2016 Annual Report
Part B

Illinois Volunteer Lake Monitoring Program

By

Gregory P. Ratliff and

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 60046

Greater Egypt Regional Planning and Development Commission

3000 W DeYoung Street, Suite 800B-3

Marion, IL 62959

Lake County Health Department

500 W. Winchester Road, Suite 102

Libertyville, Illinois 60048

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Acknowledgements

First and foremost, thanks to the 255 volunteer lake scientists who make this program a possibility. Their dedication to Illinois lakes is greatly appreciated and acknowledged.

Lake/County	Volunteer
Altamont New Effingham Co.	Ray Casselman Dustin Lightfoot Vaughn Voelker Kevin Whitten
Antioch Lake Co.	Cal M Ulfsrud
Apple Canyon Jo Daviess Co.	Darryle G Burmeister Sharron Burmeister Gary Hannon Shaun Nordlie Tom Ohm Kim Rees Bill Ware Erin Winter
Arcadia Williamson Co.	Keith Gardner Bill Nielsen
Bangs Lake Co.	Joseph Nichele
Barrington Lake Co.	Val Dyokas Tom McGonigle
Bass Lee Co.	Jerry Corcoran
Beaver Grundy Co.	Barb Arnold Jim Arnold
Bertinetti Christian Co.	Daniel Raab
Bird's Pond Sangamon Co.	John Campbell Harry Hendrickson Phil Voth
Black Oak Lee Co.	Jerry Corcoran
Bloomington Mclean Co.	Tony Alwood Chad Garey Jill A Mayes
Bluff Lake Co.	John Krutsch Marjorie Krutsch
Butler Lake Co.	Dan Colwell Mary Colwell
Camelot Peoria Co.	Gregory A Dennis Joe Rush Blake Sondgeroth Bob Wilder Dennis Woods
Campus Jackson Co.	Jared Bilak Marjorie Brooks
Candlewick Boone Co.	Chuck Hart
Carbondale Jackson Co.	Rich Calhoun Kevin Hill Paul Jaros Clayton Kile Erica Stuart John Wallace
Catatoga Macoupin Co.	Marie Dawson Walter L Dawson
Catherine Lake Co.	John Massman Gerard Urbanozo Dan Wolski
Cedar Jackson Co.	Kile Clayton Karen Frailey Paul Jaros Kevin Hill Clayton Kile Tyler Pierson John Wallace

Channel Lake Co.	Gerard Urbanozo Dan Wolski
Charles DuPage Co.	Ken Brennan Darlene Garay
Charleston Side Channel Coles Co.	Garrod Eads Doug Homann Trevor Stewart
Charlotte Kane Co.	Nancy Howell Mike Howell Reidar Hahn Dan Hockstetter
Chautauqua Jackson Co.	Michael T Madigan Nancy L Spear
Countryside Lake Co.	Eric Butler Ethan Butler
Cross Lake Co.	Mikkel Denkenberger Gregory Goldbogen Pam Goldbogen
Crystal Champaign Co.	Kara Dudek Derek Liebert Caitlin Lill Luke Miller Emily Mamer
Crystal McHenry Co.	Bob Bruzzino Kelly Burdick Kristen Davis Sue DeThorne Jeremy Husnik
Dawson Mclean Co.	Roger Hagar Allan (Jim) Zoerb
Deep Lake Co.	Peter Brunk Ron Riesbeck
Devils Kitchen Williamson Co.	Don Johnson
Druce Lake Co.	Sarah Bush Lori Rieth Dan Wolski
Duck Lake Co.	Brenda Cornils
Dunns Lake Co.	Gerard Urbanozo Dan Wolski
East Loon Lake Co.	Bill Lomas
Echo Lake Co.	Anne McMorris Hannah McMorris
Evergreen Mclean Co.	Tony Alwood Chad Garey Jill A Mayes
Fischer Lake Co.	Dennis Dwozarski Richard Hartman
Forest Lake Co.	Larry Steker Joe Wachter
Fourth Lake Co.	Jack Nowak Donald Wilson
Fox Lake Co.	Gerard Urbanozo
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.	Linda Salerno Pete Salerno Don Schultz Marti Schultz
Goose McHenry Co.	Dylan Nelson Ross K Nelson Jennifer Olson
Grass Lake Co.	Gerard Urbanozo
Herrin New Williamson Co.	Matt Perrine Stephen K Phillips
Highland Lake Co.	Mike Kalstrup
Highland Silver Madison Co.	Mike Buss Tony Hempen Jeff Hindelang

Homer Champaign Co.	Austin Haskett Brad Nelson Jacob Pruiett
Honey Lake Co.	Wyatt Byrd Conrad Pannkuk Brian Thomson
Island Lake Co.	Ken Wick
Jacksonville Morgan Co.	David Byus Jordan Byus Mark Quinlan
Jaycee Jefferson Co.	Anderson Barker Chris Barker
Joliet Jr. College Will Co.	Polly Lavery Virginia Piekarski
Killarney McHenry Co.	Jeff Joy Neil O'Brien Patricia O'Brien Dennis Oleksy
Kinkaid Jackson Co.	Scott Wilmouth
La Fox Pond Kane Co.	Brad Kleckner J. Brian Towey
Lake of Egypt Williamson Co.	Sandra Anspaugh Tom Anspaugh JoAnn Malacarne Leroy Pfaltzgraff Lori Pfaltzgraff
Lake of the Hollow Lake Co.	Boyce Carsella Stephen Schmidt
Lake of the Woods Champaign Co.	Rachel Bohmhach Austin Haskett Brad Nelson Jacob Pruiett
Lancelot Peoria Co.	Gregory A Dennis Joe Rush Blake Sondgeroth Bob Wilder Dennis Woods
Leopold Lake Co.	Joe Marencik
Linden Lake Co.	Chelsea Delaney Mitchell Schieble
Little Silver Lake Co.	James Sheehan
Loch Lomond Lake Co.	Tony Baade Ruben Dixon Jim Nelson Rob Scharf
Long Lake Co.	Dan Heupel Robert Ringa III
Louise Lake Co.	Geoff Ommen
Loveless DuPage Co.	Rebecca Riebe Mike Riebe
Matthews Lake Co.	Gerard Urbanozo Nick Walkosz Dan Wolski
Mattoon Shelby Co.	AJ Cobble Kory Culp Heather McFarland
Mauvaise Terre Morgan Co.	David Byus Jordan Byus Mark Quinlan
McCullom McHenry Co.	Logan Gilbertsen Richard Gilbertsen
Miller Jefferson Co.	Joan Beckman Eddie Greer Jack Lietz Thomas Zielonko
Miltmore Lake Co.	Jack Nowak Donald Wilson
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.	Gregg Bischoff Pat Bischoff David Crawshaw
Nippersink Lake Co.	Sarah Bush Gerard Urbanozo Dan Wolski
Otter Macoupin Co.	Stan Crawford Brian Durbin Otis Foster Joe Hogan Tim Walter
Paradise Coles Co.	AJ Cobble Kory Culp Heather McFarland
Paris Twin East Edgar Co.	Hannah Bowers Chris Chapman Anna Cline Hannah Hixson Jase Hixson Savannah Mays Greg Whiteman Jami Wilson Mikayla Wilson
Paris Twin West Edgar Co.	Hannah Bowers Chris Chapman Anna Cline Hannah Hixson Jase Hixson Savannah Mays Greg Whiteman Jami Wilson Mikayla Wilson
Petite Lake Co.	Melissa Marra
Pierce Winnebago Co.	Phillip (Jack) Schroeder
Pine Lee Co.	Jerry Corcoran
Pistakee McHenry Co.	Gerard Urbanozo
Potomac Lake Co.	Chelsea Delaney Mitchell Schieble
Redhead Lake Co.	Brian Coyne
Richardson Wildlife Lee Co.	J. Brian Towey
Sand Lake Co.	Michael Plishka
Sara Effingham Co.	Janet Kennedy
Silver McHenry Co.	Bruce Wallace Sandy Wallace
Spring Lake Co.	Melissa Marra
Spring McDonough Co.	Brian McIlhenny
Spring Arbor Jackson Co.	John Roseberry
Spring Ledge Lake Co.	Mike Heinrich Tom Heinrich
Springfield Sangamon Co.	Dan Brill Mike Daley Tom Daley Steve Frank Michelle B Nicol
Stephen Will Co.	Ken Rathbun Will Rathbun
Summerset Winnebago Co.	Walter Raduns Dan Van Kirk
Sunset Champaign Co.	Rachel Bohmbach Austin Haskett Brad Nelson
Sunset Lee Co.	Jerry Corcoran
Sunset Macoupin Co.	Paul Hlatko Paula Hlatko Amy Jo Walkenbach Bill Walkenbach

Swan Cook Co.	Sarah Anderson John Kanzia Anna Neu Michael O'Neill Kristen Rathbun
Taylorville Christian Co.	Taylor Donaldson Mark Jacoby
Third Lake Co.	Patty Morthorst Tom Morthorst
Three Oaks North McHenry Co.	Paul McPherson
Three Oaks South McHenry Co.	Paul McPherson
Timber Lake Co.	Dawn Cooper Tony Cooper
Tower Lake Co.	Jack Johnson Judd Lautenschlager
Twin Oaks Champaign Co.	Jim Roberts
Valley Lake Co.	Marian Kowalski
Vermilion Vermilion Co.	Bert C Nicholson Paul Sermerscheim Dale Smith
Virginia Cook Co.	Janet Herzog Paul Herzog
Waterford Lake Co.	Chelsea Delaney Ralph Kostreva Stacy Kostreva Mitchell Schieble
Weslake St. Clair Co.	Charles Meirink
West Frankfort Old Franklin Co.	Ed Hammonds
West Loon Lake Co.	Bill Lomas
Wonder McHenry Co.	Tony Musel Jody Nichols Mark Nichols Ken Shaleen Brian Verdino
Woodhaven Lee Co.	Jerry Corcoran
Woods Creek McHenry Co.	Eric Baillargeon Chloe Basch Marvin Basch Adam Brink Tom Dunn Zach Hansen Robert Libka Bonnie Libka Jose Maldonado Jake Popovich Charles Schumann
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, Roy Smogor (IEPA), Holly Hudson, Tyler Carpenter and Alana Bartolai. This report was written by Greg Ratliff and review by Gregg Good, Mike Bundren, Teri Holland and Tara Norris.

