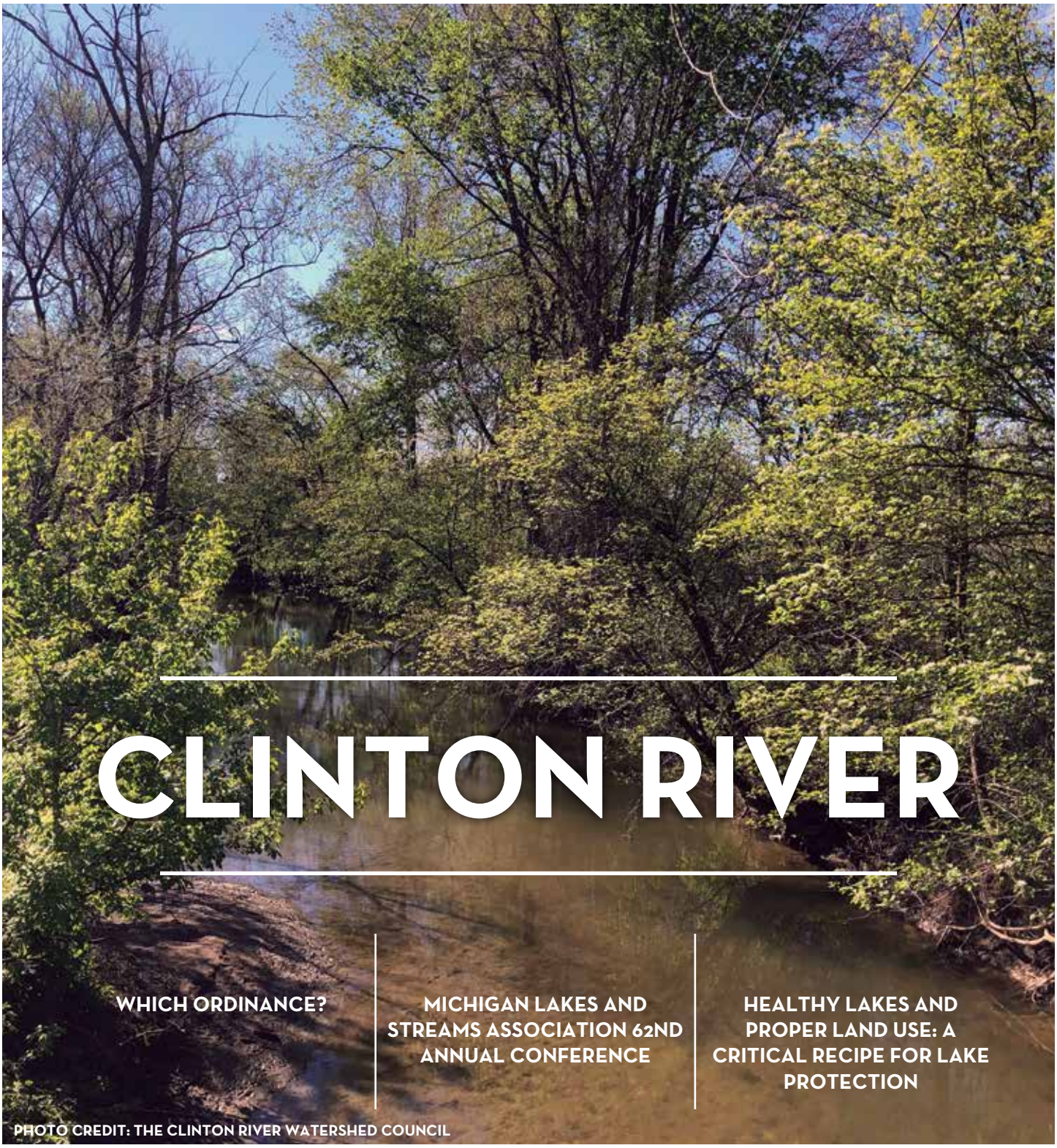
THE MICHIGAN
RIPARIAN
SUMMER 2023 | VOLUME 59 | NUMBER 3



CLINTON RIVER

WHICH ORDINANCE?

MICHIGAN LAKES AND STREAMS ASSOCIATION 62ND ANNUAL CONFERENCE

HEALTHY LAKES AND PROPER LAND USE: A CRITICAL RECIPE FOR LAKE PROTECTION

PHOTO CREDIT: THE CLINTON RIVER WATERSHED COUNCIL

INSIDE

SUMMER 2023 | VOLUME 59 | NUMBER 3

FEATURE

IN EVERY ISSUE

THE MICHIGAN RIPARIAN
mi-riparian.org

The Michigan Riparian (ISSN 0279-2524) is published quarterly for $6.25 per issue by the Michigan Lakes & Streams Association, Inc., a Michigan nonprofit corporation. Nonprofit postage is paid at Lansing, Michigan and additional mailing offices.
Postmaster:
Send address changes to:
MLSA
PO Box 19615
Kalamazoo, MI 49019

The Michigan Riparian is the only magazine devoted exclusively to the protection, preservation, and improvement of Michigan waters and to the rights of riparians to enjoy their waterfront property.
The Michigan Riparian magazine is published quarterly and is mailed to subscribers in the spring, summer, fall, and winter each year.

The Michigan Riparian
PUBLISHED BY MLSA
PO Box 19615
Kalamazoo, MI 49019
Phone: 989-831-5100
E-mail: info@mymlsa.org
SUBSCRIPTION RATES (4 issues/year)
Individual annual subscription: $25
Member association quantity subscriptions: $14
ADVERTISING RATES
Advertising rates sent upon request or available at mi-riparian.org.
Deadlines: February 1 for Spring issue
May 1 for Summer issue
August 1 for Fall issue
November 1 for Winter issue
Printed by Spartan Printing, Lansing, Michigan

CONNECT WITH US

FACEBOOK
@MichiganRiparian

INSTAGRAM
@MichiganRiparian

TWITTER
@miriparian

DIRECTOR'S NOTES

This issue is coming just after a wonderfully successful 62nd Annual Conference at Crystal Mountain in early May. It was very exciting to see so many returning members and ***122*** newcomers this year. We were able to welcome back the MiCorps Cooperative Lakes Monitoring in-person training after only being available online during the COVID-19 pandemic. It was our last year at Crystal Mountain and we went out with a bang. I invite you to check out all the photos captured by MLSA President, David Maturen, in the Conference Recap that follows in this issue. I also invite you to save the date for our 63rd Annual Conference on April 26 and 27, 2024. We have a brand new conference center location and are already pulling together session ideas from our partners and the conference feedback we received.

As things have calmed down after our event, I have been catching up on some related reading. One of our keynote speakers was Ted Rulseh, who joined us all the way from Wisconsin and had an inspiring presentation. He is the author of several books relevant to riparians all around the midwest as well as the country. Before his talk I had the pleasure of reading his newest book, *Ripple Effects: How We're Loving Our Lakes to Death*. Since the conference I have started reading some of his other published works as well. You can check out Ted's books, presentations, and blog on his website: thelakeguy.net. If you were unable to attend the conference, I highly recommend checking out his online resources for your own reading list.

I have a couple of other lake and stream-related books on my shelf for summer reading. One is a book just published this year, *The Devil's Element: Phosphorus and a World Out of Balance* by Dan Egan. I haven't started this one yet but I recently attended a talk by the author, so I'm looking forward to it. I am especially interested because I previously read Dan Egan's best seller, *The Death and Life of the Great Lakes*, which I would highly recommend if you haven't read it. This book tells the story of the Great Lakes like a historical account you wish was fictional.

Another book on my list is *The Nature of Oaks: The Rich Ecology of Our Most Essential Native Trees* by Douglas W. Tallamy. I bring this one up because there is a connection between trees and our water that we often overlook. We have a couple of articles from the past and present in this issue that address the importance of trees to the riparian zones of our lakes and streams. I hope you will take some time this summer to enjoy a cool drink and a good book by the lake. I am always looking to discover more books about our waters, so please share your favorites with me.

Enjoy your water,

Melissa DeSimone

MELISSA DESIMONE | MLSA EXECUTIVE DIRECTOR

MLSA is a 501(c)3 nonprofit, statewide organization dedicated to the preservation, protection, and wise management of Michigan's vast treasure of inland lakes and streams.

"WHICH ORDINANCE?"

CLIFFORD H. BLOOM, ESQ.
BLOOM SLUGGETT, PC
GRAND RAPIDS, MICHIGAN
WWW.BLOOMSLUGGETT.COM

Legislation enacted by Michigan municipalities (including townships, cities, and villages) is by means of an ordinance. Pursuant to both the Michigan Constitution and statutes, local governments have wide and extensive ordinance powers. It is almost always a beneficial exercise for riparians, lake and river associations, and other water stakeholders to periodically review local municipal ordinances to ensure that they protect the waterfront.

There are generally two types of municipal ordinances in Michigan – zoning ordinances and everything else. Ordinances that do not contain zoning regulations are often referred to as police power ordinances, non-zoning ordinances, standalone ordinances, or regulatory ordinances (even though the meaning is generally identical for all of them) (hereafter, "police power ordinances"). Zoning ordinances typically regulate land uses and development, whereas police power ordinances usually regulate activities or the characteristics of buildings, structures, and fixtures (for example, building codes). Police power ordinances that regulate the waterfront can include dock and boat ordinances, wetland ordinances, dune protection ordinances, environmental ordinances, land division ordinances, private road ordinances, fertilizer ordinances, and tree ordinances. Unfortunately, the *use* (zoning regulations) versus *activities* (police power ordinances) distinction is imperfect and there is frequently a great deal of overlap between zoning and non-zoning ordinance topics.

Zoning ordinances are more difficult for a Michigan municipality to enact. All zoning regulations are governed by the Michigan Zoning Enabling Act, being MCL 125.3101 *et seq*. (the "ZEA"). Pursuant to the ZEA, zoning ordinances (and amendments) for cities, villages, and townships originate with the local planning commission. The planning commission must hold at least one public hearing on any proposed zoning regulations (with the appropriate notice appearing in the newspaper at least 15 days before the public hearing). Once the public hearing has been held, the planning commission makes a recommendation to the legislative body of the municipality (i.e. the township board, city council, or village council) regarding whether or not to adopt the zoning regulations. If the legislative body adopts and enacts the new zoning regulations, a notice of adoption must appear in the newspaper within 30 days.

