



LILLY CENTER FOR
**LAKE &
STREAMS™**



GRACE
COLLEGE



Lake Tippecanoe

LAKE SIZE: 786 acres

WATERSHED SIZE: 72,846 acres

MAX DEPTH: 122 feet

AVERAGE DEPTH: 37 feet

INLETS: Tippecanoe River via James Lake, Grassy Creek

OUTLETS: Flows to Oswego Lake then to Tippecanoe River

ACCESS: Public: Enter through Grassy Creek 1 mi S. of N Webster

RECREATION: Boat, Fish, Ski, Swim

LAKE BOTTOM: Clay, Gravel, Muck, Sand

BEST FISHING: Bluegill, Redear, Catfish, Black Crappie, Largemouth Bass, Northern Pike, Rock Bass, Yellow Perch

LAKE TIPPECANOE:

Past, Present & Future

Since glaciers first formed this lake, the health of Lake Tippecanoe has been of importance to the surrounding residents, businesses, families, and even the economy. Understanding the past of Lake Tippecanoe helps in guiding present and future research. Trends on local lakes assist in providing context for years past as well as years to come. Each lake is different with a story and rhythm of its own. Families on Lake Tippecanoe, whether they have visited the lake for one summer or for one century, have shaped this lake just as it has shaped them. And now you have the power to leave a legacy for a healthy Lake Tippecanoe for future generations.

Our Study:

The Lilly Center for Lakes & Streams has been closely studying local lakes since 2007. However, lakes in Kosciusko County have a wonderful heritage of scientific research going back to 1875. Understanding the health of local lakes in the context of their history can assist in guiding future research and actions. As we investigated the past and the present of local lakes, we researched and collected data on water clarity, nutrients, dissolved oxygen and other parameters. This is a summary of our results and research specific to your home: Lake Tippecanoe. Past data was collected only from university and government sources during the months of July and August. Both past and present research uses data collected in open water above the deepest point in the lake. This research and its publication was funded by the K21 Health Foundation, Kosciusko County Convention Recreation and Visitors Commission, Grace College and private donors.

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THE HISTORY OF LAKE TIPPECANOE

How the Lake Was Formed

Lake Tippecanoe is a glacial lake. It was formed by the movement of glaciers which retreated from the land and left behind large deposits of ice and glacial material. These deposits left depressions in the land and as they melted they created large pools of water, or glacial lakes. This and other natural Kosciusko County lakes are glacial lakes. The nearby Great Lakes are the largest glacial lakes in the world.



THE TURN OF THE CENTURY

Until the start of the 1900s, Indiana lakes had not yet been widely viewed as subjects for research.

Rather, local lakes were places of recreation and fellowship. Throughout the 1900s, businesses were established on Lake Tippecanoe to make the lake a vacationer's paradise. Patona Bay Marina and Resort was established in 1909, Tippecanoe Boat Company was established in 1925, and Tippecanoe Lake Country Club opened the following year in 1926. In addition to these attractions, Lake Tippecanoe was also home to the once traditional concert hall, Tippy Dance Hall, which at one time boasted such acts as Duke Ellington and Louis Armstrong.



RESEARCH ON LAKE TIPPECANOE

Through the Decades

1875: Indiana Geological Survey examines and collects data on lakes in Kosciusko County.

1912: Indiana University gathers temperature profiles, dissolved oxygen profiles, and algae abundance data for Lake Tippecanoe.

1946–1948: Indiana Department of Conservation studies the lake for general hydrology, background history, ice thickness data, and temperature profiles.

1900s

1910s

1920s

1930s

1940s

1950s

1896–1902: The Indiana University Biological Station collects temperature profiles and algae species data. Student room and board costs are \$1.25–\$3.00 per week.

1973: EPA conducts lakes survey to collect temperature and dissolved oxygen profiles.

2007–PRESENT: Grace College's Lilly Center for Lakes & Streams collects data on Secchi depth, temperature profiles, dissolved oxygen profiles, nutrients, algae toxins and algae counts on Lake Tippecanoe.

1960s

1970s

1980s

1990s

2000s

2010s

1992–PRESENT: Volunteers collect Secchi depth and nutrient data on Lake Tippecanoe as part of Indiana University volunteer program.

1989, 1994, 1996, 1998, 2003, 2006, 2012: Indiana University Clean Lakes Program collects data on Secchi depth, nutrients, and algae counts.

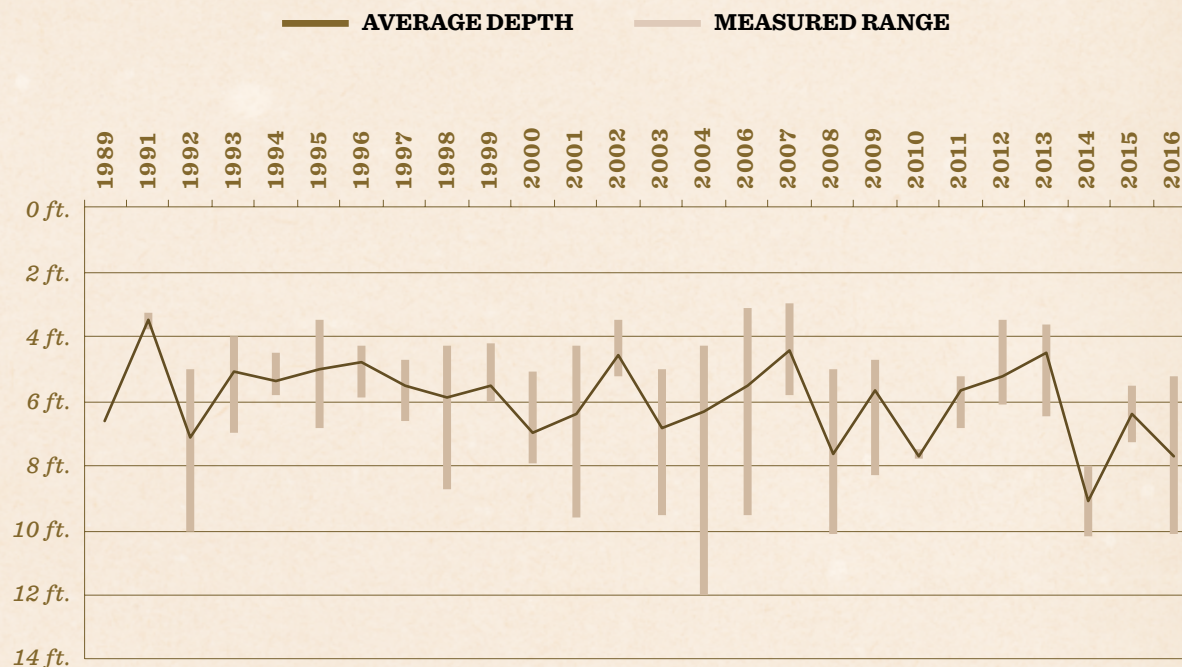
Water Clarity

The first Secchi disk was created in 1865 by Father Pietro Angelo Secchi, who was the pope's scientific adviser. Secchi had been asked to create a new and reliable transparency instrument to measure water clarity, so he created an all-white disk which could be lowered into water to measure clarity depth. On April 20, 1865, the first Secchi disk was lowered by Secchi from the papal stream yacht into the Mediterranean Sea.¹ To read more about the Secchi disk and the importance of measuring water clarity, see page 18.



Water Clarity Pioneer
Father Pietro Angelo Secchi

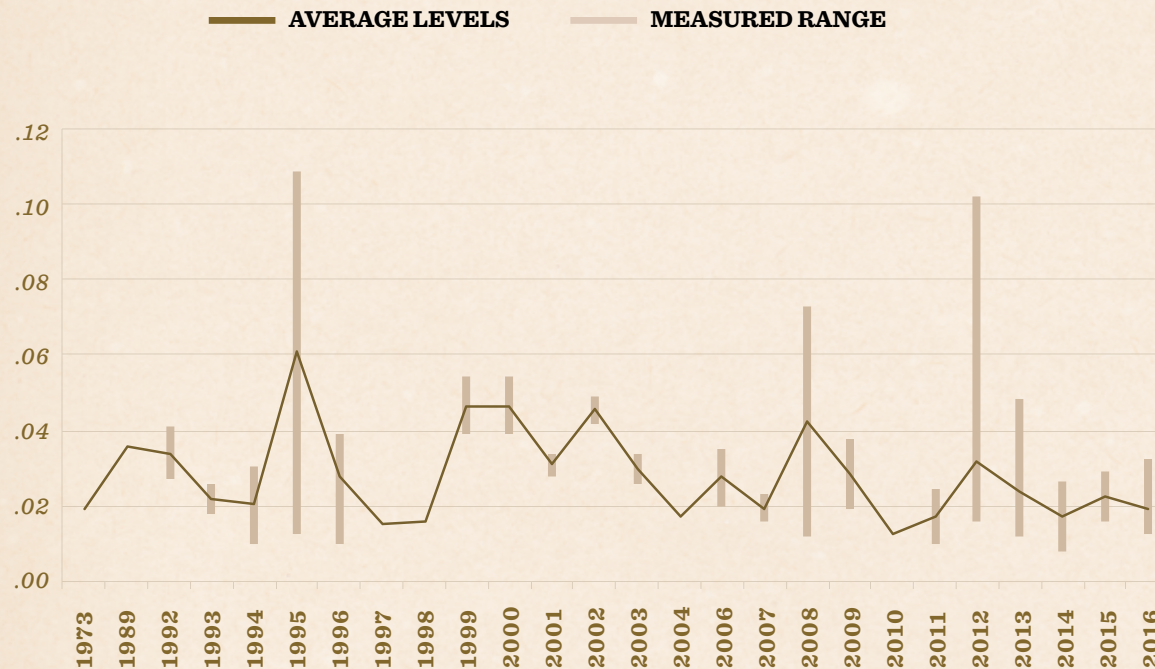
HISTORY OF WATER CLARITY IN LAKE TIPPECANOE



DATA SUMMARY:

Water clarity for July and August in Lake Tippecanoe shows much variability over the last 30 years with a significant increase in recent years. Water clarity decreases during certain years could be due to more algae growth as a result of increased nutrient (phosphorus and nitrogen) levels. Increases in water clarity are likely due to less algae which could be the result of less nutrients or high populations of invasive zebra mussels which eat some types of algae.

