	Lake	Deep	Lake	Lake of Egypt	Williamson	Silver	McHenry
Bass	Lee	Devils Kitchen	Williamson	Little Silver	Lake	Spring	McDonough
Black Oak	Lee	Evergreen	Mclean	Loch Lomond	Lake	Spring Arbor	Jackson
Bloomington	Mclean	Forest	Lake	Long	Lake	Sunset	Lee
Carbondale	Jackson	Galena	Jo Daviess	Miller	Jefferson	Swan	Cook
Catatoga	Macoupin	Hastings	Lake	Miltmore	Lake	Third	Lake
Cedar	Jackson	Honey	Lake	Murphysboro	Jackson	Twin Oaks	Champaign
Charles	DuPage	Jacksonville	Morgan	Otter	Macoupin	Valley	Lake
Chautauqua	Jackson	Killarney	McHenry	Pine	Lee	Vermilion	Vermilion
Countryside	Lake	Kinkaid	Jackson	Richardson Wildlife	Lee	Virginia	Cook
Crystal	Champaign	La Fox Pond	Kane	Sara	Effingham	Woodhaven	Lee
Dawson	Mclean						

Figure 1

2017 Volunteer Lakes

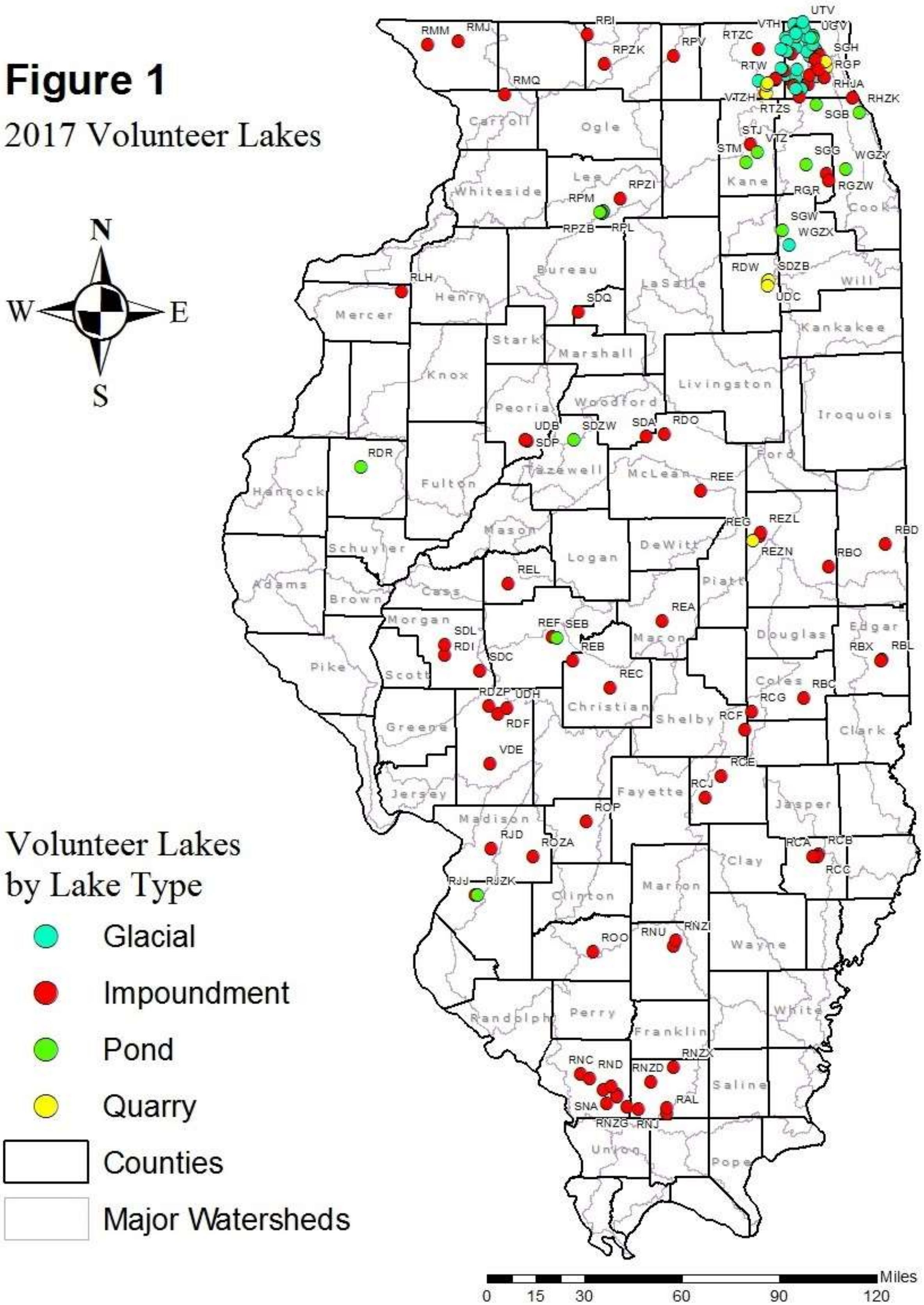
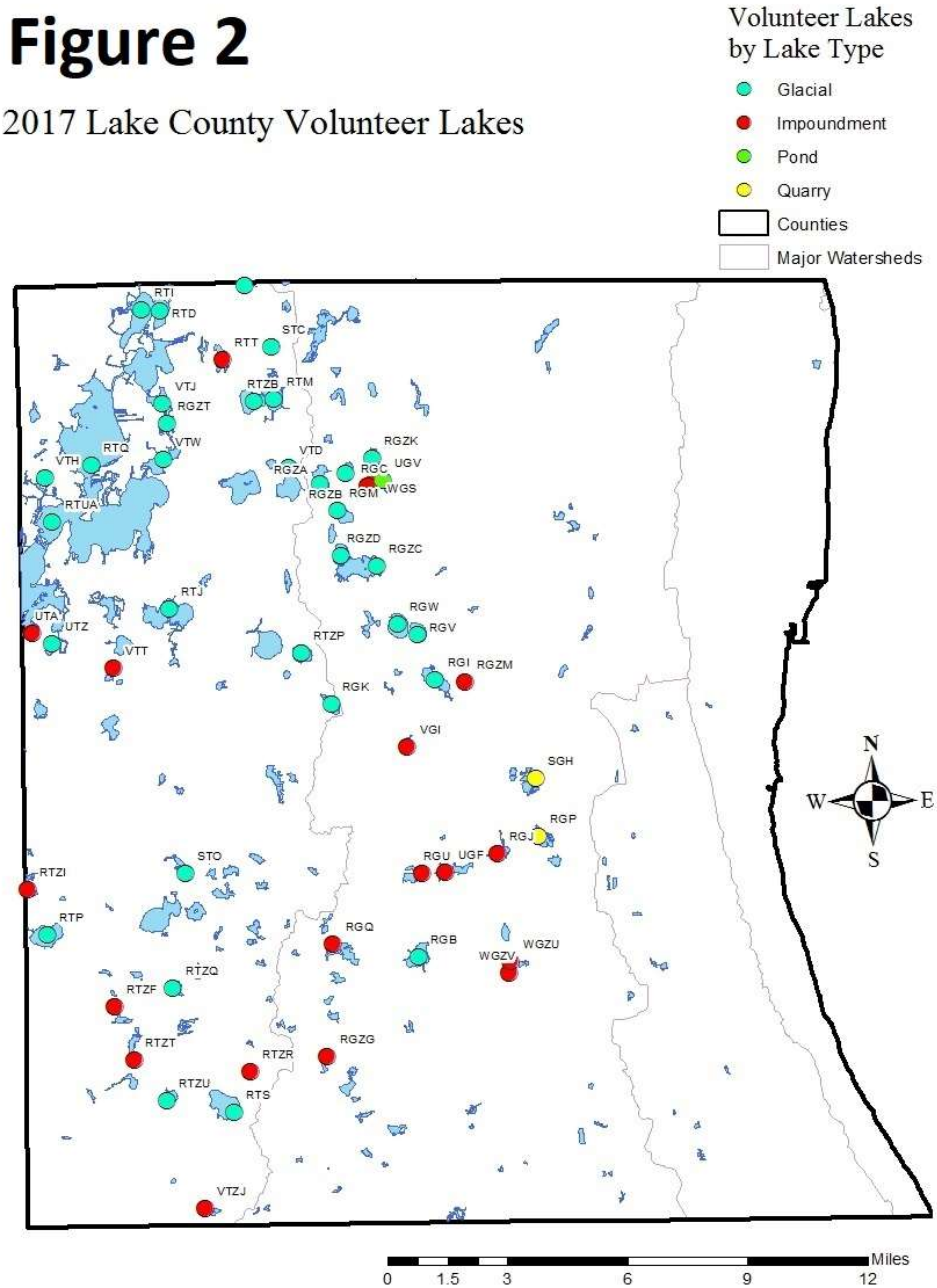


Figure 2

2017 Lake County Volunteer Lakes



Transparency Ranking

One hundred thirteen lakes are ranked highest to lowest based on median summer Secchi depth transparency, in inches (Table 3). The list is ranked in ascending order, from the least productive (least amount of nutrients) to the most productive (most amount of nutrients) lakes. Secchi transparency data were not submitted for six of the lakes that were monitored and thus, these lakes are not ranked and are not included in Table 3. For two additional lakes, water samples were analyzed, but since Secchi transparency data were not provided, these lakes could not be ranked, but they are included in the table. Table 3 will be updated when the Secchi transparency data are provided.

Transparency Variability

Median transparency data for all the years a lake has been monitored are available online at http://dataservices.epa.illinois.gov/waBowSurfaceWater. The collection of annual median Secchi transparencies helps establish a "trend" for that lake. A trend is a way to describe the pattern of data over time. Increasing, decreasing, stable, and fluctuating are all terms used to describe the Secchi transparency trend for a lake.