Generally, police power ordinances do not need to originate with or even be considered by a municipal planning commission (unless the legislative body asks for the planning commission's recommendations or input). And, in most cases, the legislative body need not hold a public hearing before adopting a police power ordinance, but must allow reasonable public comment pursuant to the Michigan Open Meetings Act, being MCL 15.261 et seq. (the "OMA"). A general law township can normally introduce and enact a police power ordinance at the same township board meeting. With most cities, villages, and charter townships, however, a police power ordinance or regulation will need two different "readings" (i.e. the ordinance provisions must be addressed at two different legislative body meetings and cannot be introduced and enacted at the same meeting). Furthermore, depending upon the city, village, or charter township involved, some or all of the proposed police power ordinance must be published in the newspaper (or otherwise) between the first and second readings. Upon enactment, the appropriate notice of adoption must also appear in the newspaper or elsewhere.

If the strict requirements for enacting a zoning ordinance are not followed (or if a municipality mistakenly enacts a zoning regulation pursuant to the more summary police power ordinance enactment procedures), the zoning ordinance will be invalid. However, if a police power ordinance is enacted with the stricter requirements for a zoning ordinance, the police power ordinance will still be valid (i.e. the municipality will not be punished for according "too much due process").

There is also another important difference between zoning regulations and police power ordinances – the lawful nonconforming use or structure defense. Pursuant to the ZEA and constitutional principles, a zoning ordinance (or an amendment thereto) cannot make unlawful (and at other times,

(CONTINUED ON PAGE 7)

(CONTINUED FROM PAGE 6)

even regulate) a use or structure that existed and was lawful before the new applicable zoning ordinance or amendment took effect. However, with a police power ordinance, there is no such "grandparent" defense right. In other words, police power ordinances (or amendments thereto) can significantly regulate, and in some cases even make unlawful, activities and matters that were lawful before the ordinance or ordinance amendment went into effect. Of course, if the municipality so desires, it can insert a "grandparent" clause into a police power ordinance, but it generally need not do so.

Can a municipality draft and enact a zoning ordinance or police power ordinance without the help of its municipal attorney or a municipal planner? In most cases, that is not advisable. Although various examples of different types of ordinances or ordinance provisions can be obtained online or virtually, the "cut and paste" route can potentially cause problems, including whether or not the resulting ordinance provisions are clear, comprehensive, and enforceable.

If municipal officials do not enforce their municipality's ordinances, can citizens file a lawsuit to enforce an ordinance provision instead? The legal concept is called "standing," and a court must determine whether a neighboring or nearby property owner has a sufficient interest in the ordinance controversy involved in order to commence and pursue an enforcement lawsuit. In general, the Michigan courts have granted standing to an adjoining or nearby property if and only if the property owner can demonstrate *special damages*. That is, a property owner who would enforce a zoning or other ordinance regulation in court must demonstrate that the potential damages they would suffer from the ordinance violation will be more significant and greater to them than any harm that would be caused by the violation to other area property owners or the general public. Rarely are claims of increased traffic, lowering of property values, noise, dust, or similar negative impacts enough to constitute special damages in order to confer standing on a neighboring or nearby property owner.

Remember, it is best to have good lake protection zoning and police power ordinances in effect before a problem occurs. Attempting to deal with an issue after the problem arises may be too late.

▪▪▪

Both the Michigan Lakes & Streams Association, Inc. and I continue to receive many inquiries from riparians regarding the problem of a significant number of boats anchoring at a sandbar or shallow area offshore where the occupants are partying for hours. Many riparians wonder what can be done to solve that problem. There have been at least four articles in *The Michigan Riparian* in the recent past that discuss the topic. Please see "Extinguishing Unwanted and Unused Roads, Alleys, and Parks (and other Assorted Lake Issues)" (Fall, 2022), "Unusual (But Potentially Helpful) Local Municipal Regulations" (Fall, 2012), "Mooring One's Boat Over the Riparian Bottomlands of Another" (Winter, 2018), and "I Can No Longer Even Enjoy My Lake…" (Winter, 2016), and "Twixt the Water and the Land" (Summer, 2018).

This problem has both Michigan common law and ordinance components. In Michigan, most riparian lots on inland lakes extend to the center of the lake through the riparian bottomlands. In general, only the riparian property owner can install and utilize docks, piers, overnight boat moorings, swim rafts, etc. on their own bottomlands. See *Swartz v Sherston*, 299 Mich 423; 300 NW 148 (1941); *Hilt v Weber*, 252 Mich 198; 233 NW 159 (1930); *Hall v Wantz*, 336 Mich 112; 57 NW2d 462 (1953). One exception to that rule is that once someone lawfully accesses a lake (even a private lake), they have the right to boat anywhere on the surface of the lake. Such watercraft users also have the right to temporarily anchor on

(CONTINUED ON PAGE 8)

WHICH ORDINANCE?

(CONTINUED FROM PAGE 7)

the bottomlands of another during a storm or for "navigability" purposes. *Ibid*. The Michigan appellate courts have generally held that "navigability" includes the right to anchor temporarily for fishing and waterfowl hunting. Unfortunately, however, the Michigan appellate courts have not expressly dealt with the issue of whether the boating public can anchor on a sandbar or otherwise for hours at a time to party or for general recreational purposes. Nor have the appellate courts addressed the issue of whether people from an anchored boat can walk in shallow waters on the bottomlands of another without the permission of the owner of the underlying bottomlands. Furthermore, civil lawsuits for trespass are likely not feasible given the attorney fees and costs involved, as well as the fact that the boaters who would be sued could very well change from day-to-day or week-to-week.

Likely the better way to solve the "nuisance boat gathering" problem is by way of a local ordinance. In the past, such ordinances have been difficult to draft. For example, should a time limit be placed on how long a given boat can be anchored offshore where it does not involve lawful activities such as fishing or waterfowl hunting? Could ordinance language be utilized that prohibits X number of boats from mooring and tying up together for more than Y hours for partying or similar purposes? As you can see, such ordinances would not only be difficult to draft, but to enforce as well. The better solution might be an ordinance that prohibits docked or moored boats from interfering with navigability or boat safety, or that create a nuisance. For example, an ordinance could be drafted that empowers police officers to require that boats or watercraft disperse or move if they are interfering with navigability, blocking a channel or canal, are anchored in such a way as to prevent riparians from moving their boats out from their dock into the open waters, or where watercraft generally create a nuisance. If a boater refuses to move notwithstanding a valid police warning, the boat operator could be issued a municipal civil infraction citation/ticket. Such an ordinance might be effective on a given lake, but it would entail a commitment by the local police authorities to vigorously enforce the ordinance and to have a source of funding for such police patrols.

THE USE OF VEGETATIVE BUFFER STRIPS TO MITIGATE THE IMPACT OF SEPTIC TANK EFFLUENTS ON LAKE WATER QUALITY

FROM THE MICHIGAN STATE UNIVERSITY EXTENSION SERVICE

THROWBACK FROM *THE MICHIGAN RIPARIAN* MAGAZINE, NOVEMBER 1983 ISSUE

Irrespective of on-site sewage disposal method, an additional way to limit nutrient input to the lake is to preserve a natural strip of phreatophytic/woody vegetation ("moisture loving plants") along the water's edge. This buffer zone of indigenous plants will help stabilize the lakeshore as a precaution against erosion. It also intercepts some of the nutrients which would otherwise enter the lake by either surface runoff or subsurface drainage such as from household drain fields. This interception is accomplished by nutrient uptake via the root systems, with subsequent conversion of at least part of these nutrients to the relatively permanent biomass of the woody tissues of trees or shrubs. This interruption and partial retention of effluent nutrients in shoreside trees and shrubs is a preferable alternative to the direct entrance of these nutrients to the lake where they may contribute to aquatic weed and algal growth. While much of the nutrient uptake by the vegetative buffer strip may be expected to return in leaf fall at the onset of winter, any interruption of effluent nutrients to algae and aquatic vegetation during the spring and summer growing season helps.

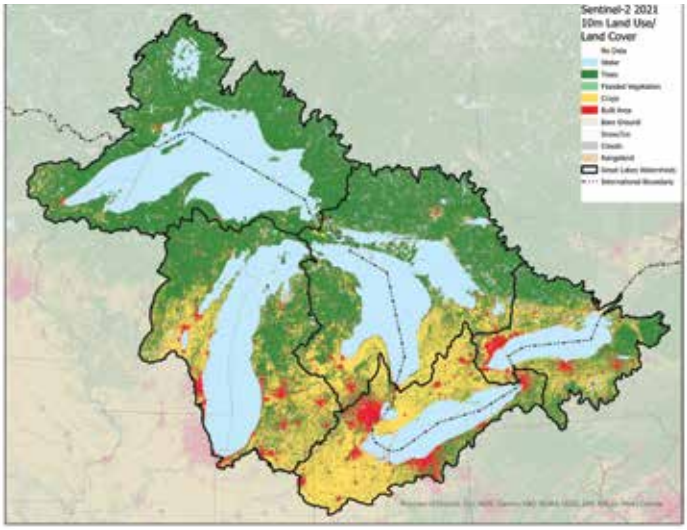
If the lake lot is just being developed, the owner should leave as wide a strip of undisturbed vegetation as possible, particularly if a relatively steep slope is involved. In addition to heightened water quality protection, this practice also increases the aesthetics of the lake by preserving its natural appearance, and provides the resident with more leisure time since less yard maintenance is required. In fact, the less the natural vegetation of the home site is disturbed, the better, so long as the initial cover is natural and thriving.

Where the property has already been extensively developed, the sculptured, manicured lawns right down to the water's edge should be modified by the reintroduction of locally common phreatophytic vegetation. This can be accomplished by the selective planting of terrestrial species observed growing in this zone at other sites around the lake where development has not yet occurred. In inventorying the surrounding habitats for selection of the species to be incorporated, attention should be paid to the comparison and contrast of the two areas with respect to soil type, moisture content, depth to water table, and slope. In selecting species for reintroduction, the assistance of the Department of Natural Resources regional forester can be invaluable.

In selecting species for incorporation in the buffer zone, a combination of deep-rooted and shallow-rooted plants should be considered for optimal drainage interception, as well as the inclusion of a suitable mixture of ground cover species. This will ideally result in a three-tiered complex of tall trees, shorter trees and shrubs, and ground-level vegetation, such as ferns, creepers, or grasses. When selecting the species to be used, their relative compatibility to one another must be considered. This may entail planting some species in different seasons or time intervals to allow for differing growth rates. Similarly, the ultimate size of the plantings should be considered with respect to their potential for screening unsightly structures on the property or the possibility that they would obstruct a preferred view. Cooperating personnel of the Michigan State University Extension Service in the Department of Horticulture, and the School of Urban Planning and Landscape Architecture may be approached for assistance in planning the best positioning of the species selected.