HISTORY OF PHOSPHORUS LEVELS IN LAKE TIPPECANOE



DATA SUMMARY:

Lake Tippecanoe total phosphorus levels in July and August do not show any obvious trends over the past 40 years. Over this time period, surface water phosphorus levels range from 0.01 to 0.10 mg/L; these levels are all above the Environmental Protection Agency recommended guidelines except one measurement.

Phosphorus Levels

The Experimental Lakes Area (ELA) in Ontario, Canada is a laboratory of 58 small lakes and their watersheds. They are unaffected by the influence of humans because they have been set aside for scientific research.²

One of the issues the ELA has had a profound impact on is the understanding of eutrophication, or the process leading to over-productive lakes. In 1974, Dr. David William Schindler found that eutrophication occurs in large part due to land runoff and much of the algae growth which occurs in lakes is primarily as a result of phosphorus rather than nitrogen or carbon.²

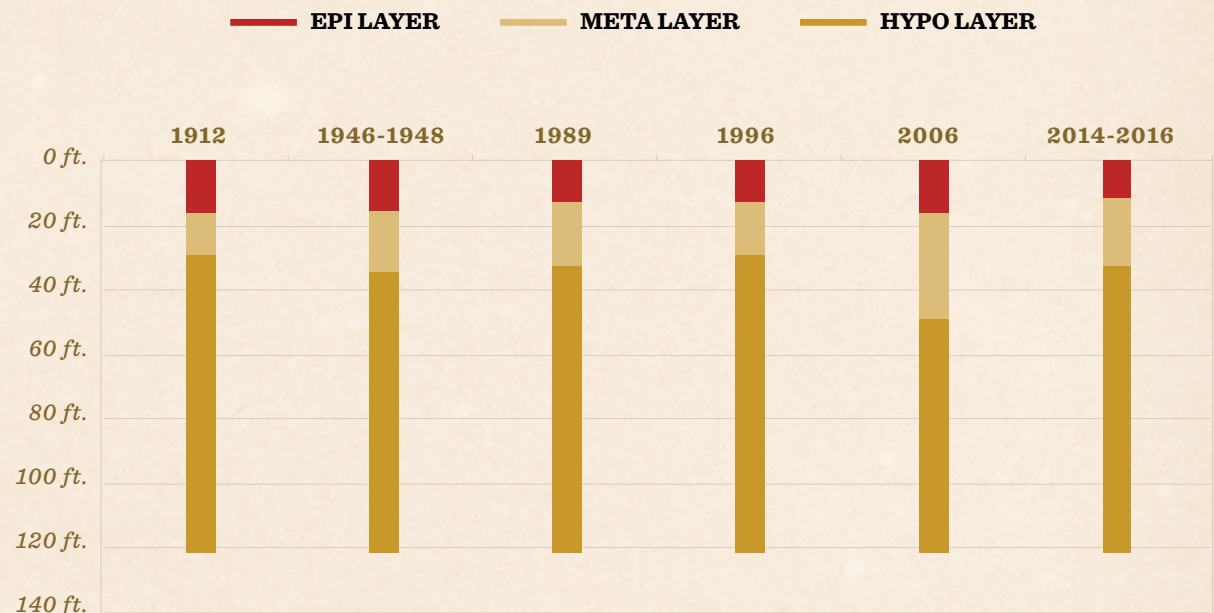
Water Temp.

EPI LIMNION LEVEL: The surface layer of a lake. This layer is the warmest and mixes from recreational activity and wind blowing across the lake surface.

METALIMNION LEVEL: The layer of water between the epilimnion and the hypolimnion. Water temperature changes quickly from warm to cold within this zone.

HYPOLIMNION LEVEL: The bottom layer of water in a lake which is colder than the top layers. This layer is isolated from the rest of the lake all summer and most of the fall, so it stays cold. Oxygen from the other two layers cannot come down into this layer.

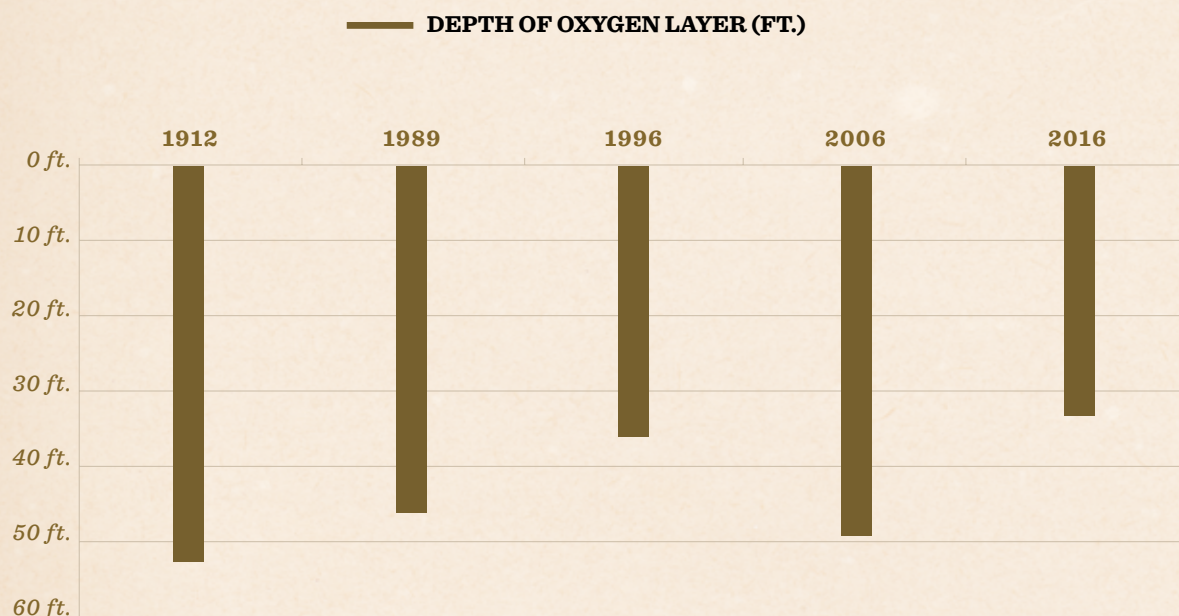
HISTORY OF WATER TEMPERATURE IN LAKE TIPPECANOE



DATA SUMMARY:

Lake Tippecanoe water temperature layers do not show any obvious trends over the past 100 years. Over this time period, surface water (epilimnion) temperatures range from 74° to 85° F for July and August while water at the bottom of the lake ranges from 40° to 45° F. You may have noticed this colder water layer at some time yourself if you have ever dived down deep into the lake.

HISTORY OF DISSOLVED OXYGEN LEVELS IN LAKE TIPPECANOE



DATA SUMMARY:

The oxygen layer depth in Lake Tippecanoe has been decreasing over the last 100 years during July and August. This increasingly limits the space in which fish can live and forces fish to a warmer surface water layer. Some fish cannot survive in warmer water which is likely why they are no longer able to survive in Lake Tippecanoe as recorded historically.

Dissolved Oxygen

Dissolved oxygen is the major factor that determines where organisms can survive in an aquatic system. During the summer, many lakes become layered based on temperature — and the bottom layer is often depleted of oxygen. This is because of chemical reactions that occur when dead plants decay on the bottom. Since the layers do not mix in the summer, the lake is not able to replenish its oxygen through mixing of lake waters. Oxygen depletion also occurs in the winter when surface ice keeps oxygen from entering the water from the air above.

Before dissolved oxygen sensors were developed, scientists used the Winkler method to measure dissolved oxygen in lakes and streams. The Winkler method is a technique which uses “titration,” or the addition of chemical reagents, to determine dissolved oxygen presence. In this method, water is added to a sample bottle and a series of reagents are added. These reagents make an acidic compound, to which the titrating compound is added to neutralize the mixture. The mixture eventually changes colors indicating the dissolved oxygen concentration.³

A Legacy on the Lake

In the 1980s, Norma and her family bought a small cottage on Oswego Lake. Growing up, her children learned about boating at Patona Bay and soon, the family built two homes on Lake Tippecanoe so they could live on the lake full-time. Norma's children grew up to love boating and now they have kids of their own on the lakes. Her grandchildren enjoy visiting and spending time at Camp Crosley, located on the shore of James Lake.