Acronyms and Abbreviations

AIS	Aquatic Invasive Species
ALU	Aquatic Life Use
AQU	Aesthetic Quality Use
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
ICLP	Illinois Clean Lakes Program
IEPA	Illinois Environmental Protection Agency
IPCB	Illinois Pollution Control Board
LCHD	Lake County Health Department
mg/L	Milligrams per Liter
ml	Milliliter
NPS	Non-point Source
NVSS	Non-volatile Suspended Solids
PLWIP	Priority Lake and Watershed Implementation Program
RFLA	Request for Lab Analysis
SD	Secchi Depth
SPU	Standard Platinum-Cobalt Units
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

Program Objectives

1. *Increase citizen knowledge of the factors that affect lake quality in order to provide a better understanding of lake/watershed ecosystems and promote informed decision making;*
2. *Encourage development and implementation of sound lake protection and management plans;*
3. *Encourage local involvement in problem solving by promoting self-reliance;*
4. *Enlist and develop local "grass roots" support and foster cooperation among citizen, organizations, and various units of government;*
5. *Gather fundamental information on Illinois lakes: with this information, current water quality can be determined as well as (with historical data) long term trends;*
6. *Provide a historic data baseline to document water quality impacts and support lake management decision-making; and*
7. *Provide an initial screening tool for guiding the implementation of lake protection/restoration techniques and framework for a technical assistance program.*

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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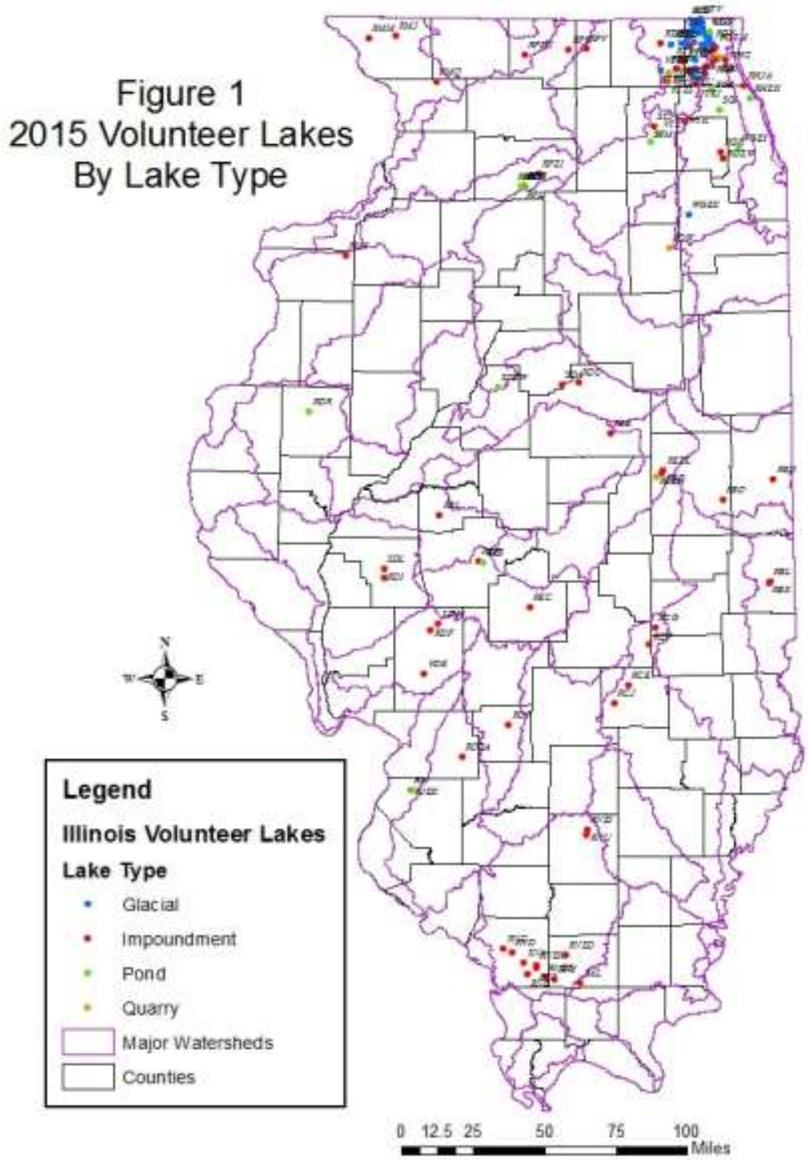
Results and Discussion

Basic Monitoring Program

__Lakes__

One hundred thirty lakes were monitored at least once in 2016. These lakes are distributed across the state with clusters occurring in several areas. The type of lakes typically in the program include; backwater, glacial, impoundments (dammed and dug), quarries (coal, sand, gravel and burrow pits) and ponds. Figures 1, 1-1, 1-2, and 1-3 show the distribution of the volunteer lakes, as well as differentiating them by lake type. Figure 1-1 volunteer lakes were coordinated by Alana Bartolai through the Lake County Health Department. Figure 1-2 lakes were coordinated by Holly Hudson through the Chicago Metropolitan Agency for Planning. Finally, Figure 1-3 lakes were coordinated by Tyler Carpenter through the Greater Egypt Regional Planning and Development Commission. Greg Ratliff coordinated those lakes not falling under the jurisdiction of the regional coordinators listed above, as well as, oversight assistance for the regional coordinators and overall data management for the program.



The size of the lakes in the program varied greatly, from a 4,200-acre impoundment reservoir, Lake Springfield of Sangamon County, to two 2-acre impoundment lakes, Charlotte Lake of Kane County and Longmeadow of Cook County. Volunteers covered 38,229 acres of lake surface water. The public's access to these lakes turned out to be 55 percent (Figure 3) by number of lakes. The private access ranged from single owner to multiple homeowner housing developments, even forest preserve lakes with limited access (Figure 4). The maximum

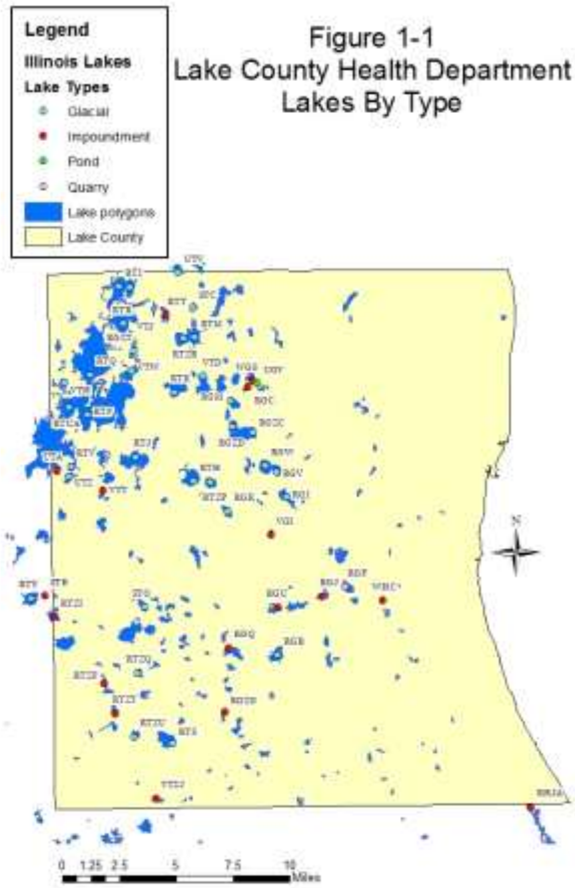


Figure 1-1
Lake County Health Department
Lakes By Type

depth of these lakes ranged from 4 ½ feet at Redhead Lake in Lake County to 100 feet at Devil's Kitchen Lake in Williamson County.

The VLMP had lakes in 24 of the 33 major watersheds in the state. The three watersheds with the highest density of VLMP lakes were the Upper Fox with 49 lakes, Des Plaines with 23 lakes, and Big Muddy with 11. Figure 2 shows the distribution of the 33 major watersheds in Illinois.

A further breakdown indicates that the 130 lakes covered 72 HUC-12 watersheds across Illinois. The top three HUC-12 watersheds for number of volunteer lakes were Nippersink Lake – Fox River watershed in First Place with nine lakes, Mill Creek watershed (071200040202) in Second Place with six lakes, and a six-way tie for Third Place for Woodhaven Lake – Green River, Bull Creek – Des Plaines River, Sequiot Creek, Squaw Creek, Cary Creek – Fox River, and Crystal Lake Outlet watersheds, all with five lakes each. The HUC code for Mill Creek watershed is provided above because more than one named Mill Creek watershed is listed in the table with volunteer lakes.

Volunteers

Two hundred sixty-three volunteers participated in the monitoring. These monitors donated over 2,917 volunteer-hours of their time for 992 monitoring events. Volunteers are primarily lakeshore residents, lake owner/managers, sportspersons, environmental group members, public water supply personnel, and interested citizens.