Trends based on lake median Secchi disk transparency should be interpreted with caution. A lake's median 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. In many of Illinois' lakes, the turbidity of the water limits macrophyte growth. The amount of macrophyte growth in a lake has a large impact on both the life cycles of aquatic animals and public use. 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: 2017 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 59 lakes collected water quality samples. Four lakes were sampled under the Tier 3 program and water samples were collected for analysis at multiple lake stations (including a sample near the lake bottom). Fifty-five lakes were sampled under the Tier 2 program and water samples were collected at a single lake site, usually the deepest site (surface sample only). The water quality data are provided in Appendix A: 2017 VLMP Lab Data. Chlorophyll samples were collected at one Tier 2 lake and those data are presented with the Tier 3 chlorophyll data.

Total Phosphorus (TP): The median values ranged from 0.007 mg/L to 0.8695 mg/L. The single highest value overall was found at Long Lake in Lake County, 1.61 mg/L total phosphorus. Thirty-two lakes had median values of TP over the 0.05 mg/L water quality standard. Nine of twenty-seven lakes with median TP under 0.05 mg/L standard had one or more sampling events with levels over the WQS standard. There were 18 lakes where **all** TP values were below the water quality standard (See Table 2). TSI^{TP} values were also calculated (See Table 3).

Table 2: 2017 lakes with all total phosphorus results below the WQS (0.05 mg/L).

Lake/County	Lake/County	Lake/County	Lake/County
Butler/Lake	Carroll/Carroll	Cedar/Jackson	Charlotte/Kane
Deep/Lake	Devils Kitchen/Williamson	Druce/Lake	Galena/Jo Daviess
Hastings/Lake	Highland/Lake	Killarney/McHenry	Lake of Egypt/Williamson
Petersburg/Menard	Sara/Effingham	Silver/McHenry	Spring Arbor/Jackson
Third/Lake	Virginia/Cook		

Chlorophyll-a: Chlorophyll-a values provide an estimate for the amount of algae present in a lake. Samples for chlorophyll-a were collected at five lakes (four Tier 3 and one Tier 2). Median chlorophyll-a concentrations ranged from 16.4 μg/L at Kinkaid Lake in Jackson County to 72.2 μg/L at Lake Charles in DuPage County. The median phosphorus levels for these two lakes were 0.0295 mg/L and 0.1170 mg/L, respectively. Lake TSI^{CHL} values were also calculated (See 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). Forty-two of the fifty-nine lakes showed no significant amounts of NVSS, less than 3 mg/L; thirteen were 10 mg/L or less; and the last three were 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.

The Total Nitrogen to Total Phosphorus (TN/TP) ratio is a tool commonly used to indicate which of the two nutrients (nitrogen or phosphorus) are limiting algal growth. A TN:TP ratio <5:1 indicates that nitrogen is the limiting nutrient and a ratio >10:1 indicates that phosphorus is the limiting nutrient. When the TN:TP ratios were calculated for the 2017 lakes, 11 lakes were determined to be nitrogen limited, 24 are considered transitional (both may be limiting growth), and 24 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 27 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 1.24 mg/L at Devils Kitchen Lake in Williamson County to 374 mg/L at Druce Lake in Lake County. Chloride sampling was generally limited to the general Chicago metropolitan area, with a few exceptions.

Alkalinity: This year all but one lake analyzed for alkalinity appear to be well buffered. Alkalinity values ranged from 19 mg/L at Devils Kitchen in Williamson County to 278 mg/L at Goose Lake in McHenry County. Values greater than 25 mg/L are considered "well buffered" (not sensitive to acid rain). Devils Kitchen values fall within the category of low sensitivity to acid rain.

Using the USGS Hardness Scale; water from 13 lakes can be considered "Very Hard," water from 29 lakes are considered "Hard," water from 9 lakes are considered "Moderately Hard," and water from 6 lakes are considered "Soft." All six lakes with soft water were found in Southern Illinois: Devils Kitchen and Lake of Egypt of Williamson County; Cedar, Spring Arbor, and Kinkaid of Jackson County; and Miller of 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.

Trophic State

The trophic status was determined for 115 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 TSIs 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 2017, twenty-three lakes were determined to be hypereutrophic, seventy-five were eutrophic, sixteen were mesotrophic, and one was oligotrophic.

For five lakes, all three indices were used to determine trophic status (four Tier 3 lakes and one Tier 2 lake). For fifty-four lakes, two TSIs were used to determine the trophic state. The last fifty-six trophic states were determined by the TSI^{SD} alone.