Norma explained that she loves Lake Tippecanoe because "It brings family and friends together... it's so peaceful and relaxing!" But she also mentioned that "If the lake isn't clean, it isn't appealing to people, and people and wildlife can get sick."

To Norma, local lakes are more than just bodies of water, they are part of her family's heritage. She shared, "The lake has been part of our family for three generations... I don't see us ever leaving the lake." As for her favorite memory on the lake? "It has to be when everybody comes back to the lake for the Fourth of July!"

*Pick out the place where you
want to help and then volunteer!*

In the future, Norma hopes to see a "...clean, healthy lake people can use." However, Norma knows that a clean lake isn't achieved overnight, "It's up to all of us to be good stewards and take care of the lakes," she explained. Norma and her husband, Jerry, take care of the lakes through their support of the Lilly Center for Lakes & Streams. She encouraged everyone around a lake to educate themselves about issues in local waterways, then "...pick out the place where you want to help and then volunteer!"



LAKE TIPPECANOE TODAY

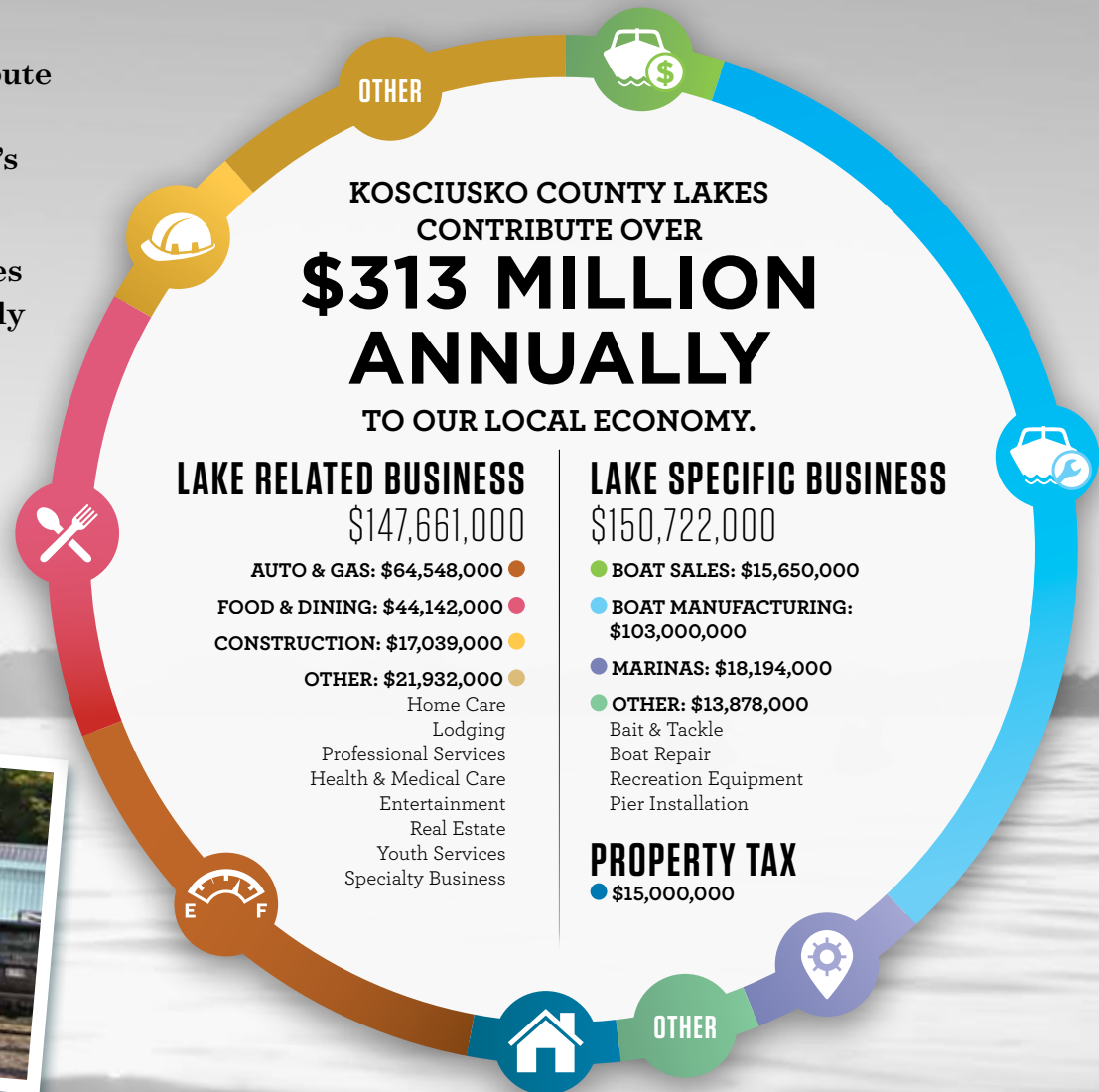
The Lilly Center for Lakes & Streams at Grace College samples streams which flow into Lake Tippecanoe biweekly year round, even in the most brutal of weather conditions. Additionally, the Lilly Center samples the lake weekly during the summer to gain a better understanding of the lake's condition during the months it is most active.

The data collected and presented in the following section is a summary of our results specific to your home: Lake Tippecanoe.

An Economic Force

Kosciusko County lakes and streams not only contribute to the natural beauty and historical richness of our community, but also largely contribute to our county's current economy.

In fact, the Lilly Center for Lakes & Streams estimates that Kosciusko County lakes contribute approximately \$313 million to the county's economy annually. Understanding the impact of our lakes on the economy is an important part of Lake Tippecanoe's story now and into the future. Essentially, the health of Lake Tippecanoe can directly affect the health and success of the economy.



Water Clarity

A MEASURE OF HOW FAR DOWN LIGHT PENETRATES THROUGH WATER

Today, we still measure water clarity using a Secchi disk, but why is consistent measurement of water clarity important? Measuring water clarity is the first step in assessing the health of a lake. A clear lake is generally a healthy lake, but murky water is a sign that something may be wrong — such as too much sediment, pollution or an overgrowth of algae. Once the clarity of water is assessed, it is important to conduct more tests to find out what is affecting the lake's water.

HOW IS WATER CLARITY MEASURED?

Water clarity is measured with a tool called a Secchi disk. A Secchi disk is a frisbee-sized metal disk that is painted with a black and white pattern. The disk is attached to a string and lowered into the lake water until the black and white pattern is no longer visually distinct. The depth of the disk is recorded as a measure of the water's clarity.