Figure 1-2 Chicago Metropolitan Agency for Planning Lakes by Type

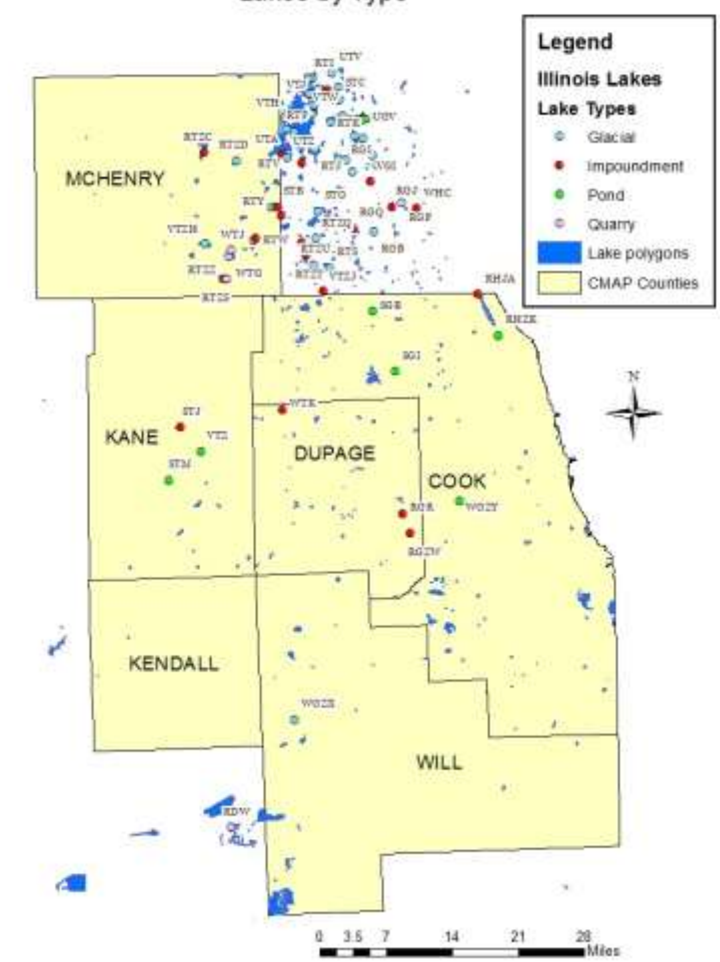


Figure 2
Major
Watersheds
Of Illinois

Figure 3
Public Access
Available

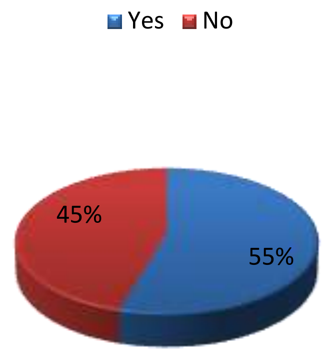
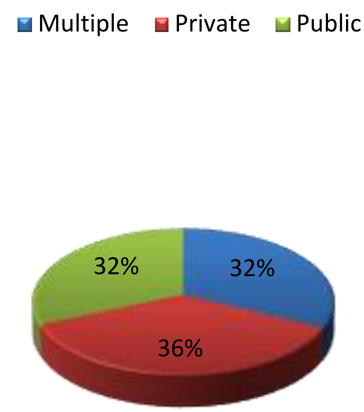


Figure 4
Lake Ownership

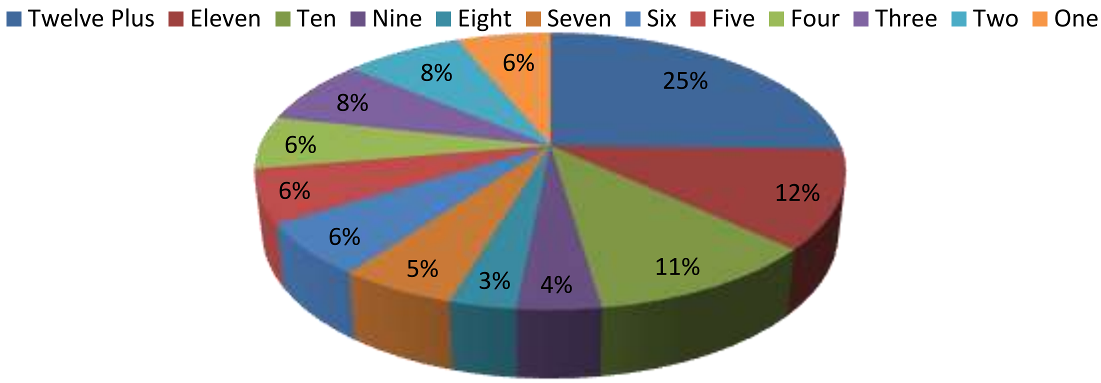


<u>Data Returns</u>

This year 33 lakes had a 100 percent data return. This means that these 33 lake monitors returned at least twelve monitoring reports covering the requested six-month from May through October. For the rest, 34 lakes had nine to eleven data returns, 19 had six to eight data returns, 26 had three to five data returns, and 18 had less than three data returns.

These 33 lakes were sampled all twelve periods of the Volunteer Program.		
Lake Name/County Name	**Lake Name/County Name**	**Lake Name/County Name**
Altamont New/Effingham	Fourth/Lake	Silver/McHenry
Barrington/Lake	Killarney/McHenry	Spring/McDonough
Bass/Lee	Kinkaid/Jackson	Spring Arbor/Jackson
Black Oak/Lee	La Fox Pond/Kane	Sunset/Lee
Bloomington/Mclean	Leopold/Lake	Swan/Cook (14)*
Candlewick	Little Silver/Lake	Third/Lake
Carbondale	Marie/Lake	Valley/Lake
Cedar/Jackson	Miller/Jefferson	Vermilion/Vermilion
Charles/DuPage (13)*	Miltmore/Lake	Virginia/Cook
Chautauqua/Jackson	Murphysboro/Jackson	Woodhaven/Lee
Forest/Lake	Pine/Lee	Woods Creek/McHenry (18)*
*The number in parenthesis denotes actual number of events monitored when more than twelve.		

Figure 5
Volunteer Participation



Key for Figure 2 Major Watersheds of Illinois.

No.	Watershed Name	No.	Watershed Name	No.	Watershed Name
1	Great Lakes/Calumet River	12	Vermilion (Illinois) River	23	Upper Kaskaskia River
1a	Lake Michigan Beaches	13	Middle Illinois River	24	Middle Kaskaskia/Shoal Creek
2	Des Plaines River	14	Machinaw River	25	Lower Kaskaskia River
3	Upper Fox River	15	Spoon River	26	Big Muddy River
4	Lower Fox River	16	Mississippi North Central River	27	Mississippi South Central River
5	Kishwaukee River	17	La Moine River	28	Mississippe South River
6	Rock River	18	Lower Illinois/Macoupin Creek	29	Vermilion (Wabash) River
7	Pecatonica River	19	Mississippi Central River	30	Embarrass/Middle Wabash River
8	Green River	20	Lower Sangamon River	31	Little and Lower Wabash/Skillet Fork
9	Mississippi North River	21	Upper Sangamon River	32	Saline River/Bay Creek
10	Kankakee/Iroquois River	22	Salt Creek of Sangamon River	33	Cache River
11	Upper Illinois/Mazon River				

Transparency Ranking

One hundred thirty summer Secchi depths transparencies, in inches, are ranked highest to lowest and summarized in the lists below. The lists are divided into the four trophic classes. Several lakes did not provide readings during the summer so those values are outside useful accuracy for our purposes; however, in those circumstances non-summer data was used for educational purposes only and included below with the at sign (@) to indicate the data used did not meet our data objectives. Organizations using our data should take care to evaluate these data to ensure it meets their data objectives.

Oligotrophic

Rank	Lake/County/Code	SD	Rank	Lake/County/Code	SD
1	Virginia/Cook/SGB	239.0	4	Deep/Lake/VTD	202.5
2	Bangs/Lake/	225.0	5	Sunset/Champaign/REZN	197.5
3	West Loon/Lake/RTZB	211.5			

Mesotrophic

Rank	Lake/County/Code	SD	Rank	Lake/County/Code	SD
6	Killarney/McHenry/RTZV	139.5	16	Zurich/Lake/RTS	91.0
7	Minear/Lake/RGP	139.0	17	Beaver/Grundy/RDW	84.0
8	Druce/Lake/RGV	121.0	17	Candlewick/Boone/RPV	84.0
9	Highland/Lake/RTZP	118.0	17	Cross/Lake/UTV	84.0
10	Little Silver/Lake/STC	114.0	20	Lake of the Hollow/Lake/UTZ	80.0
11	Crystal/McHenry/VTZH	108.0	21	Honey/Lake/RTZU	79.5
11	Silver/McHenry/RTW	108.0	21	Leopold/Lake/VGI	79.5
13	Third/Lake/RGW	106.0	23	Apple Canyon/Jo Daviess/RMJ	79.0
14	Summerset/Winnebago/RPI	98.0	23	Butler/Lake/RGJ	79.0
15	Gages/Lake/RGI	95.0			

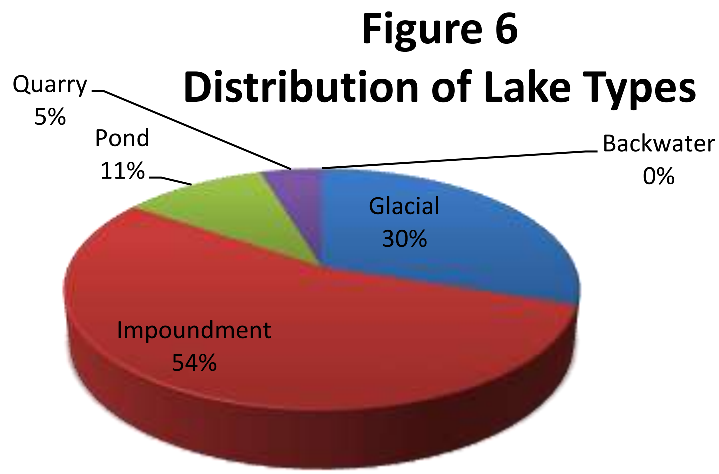
Eutrophic

Rank	Lake/County/Code	SD	Rank	Lake/County/Code	SD
25	Fyre/Mercer/RLH	76.0	63	Arcadia//RAZP	35.0
26	Catatoga/Macoupin/VDE	73.5	63	Homer/Champaign/RBO	35.0
27	Miltmore/Lake/RGZD	72.0	63	Woods Creek/McHenry/RTZZ	35.0
28	Charlotte/Kane/VTZ	67.5	66	Dawson/McLean/REE	34.5
29	Linden/Lake/RGC	66.0	67	Charles/DuPage/RGR	34.0
30	Sand/Lake/RGM	64.5	67	Echo//RTZR	34.0
31	Galena/Jo Daviess/RMM	62.0	69	Woodhaven/Lee/RPM	33.5
32	Chicago Botanic Gardens/Cook/RHJA	60.0	70	Bluff/Lake/VTJ	33.0
32	Devils Kitchen/Williamson/RNJ	60.0	70	Weslake/St. Clair/RJJ	33.0
32	Waterford/Lake/WGS	60.0	72	Sara/Effingham/RCE	32.0
35	Catherine/Lake/RTD	59.0	73	Lancelot/Peoria/SDP	31.0
35	East Loon/Lake/RTM	59.0	73	Pine/Lee/RPZB	31.0
37	Kincaid/Jackson/RNC	58.0	75	Altamont New/Effingham/RCJ	30.0
37	Petersburg/Menard/REL	58.0	75	Goose/McHenry/RTZS	30.0
39	Joliet Jr College/Will/WGZ	56.0	75	Potomac//RGZK	30.0
40	Jaycee/Jefferson/RNU	53.5	78	Bloomington/McLean/RDO	29.5
41	Lake of Egypt/Williamson/RAL	53.0	78	La Fox Pond/Kane/STM	29.5
42	Barrington/Lake/RTZT	49.0	78	Otter/Macoupin/RDF	29.5
43	Countryside/Lake/RGQ	48.0	81	Lake of the Woods/Champaign/REG	27.0