Table 3: 2017 Transparency Rank and Trophic State Indices

Tier	Lake Code	Waterbody	Median SD Rank	Median SD (In)	Median TSI^{TP}	Median TSI^{CHL}	Median TSI^{SD}	Trophic State
2	VTD	Deep	1	254.5	41.1		33.1	Mesotrophic

Table 3: 2017 Transparency Rank and Trophic State Indices								
Tier	Lake Code	Waterbody	Median SD Rank	Median SD (In)	Median TSI^{TP}	Median TSI^{CHL}	Median TSI^{SD}	Trophic State
2	SGB	Virginia	2	247.0	32.2		33.6	Oligotrophic
1	RTZB	West Loon	3	143.5			41.4	Mesotrophic
2	RTW	Silver	4	132.0	41.1		42.6	Mesotrophic
1	VTZH	Crystal	5	120.0			44.0	Mesotrophic
2	RTZV	Killarney	6	114.0	45.8		44.7	Mesotrophic
1	RTS	Zurich	7	109.5			45.3	Mesotrophic
1	RDW	Beaver	8	93.0			47.6	Mesotrophic
1	RLH	Fyre	9	92.0			47.8	Mesotrophic
2	VGI	Leopold	10	88.5	59.7		48.3	Eutrophic
2	VDE	Catatoga	11	86.0	63.7		48.7	Eutrophic
1	RGZD	Miltmore	12	85.5			48.8	Mesotrophic
1	STC	Little Silver	13	84.0			49.1	Mesotrophic
2	RMJ	Apple Canyon	14	83.0	55.1		49.3	Eutrophic
2	VTZ	Charlotte	15	82.0	53.2		49.4	Eutrophic
2	RTZP	Highland	16	81.0	49.4		49.6	Mesotrophic
1	RGI	Gages	17	79.0			50.0	Eutrophic
2	RGV	Druce	18	77.0	41.7		50.3	Mesotrophic
1	UTV	Cross	19	72.0			51.3	Eutrophic
1	RNU	Jaycee	20	71.0			51.5	Eutrophic
2	REL	Petersburg	21	70.0	50.0		51.7	Eutrophic
1	RNZO	New Thompson	22	67.0			52.3	Eutrophic
2	RPJ	Bass	23	64.0	60.3		53.0	Eutrophic
1	RTM	East Loon	24	63.0			53.2	Eutrophic
2	RPM	Woodhaven	25	62.0	58.7		53.5	Eutrophic
2	RGW	Third	26	61.0	51.7		53.7	Eutrophic
1	RTZT	Barrington	27	60.0			53.9	Eutrophic
2	RNJ	Devils Kitchen	27	60.0	43.2		53.9	Mesotrophic
2	SDP	Lancelot	29	58.0	71.9		54.4	Hypereutrophic
2	RNE	Cedar	30	57.0	47.3		54.7	Mesotrophic
3	RNC	Kinkaid	30	57.0	52.9	58.0	54.7	Eutrophic
2	RGJ	Butler	32	56.5	55.8		54.8	Eutrophic
1	UGF	St. Mary's	33	55.0			55.2	Eutrophic
1	WGS	Waterford	33	55.0			55.2	Eutrophic
2	RAL	Lake of Egypt	35	54.0	54.1		55.4	Eutrophic
1	RPZB	Pine	36	51.5			56.1	Eutrophic
1	STM	La Fox Pond	37	51.0			56.3	Eutrophic
3	WGZY	Swan	38	50.5	101.6	72.0	56.4	Eutrophic
2	RMM	Galena	39	48.0	58.1		57.1	Eutrophic

Table 3: 2017 Transparency Rank and Trophic State Indices								
Tier	**Lake Code**	**Waterbody**	**Median SD Rank**	**Median SD (In)**	**Median TSI^{TP}**	**Median TSI^{CHL}**	**Median TSI^{SD}**	**Trophic State**
2	RGZB	Hastings	39	48.0	55.2		57.1	Eutrophic
2	RTZU	Honey	41	47.0	65.0		57.4	Eutrophic
2	UGV	Spring Ledge	41	47.0	66.3		57.4	Eutrophic
2	RTZF	Tower	43	46.0	66.4		57.8	Eutrophic
1	RPI	Summerset	44	44.0			58.4	Eutrophic
2	RNZG	Spring Arbor	45	42.5	48.7		58.9	Mesotrophic
1	STO	Napa Suwe	46	42.0			59.1	Eutrophic
1	RGC	Linden	47	40.0			59.8	Eutrophic
1	RPK	Black Oak	48	39.0			60.1	Eutrophic
1	SDQ	Thunderbird	48	39.0			60.1	Eutrophic
2	RTZR	Echo	50	38.5	64.6		60.3	Eutrophic
1	RTD	Catherine	51	38.0			60.5	Eutrophic
2	RTZS	Goose	51	38.0	73.8		60.5	Hypereutrophic
2	RGZG	Forest	53	37.0	57.7		60.9	Eutrophic
1	WGZU	Big Bear	54	36.0			61.3	Eutrophic
2	RPV	Candlewick	54	36.0	60.0		61.3	Eutrophic
2	REE	Dawson	54	36.0	54.8		61.3	Eutrophic
1	RGZC	Fourth	54	36.0			61.3	Eutrophic
2	RCE	Sara	54	36.0	55.0		61.3	Eutrophic
1	RPL	Sunset	54	36.0			61.3	Eutrophic
2	RTZZ	Woods Creek	54	36.0	61.7		61.3	Eutrophic
1	RNZC	Herrin New	61	35.0			61.7	Eutrophic
2	RHJA	Chicago Botanic Garden	62	34.5	73.5	65.2	61.9	Eutrophic
2	RAZP	Arcadia	63	34.0	61.8		62.1	Eutrophic
3	RTJ	Long	63	34.0	68.2	66.7	62.1	Eutrophic
1	RGQ	Countryside	65	33.0			62.5	Eutrophic
2	RBU	Crystal	66	32.0	70.2		63.0	Hypereutrophic
3	RGR	Charles	67	31.0	72.8	72.6	63.4	Hypereutrophic
1	SGW	Stephen	68	30.5			63.7	Eutrophic
2	UDB	Camelot	69	30.0	67.3		63.9	Eutrophic
2	RGU	Loch Lomond	69	30.0	71.9		63.9	Eutrophic
1	VTJ	Bluff	71	28.0			64.9	Eutrophic
1	RNZH	Campus	71	28.0			64.9	Eutrophic
1	RJZK	Gamlin	71	28.0			64.9	Eutrophic
1	RDI	Jacksonville	71	28.0			64.9	Eutrophic
1	RGP	Minear	71	28.0			64.9	Eutrophic
2	RDF	Otter	71	28.0	55.9		64.9	Eutrophic
1	RGZK	Potomac	71	28.0			64.9	Eutrophic