Secchi Disk

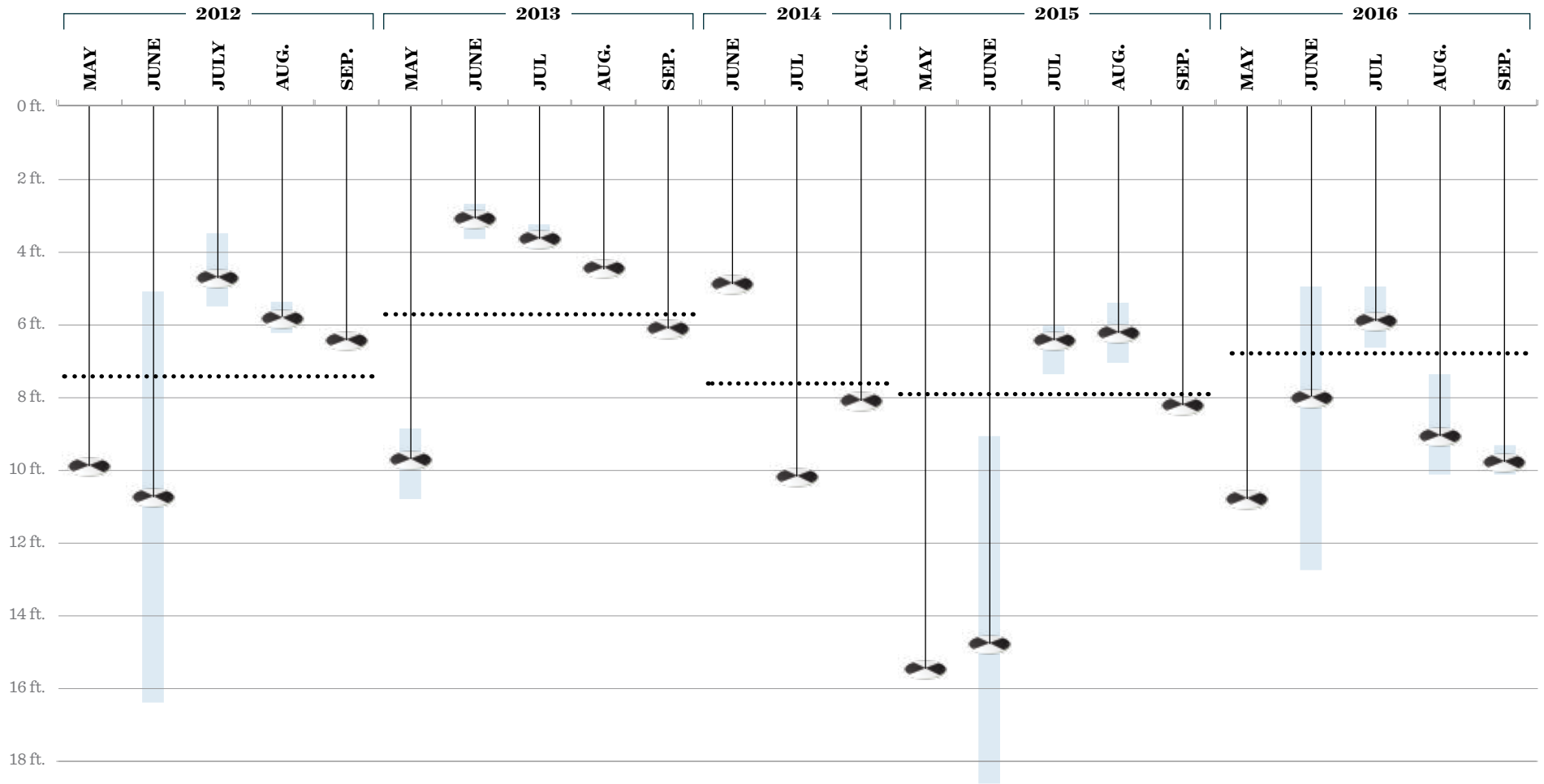


Current Water Clarity

IN LAKE TIPPECANOE

DATA SUMMARY: Lake Tippecanoe's water clarity was typically lowest during June or July each year before improving toward the end of summer. This decreased clarity is likely due to generally higher nutrient (nitrogen and phosphorus) levels. Lake Tippecanoe's water clarity was similar to other all-sports lakes in the county.

 LAKE TIPPECANOE AVERAGE
  LAKE TIPPECANOE MEASURED RANGE
 ALL-SPORTS LAKES IN COUNTY (YEARLY AVERAGE)



Nutrients

SOLUBLE MINERALS THAT PLANTS NEED TO GROW

TOO MUCH OF A GOOD THING: Nutrients are good for lawns and gardens. But when they enter the lake in the form of fertilizers, human and animal waste, or yard waste, they make aquatic plants and algae grow too much. Two of the most important nutrients to study are phosphorus and nitrogen. They are responsible for a majority of weed and algae growth in the lake.

NUTRIENTS, PLANTS AND ALGAE

The figure below shows how nutrients affect a lake's plant life

Few Nutrients

Optimum Nutrient Levels

Nutrient Overload

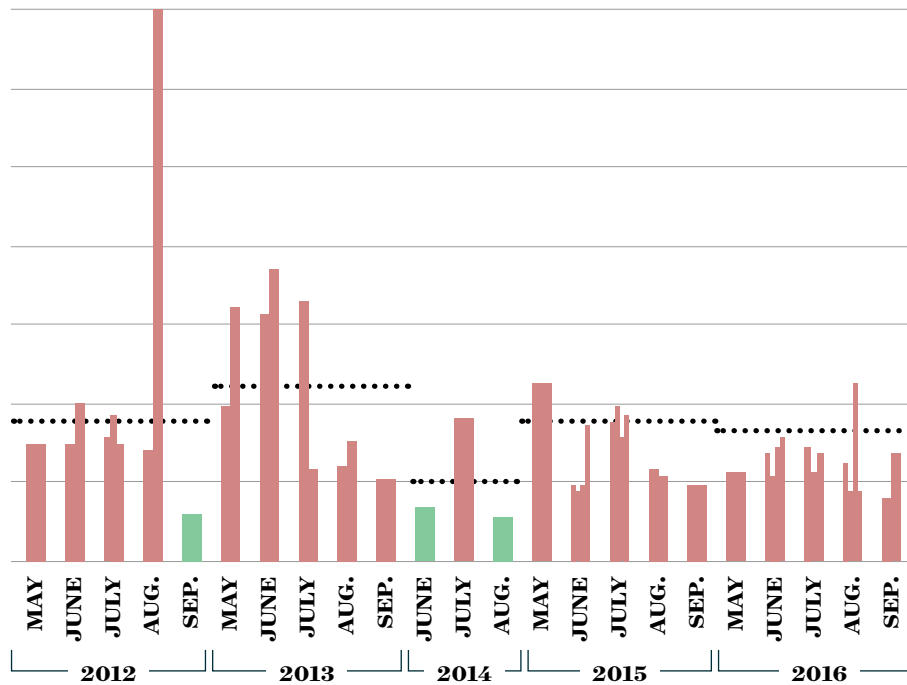


Current Nutrient Levels IN LAKE TIPPECANOE

DATA SUMMARY:

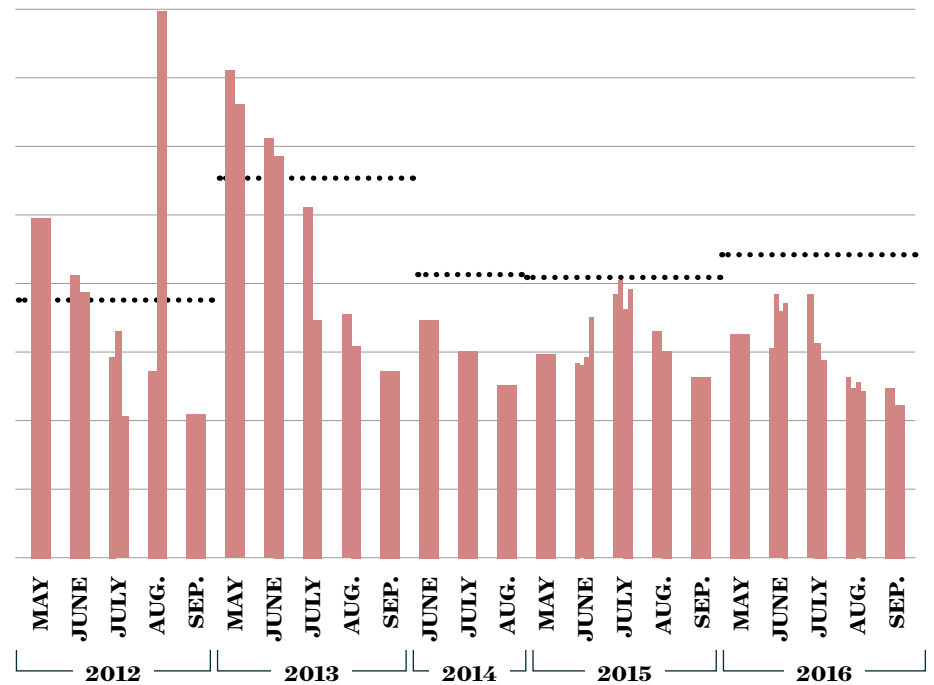
Both phosphorus and nitrogen levels in Lake Tippecanoe were consistently above the Environmental Protection Agency recommended guidelines. The phosphorus and nitrogen levels were variable throughout the summer, indicating varying sources of nutrients and weeds and algae using these nutrients. Lake Tippecanoe's phosphorus and nitrogen levels were similar to other all-sports lakes in the county.

|| LAKE TIPPECANOE ALL-SPORTS LAKES IN COUNTY (YEARLY AVERAGE)