43	Fischer/Lake/VTT	48.0	82	Stephen//SGW	26.5
45	Crystal/Champaign/RBU	47.5	83	Chautauqua/Jackson/SNA	25.0
46	Channel/Lake/RTI	41.5	83	Evergreen/McLean/SDA	25.0
47	Antioch/Lake/RTT	40.5	83	Miller/Jefferson/RNZI	25.0
48	Cedar/Jackson/RNE	40.0	86	Campus/Jackson/RNZH	24.5
48	Spring Arbor/Jackson/RNZG	40.0	87	Bird's Pond/Sangamon/SEB	24.0
48	Sunset/Macoupin/UDH	40.0	87	Forest/Lake/RGZG	24.0
51	Swan/Cook/WGZY	39.5	87	Gamlin/St. Clair/RJZK	24.0
52	Tower/Lake/RTZF	39.0	87	Jacksonville/Morgan/RDI	24.0
53	Long/Lake/RTJ	38.0	91	Richardson Wildlife/Lee/RPZI	23.0
53	Timber/Lake/RGZC	38.0	91	Valley/Lake/RGZM	23.0
55	Black Oak/Lee/RPK	37.5	93	Twin Oaks/Champaign/REZL	22.5
55	McCullom/McHenry/RTZD	37.5	94	Island/Lake/RTZI	22.0
57	Sunset/Lee/RPL	37.0	94	Pierce/Winnebago/RPC	22.0
58	Bass/Lee/RPJ	36.0	96	Murphysboro/Jackson/RND	21.5
58	Herrin New/Williamson/RNZD	36.0	97	Vermilion/Vermilion/RBD	21.0
58	New Thompson//RNZO	36.0	98	Petite/Lake/VTW	20.0
61	Camelot/Peoria/UDB	35.5	98	Springfield/Sangamon/REF	20.0
61	Spring Ledge/Lake/UGV	35.5			

Hypereutrophic

Rank	Lake/County/Code	SD	Rank	Lake/County/Code	SD
100	Bertinetti/Christian/REZG	19.0	112	Highland Silver/Madison/ROZA	14.0
100	Matthews/Lake/UTA	19.0	113	Mauvaise Terre/Morgan/SDL	14.0
100	Taylorville/Christian/REC	19.0	113	Napa Suwe/Lake/STO	14.0
103	Paris Twin East/Edgar/RBL	18.0	113	Spring/McDonough/RDR	14.0
103	Paris Twin West/Edgar/RBX	18.0	116	Charleston SCR//RBC	13.0
103	Pistakee/Lake/RTU	18.0	116	Paradise/Coles/RCG	13.0
103	Spring/Lake/RGZT	18.0	118	Grass/Lake/RTQ	12.0
107	Fourth/Lake/RGZC	17.5	119	Golfview/DuPage/RGZW	11.5
108	Mattoon/Shelby/RCF	17.0	119	Loch Lomond/Lake/RGU	11.5
108	Wonder/McHenry/RTZC	17.0	121	Nippersink/Lake/RTUA	10.0
110	Fox/Lake/RTF	16.0	122	Dunns/Lake/VTH	9.5
111	Carbondale/Jackson/RNI	14.5	123	Louise/Lake/VTZJ	6.0



To turn ranking the volunteer lakes into a more useful tool, we look at the lake type, geological region, and lake size. Therefore, ranking in this report provides a means for participants to find and consider lakes undergoing similar processes as the lakes they manage. To help this comparison, Figures: 6-1, 6-2, 6-3, and 6-4 rank the lakes within four of the five specific lake types categorized and studied within this report; Glacial, Impoundment, Quarry, and Pond. Backwater is the fifth type of lake but had no representative this year (Figure 6).

Deep Lake has the deepest transparency with a value of 257 inches. Deep Lake is a glacial lake located in Lake County. The lowest transparency goes to Carbondale Lake, a reservoir impoundment in Jackson County.

Most lakes in the volunteer program follow a similar linear morphology where turbid water from a stream or river flows into a wider lake bed. The water slows, allowing particulates to drop out of the water to form lake sediments and reducing turbidity. Site 1 is typically the furthest site from the inlets, as well as the deepest part of the lake, especially for impoundment lakes. Best management practices (BMP) that target reducing turbidity in the lakes that show this shift are likely to benefit water clarity to a high degree. Additionally, this change in transparency highlights the necessity to use other means to predict algal biomass and trophic state in waters that have high turbidity related to NVSS.

Figure 6-1
39 Glacial Lake Transparencies
(Inches)

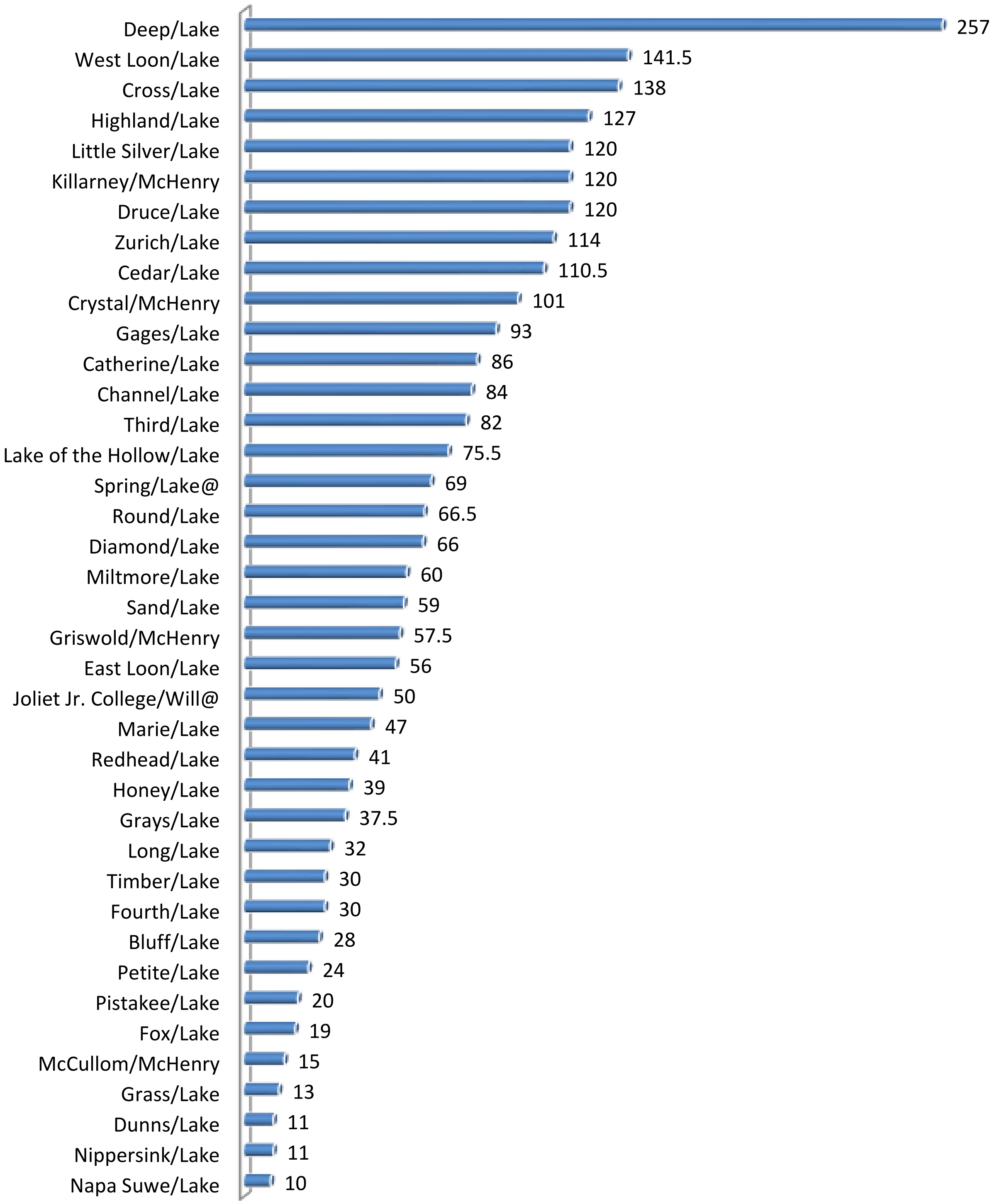


Figure 6-2
71 Impoundment Lake Transparencies (Inches)