Once the choice of species is made, appropriate seedlings or larger individuals must be acquired. Care should be taken to avoid the introduction of exotic species which may disrupt the local ecology. Similarly, individuals should be cautioned not to attempt to remove any wild species from public land, as this is a violation of state law.

The American homeowner would appear to take considerable pride in his or her lawn, as indicated by the large market in home gardening supplies. This same pride and industriousness can be applied to the lake property setting, with the resident deriving similar satisfaction. However, the effort expended must be redirected toward the more environmentally beneficial ramifications of vegetative buffer strip landscaping.



LAND COVER IN THE GREAT LAKES WATERSHED

FOREST TO MI FAUCET

MIKE SMALLIGAN
MDNR FOREST STEWARDSHIP COORDINATOR

Do you know the source of your drinking water? If you live in a rural area, you get drinking water from your own well in your backyard. About 2.5 million people in rural Michigan get water from 1.25 million wells. Around 7.5 million people live in urban areas and pay a municipal water utility to deliver their drinking water. While some of this municipal water comes from deep wells and a little comes from rivers, almost 6 million people in Michigan rely on the Great Lakes as the source of their drinking water. Which Great Lake would you prefer to drink from – Lake Erie, green with algae or cold, blue Lake Superior?

If the drinking water in your faucet comes from a well, river, or Great Lake, a forest helped keep it clean before it was treated and delivered to your home. Forests cover 56% of Michigan's land so more than half of our water flows through 20 million acres of forest on its way to rivers, lakes, and the Great Lakes. Better than any other land use, forests provide clean water and protect the sources of our drinking water. Permanent vegetation in forests slows the velocity of water, reduces runoff that causes erosion, and filters water through plants and soil.

Lake Superior is clear and blue because its watershed is 91% forest. Detroit is fortunate that it gets water from Lake Huron with 67% forest in its watershed. Lake Michigan is in fair shape with 49% forest in its watershed. Lake Erie is the most polluted Great Lake because its watershed is 19% forest, 61% agriculture, and 18% urban. As we replace forests with factories, farms, and suburban sprawl, we increase pollution as well as the cost to clean our drinking water.

The Michigan Forest Stewardship Program is leading a team of a dozen conservation partners on a new project called "Forest to Mi Faucet" to highlight the connections between forests and drinking water. Forest to Mi Faucet is funded by the USDA Forest Service and builds on its national Forests to Faucets spatial analysis of priority watersheds for protecting surface drinking water. Partners on the project with the Department of Natural Resources include four watershed councils, three land conservancies, three regional conservation organizations, the Michigan Forest Association, and Michigan Master Loggers. All partners will help a dozen municipal water utilities implement their source water protection plans with three forest-based strategies.

First, we must protect forests so they can continue to protect water quality. Deforestation still occurs in southern Michigan where we lose 52,080 acres of forest annually, even though we gain 54,220 acres of forest from other land use around the state, yielding a net zero deforestation overall (USDA Forest Service, Forests of Michigan, 2019). Only 6% of Michigan's public or private forests are protected in ways that limit timber harvests to favor other ecological functions. Land conservancies should establish conservation easements and nature preserves to protect forests that are important for source water protection, especially in the southern Lower Peninsula where we have 80% of our people and only 18% of our forests. Michigan landowners should participate in the global movement to protect 30% of our land and water by 2030. For more information, check out "30 by 30".

(CONTINUED ON PAGE 11)

PHOTO CREDIT: MIKE SMALLIGAN
STUDENTS IN FRANKFORT PLANT TREES IN THEIR SCHOOL FOREST

> **Better than any other land use, forests provide clean water and protect the sources of our drinking water.**

(CONTINUED FROM PAGE 10)

Second, we must manage all forests well. Forest to Mi Faucet will encourage landowners, foresters, and Master Loggers to take good care of the woods. Partners will promote forest management plans, forest certification with American Tree Farm System, membership in the Michigan Forest Association, and logger training to always use forestry best management practices to protect soil and water quality.

Third, we can expand forests in strategic places. Partners will plant 60,000 trees in riparian zones and the DNR will plant 750,000 trees in upland state forests. Riparian forest buffers and other agroforestry practices help keep soil, nutrients, and manure on farms, not in our drinking water. Green infrastructure like rain gardens in cities are important to reduce runoff, especially in cities like Lansing and Detroit that have combined sewer overflows that dump 9 billion gallons of raw sewage into the Great Lakes every year.

Forest to Mi Faucet hopes to build the foundation for a future "payment for ecosystem services" market where family forest owners are compensated for providing clean water by managing their forests well and protecting sources of drinking water. Carbon markets for large and small forest owners are expanding rapidly, but markets for clean water are rare in the United States and not yet available in Michigan.

All of these Forest to Mi Faucet concepts apply directly to riparian homeowners seeking to protect water quality for recreation, fishing, and the property value of their home.

Homeowners should minimize lawn chemicals, maintain or remove septic systems, and plant natural shoreline buffers instead of seawalls or riprap. Permits from the Department of Environment, Great Lakes, and Energy are required to install or repair seawalls and riprap. Design ideas, native

(CONTINUED ON PAGE 12)

FOREST TO MI FAUCET

(CONTINUED FROM PAGE 11)

plant lists, and trained landscapers can be found at ShorelinePartnership.org. Planting trees near water or placing dead wood into the lake (which also requires a permit from EGLE) provides great fish habitat. For more information, see ForestsForFish.org.)

Riparian homeowners should also look upstream from their lake or river to explore the land use in their watershed that is impacting downstream water quality. If there are lots of forests, work with local land conservancies to help landowners protect and manage forests well. If there is a lot of agriculture, work with conservation districts, drain commissioners, and USDA programs to incentivize vegetated riparian buffers on farmland.

Instead of spending lake association money to dump more chemicals into your lake to treat water polluted by too many chemicals, try investing upstream in forest protection and better land management. Fix the real problem, not just the symptom. Paying a farmer to install a bridge to keep cows out of a stream or to plant wildflowers for pollinators along a drain could be cheaper and more effective than dumping even more chemicals into your lake.

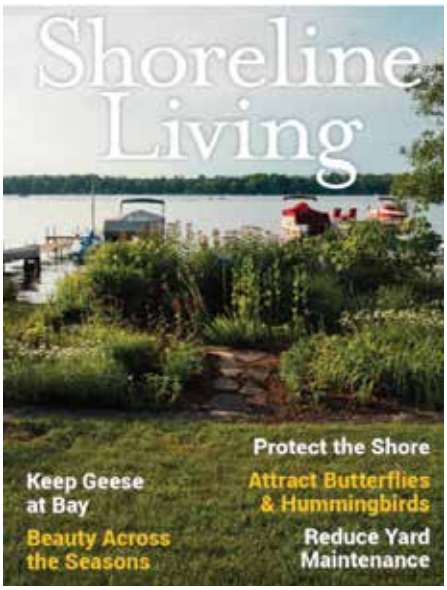


PHOTO CREDIT: MARK BUGNAKSI PHOTOGRAPHY
SHORELINE LIVING MAGAZINE

Forest to Mi Faucet is a team effort. Water utilities, land conservancies, conservation organizations, and watershed councils can be great partners for lake or stream associations to improve or protect water quality. Please join us by managing your home or forest in ways that protect drinking water. Life depends on it.

More information is available at Mi.gov/ForestToMiFaucet or by contacting Mike Smalligan at SmalliganM@michigan.gov.

THE CLINTON RIVER SMART STORMWATER MANAGEMENT PROJECT:

MONITORING AND MODELING IMPACTS OF URBANIZATION, CLIMATE CHANGE, AND E. COLI IN SOUTHEAST MICHIGAN

DR. GLENN O'NEIL | GIS RESEARCH SPECIALIST, INSTITUTE OF WATER RESEARCH, MICHIGAN STATE UNIVERSITY

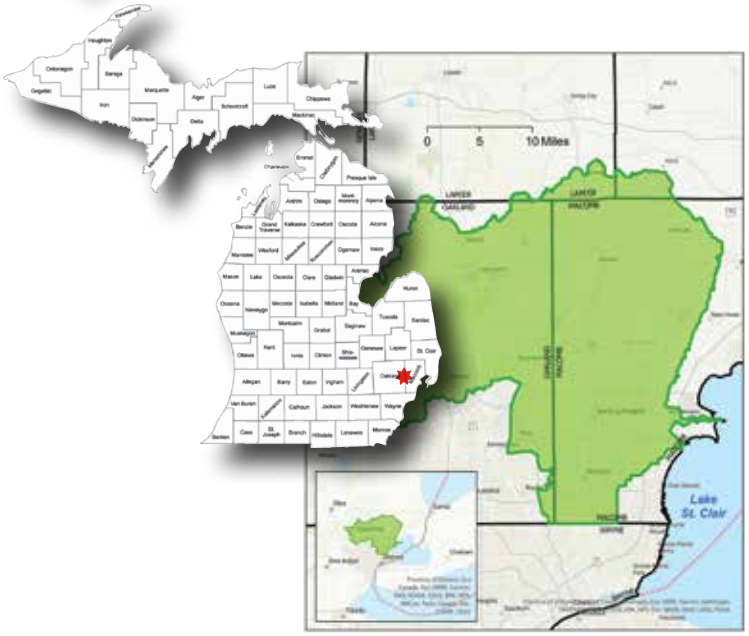


FIGURE 1: THE CLINTON RIVER WATERSHED

A project to help stakeholders in southeast Michigan more effectively manage the region's water resources and explore a "Smart Watershed" as a template for managing the Great Lakes has been developed and completed by a team of outreach specialists, researchers, and modelers from Michigan State University's Institute of Water Research (MSU-IWR), and the University of Michigan (UM). The Clinton River Smart Stormwater Management Project, funded by Michigan's Department of Environment, Great Lakes, and Energy (EGLE) through the EPA's Great Lakes Restoration Initiative, focused on the Clinton River and Lake St. Clair (Figure 1). The project demonstrates how lakes and streams in the Great Lakes basin could be affected by climate change and urbanization and what steps managers can take to mitigate those impacts.