Table 3: 2017 Transparency Rank and Trophic State Indices								
Tier	Lake Code	Waterbody	Median SD Rank	Median SD (In)	Median TSI^{TP}	Median TSI^{CHL}	Median TSI^{SD}	Trophic State
1	REB	Sangchris	71	28.0			64.9	Eutrophic
1	UDH	Sunset	71	28.0			64.9	Eutrophic
1	RGZA	Crooked	80	26.5			65.7	Eutrophic
1	RND	Murphysboro	80	26.5			65.7	Eutrophic
1	RJD	Dunlap	82	26.0			66.0	Eutrophic
1	SDA	Evergreen	82	26.0			66.0	Eutrophic
2	RJJ	Weslake	82	26.0	80.4		66.0	Hypereutrophic
2	SEB	Bird's Pond	85	24.0	68.9		67.1	Eutrophic
1	RDO	Bloomington	85	24.0			67.1	Eutrophic
1	RTZG	Duck	85	24.0			67.1	Eutrophic
1	RHZK	Longmeadow	85	24.0			67.1	Eutrophic
2	RGZM	Valley	89	23.0	74.9		67.7	Hypereutrophic
1	SNA	Chautauqua	90	22.5			68.1	Eutrophic
1	VGZF	DeBoer Woods	91	21.5			68.7	Eutrophic
2	RNZI	Miller	92	20.5	67.5		69.4	Eutrophic
1	RPZI	Richardson Wildlife	93	20.0			69.8	Eutrophic
2	REZL	Twin Oaks	94	19.5	69.9		70.1	Eutrophic
2	RGZW	Golfview	95	19.0	80.1		70.5	Hypereutrophic
1	STJ	Campton	96	18.5			70.9	Hypereutrophic
2	RTZC	Wonder	97	18.0	70.4		71.3	Hypereutrophic
2	RBD	Vermilion	98	17.0	66.2		72.1	Eutrophic
1	VTH	Dunns	99	14.5			74.4	Hypereutrophic
2	RGB	Diamond	100	14.0	68.2		74.9	Eutrophic
2	RCF	Mattoon	100	14.0	71.8		74.9	Hypereutrophic
1	SDL	Mauvaise Terre	100	14.0			74.9	Hypereutrophic
1	RBL	Paris Twin East	100	14.0			74.9	Hypereutrophic
1	RBX	Paris Twin West	100	14.0			74.9	Hypereutrophic
1	RTUA	Nippersink	105	13.0			76.0	Hypereutrophic
2	REF	Springfield	105	13.0	89.8		76.0	Hypereutrophic
2	RDR	Spring	107	12.5	75.9		76.5	Hypereutrophic
2	RNI	Carbondale	108	12.0	78.7		77.1	Hypereutrophic
1	VTZJ	Louise	109	11.5			77.7	Hypereutrophic
2	RBC	Charleston SCR	110	11.0	75.0		78.4	Hypereutrophic
1	RTQ	Grass	111	10.5			79.0	Hypereutrophic
1	SGH	Independence Grove	112	10.0			79.4	Hypereutrophic
2	RCG	Paradise	112	10.0	81.3		79.7	Hypereutrophic
2	RMQ	Carroll			46.6			Mesotrophic
2	SDZW	Ossami			66.8			Eutrophic