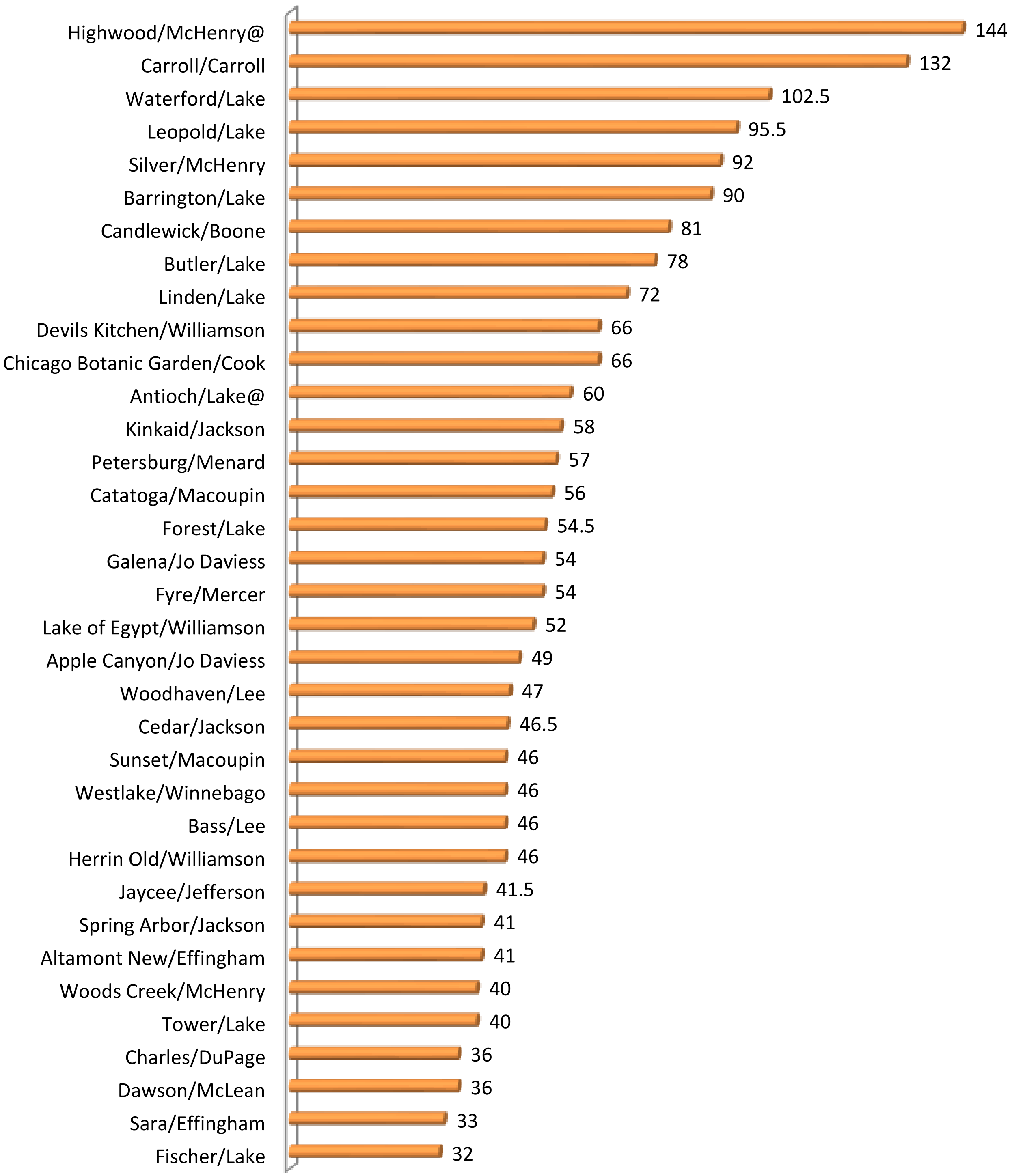


Figure 6-2
71 Impoundment Lake Transparencies (Inches) Continued

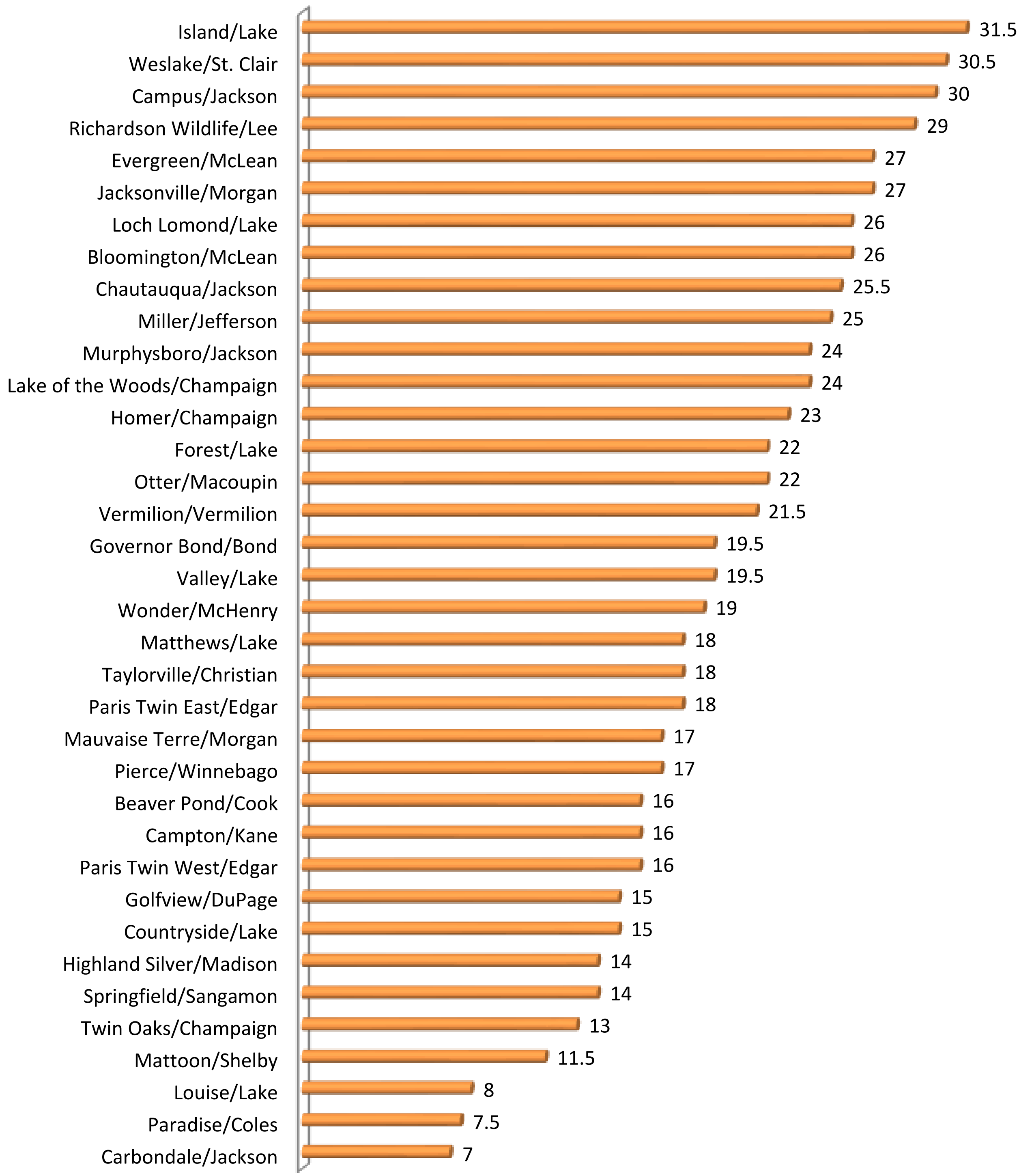


Figure 6-3
14 Pond Transparencies
(Inches)

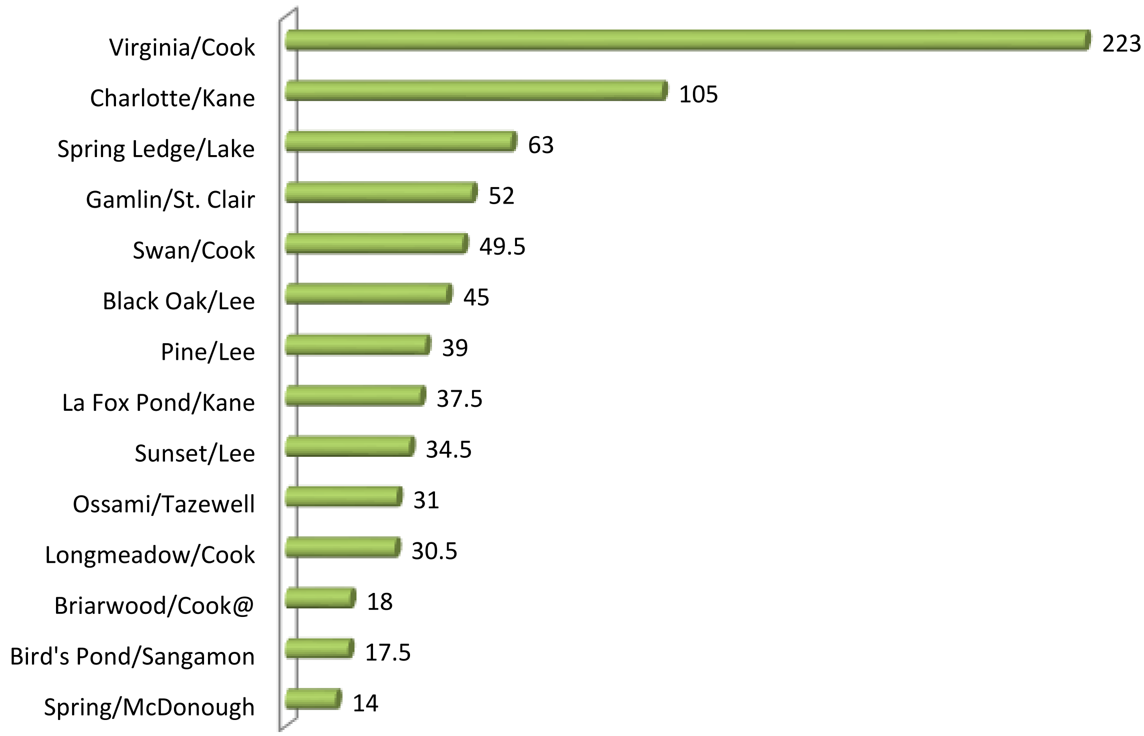
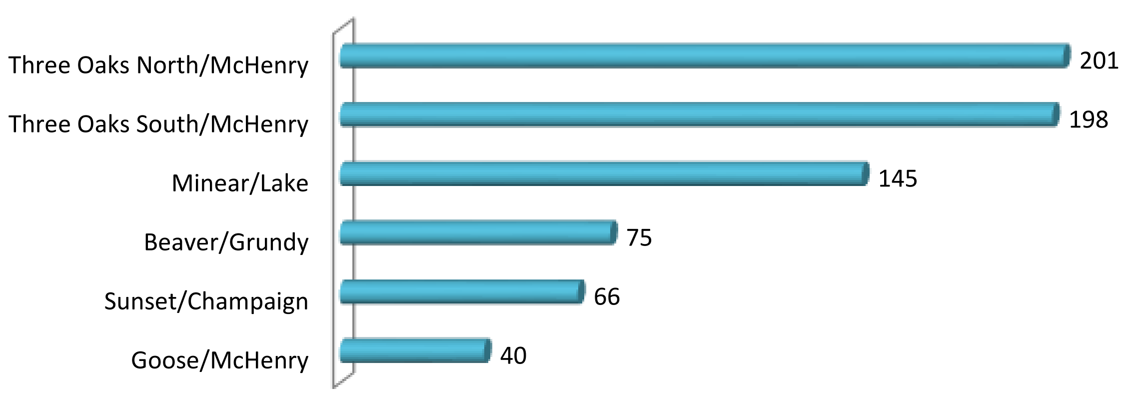


Figure 6-4
6 Quarry Lake Transparencies
(Inches)



Transparency Variability

Average transparency data for all the years a lake has been monitored is available online at http://dataservices.epa.illinois.gov/waBowSurfaceWater. The collection of annual average 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 should be interpreted with caution. A lake’s median transparency for a year can be affected by 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 management of lake, like plant treatments, drawdowns etc.; and
8. Spills, construction, or other temporary human impacts.