The project's primary outputs include a hydrologic model of the Clinton River watershed that the team utilized to simulate multiple climate change, urbanization, and conservation scenarios; an assessment of *E. coli* risk from storm events through stream monitoring; a network of real-time water level sensors deployed throughout the region; and the Clinton River Watershed Explorer (CRWE) (https://iwr.msu.edu/clintonriver/), an online decision support system that integrates these outputs into a user-friendly and accessible platform for stakeholders.

The project team coordinated with stakeholders from Michigan's Macomb and Oakland counties to identify the priority water issues and data gaps that they face, and how the expertise from the project team could help address those needs. Those issues included flooding and *E. coli* concentrations in streams and lakes, while data gaps were generally those issues that could be effectively mitigated now and under a warmer and wetter future. Stakeholder input was a key collaborative component throughout the project and helped inform deployment of sensors, *E. coli* analysis, scenario modeling, and decision support system development. This article highlights the key outputs of the collaboration.

SENSOR NETWORK

As part of this project, researchers at MSU-IWR and UM expanded a network of real-time and passive water level sensors for southeast Michigan. By the end of the project, 48 sensors were recording stage readings of streams and lakes throughout the Clinton River watershed (Figure 2). The CRWE makes these readings readily available to stakeholders, allowing them to monitor hydrologic conditions in real time, and analyze historical data to better

(CONTINUED ON PAGE 14)

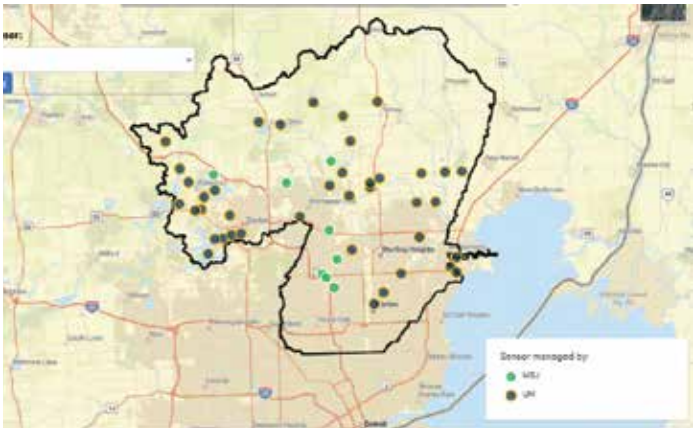


FIGURE 2: WATER LEVEL SENSORS DEPLOYED IN THE CLINTON RIVER WATERSHED

THE CLINTON RIVER SMART STORMWATER MANAGEMENT PROJECT

(CONTINUED FROM PAGE 13)

understand how the region's streams and lakes respond to various climatic conditions. The project team hopes to leverage this network and data to create smart controls that will allow water managers to effectively respond to flooding events in real time.

HYDROLOGIC MODELING

To explore the impacts of urbanization and other land cover change scenarios on the region's water resources, the research team developed a hydrologic model of the Clinton River watershed using the Soil and Water Assessment Tool (SWAT). The team calibrated the model to the observed historical conditions in the watershed's stream gauges, which then enabled the model to simulate a range of scenarios that could help stakeholders evaluate various water management strategies. These included the incremental impacts of urbanization on surface runoff (Figure 3), evapotranspiration, and groundwater recharge; how those results change under various future climate change scenarios; the importance of wetland preservation; and how land cover change at local scales affects hydrology.

E. COLI MONITORING

To assess the threat of *E. coli* in the watershed and explore the predictive capability of streamflow as an indicator of *E. coli* presence, a team of graduate students from UM's School for Environmental Sustainability conducted a monitoring program during the spring and summer months of 2021 at key locations in the Clinton River watershed. The team gathered samples during both dry conditions and during significant storm events of *E. coli* concentrations in streams (Figure 4) and then compared those values to nearby gauge-measured stream flow rates. Results showed that *E. coli* concentrations spiked during large rain events, especially during first flush episodes following longer periods of dry conditions, yielding a positive statistical relationship between stream flow and *E. coli*. However, observed concentrations often exceeded EPA criteria for partial and total body contact during dry conditions, implying that *E. coli* poses a persistent threat within the watershed (Figure 5).

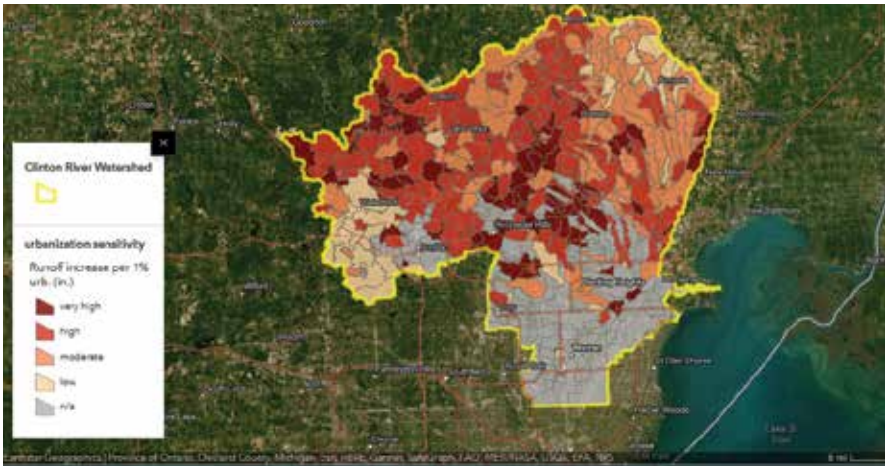


FIGURE 3: LANDSCAPE SENSITIVITY TO SURFACE RUNOFF DUE TO URBANIZATION

FIGURE 4: UM GRADUATE STUDENTS GATHERING E. COLI SAMPLES IN 2021

The CRWE ties all the project's components into a user-friendly interface (Figure 6). The system has narrative components to provide background and context for broader audiences and analytical tools for water managers to explore the outputs of the hydrologic modeling, water-level sensors, and *E. coli* monitoring in greater depth. These explorations include digitizing land cover change scenarios at field scale on a map and viewing estimated changes in surface runoff, watershed-scale simulations of increasing rates of urbanization, displays of the sensor-driven water-level monitoring, and interactive charts of the relationships between streamflow and *E. coli*. The narrative components include guided tours of the watershed, visualizations of the watershed's hydrologic cycle, and examples of successful green infrastructure projects in the watershed.

STAKEHOLDER FEEDBACK

The data and tools generated by the project have been well received by

(CONTINUED ON PAGE 15)

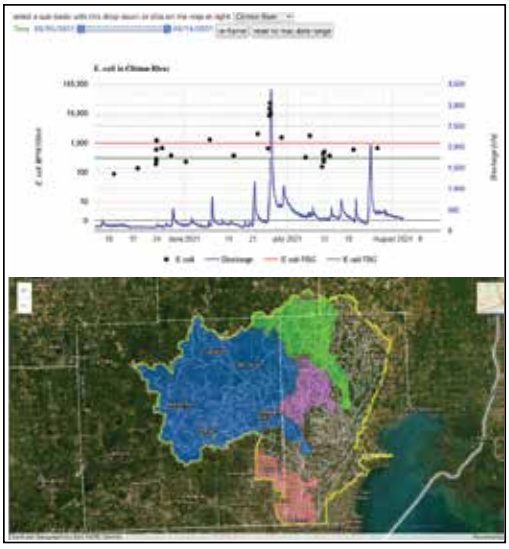


FIGURE 5: CRWE E. COLI ANALYSIS TOOLS

(CONTINUED FROM PAGE 14)

stakeholders in the region. "Both Macomb and Oakland counties are looking at doing microbial source tracking. Adding a map layer of sanitary and storm sewers alongside what the system already offers could allow us to see where contamination is getting into our system," said Stacey McFarlane, Public Health Service Manager, Macomb County Health Department.

Ryan Woloszyk, Civil Engineer III, Oakland County Commissioner's Office said, "I think it's been a really good project. There's a lot of good information that came out of it. What you've done with the sensors and with the project itself is helpful to water management efforts in the region."

Eric Diesing, former Chief Watershed Ecologist with the Clinton River Watershed Council summed up the project saying, "Overall a huge success…especially the *E. coli* data that I've seen from the student monitoring team. Looking at *E. coli* levels and how the rivers respond to the initial first flush was super helpful, and I have a printout of all those graphs."

To view and interact with the project outputs, explore the CRWE at https://iwr.msu.edu/clintonriver/, and use the contact page to ask questions or provide feedback.

FIGURE 6: CRWE HOME PAGE

PROJECT TEAM

The project team from MSU-IWR included: Jeremiah Asher, Greg Crosariol, Younsuk Dong, Glenn O'Neil, and Michael Thomas. UM team members included: Fariborz Daneshar, Megan DiCocco, Daniel Dominique, Tori Graves Field, Andrew Gronewald, Megan Houle, Weichen Huang, Valeriy Ivanov, Branko Kerkez, Kate Kusiak Galvin, Timothy Marchman, Kevin Murphy, Christine Purdy, Analise Sala, Paul Seelbach, Jacqueline Schmidt, Meagan Tobias, and Huayile Zhang.

PROTECTING AND RESTORING MICHIGAN'S LAKES AND STREAMS

62ND ANNUAL MLSA CONFERENCE

2023

SENATOR SEAN MCCANN KEYNOTE

"As the legislature continues to act, I look forward to ensuring that we are taking the actions necessary to preserve and protect our environment. I want to thank you all for your dedication to the preservation, protection, and management of inland lakes and streams."

HEALTHY LAKES AND PROPER LAND USE

Dr. Jermalowicz-Jones presented on multiple land uses that have negative impacts on lake water quality and how to use alternatives.

THE STRENGTH OF A TOWNSHIP ORDINANCE TO PROTECT THE LAKE

LuAnne Kozma, President of the Protect Lake Charlevoix Shoreland Group, included numerous slides that demonstrated the struggle between the Shoreland Group and the Township relative to preventing a large personal marina from being constructed on the pristine shore of Lake Charlevoix.

UNDERSTANDING THE INTERSECTION OF AGRICULTURE AND RIPARIAN ZONES

Michael Wozniak, MI Department of Agriculture and Rural Development, Environmental Stewardship Division, Right to Farm Manager, and Spills Response Coordinator, was joined by Daniel Busby, Verifier for Farm Programs, MI Department of Agriculture. These briefs discussed the voluntary programs that farms can participate in to protect the environment and improve farming processes and efficiency.