PHOSPHORUS LEVELS IN LAKE TIPPECANOE

Good Levels Bad Levels



NITROGEN LEVELS IN LAKE TIPPECANOE

Good Levels Bad Levels

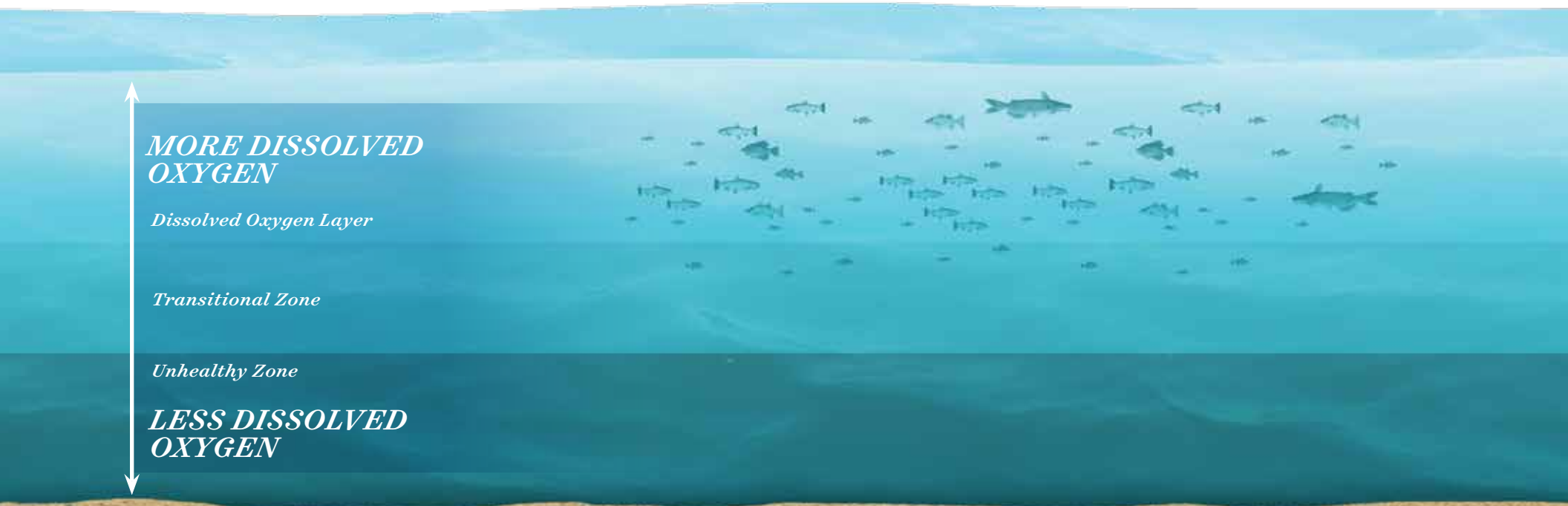
Dissolved Oxygen

GASEOUS OXYGEN IN WATER AND AVAILABLE TO AQUATIC ORGANISMS FOR RESPIRATION

THE EFFECTS OF DISSOLVED OXYGEN: Dissolved oxygen is the major factor that determines where organisms can survive in an aquatic system. During the summer, many lakes become layered based on temperature — and the bottom layer is often depleted of oxygen. This is because of chemical reactions that occur when dead plants decay on the bottom. Since this layer does not mix with the other layers, it is not able to replenish its oxygen through mixing of lake waters. Oxygen depletion also occurs in the winter when surface ice keeps oxygen from entering the water from the air above.

DISSOLVED OXYGEN LAYER

The figure below shows how far down fish and other aquatic species have enough oxygen to survive

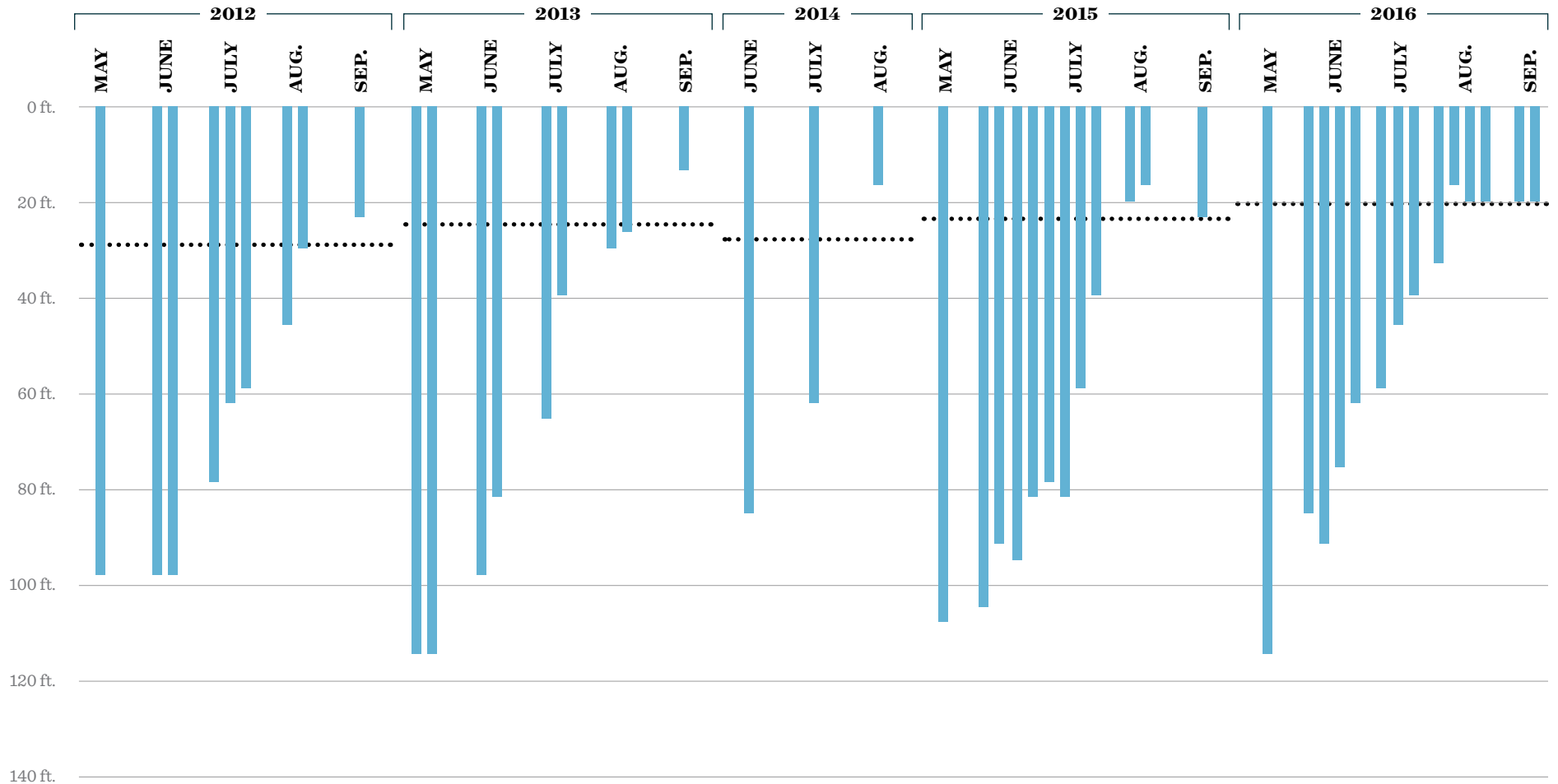


Current Dissolved Oxygen Levels

IN LAKE TIPPECANOE

DATA SUMMARY: Lake Tippecanoe's oxygen layer was consistently thinnest toward the end of the summer, squeezing fish into a smaller space and forcing them into warmer water. The oxygen layer varied among all-sports lakes in the county (partially depending on the lake depth), and Lake Tippecanoe's oxygen layer was usually thicker.

||| LAKE TIPPECANOE ALL-SPORTS LAKES IN COUNTY (YEARLY AVERAGE)



Blue-Green Algae

ALSO CYANOBACTERIA; A SPECIFIC GROUP OF MICROSCOPIC ORGANISMS THAT TYPICALLY LIVE IN WATER AND USE LIGHT FOR PHOTOSYNTHESIS

WHY ANALYZE ALGAE? You have probably seen green or brown “scum” on the surface of the lake before. That is most likely algae. Algae can also be mixed down into the water, changing the color of the lake. Our research focused specifically on blue-green algae because it is the type of freshwater algae capable of producing health-threatening toxins.

WHAT IS BLUE-GREEN ALGAE? A type of algae distinguishable from other algae by its paint-like or “pea soup” appearance. This algae is actually a kind of bacteria that is often blue-green in color but can also be blue, green, reddish-purple or brown.

HEALTH RISKS BASED ON BLUE-GREEN ALGAE LEVELS

*For recreational waters
as outlined by the World
Health Organization*

	LOW RISK LEVELS	MODERATE RISK LEVELS	HIGH RISK LEVELS
Possible Health Problems	Short-term adverse health outcomes, e.g. skin irritations, gastrointestinal illness	Potential for long-term illness with some cyanobacterial species Short-term adverse health outcomes, e.g. skin irritations, gastrointestinal illness	Potential for acute poisoning Potential for long-term illness with some cyanobacterial species Short-term adverse health outcomes, e.g. skin irritations, gastrointestinal illness
Typical Actions	Post on-site risk advisory signs Inform relevant authorities	Watch for scums or conditions conducive to scums Discourage swimming and further investigate hazard Post on-site risk advisory signs Inform relevant authorities	Immediate action to control contact with scums; possible prohibition of swimming and other water contact activities Public health follow-up investigation Inform public and relevant authorities