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 means 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. On many of Illinois’ lakes, the turbidity of the water limits the estimates to emergent species. Each range was given a weighted point value for whether that coverage range is good (0 points) to poor (15 points) for “Aquatic Life Uses” and “Aesthetic Quality Uses.”

Expanded Monitoring Programs

<u>Water Quality Monitoring</u>

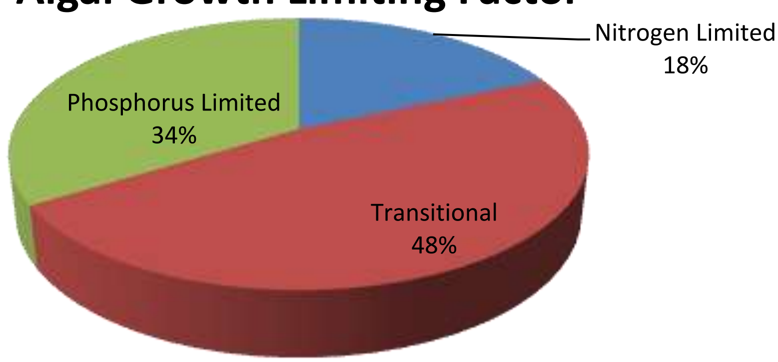
In 2015, volunteers at 65 lakes collected water samples from one foot below the lake water surface. Under Tier 3, 4 of these lakes collected water samples for analysis at multiple stations on the lake, while 61 other lakes sampled at the representative site only, for Tier 2. The water quality data are provided in Appendix A. Not all samples were analyzed for all constituents. For the most part, Chloride analysis was limited to the general Chicago metropolitan area of Cook, DuPage, Kane, Kendall, Lake, McHenry, and Will counties. One Tier II lake collected chlorophyll samples.

Total Phosphorus (TP): The median values ranged from 0.0034 mg/L to 0.884 mg/L. The single highest value overall was found at Swan Lake in Cook County, 0.902 mg/L. 29 lakes had median values of TP over the 0.05 mg/L. It should be noted that nine of 13 lakes with median TP under 0.05 mg/L had one or more sampling events with levels over that benchmark. Lake TSI^{TP}'s were calculated. The 23 lakes with values **<u>all</u>** under the benchmark are:

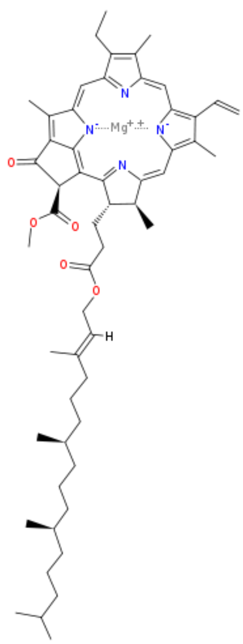
Butler/Lake	Candlewick/Boone	Carroll/Carroll	Cedar/Jackson
Charlotte[2]/Kane	Dawson/Mclean	Deep/Lake	Devils Kitchen/Williamson
Druce/Lake	Highwood/McHenry	Homer/Champaign	Killarney/McHenry
Lake of Egypt/Williamson	Miltmore/Lake	Ossami/Tazewell	Silver/McHenry
Spring Arbor/Jackson	Sunset/Champaign	Third/Lake	Three Oaks North/McHenry
Three Oaks South/McHenry	Tower/Lake	Virginia/Cook	

Nitrogen: Lakes were analyzed for three sources of nitrogen; ammonia, nitrites + nitrates (inorganic nitrogen), and Total Kjeldahl Nitrogen (TKN). Total Nitrogen to Total Phosphorus (TN/TP) ratios were calculated. These ratios indicate that 12 lakes are nitrogen limited, 31 are transitional, and 22 are phosphorus limited (Figure 7). This spread of limiting nutrients highlights the need to consider both nutrients when creating a management plan.

Figure 7
Algal Growth Limiting Factor



Whether or not the nutrient identified as the limiting nutrient is truly the limiting factor for algal growth depends also on light availability. The amount of light available for algal growth varies depending on the suspended solids in the water column, as well as the absorbency of the water's true color. Predation by zooplankton can also limit algal growth. It should be noted that some cyanobacteria have additional metabolic mechanisms to compensate for low phosphorus availability. 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.



Chlorophyll-a

TN/TP ratios ranged from 2:1 at Swan Lake in Cook County to 215:1 at Three Oaks Lake South in McHenry County. As mentioned earlier, when inorganic nitrogen (nitrate + nitrite + ammonia) is available over 0.3 mg/L in a lake, summer algae blooms should be expected. In lakes where inorganic nitrogen is low, but phosphorus is readily available, the lake's nutrient factors favor blue-green algae growth.

Figure 8a is created from data collected at Tier II lakes and shows the distribution of the growth limiting nutrient categories. Remember, Tier II lakes collect water chemistry at site 1 only. Figure 8b is created from data collected at Tier 3 lakes and also shows the distribution of the growth limiting nutrient categories. These nutrient data were collected at multiple locations at the lake.

Chlorophyll-a: Lake TSI^{CHL} was calculated from chlorophyll data collected at five lakes. Median chlorophyll-a concentration values ranged from 23.0 μg/L at Apple Canyon Lake in Jo Daviess County to 79.3 μg/L at Lake Springfield in Sangamon County. The median phosphorus levels for these two lakes were 0.057 mg/L and 0.223 mg/L, respectively. Additionally, Apple Canyon Lake is transitional (N/P = 17:1), while Lake Springfield is nitrogen limited (N/P = 7:1). The data does not show a direct correlation between increasing phosphorus levels and increased chlorophyll-a concentration. This is likely due to this year's very limited number of data points for chlorophyll-a.

Non-volatile Suspended Solids (NVSS): NVSS median values were calculated by subtracting the volatile suspended solids (VSS) from the total suspended solids (TSS). (TSS – VSS = NVSS). 55 of the 65 lakes showed no significant amounts of NVSS, less than 3 mg/L; while the rest were 10 mg/L or less.

Chloride: None of the 28 lakes sampled for chloride had median values over the Agency's water quality standard (WQS) for surface water of 500 mg/L. The median values ranged from 14 mg/L at Dawson Lake in Mclean County, to 374 mg/L at Three Oaks Lake South in McHenry County. Chloride sampling was generally limited to the general Chicago metropolitan area of Cook, Kane, DuPage, McHenry, Lake, Will and Kendall counties. The WQS was not exceeded this year by any single sample for the lakes in this study. The highest single value returned was 383 mg/L at Three Oaks Lake North in McHenry County and the single lowest value returned was 14 mg/L at Dawson Lake in Mclean County.

Alkalinity: This year all lakes analyzed for alkalinity appear to be well buffered, with a range of 28 mg/L at Herrin Lake New in Williamson County to 281 mg/L at Longmeadow Lake in Cook County. As mentioned previously, values greater than 25 mg/L are considered "well buffered," (Figure 8-1).

Using the USGS Hardness Scale; 17 were "Very Hard," 29 were "Hard," 13 were "Moderately Hard," and 6 were "Soft" (Figure 8-2). Five of six with soft water were all found in Southern Illinois; Devils Kitchen Lake, Lake of Egypt and Herrin Lake Old of Williamson County, Cedar Lake of Jackson County and Miller Lake of Jefferson County. Highland Silver Lake of Madison County had a median alkalinity in the soft water range this year in the Central Illinois Region.

Figure 8-1
Sensitivity to Acid Rain

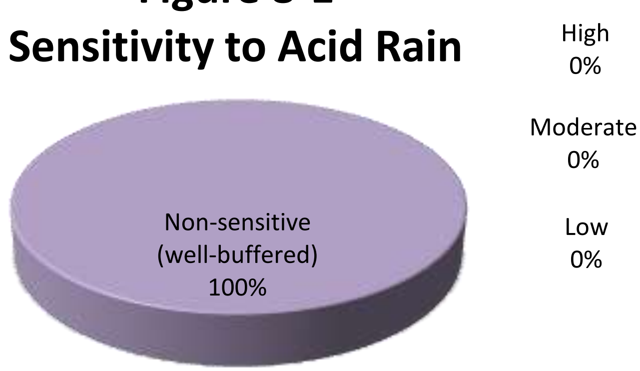
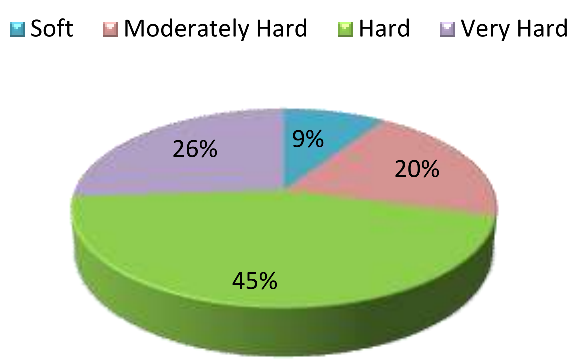


Figure 8-2
Water Hardnes



Trophic State Index

Trophic State Indexes were calculated for 130 lakes based on Secchi depth transparencies. A TSI^{TP} was also calculated for 65 of these lakes and a TSI^{CHL} was calculated for a further subset of the TSI^{TP} lakes. Sixty-five lakes were Tier I and only had a single TSI to base the trophic state upon, TSI^{SD}. Those lakes reflect the same data as found in the discussion of the Secchi depth transparency ranking section, above.

A watershed map (Figure 9) was created to show the distribution of the Secchi Depth trophic state across the state. The Upper Fox, the Des Plaines, and the Big Muddy watersheds contain the heaviest grouping of study lakes, with 45, 23, and 12 VLMP lakes, respectively. The boxed map presents the Lake County portion of the Upper Fox and Des Plaines watersheds in an expanded panel. Breakouts maps of the densely populated watershed are seen in Figures 9-1, 9-2, and 9-3. A HUC is a sequence of numbers or letters that identify a hydrological feature like a river, river reach, lake, or as in this case, a watershed. For more information on HUC, visit the USGS's Water Resource pages at http://water.usgs.gov/GIS/huc.html.