Dissolved Oxygen and Temperature Measurements

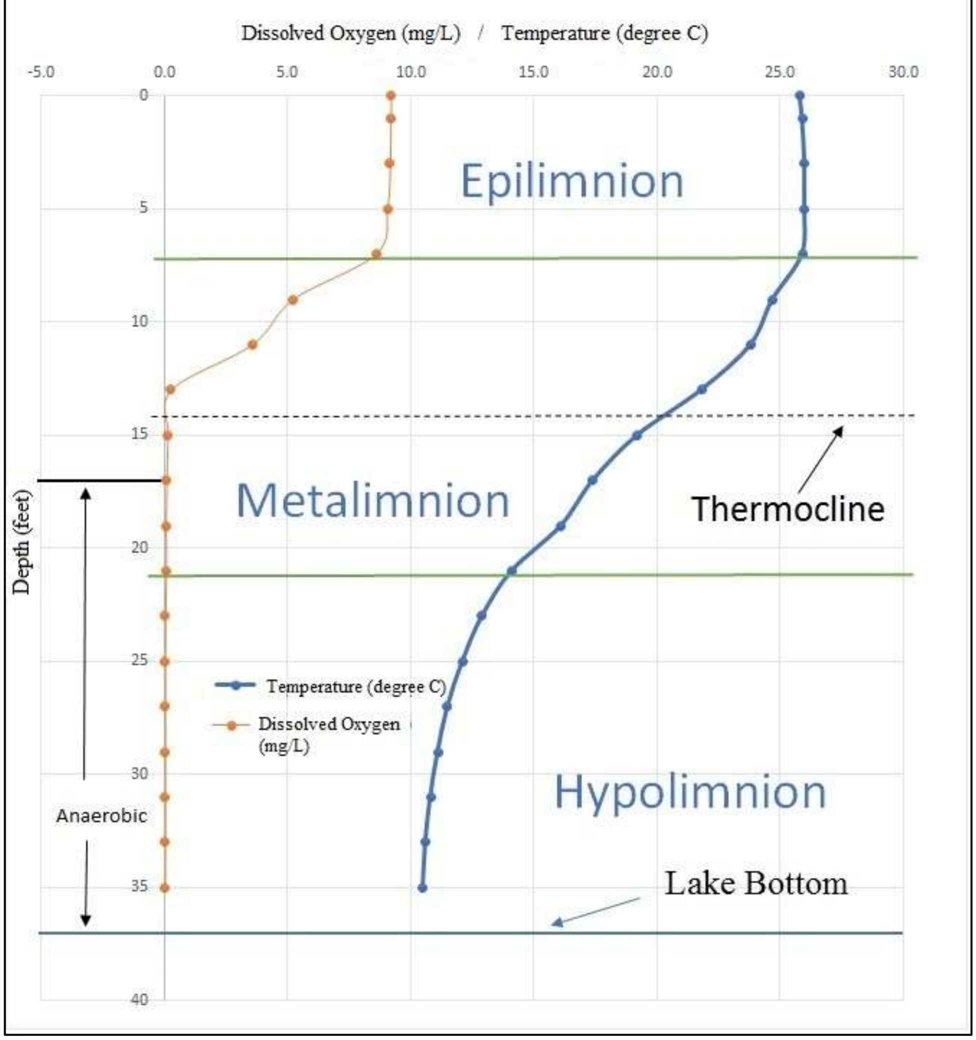
Dissolved oxygen (DO) and temperature were measured at twenty-nine lakes at the same lake sites monitored for Secchi transparency. All four Tier 3 lakes and twenty-five Tier 2 lakes provided data sheets which have been compiled into Appendix C: 2017 VLMP Dissolved Oxygen Data. Table 4 below shows an example of a typical DO/Temp data sheet collected by the VLMP volunteers.

The collected 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 phosphorous 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.

Table 4: DO/Temperature Data, RMM-1, 07/13/2017, 09:35

Depth (feet)	DO (mg/l)	Temperature (°C)
0	9.2	25.8
1	9.2	25.9
3	9.2	26.0
5	9.1	26.0
7	8.6	25.9
9	5.2	24.7
11	3.6	23.8
13	0.3	21.8
15	0.1	19.2
17	0.1	17.4
19	0.1	16.1
21	0.1	14.1
23	0.0	12.9
25	0.0	12.1
27	0.0	11.5
29	0.0	11.1
31	0.0	10.8
33	0.0	10.6
35	0.0	10.5

Figure 3: DO/Temperature Profile, Galena/Jo Daviess, RMM-1, 7/13/2017



Summary

The two hundred sixty-two volunteers collectively pooled 2,601 hours of effort to visit one hundred thirteen lakes for a total of eight hundred sixty-seven monitoring trips. 2017 volunteer were lake shore residents, lake owner or managers, sports persons, environmental group members, public water supply personnel, or interested citizens. Though a large cluster of lakes in the program are in the apply-named Lake County (43 lakes), the rest of the lakes are scattered throughout the state and 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 fifty-nine lakes sampled ranged from 0.007 mg/L to 0.8695 mg/L. Two of these lakes had median TP values over the Illinois Water Quality Standards (WQS) in freshwater lakes (0.05 mg/L). Of the twenty-seven lakes with median TP values under the standard, nine had at least one exceedance of the standard. Thirty percent of the lakes studied did not exceed the Illinois WQS for total phosphorus.

The other nutrient of concern is total nitrogen (adding nitrate + nitrite values to TKN gives the total nitrogen). Unlike total phosphorus, there is no Illinois WQS for total nitrogen. Total nitrogen values had a median range of 0.390 mg/L to 6.53 mg/L this sampling season. The highest total nitrogen reached 9.92 mg/L at Vermilion Lake in Vermilion County.