TWO RIVERS COALITION PARTNERING WITH PROTHONOTARY WARBLERS

Dan Burton, Vice President of Two Rivers Coalition, illustrated the importance of healthy floodplain forests and the need to include such forests in a watershed plan. He highlighted the focus on the Prothonotary Warbler bird as an indicator species for the condition/health of a floodplain forest.

THE IMPORTANCE OF WOOD AND LARGE WOOD MANAGEMENT IN RIVERS

Matthias Bonzo, Project Coordinator for Trout Unlimited, emphasized the need to have fallen trees in rivers/streams because their organic matter starts the food chain for healthy trout and salmon.

ANNIS WATER RESOURCES INSTITUTE REPORTS

Paris Velasquez's research looked at the role of salinity and phosphorus

(CONTINUED ON PAGE 17)

(CONTINUED FROM PAGE 16)

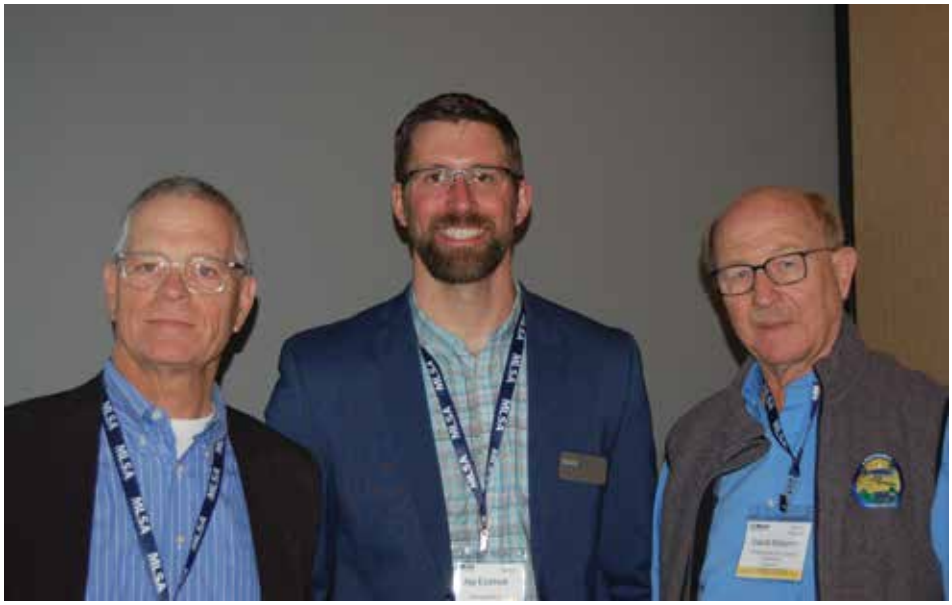
content in the water column. She advised homeowners to address high levels of phosphorus before dealing with high salinity to prevent phosphorus from reaching the water surface and propagating algal blooms once the lake begins to turn over again.

Davis Fray's talk summarized a chapter of his thesis research involving the use of molecular methods to describe the diversity and taxonomic composition of algal communities. He used a technique called metabarcoding to investigate microbial mats in anoxic, high-sulfur springs, revealing increased diversity and distinct communities.

John Hart presented the second chapter of his master's thesis on a conceptual fecal impairment framework. This framework was applied in two case studies, watershed and beach, to better categorize sites impaired by fecal pollution to prioritize their remediation.

Jillian Green's presentation included two remote sensing projects: one using Sentinel-3 OLCI imagery to quantify harmful algal bloom (HAB) growth in Muskegon Lake, and one using Landsat 8 imagery to predict water clarity across Michigan's inland lakes. Both projects display the application, feasibility, and potential benefits of using remote sensing for widespread lake quality monitoring in Michigan lakes.

Katherine Lucas's presentation focused on her thesis experiment. The project is set to be carried out this summer at the Mona Lake Celery Flats and aims to provide valuable insights to the restoration collaborators while contributing to the broader understanding of how climate change will affect our ecosystems, along with their management. Partial funding for this project was provided by MLSA and McNALMS.



EMERGENCY RISKS AND LESSONS LEARNED FROM THE KALAMAZOO OIL SPILL

Ralph Dollhoph is an on-scene coordinator for the EPA and has operated in the field since 1985. He provided a detailed overview of the process and insights from the 2010 Kalamazoo oil spill.

Jay Eickholt is the Emergency Management Coordinator, Health and Safety in the Environmental Support Division of EGLE. He covered the many aspects of emergency coordination and safety planning in Michigan to protect the water at federal, state, county, local, and industry levels.

(CONTINUED ON PAGE 18)

(CONTINUED FROM PAGE 17)

TITTABAWASSEE RIVER BOTTOMLANDS – NUISANCE WOODY VEGETATION MANAGEMENT

Paul Hausler, Water Resources Practice Leader, Progressive AE, and David Rothman, Vice President of the Four Lakes Task Force, discussed the extensive work that went into the restoration of the Tittabawassee River after the dam failures of 2020.

2023 RIPARIAN OF THE YEAR

Rusty Gowland, President and Founder of the Black Lake Preservation Society

2023 COOK SCHOLARSHIP RECIPIENT

Molly Engelman, Fisheries and Wildlife major with a concentration in Water Sciences at Michigan State University

RIPARIAN RIGHTS Q&A AND UPDATE BY ATTORNEY CLIFF BLOOM

Cliff provided participants the opportunity to ask their specific questions involving riparian and lake association legal matters. He spent the morning session talking about issues involving the following: bottomlands trespass, short-term rentals, wind generator towers, solar farms, lake access devices (such as parks, walkways, etc.), property owners associations, wake boats, use of lake-friendly local ordinances, prescriptive easements vs. adverse possession, and special assessment districts. He also explained what is happening with the current status of court cases involved with court-ordered lake levels.

LAKE STEWARDSHIP: DOING "WHAT IT TAKES" KEYNOTE BY TED RULSEH

This was an inspiring session that provided the motivation and encouragement to all the riparians who make positive change on their inland lakes year in and year out. Ted used examples of lake leaders doing the important work needed to protect our water from around the State of Michigan.

LAKE IMPROVEMENT BOARDS –MORE THAN JUST KILLING THE WEEDS

Mark Kieser, Senior Scientist for Kieser & Associates, and Rex Vaughn, Cedar Lake Improvement Board Chair and Riparian representative, Alcona-Iosco Cedar Lake Association, and MLSA board member, discussed how lake boards can use a watershed management plan to guide improvement projects.

WHY ZONING MATTERS: EXPLORING INNOVATIVE WATERFRONT ZONING IN EVANGELINE TOWNSHIP

Mary Reilly, Michigan State University Extension Educator, provided an excellent overview of zoning and explained why it is so important for residents, local and county governments, and state agencies to work as a team to protect our water and land.

(CONTINUED ON PAGE 19)

(CONTINUED FROM PAGE 18)

Rod Courtwright, Chairman Planning Commission for Evangeline Township, has soil conservation, planning, education, and public policy experience, and has led efforts in his township and region to be one of the leading zoning government bodies in the state.

MI SHORELAND STEWARDS AMBASSADOR PROGRAM

This program recognizes individuals who are working to increase shoreline resiliency of their lake properties by using natural landscaping. The program is also looking for passionate individuals to become part of their ambassador program to create awareness and help individuals on their lake access valuable resources for these programs.

NATIVE PLANTS? WHAT SHOULD I CHOOSE?

The session, hosted by Julia Kirkwood from EGLE, focused on promoting the use of native plants and landscaping in ways that aid in maintaining shoreline resiliency and water quality. This was an activity-filled workshop, where session attendees were able to use a number of resources to help design landscapes that support native fauna and help to increase shoreline resiliency and water quality.

EVERYTHING YOU WANTED TO KNOW BUT WERE AFRAID TO ASK ABOUT THE BASICS OF LAKE ASSOCIATIONS

Attorney and PBWOA President, Mark Teicher, along with Craig DeSimone, Gravel Lake Association President, discussed the legal details and funding details of running a successful association, as well as how to encourage member participation.

MICHIGAN WATERS, WHAT IS KNOWN AFTER YEARS OF NOTHING

John A. Yellich, Michigan Geological Survey Director, reviewed the recorded geology of the state since 1915 and the funding finally released in 2023 to expand a program to collect data from the mining industry, oil industry, local governments, and university research for the creation of a public database.

STATE AND LOCAL HEALTH DEPARTMENT RULES AND REGULATIONS ASSOCIATED WITH CONTAMINATING LAKES AND STREAMS

Sara Pearson, EGLE Source Water Unit Supervisor, discussed state and local health department rules and regulations associated with wells and septic systems.

CRYSTAL LAKE AND WATERSHED ASSOCIATION (CLWA) OPEN HOUSE

The board of the CLWA graciously welcomed conference attendees to check out their boat wash station. They learned about the history and process for creating and running the station to protect Crystal Lake.

CONCLUSIONS

Thank you to the MiCorps Cooperative Lakes Monitoring Program administrators, trainers, and especially the volunteers who joined us for training and stayed for the conference, too. This opportunity is available each year during the MLSA conference event.

Please join us in 2024 for more incredible sessions at our 63rd Annual Conference on Muskegon Lake. Check the MLSA website for details as they are made available.

> "One cannot outsource responsibility for the ecology of the lake."
>
> - RUSTY GOWLAND, 2023 RIPARIAN OF THE YEAR

HEALTHY LAKES AND PROPER LAND USE: A CRITICAL RECIPE FOR LAKE PROTECTION

DR. JENNIFER JERMALOWICZ-JONES, CLP | MLSA SCIENCE ADVISOR

NOTE: THE VARIOUS LINKS MENTIONED IN THIS ARTICLE WILL BE AVAILABLE IN *THE MICHIGAN RIPARIAN* COMPANION E-NEWSLETTER.

Many of Michigan's lakes have been developed and are thus vulnerable to water quality degradation from nonpoint and point source pollution from improper land use. The U.S. Environmental Protection Agency (EPA) defines land use as "human use of land including economic and cultural activities practiced at a given place". The two major categories of land use include land activities on rural and urban lands (Coulter et al., 2007). Human behaviors and culture play a pivotal role in the manner of land use (Amato et al., 2015). Land use can affect all components of the water profile from surface waters to the underlying groundwater (Figure 1).