Figure 9 Secchi Depth Transparency Map
130 Volunteer Lakes by Trophic State

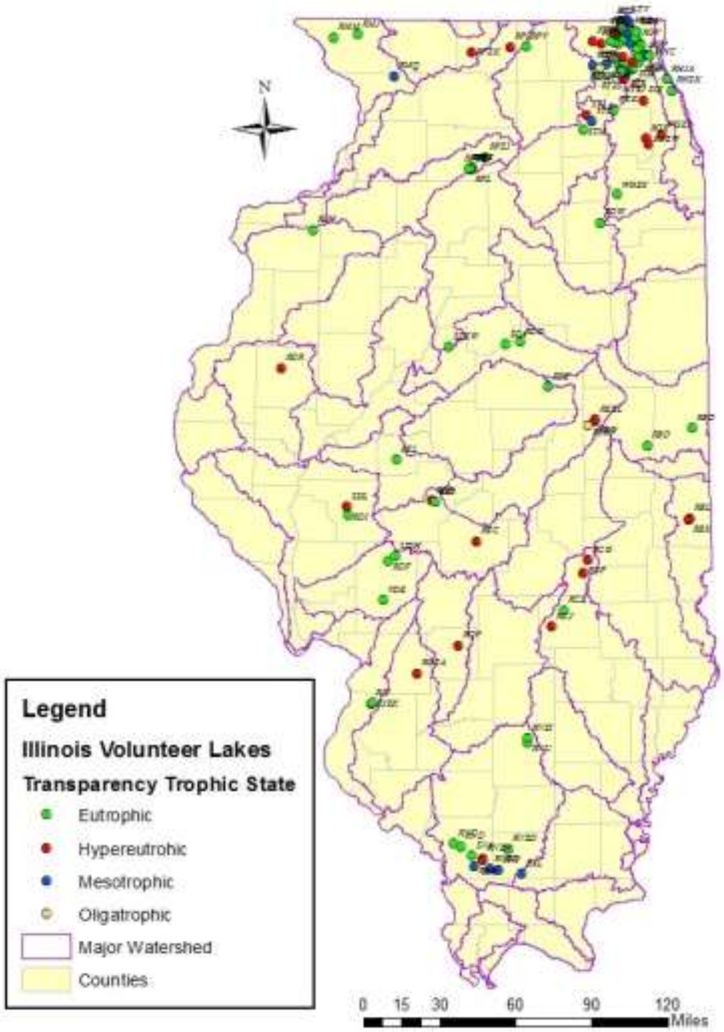


Figure 9-1 Watershed Lake Density
Upper Fox Watershed, 45 Volunteer Lakes

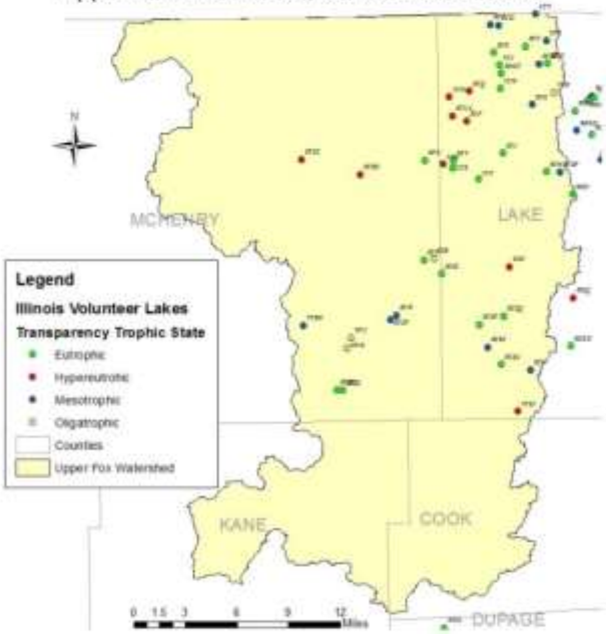


Figure 9-2 Watershed Lake Density
Des Plaines Watershed, 23 Volunteer Lakes

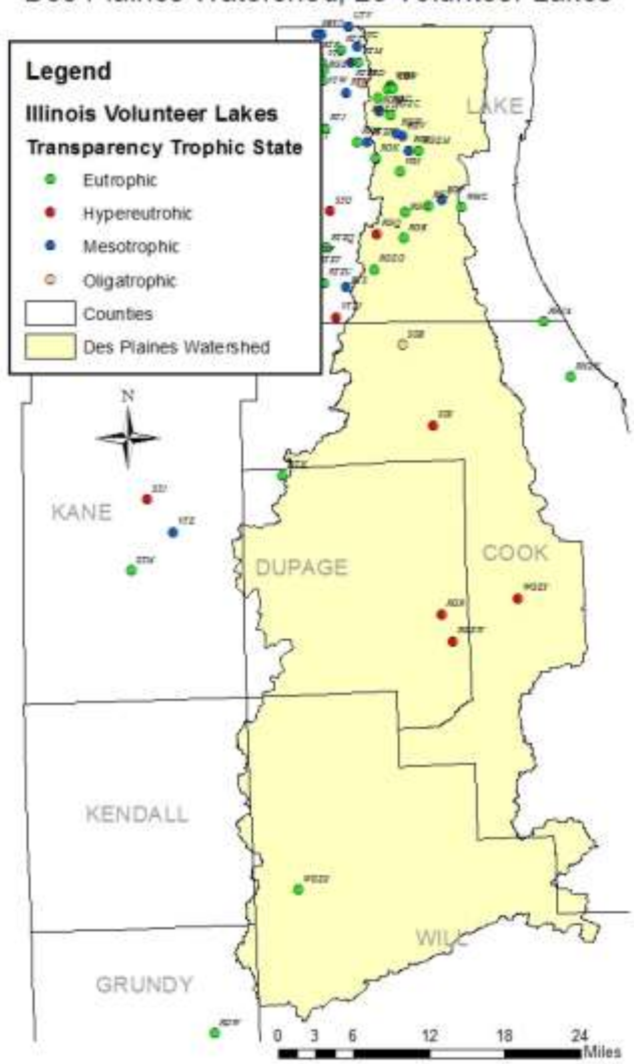


Figure 9-3 Watershed Lake Density
Big Muddy Watershed, 11 Volunteer Lakes

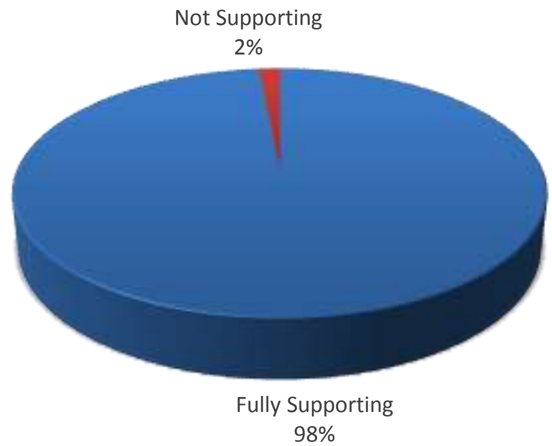
Evaluation of Aquatic Life Use

The sample results were used to calculate 130 TSI values for Secchi depth, 65 TSI values for TP, and 5 TSI values for chlorophyll-a.

The TSIs, macrophyte coverage assessment and NVSS medians are assigned point values as indicated under Weighting Criteria for ALU in the Data Evaluation section in the VLMP Report Part A.

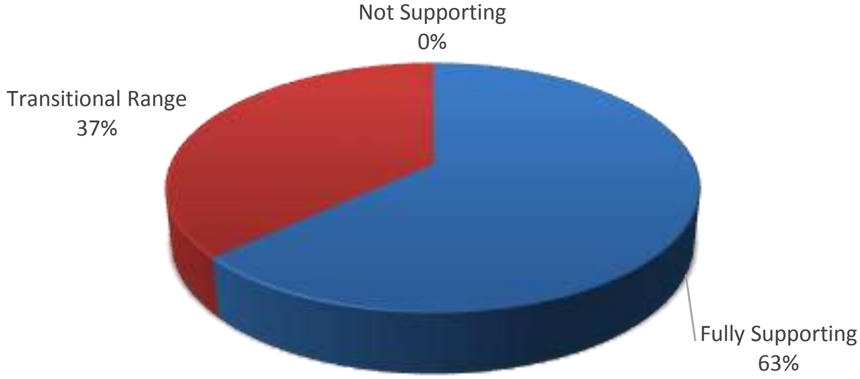
As with TSI values, the ratings are weighted by using the two out of three rule when all three values are available, then by ALU^{TP} first and ALU^{CHL} second when only two TSI values. The ALU^{SD} alone cannot be used, unless NVSS was calculated in the absence of usable Total Phosphorus data. Therefore, lakes only collecting Secchi information cannot be used to directly determine aquatic life use in a lake, but they can be compared with similar lakes of their type using TSI^{SD} and macrophyte coverage. Sixty-four of sixty-five lakes with chemical data available were rated Fully Supporting for aquatic life use. The other lake was rated Not Supporting (Figure 10-1).

Figure 10-1 Aquatic Life Use (65 Tier 2 & 3 Lakes)



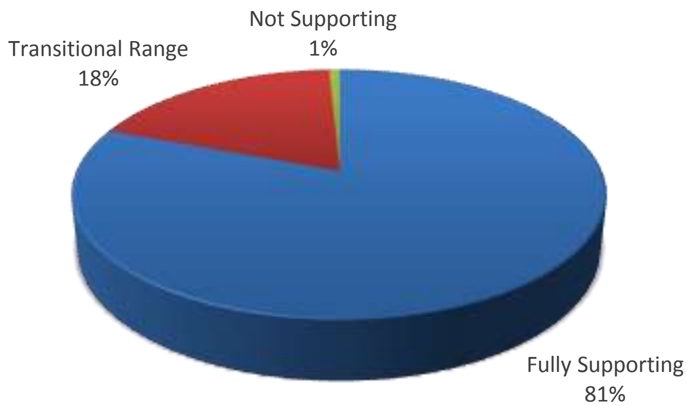
Sixty-five lakes had only Secchi monitoring data. This data was used to extrapolate ALU using the Secchi Depth TSI and the percent of macrophyte coverage over the lake bottom. A high and low NVSS range was estimated using the minimum value (0) and the maximum value (15), since water samples were not taken. Two final scores were then generated, a high value and a low value, providing a numerical range for the final ALU score. If the two values both fell into the same category, the lake was rated for that category. If the scores fell into both categories, the lake was determined to be in a Transitional Range between Fully Supporting and Not Supporting. 41 lakes were rated Fully Supported and 24 were identified in the Transitional Range (having its low score in Fully Supporting and its high score in Not Supporting (Figure 10-2).

Figure 10-2 Aquatic Life Use (65 Tier 1 Lakes)



Overall, 105 (81 percent) of the lakes evaluated for their ability to support aquatic life are Fully Supporting (Figure 10-3). The others are divided between 24 (18 percent) in the Transitional Range and 1 (1 percent) in Not Supporting.