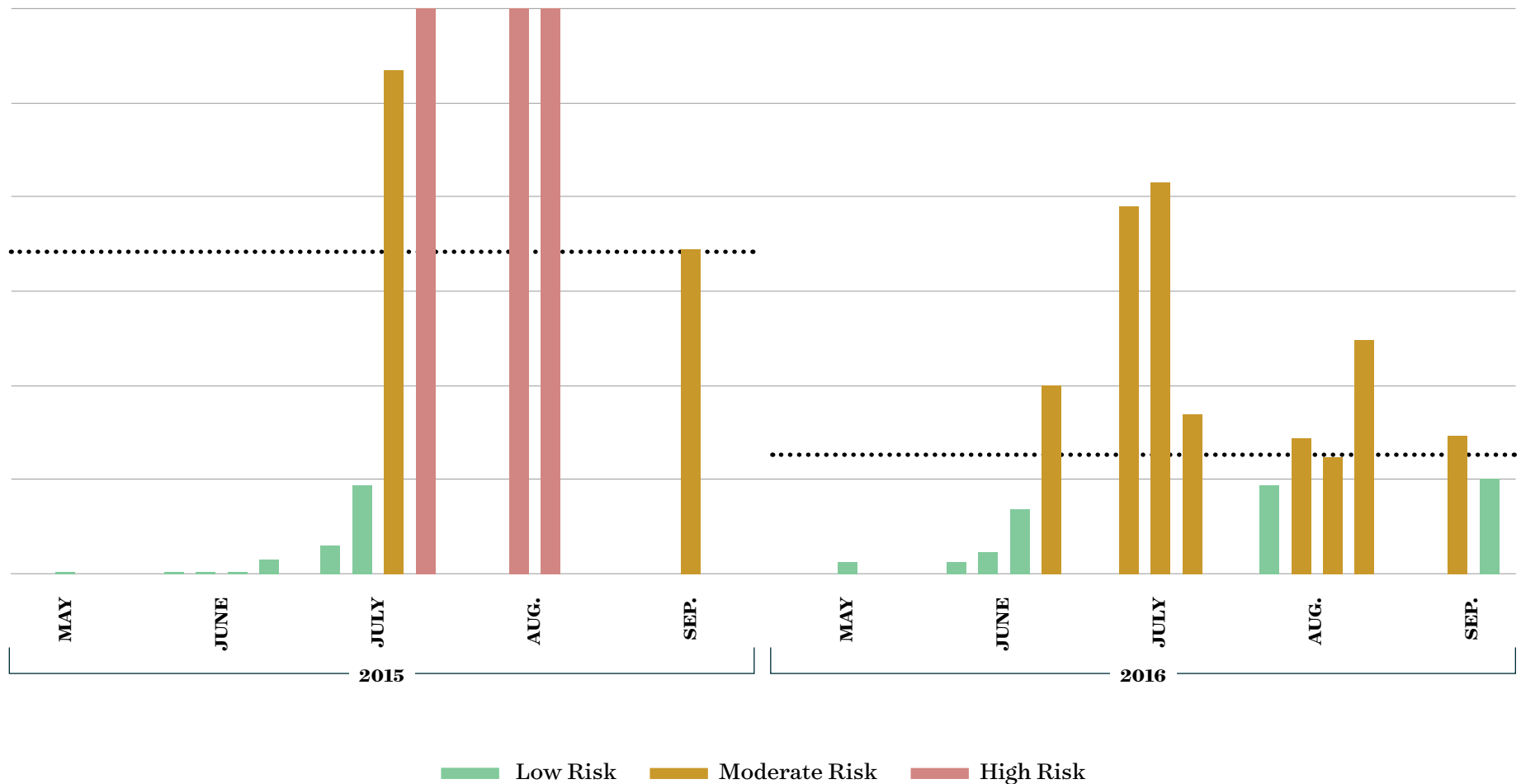
*Blue-Green
Algae Layer*



Current Algae Levels IN LAKE TIPPECANOE

DATA SUMMARY: Blue-green algae populations in Lake Tippecanoe were often above human health guidelines even though the microcystin toxin levels sometimes remained low at those same times (see toxins on next page). Algae levels were in the "high risk" zone three times and in the "moderate risk" zone ten times in the last two years. Algae levels were substantially lower in 2016 showing the variability in blue-green algae populations. Lake Tippecanoe's algae levels were similar to other all-sports lakes studied in the county.

|| LAKE TIPPECANOE ALL-SPORTS LAKES IN COUNTY (YEARLY AVERAGE)



Microcystin Toxin

A COMMON TOXIN PRODUCED BY BLUE-GREEN ALGAE THAT PRIMARILY TARGETS THE LIVER BUT IS ALSO A SKIN, EYE AND THROAT IRRITANT

BLUE-GREEN ALGAE AND TOXIN LEVELS: In addition to measuring the amount of blue-green algae in the lake, we also measured toxins produced by the algae. Both measurements are important because it is not yet understood what causes blue-green algae to release toxins – although our research planned for this summer on Lake Tippecanoe will likely give us more clues. A lake may have

a lot of blue-green algae but not much toxin. The ratio of blue-green algae to toxin is not consistent, so it is important to investigate both.

WHAT IS MICROCYSTIN? Microcystin is the most commonly studied toxin produced by blue-green algae. At high levels, microcystin can cause a variety of health problems (see chart below).

HEALTH RISKS BASED ON MICROCYSTIN LEVELS

*For recreational waters
as outlined by the World
Health Organization*

	LOW RISK LEVELS	MODERATE RISK LEVELS	HIGH RISK LEVELS
Possible Health Problems	Short-term adverse health outcomes, e.g. skin irritations, gastrointestinal illness	Potential for long-term illness Short-term adverse health outcomes, e.g. skin irritations, gastrointestinal illness	Potential for acute poisoning Potential for long-term illness Short-term adverse health outcomes, e.g. skin irritation, gastrointestinal illness
Typical Actions	Post on-site risk advisory signs Inform relevant authorities	Watch for scums or conditions conducive to scums Discourage swimming and further investigate hazard Post on-site risk advisory signs Inform relevant authorities	Immediate action to control contact with scums; possible prohibition of swimming and other water contact activities Public health follow-up investigation Inform public and relevant authorities

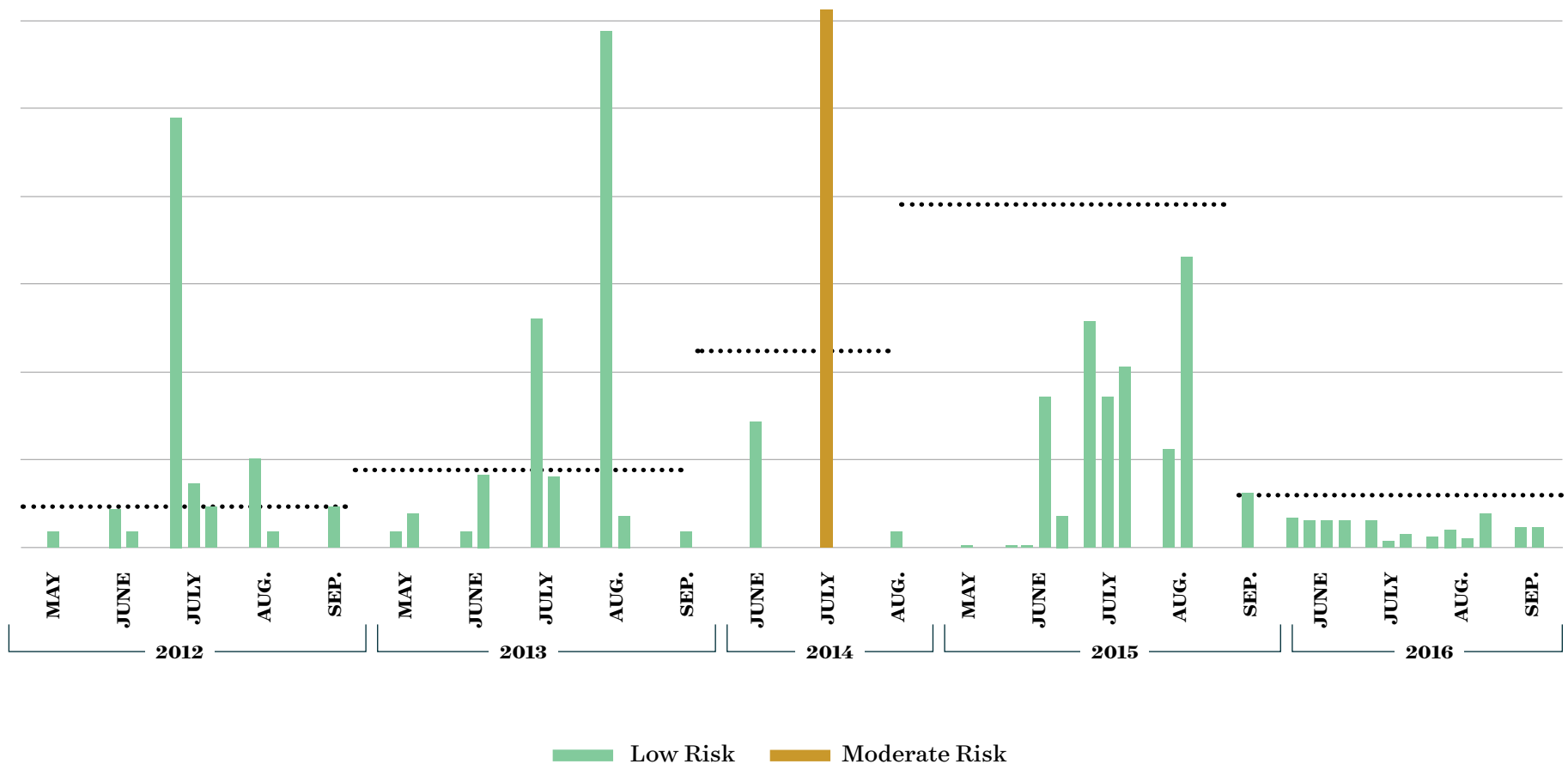
*Sometimes
blue-green algae
can produce toxins*