Nonpoint source (NPS) pollution is the pollution caused when climatic events carry pollutants off of the land and into lakes, streams, wetlands, and other water bodies. Unlike point source pollution, which is derived from distinctive discharge pipes, NPS pollution is often diffuse in nature. This creates challenges in determining the location of pollution sources which makes mitigation (treatments) a difficult and sometimes impossible task. NPS pollution is regulated and includes categories such as agricultural source runoff and confined animal feed operations (CAFOs), small urban runoff (populations with < 100,000 residents), urban stormwater runoff from unsewered areas, septic tanks, runoff from abandoned mines, land disturbing activities, and atmospheric deposition. The NPS pollutants of greatest concern to local waterways include nutrients such as nitrogen and phosphorus, sediment, toxic compounds, and pathogens (*E. coli*, among many others). The Water National Quality Inventory (1994) ranked the leading sources of water quality impairment to lakes as agriculture, municipal point sources, and urban runoff. All of these pollutants can result in accelerated lake eutrophication (cultural eutrophication) which includes impacts such as widespread harmful algal blooms (HABs), dissolved oxygen depletion and fish kills, excessive nutrient loading and aquatic vegetation growth, and increased total suspended solids. Continued alterations in the lake trophic status can lead to what is known as an "alternate stable state" (Figure 2) that may lead to an ongoing turbid state where water clarity is low, submersed aquatic vegetation declines, and surface algae thrives. Over time, this can result in widespread HABs and render a lake nearly unusable.

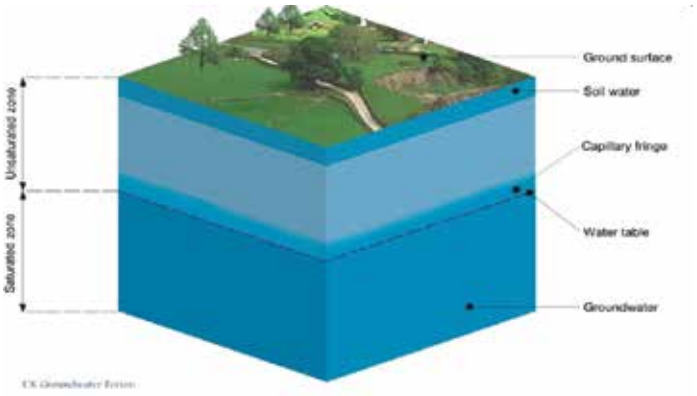


FIGURE 1. CROSS SECTIONAL VIEW OF THE EARTH WATER PROFILE

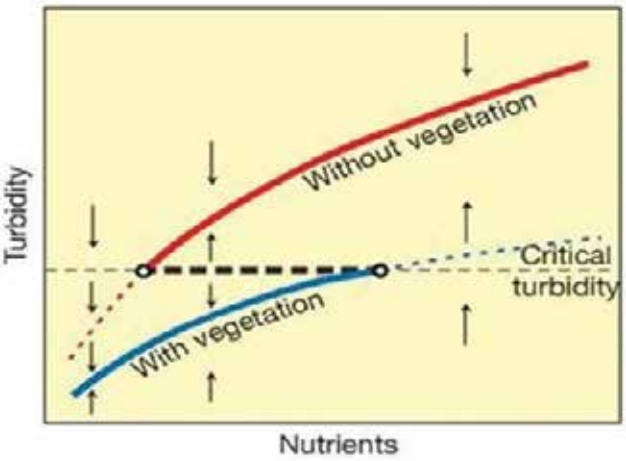


FIGURE 2. DIAGRAM OF ALTERNATE STABLE STATES ADAPTED FROM SCHEFFER ET AL., 1998

EXAMPLES OF POOR LAND USE

1. POORLY MAINTAINED SEPTIC SYSTEMS AND DRAINFIELDS

A basic septic system typically consists of a pipe leading from the home to the septic tank, the septic tank itself, the drain field, and the soil. The tank is usually an impermeable substance such as concrete or polyethylene and delivers the waste from the home to the drain field. The sludge settles out at the tank bottom and the oils and buoyant materials float to the surface. Ultimately the drain field receives the contents of the septic tank and disperses the materials into the surrounding soils. The problem arises when this material enters the zone of water near the water table and gradually seeps into the lake bottom. This phenomenon has been noted by many scholars on inland waterways as it contributes sizable loads of nutrients and pathogens to lake water. Lake bed seepage is highly

(CONTINUED ON PAGE 21)

(CONTINUED FROM PAGE 20)

dependent upon water table characteristics such as slope (Winter 1981). In addition, the higher the rainfall the more likely seepage will occur and allow groundwater nutrients to enter waterways. Seepage velocities will differ greatly among sites and thus failing septic systems will have varying impacts on the water quality of specific lakes. Seepage in lake systems occurs as far as 80 meters from the shore (Lee 1977). This finding may help explain the observed increases in submersed aquatic plant growth near areas with abundant septic tank systems that may not be adequately maintained.

On ideal soil types, microbes in the soil are able to decompose nutrients and reduce the probability of groundwater contamination. However, many lakes in Michigan contain soils that are not suitable for septic systems. Soils that are mucky, not very permeable, and prone to saturation or ponding may be associated with a marked reduction in phosphorus assimilation and adsorption (Gilliom and Patmont, 1983; Sawhney and Starr, 1977) which leads to the discharge of phosphorus into the groundwater, especially in areas with a high water table. In the study by Gilliom and Patmont (1983) on Pine Lake in the Puget Sound of the western United States, they found that it may take 20-30 years for the phosphorus to make its way to the lake and cause negative impacts on water quality. Typical septic tank effluents are rich in nutrients such as phosphorus and nitrogen, chlorides, fecal coliform, sulfates, and carbon (Cantor and Knox, 1985). Phosphorus and nitrogen have long been identified as the key causes of nuisance aquatic plant and algae growth in inland lakes. Although phosphorus is often the limiting growth factor for aquatic plant growth, nitrogen is often more mobile in the groundwater and thus is found in abundance in groundwater contributions to lakes. For example, a groundwater seepage study on submersed aquatic plant growth in White Lake, Muskegon County, Michigan (Jermalowicz-Jones 2005) found that both phosphorus and nitrogen concentrations were higher in developed areas than in undeveloped areas. This helped to explain why the relatively undeveloped northern shore of White Lake contained significantly less submersed aquatic plant growth than the developed southern shoreline. Sass et al. (2010) found that lakes associated with rigorous development in surrounding watersheds had more invasive species and less native aquatic plant diversity than less developed lakes. Thus, land use activities such as failing septic systems may not only affect aquatic plant biomass and algal biomass, but also the composition and species richness of aquatic plant communities.

(CONTINUED ON PAGE 22)

REPRINTING ARTICLES FROM THE MAGAZINE

Frequently, lake associations, the press, educational institutions, and others request permission to reprint an article from *The Michigan Riparian* magazine in a newsletter, newspaper, or other publication. In general, *The Michigan Riparian* magazine is relatively liberal in granting permission for such reprints. However, no such reprint can be done without the express prior written permission of the magazine.

If you or your organization wishes to reprint an article from *The Michigan Riparian* magazine, please contact us at (989) 831-5100 or info@mymlsa.org. If approved, we will notify you by email or letter. When permission is granted, the following language must appear just before or after the reprint:

"Reprinted with permission of *The Michigan Riparian* magazine from the (indicate the season & year) issue, author's name: _____ Copywritten by the Michigan Lakes & Streams Association, Inc."

FIGURE 3. A GREEN LAWN ABUTTING A TRIBUTARY PRIOR TO ENTERING AN INLAND LAKE

FIGURE 4. PHOTO OF A NATURAL OR "SOFT" SHORELINE AROUND AN INLAND LAKE

HEALTHY LAKES AND PROPER LAND USE

(CONTINUED FROM PAGE 21)

Poorly maintained septic systems may also lead to increases in toxin-producing blue-green algae such as Microcystis. This alga is indicative of nutrient-rich waters and forms an unsightly green scum on the surface of a water body. Toxins are released from the algal cells and may be dangerous to animals and humans in elevated concentrations. Furthermore, the alga may shade underlying native aquatic plants and create a sharp decline in biomass which leads to lower dissolved oxygen levels in the water column. To learn more about proper septic system and drain field maintenance and repair, visit https://www.epa.gov/septic.

2. DEVELOPMENT TOO CLOSE TO LAKE SHORELINE

Many inland lakes have waterfront homes that are close to a lake shoreline. This is regulated by local ordinances but many homes are within 200 feet of the lake shoreline. This can increase the amount of runoff with increased impervious surfaces close to the lake.

The use of low impact development (LID) practices will help reduce runoff and protect water quality. An example of a low impact development practice would be the installation of vegetation buffers along lake shorelines, especially in front of recently constructed homes with impervious surfaces. Following this protocol will allow for improvements to water quality at the regional scale. Future development around lakes should consider significant set-back distances with a generous greenbelt along the lakeshore and adequate tree cover. To learn more about LID visit https://www.epa.gov/nps/urban-runoff-low-impact-development.

3. USE OF ANY LAWN FERTILIZERS

Most lakefront owners desire a green lawn (Figure 3). This is an aesthetic preference, but some are unaware of the natural fertilizers in lake water itself. Always avoid the use of lawn fertilizers that contain phosphorus. Phosphorus is the main nutrient required for aquatic plant and algae growth, and plants grow in excess when phosphorus is abundant. Many counties in Michigan now have a ban on the use of fertilizers that contain phosphorus. When possible, water lawns with lake water that usually contains adequate phosphorus for successful lawn growth. If you must fertilize your lawn, be sure that the middle number on the bag of fertilizer reads "0" to denote the absence of phosphorus. If possible, also use low-nitrogen fertilizer or just use lake water. Nitrogen in the forms of nitrate and ammonia can also be detrimental to lake health and exacerbate algal growth. If you are unsure whether your lawn soils are fertile enough for solely lake water, visit the following Michigan State University website for a testing kit to assist you with a decision: https://homesoiltest.msu.edu/.