Figure 10-3 Aquatic Life Use All Tiers - 130 Lakes



Potential Causes: Some of the potential causes for impairment for ALU in the 25 lakes rated Transitional and Not Supporting include not having sufficient aquatic plant coverage, having too much aquatic plant coverage, and total phosphorus exceeding the WQS of 0.05 mg/L.

Potential Sources: The volunteer or lake managing body should look for the source of the cause.

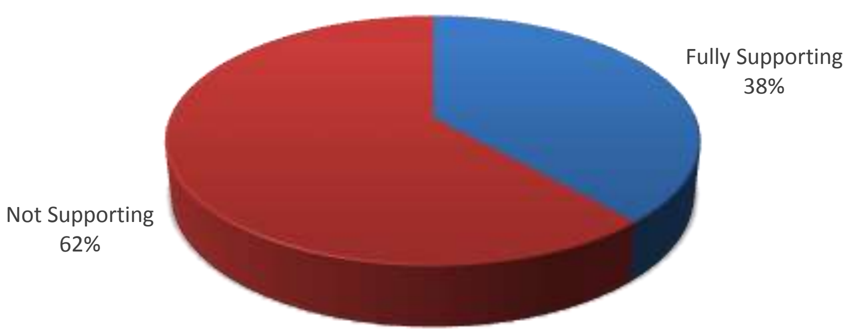
Evaluation of Aesthetic Quality Use

The sample results were used to calculate 130 TSI values for Secchi depth, 65 TSI values for TP, and 5 TSI values for chlorophyll-a.

The TSIs, macrophyte coverage assessment and NVSS medians are assigned point values as indicated under Weighting Criteria for AQU in the Data Evaluation section.

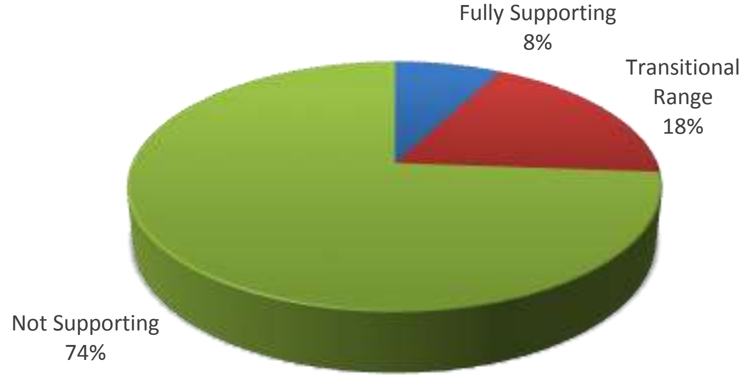
As with TSI values, the ratings are weighted by using the two out of three rule when all three values are available, then by AQU^{TP} first and AQU^{CHL} second when only two TSI values. The AQU^{SD} alone cannot be used, unless NVSS was calculated in the absence of usable total Phosphorus data. Therefore, lakes only collecting Secchi information cannot be used to directly determine aesthetic quality conditions in a lake, but they can be compared with similar lakes of their type using TSI^{SD} and macrophyte coverage. Twenty-five lakes (38 percent) were rated Fully Supporting and forty (62 percent) were rated Not Supporting for aesthetic quality use (Figure 11-1).

Figure 11-1 Aesthetic Quality Use (65 Tier 2 & 3 Lakes)



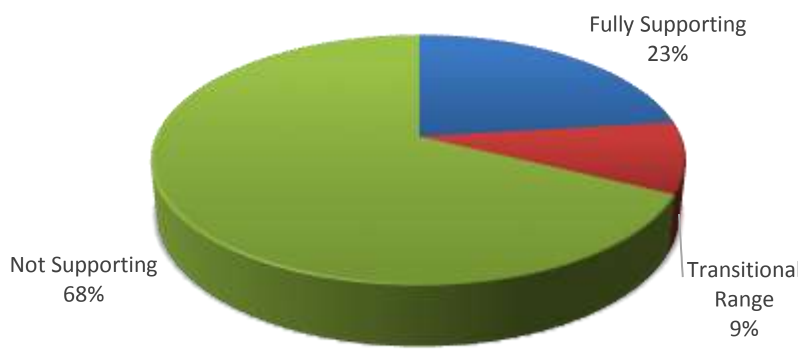
Sixty-five lakes had only Secchi monitoring data. This data was used to extrapolate AQU using the Secchi Depth TSI and the percent of macrophyte coverage over the lake. A high and low NVSS range was estimated using the minimum value (0) and the maximum value (15), since water samples were not taken. Two final scores were then generated, a high value and a low value, providing a numerical range for the final AQU score. If the scores fell into both categories, the lake was determined to be in a Transitional Range between Fully Supporting and Not Supporting. Five lakes were rated Fully Supporting, twelve were Transitional, and forty-eight were rated Not Supporting for AQU (Figure 11-2).

Figure 11-2 Aesthetic Quality Use (65 Tier 1 Lakes)



Overall, 30 of the lakes (23 percent) evaluated for their aesthetic quality are Fully Supporting. The others are divided between 12 (9 percent) in the Transitional Range and 88 (68 percent) in Not Supporting (Figure 11-3).

Figure 11-3 Aesthetic Quality Use All Tiers - 130 Lakes



Potential Causes: The potential causes for impairment for AQU in the 100 lakes rated less than Fully Supporting have a variety of causes: an over-abundance of aquatic plant coverage, severe algae blooms, high turbidity and total phosphorus levels over the WQS for lakes over 20 acres.

Potential Sources: The volunteer or lake managing body should look for the source of the cause.

Summary

Data from the Volunteer Lake Monitoring Program continues to show heavy loading of nutrients, such as phosphorus, into Illinois lakes. Data for the sixty-five lakes with total phosphorus values had a median range of 0.0034 mg/L to 0.8840 mg/L. The median value of 0.0034 is the laboratory method detection limit for total phosphorus; therefore, this lake's median value was a non-detection of phosphorus in the sample. The lowest single value for total phosphorus that was not non-detection was 0.004 mg/L and the highest was 0.9260 mg/L. The water quality standard for Illinois surface water is 0.05 mg/L. Median total phosphorus values at thirty-six lakes were below the water quality standard, but fourteen of the thirty-six lakes had at least one sampling event value over 0.05 mg/L. The other nutrient of concern is Total Nitrogen (which is adding Nitrate/Nitrite values to TKN). Total Nitrogen values had a median range of 0.267 mg/L to 8.850 mg/L. Two lakes, Sunset Lake in Champaign County and Three Oaks Lake North in McHenry County, in the middle of August, had the lowest single values for total nitrogen as "not detected" (meaning both Nitrate/Nitrite and TKN values were both "not detected") which (for laboratory purposes) is less than 0.19 mg/L and the highest was 12.45 mg/L at Vermilion Lake, in Vermilion County, in late June.

Other than nutrients, macrophyte coverage appears to be the number one factor that determines favorable conditions for both aquatic life and aesthetic quality uses. Thirty-eight of the one-hundred thirty lakes studied had good macrophyte coverage for supporting aquatic life while maintaining good recreational use

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 issues 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/monitoring/vlmp/data/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

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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.

Aquatic invertebrates: Aquatic animals without an internal skeletal structure such as insects, mollusks, and crayfish.

Beneficial use: The uses of a water resource that are protected by state laws called water quality standards. Uses include aquatic life, recreation, human consumption, and fish or wildlife habitat.

Benthic: Living in or on the bottom of a body of water.

Benthos: Collectively, all organisms living in, on, or near the bottom substrate in aquatic habitats (examples are oysters, clams, burrowing worms).

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.

Littoral Zone: The near shore shallow water zone of a lake, where light penetrates to the bottom and aquatic plants grow. Some shallow ponds are entirely littoral.

Macroinvertebrate: Any non-vertebrate organism that is large enough to be seen without the aid of a microscope.

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).

Metabolism: the sum of the physical and chemical processes ongoing in all living things.

Methemoglobinemia: a condition brought on by drinking water high in nitrates, that reduces the ability of blood to carry oxygen and may also cause respiratory problems. Infants are particularly at risk.

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.

Pollutant: A contaminant that adversely alters the physical, chemical, or biological properties of the environment. The term includes nutrients, sediment, pathogens, toxic metals, carcinogens, oxygen-demanding materials, and all other harmful substances. With reference to nonpoint sources, the term is sometimes used to apply to contaminants released in low concentrations from many activities which collectively degrade water quality. As defined in the federal Clean Water Act, pollutant means dredged spoil, solid waste, incinerator residue, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand, cellar dirt, and industrial, municipal, and agricultural waste discharged into water.

Protoplasm: the living substance of in a cell (includes the cytoplasm and nucleus).

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

Saturation: the maximum concentration that water can hold (of any substance, in this case oxygen). This is a function of temperature and pressure.

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.

STORET: USEPA's old national data storage database; it is housed in a computer mainframe system.

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),** which usually extends to a depth of about 20 feet. The narrow transition zone between the epilimnion and cold bottom water **(hypolimnion)** is called the **thermocline**.

Super-Saturation: a concentration of a substance (in this case oxygen) above the maximum concentration that water can hold at a given temperature and pressure. This can happen when temperature or pressure changes, or from biological activity.

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

Thermal Stratification: As lake water is warmed in the summer, the water in the deep pond or lake is layered into three levels: 1) warmer (less dense) epilimnion layer at the surface; 2) the thin thermocline or transition layer; and 3) the cold and deep hypolimnion layer.

Thermally Stratified: Lake water often separates into zones or layers by temperature difference.

Thermocline: the zone in a temperature-stratified lake between the epilimnion and the hypolimnion, also referred to as the "metalimnion."

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.

Watershed Based Plan: A watershed-based plan is a document designed to protect and improve water quality by controlling nonpoint source pollution and related water quality problems. Such plans provide an integrated, holistic process to effectively and efficiently protect, enhance and restore the physical, chemical and biological integrity of water resources within a defined hydrologic area (watershed). Watershed based plans present assessment and management information for a geographically defined watershed, including the analyses, actions, participants, and resources related to development and implementation of the plan. Watershed based plans should be consistent with the nine minimum elements of watershed-based plan as defined by USEPA watershed-based plan guidance, the Chicago Metropolitan Agency for Planning's Guidance for Developing Watershed Action Plans in Illinois, total maximum daily load (TMDL) implementation plan requirements, and current watershed planning principles.

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.

Wetlands: Areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

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