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 Bugger Strips, and Where to Go for Lake Information are just a few of the subjects covered by the fact sheets. They can be found at the following address:

http://www.epa.illinois.gov/topics/water-quality/surface-water/lake-notes/index

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

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

Contact Number: (217)782-3362

Links for 319 Grants

- Section 319 Request for Proposals
- Section 319 Application
- Section 319 Application Instructions
- Section 319 Certifications and Grant Conditions

Glossary of Terms

Algae: a group of photosynthetic eukaryotes that are single celled, colonial, or filamentous aquatic plants, often microscopic.

Algal bloom: A condition which occurs when excessive nutrient levels and other physical and chemical conditions facilitate rapid growth of algae. Algal blooms may cause changes in water color. The decay of the algal bloom may reduce dissolved oxygen levels in the water.

Alkalinity: A measure of the capacity of water to neutralize acids. It is a measure of carbonates, bicarbonates, and hydroxide present in water. Low alkalinity is the main indicator of susceptibility to acid rain. Increasing alkalinity is often related to increased algae productivity. (Expressed as milligrams per liter (mg/L) of calcium carbonate ($CaCO_3$), or as micro equivalents per liter (µeq/l). 20 µeq/l = 1 mg/L of $CaCO_3$.)

Ammonia: A form of nitrogen found in organic materials and many fertilizers. It is the first form of nitrogen released when organic matter decays. It can be used by most aquatic plants and is therefore an important nutrient. It converts rapidly to nitrate (NO_3^-) if oxygen is present. The conversion rate is related to water temperature. Ammonia is toxic to fish at relatively low concentrations in pH-neutral or alkaline water. Under acid conditions, non-toxic ammonium ions (NH_4^+) form, but at high pH values the toxic ammonium hydroxide (NH_4OH) occurs. The water quality standard for indigenous aquatic life is 0.1 mg/L of unionized ammonia. At a pH of 7 and a temperature of 68^o Fahrenheit (20^o Celsius), the ratio of ammonium ions to ammonium hydroxide is 250:1; at pH 8, the ratio is 26:1.

Anaerobic: Any process that can occur without molecular oxygen; also applicable to organisms that can survive without free oxygen.

Aquatic Invasive Species (AIS): AIS is a species that is non-native to the ecosystem under consideration and whose introduction causes or is likely to cause economic or environmental harm or harm to human health.

Best management practices (BMPs): Management practices (such as nutrient management) or structural practices (such as terraces) designed to reduce the quantities of pollutants — such as sediment, nitrogen, phosphorus, and animal wastes — that are washed by rain and snow melt from lands into nearby receiving waters, such as lakes, creeks, streams, rivers, estuaries, and ground water.

Biomass: The total quantity of plants and animals in a lake. Measured as organisms or dry matter per cubic meter, biomass indicates the degree of a lake system's eutrophication or productivity.

Blue-green algae: Algae which are often associated with problem blooms in lakes. Some produce chemicals toxic to other organisms, including humans. They often form floating scum as they die. Many can fix nitrogen (N_2) from the air to provide their own nutrient.

Chlorophyll: Green pigments essential to photosynthesis.

Chlorophyll-a: A green photosynthetic pigment found in the cells of all algae and other plants. The chlorophyll-*a* level in lake water is used to estimate the concentration of planktonic algae in the lake.

Chlorophyll-*b*: A type of chlorophyll found in green algae and euglenoids. Both are good food for zooplankton which is good fish food.

Chlorophyll-*c*: A type of chlorophyll found in diatoms and golden-brown algae. Both are good food for zooplankton which is good fish food.

Conductivity: The ability of water or other substance to carry an electric current.

Color: Measured in color units that relate to a standard. A yellow-brown natural color is associated with lakes or rivers receiving wetland drainage. Color also affects light penetration and therefore the depth at which plants can grow.

Cultural Eutrophication: The enrichment of lakes with nutrients (especially phosphorus) are from human activity, resulting in an acceleration of the natural ageing process of the lake.

Detritus: Fragments of plant material.

Diatoms: Any number of microscopic algae whose cell walls consist of two box-like parts or valves and contain silica.

Dinoflagellates: Unicellular biflagellate algae with thick cellulose plates.

Dissolved Oxygen: Dissolved oxygen is the amount of oxygen dissolved in the water. The DO concentration in water is affected by the water temperature, water quality, and other factors.

Epilimnion: the upper (usually warmer) circulated zone of water in a temperature stratified lake.

Erosion: Wearing of rock or soil by the gradual detachment of soil or rock fragments by water, wind, ice, and other mechanical, chemical, or biological forces.

Euphotic: the zone of vertical light penetration in a lake.

Eutrophic: water which are rich in plant nutrients and capable of supporting high amounts of plant and animal growth (Secchi transparency less than 6.6 feet and TSI 50 to 70).

Eutrophication: the lake aging process via nutrient enrichment and sedimentation; both a natural and human induced process.

Hypereutrophic: a lake with extreme level of nutrients and nuisance plant growth, often are from human activities (a TSI greater than 70).

Hypolimnion: the lower (usually cooler) non-circulated zone of water in a temperature stratified lake.

Invasive Species: An alien species whose introduction does, or is likely to, cause economic or environmental harm to human health.