4. LACK OF SHORELINE BUFFER/POOR SHORELINE MANAGEMENT

There has been much research in recent years on the advantages of natural shorelines (Figure 4) for good lake health. Natural shorelines absorb more wave energy relative to hard shorelines such as seawalls and concrete, and also provide micro-habitats for spawning fish and other wildlife. In addition, properly constructed soft shorelines can also effectively reduce erosion of the land into the water which reduces turbidity over time. Visit the Michigan Natural Shoreline Partnership's website to learn more about natural shorelines and find certified contractors that can help develop one on your shoreline: https://www.shorelinepartnership.org/. Furthermore, poor shoreline development can include homes that are too close to shore and especially with impervious surfaces (Figure 5).

(CONTINUED ON PAGE 23)

(CONTINUED FROM PAGE 22)

5. DUMPING LEAVES INTO STORM DRAINS OR THE LAKE

Most foreign substances that enter storm drains eventually empty into inland waters. Leaves in particular are commonly placed onto streets with drains and these leaves end up on the lake bottom (Figure 6). Leaves are high in tannins and break down very slowly and thus accumulate on the lake bottom. If they are dense in nearshore areas, they can cover fish spawning beds and other sensitive habitats. Decomposition of leaves is a slow process and reduces oxygen in the water which can stress aquatic life. Also, do not burn leaves nearshore as the ash is also high in nutrients and can enter the lake. Instead, consider composting them as described on this site: https://www.compostguide.com/using-leaves-for-composting/.

6. POORLY MAINTAINED STORM DRAINS OR TRIBUTARIES

The control of nutrients from a surrounding watershed or catchment to any lake is a proven necessity for long-term nutrient reduction. Storm drains and tributaries are conduits for transporting nutrients and solids to lakes. Although nutrients are essential for the primary production of algae and aquatic plants in a lake ecosystem, an overabundance of nutrients causes substantial problems, as noted above. In

(CONTINUED ON PAGE 24)

FIGURE 5. HOUSING DEVELOPMENT TOO CLOSE TO A LAKE SHORELINE WITH MANY IMPERVIOUS SURFACES PRESENT

FIGURE 6. LEAVES ENTERING A STORM DRAIN ON AN INLAND LAKE

HEALTHY LAKES AND PROPER LAND USE

(CONTINUED FROM PAGE 23)

FIGURE 7. A POORLY MAINTAINED DRAIN LEADING INTO AN INLAND LAKE

FIGURE 8. EROSION OF A BANK ALONG A LAKE SHORELINE

vulnerable areas, these pollutants enter lakes after a climatic event such as heavy rainfall or snowmelt. Poorly maintained drains and tributaries are a major source of water quality degradation in receiving lakes (Figure 7). The surrounding landscape is crucial for the determination of critical source areas along these waterways as some areas contain high slopes which increase the probability of erosion, while others contain soils that pond and contribute pollutants to the lake via runoff from the land. A drain or tributary inventory of the areas entering a lake should be conducted to quantify the pollutant loads and also determine the specific sources. This will allow for cost-effective and site-specific mitigation which is critical for effective water quality improvements over time.

7. POOR EROSION CONTROL ALONG THE SHORELINE, DRAINS, OR TRIBUTARIES

The fetch in an inland lake (which is the distance across the greatest length of the lake to produce a wind-driven wave) is responsible for wave height, which influences erosion over time. Shoreline bathymetry also plays a big part in determining the degree of erosion at a particular shoreline site. Sites with straight shorelines and points that are exposed to long wind fetches from prevailing wind directions are vulnerable to more frequent and higher waves. Additionally, where the water deepens abruptly and there is less resistance or bottom roughness to influence the wave, exposed shorelines are susceptible to larger waves. Lastly, heavy human foot traffic and mowed areas all contribute to substantial shoreline erosion in certain reaches of the lake. A loss of vegetative cover in these locations accelerates erosion and sedimentation. Bank undercutting and gully erosion are two common types of erosion that contribute to inputs of soils into lakes that become

(CONTINUED ON PAGE 26)

FIGURE 9. GULLY EROSION ENTERING AN INLAND LAKE

FIGURE 10. FILLING OF WETLAND AREAS FOR DEVELOPMENT

HEALTHY LAKES AND PROPER LAND USE

(CONTINUED FROM PAGE 24)

sediments. Figures 8 and 9 demonstrate bank and gully erosion, respectively, which are common on inland lakes and should be mitigated to improve water quality.

8. FILLING OF WETLANDS NEAR THE LAKE OR TRIBUTARIES

Wetlands have a critical role in serving as both sinks as well as sources of nutrients to adjacent waterways. They can be powerful filters for inland lakes and are protected. In recent years, development or filling of wetlands has increasingly become permitted and this is of great concern and should be discouraged (Figure 10). The following site provides extensive information on the types of wetlands, their functions, and importance: https://www.epa.gov/wetlands.

9. FEEDING/PROMOTING CANADA GEESE OR SEAGULLS

The Canada goose is the largest and most widely distributed goose throughout the arctic and temperate regions of North America. Historical hunting once reduced migrating geese populations, prompting a massive undertaking to reestablish the species within the United States. In the early 1940s, Canada goose populations were so low that there was some fear of extinction. Efforts by the federal government and many states to provide protection brought the populations back up to a more desirable level in the 1980s. In Michigan, their numbers presently exceed 300,000 (DNR 2018). Its distinctive cackling and V-shaped migrations are known by all as a signal of changing seasons. However, not all Canada geese embark on long-distance journeys; some establish resident populations which are the cause of most conflicts today. This resident type has found the perfect environment in the urban open-water habitat dotting Michigan's landscape. Modern land use has encouraged the creation of open spaces, eliminating ground cover for predators and providing well-manicured lawns adjacent to ponds and lakes in which Canada geese thrive. Extensive food resources, protected nesting areas, and refuge from predators has triggered a population explosion among resident geese.

Both Canada geese groups share the well-known black-headed, white "chinstrap" characteristic, making them difficult to distinguish. Geese are grazing herbivores and prefer grass, aquatic vegetation, seeds, and various grains. Adults can weigh from 10 to 17 pounds, eat up to 4 pounds of grass a day, and return up to 2 pounds of that as feces (Crowford 1999). Canada geese live up to 24 years, keep the same mate for life, and return to nest in the same location, generally during the months of March through May (DNR 2018). Adult geese are particularly aggressive during breeding and nesting season, and their behavior can cause problems for lake residents and visitors when they attack and nip (Eccher 2000). As the population rises nationwide and fierce turf wars follow, it is important to remember that Canada geese also provide recreational viewing and hunting opportunities for many. A continued expansion of ideal habitat requirements challenges managers and lake residents to find some level of tolerance. Further complicating management strategies for controlling resident populations is the fact that Canada geese are managed and protected by the US Fish & Wildlife Service under the Migratory Bird Treaty Act of 1918. This has made it unlawful to kill, hunt, or disturb nests and eggs unless permitted by the Secretary of the Interior. They can be legally hunted during hunting season with the proper license; however, hunting access is often limited due to the proximity to human environments. Feeding them is strongly discouraged as this allows them to reside in a given area and defecate on lawns, docks, and in the lake. The MDNR has additional information on goose control and permitting for those activities at the following site: https://www.michigan.gov/dnr/managing-resources/wildlife/nuisance-wildlife/nuisance-canada-goose-faqs.

(CONTINUED ON PAGE 27)

(CONTINUED FROM PAGE 26)

LITERATURE CITED:

Canter, L.W., and R.C. Knox. Septic tank system effluents on groundwater quality. Chelsea, Michigan, Lewis Publications, Inc. 336 p.

Crowford, H.M., 1999. Animal Waste and Water Quality, Fact Sheet #6. Clean Waters Sea Grant Extension Program. University of Connecticut Cooperative Extension.

Eccher, C.J. 2000. Please Don't Feed the Ducks. Lake Line FOLA Newsletter. Retrieved 2/22/2018: http://icelandmag.is/article/city-authorities-urge-people-please-dont-feed-ducks-lake-tjornin.

Gilliom, R.J., and Patmont, C.R. 1983. Lake phosphorus loading from septic systems by seasonally perched groundwater. Journal of the Water Pollution Control Federation. 55(10):1297-1305.

Jermalowicz-Jones, J.L. 2005-2007. Submersed aquatic macrophyte growth and groundwater nutrient contributions associated with development around White Lake, Muskegon County, Michigan. MS thesis. Grand Valley State University, Allendale, Michigan. 89 pp.

Lee, D.R. 1977. A device for measuring seepage flux in lakes and estuaries. Limnology and Oceanography 22(1):140-147.

Michigan Department of Natural Resources. 2018. Goose-Human Conflicts and Control Techniques. Retrieved 2/22/2018: http://www.michigan.gov/dnr/0,4570,7-153-10370_12145_25065-59467--,00.html#Legal Status. Van Buren Conservation District, July 2012, Landscaping for Water Quality.

Sass. L.L., Bozek, M.A., Hauxwell, J.A., Wagner, K., and Knights, S. 2010. Response of aquatic macrophytes to human land use perturbations in the watersheds of Wisconsin lakes, USA. Aquatic Botany 93:1-8.

Sawhney, B.L., and J.L. Starr. 1977. Movement of phosphorus from a septic system drain field 49(11):2238-2242.

Scheffer, M., Jeppesen, E. (1998). Alternative Stable States. In: Jeppesen, E., Søndergaard, M., Søndergaard, M., Christoffersen, K. (eds) The Structuring Role of Submerged Macrophytes in Lakes. Ecological Studies, vol 131. Springer, New York, NY. https://doi.org/10.1007/978-1-4612-0695-8_31

Winter, T.C. 1981. Effects of water-table configuration on seepage through lake beds. Limnology and Oceanography 26(5):925-934.

HIDDEN DANGER: FECAL POLLUTION AND EFFECTIVE PREVENTION

JOHN J. HART, MIKE FOSTER, MARK S. KIESER
KIESER & ASSOCIATES, LLC | 536 E MICHIGAN AVE. #300 | KALAMAZOO, MI 49007

As summer quickly approaches, many homeowners are gearing up for another fun season on the water with boating, swimming, fishing, and many other activities on the docket. As these plans come together, there is one issue that could throw a wrench into the works: nonpoint source fecal pollution. Fecal pollution poses a threat to both you and your lake through the introduction of harmful pathogens such as giardia, cryptosporidium, norovirus, and hepatitis A, many of which can cause a variety of gastrointestinal illnesses if ingested. Nonpoint source fecal pollution is also associated with excess nutrients that can cause eutrophication and harmful algal blooms in our waterbodies.