Current Toxin Levels IN LAKE TIPPECANOE

DATA SUMMARY: While Lake Tippecanoe microcystin toxin levels were highly variable over the last five years, levels were typically in the “low risk” zone. Lake Tippecanoe’s microcystin levels were similar to other all-sports lakes in the county. Even though Lake Tippecanoe’s microcystin toxin levels were usually below guidelines for human health, there is strong potential for future risk. The lake’s blue-green algae numbers suggest that under the right conditions, such as high nutrient levels and warm temperatures, blue-green algae could produce microcystin toxin levels above human health guidelines in Lake Tippecanoe.

|| LAKE TIPPECANOE ALL-SPORTS LAKES IN COUNTY (YEARLY AVERAGE)



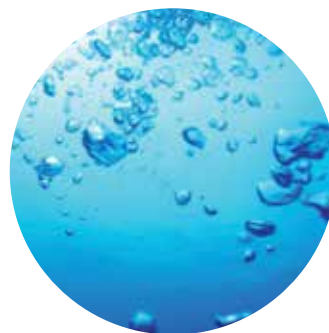
Why the Data Matters

Lake Tippecanoe has a story which includes a strong research heritage stretching back over 100 years. Though this previous research was limited and sporadic, pairing it with recent research from the Lilly Center allows us to explore some possible trends in our lakes. For Lake Tippecanoe, these trends show us some progress and reason for hope for the future, but they also show challenges that require more focused and strategic action:



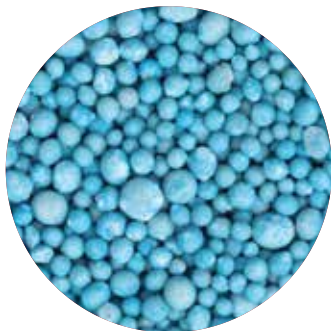
WATER CLARITY

Past trends over the last 25-30 years show much variability in water clarity with improvement most recently. Water clarity declines could be due to more algae growth overall, while increases in water clarity are likely due to less algae, potentially from high populations of invasive zebra mussels that eat some types of algae.



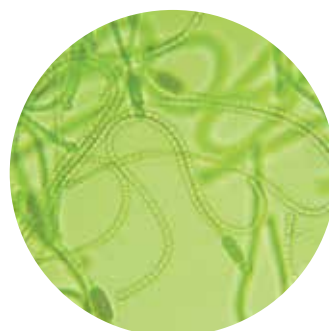
OXYGEN LEVELS

Past trends over the last 100 years show oxygen levels have declined over time in Lake Tippecanoe. This increasingly limits the space in which fish can live and can lead to more available nutrients which sustain algae and weed growth. Currently, fish can survive in only about 27% of Lake Tippecanoe's total depth.



PHOSPHORUS LEVELS

Past trends over the last 40 years show no obvious trends in phosphorus levels. Past and current phosphorus and nitrogen levels are consistently above recommended guidelines, encouraging excess weed and algae growth in Lake Tippecanoe.



BLUE-GREEN ALGAE

Blue-green algae populations in Lake Tippecanoe are often above human health guidelines even though algae toxin levels have generally remained low. Lake Tippecanoe's algae toxin levels were similar to other popular lakes in the county. High blue-green algae populations suggest there is strong potential for future risk.

Some of these measures show signs of hope, while others encourage us to work even harder toward a cleaner Lake Tippecanoe. The Lilly Center's current research now makes county lakes, once studied sporadically and inconsistently, the most thoroughly studied in the state allowing future strategic actions based on science.



THE FUTURE OF LAKE TIPPECANOE

At the Lilly Center for Lakes & Streams, we are increasing our momentum with cutting edge research and groundbreaking education. We are also increasing collaboration with local groups to make sure these trends reflect the positive work of so many organizations, community groups, and individuals who have been the bright spots in the lake's story.

THE LILLY CENTER FOR LAKES & STREAMS IS DEDICATED TO MAKING LAKE TIPPECANOE CLEAN, HEALTHY, SAFE AND BEAUTIFUL

WE HAVE THE EXPERTISE AND TOOLS TO CONDUCT GUIDING RESEARCH.

Led by a professor of freshwater science, outfitted with the necessary equipment, and growing to meet continuing community need the Lilly Center can perform high-quality research at a local level, focusing on the lakes and streams of Kosciusko County.

WE HAVE THE CAPACITY AND COMPETENCY TO PROVIDE RESOURCES.

Our website is a clearinghouse of data, tools and other resources pertaining to Kosciusko County lakes and streams. Our offices house educational and scientific resources we make available to local communities and our facilities are continuing to expand. And now, the Lilly Center's presence in the community is supported into the future by our growing endowment fund.

WE HAVE THE BACKGROUND AND TALENT TO ENGAGE AND EDUCATE RESIDENTS.

Our staff is experienced at national and local levels with operating K-12 and community outreach programs. Our Grace College student interns and volunteers give us the personnel we need to effectively and efficiently conduct our education programs.

WE HAVE THE INFRASTRUCTURE AND POSITIONING TO LEAD COLLABORATIVE EFFORTS AMONG LOCAL ORGANIZATIONS.

Our expanding Grace College facilities accommodate meetings, workshops and other gatherings. With countywide perspective we help create working partnerships and facilitate exchanges of knowledge and expertise.

WE WANT OUR LAKES AND STREAMS TO BE SOMETHING WE CAN ALL BE PROUD OF, TO BE CLEAN, HEALTHY, SAFE AND BEAUTIFUL.

By supporting the Lilly Center for Lakes & Streams you're ensuring that every effort is being made to make the lakes and streams of Kosciusko County cleaner now and into the future through ongoing research, education, and collaboration.

Preparing for the Future

In 2015, the Lilly Center for Lakes & Streams established an endowment fund for the purpose of establishing the Lilly Center as a permanent entity in the county for groundbreaking research, community and K-12 education, and effective collaboration. Funds contributed to the endowment sustain our efforts for the health of our economy, for the health of our communities, and for the health of your children and grandchildren.

The response and support for this endowment project has been astounding. We have received gifts and pledges from individuals, businesses and organizations which have helped us raise over \$5M to be set aside in an endowment fund to provide ongoing support for the Lilly Center into the future.

Furthermore, this spring, Grace College's Lilly Center for Lakes & Streams announced its change in name. The new name acknowledges the substantial leadership gifts for the Lilly Center's endowment that were secured from Lilly Endowment, Inc. as well as from the Lilly Family through the Ruth Lilly Philanthropic Foundation.

The Lilly Center for Lakes & Streams is honored to be affiliated with the Lilly Family and their legacy of research involvement on local lakes. The Lilly Family's influence in a legacy of research excellence with Kosciusko County lakes is unmatched in our region. The Lilly Center for Lakes & Streams is committed to excellence in all our efforts to ensure that our local lakes continue to be among the most thoroughly studied in the state for generations to come.

LILLY CENTER FOR
**LAKES &
STREAMS**™



GRACE
COLLEGE

COLLABORATING TO MAKE KOSCIUSKO COUNTY LAKES CLEANER

Lake Tippecanoe is best served as these organizations continue to grow in partnership as each brings important impact in their unique areas of expertise:



LAKE TIPPECANOE PROPERTY OWNERS (LTPO) "The Lake Tippecanoe Property Owners was formed in 1944 as the Lake Tippecanoe Protective Association. It was founded largely for the purpose of preserving the beauty and health of the lake. Today, we still have that as a primary goal." However, to meet the present challenges facing waterways, LTPO's goals have been expanded and are, "To preserve and protect the ecology; encourage only those uses of property around the lake which will produce a positive impression and a positive environmental impact; to prevent dangerous, injurious, or noxious conditions such as pollution, unsanitary conditions, or overcrowding on land or water." For more information, visit ltpo.org.



THE WATERSHED FOUNDATION (TWF) was founded in 1997 to protect and improve water quality in our local lakes and streams. TWF takes action by stopping pollution at its source. The Foundation achieves success by installing water quality improvement projects on the land, empowering landowners to make clear choices for clean water, and leading partnerships throughout the upper Tippecanoe River watershed. For more information, visit WatershedFoundation.org.