Lake: A man-made impoundment or natural body of fresh water of considerable size, whose open-water and deep-bottom zones (no light penetration to bottom) are large compared to the shallow-water (shoreline) zone, which has light penetration to its bottom.

Limnology: The scientific study of the life and phenomena of lakes, ponds and streams.

Macrophyte: water plants that are visible to the unaided eye.

Mesotrophic: waters intermediate in eutrophy between oligotrophic and eutrophic (Secchi transparency 6.6 to 12.1 feet and TSI 40 to 50).

Native Species: A species naturally occurring of originating in a geographical region or in a specific ecosystem.

Nonpoint source (NPS) pollution: Unlike pollution from industrial and sewage treatment plants, NPS pollution comes from many diffuse sources. NPS pollution is caused by rainfall or snowmelt moving over and through the ground. As the runoff moves, it picks up and carries away natural and human-made pollutants, finally depositing them into lakes, rivers, wetlands and even our underground sources of drinking water. It has been determined that over 60 percent of the (national) documented water pollution problem can be traced to nonpoint sources.

Nutrients: Chemicals that are needed by plants and animals for growth (e.g., nitrogen, phosphorus). In water resources, if other physical and chemical conditions are optimal, excessive amounts of nutrients can lead to degradation of water quality by promoting excessive growth, accumulation, and subsequent decay of plants, especially algae. Some nutrients can be toxic to animals at high concentrations.

Oligotrophic: water with low concentrations of plant nutrients and hence relatively low amounts of plant and animal growth (Secchi transparency greater than 12.1 feet and TSI less than 40).

Online Lakes Database: An online interface for volunteer lake monitors to input their data into the IEPA Lake's Data Management System. It also provides a means for all citizens to view current and historical water quality information on monitored lakes. Database currently contains only those lakes sampled since 1999. Prior to 1999, all data may be accessed through USEPA's **STORET**.

pH: A measure of the acidic or basic (alkaline) nature of water, relating to the number of hydrogen ions. A pH of 7 is neutral. Acid waters are below 7; alkaline waters are above 7.

Pheophytin: The dead chlorophyll of algal cells. Can indicate when an algal bloom dies off.

Phosphorus: One of the major nutrients needed for plant growth. Phosphorus is the critical nutrient for algae growth in lake and ponds.

Photosynthesis: the process by which green plants use sunlight, water, and carbon dioxide to produce oxygen.

Plankton: Small organisms that float passively (or swim weakly) in open water. The two groups of plankton are: phytoplankton, also called algae; and planktonic animals, also called zooplankton.

Representative Site: is the deepest area of the lake and is called Site 1.

Secchi Disk Transparency: the depth in the water column that an eight inch, black and white disk disappears from view. Two or three time the Secchi depth is the depth that sunlight can reach into the water column and thereby support plant growth. A healthy plant community is needed for animal (fish) habitat within the lake.

Sediment: Particles and/or clumps of particles of sand, clay, silt, and plant or animal matter carried in water.

Stratification: The layering of water due to differences in density. Water's greatest density occurs at 39^{o} Fahrenheit (4^{o} Celsius). As water warms during the summer, it remains near the surface while colder water remains near the bottom. Wind mixing determines the thickness of the warm surface water layer **(epilimnion).** The narrow transition zone between the epilimnion and cold bottom water **(hypolimnion)** is called the **metalimnion**.

Suspended solids: Suspended solids refer to small solid particles which remain in suspension in water as a colloid or due to the motion of the water. It is used as one indicator of water quality

Thermocline: the thermocline is defined as "the plane of maximum rate of decrease of temperature with respect to depth."

Total Phosphorus: A measure of all forms of phosphorus (organic and inorganic) in water.

Total Suspended Solid (TSS): The weight of particles that are suspended in water. Suspended solids in water reduce light penetration in the water column, can clog the gills of fish and invertebrates, and are often associated with toxic contaminants because organics and metals tend to bind to particles. Total suspended solids are differentiated from total dissolved solids by a standardized filtration process, the dissolved portion passing through the filter.

Transparency: A measure of water clarity that, in lakes and ponds, indirectly measures algal productivity. Transparency is determined by the depth at which a Secchi disk lowered into the water column is no longer visible.

Trophic: A level of nutrition, nutrient enrichment within a lake.

Trophic State Index (TSI): A simplified index of biological productivity in lakes.

Turbidity: A measure of the amount of light intercepted by a given volume of water due to the presence of suspended and dissolved matter and microscopic biota. Increasing the turbidity of the water decreases the amount of light that penetrates the water column. High levels of turbidity are harmful to aquatic life.

Volatile suspended solids (VSS): That fraction of suspended solids, including organic matter and volatile inorganic salts, which will ignite and burn when placed in an electric muffle furnace at 550 °C for 15 minutes.

Watershed: A region or area divided by points of high land that drains into a lake, stream, or river.

Water quality standards: Established limits of certain chemical, physical, and biological parameters in a water body; water quality standards are established for the different designated uses of a water body.

Zooplankton: microscopic animals found in the water of lakes and rivers.