Some common sources of fecal pollution are leaking/failing septic systems, illicit sewer connections into streams, livestock access to streams, areas with combined sewer/sanitary sewer overflows, and runoff from manure applications in agricultural areas.[1,2] Storm sewers are a common source of fecal pollution with fecal material from wildlife such as racoons and household pets being washed into waterbodies.[3] Lakes that: a) are surrounded by septic systems, b) receive discharges from storm sewers, or c) are in close proximity to animal agriculture are at a heightened risk for pathogen contamination from fecal pollution. To understand health risks to swimmers, proper identification of the waste source is key.

The most common way fecal pollution is monitored is by culturing Fecal Indicator Bacteria (FIB). In freshwater systems, *Escherichia coli (E. coli)* is the FIB of choice. E. *coli* are present in the guts of all warm-blooded animals and their presence is associated with fecal pollution.[4] In order to protect swimmers, the U.S. Environmental Protection Agency (EPA) has established a daily beach action value (BAV) for *E. coli* in aquatic systems of 237 *E. coli* colonies per 100 milliliters of water.[5] Beaches and waterbodies where swimming occurs that test above this limit are closed to protect public health until further testing can show that *E. coli* has dropped below the BAV. Additionally, the EPA mandates that every state is required to set their own action limits for waterbodies. The State of Michigan has set its daily BAV at 300 *E. coli* colonies per 100 milliliters of water.[6]

While *E. coli* is an effective FIB for public health, it has some drawbacks

(CONTINUED ON PAGE 29

(CONTINUED FROM PAGE 28)

for identifying and treating the source of the problem. Several studies have shown that *E. coli* is only a general indicator organism that can originate from many different species. *E. coli* has also been documented to survive and grow in lake and stream sediments, meaning it may persist in the environment.[7,8] This can make identification and treatment of the source(s) difficult.

Recent scientific advancements have addressed these limitations by analyzing samples for environmental DNA called Microbial Source Tracking (MST). MST aims to target and measure individual species, and has been implemented in a variety of waterbodies.[9,10] From MST, the source can be properly identified, and effective treatment strategies can be implemented.

Once the origin of the bacteria is identified, experience and expertise in stormwater and nonpoint source runoff management comes into play. Examples of effective practices to minimize impacts of fecal pollution include: 1) picking up pet waste, 2) regularly pumping septic tanks, 3) establishing vegetative buffers to deter local waterfowl from shorelines, 4) keeping farm animals from congregating in streams, 5) altering manure storage practices on farms, 6) keeping trash properly stored to discourage racoons, and 7) working with your community through their stormwater management efforts.[11,12]

For more information please contact John Hart (email: jhart@kieser-associates.com, phone: (269) 344-7117). John is an expert on applying Microbial Source Tracking techniques to aid in nonpoint source fecal identification for a variety of watersheds and waterbodies. He has published several peer-reviewed publications and has received the Outstanding Publication Award from Grand Valley State University for his efforts.

[1] Dila, D. K., Corsi, S. R., Lenaker, P. L., Baldwin, A. K., Bootsma, M. J., & McLellan, S. L. (2018). Patterns of Host-Associated Fecal Indicators Driven by Hydrology, Precipitation, and Land Use Attributes in Great Lakes Watersheds. *Environmental Science and Technology*, 52(20), 11500–11509. https://doi.org/10.1021/acs.est.8b01945

[2] Flood, M. T., Hernandez-Suarez, J. S., Nejadhashemi, A. P., Martin, S. L., Hyndman, D., & Rose, J. B. (2022). Connecting microbial, nutrient, physiochemical, and land use variables for the evaluation of water quality within mixed use watersheds. Water Research, 219, 118526. https://doi.org/10.1016/j.watres.2022.118526

[3] Ram, J. L., Thompson, B., Turner, C., Nechvatal, J. M., Sheehan, H., & Bobrin, J. (2007). Identification of pets and raccoons as sources of bacterial contamination of urban storm sewers using a sequence-based bacterial source tracking method. *Water Research*, 41(16), 3605–3614. https://doi.org/https://doi.org/10.1016/j.watres.2007.04.013

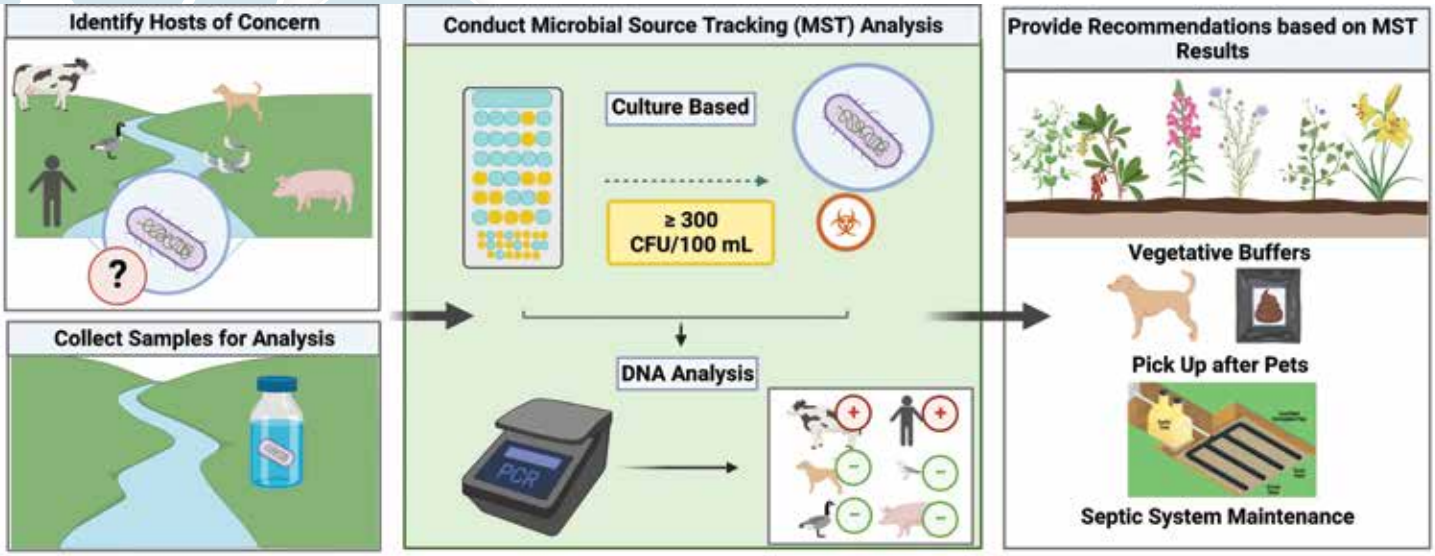
[4] Dufour, A. (2021). A short history of methods used to measure bathing beach water quality. Journal of *Microbiological Methods*, 181, 106134. https://doi.org/10.1016/j.mimet.2021.106134

[5] US EPA. Recreational Water Quality Criteria. *U. S. Environ. Prot. Agency* 1–69 (2012).

(CONTINUED ON PAGE 30)

HIDDEN DANGER: FECAL POLLUTION AND EFFECTIVE PREVENTION

(CONTINUED FROM PAGE 29)



EXAMPLE OF THE ENTIRE SOURCE TRACKING PROCESS (CFU=COLONY FORMING UNITS; PCR=POLYMERASE CHAIN REACTION). PCR IS A METHOD THAT AMPLIFIES HOST-ASSOCIATED DNA OF THE SPECIES OF INTEREST AND HELPS WITH MICROBIAL SOURCE TRACKING APPLICATIONS.

[6] *Michigan Public Health Code and Rule* 323.1062(1). 1–72 (1994).

[7] Jamieson, R. C., Joy, D. M., Lee, H., Kostaschuk, R. & Gordon, R. J. Resuspension of Sediment-Associated *Escherichia coli* in a Natural Stream . J. Environ. Qual. *34*, 581–589 (2005).

[8] Safaie, A., Weiskerger, C. J., Nevers, M. B., Byappanahalli, M. N. & Phanikumar, M. S. Evaluating the impacts of foreshore sand and birds on microbiological contamination at a freshwater beach. *Water Res.* **190**, 116671 (2021).

[9] Jamison, M. N., Hart, J. J. & Szlag, D. C. Improving the Identification of Fecal Contamination in Recreational Water through the Standardization and Normalization of Microbial Source Tracking. *ACS ES&T Water* (2022) doi:10.1021/acsestwater.2c00185.

[10] Hart, J. J., Jamison, M. N., McNair, J. N., Woznicki, S. A., Jordan, B., & Rediske, R. (2022). Using Watershed Characteristics for Improving Fecal Source Identification. *BioRxiv*, 2022.06.16.496426. https://doi.org/10.1101/2022.06.16.496426

[11] Michigan Department of Environment, Great Lakes, and Energy *Reducing E. coli Contamination of Beaches, Rivers, and Lakes A Guide for Homeowners*. https://www.michigan.gov/-/media/Project/Websites/egle/Documents/Programs/WRD/SWAS/TMDL-Ecoli/ecoli-reducing-guide-homeowners.pdf?rev=6218fa3c92c44e548d82072f60270166 (2021).

[12] Agency, Minnesota Pollution Control. Overview and management strategies for bacteria in stormwater. https://stormwater.pca.state.mn.us/index.php?title=Overview_and_management_strategies_for_bacteria_in_stormwater.

Live On A Lake?

Concerned about the Future of your Water Resources?
Know someone who is?
Join MLSA and Subscribe to *The Michigan Riparian* today
Or Give the Gift of MLSA to friends and family.

Your annual membership of $45 entitles you to a subscription to *The Michigan Riparian* magazine as well as supports our educational programs and water protection efforts.

Join or renew online with a credit card -- mymlsa.org
Or mail your check payable to:
MLSA | PO Box 19615 | Kalamazoo, MI 49019

We have multi-year membership and subscription options:

- ☐ 2 years is $80
- ☐ 5 years is $150
- ☐ Lifetime is $500
- ☐ ONLY subscribe to *The Michigan Riparian* magazine for $25 (one year)

First Name: _____ Last Name: _____

E-Mail: _____

Mailing Address: _____

City: _____ State: _____ Zip: _____

Phone Number: _____

THE MICHIGAN RIPARIAN
www.mi-riparian.org

PO Box 19615
Kalamazoo, MI 49019

NON-PROFIT ORG.
U.S. POSTAGE
PAID
LANSING, MI
PERMIT #975

NOTE TO SUBSCRIBERS:
Please email info@mymlsa.org with any changes regarding your mailing address.