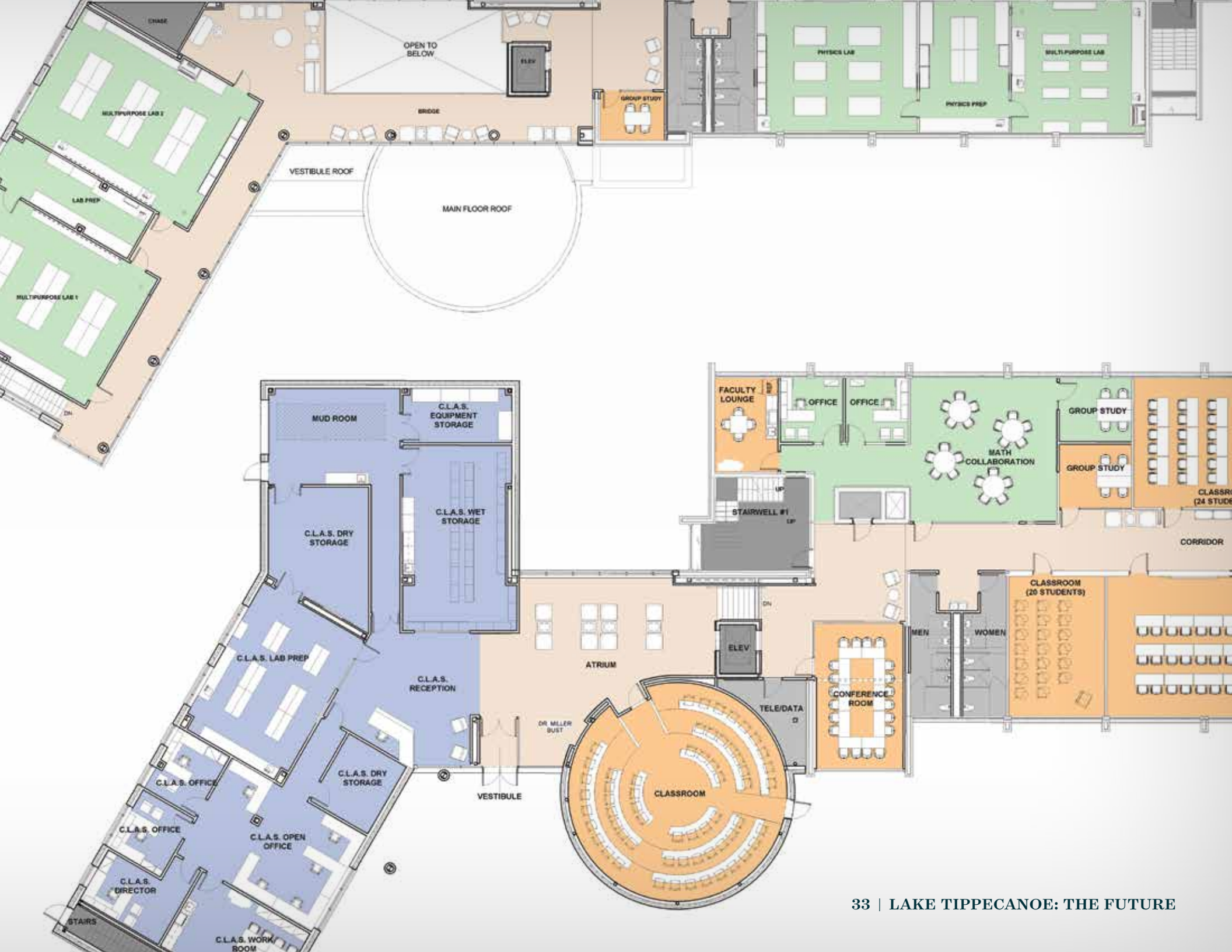
LILLY CENTER FOR LAKES & STREAMS AT GRACE COLLEGE Established in 2007, the Lilly Center for Lakes & Streams is dedicated to conducting research, providing lake and stream education, and collaborating with other groups to make Lake Tippecanoe and other county lakes clean, healthy, safe and beautiful. For more information, visit lakes.grace.edu.

New Facilities

The Lilly Center for Lakes & Streams has experienced great growth in programming, research, staff, and community involvement over the last decade. New facilities will feature state-of-the-art laboratory space, community and educational resources, increased storage space which will allow for program expansions, and collaborative office space.

The Lilly Center for Lakes & Streams is looking forward to the construction of new facilities. Grace College is beginning construction on a new science facility: the Dr. Dane A. Miller Science Complex this summer. With major funding by Dr. Dane and Mary Louise Miller, Zimmer Biomet, K21 Health Foundation, and friends of Grace College, the new facility will include specifically designed and dedicated space for the Lilly Center. This space will help the Lilly Center increase its impact in the community.





LAKE TIPPECANOE HAS A GREAT STORY. NOW IT IS YOUR TURN TO HELP WRITE THE NEXT CHAPTER.

Lake Tippecanoe and other Kosciusko County lakes have shaped not only our local landscape, but each of our lives. Our endowment fund is one way to ensure that these resources are always studied, monitored, and never forgotten. But, making and keeping them clean is up to you.

Making our lakes and streams cleaner is more important than ever. The health of our lakes is directly linked to the health of the local economy, the health of your children and grandchildren, and the health of our greater community.

Endowment funds ensure the Lilly Center's presence, but ensuring continual program growth in areas of groundbreaking research, K-12 and community education, and collaboration with partner groups can only be accomplished through your ongoing support.



What you can do to help:



REDUCE FERTILIZER USAGE ON YOUR LAWN AND GARDEN

(especially close to the lake) to save yourself some money and keep extra nutrients out of Lake Tippecanoe. If you want to know exactly how much nutrients your lawn or garden needs, the Lilly Center for Lakes & Streams can help you with soil testing resources.



EXPAND COLLABORATIVE RELATIONSHIPS AND PROJECTS WITH NON-LAKE RESIDENTS.

Water flows downhill, so neighborhoods, industries, farmers and businesses in areas surrounding Lake Tippecanoe all influence the lake. Your support and participation has allowed the Lilly Center for Lakes & Streams to pursue these efforts, and we look forward to working with you to expand them.



ADD BEAUTIFUL VEGETATION ALONG YOUR SHORELINE

to filter out nutrients as water carries them toward the lake. Native plants (those plants that occur naturally in our region) are best because they cut down on your maintenance costs and provide the best filtration. The Lilly Center for Lakes & Streams has information to help you get started.



PROVIDE FINANCIAL SUPPORT

toward research to solve the identified challenges facing Lake Tippecanoe. The Lilly Center samples inflowing and outflowing streams and can use this data to start quantifying nutrient sources. This will help us navigate future efforts toward efficiently reducing these nutrient sources. Your financial support helps us pursue strategic actions based on science.



AVOID YARD WASTE ENTERING THE LAKE.

Leaves, grass clippings or other yard waste have nutrients which increase algae growth, reduce water clarity and lead to less oxygen for fish. Use this yard waste as compost in your garden to further reduce your fertilizer use or have it removed from your property. If you would like to start composting and need some direction, the Lilly Center for Lakes & Streams can help.



ENGAGE OUR LAKE NEIGHBORS AND OUR NON-LAKE COMMUNITY MEMBERS

in educational programs that inform them about how to best take care of Lake Tippecanoe. You might consider helping as a volunteer for the Northern Indiana Lakes Festival or financially supporting one of our K-12 programs.

Making the Lake the Best it Can Be

The Tippecanoe Lakes, specifically Oswego Lake, have played an important role in John Warren's family.

John has spent the last 30 years enjoying Oswego Lake and explained, "There's just a natural beauty to the lake that I've grown to appreciate." In the mid-1980s, John's sister and brother-in-law bought a boat and rented dock space at Patona Bay. The family would go on boat rides and enjoy cookouts on the lake. John's parents, Bill and Molly, also purchased a home in 1990 so the family could enjoy lake living. John's sister and brother-in-law even bought a home on the lake and five years ago, John and his wife, Lisa, purchased a home on Oswego Lake across from his parents' home.

John mentioned that the lake adds value to the surrounding community recreationally and, in turn, economically: "The quality of life that clean, healthy lakes bring to the community is important," John elaborated. He explained that preserving local lakes for future generations is vital and that some of his favorite memories are of, "...watching my son, nieces and nephews grow on the lake and enjoy it."

As a supporter of groups such as the Lake Tippecanoe Property Owners, The Watershed Foundation, and the Lilly Center for Lakes & Streams, John is doing his part to care for Oswego Lake. He explained that he is a strong proponent of lake enhancement initiatives, has a glacial stone wall along his lakefront shoreline, and uses non-phosphorus fertilizer on his yard. John added, "It's so important that both lake residents and community members not take our lakes for granted."

*It's so important that both lake residents
and community members not take our lakes
for granted.*

In the future, John hopes that life on Oswego Lake does not look much different, but that its natural beauty is preserved for generations to come.



It's time to make a difference.

If you would like to support the Lilly Center for Lakes & Streams in our efforts to make your lake clean, healthy, safe and beautiful through groundbreaking research, K-12 and community education, and collaboration, you may enclose your donation in the envelope included. All gifts are tax-deductible and 100% of funds go directly to the Lilly Center to support our work.

Interested in making a difference in your lake for future generations? Call us at 574-372-5100 x6445 to talk to us about planned and estate giving options.

DONATE ONLINE

Would you like for your gift to start making a difference in your lake's health right away? Just visit our website and click "Donate Now".

lakes.grace.edu



REFERENCES:

1. What is a Secchi? (2015, April 29). Retrieved April 11, 2017, from <http://www.secchidipin.org/index.php/monitoring-methods/the-secchi-disk/what-is-a-secchi/>.
2. Who We Are. (n.d.). Retrieved April 11, 2017, from <https://www.iisd.org/ela/about/who-we-are/>
3. Bruckner, M. C. (2017, April 6). The Winkler Method - Measuring Dissolved Oxygen. Retrieved April 11, 2017 from http://serc.carleton.edu/microbelife/research_methods/enviro_n_sampling/oxygen.html

Historic images courtesy of the Indiana Historical Society.

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